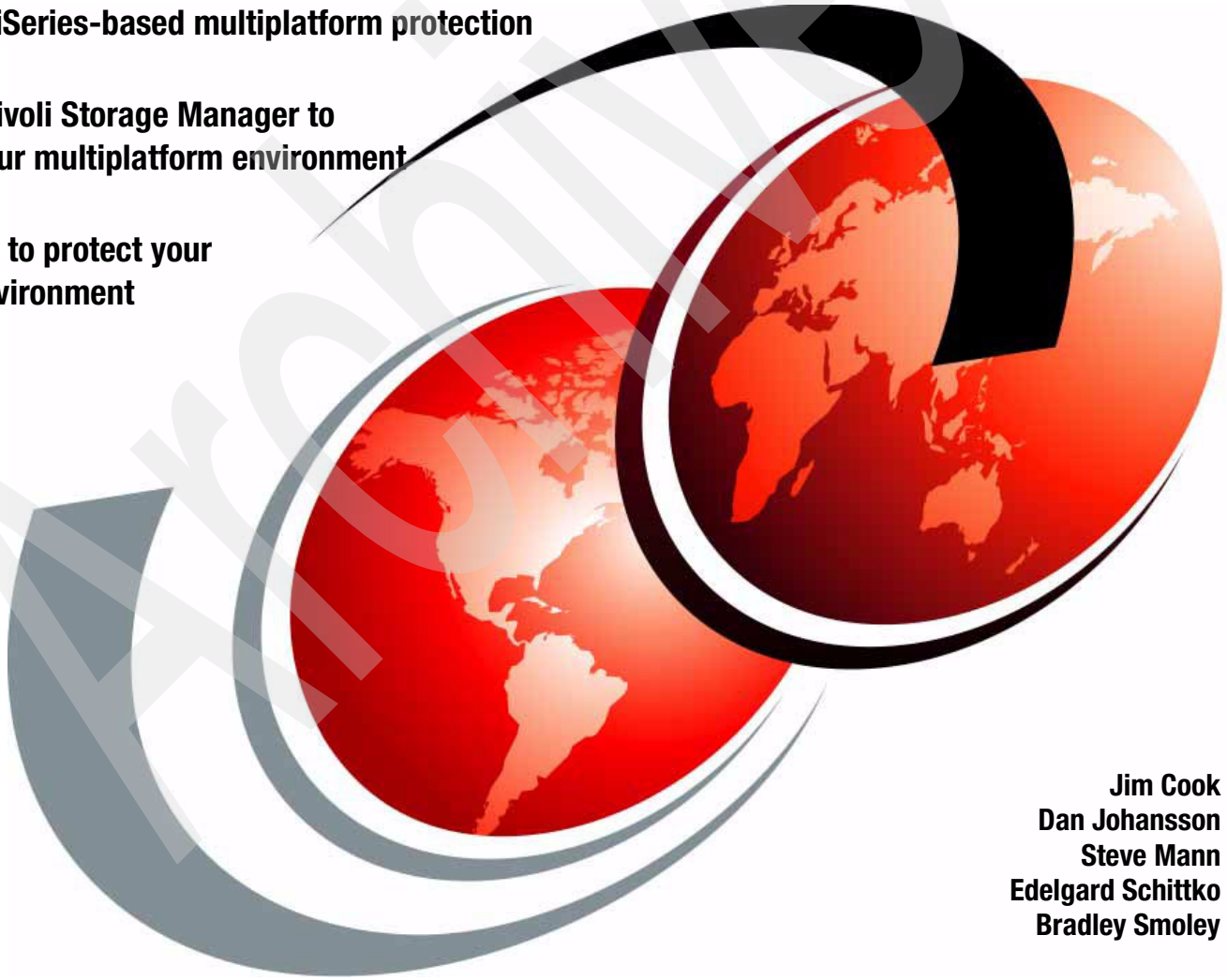
IBM

Integrating Backup Recovery and Media Services and IBM Tivoli Storage Manager

on the IBM @server iSeries Server

- Use BRMS and IBM Tivoli Storage Manager for the most complete iSeries-based multiplatform protection
- Use IBM Tivoli Storage Manager to protect your multiplatform environment
- Use BRMS to protect your iSeries environment



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International Technical Support Organization

Integrating Backup Recovery and Media Services and IBM Tivoli Storage Manager on the IBM @server iSeries Server

December 2003

SG24-7031-00

Note: Before using this information and the product it supports, read the information in “Notices” on page ix.

First Edition (December 2003)

This edition applies to Version 5 Release 2 of Backup Recovery and Media Services for iSeries (5722-BR1) and Version 5.1.5 and Version 5.2 of IBM Tivoli Storage Manager for OS/400 Portable Application Solutions Environment (PASE) Server (5698-ISX).

Contents

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Preface

IBM® Backup Recovery and Media Services (BRMS) for the IBM @server iSeries™ server is the strategic solution for managing backup, recovery, media, and storage in an iSeries-only environment. IBM Tivoli® Storage Manager server and client products are the IBM tools that correspond to backup, recovery, media, and storage management functions in a heterogeneous (multiplatform) environment. IBM offers a unique integrated solution by combining the proven performance of BRMS on the iSeries server with the multiplatform capabilities of IBM Tivoli Storage Manager.

In a multiplatform environment that includes iSeries servers, you can use the two products independently of each other. However, by integrating the two products, you achieve a much more powerful set of capabilities to back up and recover your mission-critical data and applications.

Based on iSeries V5R2 BRMS and V5.2 of IBM Tivoli Storage Manager, this IBM Redbook provides:

- An overview of BRMS and IBM Tivoli Storage Manager terminology, constructs, and capabilities
- Cookbook examples to get BRMS and IBM Tivoli Storage Manager server up and running on your iSeries server, as well as to set up your iSeries server as the BRMS Application Client to an IBM Tivoli Storage Manager server running on the iSeries server
- Troubleshooting guidance and tips for integrating BRMS and IBM Tivoli Storage Manager server on the iSeries server
- “As is” iSeries user programs and OS/400® commands to enable an iSeries system operator to manage integrated BRMS and IBM Tivoli Storage Manager server functions through a single user interface

The team that wrote this redbook

This redbook was produced by a team of specialists from around the world working at the International Technical Support Organization (ITSO), Rochester Center.

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Dan Johansson is an Senior Technical Support Specialist working for IBM in Sweden. He has over 30 years of computer experience, including 25 years working within IBM midrange computer systems. He was part of the 1403 team sent to Germany to transfer IBM printer manufacturing to Sweden. Dan has assisted and led several BRMS installations both with and without IBM Tivoli Storage Manager. He is currently providing customers with overall iSeries assistance at the Support Center. He has a degree in mechanical engineering.

Steve Mann is an iSeries Advisory I/T Specialist working for IBM Switzerland. He has 14 years experience in working with the AS/400® and iSeries servers. He is both an IBM Certified Solutions Expert for iSeries and a Certified Tivoli Storage Manager consultant. His areas of expertise include logical partitioning planning and implementation, system management, BRMS, IBM Tivoli Storage Manager, and system recovery. He has extensive

experience with both IBM Tivoli Storage Manager for OS/400 Portable Application Solutions Environment (PASE) and BRMS, providing planning and implementations services for customers. He coauthored the IBM Redbook *LPAR Configuration and Management: Working with IBM @server iSeries Logical Partitions*, SG24-6251.

Edelgard Schittko is an iSeries Advisory I/T Specialist working for iSeries Technical Sales Support in IBM Germany. She has 12 years of experience in working with the AS/400 and iSeries in midrange customer and large customer environments. She has been with IBM for over 13 years, working with BRMS since 1994. Her areas of expertise include iSeries and Storage Area Network, iSeries and tape libraries, and iSeries backup and recovery with and without BRMS. Edelgard coauthored the first edition of the redbook *Backup, Recovery, and Media Services for OS/400: A Practical Approach*, SG24-4840. She holds a degree in mathematics from Humboldt University in Berlin, Germany.

Bradley Smoley is a Staff Software Engineer in Rochester, MN. He has over six years of experience in the save and restore and BRMS field. He holds a degree in business computer information systems from Saint Cloud State University, in MN. His areas of expertise include BRMS, integrated file system (IFS), save and restore, program temporary fixes (PTFs), and installation. He has written articles about BRMS and general save and restore topics for *iSeries Newsletter* and *iSeries Magazine*.

Thanks to the following people for their contributions to this project:

- BRMS Development, IBM Rochester
  Dave Bhaskaran
  Brian Hofmeister
  Steve Hank
  Scott Maxson
- Harry Husfelt, BM Tivoli Storage Manager for OS/400 PASE
- Charlotte Brooks, ITSO San Jose
- ITSO Rochester
- IBM Integrated Technology Services (ITS) Global Product Support
- Hans Gross (IBM Germany ITS Mainz) who supplied the IBM AIX® command interface DSMADMC, used to automate the start and stop of the iSeries IBM Tivoli Storage Manager server in OS/400 PASE

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Part 1

Overview

This part presents a general overview of iSeries server and backup and recovery considerations for the attached workstations. This includes on overview of the two products addressed in this redbook:

- Backup Recovery and Media Services, OS/400 V5R2 (5722-BR1)
- Tivoli Storage Manager V5.2 (5698-ISX)

1

Introduction to integration

Over the past few years, Backup Recovery and Media Services (BRMS), 5722-BR1, has become known as the recovery tool for *iSeries objects*. During that same time, the IBM Tivoli Storage Manager set of server and client products has become known as the recovery tools for *multiplatform* (multiple operating systems) *environments*.

In an iSeries-only environment or environments, *PC workstations* may store their data within the iSeries integrated file system (IFS). In these environments, you can use OS/400 save and restore commands to back up iSeries system data (defined later) and IFS supported file system data. This includes normal OS/400 objects under the *library* file system or other supported file systems. For automated management of these save and restore functions, a product, such as BRMS, is required to track activity and automate actions as much as possible.

IBM Tivoli Storage Manager has had an iSeries product for years that, in general, supported up to its version 3.1 capabilities. iSeries customers running this software level are integrating IBM Tivoli Storage Manager capabilities with the “BRMS client to IBM Tivoli Storage Manager” capabilities.

Over time, however, continued enhancements in the IBM Tivoli Storage Manager set of products was not included into AS/400 or iSeries versions. In large multiplatform environments, BRMS often became the iSeries-only backup recovery tool. Newer versions of IBM Tivoli Storage Manage server and client products were used on non-iSeries platforms. With the availability of IBM Tivoli Storage Manager Version 5.1.5 (and IBM Tivoli Storage Manager Version 5.2) for OS/400 Portable Application Solutions Environment (PASE), the large common set of functions is now available on all IBM Tivoli Storage Manager products. IBM offers a *rich integrated solution* that gives you the most powerful recovery procedures available.

This book also provides an overview of BRMS and IBM Tivoli Storage Manager on iSeries terminology and capabilities. It provides sufficient examples for you to install and set up (configure) these products. It also provides save and restore examples, using OS/400 library and IFS objects.

Prior to reading this redbook, you must have sufficient knowledge to use the OS/400 command interface, its Windows® operating system-based graphical user interface (GUI)

iSeries Navigator (formerly called Operations Navigator), or both. You must also have some general knowledge about both BRMS and IBM Tivoli Storage Manager, with perhaps some expertise in one of these products.

This redbook provides “cookbook-oriented” information to enable you to get these products up and running on your iSeries server. You achieve this by using V5R2 iSeries BRMS together with IBM Tivoli Storage Manager Version 5.2 for OS/400 PASE. This gives you a comprehensive storage management capability in your iSeries environment.

The book’s primary intent is to show specific examples of:

- Getting both BRMS and IBM Tivoli Storage Manager for OS/400 PASE up and running on your iSeries server with “more than the basics” capabilities enabled
- Using the two products together to demonstrate the advantages of integrating these two products in a multi-platform environment

  This includes using the IBM Tivoli Storage Manager server on iSeries and a set of Tivoli Storage Manager application programming interfaces (APIs) for BRMS. This set of APIs enables the iSeries to be a backup client (called the *BRMS Application Client*) to any Tivoli Storage Manager server.

With the focus on cookbook content, detailed coverage of BRMS and IBM Tivoli Storage Manager for OS/400 PASE capabilities is beyond the scope of this redbook. You must have access and refer to the following documents, as well as to IBM education courses and other sources, for both products that deliver this coverage:

- *IBM Tivoli Storage Management Concepts*, SG24-4877
- *Backup Recovery and Media Services for OS/400: A Practical Approach*, SG24-4840
- *Backup Recovery and Media Services for iSeries*, SC41-5345
- *IBM Tivoli Storage Manager Implementation Guide*, SG24-5416
- *A Practical Guide to Implementing Tivoli Storage Manager on AS/400*, SG24-5472

  SG24-5472 is based on IBM Tivoli Storage Manager Version 3.1. However, it thoroughly covers IBM Tivoli Storage Manager terminology and constructs on AS/400 (iSeries), an overview of AS/400 (iSeries) architecture (such as object terminology, the library, and IFS structure), and the OS/400 command interface. Read this redbook for more background information about the iSeries server and general Tivoli Storage Manager on iSeries capabilities and to see sample backup scenarios.
- *Tivoli Storage Manager Version 5.1 Technical Guide*, SG24-6554

  This book covers IBM Tivoli Storage Manager Version 5 capabilities on all platforms.
- *Backup Recovery and Media Services for OS/400: More Practical Information*, REDP0508
- *IBM Tivoli Storage Manager for OS/400 PASE Administrator’s Guide*, GC23-4694
- *IBM Tivoli Storage Manager for OS/400 PASE - Administrator’s Reference Guide*, GC23-4695
- *IBM Tivoli Storage Manager for OS/400 PASE Quick Start*, GC23-4696

We recommend that you also participate in a BRMS or IBM Tivoli Storage Manager IBM education course if you are new to either of these products. See “Education” on page 12, for more information about IBM education in this area.

Notes:

- You can divide an iSeries server into logical partitions (LPAR). All references to an iSeries server in this redbook relate to a system with no partitions or a single partition within that system running OS/400.
- Throughout this redbook, we use the acronym TSM at times when the software interface uses TSM as a parameter.

1.1 IBM Tivoli Storage Manager and BRMS together: A solid backup strategy

Many of the key capabilities and interfaces available with each product include:

- User interface
  - BRMS has a set of OS/400 BRMS commands to configure, save, restore, schedule, and otherwise manage automated running of BRMS functions. The *BRMS iSeries Navigator client* (installed as a plug-in to iSeries Navigator) offers a Windows operating system-based GUI to its functions.
  - IBM Tivoli Storage Manager offers a browser-based graphical Web administrative client interface to management functions and supports command-level statements. The command-level UNIX®-like interface is available on the browser-based interface.
- Policies to manage save and restore activities

  Both products provide similar capabilities in the following areas. Note that the defaults and implementation details may be different for each product.
  - Directory level or individual object (file)-level save and restore functions. OS/400 provides the QSYS.lib file system for library-level saves and restores.
  - Scheduled save and restore functions. BRMS uses OS/400 job scheduler as a default scheduling facility.
  - Expiration, retention, and multiple version management.
  - Full or “changed only” (incremental) saves. Defaults may be different within each product.
  - Rules to migrate saved data from disk (internal storage) to external media.
- Saves to internal storage as well as external tape device media
  - BRMS supports saves to OS/400 save files, tape device media, or, an IBM Tivoli Storage Manager server, using the IBM Tivoli Storage Manager APIs.
  - IBM Tivoli Storage Manager, using both server and client products, supports saves to disk pools (internal storage pools), tape (pools) device media, or optical (pools) device media. The internal storage is sometimes referred to as *caching to disk*.
  - Both products support movement of saved data from this internal storage repository to external device media.
  - Depending on which product you are using, there are various levels of automated movement of internal data to external media and automatic loading of offline data previously managed by the product.

- Use and manage tape devices in tape library servers
  - Both products support the use and media management of tape devices within a tape library server, for example:
    - Automatically mounting the required tape media
    - Allocating specific tape devices exclusively or as sharable.
  - Based upon user-specified parameter values, both products support the capability of spreading or not spreading saved data onto multiple media. For example, you may have over one terabyte of data to save. The fastest possible save can occur only if some of the objects are saved in parallel, but this can require more physical media. In some environments, you may consider this additional exposure to a tape media error. In those cases, you determine to save to fewer tape devices.
  - Both products support reclaiming tape media volumes when data on them has expired. Where you may have a mixture of expired and unexpired data on the same tape media, IBM Tivoli Storage Manager can consolidate sets of unexpired data onto a lesser number of media, potentially freeing up more media for reuse.
- Use database constructs to contain the full backup recovery and associated recovery log information

  Both products use a database, rather than a flat file indexed catalog, to contain and access the important recovery information. BRMS contains its database in the OS/400 library QUSRBRM, while IBM Tivoli Storage Manager has a specific set of database and recovery log volumes. For either product, you must backup this information to ensure a successful disaster recovery.
- Disaster recovery facilities

  Both products provide disaster recovery capabilities.
  - BRMS tracks on- and off-site data. Recovery reports are produced and maintained as part of the backup process. These provide step-by-step instructions for recovery. We show report examples in this book, but do not cover disaster recovery in any detail.
  - The IBM Tivoli Storage Manager's Disaster Recovery Manager (DRM) option, not covered in this redbook, includes tracking your on-site and off-site tapes. It also identifies which tapes to take off site. You can audit and refresh daily the automatically generated disaster recovery plan. This means your disaster recovery plan is as current as last night's backup. And, The IBM Tivoli Storage Manager V3.7 Disaster Recovery module includes electronic vaulting of the disaster recovery data to another IBM Tivoli Storage Manager server.
- Central management

  Both products provide a level of centralized management where you either configure multiple IBM Tivoli Storage Manager servers or install the BRMS Network Management feature.
  - BRMS functions can be used under iSeries Management Central interfaces.
  - The IBM Tivoli Storage Manager central management support is part of the base product. You can use the Tivoli Enterprise™ Console (TEC) and Tivoli Business System Manager to provide additional automation and business impact analysis.
- Backup and archive client functions
  - There is a family of IBM Tivoli Storage Manager backup and archive clients for various platforms (operating systems), but none for the iSeries OS/400. These Tivoli backup and archive clients have many functions. These include the ability to schedule the saving and restoring of data exchanged with any IBM Tivoli Storage Manager server product.

– Using the Tivoli Storage Manager APIs for BRMS, you can configure your iSeries server to run BRMS as an iSeries BRMS Application Client to perform save and restore functions to any IBM Tivoli Storage Manager server product.

Be sure to refer to the following chapters for more information:

- See Chapter 2, “Backup Recovery and Media Services” on page 15
- See Chapter 3, “IBM Tivoli Storage Manager” on page 33
- Chapter 9, “Setting up an iSeries server as the Backup Recovery and Media Services Application Client” on page 249, which explains how to set up the iSeries server to communicate with an IBM Tivoli Storage Manager server running on another iSeries server

1.1.1 IBM Tivoli Storage Manager and the iSeries server

From an iSeries standpoint, IBM Tivoli Storage Manager can be viewed as:

- A server running on an iSeries itself that uses the OS/400 PASE IBM AIX-like environment
- A server on a different platform to which the iSeries server saves backup data

IBM Tivoli Storage Manager as a client

This is a common setup where the iSeries is a client only. IBM Tivoli Storage Manager is a multiplatform set of server and client products, but there is no client IBM Tivoli Storage Manager product for the iSeries server. It is not equivalent to an IBM Tivoli Storage Manager backup and archive client product. However, you can use the iSeries BRMS Application Client setup to deliver its saved user data to any IBM Tivoli Storage Manager server in the network. The BRMS Application Client setup can request its saved data when it is needed.

All of this is possible to any IBM Tivoli Storage Manager server product, including the IBM Tivoli Storage Manager for OS/400 PASE server.

IBM Tivoli Storage Manager on iSeries (OS/400 PASE environment) as a server

Running IBM Tivoli Storage Manager under the iSeries OS/400 PASE environment (based on AIX 5.2L) as an IBM Tivoli Storage Manager server is used when your iSeries is the primary business system. In this same environment, you can backup other servers and users in your network to this iSeries server. You can use all the IBM Tivoli Storage Manager client platform products and the iSeries BRMS Application Client to exchange saved data with the iSeries IBM Tivoli Storage Manager server.

Running the IBM Tivoli Storage Manager server on the iSeries also means that you have tape and disk resources available in your iSeries server. When you use both BRMS and IBM Tivoli Storage Manager with these tape devices, you *must* plan and configure appropriately your tape management procedures.

You may have enough tape drive resources to let IBM Tivoli Storage Manager and BRMS run in parallel with separate devices or your need to share the same tape devices. You can schedule each product’s use of a shared device so that, when one product is finished using the device, it is available for use.

You can use BRMS as an IBM Tivoli Storage Manager tape manager, which allows BRMS to handle IBM Tivoli Storage Manager’s tape inventory. When you use BRMS and IBM Tivoli Storage Manager on the same system, we recommend that you have BRMS perform all tape management. To do this, you must have defined the IBM Tivoli Storage Manager tape

volumes in BRMS, although BRMS does not need to actually read or write to any of those tapes.

BRMS does the mounting, demounting, and expiring of volumes on request from IBM Tivoli Storage Manager.

Figure 1-1 shows the set of IBM Tivoli Storage Manager server and client products through December 2003.

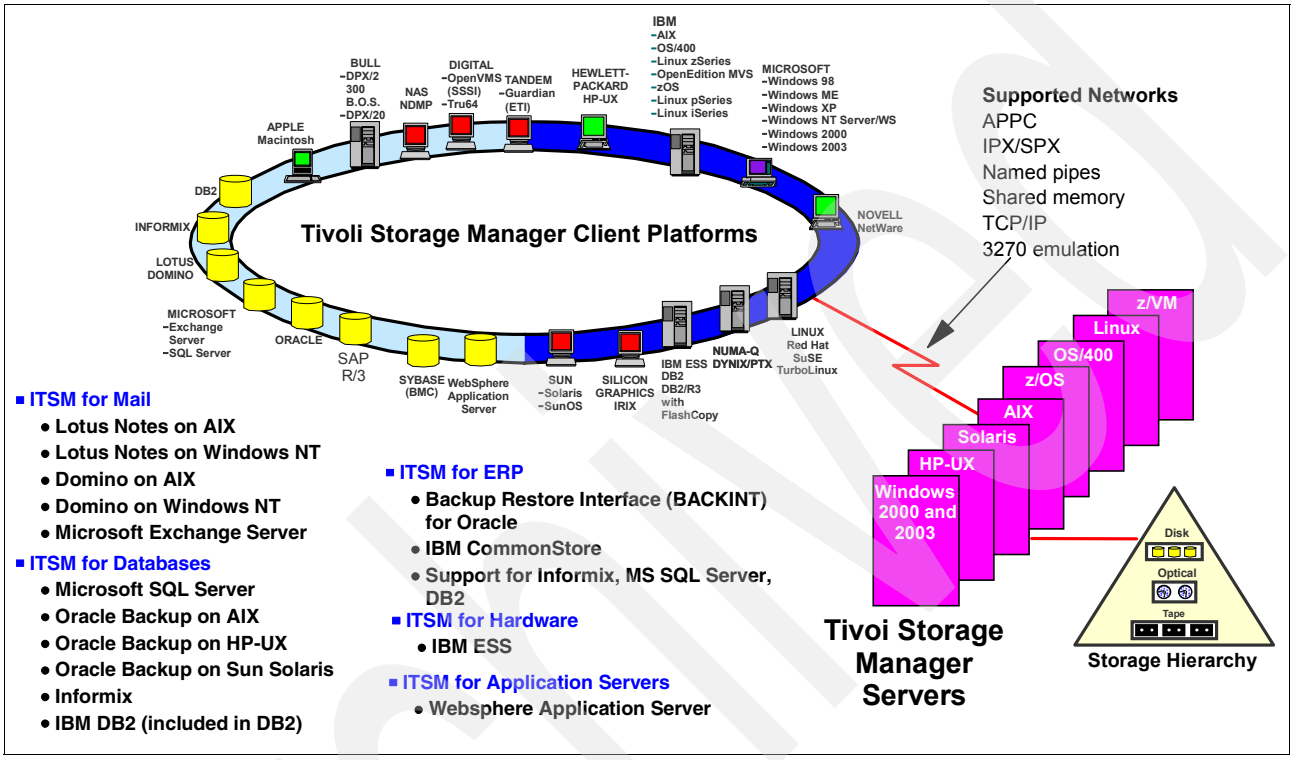

Figure 1-1 Summary of IBM Tivoli Storage Manager server and client products

For the latest on IBM Tivoli Storage Manager products, see:

http://www-3.ibm.com/software/tivoli/products/storage-mgr/platforms.html

1.2 General considerations for backing up your iSeries data

Before you start setting up your backup and restore environment, you must thoroughly understand why and when you back up your data, as well as what to back up. To help you understand these concepts, see “Consideration before you begin” on page 370, which contains several basic questions for you to answer.

1.2.1 Data in an iSeries server

There are two major classifications of data within the iSeries server, user data and system data. Understanding the grouping of objects into these two data classifications is important in understanding the scope and limitations when using BRMS or IBM Tivoli Storage Manager to back up iSeries objects.

Examples of user objects are OS/400 user profiles and any object in most OS/400 libraries and Integrated File System folders/directories. Examples of system objects include OS/400 and iSeries microcode, and objects needed by the operating system residing in special OS/400 libraries, such as QSYS and QSYS2.

From a backup and recovery viewpoint, the primary distinctions between system and user data are:

- To save most system data, your iSeries server must be in a restricted state.
- In a disaster recovery process, you must have much of the system data restored first to restore any user data.

See 2.3, “Differences between user data and system data” on page 23, for more complete information about these two types of data. As implemented in OS/400 V5R2, the IBM Tivoli Storage Manager server cannot run in the iSeries restricted state. Therefore, IBM Tivoli Storage Manager alone cannot be used exclusively to back up a complete iSeries server.

OS/400 IFS

You can use the IFS to assist you with the backup examples shown later in this redbook. You can also use it to plan your backup and recovery process.

All data, programs (except microcode), and other OS/400 objects are stored within the IFS libraries or folders and directories. The IFS enables the iSeries to support several different file systems that can be stored and used within the iSeries server. Much of the OS/400 interface accesses objects within the library or QSYS.lib file system. Other supported files systems are the UNIX-like and Windows operating system-like hierarchy of directories (folders) with which many are familiar.

QSYS.lib appears within the directory or folder hierarchy as a higher level directory.

Note: With all data and objects stored in the OS/400 IFS, saving the entire IFS is not sufficient to back up the entire iSeries server. Certain OS/400 save functions are required for specific sets of system data (such as system configuration data) to enable a full system save. This is sufficient for a disaster recovery.

The iSeries server offers the Work with Links (WRKLNK) command interface and an iSeries Navigator interface to the IFS. Figure 1-2 shows two windows of an IFS structure on one of the iSeries server used for this redbook.

In the left pane, notice the QSYS.lib directory and the Root directory. Expanding QSYS.lib shows all the OS/400 libraries on the system. Expanding Root in the left pane shows, in the right pane, many directories, such as QIBM. These directories have many subdirectories that include directories for cross-platform product software, such as HTTP Server for iSeries powered by Apache and WebSphere® Application Server Version *n.n*.

In the right pane, we expanded the tsmvol directory to display its subdirectories. The directory names should be familiar to those of you who have used IBM Tivoli Storage Manager before.

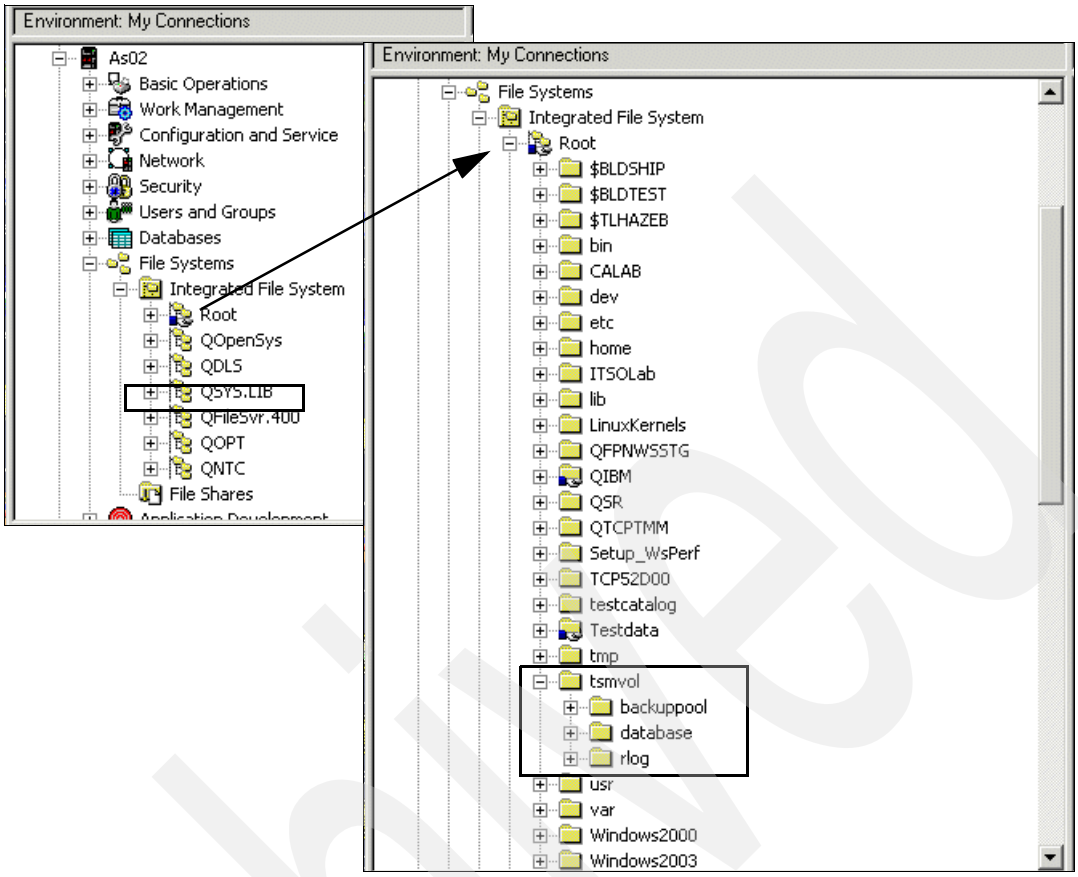

Figure 1-2 OS/400 IFS directory structure example

Consider a Windows operating system that is installed on an Integrated xSeries® Server for iSeries (formerly called the Integrated Netfinity® Server) hardware feature. In this case, the IFS contains directories that have an iSeries *network storage object* that defines the Windows operating system and any virtual disks used by the Windows operating system. You can also see, within the IFS directory structure, the associated objects used by a Linux guest partition.

For example, directory QNTC contains a directory used by Windows 2003 if it is installed on an Integrated xSeries Server. You must vary on the associated OS/400 network storage object to access this directory.

Auxiliary storage pools

By default, all disk devices attached to a system (or partition) are considered as belonging to the system auxiliary storage pool (ASP). This is commonly referred to as *Pool 1*, *system ASP*, or **SYSBAS*. This is the typical iSeries environment and understanding auxiliary storage pools is not required.

For special customer-determined reasons, specific disk drives can be assigned to a specific ASP, pool numbers 2 through *nnn*. Objects are placed into one of the user disk pools, and any associated data is restricted to the assigned disk devices. Object data placed within a non-system ASP cannot normally overflow into disks outside an ASP.

There are two categories of ASPs beyond the system ASP:

- **User disk pool** (user ASP or dependent ASP): Data is typically placed into a dependent ASP for the purposes of isolating disk arm movement to access only this data. For example, a large performance critical database file or table is placed into a dependent

ASP so that the associated disk arms are never moved by requests for other objects, such as OS/400 code, or other data used by other applications.

The system ASP and any dependent ASPs are considered part of *SYSBAS. Any data within *SYSBAS, assuming acceptable OS/400 object authority, is accessible by any system function or application on the system.

- **Private disk pool** (independent ASP (IASP)): Similar to dependent disk pools, disk devices are assigned to an IASP. An IASP must be varied on for its resources to be accessible. There are two primary purposes for placing objects and associated data into an IASP:
  - Partition objects with the same name, and perhaps the same library, into separate name spaces so that a form of consolidation onto the same iSeries server or partition can be implemented without moving to LPAR configurations.

    Objects and data created or restored into an IASP normally remain in the partition and cannot be accessed by normal application access requests. the OS/400 Set ASP Group (SETASPGRP) command or a job description Initial ASP Group (INASPGRP) parameter can identify the IASP to use. Assuming normal OS/400 object access authority, the application can access the objects within *SYSBAS and the specified IASP.
  - Partition objects on disks within a physical input/output (I/O) tower (or within an iSeries I/O processor (IOP) within LPAR partitions) to be switchable between systems or partitions. This is used as a way to implement a form of limited high availability between configured iSeries servers. You use OS/400 commands or iSeries Navigator to vary off the IASP, switch the IASP from one system to the other, and vary on the switched IASP on the receiving system. After a few minutes, the switched I/O hardware and data are available to applications on the receiving system.

1.2.2 System environment used in this redbook

Figure 1-3 shows the environment used throughout this redbook. Refer back to this figure as necessary in all of our examples.

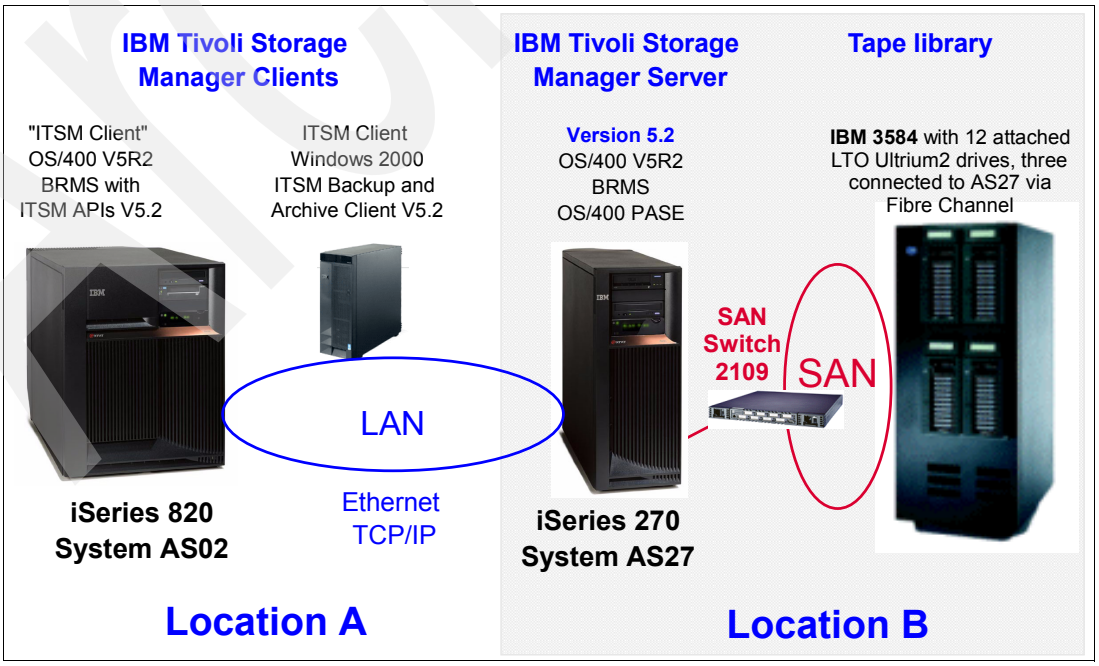

Figure 1-3 System setup

Here IBM Tivoli Storage Manager is installed and configured as a server on iSeries server AS27, which has the 3584 LTO Tape Library Server attached. From an IBM Tivoli Storage Manager client perspective, we use a Windows 2000 PC workstation with IBM Tivoli Storage Manager Backup-Archive Client V5.2 installed. Also iSeries server AS02 is configured as a V5R2 BRMS Application Client that performs backups to system AS27's IBM Tivoli Storage Manager server.

1.3 Education

As mentioned earlier, you should have sufficient knowledge about the iSeries server, its Operations Navigator client, and some basic skill for using BRMS and IBM Tivoli Storage Manager.

For those of you who are new to either BRMS or ITSM, we recommend that you contact IBM Education and register for BRMS class AS28 and the IBM Tivoli Storage Manager implementation class TS572. You should also consider taking the following IBM BRMS and Tivoli education courses.

For BRMS, the courses that are available are:

- Backup, Recovery and Media Services/400 Workshop (stand up course, #S6219)
- Domino - iSeries - BRMS (Web lecture)

For more information, go to the following Web site and select **iSeries and AS/400**:

http://www-3.ibm.com/services/learning/index2.html

For IBM Tivoli Storage Manager classes, the following courses are available:

- 5.1.5 for iSeries (self-paced)
- IBM Tivoli Storage Manager 5.2 Automating Client Operations (self-paced)
- IBM Tivoli Storage Manager 5.2 Configuring the Client and Managing Client Data (self-paced)
- IBM Tivoli Storage Manager 5.2 Defining Policies; Configuring Database and Recovery Log Volumes (self-paced)
- IBM Tivoli Storage Manager 5.2 Implementation (classroom)
- IBM Tivoli Storage Manager 5.2 Monitoring and Event Logging, Plus Protecting the Database (self-paced)
- IBM Tivoli Storage Manager 5.2 Overview and Installation (self-paced)
- IBM Tivoli Storage Manager 5.2 Total Integration (classroom)

For the latest Tivoli course information, see:

http://www-3.ibm.com/software/tivoli/education/edu_prd.html

1.4 Organization of this redbook

To facilitate your use of this redbook, review the following outline:

- Part 1: Overview
  - Introduction to integration
  - BRMS general overview
  - IBM Tivoli Storage Manager general overview
- Part 2: Tivoli Manager details
  - Installing IBM Tivoli Storage Manager as a server on iSeries server
  - Basic server configuration
  - Getting the IBM Tivoli Storage Manager server into production mode
- Part 3: Backup, Recovery, and Media Services details
  - Installing and setting up BRMS
  - Getting BRMS into production mode
  - Setting up the iSeries BRMS Application Client to use the IBM Tivoli Storage Manager as a server

    There is no IBM Tivoli Storage Manager Backup and Archive Client for iSeries. However, with the use of BRMS-provided Tivoli Storage Manager APIs and documentation in this redbook, you can perform iSeries-oriented backup and archive functions to an IBM Tivoli Storage Manager server.
- Part 4: BRMS and IBM Tivoli Storage Manager advanced topics

  The advanced topics focus on getting these products up and running, rather than how to use the most advanced capabilities of these two products. The topics that are covered include:
  - BRMS movement of IBM Tivoli Storage Manager media

    This chapter contains “as is” programs that provide a single iSeries interface to control IBM Tivoli Storage Manager movement of media through BRMS. The movement is based on sample interface programs which are not supported by IBM. They provide a single interface to the user, rather than requiring the use of separate interfaces for BRMS and IBM Tivoli Storage Manager.
  - Backup Recovery and Media Services troubleshooting
  - IBM Tivoli Storage Manager troubleshooting
- Part 5: Appendixes
  - General backup and recovery considerations
  - Backup Recovery and Media Services reports

    BRMS reports are invaluable when actually performing a recovery process on an iSeries server.
  - AIX administrative client in OS/400 PASE and sample programs

    There is no IBM Tivoli Storage Manager administrative client function on the iSeries server. However, this appendix shows how to use IBM AIX-based IBM Tivoli Storage Manager administrative client software under OS/400 PASE to perform corresponding administrative client functions. Sample programs are provided “as is”, although they are already in use in actual customer environments. iSeries source programs are provided for modification to specific customer requirements.

2

Backup Recovery and Media Services

Backup Recovery and Media Services (BRMS) enables a fully automated backup, recovery, and media management strategy used with OS/400 on the iSeries server. The BRMS licensed program product (LPP) 5722-BR1 contains standard, network, and advanced features. Within this Redbook, we focus on the standard feature only. For more information about BRMS network and advanced features, see *Backup Recovery and Media Services*, SC41-5345.

2.1 General overview of the BRMS product

BRMS is the IBM strategic product on the iSeries server to assist in saving, restoring, and managing media. BRMS has various backup options that allow you to specify what, when, and where to save items. It allows for save while active and the ability to perform:

- Full saves
- Cumulative saves (saves only objects that changed since the most recent full BRMS save)
- Incremental saves (saves only objects that changed since the most recent BRMS save of any kind: full, cumulative, or incremental)

You can perform attended or unattended backups and schedule backups using the native OS/400 job scheduler or the Advanced Job Scheduler (5722JS1). BRMS gives you the ability to control subsystems, job queues, the signing off of interactive users, initial program loads (IPLs) and other work-management type operations. It automatically records what is saved and the physical location of the tapes that contain the data. It also provides detailed reports with instructions that explain how to recover your system.

The BRMS LPP supports three features:

- **Standard feature**: Gives you the capability to implement a fully automatic backup, recovery, and media management strategy. It allows users to restore objects from a specific date and time and allows the usage of tape libraries by controlling the mounting, dismounting, and ejecting of tapes as required.
- **Network feature**: Enables BRMS systems to interconnect via a network to other BRMS systems. This allows the systems to share media inventories and policies associated with the media.
- **Advanced feature**: Provides hierarchical storage management (HSM) capabilities. For more information about this feature, see *Hierarchical Storage Management Use*, SC41-5351.

Figure 2-1 shows a typical flow of how BRMS implements your backup and recovery solution.

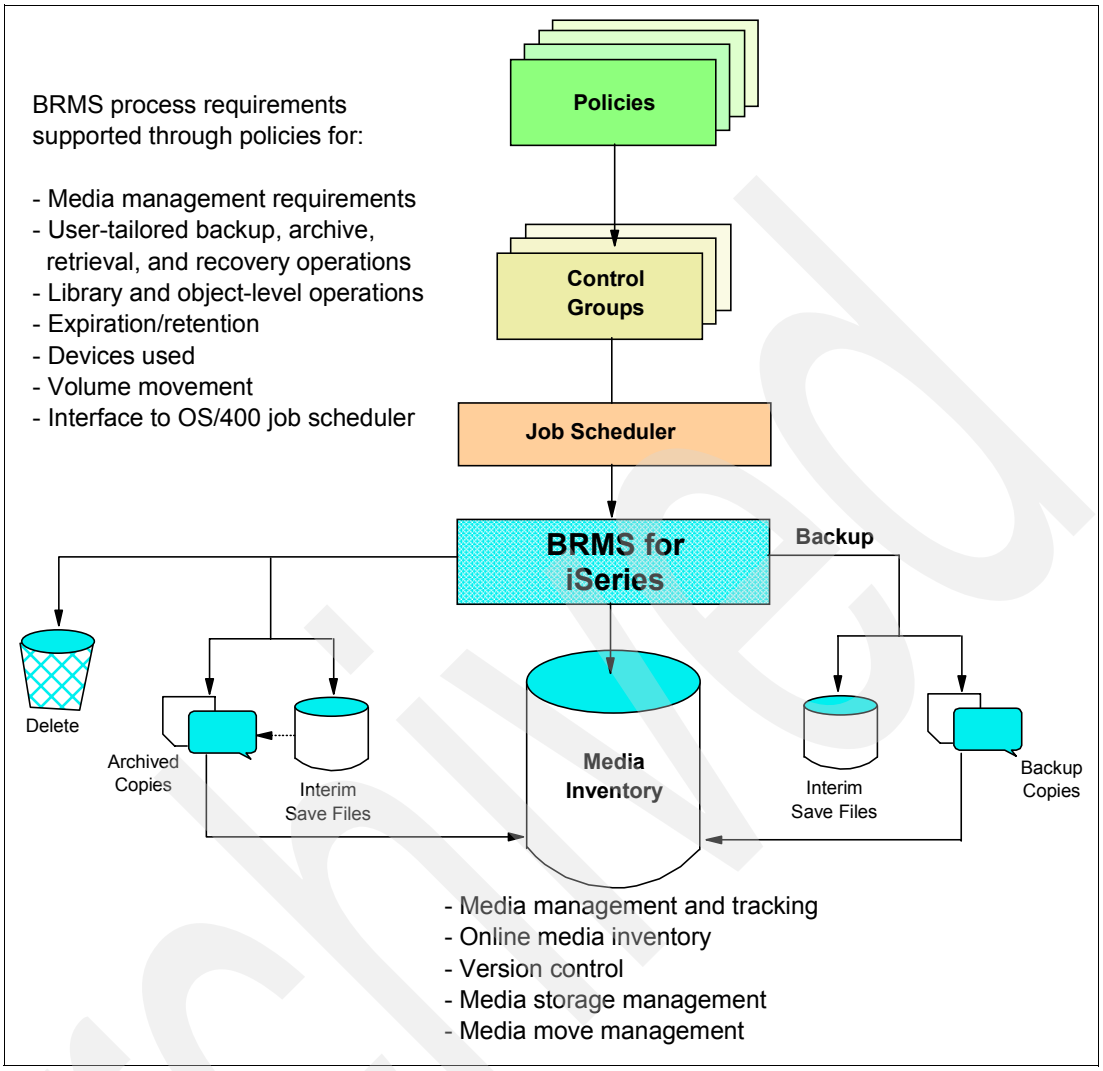

Figure 2-1 Overview of BRMS operations

BRMS contains default values so you can begin using it immediately or you can customize your backups to fit your backup strategy. There are two interfaces to BRMS:

- 5250 interface (green screen): Within this client, there are two ways to navigate around within BRMS as explained in 2.1.1, “5250 emulation interface” on page 18.
- BRMS iSeries Navigator client interface: See 2.1.2, “BRMS iSeries Navigator client” on page 21, for more information.

There are some differences between the 5250 interface and BRMS iSeries Navigator client. Within the BRMS iSeries Navigator client, you can set policy properties to perform functions that you cannot set using control group attributes through the 5250 interface, including:

- Ending integrated Windows servers before backup.
- Ending hosted logical partitions before backup. Through V5R2, a hosted partition runs Linux with access to a set of input/output (I/O) devices shared and a hosting OS/400 partition.
- Unmounting of user-defined file systems (UDFS) before backup.
- Starting integrated Windows servers after backup.
- Starting hosted logical partitions after backup.

- Customizing what a user can do down to a specific function (using the iSeries Navigator Application Administration function).

You cannot perform some functions on the 5250 emulation interface with the BRMS iSeries Navigator client:

- Advanced functions, such as hierarchical storage management
- BRMS network support
- Deletion of the BRMS configuration of the IBM Tivoli Storage Manager application programming interfaces (APIs)

In addition, Table 2-1 explains some differences in terminology.

Table 2-1 Terminology differences between BRMS 5250 and iSeries Navigator client interfaces

BRMS iSeries Navigator client term	Definition
Backup history	A list that contains information about each object saved as part of a backup done with BRMS. The backup history includes any items backed up using a backup policy. In the 5250 emulation interface, this is *media information*.
Backup policy	A group of defaults that controls what information is backed up, how it is backed up, and where it is backed up. A backup policy in iSeries Navigator is a combination of a backup control group and a media policy in the 5250 emulation interface.
Global policy properties	Settings that are used, in conjuction with values you specify in your backup policies, to enable you to control how BRMS operates in your environment. In the 5250 emulation interface, this is known as a *system policy*.
Media pool	A grouping of media by similar characteristics, such as density or capacity. In the 5250 emulation interface, this is a known as a *media class*.

2.1.1 5250 emulation interface

To navigate around BRMS and work with a BRMS control group, follow this example:

1. Enter the `GO BRMS` command.
2. The main BRMS display (Figure 2-2) appears. Enter option `2` (Backup).

```
BRMS            Backup Recovery and Media Services for iSeries
                                                          System:      AS02
Select one of the following:

     1. Media management
     2. Backup
     3. Archive
     4. Recovery
     5. Migration

    10. Scheduling
    11. Policy administration
    12. Reports

    20. Start console monitor

Selection or command
===> 2

F3=Exit   F4=Prompt   F9=Retrieve   F10=Commands   F12=Cancel   F13=Functions
```

Figure 2-2 Main BRMS menu

3. On the Backup display (Figure 2-3), select option 1 (Backup planning).

```
BRMBKU                          Backup
                                                          System:      AS02
Select one of the following:

     1. Backup planning
     2. Perform backup
     3. Display backup activity
     4. Start console monitor



Selection or command
===> 1

F3=Exit   F4=Prompt   F9=Retrieve   F10=Commands   F12=Cancel   F13=Functions
```

Figure 2-3 BRMS backup menu

4. On the Backup Planning display (Figure 2-4), select option 2 (Work with backup control groups).

```
BRMBKUPLN                      Backup Planning
                                                          System:      AS02
Select one of the following:

     1. Work with backup policy
     2. Work with backup control groups
     3. Display backup plan
     4. Print backup plan
     5. Work with backup lists
     6. Backup analysis




Selection or command
===> 2

F3=Exit    F4=Prompt    F9=Retrieve    F10=Commands    F12=Cancel    F13=Functions
```

Figure 2-4 BRMS backup planning menu

You now see the Work with Backup Control Group display (Figure 2-5). It lists all of the control groups.

```
                      Work with Backup Control Groups                 AS02

 Position to. . . . . .               Starting characters

 Type options, press Enter
   1=Create    2=Edit entries    3=Copy      4=Delete   5=Display
   6=Add to schedule   8=Change attributes   9=Subsystems to process ...
               Full       Incr       Weekly
    Control    Media      Media      Activity
Opt Group      Policy     Policy     SMTWTFS  Text

    *BKUGRP    *BKUPCY    *BKUPCY    *BKUPCY  Backs up all user data
    *SYSGRP    SAVSYS     SAVSYS     *BKUPCY  Backs up all system data
    *SYSTEM    SYSTEM     SYSTEM     *BKUPCY  Backs up the entire system
    BRADLEY    BRAD       BRAD       *BKUPCY  *NONE

                                                                    Bottom
 F3=Exit      F5=Refresh   F7=Work with BRM scheduled jobs
 F9=Change backup policy   F23=More options   F24=More keys
```

Figure 2-5 BRMS working with control groups using menus

You can access this same display using the Work with Control Groups (WRKCTLGBRM) command. If you need to see a list of all BRMS commands, you can issue the GO CMDBRM command. From the BRMS Commands display (Figure 2-6), you enter the WRKCTLGBRM command. This takes you to the Work with Backup Control Group display which is the same as the one shown in Figure 2-5.

```
CMDBRM                          BRMS Commands
                                                          System:      AS02
Select one of the following:

  Work with commands
    36. Work with ASP descriptions                          WRKASPBRM
    37. Work with calendars using BRM                       WRKCALBRM
    38. Work with classes using BRM                         WRKCLSBRM
    39. Work with containers using BRM                      WRKCNRBRM
    40. Work with control groups                            WRKCTLGBRM
    41. Work with devices using BRM                         WRKDEVBRM
    42. Work with link information                          WRKLNKBRM
    43. Work with saved folders                             WRKFLRBRM
    44. Work with lists using BRM                           WRKLBRM
    45. Work with locations using BRM                       WRKLOCBRM
    46. Work with media using BRM                           WRKMEDBRM
    47. Work with media information                         WRKMEDIBRM
    48. Work with media libraries                           WRKMLBBRM
                                                                More...
Selection or command
===> WRKCTLGBRM

F3=Exit    F4=Prompt    F9=Retrieve    F12=Cancel    F13=Functions
```

Figure 2-6 List of BRMS commands output

Table 2-2 lists some of the more frequently used BRMS commands.

Table 2-2 Commonly used BRMS commands

Command	Description of commands
WRKMEDBRM	Allows you to work with media that BRMS owns
WRKPCYBRM	Allows you to work with different BRMS policies (med, arc, bku, mov, mgr, rcy, rtv, sys)
WRKCLSBRM	Allows you to work with or create media classes within BRMS
WRKLOCBRM	Allows you to work with or create BRMS locations
WRKDEVBRM	Allows you to work with devices that BRMS knows about
WRKLNKBRM	allows you to work with objects that were saved within the IFS
WRKLBRM	Allows you to work with or create save lists within BRMS
WRKMEDIBRM	Allows you to work with items saved within BRMS

2.1.2 BRMS iSeries Navigator client

To use the BRMS iSeries Navigator client, you must install the BRMS plug-in on your PC first. See 7.3.1, “Installing the BRMS iSeries Navigator client” on page 137, which explains how to install this support.

After you successfully install the BRMS plug-in, you are ready to use the BRMS iSeries Navigator client. For example, in iSeries Navigator (Figure 2-7), expand ***server name*** (in which you installed the BRMS plug-in)**-> Backup Recovery and Media Services-> Backup Policies**. Then you see a list of the BRMS backup policies in the right pane.

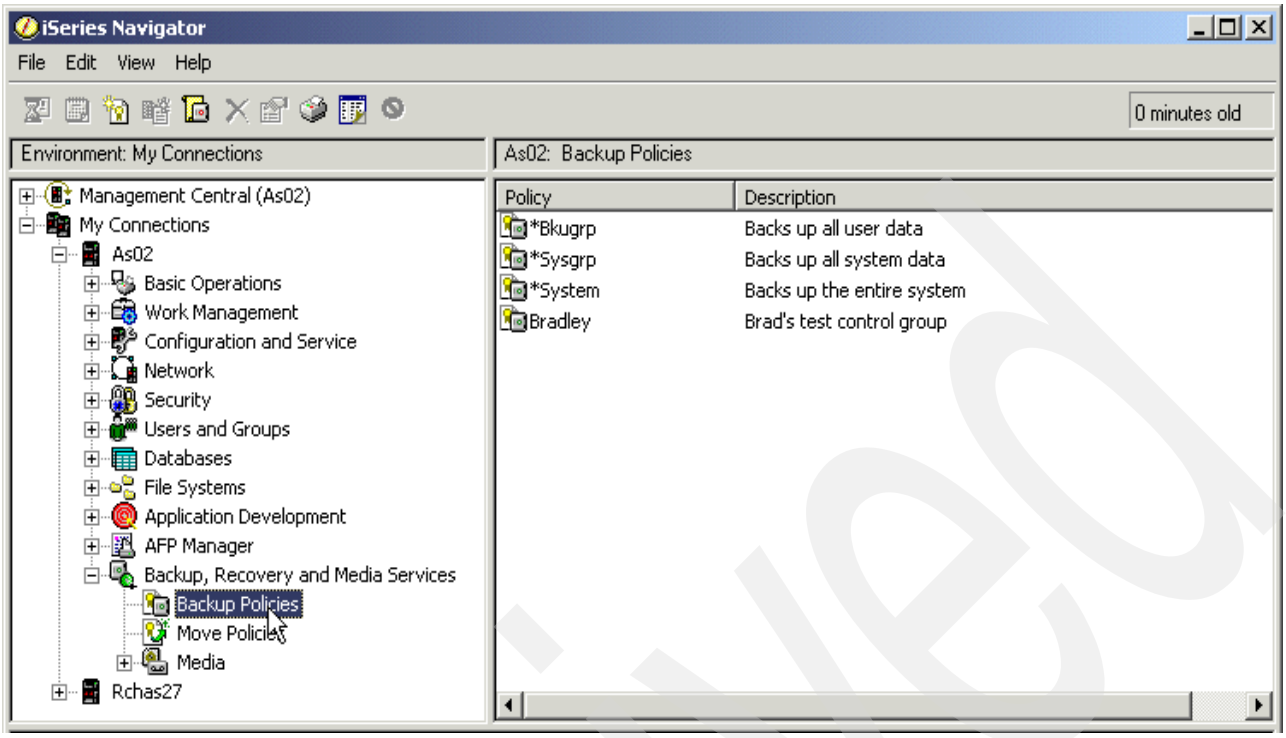

Figure 2-7 Using iSeries Navigator to select the backup policy

Note: For complete information about the BRMS iSeries Navigator client, see the student guide located on the Web at:

`http://www-1.ibm.com/servers/eserver/iseries/service/brms/pdf/StudentGuide52.pdf`

2.2 Media options available within BRMS

Three media options are available within BRMS:

- **Save files (SAVF)**

  A SAVF is an OS/400 object type of *FILE, but it is not the same as other file type objects, such as a database file (SQL table). A save file is a special object on the system storage that you can use for saving objects to and restoring objects from. You can view or print a list of objects within a save file, but general application programs cannot read or write to the object data in the save file.

  Within BRMS, you can use a SAVF by creating a media policy that saves to a SAVF, or use the media policy generated by BRMS called SAVF. Saving to a save file is typically the fastest way to save an object or sets of objects. You save to tape media later for the appropriate backup policy.

  The most important considerations and limitations when using save files are:

  – You can save more than one object to a SAVF. However, you cannot save more than one library to that save file.

  – You can specify more than one library on a Save Library with BRMS (SAVLIBBRM) command, but BRMS internally issues an OS/400 Save Library (SAVLIB) command for each library.

- You can use the SAVLIBBRM command to save to a save file using the SAVF parameter. Note that *SAVF in not a valid value for the DEV (Device) parameter on the SAVLIBBRM command. You can specify DEV(*NONE) and then SAVF(save-file -name) on this command to save to the named save file.
- You can use the Save a Save File BRMS (SAVSAVFBRM) command to save a save file to a tape device. If you use the Display Tape command later on the media containing the saved save file, the media appears as though the save was performed by the SAVLIB command and not the SAVSAVFBRM command.

- **Physical media**

  Physical media is the most popular type of media used with BRMS. It is used because BRMS has the function to control tape libraries, making backups almost operator free. BRMS supports all media that is supported by OS/400, excluding DVD and optical. Among the tape device types that are supported are *MLR3, *SLR100, *QIC4GB, *QIC4DC, *QIC5010, *SLR7, *ULTRIUM1, *ULTRIUM2, *FMT3590H, *FMT3590E, *FMT3590, *QIC120, *QIC150, *QIC525, *QIC1000, *QIC2GB, *QIC2DC, *FMT3570, *FMT3570E, *FMT3480, and *FMT3490E.

- **IBM Tivoli Storage Manager server**

  IBM developed IBM Tivoli Storage Manager APIs for iSeries (LPP 5733-197). BRMS integrates the functions provided by the IBM Tivoli Storage Manager APIs. When the APIs are installed with BRMS, you can configure the iSeries server as the BRMS Application Client to use an IBM Tivoli Storage Manager server as a device for saving and restore *user* data. The IBM Tivoli Storage Manager server manages the storage of the saved data until BRMS requests the data to be restored or deleted from the IBM Tivoli Storage Manager server.

2.3 Differences between user data and system data

There are two types of data on the iSeries, user data and system data. To see the difference between user and system data, the objects that are associated with each are:

- User data includes any information that you enter into the server, including:
  - User profiles
  - Private authorities
  - Configuration objects
  - IBM libraries with user data (QGPL, QUSRSYS, QS36F, #LIBRARY and all LPPs
  - User libraries (user-created library name)
  - Documents and folders (Document Library Objects (DLO))
  - Distribution objects
  - User objects in directories (IFS)
- System data is IBM-supplied data that runs the hardware and software for your server. System data includes:
  - Licensed Internal Code (LIC)
  - Operating System/400® (OS/400)
  - All objects residing in IBM-supplied libraries QSYS and QSYS2
  - All LPP libraries, such as QIWS, QPASE, QBRM, QANSAPI, and QITSM: Typically this means any library that starts with the letter Q.
  - Some objects in directories such as /QIBM/ProdData and /QOpenSys/QIBM/ProdData

The other main difference between user data and system data is that, to save most system data, your iSeries server must be in a restricted state. This means that you must end all subsystems (SBS) and you need to run on the main console to issue any commands. For

user data, you do not need to be restricted. However, you may not be able to lock all objects needed, and therefore, not save everything that you want.

2.4 Backup strategies

Your backup strategy is very important. You need to make several considerations regarding this strategy. Some points to consider when creating your backup strategy are:

- Are you saving everything that is needed in case of a disaster recovery?

  You need to determine the minimum that you need to save to get your system up and running in the most efficient amount of time.

- What is your time frame to complete the save?

  Decide whether you have the time to perform a full system save every night, you need to implement save-while-active function to save your user data, or you need to omit some objects to get your save to complete in time. These are just a few options that you need to address if you have a time constraint.

- To what are you going to back up your system?

  Decide whether you are going to back up to tape, SAVF, or IBM Tivoli Storage Manager server. Keep in mind that BRMS does not support DVD or optical.

- Where are you going to keep the media?

  This is one of the most important points. You need to make sure that you have a copy of your media off site in case of a disaster on site. You may also want to keep a copy on site for everyday individual restores.

We recommend that you always perform a full system save. We realize that doing a full system save everyday is not an option for most customers, so we list some examples of save strategies that you can use:

- Use BRMS to perform a full system save. This is the best and most secure option if a disaster occurs.
- Create a user control group to tailor your backups.
  - Perform a full system save on the weekend and then save your user data every night.
  - Perform a full system backup once a month and perform a full save of your user data once a week. Then do incremental saves of your user data everyday.
  - Remember most system data does not change unless you upgrade or install program temporary fixes (PTFs), so saving it once a month may be sufficient.
  - Save user data only and never save Licensed Internal Code (LIC), OS/400 or LPPs.

    We do not recommend this. However if edited IBM-supplied objects, the time it takes to reinstall LIC, OS/400, and LPPs from the original media, and applying all PTFs is not important to you, this may be an option.
- Use BRMS save commands to save data that is needed for recovery.
- Do not use BRMS. Use the Save and Restore commands provided with OS/400 and perform your own backup and recovery management tasks.

  For a small iSeries server with a simple application environment change activity, this is reasonable. As the application environment change activity increases, this requires much human resource to keep up with the change activity, manual tracking of backup activity, programming development to automate the backup process, and testing to ensure recoverability.

Customer feedback on BRMS packaging of features and customer value over the years clearly demonstrate that you should use BRMS in all but simple environments. To appreciate what BRMS provides, start by reviewing *Backup and Recovery*, SC41-5304.

In addition to what we already covered, BRMS also gives you the ability to back up a hosted Linux environment and any integrated Windows servers running on an Integrated xSeries Server or Integrated xSeries Server Adapter. Both Linux and integrated Windows servers use storage space objects within the IFS. BRMS backs up the Linux storage space and the Windows server storage space. You can also save the Windows server while it is varied on, which includes saving the QNTC file system.

2.5 Save-while-active function

The save-while-active function is an option on several OS/400 save commands. It allows you to save parts of your server without placing your server in a restricted state. You can use the save-while-active function to reduce your save outage. BRMS also supports save-while active within its commands and in its backup control groups.

2.5.1 How it works

OS/400 objects consist of units of storage, which are called *pages*. When you use the save-while-active function to save an object, the server creates two images of the pages of the object. The first image contains any updates to the object as happens with normal system activity that may change the object. The second image is an image of the object at a single point in time. The save-while-active job uses this image to save the object to the media.

When an application makes changes to an object during a save-while-active job, the server uses one image of the object pages to make the changes. At the same time, the server uses the other image to save the object to the media. The image that the server saves does not have the changes that you made during the save-while-active job. The image on the media is as it existed when the server reached a checkpoint.

2.5.2 Checkpoint processing

The checkpoint for an object is the instant in which the server creates an image of that object. The image that the server creates at that instant is the checkpoint image of the object. The creating of a checkpoint image is similar to taking a photograph of a moving automobile. The point in time that you take the photograph equates the checkpoint. The photograph of the moving automobile is equal to the checkpoint image. When the server finishes making the checkpoint image of the object, the object reaches a checkpoint.

Despite the name, save while active, you cannot change objects at any time during the save operation. The server allocates (or locks) objects as it obtains checkpoint images. Some of the operations that are prevented during checkpoint processing are:

- Changing an object
- Deleting an object
- Renaming an object
- Moving an object to a different library or folder
- Changing the ownership of an object
- Compressing or decompressing an object

After the server obtains the checkpoint images, the applications can change most objects types. However an attempt to perform one of the following operations may result in a message stating that the library is in use:

- Performing additional save or restore operations on objects or libraries being saved
- Deleting, renaming, or reclaiming a library from objects that you are saving
- Loading, applying, removing, or installing PTFs that affect a library from objects that you are saving
- Saving, restoring, installing, or deleting licensed programs that contain a library from objects you are saving

In addition, the following object types have operations that are restricted after checkpoint process is complete. An attempt to perform one of these operations results in a message indicating that the object is in use:

- FILE-PF (physical file)
  - Using the Change Physical File (CHGPF) command with the parameter specifications of SRCFILE, ACCPTHSIZ, NODGRP, or PTNKEY to change a physical file
  - Using an SQL Alter Table statement to change a physical file
- JRN (journal)
  - Deleting a journal with an associated journal receiver
  - Using the Work with Journal (WRKJRN) interface to recover a journal that has an associated journal receiver you are saving
- JRNRCV (journal receiver)
  - Deleting or moving the journal receiver
  - Attaching or detaching the journal receiver from a journal
  - Deleting the journal with which the receiver is associated
  - Using the WRKJRN interface to recover a damaged journal receiver
- PRDLOD (product load)
  - Deleting, moving, or renaming the product load

2.5.3 Synchronization

When you save more than one object, you must choose when the objects will reach a checkpoint in relationship to each other. This is called *synchronization*. There are three kinds of synchronization:

- **Full synchronization**: With full synchronization, the checkpoints for all of the objects occur at the same time. The checkpoints occur during a time period in which no changes can occur to the objects. We strongly recommend that you use full synchronization, even when you are saving objects in only one library.
- **Library synchronization**: With library synchronization, the checkpoints for all of the objects in a library occur at the same time.
- **System-defined synchronization**: With system-defined synchronization, the server decides when the checkpoints for the objects occur. The checkpoints for the objects may occur at different times, resulting in complex restore procedures.

The recommended way to use the save-while-active function is to end your applications that change objects. However, if you are in a restricted state, the save-while-active function is ignored. You can restart the applications after the server reaches a checkpoint for those

objects. You can choose to have the save-while-active function send a notification when it completes the checkpoint processing. Within a backup control group exit, you can use the Monitor Save While Active (MONSWABRM) command to monitor your save-while-active message queue for checkpoint completion messages (CPI3710 and CPI3712). After one of these messages is found to be in the message queue, the MONSWABRM command can run another command or send a message to users stating that checkpoint was made.

After the save-while-active function completes checkpoint processing, it is safe to start your applications again. When you use the save-while-active function in this way, the save-outage time can be much less than with normal save operations. If you cannot end your applications, you can still use the save-while-active function, although it affects the performance and response time of your applications. You should also use journaling or commitment control for all of the objects you are saving. If applications are running and they are using commitment control, the save-while-active job ends. A good example of this is when the management central server (*MGTC) is active and there commits are being done to library QUSRSYS. This is documented in Informational Authorized Program Analysis Records (APAR) II12473, which you can locate on the Web at:

http://www-912.ibm.com/n_dir/nas4apar.nsf/$$Search?openform

You see a CPF377C message in the job log and the save ends. Also a CPI8365 message is in QSYSOPR message queue stating which job was stopping the save-while active function from completing.

For more information about the save-while-active function and BRMS, see Chapter 7 in the *Backup Recovery and Media Services*, SC41-5345.

2.6 Backing up Lotus Domino servers

BRMS has the specific capability to save Lotus® Domino® products and their databases offline as well as online. There are four ways to back up your Domino databases.

- **Full dedicated backups**: Requires the Domino server or servers to be ended until the backup completes.
- **Full online backups**: Allows the Domino server or servers to be online, although not all databases can be saved depending on object locks.
- **Selective backups**: Gives you the ability to choose which databases to save online.
- **Incremental online backups**: Only saves changed objects in the database since the last full save of it. The Domino server or servers can be online or offline. This requires some additional setup on the Domino servers.

Lotus developed a command that allows you to save everything within a Domino database even when the server is online. This command is the Save Domino Server Using BRMS (SAVDOMBRM) command. You can only run it within a BRMS control group inside of an exit. When using BRMS commands or the SAVDOMBRM command, you can save your Domino databases to physical media (tapes), save files (SAVF), or an IBM Tivoli Storage Manager server.

For more information about BRMS and saving Domino servers, see:

- *Domino 6 for iSeries Best Practices Guide*, SG24-6937
- The BRMS Web site at:

  http://www-1.ibm.com/servers/eserver/iseries/service/brms/

2.7 Full system save

A save that saves the entire system is called a *full system save*. When performing a full system save, you must end all subsystems and be on the main console. For this reason, you cannot schedule a full system save. However, BRMS gives you the ability to use console monitoring to set up a scheduled job. The main console has an active job on it until the backup is complete.

For other sources of information about full system save, see the following sections:

- 8.1.8, “Full versus incremental backups” on page 172
- 9.5.1, “Full backup for system AS02” on page 313
- 9.5.2, “Full system backup restore considerations” on page 324

Some applications are already setup to perform full system saves. If you prefer, you can create your own Command Language Program (CLP).

The default ways to perform a full system save are:

- Using a BRMS backup control group
- Using the non-BRMS OS/400 functions under the OS/400 GO BACKUP option 11
- Using the non-BRMS OS/400 functions under the OS/400 GO SAVE option 21

When you choose to back up your iSeries server without BRMS, you typically have a system environment that has only a few things to back up and restore when necessary. Or you have a more complex operating environment with an available human resource that is focused on system backup and recovery.

Since this redbook is focused on integrating BRMS with IBM Tivoli Storage Manager, Figure 2-8 shows the BRMS *SYSTEM control group that is already set up to perform a full system save.

```
                  Display Backup Control Group Entries              AS02

Group . . . . . . . . . . . : *SYSTEM
Default activity  . . . . . : *BKUPCY
Text  . . . . . . . . . . . : Backs up the entire system

                      Auxiliary   Weekly    Retain  Save      SWA
     Backup      List  Storage     Activity  Object  While     Message
Seq  Items       Type  Pool Device SMTWTFS   Detail  Active    Queue
  10 *EXIT                       *DFTACT
  20 *SAVSYS                     *DFTACT
  30 *IBM                        *DFTACT   *NO     *NO
  40 *ALLUSR           *SYSBAS   *DFTACT   *ERR    *NO
  50 *ALLDLO                     *DFTACT   *NO     *NO
  60 *LINK             *ALLAVL   *DFTACT   *YES    *NO
  70 *EXIT                       *DFTACT




                                                                  Bottom
Press Enter to continue.

F3=Exit   F11=Display exits   F12=Cancel
```

*Figure 2-8 *SYSTEM control group entries*

You can also run two control groups to achieve the same results. The *SYSGRP shown in Figure 2-9 saves all the IBM-supplied data (excluding IBM IFS data).

```
                  Display Backup Control Group Entries              AS02

Group . . . . . . . . . . . : *SYSGRP
Default activity  . . . . . : *BKUPCY
Text  . . . . . . . . . . . : Backs up all system data

                       Auxiliary   Weekly    Retain  Save      SWA
     Backup      List  Storage     Activity  Object  While     Message
Seq  Items       Type  Pool Device SMTWTFS   Detail  Active    Queue
  10 *EXIT                       *DFTACT
  20 *SAVSYS                     *DFTACT
  30 *IBM                        *DFTACT   *NO     *NO
  40 *EXIT                       *DFTACT

                                                                  Bottom
Press Enter to continue.

F3=Exit   F11=Display exits   F12=Cancel
```

*Figure 2-9 *SYSGRP control group entries*

The second group that you need to run is *BKUGRP. This saves all of your user data as shown in Figure 2-10.

```
                  Display Backup Control Group Entries              AS02

Group . . . . . . . . . . . : *BKUGRP
Default activity  . . . . . : *BKUPCY
Text  . . . . . . . . . . . : Backs up all user data

                       Auxiliary   Weekly    Retain  Save      SWA
     Backup      List  Storage     Activity  Object  While     Message
Seq  Items       Type  Pool Device SMTWTFS   Detail  Active    Queue
  10 *EXIT                       *DFTACT
  20 *SAVSECDTA                  *DFTACT   *NO
  30 *SAVCFG                     *DFTACT   *NO
  40 *ALLUSR           *SYSBAS   *DFTACT   *ERR    *NO
  50 *ALLDLO                     *DFTACT   *NO     *NO
  60 *LINK             *ALLAVL   *DFTACT   *YES    *NO
  70 *EXIT                       *DFTACT

                                                                  Bottom
Press Enter to continue.

F3=Exit   F11=Display exits   F12=Cancel
```

*Figure 2-10 *BKUGRP control group entries*

2.8 Full system recovery

BRMS makes full system recovery easier than using multiple OS/400 save and restore commands in the appropriate sequence. When performing a full system recovery without BRMS, you need to follow the guidance in *Backup and Recovery*, SC41-5304, and determine which checklist best describes your situation. For example, if you are restoring your entire system, checklist 20 or appendix E is the best documentation to follow.

When using BRMS to perform a full system recovery, you can follow the recovery report created with the Start Maintenance for BRMS (STRMNTBRM) command shown in Figure 2-11 with Print recovery reports (PRTRCYRPT) parameter set to *ALL. The report is generated as a spooled file and is named QP1ARCY.

```
                    Start Maintenance for BRM (STRMNTBRM)

Type choices, press Enter.

Expire media . . . . . . . . . . > *NO          *YES, *NO
Remove media information:
  Media contents . . . . . . . . > *NONE        *EXP, *REUSE, *NONE
  Object level detail  . . . . .   *MEDCON      1-9999, *MEDCON
Remove migration information . .   180          1-9999, *NONE
Run media movement . . . . . . .   *NO          *NO, *YES
Remove log entries:
  Type . . . . . . . . . . . . . > *NONE        *ALL, *NONE, *ARC, *BKU, *M...
  From date  . . . . . . . . . .   *BEGIN       Date, *CURRENT, *BEGIN, nnnnn
  To date  . . . . . . . . . . .   90          Date, *CURRENT, *END, nnnnn
Run cleanup operations . . . . . > *NO          *YES, *NO
Retrieve volume statistics . . . > *NO          *YES, *NO
Audit system media . . . . . . .   *NETGRP
              + for more values
Change BRM journal receivers . . > *NO          *YES, *NO
Print expired media report . . .   *YES         *YES, *NO
Print version report . . . . . .   *EXPMED      *EXPMED, *YES, *NO
Print media information  . . . .   *YES         *YES, *NO
Print recovery reports . . . . .   *ALL         *ALL, *NONE, *RCYANL...
              + for more values
Recovery locations . . . . . . .   *ALL         Name, *ALL, *HOME
              + for more values
Print system information . . . .   *NO          *NO, *YES
Reorganize BRMS database . . . .   *NO          *YES, *NO

                                                                    Bottom
F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
F24=More keys
```

Figure 2-11 Generating all BRMS reports using the STRMNTBRM command

Another way to get the recovery reports is to use the Start Recovery Using BRMS (STRRCYBRM) command with the action parameter set to *report as shown in Figure 2-12. If your save strategy includes saving to save files (SAVFs) or an IBM Tivoli Storage Manager server, you need to change the parameters on the STRRCYBRM command to include those saves as well.

Note: When you create recovery reports, we recommend that you create two copies, one on site for day-to-day restores and one off site in case of a disaster.

The advantage of using the BRMS recovery report is that it gives you detailed instructions about which command to issue, which tape to use, and where the tape is located.

```
                    Start Recovery using BRM (STRRCYBRM)

Type choices, press Enter.

Option . . . . . .   *SYSTEM       *SYSTEM, *SYSBAS, *SAVSYS...
Action . . . . . .   *REPORT       *REPORT, *RESTORE
Time period for recovery:
  Start time and date:
  Beginning time . . . . . .   *AVAIL        Time, *AVAIL
  Beginning date . . . . . .   *BEGIN        Date, *CURRENT, *BEGIN
  End time and date:
  Ending time  . . . . . .   *AVAIL        Time, *AVAIL
  Ending date  . . . . . .   *END          Date, *CURRENT, *END
Use save files . . . . . .   *NO           *NO, *YES
Auxiliary storage pool . . . . .   *SYSTEM       Name, 1-32, *SYSTEM
Library  . . . . . .                      Name, generic*
List . . . . . .   *ALL          Name, *ALL
Control group selection:
  Control group  . . . . . .   *SELECT       Name, *SELECT, *SYSTEM...
  Sequence number  . . . . . .              1-99
              + for more values
Allow duplicate entries  . . . .   *NO           *NO, *YES
Use TSM  . . . . . .   *NO           *NO, *YES
Volume location  . . . . . .   *ALL          *ALL, *HOME, OFFICE, TAPEDR...
              + for more values
Library to omit  . . . . . .   *DELETE       *DELETE, *NONE
From system  . . . . . .   *LCL
Print system information . . . .   *NO           *NO, *YES


                                                                      Bottom
F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
F24=More keys
```

Figure 2-12 Generating a recovery report from the STRRCYBRM command

When performing a full system recovery to a system that has a different local control point name, which is found by using the Display Network Attributes (DSPNETA) command, there are some additional considerations as explained in Informational APAR II12462, which you can search for at:

http://www-912.ibm.com/n_dir/nas4apar.nsf/$$Search?openform

For a complete recovery report, see Appendix B, “Backup Recovery and Media Services reports” on page 375.

2.9 System backup strategies to an IBM Tivoli Storage Manager server

Unlike native OS/400 commands, BRMS can save and restore to or from a Tivoli Storage Manager server. You do this by using the BRMS Application Client, which is provided in the standard feature of BRMS LPP. The Tivoli Storage Manager APIs LPP (5733-197) are also necessary on the iSeries server. BRMS uses the IBM Tivoli Storage Manager server as it

would use any other type of storage device. There are some advantages and restrictions when saving iSeries data to the IBM Tivoli Storage Manager server.

2.9.1 Advantages

The advantages of using BRMS to save to an IBM Tivoli Storage Manager server are:

- You can use BRMS policies to save non-system objects across a network for storage on any server in the IBM Tivoli Storage Manager family.
- You can reduce the amount of media that is required at the off-site location, increasing the level of backup automation.
- You can reduce the amount of time that is spent managing media.
- You can minimize device purchases on the off-site system.

2.9.2 Restrictions

When saving to an IBM Tivoli Storage Manager server, consider the following restrictions:

- Save-while-active *SYNCLIB is not supported when saving libraries to an IBM Tivoli Storage Manager server.
- You cannot save iSeries system data to an IBM Tivoli Storage Manager server.
  - The iSeries and BRMS architecture only allows save of system data to local media so that you are protected if you need to recover your system. Only after OS/400 is restored, communication with an IBM Tivoli Storage Manager server can be established for restoration of the user data that is stored on the server.
  - Any user data that you can save to a save file, you can also save to an IBM Tivoli Storage Manager server, except user data that is required to restore OS/400 to a functional level. This includes security data, configuration data, IBM-supplied libraries, licensed program products, IBM-supplied libraries that are considered user data such as QGPL, QUSRSYS, QUSRBRM, and BRMS media information.
- You cannot schedule operations from an IBM Tivoli Storage Manager server. However, you can schedule your BRMS operations at the client using the native OS/400 job scheduler or Advanced Job Scheduler LPP.
- BRMS uses its own media policies to manage the retention and expiration of data that is stored on the IBM Tivoli Storage Manager server. IBM Tivoli Storage Manager policies are not used for this purpose.
- You can only use BRMS to restore data saved to an IBM Tivoli Storage Manager server.

2.10 Restore considerations

When using BRMS to perform saves, there are some restore considerations:

- If you are performing a full system restore, make sure that the media is owned by the system to which you are doing the restore. If it is not, you must follow the guidance in Informational APAR II12462.

  http://www-912.ibm.com/n_dir/nas4apar.nsf/$$Search?openform
- If you saved iSeries data to an IBM Tivoli Storage Manager server, you can only restore that data from the IBM Tivoli Storage Manager server using BRMS.
- A save to an IBM Tivoli Storage Manager server only contains user data. Therefore, a full system recovery is not possible from an IBM Tivoli Storage Manager server.

3

IBM Tivoli Storage Manager

IBM Tivoli Storage Manager is a family of server and client products. These products enable powerful multiplatform (different operating systems) backup and recovery capabilities. Many of the IBM Tivoli Storage Manager capabilities and concepts are similar to those provided through Backup Recovery and Media Services (BRMS) for iSeries servers only, but contain extended capabilities and apply to multiple operating systems.

This chapter introduces IBM Tivoli Storage Manager capabilities, terminology, and constructs. As stated elsewhere, this redbook does not address the entire range of IBM Tivoli Storage Manager capabilities. Refer to the following chapters for more information about installing IBM Tivoli Storage Manager on iSeries servers and how to get the IBM Tivoli Storage Manager server up and running on an iSeries server.

3.1 IBM Tivoli Storage Manager overview

IBM Tivoli Storage Manager is a cross-platform storage management application that allows enterpise-wide storage management from PCs to mainframe systems. It provides backup, archive, and application protection for most of today's many different operating system environments.

Most of the iSeries servers with Enterprise Editions now have an IBM Tivoli Storage Manager server and five IBM Tivoli Storage Manager clients included in their software package. Check the following Web page to see if IBM Tivoli Storage Manager software is bundled with your iSeries server:

http://www-1.ibm.com/servers/eserver/iseries/hardware/editions/

IBM Tivoli Storage Manager is a client/server solution. It is comprised of an IBM Tivoli Storage Manager server and IBM Tivoli Storage Manager clients.

IBM Tivoli Storage Manager server manages the storage hardware. It provides a secure environment, automation, and reporting and monitoring functions. It also implements the storage management policies and stores all object inventory information in the IBM Tivoli Storage Manager database.

IBM Tivoli Storage Manager client software and complementary products implement data management functions. Such functions include data backup and recovery, archival, hierarchical space management, or disaster recovery.

3.1.1 IBM Tivoli Storage Manager server

The main components of an IBM Tivoli Storage Manager server are the same for all platforms, regardless of whether the IBM Tivoli Storage Manager server is on an iSeries, IBM @server pSeries®, or a Windows-based server. Each IBM Tivoli Storage Manager server is comprised of the following main components:

- IBM Tivoli Storage Manager server program
- IBM Tivoli Storage Manager database/recovery log
- IBM Tivoli Storage Manager storage hierarchy
- IBM Tivoli Storage Manager administrative interface
- IBM Tivoli Storage Manager security

IBM Tivoli Storage Manager server program

The server program provides backup, archive, and space management services to IBM Tivoli Storage Manager clients. You can set up multiple servers in your enterprise network to balance storage, processor, and network resources.

The iSeries IBM Tivoli Storage Manager server uses the OS/400 Portable Application Solutions Environment (PASE) to run the server. OS/400 PASE is an optional licensed program product (LPP) for OS/400 (option 33 5722-SS1). It is included in the standard OS/400 distribution software package at V5R2M0.

By default, the IBM Tivoli Storage Manager server performs its primary functions using IP port 1500. You can run multiple IBM Tivoli Storage Manager servers on the same system. Each server requires a unique port number.

The IBM Tivoli Storage Manager server can run on multiple platforms. See the IBM Tivoli Storage Manager Web home page for a detailed list of all supported IBM Tivoli Storage Manager server platforms:

http://www-3.ibm.com/software/tivoli/products/storage-mgr/platforms.html

IBM Tivoli Storage Manager database and recovery log

The heart of the IBM Tivoli Storage Manager server is its database and recovery log. IBM Tivoli Storage Manager has a relational database and transaction log to manage its data. The database itself doesn't contain any client data. Instead, the database points to the locations of the client files in the IBM Tivoli Storage Manager storage hierarchy (tape, disk, etc.).

All policy information, logging, authentication, and security, media management, and object inventory are managed through this database. Most of the fields are externalized using IBM Tivoli Storage Manager high-level administration commands, SQL SELECT statements, or for reporting purposes, an ODBC driver.

The recovery log contains information about database updates that are not yet committed. Changes to the database are recorded in the recovery log to maintain a consistent database image.

On the iSeries server, the IBM Tivoli Storage Manager database and recovery log are stored in the integrated file system (IFS). They can consist of multiple database and recovery log volumes, which are individual streamed files (STMF), that can be combined to create and extend these storage entities.

IBM Tivoli Storage Manager storage hierarchy

All IBM Tivoli Storage Manager managed client data is stored in the IBM Tivoli Storage Manager storage hierarchy. IBM Tivoli Storage Manager uses the concept *storage pools*, which can consist of different storage devices, such as disk (OS/400 IFS) or tape. They are controlled by the IBM Tivoli Storage Manager server. IBM Tivoli Storage Manager also uses *copy storage pools*, which are normally used to produce a copy of a storage pool for off-site or disaster recovery requirements.

IBM Tivoli Storage Manager uses its own model of storage to view, classify, and control these storage devices, and to implement its storage management functionality. IBM Tivoli Storage Manager storage management concentrates on managing data objects instead of managing and controlling backup tapes. This is the main difference between the storage management approach of IBM Tivoli Storage Manager and other commonly used systems. Data objects can be files or directories that are backed up from the client systems. They can be objects, such as tables or records from database applications, or simply a block of data that a client system wants to store on the server storage.

A storage pool is built from one or more *storage pool volumes*. Disk storage pool volumes are individual stream files in the OS/400 IFS. In the case of a tape storage pool, a storage pool volume is a single physical tape cartridge.

To describe how IBM Tivoli Storage Manager can access those physical volumes to place the data objects on them, IBM Tivoli Storage Manager has another logical entity called a *device class* (for tape storage pools). A device class is connected to a sequential tape storage pool and specifies how volumes of this storage pool can be accessed. IBM Tivoli Storage Manager organizes storage pools in one or more hierarchical structures.

Figure 3-1 shows the flow of client backup data in the our test IBM Tivoli Storage Manager configuration used throughout this redbook. The flow occurs as explained here:

1. An IBM Tivoli Storage Manager client sends backup data to the IBM Tivoli Storage Manager server and places it in the disk storage pool BACKUPPOOL. This storage pool comprises four storage pool volumes, which reside as STMFs in the OS/400 IFS (/tsmvol/backuppool/bkpvol01 through 04).
2. The IBM Tivoli Storage Manager client data is migrated from the BACKUPPOOL to the tape storage pool BACKUPLTO. This storage pool comprises of physical LTO tapes (known to IBM Tivoli Storage Manager as *storage pool volumes*) in a 3584 tape library.
3. The IBM Tivoli Storage Manager client data is then copied to another storage pool COPYLTO to produce a second copy of the clients data. Again, this storage pool also comprises of physical LTO tapes in the 3584 tape library.
4. The COPYLTO volumes in the 3584 tape library are ejected and moved to an off-site location for disaster recovery.

Throughout this process, the IBM Tivoli Storage Manager database keeps track of where the clients backup data resides.

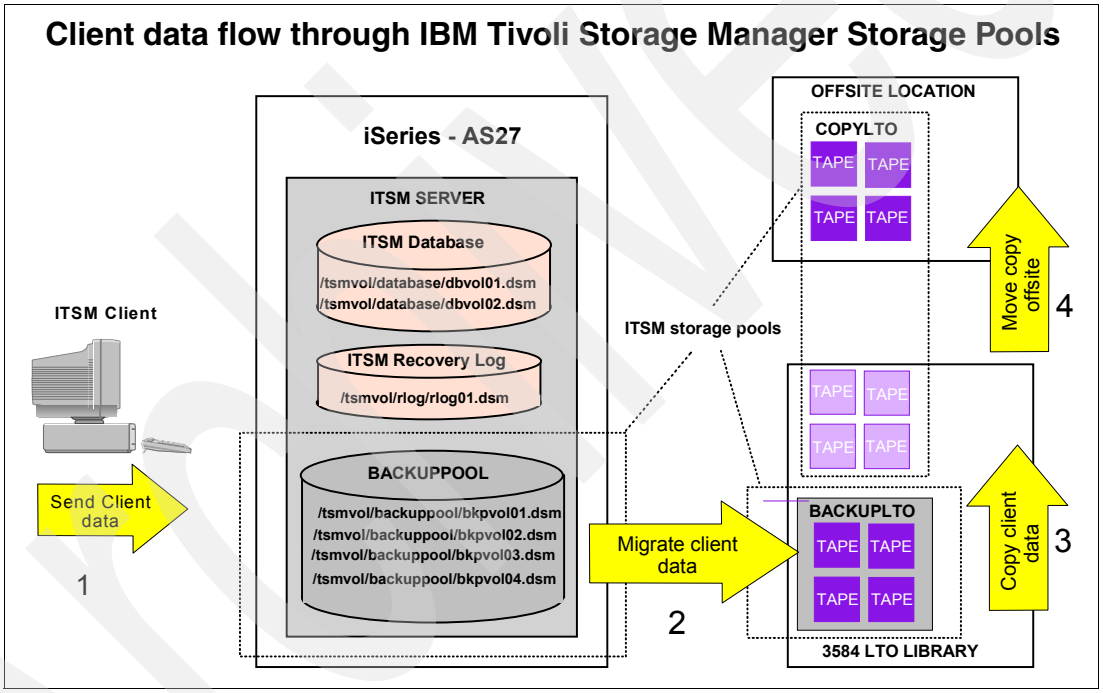

Figure 3-1 IBM Tivoli Storage Manager storage hierarchy

IBM Tivoli Storage Manager administrative interface

The administrative interface allows administrators to control and monitor server activities, define management policies for clients, and set up schedules to provide services to clients at regular intervals. Administrative interfaces that are available include a Web browser interface and command-line administrative client.

IBM Tivoli Storage Manager Web administrative client interface

The Web administrative client interface allows you to access IBM Tivoli Storage Manager server functions from any workstation with a Web browser that has the appropriate support for Java™. IBM Tivoli Storage Manager allows you to manage and control multiple servers from a single interface that runs in a Web browser. The Web administrative client interface also allows you to enter IBM Tivoli Storage Manager commands through the Server Command window (see Figure 3-2).

The Web administrative client interface is also commonly referred to as a *Tivoli Storage Manager administrative client*.

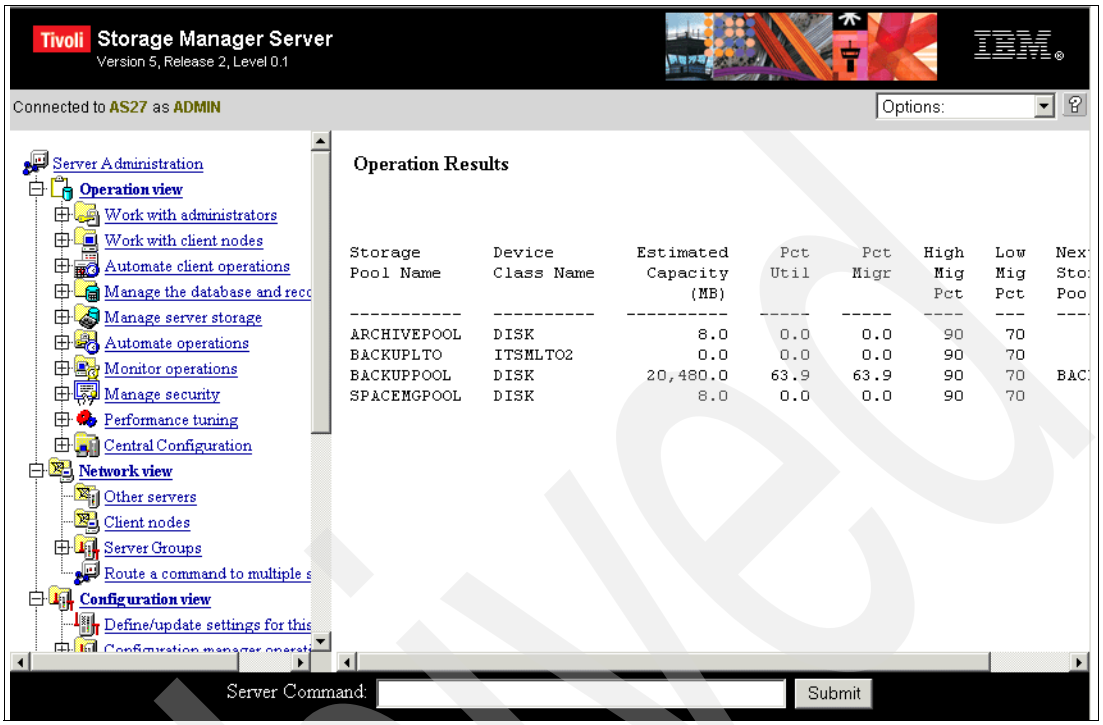

Figure 3-2 IBM Tivoli Storage Manager Web administrative client interface

By default, the IBM Tivoli Storage Manager administrative client performs its primary functions using IP port 1580. You can run multiple IBM Tivoli Storage Manager servers on the same system and manage them using this interface.

IBM Tivoli Storage Manager administrative command line interface

You can optionally install an administrative client with the backup-archive client. The administrative client package consists of the Tivoli Storage Manager server command line, which you can use to remotely manage a Tivoli Storage Manager server from a network-attached machine. The administrative command-line client is a program that runs using an IBM Tivoli Storage Manager client product component. It enables authorized administrators to control and monitor the server through administrative commands (see Figure 3-3).

There is no IBM Tivoli Storage Manager administrative client product that runs natively on the iSeries server. See Appendix C, “AIX administrative client in OS/400 PASE sample programs” on page 399, for details about porting the AIX client to the OS/400 IFS.

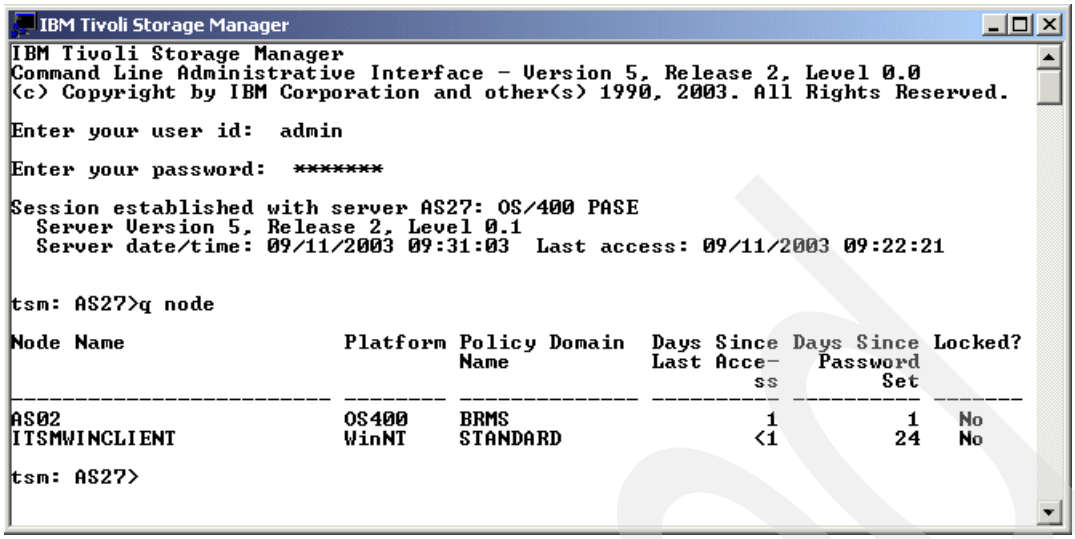

Figure 3-3 IBM Tivoli Storage Manager client command line interface

IBM Tivoli Storage Manager security

Tivoli Storage Manager server is controlled and managed by administrators. Tivoli Storage Manager has five privilege levels for administrators:

- SYSTEM
- POLICY
- STORAGE
- OPERATOR
- ANALYST

The highest privilege is SYSTEM. It is equivalent to OS/400 *SECOFR, in that SYSTEM-level security has full rights within IBM Tivoli Storage Manager. IBM Tivoli Storage Manager security offers a great deal of flexibility to secure IBM Tivoli Storage Manager environments. For example, you can give responsibility for all AIX clients to one department and all Windows clients to another department. Each department only has rights to control their own IBM Tivoli Storage Manager backup clients.

See Chapter 4, “Using Commands Based on Privilege Class” in *IBM Tivoli Storage Manager for OS/400 PASE Administrator’s Reference*, GC23-4695, about more functions that are allowed from different levels of administrators.

3.1.2 IBM Tivoli Storage Manager clients

The IBM Tivoli Storage Manager client sends data to, and retrieves data from, an IBM Tivoli Storage Manager server. Each IBM Tivoli Storage Manager client has its own unique node name to identify it to the IBM Tivoli Storage Manager server.

The different types of IBM Tivoli Storage Manager clients are:

- Backup-archive
- Data protection
- Application programming interface (API)
- Hierarchical space management

Backup-archive

The backup process creates a copy of the file or application data that can be recovered if the original data is lost or destroyed. Unlike other backup applications, IBM Tivoli Storage Manager implements a progressive backup methodology to move data quickly and reliably. Using progressive backups, the storage administrator can specify the number of file versions maintained by IBM Tivoli Storage Manager and the length of time they are retained.

Backups can be scheduled, performed manually from the IBM Tivoli Storage Manager client interface, or performed remotely using a Web-based interface. The restore process transfers a backup data copy from IBM Tivoli Storage Manager storage hierarchy into a designated machine.

Data protection

The IBM Tivoli Storage Manager data protection client, also called an *application client*, allows for the backup and restoration of data used by various business applications, such as common industry databases, mail, and application servers. The IBM Tivoli Storage Manager data protection client receives backup and restore requests from the business application and translates them for IBM Tivoli Storage Manager server processing. Backup and restore processing can be done while the business application is online.

Application programming interface

The API client allows you to create custom IBM Tivoli Storage Manager client implementations. For example, BRMS uses these APIs to send OS/400 data to an IBM Tivoli Storage Manager server.

Hierarchical space management

Hierarchical space management provides the automatic and transparent movement of operational data from the user system disk space to a main storage repository. If the user accesses this data, it is dynamically and transparently restored to the client storage.

3.2 IBM Tivoli Storage Manager clients

This section provides an overview of IBM Tivoli Storage Manager client products. See Figure 1-1 on page 8 for a graphic representation of the clients listed here:

- IBM Tivoli Storage Manager, Version 5.2 clients:
  - AIX 5.1 and 5.2 (32-bit and 64-bit)
  - HP/UX 11.0, 11i (32-bit and 64-bit)
  - Linux x86 2.4 kernel (Red Hat 7.2, 7.3, 8, and Advanced Server 2.1; SuSE 7.3, 8.0, 8.1, and SLES 7 and 8; TurboLinux 7.5, and 8.0)
  - Linux for pSeries 2.4 kernel (SuSE 8.0)
  - Linux/390 and IBM @server zSeries® 2.4 kernel (SuSE Linux Enterprise Server 7, 8)
  - Macintosh, X(10).x
  - Novell NetWare 5.1, 6
  - OS/390®, zSeries USS (S/390® V2R10 with SMP/E, z/OS® V1R1, V1R2, V1R3, and V1R4)
  - OS/400 5.1 or 5.2 API client
  - SGI IRIX UNIX, Release 6.5 with EFS or XFS File Systems (with V5.1 functional client)
  - Sun Solaris, 7, 8, or 9 (32-bit or 64 bit)
- Tru64 UNIX, Version 5.1A (with V5.1 functional client)
- Windows XP (32 bit and 64 bit), Windows Server 2003 (32 bit or 64 bit), Windows 2000 Professional, Server, Advanced Server, and Datacenter Server

- Windows NT® 4.0 SP5 and SP6a (with V5.1 functional client)
- Novell NetWare 5.1, 6

V5.1 clients not migrated that can be used with V5.2 servers include:

- AIX 4.3.3
- Solaris 2.6
- Macintosh 9
- Windows 98

This list of supported IBM Tivoli Storage Manager clients can change overtime. Refer to the following Web site for the latest information:

http://www-3.ibm.com/software/tivoli/products/storage-mgr/platforms.html

3.3 IBM Tivoli Storage Manager backup-archive concepts

The IBM Tivoli Storage Manager architecture uses an intelligent backup methodology that provides efficiencies during both the backup and restoration of client data. During the initial client backup, IBM Tivoli Storage Manager backs up all eligible files, creating a full backup. Subsequently, files are backed up again only if they are new or changed since the last backup. IBM Tivoli Storage Manager maintains a pointer in its database to the latest version of each file for each client. This eliminates the need for another full backup to consolidate the files into a single image.

Other backup products require an initial full backup, followed by regular incremental or differential backups (usually once a day), and then additional periodic full backups (usually once a week). This less-efficient backup method results in redundant weekly full backups of files that have not changed, wasting both network and media resources. The multistep restore process of such products requires restoration of the last full backup, along with more recent incremental or differential backups, to recover the latest version of a file or an entire system.

At any time, IBM Tivoli Storage Manager enables the creation of a complete set of client files (backup set) on the server system using the most recent backup versions stored in the server storage repository. You can use these backup sets to retain a snapshot of all client files for a longer period of time (Instant Archive). Simply copy this backup set to portable media and restore is locally (Rapid Recovery).

File archive means that you create a copy of a file as a separate object in the storage repository to be retained for a specific period of time. Typically you use this function to create an additional copy of data to be saved for historical purposes. Vital records (data you keep for legal or other business reasons) are likely candidates for the archive process. You can specify to delete the original copy of the data on the source system after the archive copy is created on the server. Therefore, you can use an archive to make additional space available on the IBM Tivoli Storage Manager client system. However, do not think of an archive as a complete space management function, because transparent automatic recall is not available.

You can access archived data by using retrieve to return it to the IBM Tivoli Storage Manager client, if the data is needed at some future time. To locate the archived data within the storage repository, IBM Tivoli Storage Manager allows you to add a description to the data and to form archive packages of related files. You can then use this description to search the server database for matching packages to determine which data to retrieve. Therefore, the difference between backup and archive is that backup creates and controls multiple backup versions that are directly attached to the original file. Archive creates an additional file that is normally kept for a specific period of time, as in the case of vital records.

3.3.1 IBM Tivoli Storage Manager Disaster Recovery Manager and disaster recovery

Disaster recovery is the process of restoring operations of a business or organization in the event of a catastrophe. There may be many aspects related to the restoration, including facilities, equipment, personnel, supplies, customer services, and data. A valuable business asset is the critical data that resides on the computer systems throughout the company. The recovery of this data needs to be a primary focus of the disaster recovery plan. IBM Tivoli Storage Manager, along with Tivoli Disaster Recovery Manager (DRM), can assist you in the technical steps that you need to make your data available to users after a widespread failure.

IBM Tivoli Storage Manager Disaster Recovery Manager is a feature of the IBM Tivoli Storage Manager Extended Edition. IBM Tivoli Storage Manager DRM helps coordinate and automate the process of recovering from a disaster. It provides for off-site media management, automated restore of the IBM Tivoli Storage Manager server, and managed client recovery. It complements the robust protection features of IBM Tivoli Storage Manager and automates many already facilitated protection functions.

Note: The newer iSeries servers, Models 825, 870, and 890, include a software packaging option called the *Enterprise Edition*, with a package feature number unique for an 825, 870, or 890. This iSeries Enterprise Edition software package provides several software products and includes the IBM Tivoli Storage Manager Extended Edition. If you do not have this iSeries Enterprise Edition software, you must purchase the IBM Tivoli Storage Manager Extended Edition separately.

DRM automatically captures information required to recover the IBM Tivoli Storage Manager server after a disaster. It assists in preparing a plan that allows recovery in the most expedient manner. This disaster recovery plan contains information, scripts, and procedures needed to automate server restoration. It also helps to ensure quick recovery of your data after a disaster.

DRM manages and tracks the movement of off-site media to reduce the time required to recover in the event of a disaster. It can track media that are stored on site, in transit, or off site in a vault, regardless of whether it is a manual or electronic vault, so your data can be easily located if disaster strikes.

DRM can also capture client recovery information. You can use this information to assist in identifying what clients need to recover, in what order, and what is required to recover them. This includes data and media that are not managed by IBM Tivoli Storage Manager.

3.4 IBM Tivoli Storage Manager client for iSeries Linux partitions

The iSeries offers innovative Linux systems integration and consolidation via industry leading logical partitioning. This partitioning supports multiple images of Linux and OS/400 and is available across the iSeries product line. On a one-way iSeries server, you can create up to nine partitions. For a 32-way server, you can create up to 31 Linux partitions.

With logical partitioning, the iSeries server enables OS/400 applications to be extended with Linux on a single server. Linux applications can access DB2® Universal Database™ (UDB) as well as OS/400 programs and services through one of 16 high-speed Virtual Ethernet LANs that interconnect the partitions. These connections can provide 1 Gb of performance and do not require local area network (LAN) adapters, switches, or physical networks.

OS/400 and BRMS have always allowed complete image backups of our OS/400 hosted Linux partitions. With the September 2003 iSeries announcements, you can perform file-level backups for iSeries-based linux servers using the IBM Tivoli Storage Manager client for Linux.

If IBM Tivoli Storage Manager for OS/400 PASE is installed in another partition on the same iSeries server, you can take advantage of the internal high-speed (1 GB) Virtual Ethernet LAN to transport the Linux backup data.

3.5 IBM Tivoli Storage Manager restore considerations

The progressive incremental backup that is the IBM Tivoli Storage Manager standard results in operations that are optimized for the restore of individual files or small numbers of files. Progressive incremental backup minimizes tape usage, reduces network traffic during backup operations, and eliminates the storage and tracking of multiple copies of the same data. It may reduce the impact to client applications during backup.

For a level of performance that is balanced across both backup and restore operations, the best method is to use progressive incremental backup with collocation set on in the storage pool. By using collocation, you reduce the number of volume mount operations required when users restore or retrieve many files from the storage pool. When collocation is set, IBM Tivoli Storage Manager attempts to use at least one tape volume for each client. Therefore using collocation also requires more volumes and the capacity to store these additional volumes in an automated library. However, if restore times are critical, collocation can provide a significant time saving recovering client data.

Part 2

IBM Tivoli Storage Manager details

This part provides more details about using IBM Tivoli Storage Manager for OS/400 Portable Application Solutions Environment (PASE). It covers the following topics:

- IBM Tivoli Storage Manager overview
- Installing IBM Tivoli Storage Manager as a server on an iSeries server
- Quick start for IBM Tivoli Storage Manager, including getting your IBM Tivoli Storage Manager server up and running with basic capabilities
- IBM Tivoli Storage Manager save and restore function scenario examples

4

Installing IBM Tivoli Storage Manager server for OS/400 PASE

This chapter provides instructions to help you install the IBM Tivoli Storage Manager for OS/400 PASE server, 5698-ISX. It includes the system requirements and prerequisite software for IBM Tivoli Storage Manager for OS/400 PASE.

4.1 iSeries server requirements

Table 4-1 shows the minimum disk space requirements for a production IBM Tivoli Storage Manager server on the iSeries platform.

Table 4-1 iSeries disk requirements

IBM Tivoli Storage Manager function	Disk space requirements
IBM Tivoli Storage Manager Server	40 MB
IBM Tivoli Storage Manager Database	500 MB
Recovery Log	100 MB
Disk Storage Pool	Enough space to back up one day's worth of changed client data per workstation.
Clients	6 MB per client (approximately)

Your disk space requirements change as you expand the scope of your system.

The database size is largely determined by the number of client files and versions of those files being stored on the server storage. As you add clients, you must increase your database size.

Storage pool space is largely determined by number and size of client files (including versions) and the backup destination (disk or sequential access media). You should reserve enough disk space to hold each day's changed data and to allow migration to tape.

4.2 IBM Tivoli Storage Manager for OS/400 PASE prerequisite software

Before you install IBM Tivoli Storage Manager on the iSeries, you must first ensure that you install all of the necessary prerequisite software. The minimum OS/400 level for the IBM Tivoli Storage Manager server is V5R1M0.

4.2.1 OS/400 PASE

OS/400 PASE is an integrated run-time environment for AIX applications running on OS/400. It supports the Application Binary Interface (ABI) of AIX. It provides a broad subset of the support provided by AIX shared libraries, shells, and utilities.

PASE is an optional function of the OS/400 licensed program product (Option 33, 5722-SS1). It provides a UNIX-like environment where the IBM Tivoli Storage Manager server for OS/400 PASE will run. However, OS/400 PASE is not a UNIX operating system on OS/400. It is designed to run AIX programs on OS/400 with little or no change.

Verify that OS/400 PASE is installed on your iSeries server by using the OS/400 Display Software Resources (DSPSFWRSC) command. If the OS/400 Option 33, licensed program product (LPP) is not installed and your OS/400 level is at V5R2M0, then you can restore it from the OS/400 B29xx_05 CD (included in your standard iSeries V5R2M0 software distribution).

If your OS/400 level is at V5R1M0, then you must order this chargeable feature from IBM.

4.2.2 Program temporary fix requirements

In addition to the OS/400 PASE software, you must install and apply the OS/400 program temporary fixes (PTFs) listed in Table 4-2.

Table 4-2 IBM Tivoli Storage Manager PTF requirements

OS/400 V5R1 PTFs	OS/400 V5R2 PTFs
SI04612	MF30253
SI04626	MF30371
SI03939	MF30245
MF28967	
SI01968	
MF27490	
MF27780	
MF28208	

The PTFs listed in this table were used while writing this redbook. By the time you read this redbook, these PTFs may have been updated. Refer to the iSeries software support Web site to determine if any of these PTFs are updated with newer PTFs. Go to:

`http://www.ibm.com/eserver/iseries/support`

When you reach this Web site, click the **Search Technical Databases** link. Then select **PTF Cover Letters** on the next page. Search for a PTF number. Any corequisite or prerequisite PTFs are included in the search results.

4.3 Installing the IBM Tivoli Storage Manager server code

The following steps explain how to install IBM Tivoli Storage Manager from the iSeries CD-ROM drive:

1. Sign on to the iSeries server with QSECOFR or a profile with equivalent authority.
2. Insert the CD labeled *IBM Tivoli Storage Manager For OS/400 PASE* into the iSeries CD-ROM drive.
3. Change the QSYSOPR message queue to break mode with severity level 95:

   ```
   CHGMSGQ MSGQ(QSYSOPR) DLVRY(*BREAK) SEV(95)
   ```

4. Enter the Restore Licensed Program (RSTLICPGM) command and press F4.

   You can only install the IBM Tivoli Storage Manager server code via the RSTLICPGM command and not using GO LICPGM option 10.

5. Install the licensed program. Enter the following information (Figure 4-1):
   - Product: `5698ISX`
   - Device: Name of your CD-ROM drive (for example, OPT01)
   - Type of object to be restored: `*ALL`
   - Language for licensed program:

- If you want to use the OS/400 system language feature for the IBM Tivoli Storage Manager server, enter *PRIMARY.
- If you want to use a different language feature than that of the operating system, then enter the required language feature number (for example 29xx).

```
                      Restore Licensed Program (RSTLICPGM)

Type choices, press Enter.

Product  . . . . . . . . . . . . > 5698ISX       Character value
Device . . . . . . . . . . . . . > OPT01         Name, *SAVF
               + for more values
Optional part to be restored . .   *BASE         *BASE, 1, 2, 3, 4, 5, 6, 7...
Type of object to be restored  .   *ALL          *ALL, *PGM, *LNG
Language for licensed program  .   *PRIMARY      Character value, *PRIMARY...
Output . . . . . . . . . . . . .   *NONE         *NONE, *PRINT
Release  . . . . . . . . . . . .   *FIRST        Character value, *FIRST
Replace release  . . . . . . . .   *ONLY         Character value, *ONLY, *NO
Volume identifier  . . . . . . .   *MOUNTED
               + for more values
End of media option  . . . . . .   *REWIND       *REWIND, *LEAVE, *UNLOAD
                                                                    More...
F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
F13=How to use this display        F24=More keys
```

Figure 4-1 RSTLICPGM 5698ISX

The installation process places most of the IBM Tivoli Storage Manager software in the iSeries integrated file system (IFS) under directory /usr/tivoli/tsm/server/. It also creates a QTSM library that basically holds the IBM Tivoli Storage Manager product information for OS/400.

6. Verify that the licensed program is installed by selecting option 10 (Display installed licensed programs) and then option 50 (Display History) from the GO LICPGM OS/400 menu.

Tip: With the iSeries Announcement of 5 September 2003, there is a new installation possibility for these IBM Tivoli Storage Manager APIs and other software, called *iSeries Enterprise Editions Installation Assistant* (5733-ED1). It is for customers with systems 825 or higher with Enterprise Edition. Installation Assistant uses the V5R2 iSeries Virtual Media Installation (VMI) function. You can learn more about these and other iSeries Announcements on the Web at:

http://www-1.ibm.com/servers/eserver/iseries/announce/

4.4 Downloading IBM Tivoli Storage Manager for OS/400 PASE fixes

The IBM Tivoli Storage Manager server for OS/400 PASE requires PTFs just like any other OS/400 LPP. IBM Tivoli Storage Manager has maintenance and patch levels. Maintenance levels are similar to OS/400 cumulative PTF packages and patch levels are similar to OS/400 HIPER fix packages.

Patches are intended to provide relief for critical problems when local circumvention is unavailable. Although the patches are tested by development, we strongly recommend that you perform additional testing before you place a patch into a production environment. Patches are included in the next maintenance level PTF.

IBM Tivoli Storage Manager code levels are represented as *Version.Release.Maintenance.Patch*. For example, for IBM Tivoli Storage Manager 5.1.5, the 5.1.5 translates as Version 5, Release 1, and Maintenance level 0. For 5.2.0.1, this means Version 5, Release 2, and Maintenance level 0 patch 1.

Be sure to read both the README and README.INSTALL files that are available with every patch and maintenance level for detailed information about the installation and issues addressed with each PTF.

Important: You must end the IBM Tivoli Storage Manager for OS/400 PASE server before you install any maintenance or patch PTFs.

You can download the latest IBM Tivoli Storage Manager fixes by using one of the methods presented in the following sections.

4.4.1 IBM FTP server via Web browser

You can download fixes (maintenance or patch PTFs) to your PC by using the following Web addresses. The PTFs are downloaded in the form of OS/400 savefiles, which you must send via FTP to your iSeries server. Read the README.INSTALL file for detailed installation instructions.

- Maintenance levels

  `ftp://ftp.software.ibm.com/storage/tivoli-storage-management/maintenance/server/`

  Select the relevant version and release and then the PASE and LATEST folders.

- Patch levels

  `ftp://ftp.software.ibm.com/storage/tivoli-storage-management/patches/server/PASE/`

  Select the relevant version, release, maintenance, and patch level.

4.4.2 IBM FTP server to OS/400

You can download the IBM Tivoli Storage Manager fixes directly to your iSeries server by accessing the IBM FTP server from your system. The following example shows you how to download patch 01 for V5R2M0 (IBM Tivoli Storage Manager). Be sure to read both the README and README.INSTALL files that are available with every patch and maintenance level since the installation steps may be different than those that are listed here.

1. Create an OS/400 savefile to receive the Tivoli Storage Manager fix on the iSeries server by entering the following command:

   ```
   CRTSAVF FILE(QGPL/Q52001SR)
   ```

   The savefile name can be any meaningful name. In this example, we use Q52001SR to represent Version 5 Release 2 Maintenance 0 Patch 01.

2. On an OS/400 command line, enter:

   ```
   FTP RMTSYS(FTP.SOFTWARE.IBM.COM)
   ```

3. For the login ID, enter `anonymous`.
4. For the guest password, enter your e-mail address.
5. Set the FTP session in to binary mode:

   ```
   bin
   ```
6. Go to the relevant PASE directory:
   - For IBM Tivoli Storage Manager patches, go to the patch directory:

     ```
     cd /storage/tivoli-storage-management/patches/server/PASE
     ```
   - For IBM Tivoli Storage Manager maintenance fixes, go to the maintenance directory:

     ```
     cd /storage/tivoli-storage-management/maintenance/server/vXrY/PASE
     ```

     Here *X* is the IBM Tivoli Storage Manager server version level and *Y* is the IBM Tivoli Storage Manager release level.
7. To list the fix subdirectories that are available, enter the following command:

   ```
   ls -l
   ```
8. Change to the required directory by entering the command:

   ```
   cd
   ```
9. Download the required fix by using the **get** command as shown here:

   ```
   get Q52001SR.savf QGPL/Q52001SR (replace
   ```
10. End the FTP session by entering **quit** or pressing F3.

4.4.3 IBM Tivoli Storage Manager support Web page

You can also download the IBM Tivoli Storage Manager fixes to your PC by selecting **Downloads** from the Tivoli support Web page, which is located at:

http://www-3.ibm.com/software/sysmgmt/products/support/IBMTivoliStorageManager.html

You must be a registered IBM support user or you must register before you can download any IBM Tivoli Storage Manager fixes.

4.5 Loading and applying IBM Tivoli Storage Manager PTFs

IBM Tivoli Storage Manager server PTFs on the iSeries do not follow the normal iSeries PTF naming conventions such as MF*nnnnn* or SI*nnnnn*. Each PTF README.INSTALL file has the IBM Tivoli Storage Manager server PTF number and installation instructions. The following example explains how to install our downloaded PTF patch 01 for V5R2M0, which is 52001SR. You must read both the README and README.INSTALL files that are available with every patch and maintenance level since the installation steps may be different that those presented here.

Ensure that you end the IBM Tivoli Storage Manager server before you apply the PTF. This does not apply to a new installation of the IBM Tivoli Storage Manager server.

1. Load the IBM Tivoli Storage Manager PTF using the OS/400 command:

   ```
   LODPTF LICPGM(5698ISX) DEV(*SAVF) SELECT(52001SR) SAVF(QGPL/Q52001SR)
   ```
2. Apply the IBM Tivoli Storage Manager PTF using the OS/400 command:

   ```
   APYPTF LICPGM(5698ISX) SELECT(52001SR)
   ```

3. Verify that the PTF is applied by typing the following OS/400 command (see Figure 4-2):

   ```
   DSPPTF LICPGM(5698ISX)
   ```

```
                                Display PTF Status
                                                                 System:   AS27
 Product ID  . . . . . . . . . . . . . :   5698ISX
 IPL source  . . . . . . . . . . . . . :   ##MACH#B
 Release of base option  . . . . . . . :   V5R1M0

Type options, press Enter.
   5=Display PTF details   6=Print cover letter   8=Display cover letter

      PTF                                                        IPL
 Opt  ID       Status                                          Action
      52001SR  Temporarily applied                             None



                                                                          Bottom
 F3=Exit   F11=Display alternate view   F17=Position to   F12=Cancel
```

Figure 4-2 DSPPTF for IBM Tivoli Storage Manager (5698ISX)

4. The applied PTF may have been modified the IBM Tivoli Storage Manager Web administrative client interface (see 5.2.1, "IBM Tivoli Storage Manager Web administrative client interface" on page 56). Perform the following steps to update the Web administrative client interface with any new changes:

   a. Start an OS/400 PASE session. From an OS/400 command line, enter:

      ```
      call qp2term
      ```

   b. Change to the IBM Tivoli Storage Manager server's directory:

      ```
      cd /usr/tivoli/tsm/server/bin
      ```

   c. Enter the following command to regenerate the IBM Tivoli Storage Manager server Web pages:

      ```
      dsmserv runfile /usr/tivoli/tsm/server/webimages/dsmserv.idl
      ```

      You must wait for the return of the dollar sign ($) prompt (indicates that the script has completed). Then press F3 to exit.

Figure 4-3 shows an example of an OS/400 PASE session after successfully running the dsmserc.idl script.

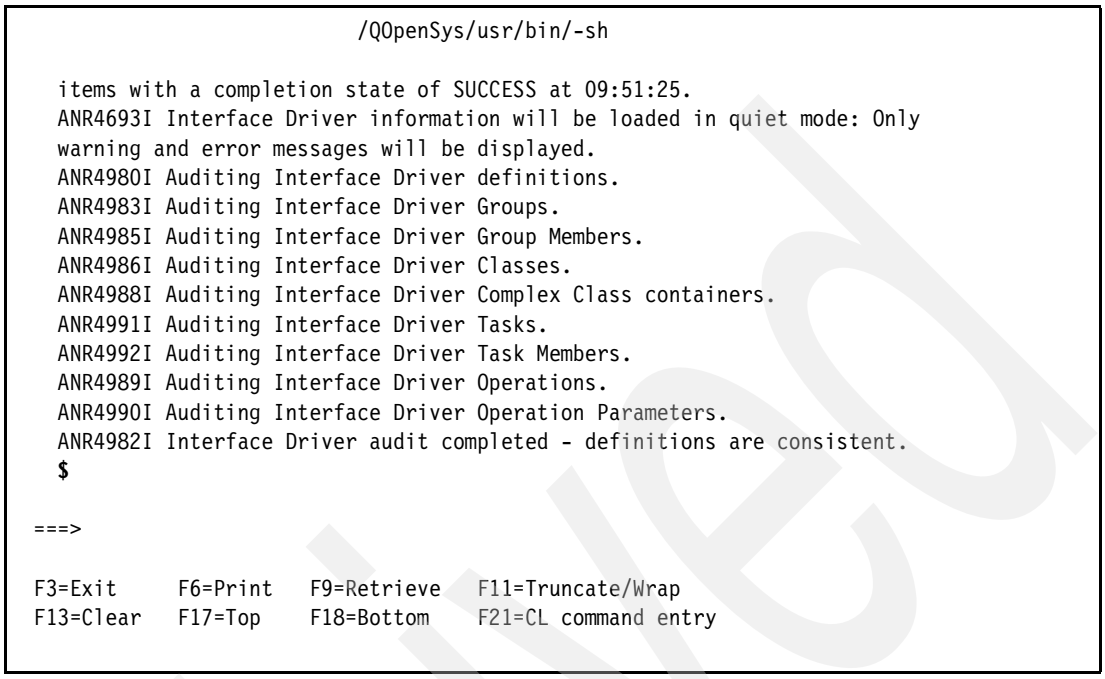

Figure 4-3 OS/400 PASE session update of the Web administrative client interface

5. If this is a new installation, then continue with Chapter 5, “First steps: IBM Tivoli Storage Manager server basic configuration” on page 53. Otherwise you may restart the IBM Tivoli Storage Manager server now.

5

First steps: IBM Tivoli Storage Manager server basic configuration

This chapter contains the basic steps to configure an IBM Tivoli Storage Manager OS/400 Portable Application Solutions Environment (PASE) server. It covers some of the common steps to help you get the IBM Tivoli Storage Manager server up and running. It shows the displays that we used to configure our test IBM Tivoli Storage Manager server to help you configure your own IBM Tivoli Storage Manager server.

5.1 Starting and stopping the IBM Tivoli Storage Manager server

There are various methods to start and stop the IBM Tivoli Storage Manager server as explained in the following sections. By default, the only way to start and stop the IBM Tivoli Storage Manager server is through an interactive session.

5.1.1 Starting and ending the IBM Tivoli Storage Manager server for the first time

As mentioned, the IBM Tivoli Storage Manager for iSeries runs in OS/400 PASE, which provides an AIX-like environment for the IBM Tivoli Storage Manager server. Initially, we start the IBM Tivoli Storage Manager server through an interactive OS/400 PASE session, although the IBM Tivoli Storage Manager server normally runs in batch mode. This is discussed later in the following section.

1. To start an OS/400 PASE session, enter the following command from an OS/400 command line:

   ```
   call qp2term
   ```

   Program qp2term runs the IBM Tivoli Storage Manager server on your iSeries server as a job in the same OS/400 subsystem as the job calling qp2term (terminal).

2. Change to the IBM Tivoli Storage Manager server's directory:

   ```
   cd /usr/tivoli/tsm/server/bin
   ```

3. Set the IBM Tivoli Storage Manager server home environmental variable:

   ```
   export DSMSERV_DIR=/usr/tivoli/tsm/server/bin
   ```

4. When it is started, the IBM Tivoli Storage Manager server looks for a control file (dsmserv.opt) in the IBM Tivoli Storage Manager server code directory. A sample file (dsmserv.opt.smp) is provided that you should copy and use as a good starting point. To copy the file, enter the following command:

   ```
   cp dsmserv.opt.smp dsmserv.opt
   ```

5. To start the IBM Tivoli Storage Manager server interactively, enter:

   ```
   dsmserv
   ```

   A display similar to the one shown in Figure 5-1 is shown as the IBM Tivoli Storage Manager server starts. The IBM Tivoli Storage Manager server is now active in OS/400 PASE. By running in OS/400 PASE through a 5250 job (the call to program qp2term), the iSeries implementation runs the IBM Tivoli Storage Manager server on your iSeries server as a job in the same OS/400 subsystem as the 5250 workstation job calling qp2term (terminal).

   Attention: Do *not* press F3 (exit the PASE interface) on this display. Otherwise, you will lose your interactive session interface to the OS/400 PASE server job.

   The time given to your IBM Tivoli Storage Manager server may be incorrect at this point. Continue with the following sections since we address this in 6.1, “Setting the correct time zone for OS/400 PASE” on page 94.

```
                              /QOpenSys/usr/bin/-sh
   ANR8200I TCP/IP driver ready for connection with clients on port 1500.
   ANR2803I License manager started.
   ANR8190I HTTP driver ready for connection with clients on port 1580.
   ANR2560I Schedule manager started.
   ANR0984I Process 1 for EXPIRATION started in the BACKGROUND at 16:18:38.
   ANR0811I Inventory client file expiration started as process 1.
   ANR0993I Server initialization complete.
   ANR0812I Inventory file expiration process 1 completed: examined 0 objects,
   deleting 0 backup objects, 0 archive objects, 0 DB backup volumes, and 0
   recovery plan files. 0 errors were encountered.
   ANR0916I TIVOLI STORAGE MANAGER distributed by Tivoli is now ready for use.ANR0985I
   ROUND completed with completion state SUCCESS at 16:18:38.
   TSM:TSM>
===>
 F3=Exit     F6=Print   F9=Retrieve   F11=Truncate/Wrap
 F13=Clear   F17=Top    F18=Bottom    F21=CL command entry
```

Figure 5-1 Interactive start of IBM Tivoli Storage Manager

6. End the IBM Tivoli Storage Manager server. Enter the **halt** command to end the IBM Tivoli Storage Manager OS/400 PASE server. Do *not* press F3 on this display to exit. We restart the server in batch mode as explained in the following section.
7. When you receive the message "ANR0991I Server shutdown complete", press F3 to return to the OS/400 command line.

5.1.2 Starting IBM Tivoli Storage Manager server in batch mode

By default, there is no batch mode environment for the IBM Tivoli Storage Manager server. Although IBM Tivoli Storage Manager server can run interactively, this mode requires that you manually start the server after each iSeries initial program load (IPL). You must do this since the interactive OS/400 PASE session (QP2TERM) cannot be started from the system startup program.

To start the IBM Tivoli Storage Manager server in batch mode, you must create a simple Command Language Program (CLP), which you can call from the OS/400 Submit Job (SBMJOB) command or add to the iSeries startup program. Use the sample code in Example 5-1 to compile into a CLP, for example, QGPL/STRTSMSRV.

Note: The following code is case sensitive. You must type the directory references in lower case as shown in Example 5-1. When using Start Program Development Manager (STRPDM) or SEU, press F13 to change the session defaults and set the Uppercase input only value to N.

Example 5-1 Sample code to start IBM Tivoli Storage Manager server in batch

```
PGM
/*STRTSMSRV*/
             ADDENVVAR  ENVVAR(DSMSERV_DIR) +
                          VALUE('/usr/tivoli/tsm/server/bin')
             ADDENVVAR  ENVVAR(DSMSERV_CONFIG) +
                          VALUE('/usr/tivoli/tsm/server/bin/dsmserv.o+
                          pt')
/**/
```

```
            CHGCURDIR  DIR('/usr/tivoli/tsm/server/bin')
/**/
            CALL       PGM(QP2SHELL) +
                         PARM('/usr/tivoli/tsm/server/bin/dsmserv')
/**/
ENDPGM
```

The following SBMJOB command calls our STRTSMSRV program created in the previous step and submits it to the QSYSWRK subsystem via the QSYSNOMAX jobq. You can also create your own IBM Tivoli Storage Manager subsystem and JOBQ and run the IBM Tivoli Storage Manager server there instead.

```
SBMJOB CMD(CALL PGM(QGPL/STRTSMSRV)) JOB(TSMPASESRV) JOBQ(QSYSNOMAX) ALWMLTTHD(*YES)
```

Note: You must set the Allow multiple threads (ALWMLTTHD) parameter on the SBMJOB command to *YES.

5.2 IBM Tivoli Storage Manager administration interfaces

Attention: There are certain limitations to the iSeries 5250 (Call qp2term) OS/400 PASE display session. The IBM Tivoli Storage Manager server cannot generate output that can be displayed properly in all cases. Therefore, we do not recommend the OS/400 PASE 5250 screen session as the normal interface for the server. Only use it as the server console in a limited form.

Instead, we recommend that you use either the Tivoli Storage Manager Web Administrative client (browser interface) or the Tivoli Storage Manager Command Line client as the interface to the Tivoli Storage Manager OS/400 PASE server. This section describes these interfaces.

There are two administration interfaces for the IBM Tivoli Storage Manager OS/400 PASE server. There is a Web administrative client interface, Tivoli Storage Manager Web Administrative client, which you can access from a Web browser. And there is a command line interface, which you must start from an IBM Tivoli Storage Manager client.

You can optionally install the IBM Tivoli Storage Manager administrative client with the backup-archive client. (As previously stated, keep in mind that there is no iSeries backup-archive client product.) A non-iSeries administrative client package consists of the Tivoli Storage Manager server command line, which you can use to remotely manage a Tivoli Storage Manager server from a network-attached machine.

All IBM Tivoli Storage Manager server configuration steps and examples in this redbook are performed using only the IBM Tivoli Storage Manager Web Administrative client interface.

5.2.1 IBM Tivoli Storage Manager Web administrative client interface

The IBM Tivoli Storage Manager Web administrative client interface requires a Java Swing-capable Web browser with Java Runtime Environment (JRE) 1.3.1 installed. The most common Web browsers that meet these requirements include:

- Netscape Navigator 6.0 (provides Java Swing support) or later
- Netscape Navigator 4.7 or later with the Java plug-in (JRE 1.3.1)
- Microsoft® Internet Explorer 5.0 or later with the Java plug-in (JRE 1.3.1)

The active IBM Tivoli Storage Manager server behaves as a Web page server for the IBM Tivoli Storage Manager Web administrative client interface. A specific HTTP Web server configuration is not required. You can access the IBM Tivoli Storage Manager Web administrative client interface from a Web browser by using:

`http://`*`itsmservername`*`:1580`

Here *itsmservername* is either the host name of the iSeries server or the numeric IP address. *1580* is the default port for the IBM Tivoli Storage Manager Web administrative client interface. See Figure 5-2. The installation default for the IBM Tivoli Storage Manager administrator is user ID `admin` and password `admin`.

Figure 5-2 IBM Tivoli Storage Manager Web administrative client interface signon page

After you log in, you see the IBM Tivoli Storage Manager Web administrative client interface main page as shown in Figure 5-3.

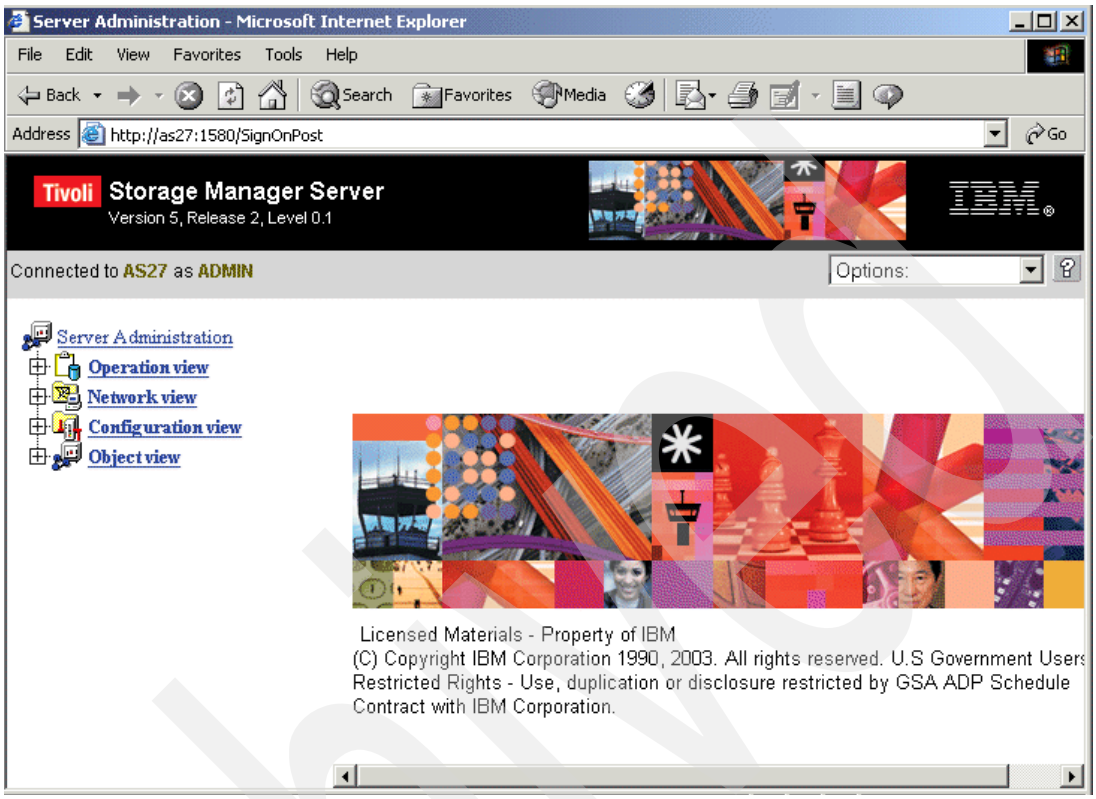

Figure 5-3 IBM Tivoli Storage Manager Web administrative client interface

Also available in the IBM Tivoli Storage Manager Web administrative client interface is a Server Command window. This enables users to type IBM Tivoli Storage Manager commands rather than clicking the left tree structure of the Web administrative client interface.

To access the Server Command window, from the Options list in the top right corner of the browser window, select **Show command line**. See Figure 5-4.

Figure 5-4 Web administrative client interface Server Command page

If you know the relevant IBM Tivoli Storage Manager commands, then using the Server Command window can save you time. You can find all the IBM Tivoli Storage Manager server commands in the *IBM Tivoli Storage Manager for OS/400 PASE - Administrator's Reference,* GC23-4695. The following sections show examples of using the Server Command window.

5.3 IBM Tivoli Storage Manager server configuration

The following sections show the basic IBM Tivoli Storage Manager server configuration steps that are required to get your IBM Tivoli Storage Manager server up and running. Refer to *IBM Tivoli Storage Manager for OS/400 PASE Administrator's Guide,* GC23-4694, for more detailed information about IBM Tivoli Storage Manager server configuration.

5.3.1 Changing the default admin password

To secure the IBM Tivoli Storage Manager server, you must change the administrator password from the default of *admin*. After you change the administrator password, you are forced to sign on to the IBM Tivoli Storage Manager server again.

The following examples show how to change the password from either the Web administrative client interface tree structure or the Server Command window.

IBM Tivoli Storage Manager Web administrative client interface tree structure

The following steps show how to change the ADMIN ID password using the IBM Tivoli Storage Manager Web administrative client interface tree structure:

1. On the left side of the page, in the Web tree structure, expand **Object view** and select **Administrators** (see Figure 5-5).

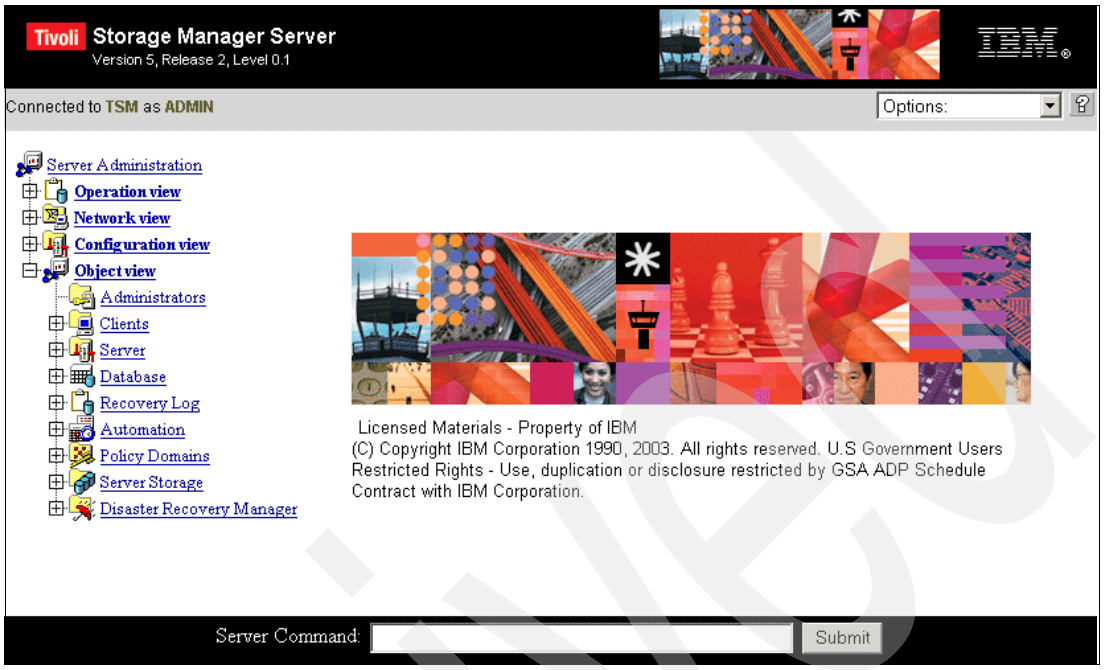

Figure 5-5 Web administrative client interface: Selecting Administrators

2. On the Administrators panel, select the **ADMIN** user ID from the list of administrators (Figure 5-6).

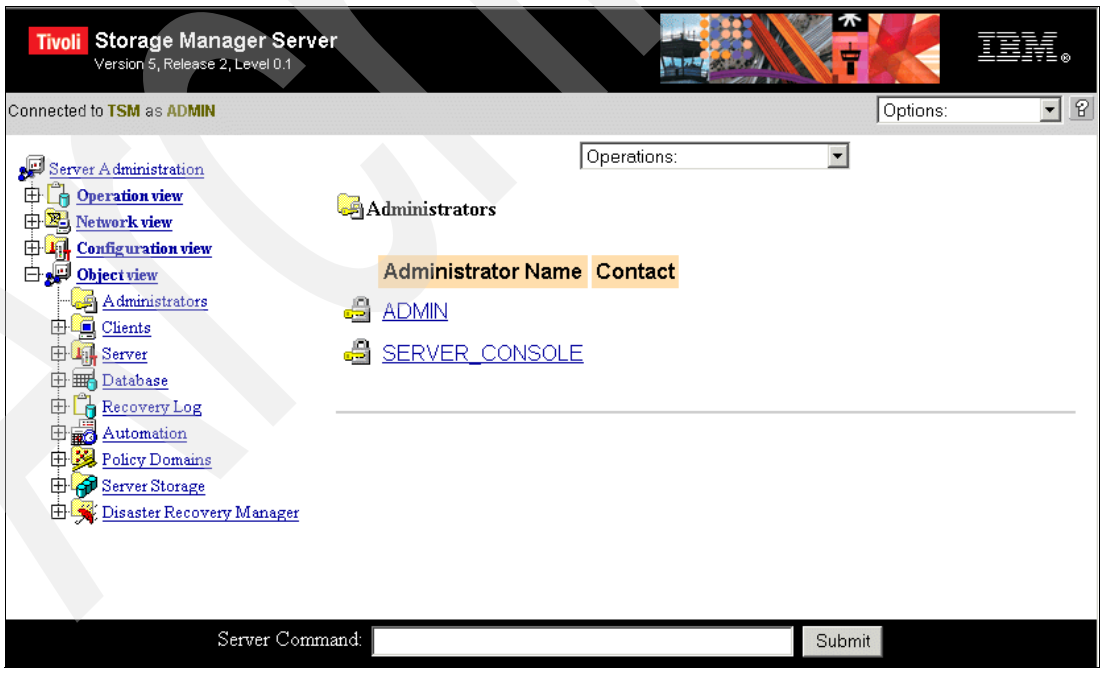

Figure 5-6 Web administrative client interface: Selecting ADMIN

3. From the Operations list, select **Update an Administrator** as shown in Figure 5-7.

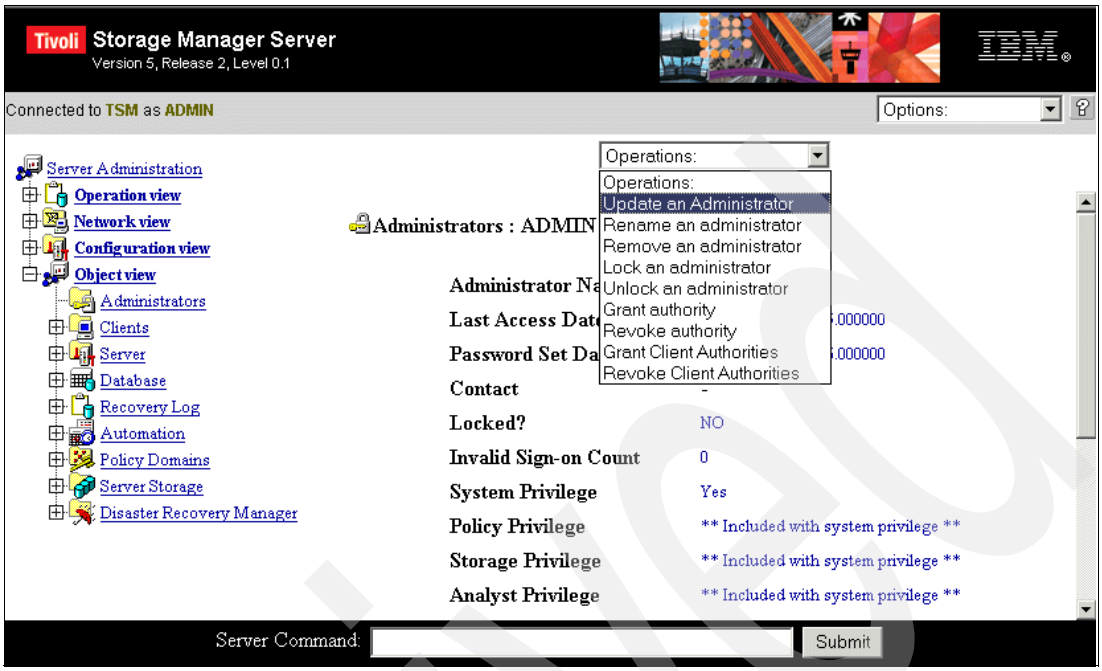

Figure 5-7 Web administrative client interface: Updating an administrator

4. On the Update an Administrator panel (Figure 5-8), in the Password field, enter the new admin password. Scroll to the end of the panel. Ignore the other fields and click **Finish** to process the update.

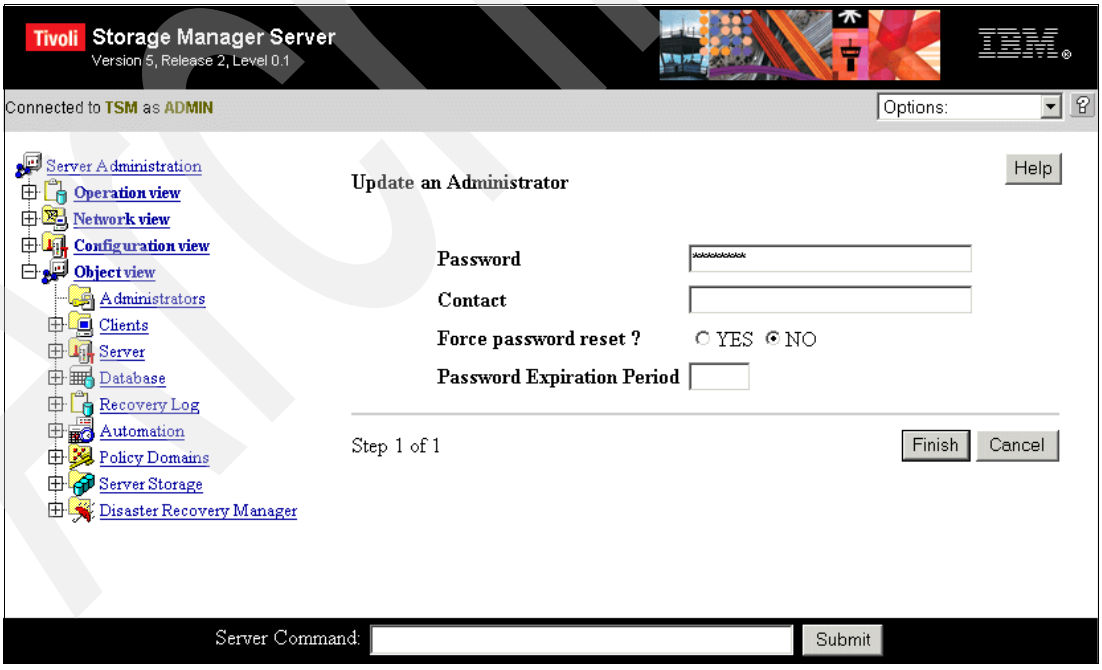

Figure 5-8 Web administrative client interface: Entering a password

IBM Tivoli Storage Manager Server Command window

The following step shows how to change the ADMIN ID password using the IBM Tivoli Storage Manager Web Server Command window with the IBM Tivoli Storage Manager **`update admin`** command.

1. In the Server Command window at the bottom of the page (Figure 5-9), type:

   ```
   update admin admin xxxxxxxx
   ```

   Here *xxxxxxxx* is the new password given to the admin user ID.

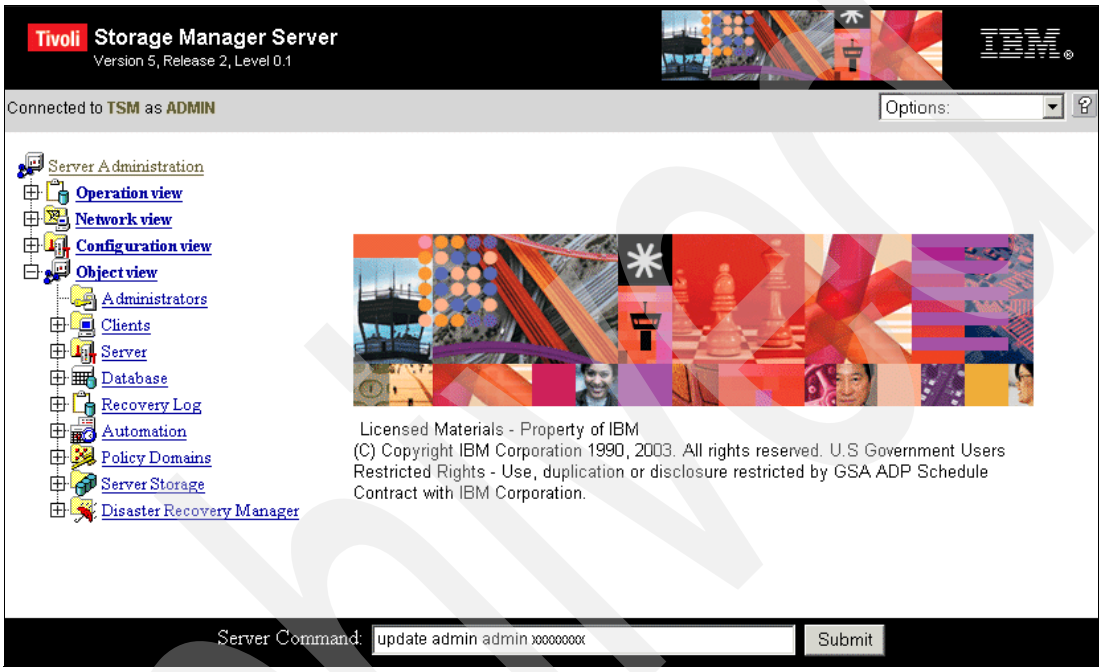

Figure 5-9 IBM Tivoli Storage Manager Server Command window: Using the update admin command

2. Click **Submit** to process the command. The page shown in Figure 5-10 displays a message indicating the update of the admin user ID was successful.

Figure 5-10 IBM Tivoli Storage Manager Server Command window: Successful update

5.3.2 Changing IBM Tivoli Storage Manager Web administrative client interface time-out value

The IBM Tivoli Storage Manager Web administrative session automatically logs off if it is not used for ten minutes. You may want to increase this setting to avoid continuously signing into the IBM Tivoli Storage Manager server. To change this parameter, choose one of the following options:

- Use the IBM Tivoli Storage Manager Web tree structure by following these steps:
  a. Expand **Object view-> Server** and select **Server Status**.
  b. From the Operations list, select **Set Web authentication time out**.
  c. Enter the new time-out value in minutes. A value of 0 means no time out.
- Use the IBM Tivoli Storage Manager Web Server Command window by entering the following command:

  ```
  SET WEBAUTHTIMEOUT n
  ```

  Here *n* is the required time out value in minutes.

5.3.3 Registering IBM Tivoli Storage Manager licenses

You must register any IBM Tivoli Storage Manager licensed functions that you purchased. The licensed files are automatically placed in the IBM Tivoli Storage Manager servers directory on the iSeries server (/usr/tivoli/tsm/server/bin/) when the product was installed.

Depending on your iSeries server model, you may already have five Tivoli Storage Manage backup-archive client licenses (mgsyslan.lic) included in the iSeries Enterprise Edition

packaging. These licenses should be registered. Initially the IBM Tivoli Storage Manager server only has one registered client after the product is installed.

Table 5-1 shows all of the licensed files that are available to IBM Tivoli Storage Manager.

Table 5-1 IBM Tivoli Storage Manager available licensed files

Licensed file name	Description
domino.lic	Each managed system that uses IBM Tivoli Storage Manager for Mail
drm.lic	IBM Tivoli Storage Manager Extended Edition (disaster recovery manager)
emcsymm.lic	Each managed system that uses IBM Tivoli Storage Manager for Hardware (EMC Symmetrix)
emcsymr3.lic	Each managed system that uses IBM Tivoli Storage Manager for Hardware (EMC Symmetrix R/3)
ess.lic	Each managed system that uses IBM Tivoli Storage Manager for Hardware (ESS)
essr3.lic	Each managed system that uses IBM Tivoli Storage Manager for Hardware (ESS R/3)
informix.lic	Each managed system that uses IBM Tivoli Storage Manager for Databases (Informix®)
library.lic	IBM Tivoli Storage Manager Managed Library
lnotes.lic	Each managed system that uses IBM Tivoli Storage Manager for Lotus Notes
mgsyslan.lic	Each managed system that uses IBM Tivoli Storage Manager Managed System for LAN
msexch.lic	Each managed system that uses IBM Tivoli Storage Manager for MicroSoft Exchange Databases
mssql.lic	Each managed system that uses IBM Tivoli Storage Manager for Databases (MS SQL Server)
oracle.lic	Each managed system that uses IBM Tivoli Storage Manager for Databases (Oracle)
r3.lic	Each managed system that uses IBM Tivoli Storage Manager for Enterprise Resource Planning
spacemgr.lic	Each managed system that uses Tivoli Storage Manager for Space Management
was.lic	Each managed system that uses IBM Tivoli Storage Manager for Application Servers (WebSphere)

With the exception of the drm.lic and library.lic, you can specify any number of license files to register. Always specify the total number of licenses you want to register. If you enter number=0 for a particular license, the license is unregistered. If you have 20 licenses and require 10 additional licenses, you must register 30.

To register five IBM Tivoli Storage Manager Backup-Archive Clients to the IBM Tivoli Storage Manager server, choose one of the following methods:

- Use the IBM Tivoli Storage Manager Web tree structure by following these steps:
  a. Expand **Object view-> Server** and select **License Information**. This displays the current licensed information of the IBM Tivoli Storage Manager server.
  b. From the Operations list, select **Register License**.
  c. On the Register License panel (Figure 5-11), in the Licensed File field, type `mgsyslan.lic`. In the Number to License field, type `5`. Click **Finish**.
  d. Click **Return**.

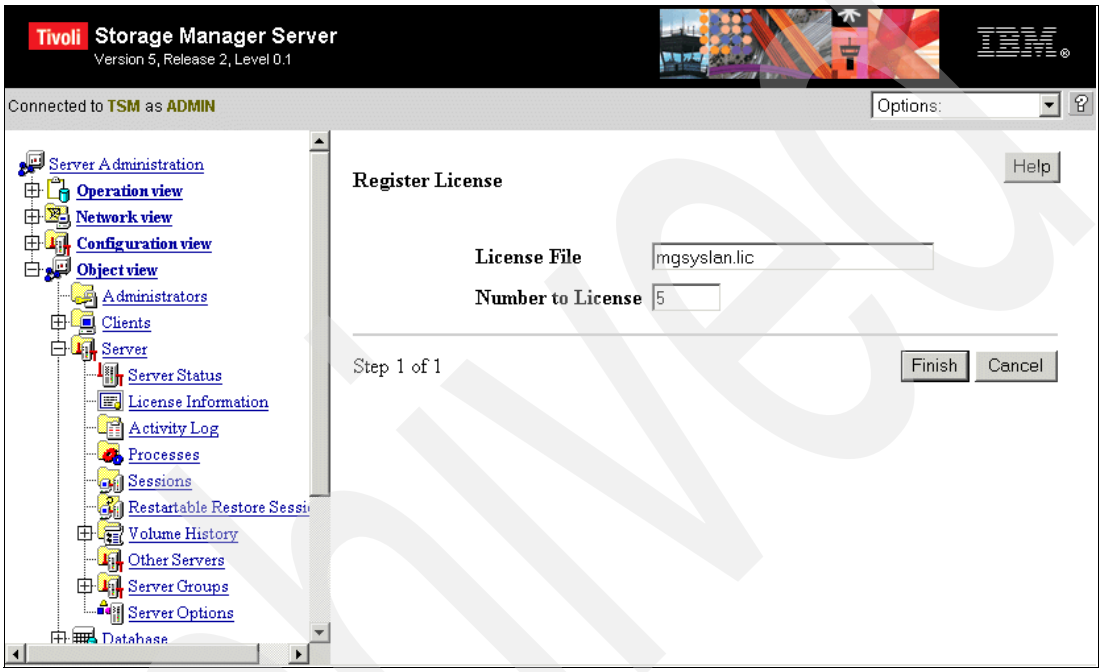

Figure 5-11 Web administrative client interface: Register License panel

- Use the IBM Tivoli Storage Manager Web Server Command window by entering the command:

```
register license file=mgsyslan.lic number=5
```

5.3.4 Querying IBM Tivoli Storage Manager licensed information

To see what IBM Tivoli Storage Manager licenses are currently registered to the IBM Tivoli Storage Manager server, use one of the following methods to query the IBM Tivoli Storage Manager licensed information:

- Use the IBM Tivoli Storage Manager Web tree structure:
  a. Expand **Object view-> Server** and select **License Information**.
  b. Scroll down the page to see all server licenses as shown in Figure 5-12.
- Use the IBM Tivoli Storage Manager Web Server Command window:
  a. Enter the following command:

```
query license or q lic
```

  b. Scroll down the page to see all server licenses as shown in Figure 5-12.

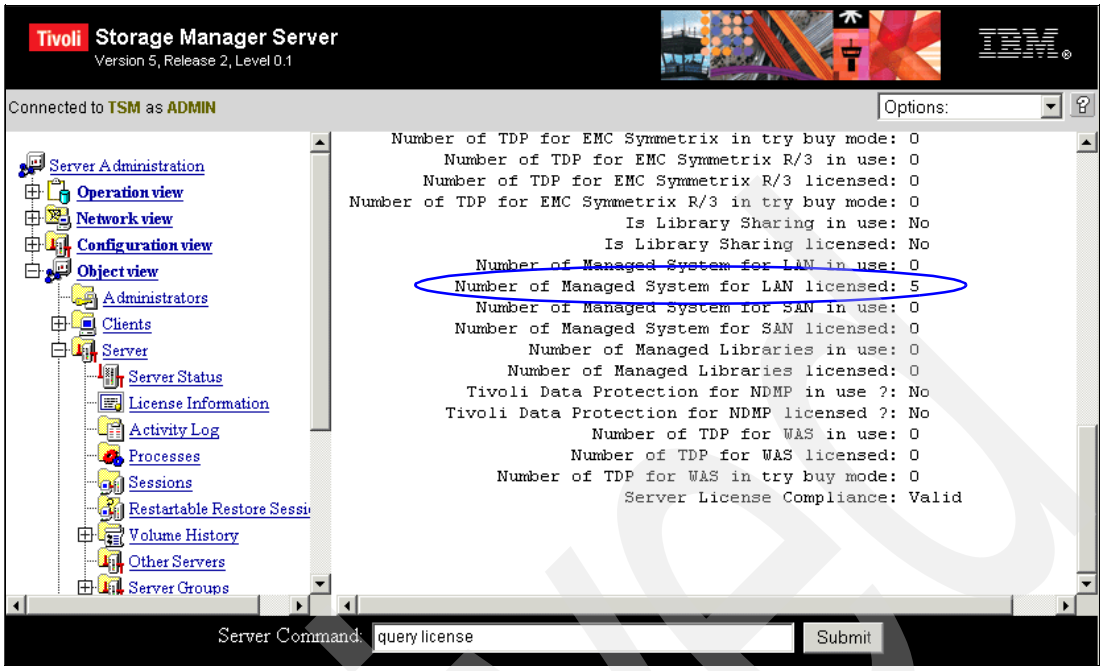

Figure 5-12 Web administrative client interface: Licensed information

5.3.5 Creating an IFS file structure for IBM Tivoli Storage Manager

The default installation places all the IBM Tivoli Storage Manager volumes in the IBM Tivoli Storage Manager server integrated file system (IFS) directory (/usr/tivoli/tsm/server/bin/). You can get the IBM Tivoli Storage Manager server up and running with this single directory. However, it is good practice to create a new directory structure for the various IBM Tivoli Storage Manager storage volumes and files that are created during the server configuration, rather than keeping them all in the same /usr/tivoli/tsm/server/bin directory.

Dividing the IBM Tivoli Storage Manager volumes into different directories gives a more structured approach to the IBM Tivoli Storage Manager server installation and provides a more manageable environment. We recommend that you start with at least five directories. You can create them by entering the following commands from an OS/400 command line:

```
CRTDIR DIR('/tsmvol/')
CRTDIR DIR('/tsmvol/database')
CRTDIR DIR('/tsmvol/rlog')
CRTDIR DIR('/tsmvol/backuppool')
CRTDIR DIR('/tsmvol/files')
```

These new directories are used in the following IBM Tivoli Storage Manager server configuration sections.

5.3.6 Increasing the IBM Tivoli Storage Manager database size

The initial IBM Tivoli Storage Manager installation automatically creates the IBM Tivoli Storage Manager database for you. This is the heart of the IBM Tivoli Storage Manager server. The IBM Tivoli Storage Manager database contains information that is needed for server operations and information about client data that must backed up, archived, and space managed.

The database does not store client data. Instead, the database points to the locations of the client files in the various storage pools. The size of the database depends on many factors, such as number of client files, number of versions kept, and any copies made for off site. See Chapter 17, “Managing the Database and Recovery Log” in the *IBM Tivoli Storage Manager for OS/400 PASE Administrator’s Reference,* GC23-4695, for sizing the IBM Tivoli Storage Manager database.

The IBM Tivoli Storage Manager database created by the installation process has, by default, one database with a size of 16 MB. The IBM Tivoli Storage Manager database can consist of numerous database volumes. This can be compared to OS/400 single level storage, where data is spread over multiple physical disks and OS/400 is responsible for the data management. The following example increases the IBM Tivoli Storage Manager database by 2 GB. It creates two 1 GB database volumes, and the IBM Tivoli Storage Manager server spreads data evenly over these two new volumes.

Each database volume created requires 1 MB extra space for overhead. Therefore, in our example, we create each volume as 1025 MB (1024 MB for the IBM Tivoli Storage Manager database data + 1 MB overhead).

Again you can perform this from both the IBM Tivoli Storage Manager Web administrative client interface tree structure and the IBM Tivoli Storage Manager Server Command window.

You must first define the database volume and then extend the database by performing the following steps:

1. Expand **Object view-> Database** and select **Database Volumes**. You see the 16 MB database volume created during the IBM Tivoli Storage Manager installation as shown in Figure 5-13.
2. From the Operations list, select **Define Database Volume**.

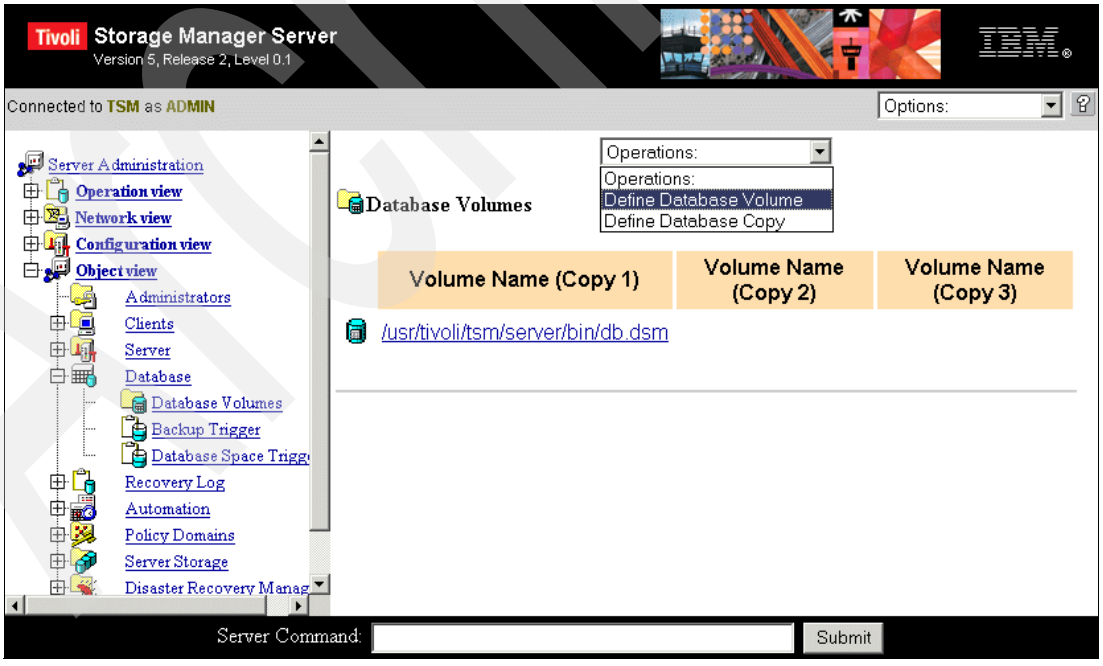

Figure 5-13 Web administrative client interface: Database Volumes panel

3. On the Define Database Volume panel (Figure 5-14), enter the IBM Tivoli Storage Manager database volume name and size. The database volume name must include the fully qualified path and the format size of the required volume in MB. In our example, as shown in Figure 5-14, we entered:
   - Volume Name: `/tsmvol/database/dbvol01.dsm`
   - Format Size: `1025`
   - Wait: **No** (the process runs as a batch process rather than interactively)

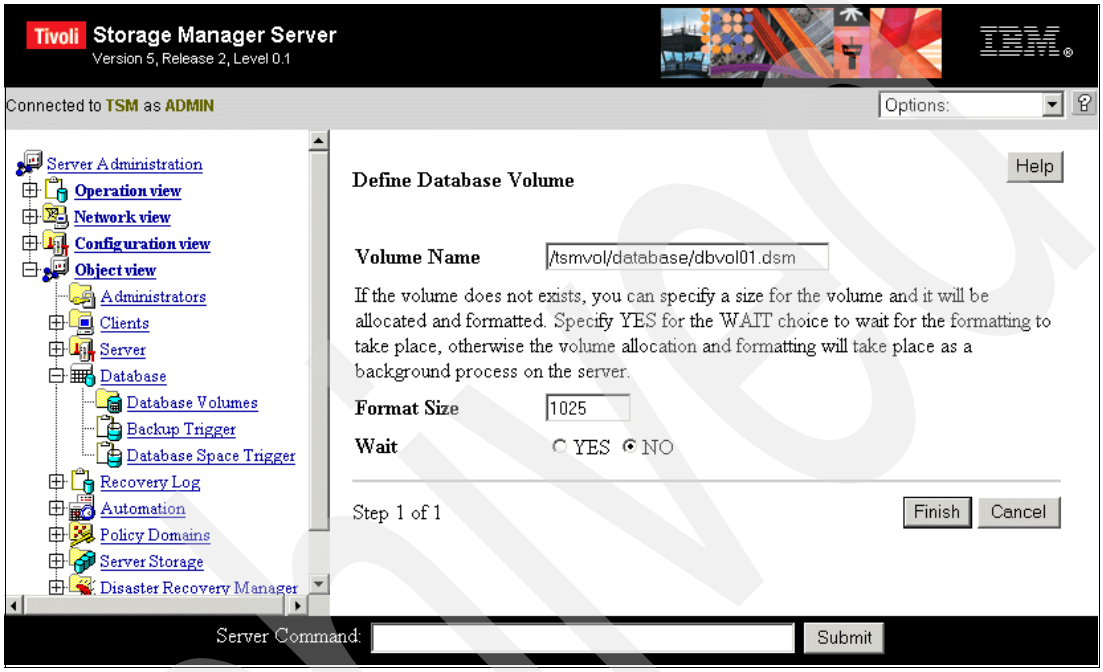

Figure 5-14 Web administrative client interface: Defining the database volume

4. Click **Finish** to submit the request.

> **Note:** You can replace steps 1 through 4 by entering the following command in the Server Command window:
>
> `define dbvolume /tsmvol/database/dbvol01.dsm formatsize=1025`

5. You see an Operation results message similar to the following example stating that the volume create process is starting:

   `"ANR2491I Volume Creation Process starting for tsmvol/database/ dbvol01.dsm, Process Id 8."`

6. The process now runs as a batch job and may take several minutes to complete. Each process is assigned a unique process number. You can see the IBM Tivoli Storage Manager active processes (see Figure 5-15) by using one of the following methods:
   - IBM Tivoli Storage Manager Web administrative client interface tree structure by expanding **Object view-> Server** and selecting **Processes**.
   - IBM Tivoli Storage Manager Web administrative client interface Server Command window by entering either of the following commands:

     ```
     query process
     q pr
     ```

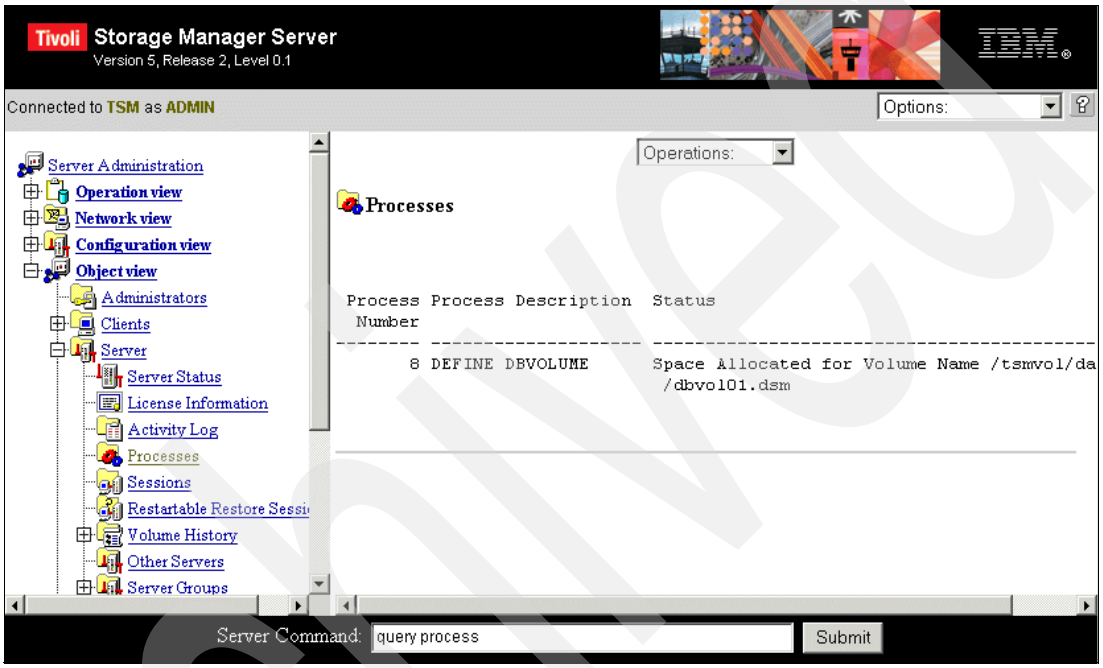

Figure 5-15 Web administrative client interface: Active processes

7. When the process is finished, check the IBM Tivoli Storage Manager messages to ensure that the process completed successfully. Use one of the following methods:
   - IBM Tivoli Storage Manager Web administrative client interface tree structure by using these steps:
     i. Expand **Object view-> Server** and select **Activity Log**.
     ii. On the Query panel, scroll down the page leaving all the parameters as default and click **Finish**.
   - IBM Tivoli Storage Manager Web Server Command window by entering either of the following commands:

     ```
     query actlog
     q act
     ```

   All IBM Tivoli Storage Manager messages are posted to the IBM Tivoli Storage Manager activity log. This log is IBM Tivoli Storage Manager equivalent of the iSeries system history log QHST. You can see the IBM Tivoli Storage Manager activity log from both the IBM Tivoli Storage Manager Web administrative client interface tree structure and the IBM Tivoli Storage Manager Server Command window. By accepting the default parameters on both methods, all messages generated during the last hour are displayed.

Regardless of the method you use, the resulting panel appears as shown in the example in Figure 5-16. You can see message ANR0986I, which shows that our new database volume has a completion status of SUCCESS.

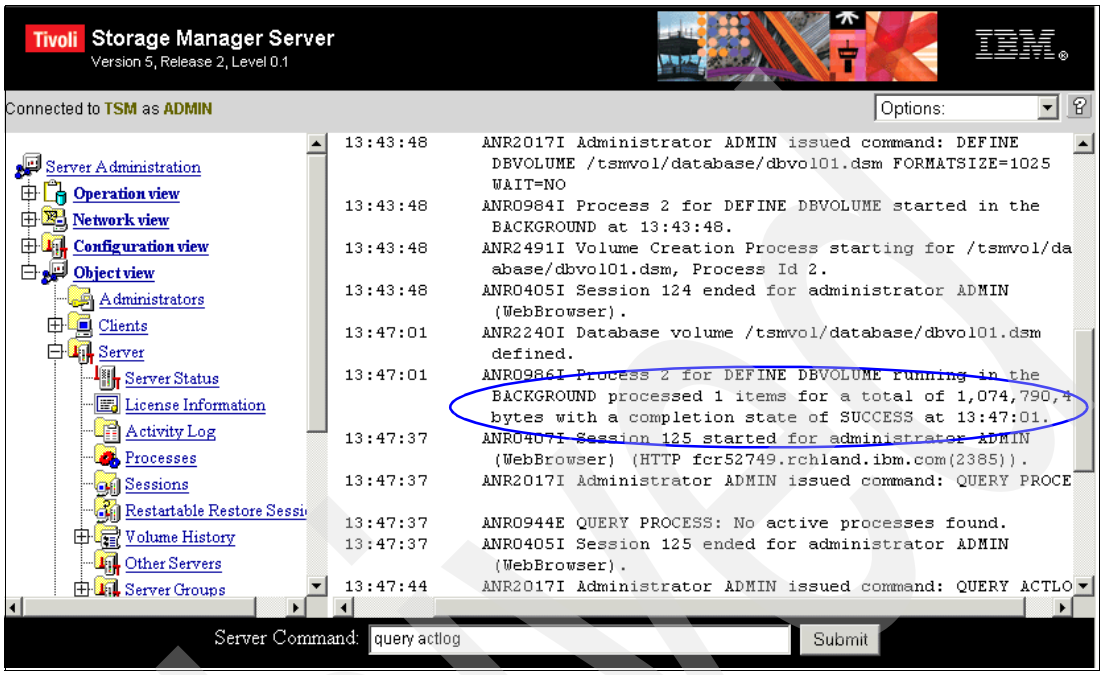

Figure 5-16 Web administrative client interface: Querying the activity log

8. Repeat steps 1 on page 67 through 7 on page 69 again using */tsmvol/database/dbvol02.dsm* for the second database volume in step 3 on page 68.

9. Query the IBM Tivoli Storage Manager database to see the new database configuration as shown in Figure 5-17. Use one of the following methods:
   - IBM Tivoli Storage Manager Web administrative client interface tree structure by expanding **Object view** and selecting **Database**.
   - IBM Tivoli Storage Manager Web Server Command window by entering the following command:

     ```
     query db
     ```

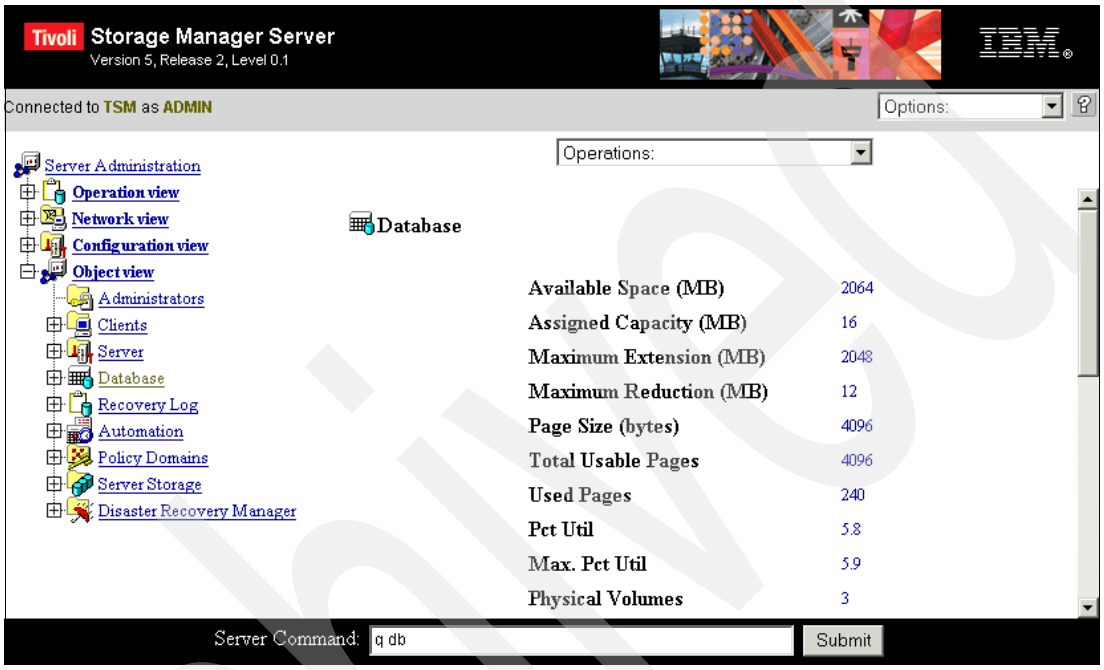

Figure 5-17 Web administrative client interface: Querying the database

10. The Assigned Capacity is still 16 MB, which is the original installation database volume. Now we have a Maximum Extension value of 2048 MB.

    Use one of the following methods to extend the IBM Tivoli Storage Manager database to use the newly created IBM Tivoli Storage Manager database volumes:

    – IBM Tivoli Storage Manager Web administrative client interface tree structure by following these steps:

      i. Expand **Object view** and select **Database**.
      ii. From the Operations list, select **Extend**.
      iii. In the Extend panel (Figure 5-18), in the Extension (MB) field, type 2048.
      iv. Click **Finish**.

    – IBM Tivoli Storage Manager Web Server Command window by entering:

      ```
      extend db 2048
      ```

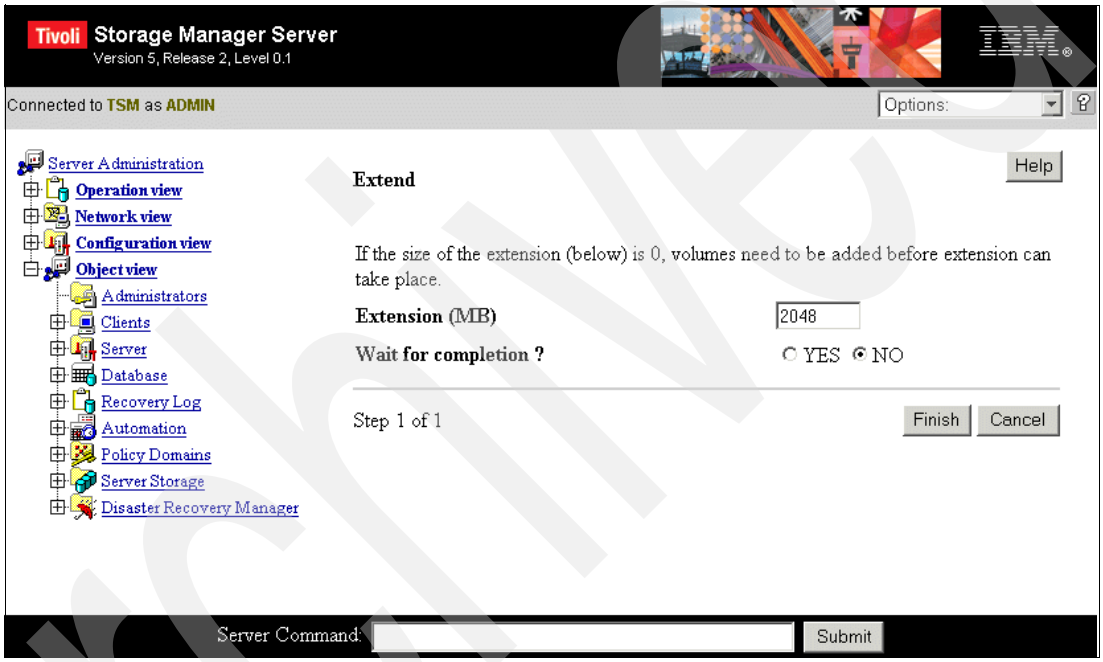

Figure 5-18 Web administrative client interface: Extending the database

11. Query the IBM Tivoli Storage Manager database to see the new Assigned Capacity (MB) of 2064 by using one of the following methods:

    – IBM Tivoli Storage Manager Web administrative client interface tree structure by expanding **Object view** and selecting **Database**.

    – IBM Tivoli Storage Manager Web Server Command window by entering:

      ```
      query db
      ```

5.3.7 Increasing the IBM Tivoli Storage Manager recovery log size

The initial IBM Tivoli Storage Manager installation automatically creates the IBM Tivoli Storage Manager recovery log for you. The recovery log contains information about IBM Tivoli Storage Manager database updates that are not yet committed. Updates can include such activities as defining a management class, backing up a client file, and registering a client node. Changes to the database are recorded in the recovery log to maintain a consistent database image. The more that log utilization increases, the more active the server is.

The size of the recovery log depends on the number of concurrent client sessions and the number of background processes executing on the server. The maximum number of concurrent client sessions is set in the server options. See Chapter 17, “Managing the Database and Recovery Log” in the *IBM Tivoli Storage Manager for OS/400 PASE Administrator’s Reference*, GC23-4695, to size the IBM Tivoli Storage Manager recovery log.

The IBM Tivoli Storage Manager recovery log created by the installation process has, by default, one recovery log volume of 8 MB. The IBM Tivoli Storage Manager recovery log can be made up of numerous recovery log volumes. Compare this to OS/400 single-level storage, where data is spread over multiple physical disks and OS/400 is responsible for the data management.

The following example increases the IBM Tivoli Storage Manager recovery log by 257 MB by creating one 257 MB recovery log volume.

Each recovery log volume created requires 1 MB extra space for overhead. Therefore, in this example, you create a volume as 257 MB (256 MB for the IBM Tivoli Storage Manager recovery log data + 1 MB overhead).

This process is similar to increasing the IBM Tivoli Storage Manager database. Only this time we use the **`define logvolume`** and **`extend log`** IBM Tivoli Storage Manager commands.

1. Expand **Object view-> Recovery Log** and select **Recovery Log Volumes**. This shows the 8 MB assigned capacity recovery log volume created during the IBM Tivoli Storage Manager installation.
2. From the Operations list, select **Define Recovery Log Volume**.
3. Enter the IBM Tivoli Storage Manager recovery log volume name and size. The recovery log volume name must include the fully qualified path and the format size of the required volume in MB. In this example, we entered:
   - Volume Name: `/tsmvol/rlog/rlogvol01.dsm`
   - Format Size: `257`
   - Wait: **No** (the process runs as a batch process rather than interactively)
4. Click **Finish** to submit the request.

> **Note:** You can replace steps 1 through 4 by entering the following command in the Server Command window:
>
> ```
> define logvolume /tsmvol/rlog/rlogvol01.dsm formatsize=257
> ```

5. The process now runs as a batch job and may take several minutes to complete.

   Use the **`q pr`** and **`q act`** IBM Tivoli Storage Manager commands in the IBM Tivoli Storage Manager Server Command window to ensure that the recovery log volume is successfully created.
6. Extend the IBM Tivoli Storage Manager recovery log to use our newly created recovery log volume (/tsmvol/rlog/rlogvol01.dsm). The Assigned Capacity is still 8 MB (this is the original installation recovery log volume). Now we have a Maximum Extension of 256 MB. Use one of the following methods to extend the size of the IBM Tivoli Storage Manager recovery log:
   - IBM Tivoli Storage Manager Web administrative client interface tree structure by following these steps:
     i. Expand **Object view** and select **Recovery Log**.
     ii. From the Operations list, select **Extend**.

iii. On the Extend panel, in the Extension (MB) field, type 256.
iv. Click **Finish**.

– IBM Tivoli Storage Manager Web Server Command window by entering the following command:

```
extend log 256
```

5.3.8 Removing the IBM Tivoli Storage Manager default database volume

You increased the IBM Tivoli Storage Manager database size. Now you can remove the default 16 MB database volume that was created during the installation process.

Before you can delete the original 16 MB database volume (/usr /tivoli/ tsm/server/bin/ db.dsm), you must first reduce the IBM Tivoli Storage Manager database by 16 MB.

1. Expand **Object view** and select **Database**.
2. From the Operations list, select **Reduce**.
3. On the Reduce panel (Figure 5-19), in the Reduction (MB) field, type 16.
4. Click **Finish**.

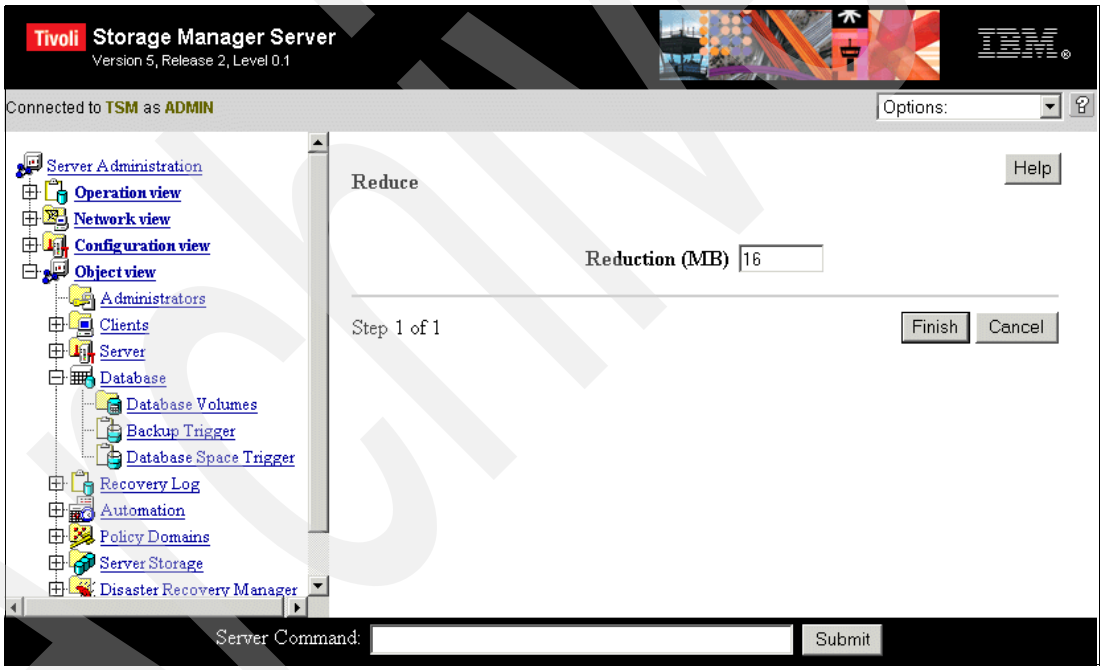

Figure 5-19 Web administrative client interface: Reduce panel

5. When you delete a database volume, it moves all valid database data that is still on the volume to the newly created database volumes (in this example, this is /tsmvol/database/dbvol01/dbvol02).
   a. Expand **Object view-> Database** and select **Database Volumes**.
   b. From the list of volumes, select **/usr /tivoli/tsm/server/bin/db.dsm**.
   c. From the Operations list, select **Delete Database Volume**.
   d. Click **Finish** to process the request.

Note: You can replace steps 1 through 5 by entering the following commands in the Server Command window:

```
reduce db 16
delete dbvolume /usr /tivoli/ tsm/server/bin/ db.dsm
```

6. The database volume /usr /tivoli/ tsm/server/bin/ db.dsm is deleted from IBM Tivoli Storage Manager, but the volume still exists as a stream file (STMF) in the OS/400 IFS.

   To delete the file, enter the following command on an OS/400 command line:

   ```
   RMVLNK OBJLNK('/usr/tivoli/tsm/server/bin/db.dsm')
   ```

5.3.9 Removing the IBM Tivoli Storage Manager default recovery log volume

You increased the IBM Tivoli Storage Manager recovery log size. Now you can remove the default 8 MB recovery log volume that was created during the installation process.

Before you can delete the original 8 MB recovery log volume (/usr /tivoli/ tsm/server/bin/ log.dsm), you must first reduce the IBM Tivoli Storage Manager recovery log by 8 MB:

1. Expand **Object view** and select **Recovery Log**.
2. From the Operations list, select **Reduce**.
3. In the Reduction (MB) field, type 8.
4. Click **Finish**.
5. When you delete a recovery log volume, it moves all valid recovery log data that is still on the volume to the newly create recovery log volumes (in our example /tsmvol/rlog/ rlogvol01).
   a. Expand **Object view-> Recovery Log** and select **Recovery Log Volumes**.
   b. Select Recovery Log Volume **/usr /tivoli/ tsm/server/bin/ log.dsm**.
   c. From the Operations list, select **Delete recovery log volume**.
   d. Click **Finish** to process the request.

Note: You can replace steps 1 through 5 by entering the following commands in the Server Command window:

```
reduce log 8
delete logvolume /usr /tivoli/ tsm/server/bin/ log.dsm
```

6. The recovery log volume /usr /tivoli/ tsm/server/bin/ log.dsm has been deleted from IBM Tivoli Storage Manager, but the volume still exists as a stream file in the OS/400 IFS.

   To delete the file enter, the following command on an OS/400 command line:

   ```
   RMVLNK OBJLNK('/usr/tivoli/tsm/server/bin/log.dsm')
   ```

5.3.10 IBM Tivoli Storage Manager server option file

The IBM Tivoli Storage Manager server uses an option file (dsmserv.opt) to control the running environment of the server. We created this file in 4.3, “Installing the IBM Tivoli Storage Manager server code” on page 47, by copying it from the sample file dsmserv.opt.smp.

To see the current IBM Tivoli Storage Manager server option settings, use one of the following methods:

- IBM Tivoli Storage Manager Web administrative client interface tree structure by expanding **Object view-> Server** and selecting **Server Options**
- IBM Tivoli Storage Manager Web Server Command window by entering the command:

```
q option
```

There are many available options in this file. See Chapter 6 “Server Options Reference” in the *IBM Tivoli Storage Manager for OS/400 PASE Administrator’s Reference*, GC23-4695, for a full list of all possible settings. Table 5-2 shows some of the common settings for the IBM Tivoli Storage Manager server.

Table 5-2 IBM Tivoli Storage Manager server option settings

dsmserv option	Default value	Recommended value	Description
EXPINTERVAL	24	0	Interval in hours as to when the inventory expiration is run. A value of 0 means the expiration is run manually from the expire inventory command. This allows you to control when this function is performed.
LANGuage	AMENG	AMENG	This is the locale used for default language on the server. See Chapter 6 “Server Options Reference” in the *IBM Tivoli Storage Manager for OS/400 PASE Administrator’s Reference*, GC23-4695, for the supported languages.
DATEformat	1	See description	The date format for the IBM Tivoli Storage Manager server. Choose the required value. 1 = MM/DD/YYYY / 2 = DD-MM-YYYY
BUFPoolsize	2048	131072	This is the database buffer pool in kilobytes. A large buffer pool means that database pages remain longer in memory cache, and Storage Manager requires fewer input/output operations to server storage. This value also depends on the amount of real iSeries memory available to IBM Tivoli Storage Manager.
LOGPoolsize	512	2048	The size, in KB, of the recovery log buffer pool. A large buffer pool may increase the rate by which recovery log transactions are committed to the database, but it also requires more memory.
MOVEBatchsize	40	1000	Specifies the number of client files that are to be moved and grouped together in a batch, within the same server transaction.
MOVESizethresh	500	500	Specifies, in MB, a threshold for the amount of data moved as a batch, within the same server transaction.
TXNGroupmax	40	256	Specifies the number of files that are transferred as a group between a client and the server between transaction commit points.
EXPQUiet	No	Yes	The server sends only minimal messages during the expiration process.

We recommend that you change the default values for all the options shown in Table 5-2 as an ideal starting point for your IBM Tivoli Storage Manager server. Although we do not show the editing of the dsmserv.opt file in this redbook, you can edit the dsmserv.opt file by using the following OS/400 command:

```
EDTF STMF('/usr/tivoli/tsm/server/bin/dsmserv.opt')
```

Important: You must restart the IBM Tivoli Storage Manager server before you activate the new dsmserv.opt settings.

5.3.11 IBM Tivoli Storage Manager server run-time options

There are also IBM Tivoli Storage Manager server run-time options which are stored in the IBM Tivoli Storage Manager server database.

To see the current IBM Tivoli Storage Manager server runtime settings, use one of the following methods:

- IBM Tivoli Storage Manager Web administrative client interface tree structure by expanding **Object view-> Server** and selecting **Server Status**
- IBM Tivoli Storage Manager Web Server Command window by entering:

```
q status
```

Table 5-3 shows some recommended settings, which may vary depending on your location's requirements. See Chapter 15 "Managing Server Operations" in the *IBM Tivoli Storage Manager for OS/400 PASE Administrator's Guide*, GC23-4694, for detailed information about all available server runtime settings.

Table 5-3 IBM Tivoli Storage Manager server run-time settings

Server Setting	Default value	Recommended value	Description
INVALIDPWLIMIT	0	3	Number of invalid signon attempts
MINPWLENGTH	0	6	Minimum password length
PASSEXP	90	90	Password expiration period in days for administrators and clients
ACTLOGRETENTION	1	7	Number of days to keep the activity log history
AUTHENTICATION	On	On	A password from an administrator or client node is required to access the IBM Tivoli Storage Manager server
SERVERNAME	TSM	See description	IBM Tivoli Storage Manager server name. Specify a meaningful name for your IBM Tivoli Storage Manager server. We used AS27 for our IBM Tivoli Storage Manager server.

You can modify these options using the IBM Tivoli Storage Manager Web administrative client interface. Or you can do this by entering the IBM Tivoli Storage Manager **set** command in the IBM Tivoli Storage Manager Server Command window.

The following examples show how to change the IBM Tivoli Storage Manager server activity log retention from the default value of 1 to 7. Changing this value ensures that you keep at least one week's worth of IBM Tivoli Storage Manager activity log history. Use one of the following methods to change your IBM Tivoli Storage Manager server:

- IBM Tivoli Storage Manager Web administrative client interface tree structure by following these steps:

  a. Expand **Object view-> Server** and select **Server Status**.
  b. From the Operations list, select **Set Activity Log Retention**.
  c. In the Set Activity Log Retention panel (Figure 5-20), enter the new retention period in number of days. In our example, we entered 7.
  d. Click **Finish** to process the request.

- IBM Tivoli Storage Manager Web Server Command window by entering the following command:

```
set actlogretention 7
```

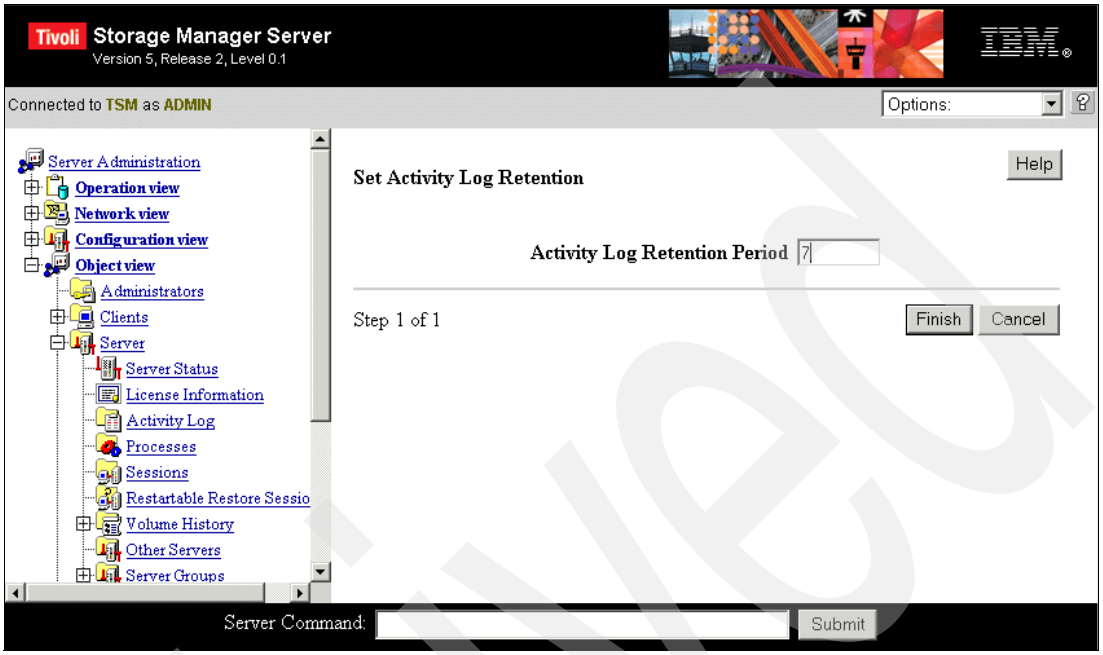

Figure 5-20 Web administrative client interface: Activity log retention

5.3.12 IBM Tivoli Storage Manager disk storage pools

The installation of the IBM Tivoli Storage Manager server creates three disk storage pools. These storage pools are used to host IBM Tivoli Storage Manager clients backup-archive data or space management data, before it is then migrated to another media, normally to tape. The size of three initial storage pools is only 8 MB each, which is insufficient in size to hold any real production client data.

In this example configuration, you use the predefined disk storage pool BACKUPPOOL and increase its size to 20 GB by adding four 5 GB storage pool volumes. Normally the disk pool should be large enough to hold a customers total daily incremental data changes. To learn more about sizing a disk storage, see Chapter 8 “Managing Storage Pools and Volumes” in the *IBM Tivoli Storage Manager for OS/400 PASE Administrator’s Guide*, GC23-4694.

To see the current IBM Tivoli Storage Manager disk storage pools, use one of the following methods:

- IBM Tivoli Storage Manager Web administrative client interface tree structure by following these steps:
  a. Expand **Object view-> Server Storage-> Storage Pools** and select **Query storage pools**.
  b. On the Query Storage Pools panel, you can specify different views of the disk storage pool information. Use the defaults and click **Finish**. This displays the disk storage pool information.
- IBM Tivoli Storage Manager Web Server Command window by entering either of the following commands:

```
query storage
q stg
```

The Operations Results panel (Figure 5-21) opens.

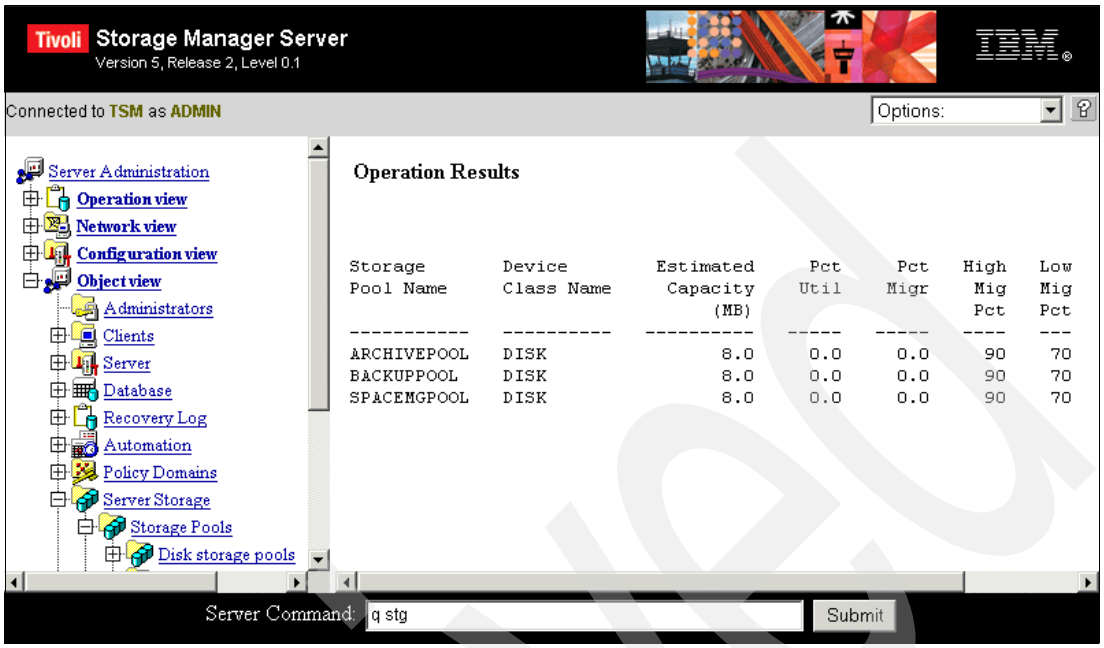

Figure 5-21 Web administrative client interface: Disk storage pools

5.3.13 Increasing the IBM Tivoli Storage Manager BACKUPPOOL size

Increasing an IBM Tivoli Storage Manager disk storage pool is similar to increasing the IBM Tivoli Storage Manager database, in that you must create extra disk volumes. However, there is no need to use the **extend** command to allocate the new volumes, because the extension is dynamically done for you. in this example, we create four new disk volumes each 5 GB in size (backupvol01 / backupvol02/ backupvol03 / backupvol04) and place them in the IFS directory /tsmvol/backuppool/. Follow this example to increase the IBM Tivoli Storage Manager BACKUPPOOL disk storage pool:

1. Expand **Object view-> Server Storage-> Storage Pools-> Disk storage pools** and select **Volumes**.
2. From the Operations list, select **Define a disk storage volume**.

3. On the Define a Disk Storage Volume panel (Figure 5-22), select the required storage pool and enter the IBM Tivoli Storage Manager volume name and size. The storage pool volume name must include the fully qualified path and the format size is the size of the required volume in MB. In our example, we enter:
   - Storage Pool Name: **BACKUPPOOL**
   - Volume Name: `/tsmvol/backuppool/bkpvol01.dsm`
   - Format Size: `5120`
   - Wait: **NO** (the process runs as a batch process rather than interactively)

   Important: The IBM Tivoli Storage Manager server checks that sufficient disk space is available on the iSeries server before it creates the disk storage pool volume. If you don't have enough disk space, you receive message "`ANR7860W Insufficient Space Available for file.....`" in the IBM Tivoli Storage Manager servers activity log.

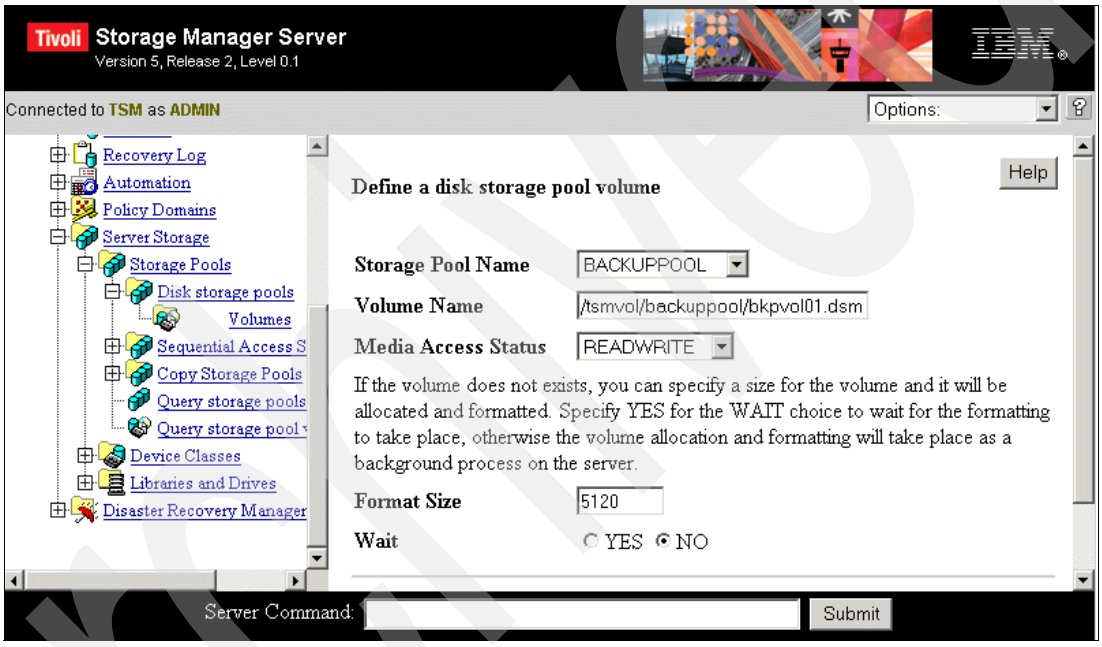

Figure 5-22 Web administrative client interface: Defining a new storage pool volume

4. Click **Finish** to submit the request.

   Note: You can replace steps one through four by entering the following command in the Server Command window:

   ```
   define volume backuppool /tsmvol/backuppool/bkpvol01.dsm formatsize=5120
   ```

5. The process now runs as a batch job and may take several minutes to complete. Check the IBM Tivoli Storage Manager active processes by using one of the following methods to see when the volume definition has finished:
   - IBM Tivoli Storage Manager Web administrative client interface tree structure by expanding **Object view-> Server** and selecting **Processes**
   - IBM Tivoli Storage Manager Web Server Command window by entering either of the following commands:

     ```
     query process
     q pr
     ```

6. When the define volume process has completed, check the IBM Tivoli Storage Manager activity log to ensure that the process completed successfully.

   Use one of the following methods to access the IBM Tivoli Storage Manager activity log:

   – IBM Tivoli Storage Manager Web administrative client interface tree structure by expanding **Object view-> Server** and selecting **Activity Log**

   – IBM Tivoli Storage Manager Web Server Command window by entering either of the following commands:

   ```
   query actlog
   q act
   ```

   Figure 5-23 shows an example of the completion messages you should see.

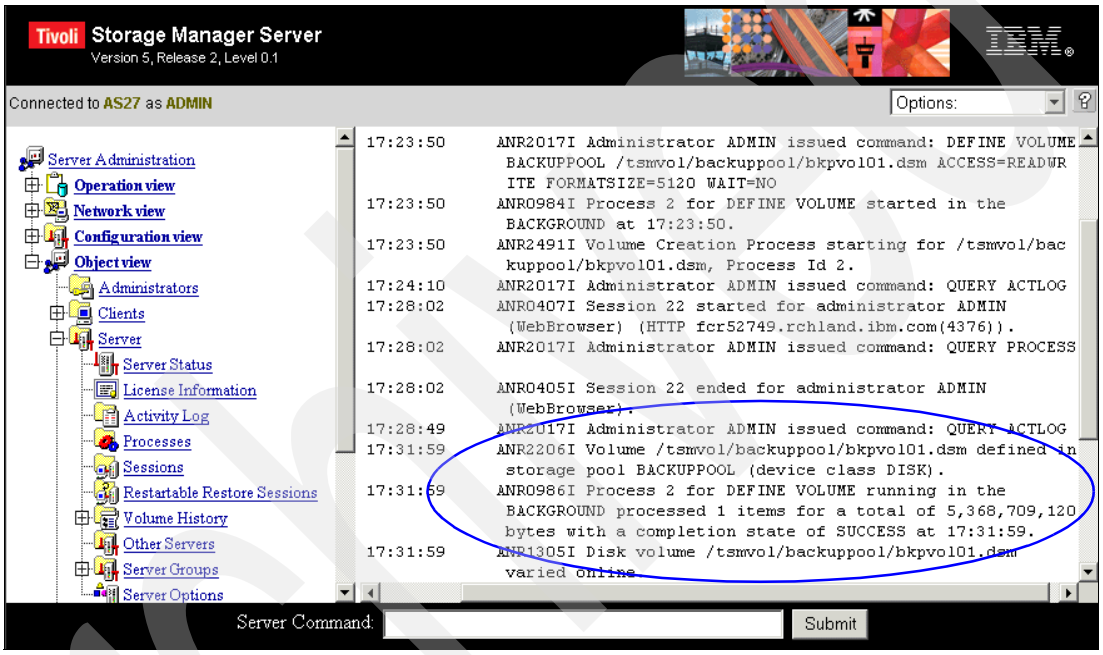

Figure 5-23 Web administrative client interface: Extending the disk storage pool

> **Note:** We recommend that you wait for each individual storage pool volume to be created before you define another volume. Submitting multiple define storage pool volumes at the same time may cause a degradation in your server's performance.

7. Repeat steps 1 through 6 again for storage volumes 02 through 04.
8. To see the new IBM Tivoli Storage Manager storage configuration, use one of the following options:

   – IBM Tivoli Storage Manager Web administrative client interface tree structure by following these steps:

     i. Expand **Object view-> Server Storage-> Storage Pools** and select **Query Storage pools**.

     ii. Review the storage configuration and click **Finish**.

   – IBM Tivoli Storage Manager Web Server Command window by entering either of the following commands:

   ```
   query storage
   q stg
   ```

9. To see the individual IBM Tivoli Storage Manager storage pools volumes defined, use one of the following options:
   - IBM Tivoli Storage Manager Web administrative client interface tree structure
     i. Expand **Object view-> Server Storage-> Storage Pools** and select **Query storage pool volumes**.
     ii. On the Query Storage Pools panel, you can specify different views of the disk storage pool information. Use the defaults and click **Finish**. See Figure 5-24.
   - IBM Tivoli Storage Manager Web Server Command window by entering either of the following commands:

```
query volume
q vol
```

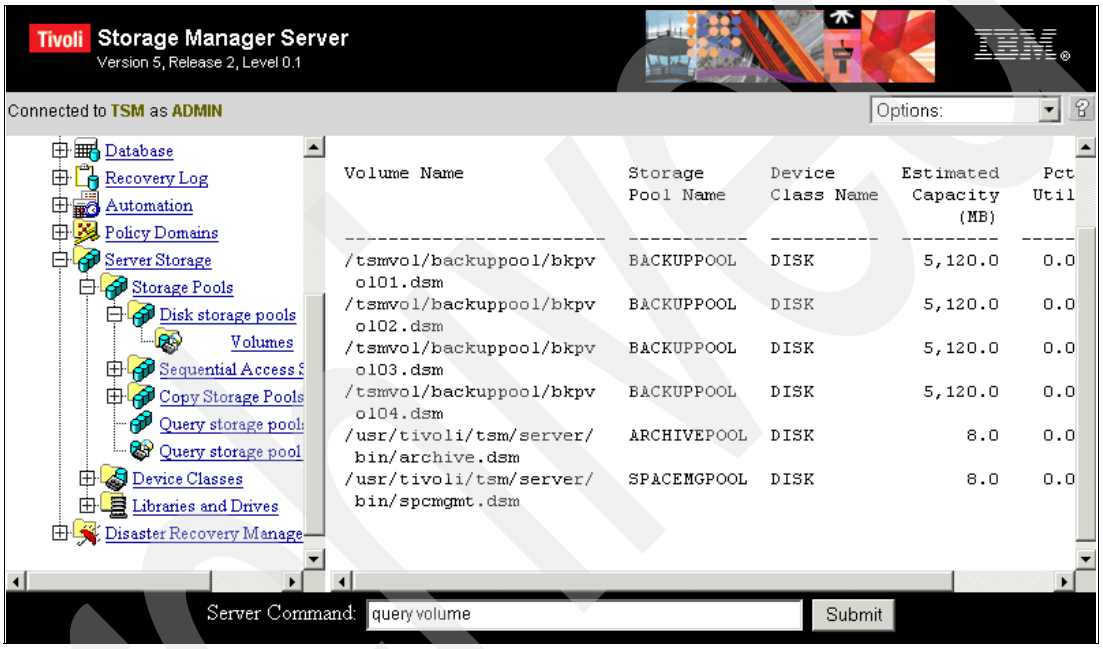

Figure 5-24 Web administrative client interface: Storage pool volumes

5.3.14 Removing the IBM Tivoli Storage Manager initial BACKUPPOOL volume

You increased the total IBM Tivoli Storage Manager BACKUPPOOL storage pool by 20 GB. Now you can remove the default 8 MB storage pool volume (/usr/tivoli/tsm/Server/bin/backup.dsm) that was created during the installation process.

Normally before you remove a storage pool volume, you must ensure that no client data resides on the volume. Since this storage pool volume has never been used, we can simply delete this volume. Otherwise you have to move any remaining data to another storage pool volume or specify “discard data” when deleting the storage pool volume. See “Managing Storage Pools and Volumes” in the *IBM Tivoli Storage Manager for OS/400 PASE Administrator’s Guide*, GC23-4694, for more information.

To remove the IBM Tivoli Storage Manager initial BACKUPPOOL volume, use one of the following options:

- IBM Tivoli Storage Manager Web administrative client interface tree structure by following these steps:
  a. Expand **Object view-> Server Storage-> Storage Pools-> Disk storage pools** and select **Volumes**.
  b. From the list of currently available storage pool names and associated volume names, select the storage pool volume **/usr/tivoli/tsm/server/bin/backup.dsm**.
  c. From the Operations list, select **Delete storage pool volume**.
  d. Click **Finish** to process the request.
- IBM Tivoli Storage Manager Web administrative client interface Server Command window by entering the following command:

```
delete volume /usr/tivoli/tsm/server/bin/backup.dsm
```

Important: Deleting any of these IBM Tivoli Storage Manager storage pool volumes later using the IBM Tivoli Storage Manager administration interface does not delete the actual byte stream file that contains the data within the OS/400 IFS. Use the IBM Tivoli Storage Manager administration interface to delete the pool from IBM Tivoli Storage Manager control information. Then, to free iSeries disk space, you must use an interface to the OS/400 to delete the byte stream file that represents the storage pool volume. You do this by using one of the following methods:

- From a PC workstation, use the Windows operating system network drive interface to delete the file.
- From an OS/400 5250 command screen, enter the Work with Link (WRKLNK) command. Select 5 (Display) for tsmvol, which lists several subfolders including backuppool. Within this folder, select one of the four subfolders, for example -bkpvol04.dsm. Specify to delete this file.

5.4 Verifying the IBM Tivoli Storage Manager server is working

This section explains how to verify that the IBM Tivoli Storage Manager server is working correctly by backing up a Windows test file to the IBM Tivoli Storage Manager for OS/400 PASE server. Although the steps detailed in this section use a Windows 2000 server as an example, you can also use a Windows NT or Windows XP system.

5.4.1 Registering an IBM Tivoli Storage Manager client node to the IBM Tivoli Storage Manager server

You must register any client node that is sending data to the IBM Tivoli Storage Manager server first. In this example, we use a Windows 2000 server as our preferred IBM Tivoli Storage Manager client, although the registration process is the same for all IBM Tivoli Storage Manager clients.

Using the IBM Tivoli Storage Manager Web tree structure, follow these steps:

1. Expand **Object view-> Clients** and select **Client Nodes**.
2. From the Operations list, select **Register a new node**.

3. On the Register a new node panel (Figure 5-25), enter a node name and password for the Windows 2000 server. The node name must be any unique name, but is normally the Windows 2000 computer name. We keep the node name and password the same here, but normally you assign a secure password. For this example, we entered ITSMWINCLIENT for both the node name and password.
4. Leave all other fields with their default values.
5. Scroll down the page and click **Finish**. The client node is added for this server.

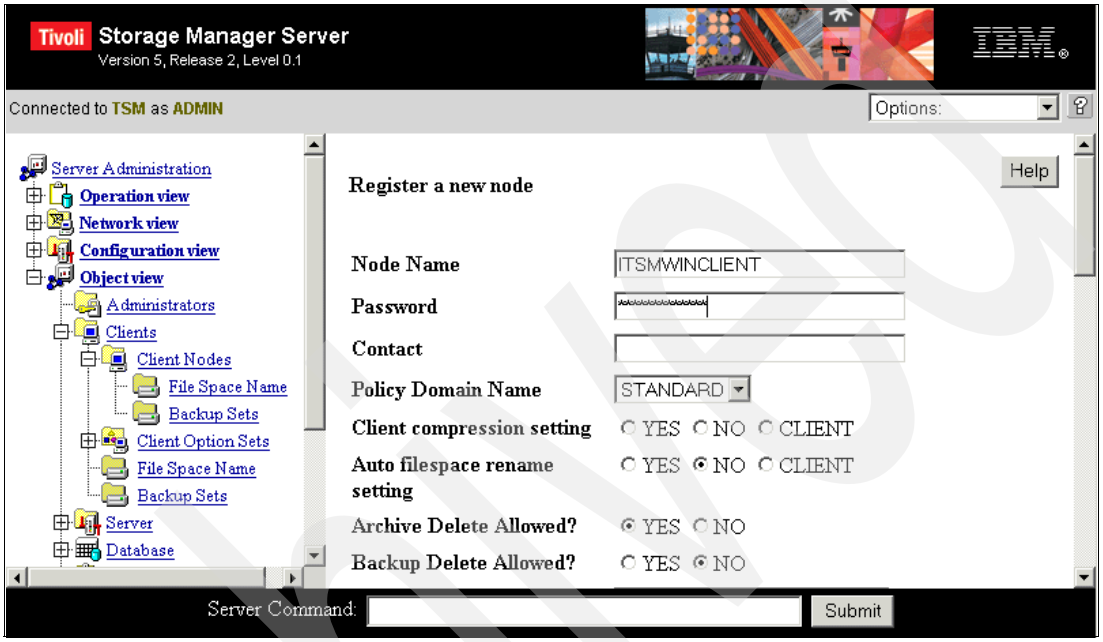

Figure 5-25 Web administrative client interface: Registering a new node

5.4.2 Downloading the IBM Tivoli Storage Manager Windows client

You can download the latest IBM Tivoli Storage Manager clients from the IBM FTP server at:

`ftp://ftp.software.ibm.com/storage/tivoli-storage-management/maintenance/client`

We downloaded the EXE file in the /v5r2/Windows/Win32/LATEST/ directory for our example IBM Tivoli Storage Manager Windows 2000 client node.

5.4.3 Installing the IBM Tivoli Storage Manager Windows client

This section explains how to install the previously download IBM Tivoli Storage Manager client code on a Windows 2000 system:

1. Double-click the EXE file that you downloaded in the previous section.
2. On the panel that asks where you want to save your files, leave the default directory settings and click **Next** to continue.
3. On the panel that asks you to choose a setup language, select your language and click **OK** to continue. We selected English (United States).
4. On the Welcome to the Install Wizard for IBM Tivoli Storage Manager Client window, click **Next** to continue.
5. On the Destination Folder panel, click **Next** to accept the default installation directory (c:\Program Files\Tivoli\TSM\).

6. On the Setup Type panel, choose the **Typical** option and click **Next** to continue.
7. On the Ready to Install the Program panel, click **Install**. The installation process takes a few minutes to complete.
8. When you see the Install Shield Wizard Completed panel, click **Finish**.

The IBM Tivoli Storage Manager Windows Client is now installed and ready for configuration Continue with the following section.

5.4.4 Configuring the IBM Tivoli Storage Manager Windows client

This section demonstrates how to configure the IBM Tivoli Storage Manager client so it can communicate with the IBM Tivoli Storage Manager for OS/400 PASE server.

Note: If you already installed the IBM Tivoli Storage Manager Windows Client on the window system, then we recommend that you rename the dsm.opt file normally found in C:\Program Files\Tivoli\TSM\baclient before you continue with the following steps.

1. Select **Start-> Programs-> Tivoli Storage Manager-> Backup Archive GUI**.
2. You may see a message indicating a TCP/IP communications failure as shown in Figure 5-26. Click **Yes** to continue. The TSM Client Configuration Wizard starts.

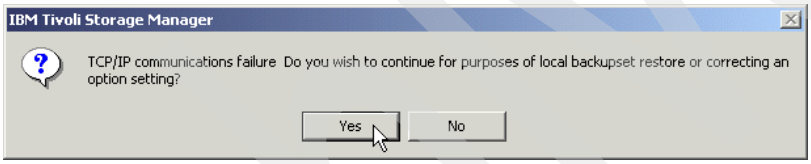

Figure 5-26 IBM Tivoli Storage Manager client configuration: Invalid TCP/IP host

3. On the TSM Client Configuration Wizards window (Figure 5-27), select the **Help me configure the TSM Backup Archive Client** check box and click **Next**.

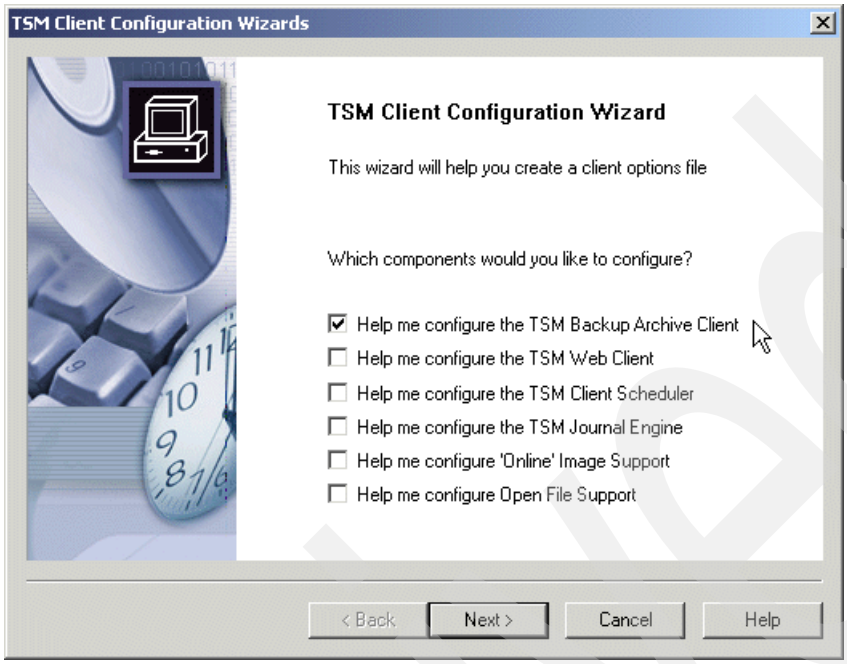

Figure 5-27 TSM Client Configuration Wizards window

4. On the Option File Task panel (Figure 5-28), select the **Create a new options file** button and click **Next**.

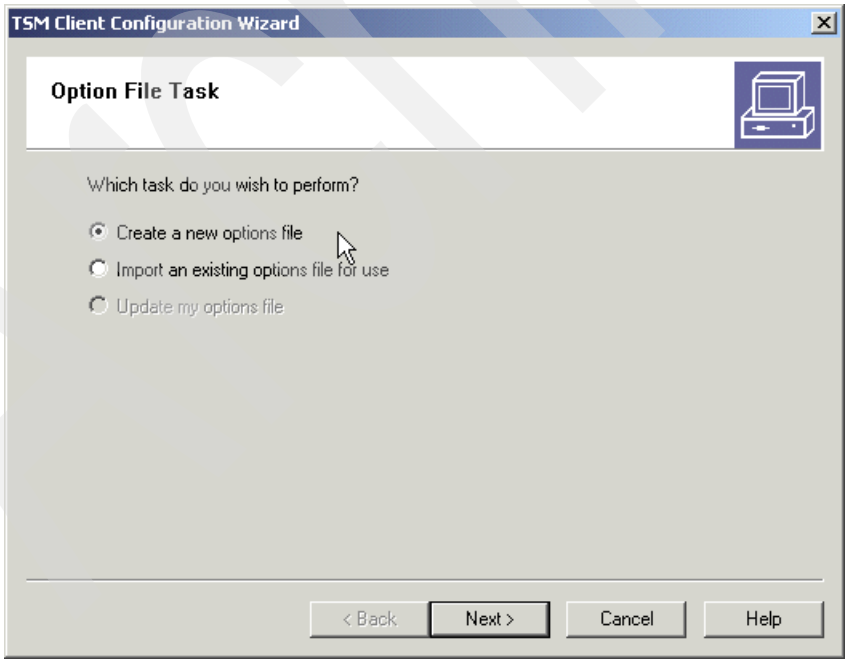

Figure 5-28 TSM Client Configuration Wizard: Option File Task

5. On the TSM authentication panel (Figure 5-29), enter the TSM node name for this Windows server. This is the client node name used in 5.4.1, “Registering an IBM Tivoli Storage Manager client node to the IBM Tivoli Storage Manager server” on page 83. In our example, we entered `ITSMWINCLIENT`. Click **Next** to continue.

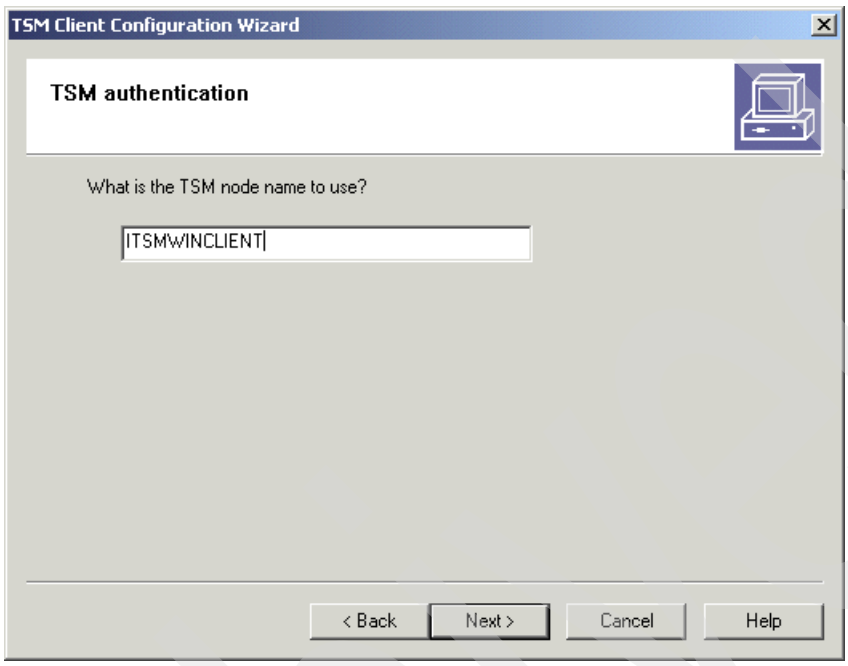

Figure 5-29 TSM Client Configuration Wizard: TSM authentication

6. On the ITSM Client/Server Communications panel (Figure 5-30), select **TCP/IP**, and click **Next**.

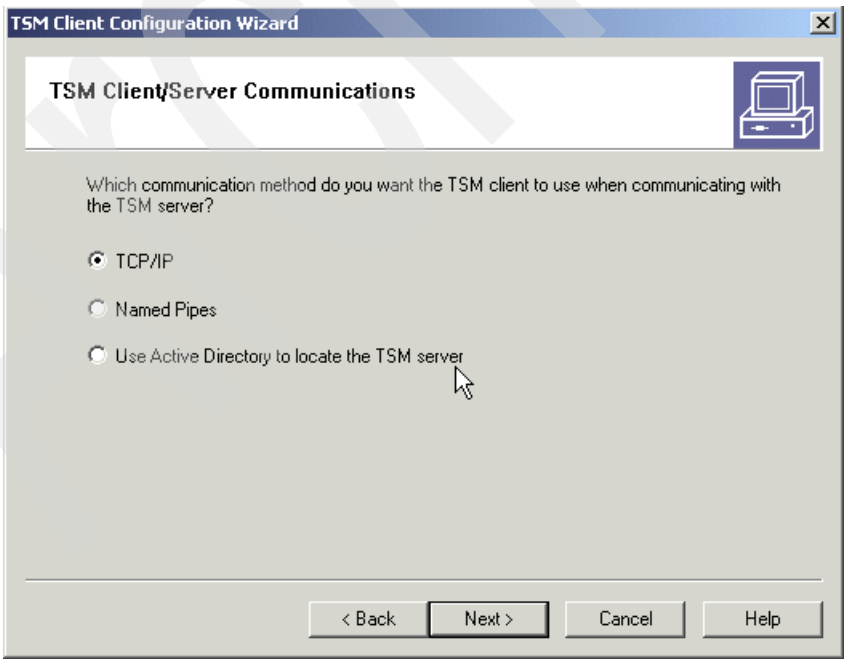

Figure 5-30 TSM Client Configuration Wizard: TSM Client/Server Communications

7. On the TCP/IP Parameters panel (Figure 5-31), enter the server address and port of the IBM Tivoli Storage Manager server. The server address is the IP address or name of the iSeries server that is running the IBM Tivoli Storage Manager for OS/400 PASE server. In our configuration, we entered `AS27` for the server address and kept the default port of `1500`. Click **Next** to continue.

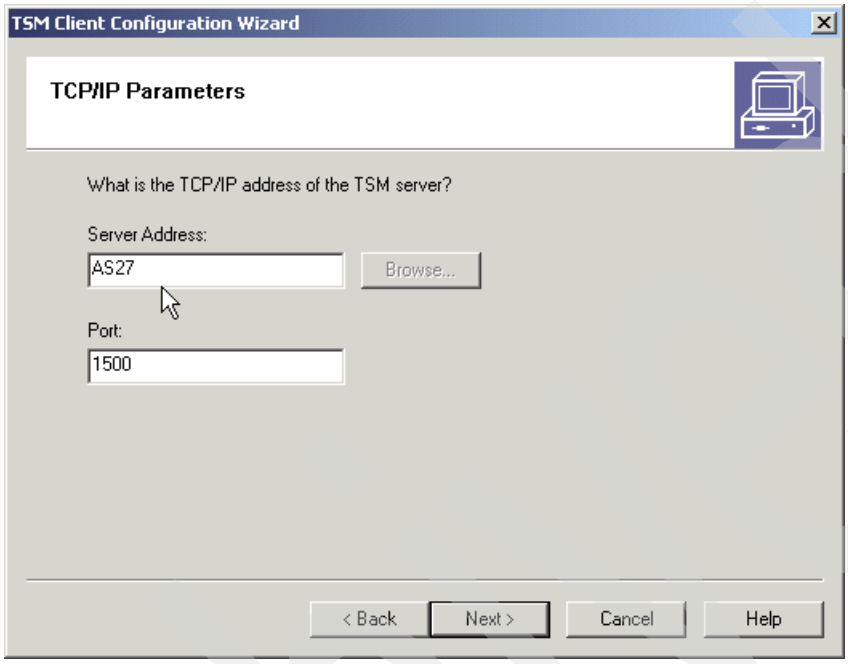

Figure 5-31 TSM Client Configuration Wizard: TCP/IP Parameters

8. On the Domain and include/exclude list panel (Figure 5-32), accept the defaults and click **Next**.

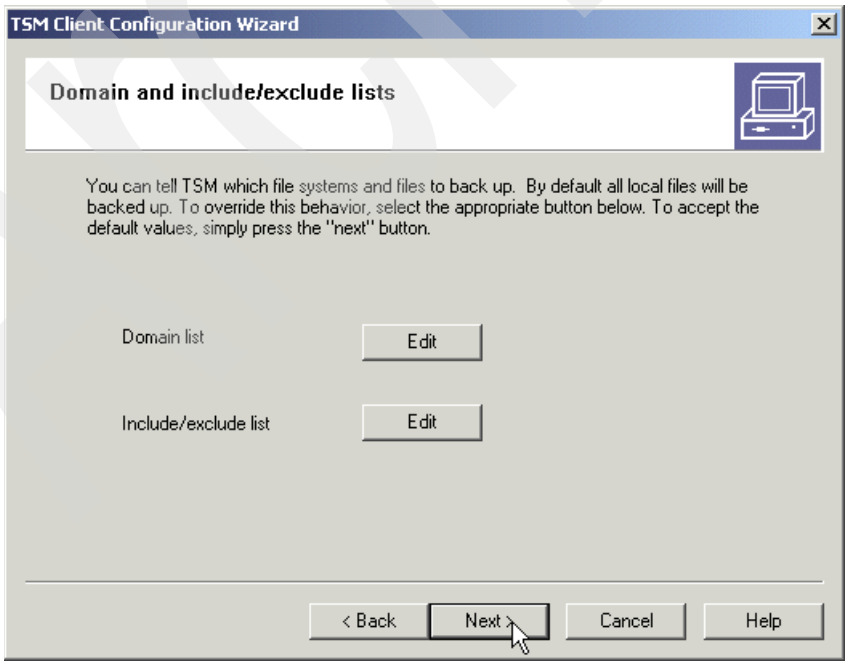

Figure 5-32 TSM Client Configuration Wizard: Domain and include/exclude lists

9. On the Completing the TSM Client Configuration Wizard panel (Figure 5-33), click **Finish**.

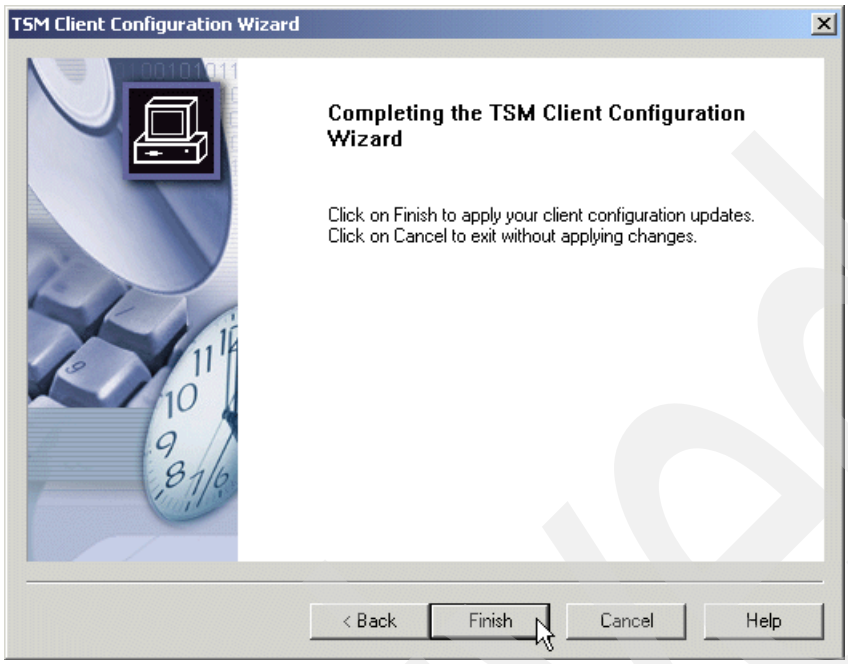

Figure 5-33 TSM Client Configuration Wizard: Completion

10. The IBM Tivoli Storage Manager client connects to the IBM Tivoli Storage Manager for OS/400 PASE server on the iSeries server. It prompts for an IBM Tivoli Storage Manager user ID and password (Figure 5-34). We enter `ITSMWINCLIENT` for both.

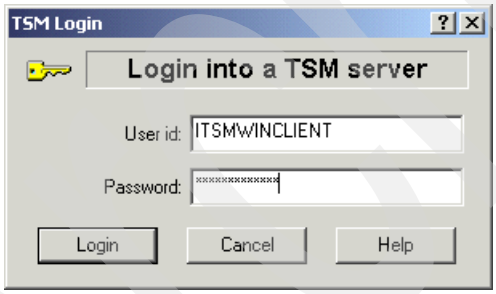

Figure 5-34 TSM Client Configuration: TSM Login

11. This completes the basic ITSM client configuration. You *must* exit and restart the ITSM client before you can perform any client backups. This is required to activate the new ITSM client configuration changes made during this configuration.

5.4.5 Backing up using the IBM Tivoli Storage Manager Windows client

This section explains how to back up a test file from a Windows c:\temp directory. This exercise is only designed to show that the IBM Tivoli Storage Manager server is functioning.

1. Create a test file using Windows Notepad. Place the file in **c:\temp** on the IBM Tivoli Storage Manager Windows client system. We created the **c:\temp\testfile.txt** file.
2. On Windows, select **Start-> Programs-> Tivoli Storage Manager-> Backup Archive GUI**.

3. Click **Backup** on the IBM Tivoli Storage Manager Backup-Archive Client (Figure 5-35).

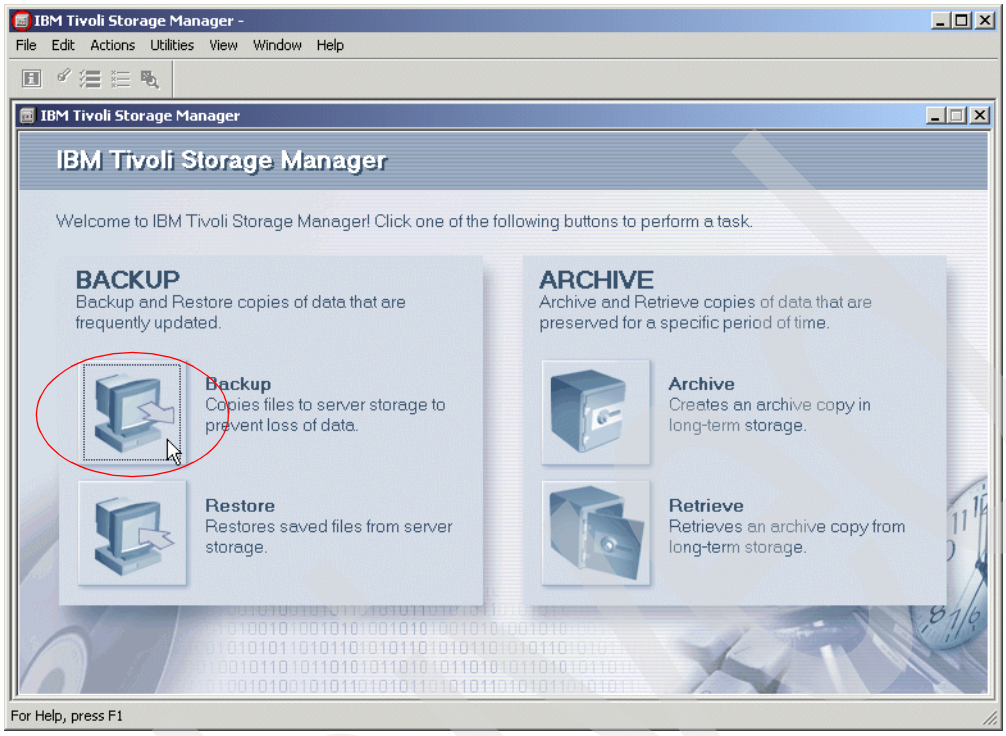

Figure 5-35 IBM Tivoli Storage Manager Windows client backup

4. On the next window (Figure 5-36), follow these steps:
   a. Expand your local directory (**local**) and then expand the **C:** drive.
   b. Scroll down to the **temp** directory and click the right hand folder next to it. You now see all the files that are available to back up in the temp directory.
   c. In the right panel, select the **testfile.txt** check box.
   d. Click the **Backup** button.

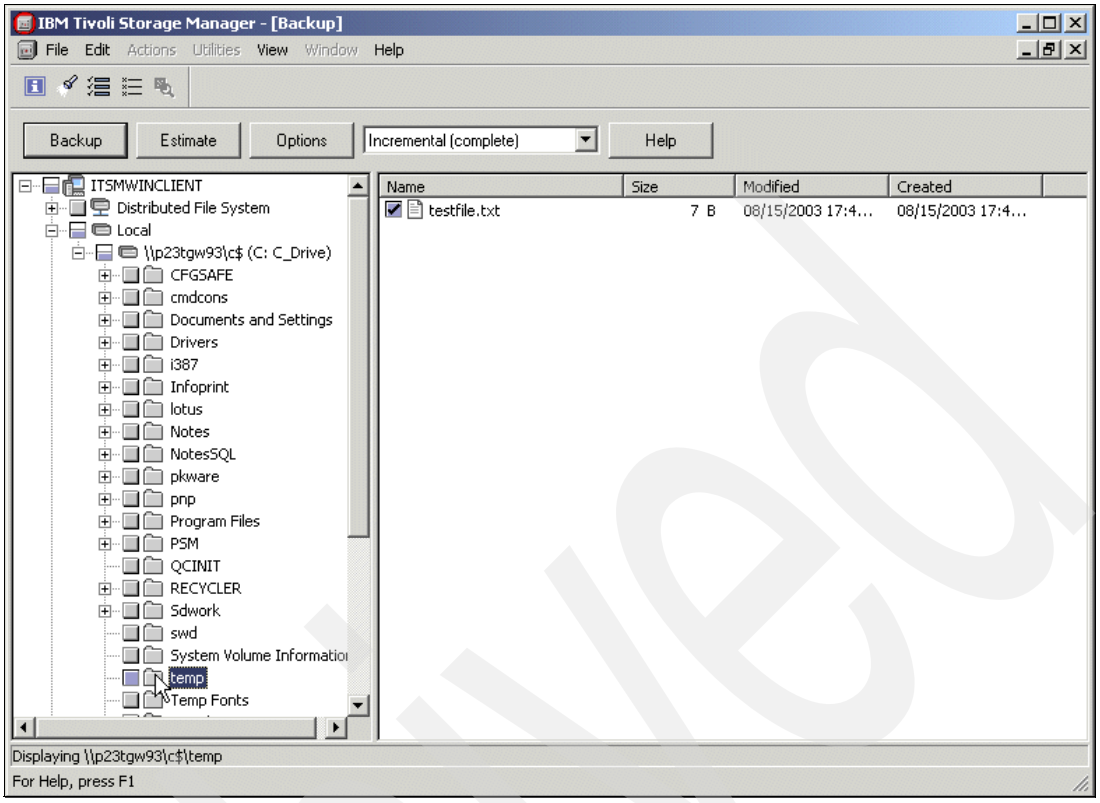

Figure 5-36 IBM Tivoli Storage Manager Windows client backup: Selecting a file

5. The c:\temp\testfile.txt is now sent to the IBM Tivoli Storage Manager server and placed in the disk storage pool BACKUPPOOL that was discussed in 5.3.12, “IBM Tivoli Storage Manager disk storage pools” on page 78. When the Backup Completed window appears, click **OK**.
6. A Detailed Status Report shows the statistics for the backup. Exit the status report by closing the window (click the x box in the upper right corner).

This concludes the basic configuration of the IBM Tivoli Storage Manager server. Continue with Chapter 6, “Next steps: Getting the IBM Tivoli Storage Manager server ready for production” on page 93, to configure you IBM Tivoli Storage Manager server further.

6

Next steps: Getting the IBM Tivoli Storage Manager server ready for production

Up to this point, we installed and started the IBM Tivoli Storage Manager server. We extended the size of the ITSM database, recovery log, and BACKUPPOOL disk storage pool. We performed these tasks through examples using the IBM Tivoli Storage Manager Web administrative client interface tree structure and the Server Command window. Finally, we verified that the IBM Tivoli Storage Manager server was working by saving a test file from an IBM Tivoli Storage Manager Windows client to the IBM Tivoli Storage Manager server.

In this chapter, you perform further configuration steps to help prepare the IBM Tivoli Storage Manager server for a production environment.

By our definition, “getting the IBM Tivoli Storage Manager server ready for production” means that we are describing realistic and meaningful backup functions and at least covering detailed disaster recovery requirements. We use this phrase to set boundaries around the scope and details of IBM Tivoli Storage Manager server capabilities that we can cover in a book such as this one, that is focused on IBM Tivoli Storage Manager server and Backup Recovery and Media Services (BRMS) integration. We imply similar boundaries through the wording of the title of Chapter 8, “Backup Recovery and Media Services up and running” on page 155.

6.1 Setting the correct time zone for OS/400 PASE

PASE requires its own time zone setting if the iSeries system value QUTCOFFSET is set to a value other than +0000. You use the following OS/400 command to verify the setting:

```
DSPSYSVAL QUTCOFFSET
```

If you changed the QUTCOFFSET system value, then you need to perform the following actions to set the correct time zone within PASE:

1. Add the environment variable for the OS/400 PASE time zone.
2. Restart the IBM Tivoli Storage Manager server.
3. Accept the new IBM Tivoli Storage Manager server time and enable sessions (depends on your time zone setting).

The following sections explain each of these steps in detail.

6.1.1 Adding an environment variable for the OS/400 PASE time zone

You must set the UNIX TZ environment variable within OS/400 PASE to correctly display local time. You can set a system-wide variable for OS/400 PASE by using the OS/400 Add Environment Variable (ADDENVVAR) command. The following example shows how to set the local time for U.S. Central time zone. All time adjustments shown are based upon the Coordinated Universal Time (CUT) or Greenwich Mean Time (GMT).

```
ADDENVVAR ENVVAR(PASE_TZ) VALUE('CST6CDT') LEVEL(*SYS)
```

You need to use the relevant PASE_TZ values from Table 6-1 for your own local time zone.

Table 6-1 OS/400 PASE time zones

PASE_TZ value	Time zone	CUT/GMT adjustments
CUT0GDT	Coordinated Universal Time	CUT
GMT0BST	United Kingdom	CUT
AZOREST1AZOREDT	Azores/Cape Verde	CUT -1
FALKST2FALKDT	Falkland Islands	CUT -2
GRNLNDST3GRNLNDDT	Greenland/East Brazil	CUT -3
AST4ADT	Central Brazil	CUT -4
EST5EDT	Eastern U.S./Colombia	CUT -5
CST6CDT	Central U.S./Honduras	CUT -6
MST7MDT	Mountain U.S	CUT -7
PST8PD	Pacific U.S /Yukon	CUT -8
AST9ADT	Alaska	CUT -9
HST10HDT	Hawaii/Aleutian Islands	CUT -10
BST11BDT	Bering Straits	CUT -11
NZST-12NZDT	New Zealand	CUT +12
MET-11METDT	Solomon Islands	CUT +11

PASE_TZ value	Time zone	CUT/GMT adjustments
EET-10EETDT	Eastern Australia	CUT +10
JST-9JDT	Japan	CUT +9
KORST-9KORDT	Korea	CUT +9
WAUST-8WAUDT	Western Australia	CUT +8
TAIST-8TAIDT	Taiwan	CUT +8
THAIST-7THAIDT	Thailand	CUT +7
TASHST-6TASHDT	Tashkent/Central Asia	CUT +6
PAKST-5PAKDT	Pakistan	CUT +5
WST-4WDT	Gorki/Central Asia/Oman	CUT +4
MEST-3MEDT	Turkey	CUT +3
SAUST-3SAUDT	Saudi Arabia	CUT +3
WET-2WET	Finland	CUT +2
USAST-2USADT	South Africa	CUT +2
NFT-1DFT	Norway/France	CUT +1

You can use the following command to view PASE_TZ and any other environment variables on your iSeries server:

```
WRKENVVAR LEVEL(*SYS)
```

You should not change any other environment variable unless directed to do so by your system administrator. The environment variables automatically shipped with OS/400 are used by iSeries Navigator-based functions and are set for maximum efficiency by default.

6.1.2 Restarting the IBM Tivoli Storage Manager server

You must stop and restart the IBM Tivoli Storage Manager server before you activate the new time zone:

1. End the IBM Tivoli Storage Manager server. In the IBM Tivoli Storage Manager Web Server Command window, enter:

   ```
   halt
   ```

2. Start the IBM Tivoli Storage Manager server. Do this in batch mode as you did in 5.1, “Starting and stopping the IBM Tivoli Storage Manager server” on page 54.

6.1.3 Accepting new IBM Tivoli Storage Manager server time, enabling sessions

Depending on your new OS/400 PASE time-zone setting, the IBM Tivoli Storage Manager server may disable backup-archive client access to the server. It may issue the error message “`ANR0110E An unexpected system date has been detected`” in the activity log.

View the IBM Tivoli Storage Manager messages in the activity log by using one of the following methods:

- IBM Tivoli Storage Manager Web administrative client interface tree structure by following these steps:
  a. Expand **Object view-> Server** and select **Activity Log**.
  b. The Query panel that opens shows several parameters that you can use to specify the activity log entries to be queried. Accept the default query parameter values.
  c. Scroll down the Query window and click **Finish**. This brings up the selected log entries.
- IBM Tivoli Storage Manager Web Server Command window by entering either of the following commands:

```
query actlog
q act
```

Figure 6-1 shows an example of the error messages you may receive in the IBM Tivoli Storage Manager server activity log. If you do not see these error messages, then this completes the setting of the OS/400 PASE time zone.

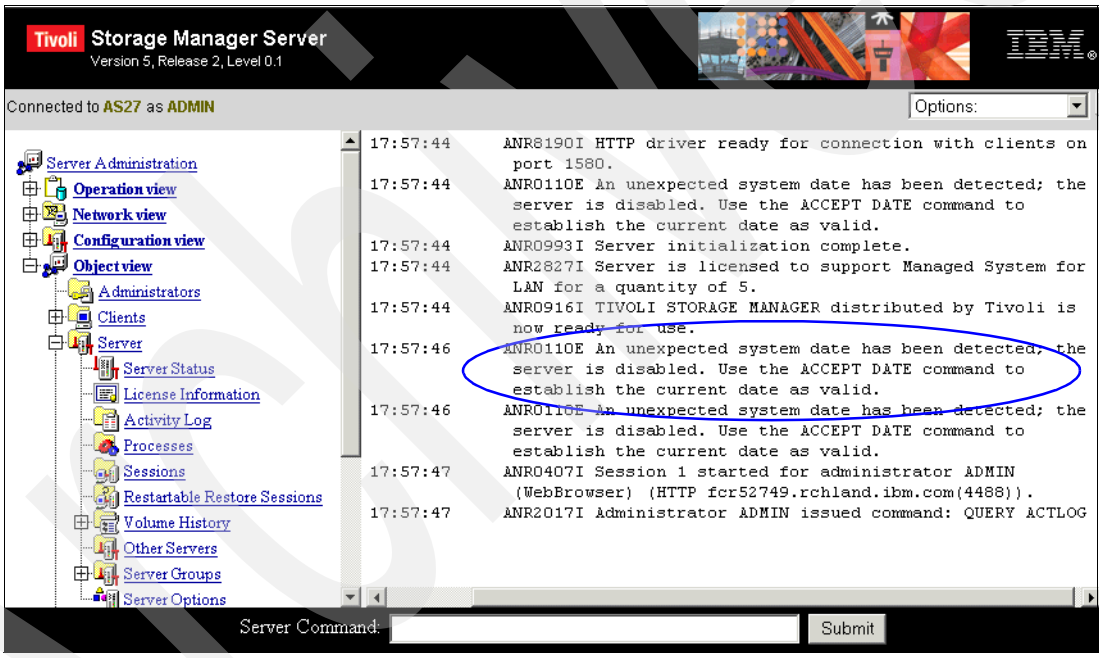

Figure 6-1 Web administrative client interface: OS/400 PASE time setting messages

If you receive messages similar to those in Figure 6-1, then continue with the following steps:

1. In the IBM Tivoli Storage Manager Server Command window, enter the following command:

   ```
   accept date
   ```

   You should receive message "`ANR0894I Current system has been accepted as valid.`"

2. In the IBM Tivoli Storage Manager Server Command window, enter the following command:

   ```
   enable sessions
   ```

   You should receive message "`ANR2096I Server now enabled for backup/archive client access.`"

This completes the setting the OS/400 PASE time zone.

6.2 IBM Tivoli Storage Manager and BRMS tape library management

You configure, use, and share a BRMS tape library with the IBM Tivoli Storage Manager for OS/400 PASE server on an iSeries server as explained in the following sections.

6.2.1 IBM Tivoli Storage Manager and BRMS tape library overview

IBM Tivoli Storage Manager can use tape devices for storing client backed-up, archived, and space-managed data and saving the IBM Tivoli Storage Manager database. These devices must first be configured in OS/400 before they can be used by IBM Tivoli Storage Manager.

There are several different ways to use tape devices with IBM Tivoli Storage Manager:

- **Manual library**: This is IBM Tivoli Storage Manager using a tape library that is not in library mode (non-BRMS).
- **Automated library**: This is used when using a tape library in library mode (non-BRMS).
- **Manual drives**: This is for all tape drives that do have the ability to be a tape library (non-BRMS).
- **USRDFN library**: This type of library (used in this chapter) is defined when IBM Tivoli Storage Manager is going to use a tape management program such as BRMS to manage their tape inventory.

We focus only on using BRMS as IBM Tivoli Storage Manager's tape management system in this redbook Refer to Chapter 4 "Configuring Storage Devices" in the *IBM Tivoli Storage Manager for OS/400 PASE Administrator's Guide*, GC23-4694, for information about using IBM Tivoli Storage Manager without BRMS.

Important: We assume that you already installed and configured BRMS on your system at this point. See Part 3, "Backup Recovery Media Services details" on page 131, which explains how to install and configure BRMS.

A main benefit to using BRMS as the IBM Tivoli Storage Manager tape manager is that it allows IBM Tivoli Storage Manager administrators to avoid dealing with checking in volumes, managing categories, and managing scratch volumes in automated libraries on an iSeries server. BRMS controls all of these administration tasks.

We create a user-defined (USRDFN) library in IBM Tivoli Storage Manager, which interacts with the BRMS tape management through a set of user-written exit programs. Sample exit programs are provided with the IBM Tivoli Storage Manager code that you can use with BRMS without modification.

The four exits required to interface with BRMS are:

- **MOUNT**: This exit is used by IBM Tivoli Storage Manager to tell the media management system to mount a specific volume.
- **DISMOUNT**: This exit is used by IBM Tivoli Storage Manager to tell the media management system that a volume that is mounted is no longer needed.
- **DELETION**: This exit is used by IBM Tivoli Storage Manager to tell the media management system that a volume is now empty and no longer needed by IBM Tivoli Storage Manager.

- **EXPIRATION**: This exit is used by IBM Tivoli Storage Manager to tell the media management system that a volume previously registered to IBM Tivoli Storage Manager is now empty and available for use.

The following section explains how to set up the BRMS exit programs and configure IBM Tivoli Storage Manager to use the BRMS media management system.

6.2.2 Creating IBM Tivoli Storage Manager and BRMS exit programs

IBM Tivoli Storage Manager comes with default exit programs in both C language and Control Language (CL) source that are needed to use a tape management program such as BRMS. They are included in source physical file QAANRSMP in library QTSM after you install licensed program product (LPP) 5698-ISX. The following section explains how to set up IBM Tivoli Storage Manager and BRMS exit programs.

From on an OS/400 command line in your IBM Tivoli Storage Manager server iSeries server, perform the following steps:

1. Create a new library called TSMEXITS:

   ```
   CRTLIB LIB(TSMEXITS) TYPE(*PROD) TEXT('ITSM exit programs')
   ```

2. Copy the exit programs from file QAANRSMP in library QTSM into TSMEXITS.

   As stated earlier, these source programs are coded in both C and Control Language (CL). Using these source file members as a base, you can customize the programs or create your own. In this environment, we use the CL program examples as is (no changes).

   a. Create a duplicate file of QAANRSMP:

      ```
      CRTDUPOBJ OBJ(QAANRSMP) FROMLIB(QTSM) OBJTYPE(*FILE) TOLIB(TSMEXITS)
      ```

      When you create this duplicate object all of the members are copied but are empty (no source statements). Since we are only going to be using the control language (CL) programs you may want to delete the C member names from the duplicated source file.

   b. Copy the CL source exit programs into the duplicated source file:

      ```
      CPYSRCF FROMFILE(QTSM/QAANRSMP) TOFILE(TSMEXITS/QAANRSMP) FROMMBR(DELETECL)
      CPYSRCF FROMFILE(QTSM/QAANRSMP) TOFILE(TSMEXITS/QAANRSMP) FROMMBR(DISMOUNTCL)
      CPYSRCF FROMFILE(QTSM/QAANRSMP) TOFILE(TSMEXITS/QAANRSMP) FROMMBR(EXPIRECL)
      CPYSRCF FROMFILE(QTSM/QAANRSMP) TOFILE(TSMEXITS/QAANRSMP) FROMMBR(MOUNTCL)
      ```

3. Enter the Programming Development Manager (`STRPDM`) command for library TSMEXITS and file QAANRSMP.
4. For all four exit programs located in this file, you need to change the type to `CLP`.
5. Type `14` (Compile) next to each exit program and compile them.
6. Verify that the programs compiled successfully. You can do this by looking for messages on your 5250 workstation message queue or by using the Work with Submitted Jobs (WRKSBMJOB) command.

6.2.3 Registering the IBM Tivoli Storage Manager exit programs

Now that the exit programs are created (compiled), define them to the IBM Tivoli Storage Manager server. From the IBM Tivoli Storage Manager Web administrative client interface, complete these steps:

1. Sign on to the IBM Tivoli Storage Manager server.
2. Expand **Object View-> Server storage-> Libraries and Drives** and select **Exit Programs**.

3. From the Operations list, select **Define Exit Program**.
4. On the Define Exit Program panel (Figure 6-2), enter the name of the library, TSMEXITS in our example, and the exit program, MOUNTCL that we created previously. Click **Finish**.

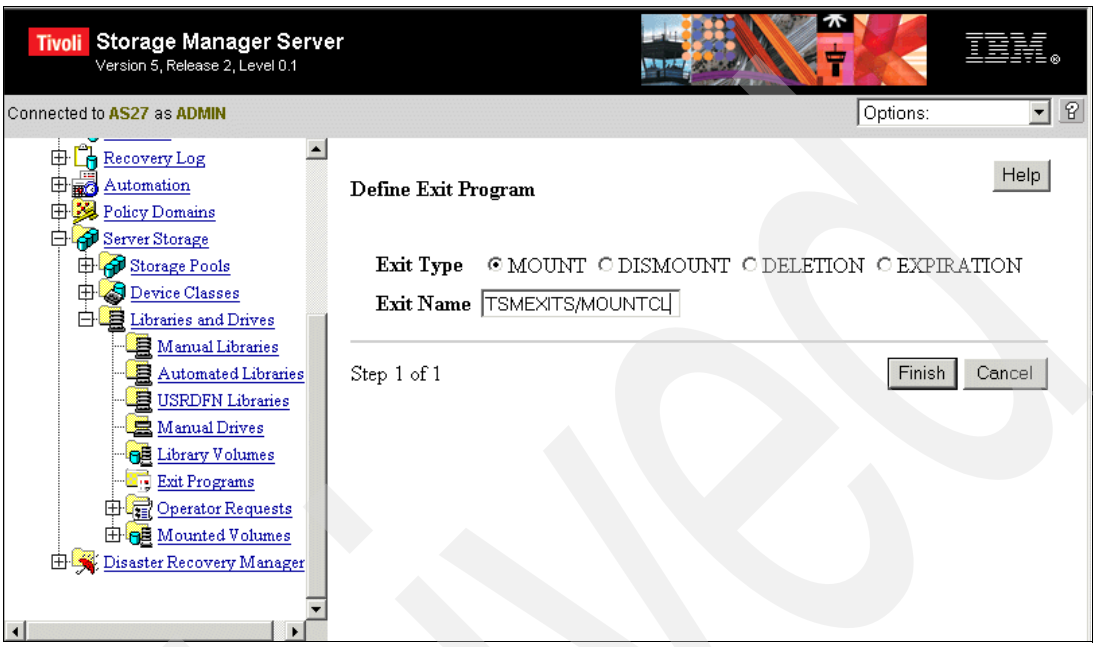

Figure 6-2 Defining your exit programs

Repeat this process for each of the four exit programs: MOUNTCL, DELETECL, EXPIRECL, and DISMOUNTCL.

6.2.4 Defining the IBM Tivoli Storage Manager USRDFN tape library

The following steps show how to define a user-defined tape library to IBM Tivoli Storage Manager:

1. The library name used in IBM Tivoli Storage Manager *must* match the name of the BRMS tape library location. To verify BRMS device information, on an OS/400 command line, enter the Work with Devices (`WRKDEVBRM`) command. You see the Work with Devices display (Figure 6-3) in BRMS.
2. Type option `5` in the Opt column next to the required tape library. In this example, we select TAPMLB05 and press Enter.

```
                                Work with Devices                          AS27

Position to . . . . . .              Starting characters

Type options, press Enter. 1=Add  2=Change  4=Remove  5=Display
  8=Work with status

Opt   Device      Category  Type/Model  Text

 5    TAPMLB05    *TAPMLB   3584/032    Entry created by BRM configuration
      TAP01       *TAP      6380/001    Entry created by BRM configuration
      TAP02       *TAP      6386/001    Entry created by BRM configuration
      TAP09       *TAP      3580/002    Entry created by BRM configuration
      TAP10       *TAP      3580/002    Entry created by BRM configuration
      TAP12       *TAP      3580/002    Entry created by BRM configuration
Bottom

F3=Exit   F5=Refresh   F12=Cancel
```

Figure 6-3 WRKDEVBRM command

In our example, the iSeries device is called TAPMLB05. The BRMS location associated with this device is also called TAPMLB05.

```
                        Display Tape Media Library Device

 Media library.. . . . . . . . :   TAPMLB05
 Device type/model . . . . . . :   3584/032

 Text  . . . . . . . . . . . . :   Entry created by BRM configuration
 Location  . . . . . . . . . . :   TAPMLB05
 Location volume count . . . . . :   11
 Location volume maximum . . . . :   *NOMAX

 Use optimum block size  . . . . :   *YES
 Next volume message . . . . . :   *NO
 Tape mount delay  . . . . . :   *IMMED
To continue, press Enter.
                                                                      More...
 F3=Exit    F12=Cancel
```

Figure 6-4 WRKDEVBRM: Display Tape Media Library Device

3. Go to the IBM Tivoli Storage Manager Web administrative client interface tree structure and follow the next steps:
   a. Expand **Object View**-> **Server Storage-> Libraries and Drives** and select **USRDFN Libraries**.
   b. From the Operations list, select **Define USRDFN Library**.
   c. In the USRDFN Library panel (Figure 6-5), in the Library Name field, enter the name of your tape library name. The library name must be the same name as your BRMS tape library location (see Figure 6-4). In this example, we enter TAPMLB05.
   d. Leave the drive selection parameter as the default of EXIT.
   e. Click **Finish** to create the library definition.

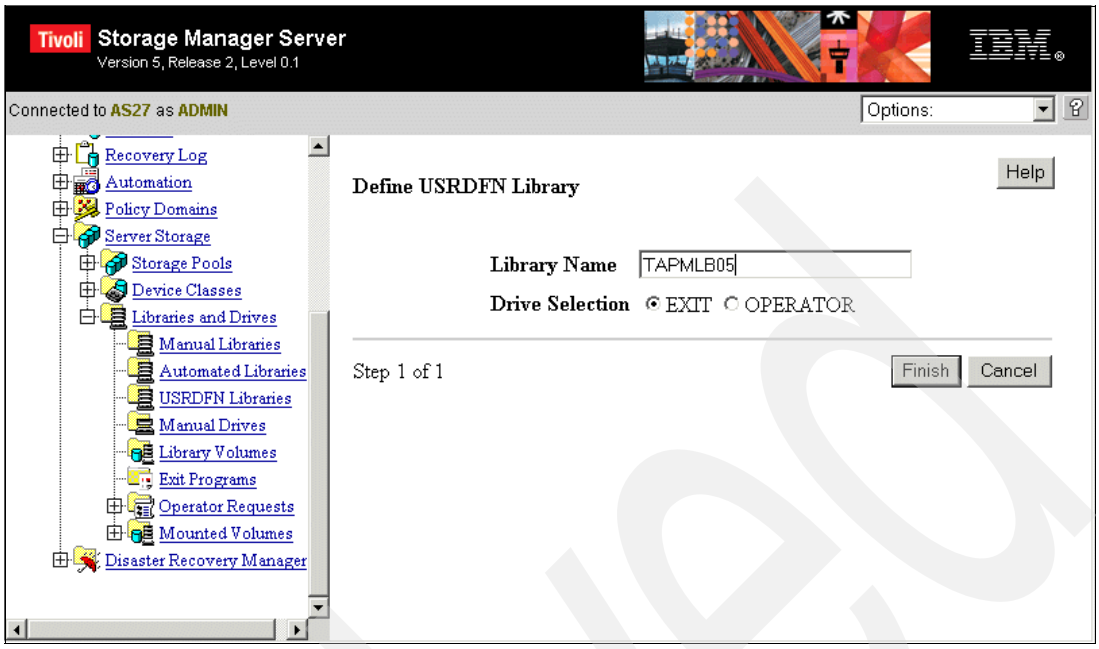

Figure 6-5 Defining a USRDFN library

6.2.5 Defining the device class

The next step is to create a device class for the IBM Tivoli Storage Manager server. The *device class* used in IBM Tivoli Storage Manager *must* have the same name as a BRMS *media class*.

We strongly recommended that you create a new media class in BRMS for use only by IBM Tivoli Storage Manager. This makes managing your run-time environment much easier than trying to reuse another BRMS media class. See 6.2.7, “Sharing a common media pool between IBM Tivoli Storage Manager, BRMS” on page 104, for further details.

1. On an OS/400 command line, enter the following command and press Enter:

   ```
   WRKCLSBRM *MED
   ```

2. Enter 1 (Add) in the Opt field and the new BRMS media class name in the Class field.
3. The Add Media Class display (Figure 6-6) opens. Since our example configuration is using LTO2 cartridges in an IBM 3584 tape library, we call our new BRMS media class ITSMLTO2. Enter the required density for your tape library media and a relevant text description. Leave all other fields with their default values. Press Enter to create the BRMS media class.

```
                              Add Media Class

Type choices, press Enter.

Media class . . . . . .   ITSMLT02      Name
Density . . . . . .       *ULTRIUM2     F4 for list
Media capacity  . . . . . .  *DENSITY    *DENSITY, Number nnnnn.nn
  Unit of measure . . . . . .            1=KB, 2=MB, 3=GB
Mark for label print  . . . . . .  *NONE  *NONE, *MOVE, *WRITE
Label size  . . . . . .   1              1=6 LPI, 2=8 LPI, 3=9 LPI
Label output queue  . . . . . .  *SYSPCY  Name, *SYSPCY, *PRTF
  Library . . . . . .                    Name, *LIBL
Shared media  . . . . . .  *YES          *YES, *NO
Text  . . . . . .         ITSM server Ultrium2 volumes
                                                              More...
F3=Exit    F4=Prompt    F12=Cancel
```

Figure 6-6 Add Media Class display

4. Create an ITSM media class with the same name. Go to the IBM Tivoli Storage Manager Web administrative client interface tree structure and follow these steps:
   a. Expand **Object view-> Server Storage** and select **Device Classes**. The left tree area lists the class of devices that may be on your system.
   b. Select the type of tape device you have. In this example, we clicked **LTO Device Classes**. In the right panel, you can define the LTO Device Classes. We use a 3584 tape library with LTO2 drives inside.
   c. From the Operations list, select **Define Device Classes**.
   d. Enter the following parameter values:
      - Device Class Name: The device class name *must* match the BRMS media class that was created in step 3.
      - Library Name: Select the library name from the list. The name should be the same as the library name used in 6.2.4, “Defining the IBM Tivoli Storage Manager USRDFN tape library” on page 99.
      - Mount Retention: This parameter indicates is how long (in minutes) the IBM Tivoli Storage Manager allocates the drive after a completed operation. Because this drive is shared, with BRMS, you want to specify a number that is small enough so native BRMS saves can allocate the drive if needed.
      - Mount Limit: This parameter defines how many drives in the tape library are available to IBM Tivoli Storage Manager. For example, you may have a tape library which has six drives available in BRMS, but only wants a maximum of two to ever be used by IBM Tivoli Storage Manager. In this case, you set Mount Limit to 2.

      In this example configuration, we enter the following values as shown in Figure 6-7:

      - Device Class Name: ITSMLT02
      - Library Name:**TAPMLB05**
      - Mount Limit: 2
      - Mount Retention: 1

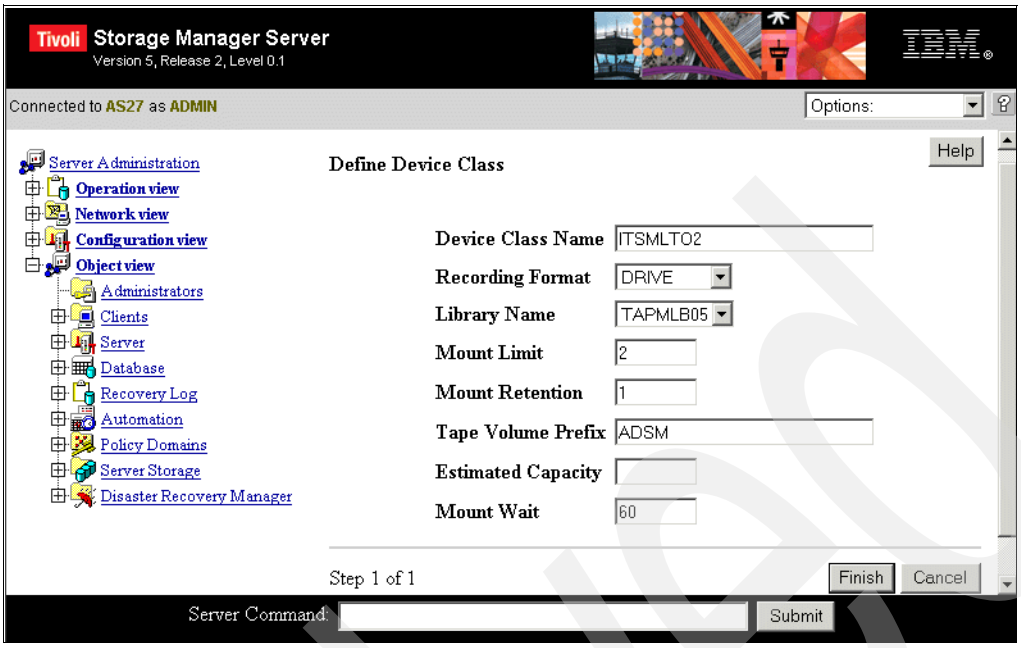

Figure 6-7 Web administrative client interface: Defining the device class

Refer to the **`define devclass`** command in Chapter 5 “Command Reference” in the *IBM Tivoli Storage Manager for OS/400 PASE Administrator’s Reference*, GC23-4695, for further details about the parameters that are available when you create an IBM Tivoli Storage Manager device class.

6.2.6 Verifying the IBM Tivoli Storage Manager and BRMS exit programs

You are now ready to verify that you can use the tape library with the IBM Tivoli Storage Manager and BRMS exit programs. You must first ensure that you have expired BRMS media available for your IBM Tivoli Storage Manager media class. You can check this by using the Work with Media using BRM (WRKMEDBRM) command. Refer to 8.7, “Adding media to the pool” on page 181, for information about adding media to BRMS. The following example explains how to perform a full online IBM Tivoli Storage Manager database backup using the new BRMS media class.

Go to the IBM Tivoli Storage Manager Web administrative client interface tree structure and follow these steps:

1. Expand **Object view** and select **Database**.
2. From the Operations list, select **Backup Database**.
3. On the Backup Database panel (Figure 6-8), follow these steps:
   a. Select the new device class created in the previous section. For Device Class, we select **ITSMLTO2** and for Type, we select **FULL**.
   b. Leave all other fields with their default values.
   c. Click **Finish** to submit the backup.

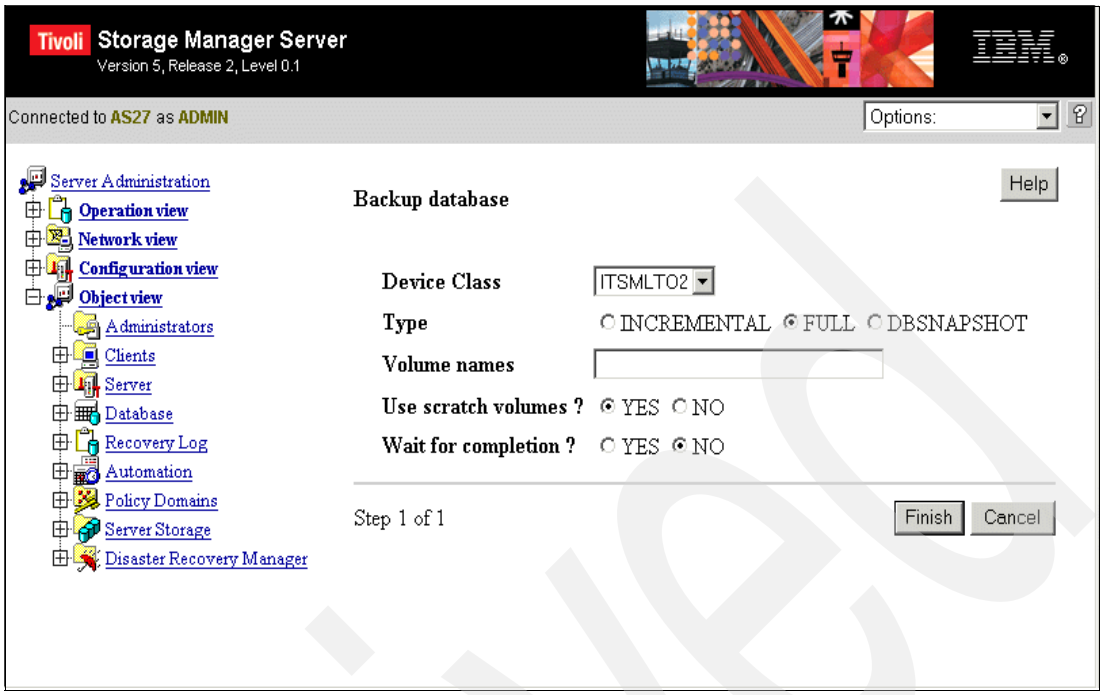

Figure 6-8 Backing up the IBM Tivoli Storage Manager database

4. To verify that the backup was complete, follow these steps:
   a. Expand **Object View-> Server** and select **Activity Log**.
   b. Accept the default values. Scroll down the page and click **Finish**.
   c. Look at the end of the log. You should see a message similar to this example:

```
ANR4551I Full database backup (process 4) complete, 509 pages copied.
```

Note: If you are using the Server Command window (not shown in Figure 6-8) of the IBM Tivoli Storage Manager Administration browser interface, you can enter the **`q act`** or **`query actlog`** command to view the same contents of the activity log instead of using the tree structure interface as described here.

6.2.7 Sharing a common media pool between IBM Tivoli Storage Manager, BRMS

We recommend that you create a separate media class for your IBM Tivoli Storage Manager server. Do *not* share media between IBM Tivoli Storage Manager and BRMS for these reasons:

- IBM Tivoli Storage Manager does not use data retention the same way that BRMS uses data retention. IBM Tivoli Storage Manager give all volumes it uses a *PERM expiration date so BRMS never expires IBM Tivoli Storage Manager server tapes, except through the **`expirecl`** exit program. We define this in 6.2.2, “Creating IBM Tivoli Storage Manager and BRMS exit programs” on page 98.
- It is possible for both applications to own the same tape volume. For example, if you use IBM Tivoli Storage Manager to perform a save to BRMS tape using the media class that you created for IBM Tivoli Storage Manager, it writes to the volume and enters an expiration date of *PERM on it. Now BRMS can do a *save with append* set to *YES using the same media class. If all the append criteria is met, BRMS writes to the next sequence number. Now both applications have data on the tape.

When IBM Tivoli Storage Manager expires the volume, because the IBM Tivoli Storage Manager data is no longer needed, it tells BRMS to expire it. The volume displays as *expired*. Now the volume can be written to again, starting with sequence number 1. Because IBM Tivoli Storage Manager does not check to see if there is any BRMS data on the volume when it expires the tape, any data that BRMS still needs is overwritten if something uses that expired volume. You do not want this to happen and later try to use the media to recover.

6.3 IBM Tivoli Storage Manager advanced storage

This section provides a high-level overview of the IBM Tivoli Storage Manager storage hierarchy, for a more detailed explanation of IBM Tivoli Storage Manager storage, see Chapter 8 “Managing Storage Pools and Volumes” in the *IBM Tivoli Storage Manager for OS/400 PASE Administrator’s Guide*, GC23-4694.

6.3.1 Overview of IBM Tivoli Storage Manager storage

The IBM Tivoli Storage Manager storage hierarchy is comprised of different *storage pools*. A storage pool can be constructed from different types of media such as disk, tape, or a file. Each pool consists of one or more *storage pool volumes*. On iSeries servers, a disk storage pool volume is a streamed (byte stream) file in the IFS. For sequential access storage pools (tape or file), volumes are individual tapes or files.

IBM Tivoli Storage Manager storage pools can be further classified as *primary storage pools* and *copy storage pools*. This takes into account the fact that data can be duplicated within the storage hierarchy for disaster recovery purposes. The duplication is performed at the storage pool level, rather than at the individual storage pool volume level.

Primary storage pools are the place where the original IBM Tivoli Storage Manager client data is stored on a backup function. They are normally on-site storage pools, either on the iSeries disk (IFS) or in a tape library. In this example configuration, this is a 3584 tape library.

Copy storage pool volumes can be defined as on site (in a tape library) or off site (ejected and placed in a secure location for disaster recovery). Each pool is categorized by type and format with an IBM Tivoli Storage Manager *device class*. The device class describes how to access and use the storage pool volumes. Tape device classes tell IBM Tivoli Storage Manager which tape library to use on the iSeries server, the number of drives in that library that are available to IBM Tivoli Storage Manager and the tape format that is used.

In the example configuration used throughout this redbook (shown in Figure 6-9), we created a 20 GB disk storage pool called BACKUPPOOL. This storage pools consists of four storage pool volumes that reside in the OS/400 IFS. Each volume is defined as a 5 GB IFS streamed file in the /tsmvol/backuppool/ directory on the iSeries server (shown on the left side of Figure 6-9). This is the first step in our IBM Tivoli Storage Manager storage hierarchy configuration.

Client data can now be saved to the iSeries disk. But how do we migrate that data to tape? Simple, we create additional storage pools.

In our environment, we create two additional storage pools. The first storage pool we create is a sequential access storage pool called BACKUPLTO. This storage pool uses tape cartridges (known as *storage pool volumes* in IBM Tivoli Storage Manager) in our 3584 tape library. These tapes contain all the IBM Tivoli Storage Manager client data migrated from the BACKUPPOOL disk storage pool and remain available in the 3584 tape library.

The second storage pool we create is a copy storage pool called COPYLTO. This storage pool also uses tape cartridges in the 3584 tape library, but these tapes are ejected each day and sent off site for disaster recovery purposes.

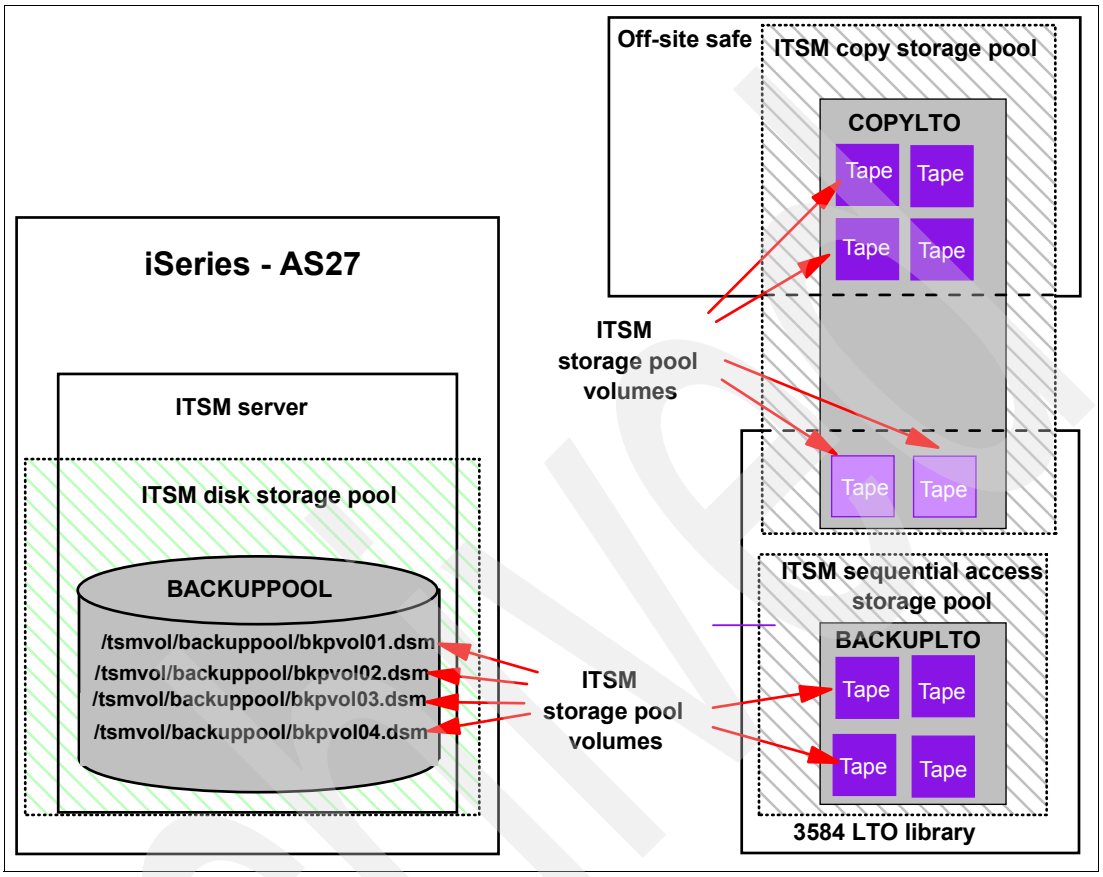

Figure 6-9 IBM Tivoli Storage Manager storage pool configuration

6.3.2 Storage pool migration

To move client data from one primary storage pool to another, we use a migration process based on either storage pool utilization or the maximum file size allowed.

Each disk storage pool has a high and low threshold value, which represents a percentage of the disk space used or filled with IBM Tivoli Storage Manager client data. Figure 6-10 shows the migration values of our BACKUPPOOL disk storage pool. The high threshold value is set to 90 percent and the low is set to 70 percent (see the top tier in Figure 6-10). This means that client data continues to be sent to the disk BACKUPPOOL until 90 percent of the disk pool is full, at which point, data is then migrated to the next storage pool defined. In our example configuration, this is the BACKUPLTO storage pool in the 3584 tape library. Data is migrated from the disk pool until the low migration threshold value is reached. Again in our example configuration, this is 70 percent.

Migration can also be forced by an IBM Tivoli Storage Manager administrator by lowering these storage pool threshold values. Figure 6-10 shows the IBM Tivoli Storage Manager storage pool BACKUPPOOL at approximately 60 percent full. When the high and low threshold values are set to 20 and 10 respectively (see the middle tier in Figure 6-10), data starts to migrate to the BACKUPLTO storage pool in the 3584 tape library. Data continues to migrate until the low threshold of 10 is met (see the bottom tier in Figure 6-10).

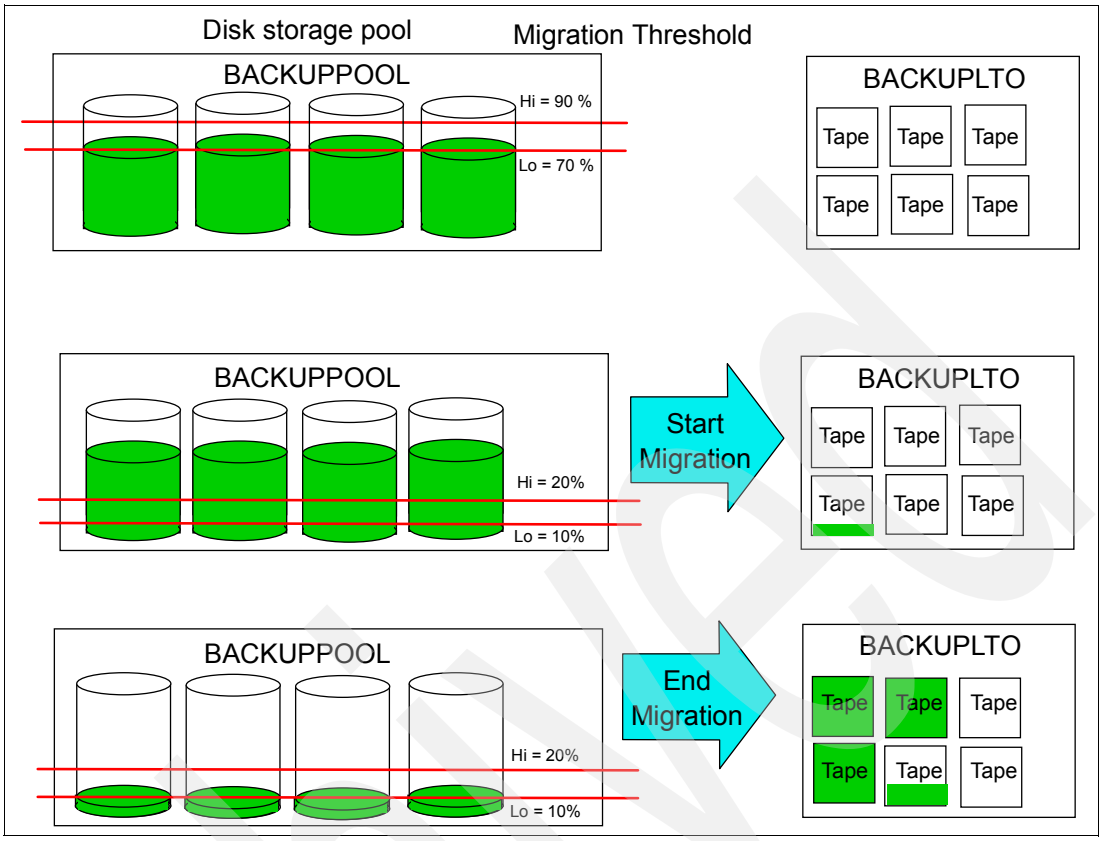

Figure 6-10 IBM Tivoli Storage Manager migration

We can also define a maximum file size that is allowed in the disk storage pool. Although, this is not used in our configuration, we can, for example, define a maximum file size limit of 300 MB. This means any file greater than 300 MB is not sent to the disk storage pool BACKUPPOOL. Instead it is sent directly to the BACKUPLTO storage pool in the 3584 tape library.

All of these “conditions” can be set up. Also the IBM Tivoli Storage Manager database keeps track of where all the client data resides within the storage hierarchy.

6.3.3 Collocation

Collocation is a parameter on the sequential access storage pools definition. This function is used to keep the same client’s data on a minimum number of tape volumes. The main purpose of this feature is to help reduce client data restore times. A disadvantage of this function is that the total number of tape cartridges used in the storage pool increases.

Figure 6-11 shows an example of three clients data spread over a disk storage pool. When the client data is migrated to the sequential access storage pool, provided enough tapes are available in the pool, IBM Tivoli Storage Manager attempts to keep all of the data for Client A on one tape volume, all of the data for Client B on another tape volume, and all of the data for Client C on a third tape volume.

All of the examples in our test configuration do not use the IBM Tivoli Storage Manager collocation feature.

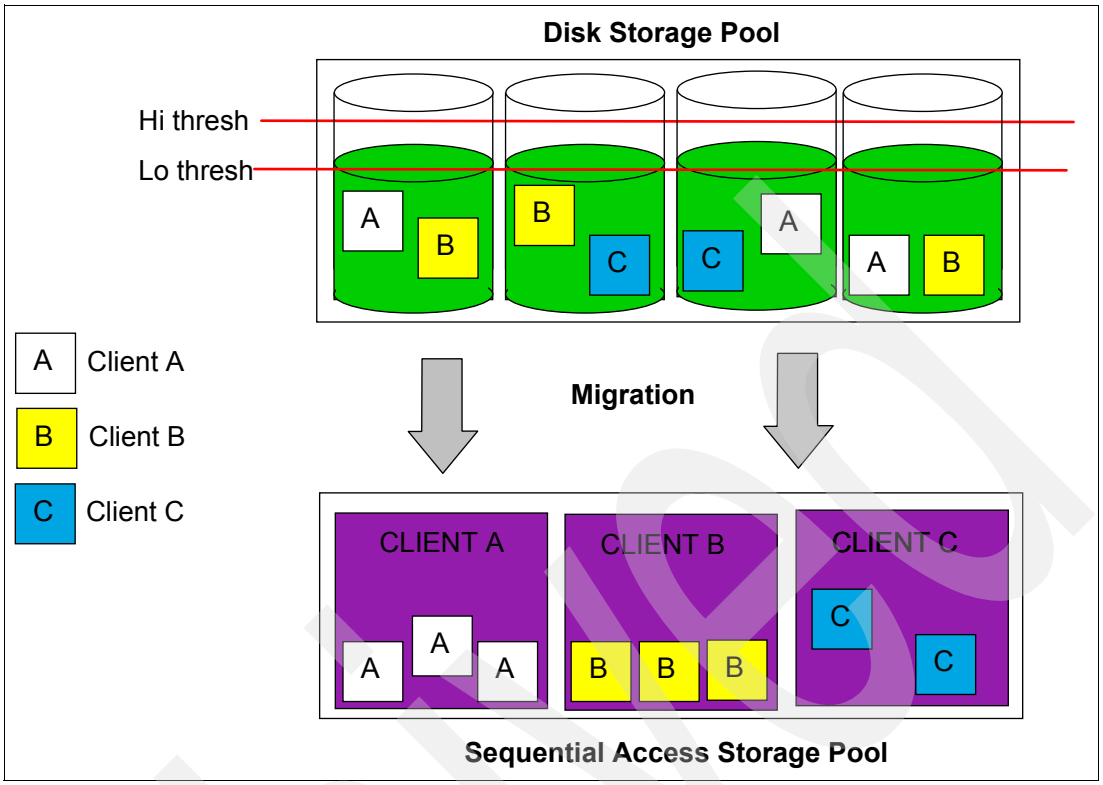

Figure 6-11 IBM Tivoli Storage Manager collocation

6.3.4 Reclamation

Space on a sequential volume becomes reclaimable as files expire or are deleted from the volume. For example, files become obsolete because of aging or limits on the number of versions of a file.

In reclamation processing, the server rewrites files on the volume being reclaimed to other volumes in the storage pool, making the reclaimed volume available for reuse. The server reclaims the space in storage pools based on a reclamation threshold that you can set for each sequential access storage pool. When the percentage of space that can be reclaimed on a volume rises above the reclamation threshold, the server reclaims the volume.

Figure 6-12 shows a sequential storage pool with four storage pool volumes. After week 1, tapes 1 through 3 are full with client data and tape 4 is empty (scratch tape). After week 2, client data has expired on the tape volumes. Tape 1 has only 25% of valid client data; tape 2 has 15% of valid client data; and tape 3 has 90% of valid client data. If the reclamation threshold of the storage pool is set to 60, which means reclamation is started when 60% or more of the tape volume contains expired client data, then valid client data is copied to another storage pool volume. In this example, active data from tape 1 and 2 is automatically copied to the empty tape 4. Also tapes 1 and 2 are reclaimed and become empty volumes (scratch tapes) available for reuse.

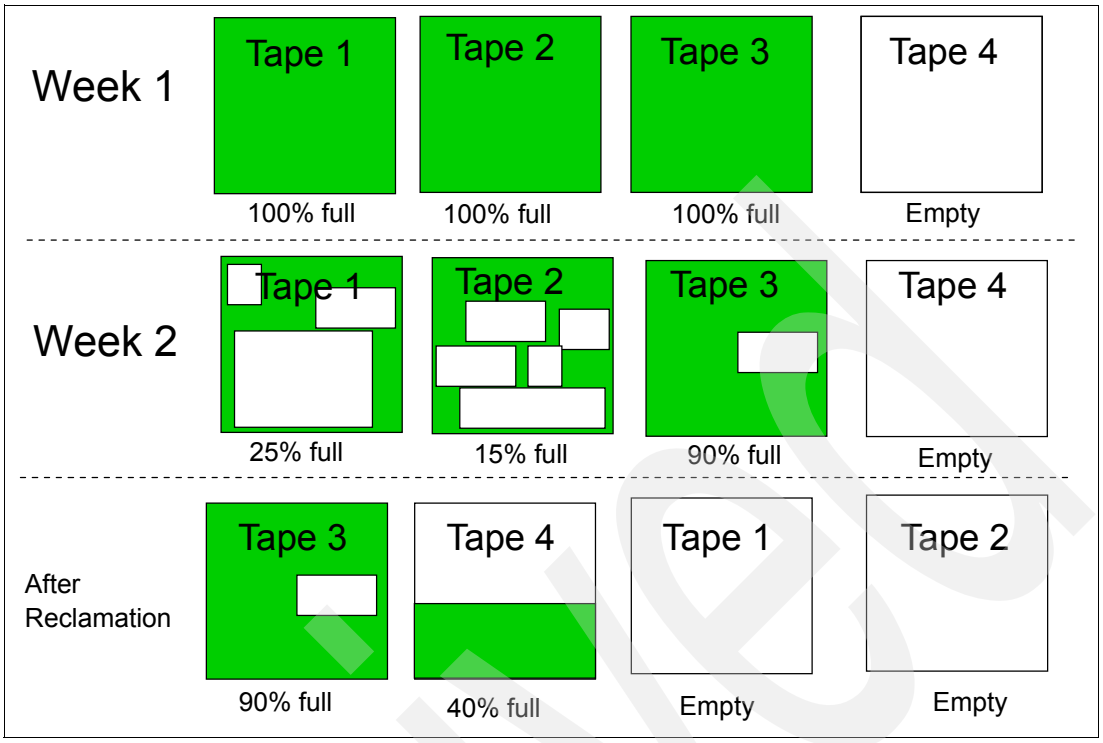

Figure 6-12 IBM Tivoli Storage Manager reclamation

6.3.5 Creating a sequential access storage pool

IBM Tivoli Storage Manager sequential access storage pools can be of tape or file type. In this example configuration, we created a sequential access storage pool called BACKUPLTO and attached the ITSMLTO2 device class created in 6.2.5, “Defining the device class” on page 101. The following steps show how to create a sequential access storage pool from both the IBM Tivoli Storage Manager Web administrative client interface tree structure and the Server Command window:

- IBM Tivoli Storage Manager Web administrative client interface tree structure by following these steps:
  a. Expand **Object view-> Server Storage-> Storage Pools** and select **Sequential Access Storage Pools**.
  b. From the Operations list, select **Define Sequential Access Storage Pool**.
  c. Enter the values for the following fields as shown in Figure 6-13:
     - Storage Pool Name: Type the value `BACKUPLTO`.
     - Device Class: The device class is created in 6.2.5, “Defining the device class” on page 101, where we define our 3584 tape library to IBM Tivoli Storage Manager. In this example, we select **ITSMLTO2**.
     - Collocate: This parameter defines whether we limit client node data to the minimum number of tapes possible. In this example, we select **NO**.
     - Maximum Scratch Volumes Allowed: This maximum number of scratch tapes allowed is a little confusing. This value defines the maximum number of tapes that can be allocated to a storage pool. For this value, we entered `10`.
  d. Scroll down to the bottom of the panel and click **Finish** to submit the request.

- IBM Tivoli Storage Manager Web Server Command window by entering the following command:

```
define stgpool backlto2 itsmlto maxscratch=10
```

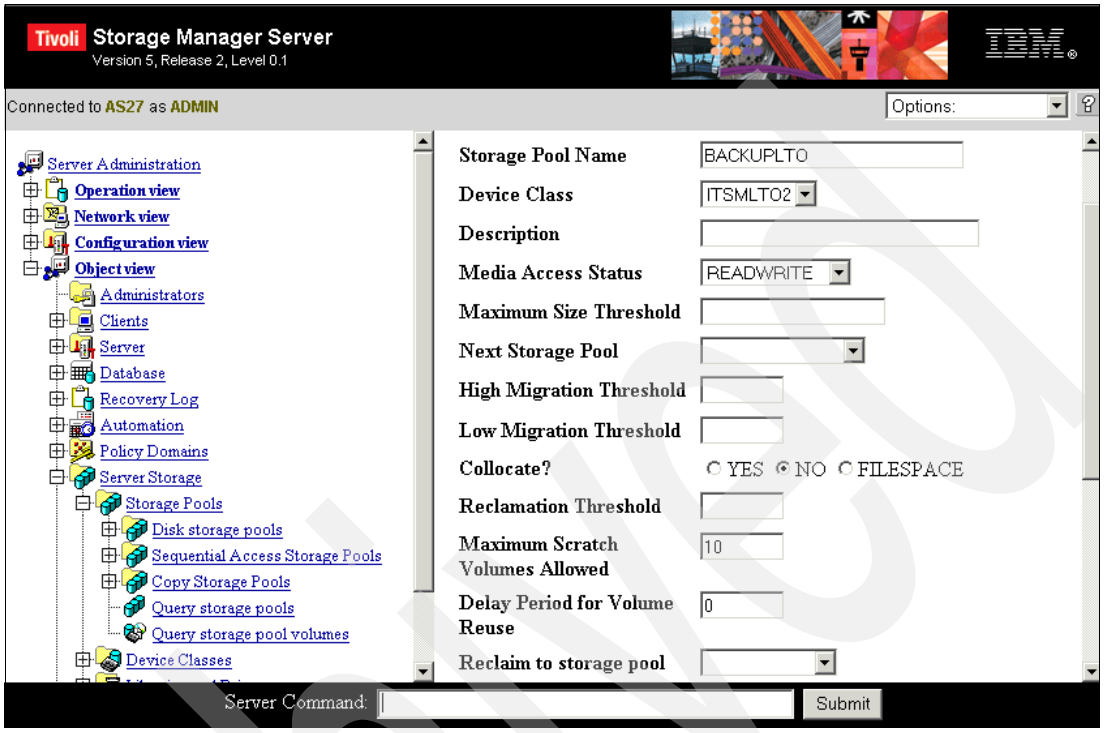

Figure 6-13 Web administrative client interface: Creating a sequential storage pool

6.3.6 Updating the disk storage pool to migrate to tape

The disk storage pool BACKUPPOOL has to be amended to allow the migration process to continue on to the new tape storage pool BACKUPLTO. Use one of the following methods to update the disk storage pool:

- IBM Tivoli Storage Manager Web administrative client interface tree structure by following these steps:
  a. Expand **Object view-> Server Storage-> Storage Pools-> Disk storage pools** and select **BACKUPPOOL**.
  b. From the Operations list, select **Update a disk storage pool**.
  c. On the Update a disk storage pool panel (Figure 6-14), in the Next Storage Pool field, select **BACKUPLTO**.
  d. Scroll down the page and click **Finish** to submit the request.
- IBM Tivoli Storage Manager Web Server Command window by entering the following command:

```
update stgpool BACKUPPOOL nextstgpool=BACKUPLTO
```

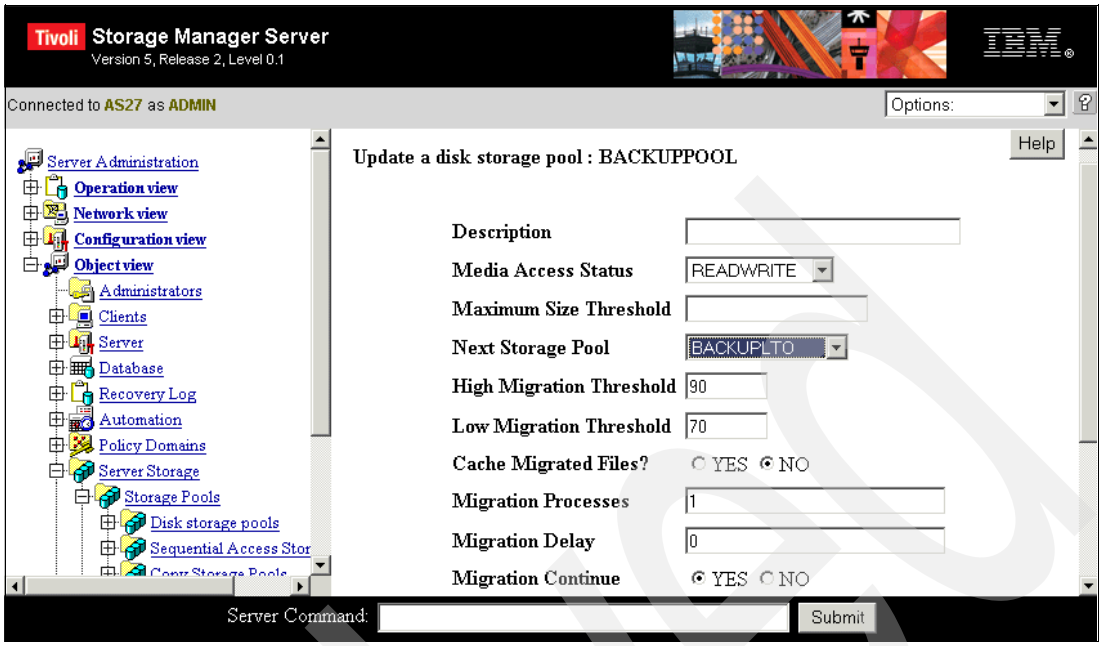

Figure 6-14 Web administrative client interface: Updating the disk storage pool

6.3.7 Creating a copy storage pool

A copy storage pool provides IBM Tivoli Storage Manager clients recovery from an on-site disaster or media failure. We created a copy storage pool called COPYLTO which is used to generate a second copy of the IBM Tivoli Storage Manager client data stored in the BACKPPOOL / BACKUPLTO storage pools. Normally, tapes in a copy storage pool will be moved off site and stored in a secure location for disaster recovery purposes. Use one of the following methods to create a copy storage pool:

- IBM Tivoli Storage Manager Web administrative client interface tree structure by following these steps:
  a. Expand **Object view-> Server Storage-> Storage Pools** and select **Copy Storage Pools**.
  b. From the Operations list, select **Define Copy Storage Pool**.
  c. Enter the values for the following fields as shown in Figure 6-15:
     - Storage Pool Name: Type the value `COPYLTO`.
     - Device Class: The device class is created in 6.2.5, “Defining the device class” on page 101, when we define the 3584 tape library to IBM Tivoli Storage Manager. For this example, we select **ITSMLTO2**.
     - Collocate: This field defines whether we limit client node data to the minimum number of tapes possible. For this example, we select **NO**.
     - Maximum Scratch Volumes Allowed: The maximum number of scratch tapes allowed is a little confusing. This value defines the maximum number of tapes that can be allocated to a storage pool. For this example, we specify `30`.
     - Delay Period for Volume Reuse: This field defines how long, in days, a tape must wait after is has expired before it can be reused. See 6.6.5, “Reusing delay for copy storage pools” on page 127, for further details. In this example, we specify `5`.
  d. Click **Finish** to submit the request.

- IBM Tivoli Storage Manager Web Server Command window by entering the following command:

```
define stgpool copylto itsmlto2 pooltype=copy maxscratch=30 reusedelay=5
```

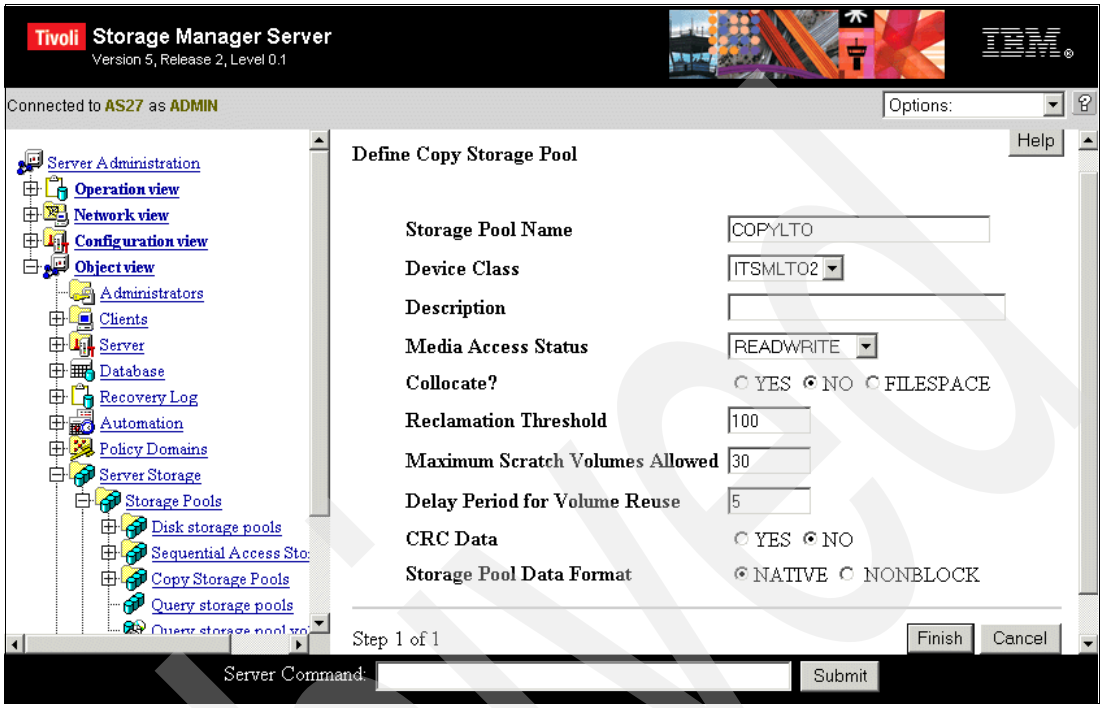

Figure 6-15 Web administrative client interface: Defining the copy storage pool

6.3.8 IBM Tivoli Storage Manager disk storage pool performance improvements

A performance enhancement was made at OS/400 V5R2M0 for the IBM Tivoli Storage Manager disk storage pool volumes in the OS/400 IFS. Normally, OS/400 reads the portion of the disk to be written to before it performs the write operation. In fact, this doubles the input/output (I/O) required because a read operation is made that is not needed.

To improve the I/O performance of the IBM Tivoli Storage Manager disk storage pool volumes, perform the following actions:

1. Load and apply PTF MF30245 for OS/400 V5R2M0.
2. Enter the following command for each IBM Tivoli Storage Manager disk storage pool volume in the OS/400 IFS:

   ```
   CHGATR OBJ('/path/stgpoolfile') ATR(*MAINSTGOPT) VALUE(*MINIMIZE)
   ```

   This enhancement allows greater write speed to the IBM Tivoli Storage Manager disk storage pool volumes. Therefore, it improves the IBM Tivoli Storage Manager backup performance.

   In this example configuration, we entered the following commands for the four disk storage pool volumes in our BACKUPPOOL disk storage pool:

   ```
   CHGATR OBJ('/tsmvol/backuppool/bkpvol01.dsm') ATR(*MAINSTGOPT) VALUE(*MINIMIZE)
   CHGATR OBJ('/tsmvol/backuppool/bkpvol02.dsm') ATR(*MAINSTGOPT) VALUE(*MINIMIZE)
   CHGATR OBJ('/tsmvol/backuppool/bkpvol03.dsm') ATR(*MAINSTGOPT) VALUE(*MINIMIZE)
   CHGATR OBJ('/tsmvol/backuppool/bkpvol04.dsm') ATR(*MAINSTGOPT) VALUE(*MINIMIZE)
   ```

6.4 IBM Tivoli Storage Manager policies

This section discusses the use of IBM Tivoli Storage Manager policies only at a very high level. For a more detailed explanation, see Chapter 11 “Implementing Policies for Client Data” in the *IBM Tivoli Storage Manager for OS/400 PASE Administrator’s Guide*, GC23-4694.

6.4.1 IBM Tivoli Storage Manager policy overview

Policies are rules that you set at the IBM Tivoli Storage Manager server to help you manage client data. Policies control how and when client data is stored, how and when files are backed up and archived to server storage, and the number of copies of a file and the length of time copies are kept in server.

The IBM Tivoli Storage Manager server organizes clients (nodes) and client data by the following IBM Tivoli Storage Manager policy definitions:

- **Policy domain**: A client system, or node, can be grouped together with other nodes into a policy domain. In a domain, all clients are managed using the same data management rules. Normally you divide your clients by system type or organizational structure. In our example configuration, we use the default policy for the Windows test client.
- **Policy set**: The policy domain links the nodes to a policy set, which consists of management classes. Only one policy set can be active within a policy domain. However, you can have many more sets of policies inactive in your policy domain.
- **Management class**: A management class contains rules called *copy groups* that it links to the specific data. When the data is linked to particular rules, it is said to be bound to the management class that contains the rules. This can happen at the object (file) level, but you can also do this at the directory or filespace level. You can link data explicitly or implicitly by using the default management class.
- **Copy group**: The copy group defines where data is stored, the number of versions that are kept, and how long they are retained. Normally there are two copy groups per management class. There is a backup copy group and an archive copy group.

IBM Tivoli Storage Manager has a default policy, called STANDARD, that is configured when the product is installed. The STANDARD policy is good for testing your backup environment. However, you may need to either update this policy or create your own polices to organize your backup strategy.

The STANDARD policy allows up to two backup versions of a file from the client’s system. Theses files are first stored in the disk storage pool BACKUPPOOL. The most recent backup version is retained for as long as the original file is on the clients file system. All other versions are retained for up to 30 days after they become inactive. Any deleted files from the client system are kept for an additional 60 days.

6.4.2 Updating the default backup copy group

If the default policy doesn’t meet your organization’s requirements, then you can update the values that are provided or create new ones. In this example, we change the number of the backup versions that are kept, from 2 to 10, for the default backup copy group STANDARD. You can update the default backup copy group by using one of the following methods:

- IBM Tivoli Storage Manager Web administrative client interface tree structure by following these steps:
  a. Expand **Object view-> Policy Domains-> Policy Sets-> Management Class** and select **Backup Copy Groups** as shown in Figure 6-16.

b. Two copy groups are displayed, one with a policy set name of ACTIVE and another called STANDARD. It is not possible to change an active policy set. Instead you must modify the STANDARD policy set. Then you must validate it and reactivate it for any changes to take effect. Select the non-active copy group **STANDARD** (circled in Figure 6-16).

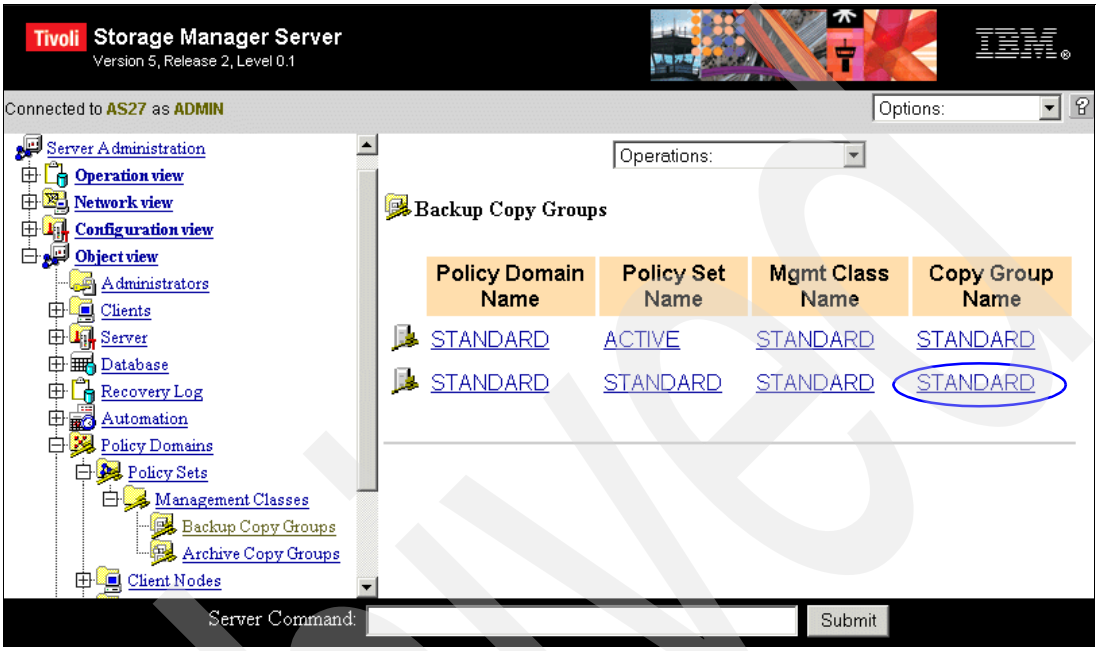

Figure 6-16 Web administrative client interface: Backing up copy groups

c. From the Operations list, select **Update Copy Group**.

d. On the Update Copy Group panel (Figure 6-17), change Versions Data Exists from 2 to 10. Again, refer to Chapter 11 “Implementing Policies for Client Data” in the *IBM Tivoli Storage Manager for OS/400 PASE Administrator’s Guide*, GC23-4694, for information about all the other parameters on this display.

e. Click **Finish** to submit the changes.

- IBM Tivoli Storage Manager Web Server Command window by entering the following command:

```
update copygroup standard standard standard verexists=10
```

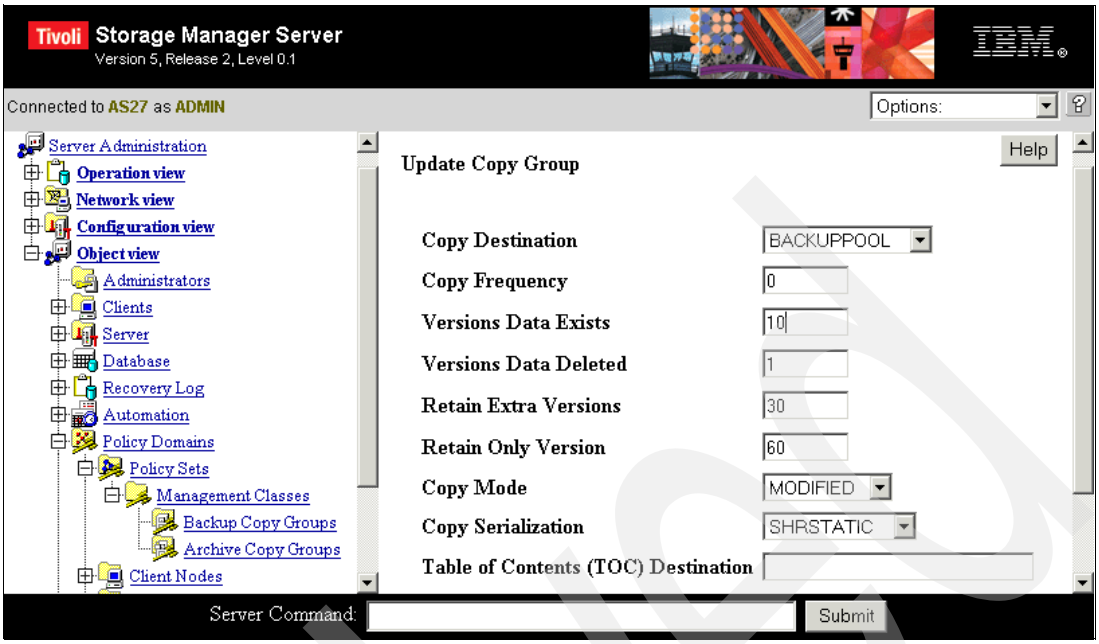

Figure 6-17 Web administrative client interface: Updating the copy group

6.4.3 Validating and activating copy group changes

The modified backup copy group changes do not take effect until you validate and activate the associated policy set. To query the current copy group settings, enter the following IBM Tivoli Storage Manager command in the Server Command window:

```
query copygroup
```

Figure 6-18 shows the ACTIVE copy group with the original Version Data Exists value of 2 and the modified copy group with the new setting of 10.

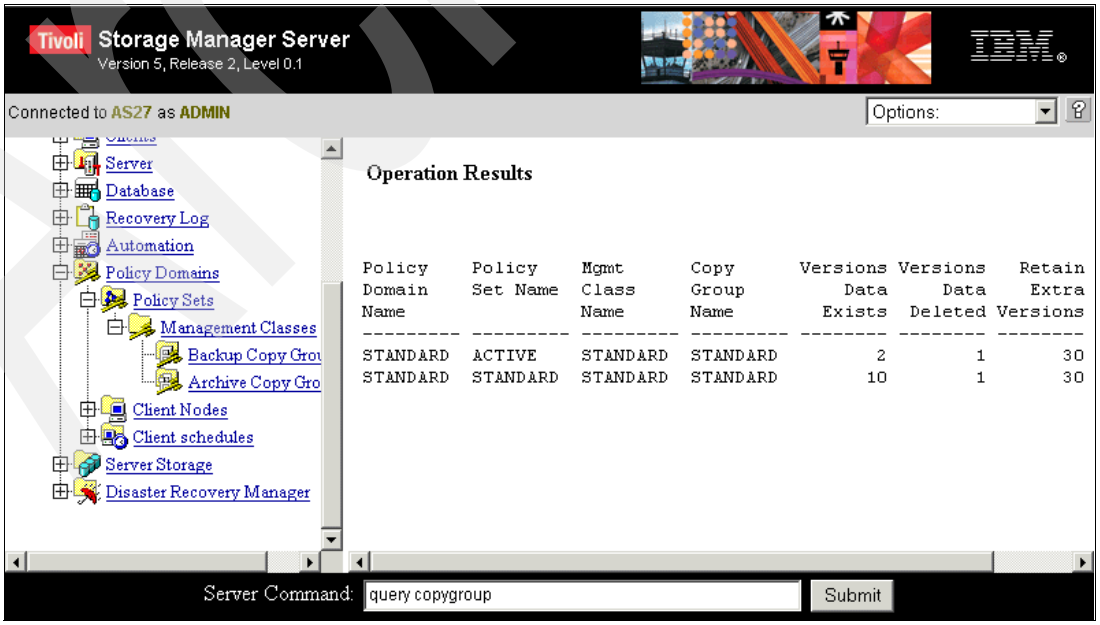

Figure 6-18 Web administrative client interface: Querying the copy group

You can validate and activate the policy set by using one of the following methods:

- IBM Tivoli Storage Manager Web administrative client interface tree structure by following these steps:
  a. Expand **Object view-> Policy Domains** and select **Policy Sets**.
  b. Select the **STANDARD** policy set name.
  c. From the Operations list, select **Validate Policy Set** and click **Finish**.
  d. You see the message "`ANR1515I Policy set STANDARD validated in domain STANDARD (ready for activation)`". Click **Return** to go back to the Policy panel.
  e. To activate the policy set, from the Operations list, select **Activate Policy Set** and click **Finish**.

  Now you see the message "`ANR1514I Policy set STANDARD activated in policy domain STANDARD`". This completes the validation and activation of the default policy set.
- IBM Tivoli Storage Manager Web Server Command window by entering the following commands:

```
validate policyset standard standard
activate policyset standard standard
```

6.5 IBM Tivoli Storage Manager daily maintenance

This section shows the main daily maintenance functions that are performed on a typical IBM Tivoli Storage Manager server. Normally IBM Tivoli Storage Manager clients send backup data to the IBM Tivoli Storage Manager server during the evening. This process is automated through client schedules or through an OS/400 scheduler when using the BRMS Application Client.

The IBM Tivoli Storage Manager server also provides an administrative command scheduler. This scheduler allows daily routine administrative tasks to be scheduled as individual commands or combined in to server command scripts. Some of the common routine tasks are:

- Creating a copy of the previous night's client backup data for off-site storage
- Forcing client data migration from disk to sequential access storage pools
- Backing up the IBM Tivoli Storage Manager database
- Deleting old IBM Tivoli Storage Manager database backups
- Expiration of client data
- Reclaiming expired data from sequential storage pool volumes

The following sections shows examples of creating server command scripts and server command schedules that are used in our IBM Tivoli Storage Manager test configuration to help automate the daily administrative tasks. If you need more information about automating server functions, see Chapter 16 "Automating Server Operations" in the *IBM Tivoli Storage Manager for OS/400 PASE Administrator's Guide*, GC23-4694.

6.5.1 Creating a daily maintenance script

An IBM Tivoli Storage Manager server command script can be compared to OS/400 Command Language Program (CLP). IBM Tivoli Storage Manager server command scripts can perform multiple IBM Tivoli Storage Manager server commands in one concurrent or sequential process. You can use the sample command script shown in Example 6-1 to perform most of the IBM Tivoli Storage Manager server's daily maintenance requirements.

IBM Tivoli Storage Manager commands are entered in the script as though they are issued from an IBM Tivoli Storage Manager command line or window. These commands are processed sequentially by adding the WAIT TAG to the end of the command line.

Example 6-1 Sample IBM Tivoli Storage Manager server command script

```
backup stgpool BACKUPPOOL COPYLTO wait=yes
backup stgpool BACKUPLTO COPYLTO wait=yes
backup db type=full devcl=ITSMLTO2 wait=yes
delete volhist type=dbb todate=-5
expire inventory
```

Note the following explanation:

- Line 1: `backup stgpool BACKUPPOOL COPYLTO wait=yes`

  The first line in the example script backs up any client data residing in the disk storage pool BACKUPPOOL and sends it to the COPYLTO pool. The client is not migrated from the BACKUPPOOL at this stage. The client data remains in the BACKUPPOOL and a second copy is created in the COPYLTO storage pool, which uses LTO tapes the 3584 tape library. The wait tag forces the script to finish backing up all the client data from the disk storage pool before moving to the second line in the command script.

- Line 2: `backup stgpool BACKUPLTO COPYLTO wait=yes`

  The second line in our example script backs up any new client data in the BACKUPLTO sequential access storage pool and sends it to the COPYLTO pool. Normally the IBM Tivoli Storage Manager client's daily backup data is placed in the disk storage pool. However, if the disk pools high migration threshold is reached, then client data is automatically migrated to the BACKUPLTO pool. This command looks for any new client data in BACKUPLTO and copies it to the COPYLTO storage pool. In fact, this process performs a tape-to-tape copy. Both storage pools use the LTO drives in the 3584 tape library. This is why we recommend that you use a tape library with at least two resources available for IBM Tivoli Storage Manager. It is possible to only use one resource, but it can require a lot of disk, operator intervention, and tapes. Again, the `wait` tag forces the command to finish before processing the next line in the script.

- Line 3: `backup db type=full devcl=ITSMLTO2 wait=yes`

  The third line performs a full backup of the IBM Tivoli Storage Manager database using the ITSMLTO2 device class, which points to the 3584 tape library. At this stage, we now have a copy of all the previous evening's backup data and a backup of the IBM Tivoli Storage Manager database. These tapes are sent off site later for disaster recovery.

- Line 4: `delete volhist type=dbb todate=-5`

  The fourth line deletes any IBM Tivoli Storage Manager database backups older than five days. When the volume is deleted, it automatically expires in BRMS.

- Line 5: `expire inventory`

  The last line in the script deletes expired files from the server database. After expired files are deleted from the database, the server can reuse the space in the storage pools that was occupied by the expired files.

The following steps show how to create an IBM Tivoli Storage Manager command script. to do this, you can use either the IBM Tivoli Storage Manager Web administrative client interface tree structure or the IBM Tivoli Storage Manager Server Command window:

- IBM Tivoli Storage Manager Web administrative client interface tree structure
  a. Expand **Operation view** and select **Automate operations-> Define a command script**
  b. In the Define a command script panel (Figure 6-19), follow these steps:
     i. Enter a valid name for the command script in the name field. The name cannot contain any spaces. In this example, we enter `DAILY_MAINT`.
     ii. In the Description field, enter an informative name. In this example, we enter `ITSM Daily Maintenance`.
     iii. In the large script window enter the IBM Tivoli Storage Manager commands to be performed. In this example, we entered the following information:

```
backup stgpool BACKUPPOOL COPYLTO wait=yes
backup stgpool BACKUPLTO COPYLTO wait=yes
backup db type=full devcl=ITSMLTO2 wait=yes
delete volhist type=dbb todate=-5
expire inventory
```

  c. Click **Finish** to process the request. See the following section to schedule this IBM Tivoli Storage Manager command script.
- IBM Tivoli Storage Manager Web Server Command window by entering the following commands in the order shown:

```
define script DAILY_MAINT "backup stgpool BACKUPPOOL COPYLTO wait=yes"
desc="ITSM Daily Maintenance"
update script DAILY_MAINT "backup stgpool BACKUPLTO COPYLTO wait=yes"
update script DAILY_MAINT "backup db type=full devcl=ITSMLTO2 wait=yes"
update script DAILY_MAINT "delete volhist type=dbb todate=-5"
update script DAILY_MAINT "expire inventory”
```

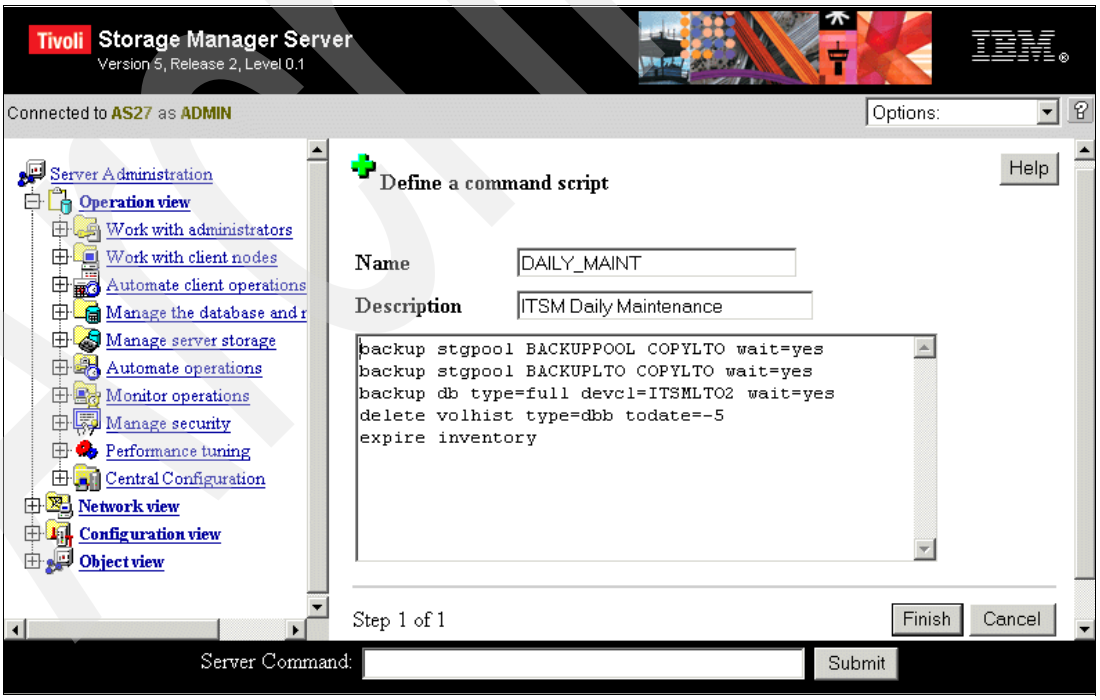

Figure 6-19 Web administrative client interface: Creating the server command script

6.5.2 Scheduling a daily maintenance script

The IBM Tivoli Storage Manager server includes an administrative command schedule. You can use this schedule to automate the processing of IBM Tivoli Storage Manager server commands at specific time periods. The following example shows how to configure a command schedule to run the DAILY_MAINT script at 05:00 each day. To do this, you can use either the IBM Tivoli Storage Manager Web administrative client interface tree structure or the Server Command window configuration method.

- IBM Tivoli Storage Manager Web administrative client interface tree structure by following these steps:

  a. Expand **Operation view-> Automate operations** and select **Define an administrative command schedule**.

  b. In our example, to schedule the DAILY_MAINT script to run each day at 05:00, we entered the following information as shown in Figure 6-20:

     - Schedule Name: `DAILY_MAINT`
     - Command: `run DAILY_MAINT`
     - Active?: **YES**
     - Description: `ITSM Daily Maintenance`
     - Start time: `05:00`

     See the “Tailoring Schedules” section in Chapter 16 of the *IBM Tivoli Storage Manager for OS/400 PASE Administrator’s Guide*, GC23-4694, for a detailed explanation about each of the available parameters.

- IBM Tivoli Storage Manager Web Server Command window by entering:

```
define schedule daily_test  type=administrative cmd="run daily_maint" active=yes
starttime=05:00 description="ITSM Daily Maintenance"
```

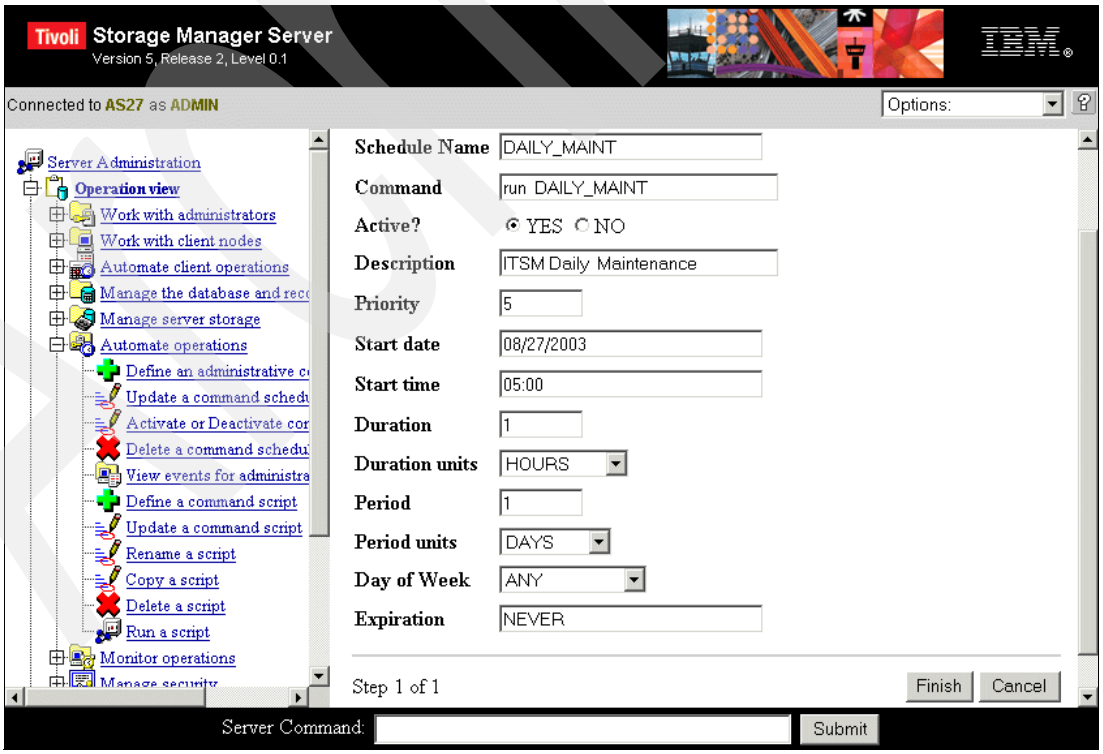

Figure 6-20 Web administrative client interface: Defining an administrative schedule

6.5.3 Scheduling disk storage pool migration

In our IBM Tivoli Storage Manager server configuration, client data is sent to the disk storage pool BACKUPPOOL. The high and low migration threshold values are set to 90% and 70% respectively. If the disk storage pool is correctly sized, then all of the evening's backup data remains in the BACKUPPOOL disk storage pool.

To force the migration of the BACKUPPOOL storage pool, we must lower the storage pool migration thresholds values by using the **update stgpool** command. This command forces the storage pool to immediately migrate data to their next level storage pool. The migration process continues until the low migration threshold is reached.

We need to create two administrative command schedules that will run each day:

- **START_MIGR**: This command schedule is run at 15:00 and sets both the high and low migration threshold values to 0. This forces all data residing in the disk storage pool to migrate to next level storage pool BACKUPLTO.

  The schedule can be created by using either the Web administrative client interface tree structure or the Server Command window (as in the previous section). You can enter the following IBM Tivoli Storage Manager command in the Server Command window to create the schedule:

  ```
  define schedule start_migr type=administrative cmd="update stg backuppool hi=0 lo=0"
  active=yes  starttime=15:00 description="Start BACKUPPOOL Migration"
  ```

- **END_MIGR**: This command schedule is run at 18:00 and resets the high and low migration threshold values back to 90% and 70% respectively. If the storage pool threshold values are not reset, then the next client backups write directly to the BACKUPLTO storage pool and defeat the purpose of using the disk storage pool.

  You can enter the following IBM Tivoli Storage Manager command in the Server Command window to create the schedule:

  ```
  define schedule end_migr type=administrative cmd="update stg backuppool hi=90 lo=70"
  active=yes  starttime=18:00 description="End BACKUPPOOL Migration"
  ```

6.5.4 Scheduling reclamation

Tapes in the sequential access and copy storage pools are eventually fragmented due to file expiration. Over time, this can cause many tapes to have little valid data on them. The reclamation process consolidates valid client data on to a smaller number of tapes, returning reclaimed tapes back to scratch status for reuse. See 6.3.4, "Reclamation" on page 108, for more details.

The server reclaims the space in storage pools based on a reclamation threshold that you can set for each sequential access and copy storage pool. When the percentage of space that can be reclaimed on a volume rises above the reclamation threshold, the server reclaims the volume.

We recommend that you control when the reclamation process runs by using schedules that set and reset the reclamation threshold for the storage pools. This way you can be sure that reclamation doesn't interfere with other IBM Tivoli Storage Manager server processes or IBM Tivoli Storage Manager client backups.

Reclamation of BACKUPLTO

We need to create daily command schedules to start and stop the reclamation process for the BACKUPLTO storage pool:

- **START_BACKLTO_REC**: This command schedule is run at 09:00 and sets the reclamation threshold to 60%. This forces all tapes in the BACKUPLTO storage pool, which has 60% or more free space to be reclaimed.

  You can create this schedule by using either the Web administrative client interface tree structure or the Server Command window (as in the previous section). You can enter the following IBM Tivoli Storage Manager command in the Server Command window to create the schedule:

  ```
  define schedule start_backuplto_rec type=administrative cmd="update stg backuplto
  rec=60" active=yes  starttime=09:00 description="Start BACKUPLTO Reclamation"
  ```

- **END_BACKUPLTO_REC**: This command schedule is run at 11:00 and resets the reclamation threshold value back to 100% (disables the reclamation process).

  You can enter the following IBM Tivoli Storage Manager command in the Server Command window to create the schedule:

  ```
  define schedule end_backuplto_rec type=administrative cmd="update stg backuplto rec=100"
  active=yes  starttime=11:00 description="End BACKUPLTO Reclamation"
  ```

Reclamation of COPYLTO

IBM Tivoli Storage Manager cannot physically move the data from one of these volumes to another. That is because they are normally in an off-site vault and, therefore, are not available in the tape library. IBM Tivoli Storage Manager manages reclamation for an off-site copy pool (COPYLTO) by obtaining the active data from a primary storage pool (BACKUPLTO/BACKUPPOOL). These active files are then written to a new tape in the COPYLTO storage pool and the off-site volume is expired. The new volume is moved to the off-site location. The off-site volumes, whose active data is now combined, is moved back to the scratch pool on site and made available for reuse.

We now create a weekly command schedule to start and stop the reclamation process for the COPYLTO storage pool. We decided to perform the COPYLTO as a weekly schedule rather than a daily one. In our configuration, we move any newly created COPYLTO tapes off site every day, but only return tapes tape on site once a week. In your configuration, you may run these schedules daily.

- **START_COPYLTO_REC**: This command schedule is run at 11:00 and sets the reclamation threshold to 60%. This forces all tapes is the COPYLTO, which have 60% or more free space to be reclaimed.

  You can create the schedule by using either the Web administrative client interface tree structure or the Server Command window (as in the previous section). You can enter the following IBM Tivoli Storage Manager command in the Server Command window to create the schedule:

  ```
  define schedule start_copylto_rec type=administrative cmd="update stg backuplto rec=60"
  active=yes  starttime=11:00 description="Start COPYLTO Reclamation" day=su
  ```

- **END_COPYLTO_REC**: This command schedule is run at 15:00 and resets the reclamation threshold value back to 100% (disables the reclamation process).

  You can enter the following IBM Tivoli Storage Manager command in the Server Command window to create the schedule:

  ```
  define schedule end_copylto_rec type=administrative cmd="update stg copylto rec=100"
  active=yes  starttime=15:00 description="End COPYLTO Reclamation" day=su
  ```

6.5.5 Querying administrative command schedules

Each scheduled administrative command is called an *event*. All scheduled events, including their status, are tracked by the server. An *event record* is created in the server database whenever processing of a scheduled command is created or missed.

You can check when the schedule is projected to run and whether it ran successfully by using the IBM Tivoli Storage Manager Web administrative client interface tree structure. Or you can do this by entering the **`query event`** command in the Server Command window.

To help manage schedules for administrative commands, you can request information about scheduled and completed events. For information about past and projected scheduled processes, use a general query. If the time range you specify includes the future, the query output shows which events should occur in the future based on current schedules.

For example, to see all the administrative command schedules that ran the previous day, we can use one of the following methods. Figure 6-21 shows the resulting panel of these steps.

- IBM Tivoli Storage Manager Web administrative client interface tree structure by following these steps:
  a. Expand **Operation view-> Automate operations** and select **View events for administrative schedules**.
  b. Enter the data and time range that you want to query. In this example, we want to query all administrative events from 05:00 to 19:00 on the previous day. We used -1 as the begin date. If you want to see future events, you can enter +1 for the date parameters.
- IBM Tivoli Storage Manager Web Server Command window by entering the following command:

```
query event * type=admin begindate=-1 begintime=05:00
```

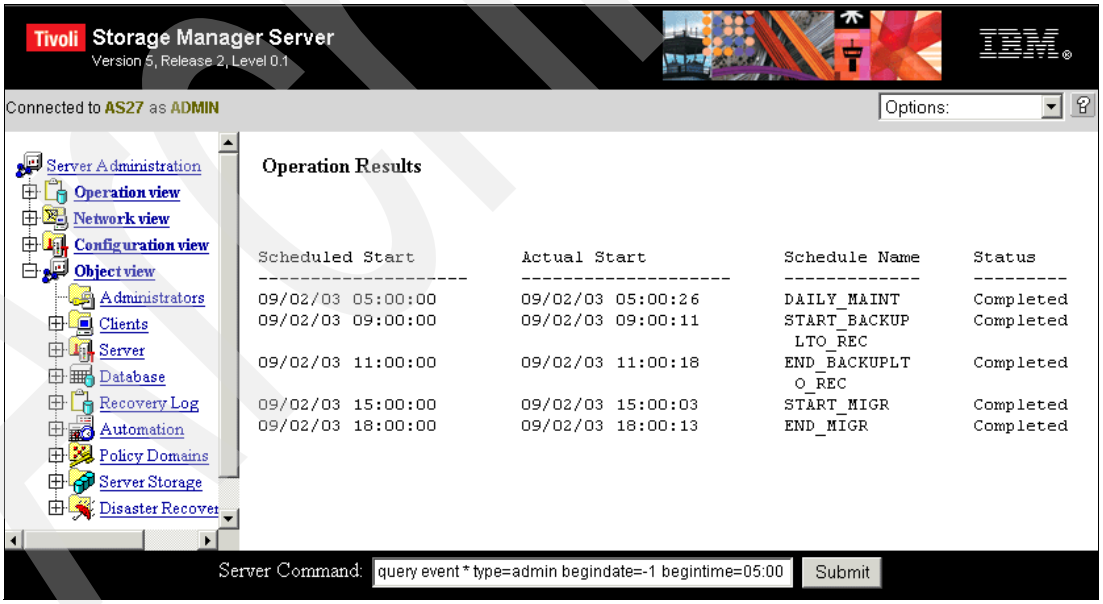

Figure 6-21 Web administrative client interface: Querying events

6.6 Disaster recovery requirements

This section looks at the various options that are available to protect the IBM Tivoli Storage Manager server and its client data from either media loss or a complete disaster.

See Chapter 21 “Protecting and Recovering Your Server” in the *IBM Tivoli Storage Manager for OS/400 PASE Administrator’s Guide*, GC23-4694, for a comprehensive guide on protecting the IBM Tivoli Storage Manager server.

6.6.1 Backing up IBM Tivoli Storage Manager storage pools

We already discussed the use and creation of copy storage pools in 6.3, “IBM Tivoli Storage Manager advanced storage” on page 105. Client data is normally kept on site in primary storage pools. In our test configuration, these primary storage pools are BACKUPPOOL and BACKUPLTO.

In the event of a media failure or complete disaster, some or all of the IBM Tivoli Storage Manager clients data can be lost. We can help protect this data by performing daily backups of the primary storage pools to an IBM Tivoli Storage Manager copy pool and then moving these copy pool volumes off site. You can back up the primary storage pools by using the IBM Tivoli Storage Manager server **backup stgpool** command.

We added the following lines to the IBM Tivoli Storage Manager Daily Maintenance script created in 6.5.1, “Creating a daily maintenance script” on page 116:

```
backup stgpool BACKUPPOOL COPYLTO wait=yes
backup stgpool BACKUPLTO COPYLTO wait=yes
```

The **backup stgpool** operation is incremental so it only copies files that arrived in the primary storage hierarchy since the previous **backup stgpool** execution. When the backup completes, move the copy pool volumes off site. See Chapter 10, “Backup Recovery and Media Services movement of IBM Tivoli Storage Manager media” on page 337, for details about IBM Tivoli Storage Manager media movement.

6.6.2 IBM Tivoli Storage Manager recovery log mode

The server uses the recovery log to keep a record of all changes to the database. When a change occurs, the recovery log is updated with some transaction information before the database is updated. This enables uncommitted transactions to be rolled back during recovery so the database remains consistent.

We can use the IBM Tivoli Storage Manager **set logmode** command to set the mode for saving recovery log records. The log mode determines how long IBM Tivoli Storage Manager saves records in the recovery log and the kind of database recovery you can use. The two log modes are:

- **NORMAL**: IBM Tivoli Storage Manager only keeps records in the recovery log until they are committed. IBM Tivoli Storage Manager deletes any unnecessary records from the recovery log. Changes made to the database since the last backup cannot be recovered. Any backup versions of the database created by entering the **backup db** command can only be used to perform point-in-time recovery. In NORMAL log mode, you may need less space for the recovery log, because IBM Tivoli Storage Manager does not keep all records already committed to the database.
- **ROLLFORWARD**: IBM Tivoli Storage Manager saves all recovery log records that contain changes made to the database since the last time it was backed up. IBM Tivoli Storage Manager deletes recovery log records only after a successful database backup. The recovery log records can be used to restore a database to its most current state (roll-forward recovery) after loading the most current database backup series. A database backup series created in ROLLFORWARD mode can be used for either point-in-time recovery or roll-forward recovery.

We recommend that you enable ROLLFORWARD log mode if your site requires a high level of availability for the IBM Tivoli Storage Manager server. ROLLFORWARD log mode may require a significant amount of space to record all activity.

Important: If you change the IBM Tivoli Storage Manager database to use the ROLLFORWARD mode, then you may need to increase the recovery log pool size. To estimate the new value, reset the cumulative consumption value using the administrative command **reset logconsumption**. Then monitor the cumulative consumption over a number of days. Divide the cumulative consumption by the number of days since you reset the value to get are presentative value. A safe size for the log pool is around 30 to 40 percent larger than this figure.

To change the recovery log mode from normal to rollforward, use the following IBM Tivoli Storage Manager command:

```
set logmode rollforward
```

6.6.3 IBM Tivoli Storage Manager database backup

It is important to run regular IBM Tivoli Storage Manager database backups. If the database becomes damaged or lost, you can only restore it by using the **dsmserv restore db** command to perform IBM Tivoli Storage Manager recovery.

Use the **backup db** command to back up an IBM Tivoli Storage Manager to sequentially access storage volumes. You can use this command to run one of the following types of backup:

- **Full backup (type=full)**: Copies the entire IBM Tivoli Storage Manager database.
- **Incremental backup** (type=incremental): Copies only those database pages that were added or changed since the last time the database was backed up. The maximum number of incremental backups you can run between full backups is 32.
- **DBSnapshot** (type=dbsnapshot): Specifies that you want to run a full snapshot database backup. The entire contents of the database are copied. A new snapshot database backup is created without interrupting the existing full and incremental backup series for the database.

IBM Tivoli Storage Manager can perform full and incremental backups of the database to tape while the server is up and running and available to clients.

Important: A new volume or tape is used each time you back up an IBM Tivoli Storage Manager database. It is not possible to appended IBM Tivoli Storage Manager database backups on the same volume. This ensure that, in the event of a media failure, not all IBM Tivoli Storage Manager database backups are lost.

Performing full and incremental backups

The first backup of your database must be a full backup. You must specify a device class when saving the IBM Tivoli Storage Manager database. In our test configuration, we use the ITSMLTO2 device class for all our IBM Tivoli Storage Manager tape operations. If all drives for this device class are busy when the backup runs, IBM Tivoli Storage Manager cancels lower priority operations, such as reclamation, to make a drive available for the backup.

The following example shows how to perform a full backup using our ITSMLTO2 device class:

```
backup db type=full devclass=ITSMLTO2
```

We perform a full database backup each day in our DAILY_MAINT script that we created in 6.5.1, “Creating a daily maintenance script” on page 116. After a full backup, you can perform incremental backups, which copies only the changes to the database since the previous backup. To perform an incremental backup of the database to the ITSMLTO2 device class, enter the following command:

```
backup db type=incremental devclass=ITSMLTO2
```

Snapshot database backups

A *snapshot database backup* is a full database backup that does not interrupt the current full and incremental backup series. Although snapshot database backups cannot restore a database or a database volume to its most current state, you can use them to restore a database to a specific point in time.

To make a snapshot backup of the database to our ITSMLTO2 device class, enter the following command:

```
backup db type=dbsnapshot devclass=ITSMLTO2
```

Important: Snapshot database backups should not replace full and incremental backups. If the server’s recovery log is in ROLLFORWARD mode, and a snapshot database backup is performed, the recovery log keeps growing. When full and incremental backups are performed with ROLLFORWARD mode enabled, the recovery log is restarted each time a full backup is performed.

6.6.4 Additional IBM Tivoli Storage Manager server recovery files

In addition to database backups, you should back up other additional information to help with the recovery of your IBM Tivoli Storage Manager server. Other important information includes volume history, device configuration, the server option file, and the IBM Tivoli Storage Manager server configuration details.

Volume history

Every volume or tape that is used by IBM Tivoli Storage Manager, including the volumes used for the IBM Tivoli Storage Manager database backups, are tracked within the server database. You can access this information while the server is up by using the **query volhistory** command. The volume history information is important because it tells you which volume holds your most recent database backup. In the event of loss or corruption of the server database, you need to know this to restore your database automatically. However if the database is not available, you cannot retrieve the information from there. IBM Tivoli Storage Manager database volume history can be copied to an external IFS streamed file by using the VOLUMEHISTORY option in the dsmserv.opt file.

Example 6-2 shows an extract from our test IBM Tivoli Storage Manager server options file (/usr/tsm/tivoli/server/bin/dsmserv.opt) after we updated it with the VOLUMEHISTORY entry.

Example 6-2 Extract from our test IBM Tivoli Storage Manager server options file

```
*   VOLUMEHISTORY
*   ************************************************************************
    VOLUMEHistory  /tsmvol/files/volhist.out
*
*   Specifies the name of a file that should contain sequential
*   volume history information when it is changed by the server.
```

```
*   Sequential information is used by the administrator
*   and server processes during server database recovery.
```

Example 6-3 shows an extract from the /tsmvol/files/volhist.out file from our IBM Tivoli Storage Manager server. You can see the third line from the bottom of the file has an entry for a full database backup on volume LB0705.

Example 6-3 Sample of the volume history file for AS27

```
************************************************************************
*
*                          Sequential Volume Usage History
*                             Updated 09/05/03 11:17:35
*
*     Operation           Volume     Backup Backup Volume Device   Volume
*     Date/Time            Type      Series Oper.   Seq   Class    Name
************************************************************************
2003/09/04 14:52:41  STGDELETE           0      0      0 ITSMLTO2 LB0352
2003/09/04 20:09:11  STGNEW              0      0      0 ITSMLTO2 LB0374
2003/09/04 21:21:25  STGDELETE           0      0      0 ITSMLTO2 LB0354
* Location for volume LB0354 is: 'OFFSITE'
2003/09/04 21:49:55  BACKUPFULL         17      0      1 ITSMLTO2 LB0354
2003/09/04 22:09:42  STGDELETE           0      0      0 ITSMLTO2 078ACE
2003/09/05 05:02:00  STGNEW              0      0      0 ITSMLTO2 LB0702
* Location for volume LB0705 is: 'OFFSITE'
2003/09/05 06:11:42  BACKUPFULL         18      0      1 ITSMLTO2 LB0705
2003/09/05 11:17:30  STGDELETE           0      0      0 ITSMLTO2 LB0379
2003/09/05 11:17:34  STGDELETE           0      0      0 ITSMLTO2 LB0714
```

You can also back up the volume history information at any time, by entering the **backup volhistory** command.

The volume history file is used in IBM Tivoli Storage Manager recovery to find the IBM Tivoli Storage Manager database backups. You can recover the database without a copy of the volume history file, but you must know where and which are your IBM Tivoli Storage Manager database backups.

Device configuration

The IBM Tivoli Storage Manager device configuration information is stored in the database, but during a database restore, it is not available from there. Therefore, to perform a restore, the server must get the information from an external device configuration file. You can copy the device configuration information to an external IFS streamed file by using the DEVCONFIG option in the dsmserv.opt file.

The text shown in Example 6-4 is an extract from our test IBM Tivoli Storage Manager server options file (/usr/tsm/tivoli/server/bin/dsmserv.opt) after we updated it with the DEVCONFIG entry.

Example 6-4 Extract from our test IBM Tivoli Storage Manager server options file

```
*   DEVCONFIG
*   ************************************************************************
    DEVCONFig /tsmvol/files/devconfig.out
*
*   Specifies the name of a file that should contain device
*   configuration information when it is changed by the server.
*   Device configuration information is used by the
*   server processes during server database recovery or load and
*   DSMSERV DUMPDB processing.
```

Example 6-5 shows a copy of the /tsmvol/files/devconfig.out file from our IBM Tivoli Storage Manager server. You can see the device class, library definition, and server name in this file.

The device information must match the devices configured on the system where the restore is performed. You may must edit those commands in an existing file so that they match. For example, you may have a single manual tape drive rather than a library at your recovery location.

Example 6-5 IBM Tivoli Storage Manager device configuration file for AS27

```
/* Device Configuration */
DEFINE DEVCLASS ITSMLTO2 DEVTYPE=LTO FORMAT=DRIVE ESTCAPACITY=102400000K MOUNTLIMIT=2
MOUNTWAIT=60 MOUNTRETENTION=1 PREFIX=ADSM LIBR
SET SERVERNAME AS27
DEFINE LIBRARY TAPMLB05 LIBTYPE=USRDFN DRIVESELECTION=EXIT
DEFINE EXIT MOUNT TSMEXITS/MOUNTCL
DEFINE EXIT DISMOUNT TSMEXITS/DISMOUNTCL
DEFINE EXIT DELETION TSMEXITS/DELETECL
DEFINE EXIT EXPIRATION TSMEXITS/EXPIRECL
```

You can also enter the **backup devconfig** command to back up the device configuration information at any time.

IBM Tivoli Storage Manager server option file

The IBM Tivoli Storage Manager server uses the server option file to control various server operations. The settings or options in the server option file affect such things as communications, devices, and performance. In our test configuration, the IBM Tivoli Storage Manager servers option file is called dsmserv.opt. It resides in the /usr/tivoli/tsm/server/bin directory in the OS/400 IFS.

IBM Tivoli Storage Manager server configuration

You can use the IBM Tivoli Storage Manager **query system** command to provide a complete and detailed listing of your IBM Tivoli Storage Manager server. This information can be useful when you recover the IBM Tivoli Storage Manager server.

6.6.5 Reusing delay for copy storage pools

When you define or update a sequential access storage pool, you can use a parameter called REUSEDELAY. This parameter specifies the number of days that must elapse before a volume can be reused or returned to scratch status after all files are expired, deleted, or moved from the volume. When you delay reuse of such volumes, they enter the *pending* state

after they no longer contain any files. Volumes remain in the *pending* state for as long as specified with the REUSEDELAY parameter for the storage pool to which the volume belongs.

Delaying reuse of volumes can be helpful under certain conditions for disaster recovery. When IBM Tivoli Storage Manager expires, deletes, or moves files from a volume, the files are not actually erased from the volumes. The database references to these files are removed. Therefore, the file data may still exist on sequential volumes if the volumes are not immediately reused.

A disaster may force you to restore the IBM Tivoli Storage Manager database using a database backup that is old or is not the most recent backup. In this case, some files may not be recoverable because IBM Tivoli Storage Manager cannot find them on current volumes. However, the files may exist on volumes that are in a *pending* state. You may be able to use the volumes in *pending* state to recover data.

You should set the REUSEDELAY parameter on your copy storage pool to delay the reuse of volumes for as long as you keep your oldest database backup. In our test configuration, we keep five copies of the IBM Tivoli Storage Manager database. Therefore, we set the REUSEDELAY parameter on our COPYLTO copy storage pool to 5 (see 6.3.7, “Creating a copy storage pool” on page 111).

6.6.6 Mirroring IBM Tivoli Storage Manager database and recovery log volumes

The database contains information about the client data in your storage pools. The recovery log contains records of changes to the database. If you lose the recovery log, you lose the changes that were made since the last database backup. If you lose the database, you lose all your client data.

Due to the iSeries single-level storage architecture, most iSeries customers already have disk RAID5 or mirrored protection on their systems. You can further protect the IBM Tivoli Storage Manager database and recovery log by mirroring them to volumes in a separate user auxiliary storage pool (ASP) on the iSeries server. However, mirroring does not protect against a disaster or a hardware failure that affects the loss of the entire system.

Database and recovery log mirroring provides the following benefits:

- Protection against database and recovery log media failures
- Uninterrupted operations if a database or recovery log volume fails
- Avoidance of costly database recoveries

However, mirroring comes at the following costs:

- Mirroring doubles (or triples) the required disk for those volumes that are mirrored.
- Mirroring can potentially affect performance.

We don’t mirror the IBM Tivoli Storage Manager database or recovery log in our test configuration. You can refer to Chapter 21 “Protecting and Recovering Your Server” in the *IBM Tivoli Storage Manager for OS/400 PASE Administrator’s Guide*, GC23-4694, for more details about mirroring IBM Tivoli Storage Manager database and recovery log volumes.

6.6.7 IBM Tivoli Storage Manager server backup with BRMS

An easy way to protect your IBM Tivoli Storage Manager for OS/400 PASE server is to perform a complete backup of all the IBM Tivoli Storage Manager objects using a BRMS control group. Run the control group run after you complete the IBM Tivoli Storage Manager

daily maintenance process, so the last backup of the client data is saved to the copy storage pool volumes.

After the BRMS control group backup finishes, you can move both sets of tapes off site as a complete recovery package. The control group history, movement, and expiration are managed by BRMS, and not by IBM Tivoli Storage Manager. In case of a disaster, you can recover the complete IBM Tivoli Storage Manager environment in one simple step.

Important: You must stop the IBM Tivoli Storage Manager server to perform a complete save of the IBM Tivoli Storage Manager server environment using a BRMS control group.

In our example configuration, we create a BRMS control group that saves the following objects:

- **TSMEXITS**: IBM Tivoli Storage Manager exits library
- **/tsmvol/**: IFS directory for IBM Tivoli Storage Manager devconfig/volhist files, database, or recovery log and disk storage pool volumes
- **/usr/tivoli/tsm/server**: IFS directory for the IBM Tivoli Storage Manager server code and dsmserv.opt file

Figure 6-22 show an example of a BRMS control group used to save the IBM Tivoli Storage Manager server environment. We created commands to stop and start our IBM Tivoli Storage Manager server which you can see as BRMS *EXIT entries. The TSMEXIT library and BACKUPITSM *LNK list are added to save the IBM Tivoli Storage Manager data.

See 8.8.1, “IBM Tivoli Storage Manager server example” on page 187, for detailed steps to create this BRMS control group.

```
                    Display Backup Control Group Entries                AS27

Group . . . . . . . . . . . : BACKUPITSM
Default activity  . . . . . : *BKUPCY
Text  . . . . . . . . . . . : Backup data needed for the ITSM server

     Backup
Seq  Items       Exit command
  10 *EXIT       ENDTSMSRV
  20 TSMEXITS
  30 BACKUPITSM
  40 *EXIT       STRTSMSRV

                                                                      Bottom
Press Enter to continue.
```

Figure 6-22 Display BRMS Control Group Entries

Important: The saving of IBM Tivoli Storage Manager via a BRMS control group should not replace, but complement, your daily online backup of the IBM Tivoli Storage Manager database (**`backup db`**). If your recovery log is in ROLLFORWARD mode and the IBM Tivoli Storage Manager database is corrupted, then you can use the normal IBM Tivoli Storage Manager database backup to recover the database back to its most current state.

6.6.8 Disaster Recover Manager

IBM Tivoli Storage Manager Disaster Recovery Manager is an optional IBM Tivoli Storage Manager module. It is included in the IBM Tivoli Storage Manager Extended Edition provided with the new iSeries Enterprise Editions.

DRM can help you configure, control, and automatically generate a disaster recovery plan. This plan contains the information, scripts, and procedures needed to automate restoration. DRM can also help ensure quick recovery of your data after a disaster.

See Chapter 22 “Using Disaster Recovery Manager” in the *IBM Tivoli Storage Manager for OS/400 PASE Administrator’s Guide*, GC23-4694, for a full description of IBM Tivoli Storage Manager DRM.

Part 3

Backup Recovery Media Services details

This part provide more details about using Backup Recovery and Media Services (BRMS) on the iSeries server.

7

Installing Backup Recovery and Media Services

This chapter explains how to:

- Install prerequisite software for a Backup Recovery and Media Services (BRMS) software installation
- Install the BRMS software itself
- Install and uninstall BRMS iSeries Navigator client
- Download and install at no charge IBM Tivoli Storage Manager application programming interfaces (APIs) for iSeries
- Use the Internet to order and install fixes

7.1 Installing prerequisite software for a BRMS software installation

Before you install BRMS software on your iSeries, you should install Option 18, Media and Storage Extensions (MSE), of the operating system (5722-SS1). BRMS uses MSE to communicate with OS/400 about media operations that involve tape drives and tape libraries. To install MSE, follow these steps:

1. Sign on as QSECOFR or with a user profile with this authority.
2. Enter the Display System Value (DSPSYSVAL) command to check the following system values:
   - QALWUSRDMN set to *ALL
   - QSYSLIBL including library QSYS2
3. Install Option 18, Media and Storage Extensions (5722-SS1).

   Note: We recommend that you install MSE before you install BRMS. If you install BRMS first and then MSE, you must run the Initialize BRMS (INZBRM) command with OPTION(*DATA) parameter after MSE is successfully installed. MSE is a fee option of OS/400 and requires a license key. You can learn more about the INZBRM command in 8.1.3, “Initializing BRMS” on page 159.

   a. On an OS/400 command line, enter:

      ```
      GO LICPGM
      ```

   b. On the Work with Licensed Programs display, select option 11 (Install Licensed Programs).

   c. Select 5722-SS1 Option 18 (Media and Storage Extensions) and press Enter.

   d. Press Enter again to confirm your selection.

   e. On the Install Options display, type the name of your installation device and press Enter to start the installation.

   f. Verify your installation with either review job log (DSPJOBLOG). You can also check this by using Display Install History (GO LICPGM option 50).

   During installation, library QMSE is created on your system.
4. If you have a license key for MSE, add your license key for product MSE *now*. If you don’t have a license key, you can use MSE for the 70-day trial period, but need the license key after that. Enter the Add License Key Information (ADDLICKEY) command. On the display, type in the 18-character license key and other parameters that are provided in your MSE license agreement.
5. Enter the Check Product Option (CHKPRDOPT) command to verify the correct installation of MSE:

   ```
   CHKPRDOPT PRDID(5722SS1) OPTION(18)
   ```

   You should see the message “CPC0C20 No errors detected by CHKPRDOPT”.

7.2 Installing the BRMS software

After you follow the installation steps in the previous section, you can install the BRMS software as explained here:

1. Sign on as QSECOFR or with a user profile with this authority.
2. Enter the DSPSYSVAL command to check the following system values:
   - QALWUSRDMN set to *ALL
   - QSYSLIBL including library QSYS2
3. Install the BRMS licensed program product:

   Note: BRMS for iSeries is a fee (additional cost) license program product (LPP). It has a base part (option *BASE). It has two additional features (OPTION 1, BRMS - Network Feature, and OPTION 2, BRMS - Advanced Functions Feature). Both features are available at an additional cost and are separately orderable in addition to the base part.

   Most iSeries servers with the Enterprise Edition package of software have BRMS with the Network Feature and one server license available for installation. If you do not have the Enterprise Edition package or need more than one server license, you must specifically order this option.

   Before your installation, verify for which parts of BRMS you have licenses and which you intend to install now. You must install the *BASE option before you install any other options. If you don't have license keys for BRMS (*BASE, OPTION 1, OPTION 2), you can use it for the 70-day trial period.

   a. On a command line, enter:

      ```
      GO LICPGM
      ```

   b. On the Work with Licensed Programs display, select option 1 (Install Licensed Programs).

   c. Select 5722-BR1 option *BASE to install the standard BRMS. In addition, if you have licenses and want to install them, you can select option 1, option 2, or both. Press Enter.

   d. Press Enter again to confirm your selection.

   e. On the Install Options display, type the name of your installation device. Press Enter to start the installation.

   f. Verify installation by reviewing the job log (DSPJOBLOG). Or you can check this by using Display Install History (GO LICPGM option 50).

   During the installation, the following actions occur on your system:

   - Libraries QBRM and QUSRBRM are created.
   - User profile QBRMS is created.
   - A default BRMS environment is created.
   - BRMS commands are copied into library QSYS.

4. If you have a license key for BRMS option *BASE and additional installed options, such as OPTION 1, OPTION 2, or both, add your license key *now*. If you don't have a license key, you are can use BRMS for the 70-day trial period.

   Enter the ADDLICKEY command. Type the 18-character license key and complete the other parameters that are provided in your BRMS license agreement.

5. Enter the CHKPRDOPT command to verify the correct installation of BRMS:

   ```
   CHKPRDOPT PRDID(5722BR1) OPTION(*BASE)
   ```

   You should see the message "CPC0C20 No errors detected by CHKPRDOPT".

6. Install the latest fixes (program temporary fixes (PTFs)) using the GO PTF menu *after* you install LPP 5722-BR1:

– Latest version of Backup and Recovery Group PTF for OS/400 V5R2 SF99085
– Latest BRMS PTF (at the time this redbook was written) SI09241 for BRMS V5R2

For more details about PTFs, see 7.5, “Using the Internet to order and install fixes” on page 143.

7. We recommend that you use the INZBRM command for initial setup of BRMS:

```
INZBRM OPTION(*DATA)
```

Notes:

- Although running the INZBRM command is not mandatory, it is useful for an initial setup in many customer environments. This is because, between installing the licensed program and setting it up, there may be some time. During that time, there can be normal system changes. BRMS needs to know the latest information before you perform the first BRMS setup.
- INZBRM has several options. Before you press Enter to run this command, use *caution* and read the help text. Normally you use either the INZBRM command with OPTION(*DATA) or OPTION(*DEVICE).

7.3 Installing and uninstalling BRMS iSeries Navigator client

The BRMS iSeries Navigator client, also known as the *BRMS plug-in*, appears as the Backup Recovery and Media Services folder. This folder appears in the iSeries Navigator hierarchy when BRMS is installed on the iSeries server and the BRMS iSeries Navigator client is installed as a plug-in on a workstation (PC). See Figure 7-1.

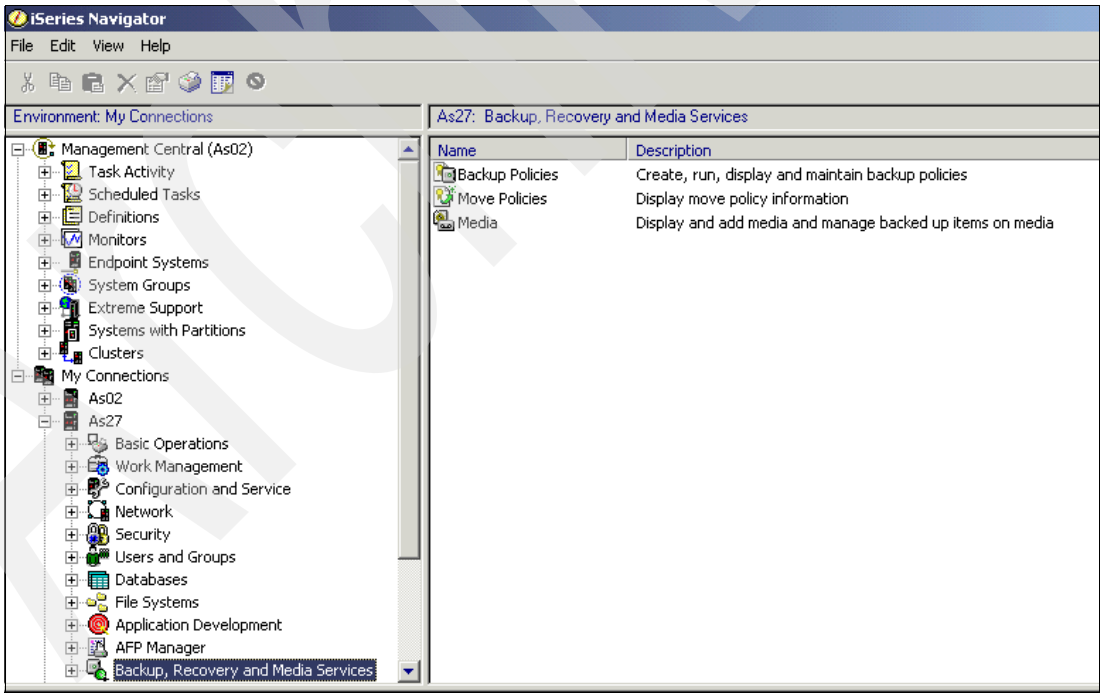

Figure 7-1 BRMS iSeries Navigator client

Parts of the following section are taken from the *BRMS iSeries Navigator client Student Guide - V5R2M0*. You can find this guide on the Web at:

http://www-1.ibm.com/servers/eserver/iseries/service/brms/pdf/StudentGuide52.pdf

7.3.1 Installing the BRMS iSeries Navigator client

There are three ways to install the BRMS iSeries Navigator client:

- Install using the iSeries Navigator Install Plug-ins icon
- Install using iSeries Navigator Rescan Plug-ins function
- Install using Selective Setup in iSeries Access for Windows

This section explains the third method of installing the BRMS iSeries Navigator client using Selective Setup in iSeries Access for Windows.

1. Check the prerequisites for installation using Selective Setup in iSeries Access for Windows. You must install the following prerequisite hardware and software on the workstation (PC) and on the iSeries before you install the BRMS iSeries Navigator client:
   - Workstation (PC)
     - Processor: 450 MHz is recommended
     - Memory: 128 MB minimum is recommended
     - Disk space: 1 GB or more of unused direct access storage device (DASD)
     - Display: Minimum resolution of 800 x 600 (1024 x 768 is recommended)
     - Operating system: Windows 98, Millennium, NT, 2000, XP, or 2003
     - IBM iSeries Access for Windows installed on your PC
   - iSeries
     - Operating System/400 (5722-SS1) installed
     - Operating System/400 Option 18, Media Storage Extensions installed
     - IBM iSeries Access for Windows (5722-XE1) installed
     - Backup Recovery and Media Services (5722-BR1) with the latest BRMS PTFs
2. Install BRMS iSeries Navigator client.
   a. Map a network drive to this iSeries server, where your PC is connected *and* where BRMS is installed. On your desktop, right-click the **Network Neighborhood** icon or the **My Network Places** icon and select **Map Network Drive**.
   b. On the Map Network Drive window (Figure 7-2), in the Path or Folder field, type `\\system name\qibm`, where *system name* is the name, or the IP address, of the system on which the BRMS product (5722-BR1) is installed. Click **Finish**.

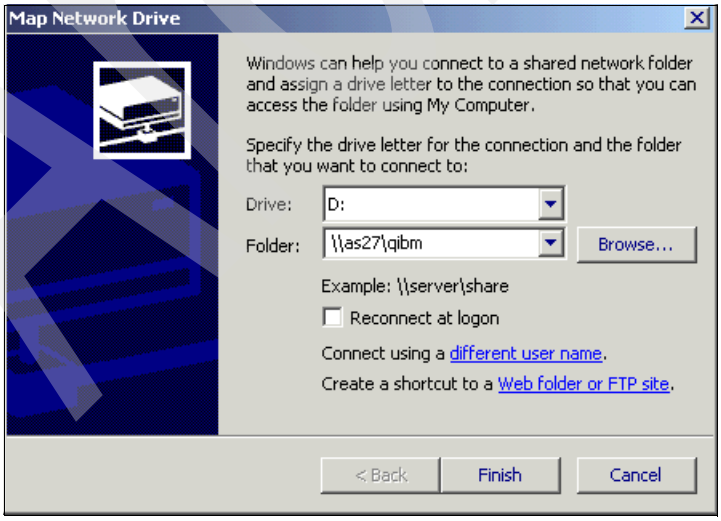

Figure 7-2 Mapping a network drive

c. Copy software from the mapped drive to the PC using Selective Setup in iSeries Access for Windows:

i. Click the **IBM iSeries Access for Windows** icon.

ii. Click the **Selective Setup** icon in the IBM iSeries Access for Windows folder.

iii. On the Selective Setup panel, click **Next**.

iv. On the Selective Setup Options panel, click **Browse**.

v. On the Choose Folder panel, select the drive mapped to drive:*system name*\qibm and click **OK**.

vi. On the Selective Setup Options panel, click **Next**.

vii. On the Components Cannot Be Installed panel, click **Next**.

viii. On the Component Selection panel (Figure 7-3), under Components of iSeries Navigator, find and select **Backup, Recovery and Media Services**. It is normally at the end of list. Verify that Backup, Recovery and Media Services is shown with a size of 2851K. Click **Next**.

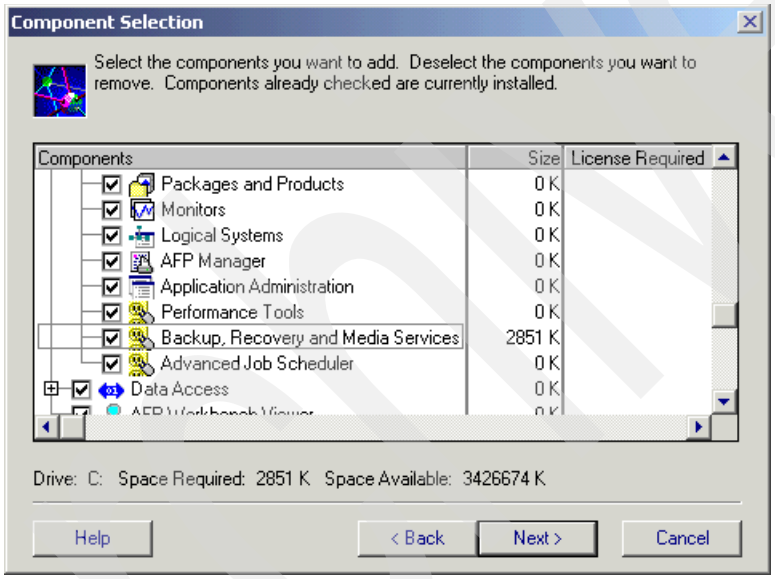

Figure 7-3 Component Selection panel in Selective Setup

ix. On the Start Copying Files panel, under Add components, you should see Backup, Recovery and Media Services listed. Click **Next**.

x. On the Install Completed panel, deselect the **View the README file** and **Add program folder** check boxes. Click **Next**.

xi. On the Setup Complete panel, click **Finish**.

xii. Restart your PC.

3. The BRMS iSeries Navigator client requires a Management Central central system to perform job scheduling functions. This requires two setup functions. They ensure that the Management Central server is started on that system. They also assign that system as your Management Central central system on your BRMS iSeries Navigator client PC workstation.

a. You can start, or if necessary stop and then restart, the Management Central server on your central system using either the 5250 workstations command interface or an iSeries Navigator session.

The Management Central server (two underlying jobs, QYPSJSVR and QYPSSRV) runs in IBM-provided subsystem QSYSWRK. If you are unsure if these jobs are active, you can, from a 5250 workstations command line, enter the following command:

```
STRTCPSVR(*MGTC)
```

Observe the associated messages. Normally you see a message stating the server is started.

Depending on what other Management Central activity is already occurring, you may need to end and then restart the Management Central server by entering:

```
ENDTCPSVR SERVER(*MGTC)
STRTCPSVR SERVDER(*MGTC)
```

To use the iSeries Navigator interface, follow these steps:

i. Expand **My Connections-> *system name*-> Network-> Servers-> TCP/IP**.

ii. On the right panel, locate **Management Central** and note the current status, which should be *Stopped* or *Started*.

iii. Right-click **Management Central** and select **Start**. Or, if necessary as described using the 5250 command interface, select **Stop**, and after the status changes, click **Start** to start the Management Central TCP/IP server on your system.

After a few seconds, the status should indicate *Started*.

Note: There may be times when the Management Central server shows a status of *Started* and some functions may not work as expected. You can look at the job logs of the two Management Central server jobs, QYPSJSVR or QYPSSRV, to look for messages that may identify the problem. Several interfaces are available to examine these job logs, two of which are:

- From a 5250 command interface, enter the following command:

  ```
  WRKSBSJOB SBS(QSYSWRK)
  ```

  Page down to find jobs YPSJSVR or QYPSSRV. Select the options to display the job and its job log.

- From an iSeries Navigator interface, expand **My Connections-> *system name*-> Network-> Servers-> TCP/IP**. On the right panel, locate Management Central. Right-click and select the **Server jobs** menu item. Select the option to display the job and its job log.

b. Define your Management Central central system from your BRMS iSeries Navigator client PC workstation session:

i. In the top of the left iSeries Navigator pane, right-click **Management Central** and select the **Change Central System** menu item.

ii. Browse the list of systems (there may be only one). Select the system you want as your central system and click **OK**.

You should now see your selected system in parentheses () after the Management Central left pane folder. Figure 7-4 shows an example of where the same system (AS02) is in your Management Central system and the one performing backup functions.

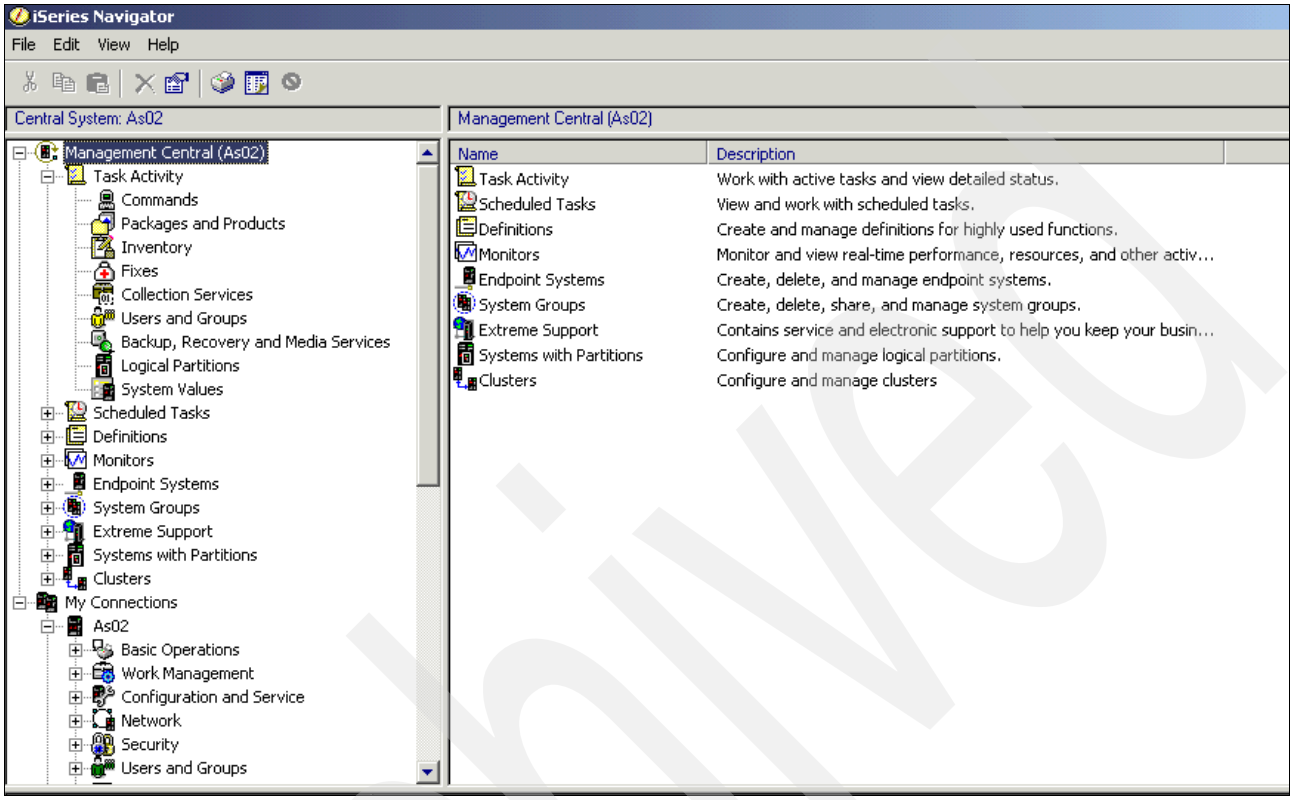

Figure 7-4 Example for one system: AS02 is central system and managed system

Figure 7-5 shows an example where your central system (AS02) is different from the one performing backup operations (AS27).

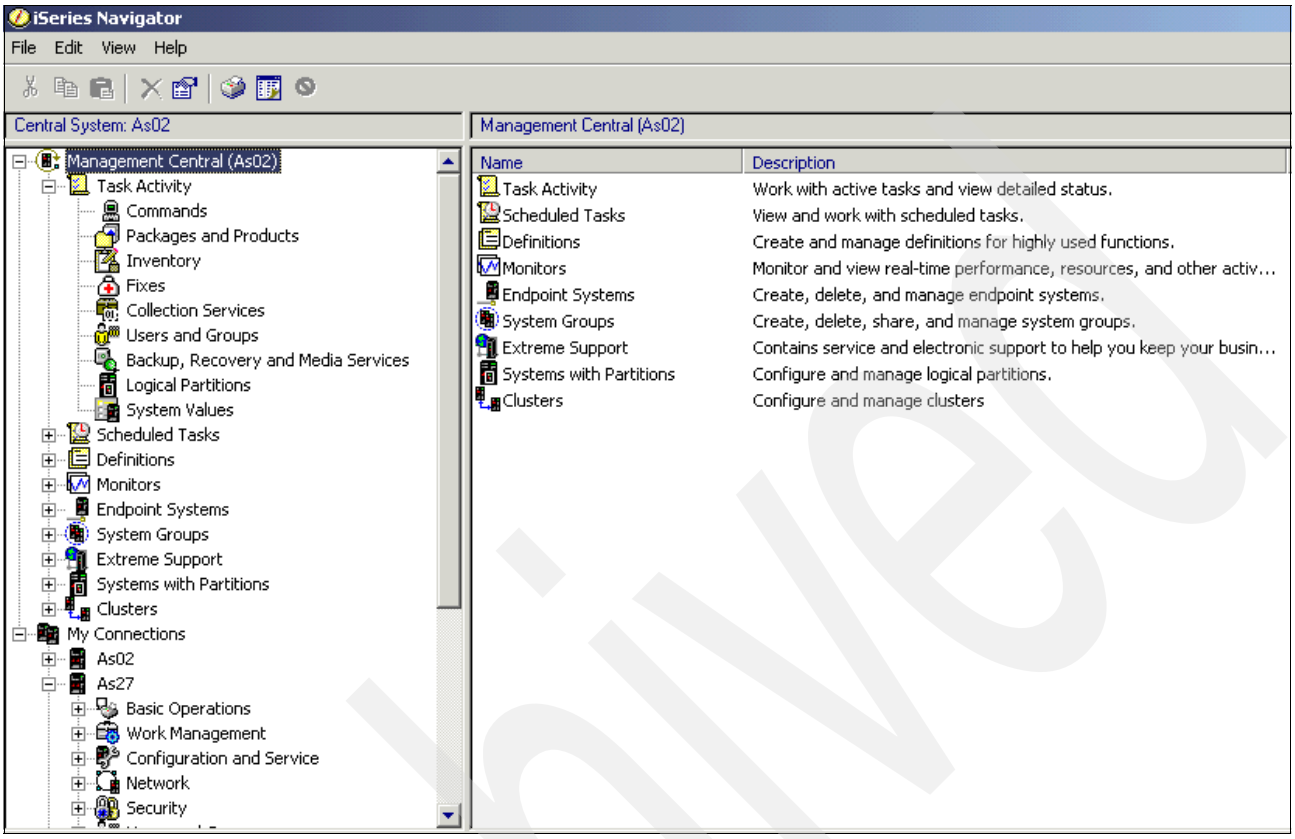

Figure 7-5 Example for two systems: AS02 is central system and AS27 is managed system

The setup is now complete so you can use the BRMS iSeries Navigator client. For more information about setting up a BRMS environment using BRMS iSeries Navigator client, see Chapter 8, “Backup Recovery and Media Services up and running” on page 155.

Tip: Using the BRMS iSeries Navigator client and Management Central defaults to using the OS/400 job scheduler for scheduled BRMS functions. You can install the additional fee (cost) product Advanced Job Scheduler (5722-JS1) as a plug-in, instead of using the basic OS/400 job scheduler functions.

For more information about the 5722-JS1 product, see *Job Scheduler for OS/400*, SC41-5324. For more information about iSeries Navigator plug-ins and Management Central, see *Managing OS/400 with Operations Navigator V5R1 Volume I: Overview and More,* SG24-6226, or refer to the iSeries Information Center at:

`http://www.ibm.com/eserver/iseries/infocenter`

7.3.2 Uninstalling the BRMS iSeries Navigator client

To uninstall the BRMS iSeries Navigator client, follow these steps:

1. Double-click the **IBM iSeries Access for Windows** icon.
2. In the IBM iSeries Access for Windows folder, double-click the **Selective Setup** icon.
3. On the Selective Setup panel, click **Next**.

4. On the Selective Setup Options panel, select **Ignore, I'm going to uninstall components** and click **Next**.
5. On the Component Selection panel, follow these steps:
   a. Expand **iSeries Navigator** to view the installed components.
   b. Find and deselect **Backup, Recovery and Media Services**, normally at the end under iSeries Navigator.
   c. Click **Next**.
6. On the Start Copying Files panel, under Remove components, verify that Backup, Recovery and Media Services is listed. Click **Next**.
7. Click **Finish**. The files are deleted on your PC.
8. After some processing, you see the Setup Completed panel, which requests that you restart your computer. Select **Yes, I want to restart my computer now**. Your PC shuts down and then restarts.

7.4 Downloading and installing no-charge IBM Tivoli Storage Manager APIs

To install IBM Tivoli Storage Manager APIs on your systems, you must have the following prerequisites:

- OS/400 V5R1 or later
- 11 MB of available disk space
- Access to an IBM Tivoli Storage Manager Server via TCP/IP or Advanced Peer-to-Peer Network (APPN) and for downloading (not necessary for downloading; needed later to set up and use the APIs)
- File Transfer Protocol (FTP) connection to an IBM FTP server

You can download the free IBM Tivoli Storage Manager APIs directly to your iSeries server by accessing the IBM FTP server from your system:

1. Create an OS/400 savefile QANSAPI to receive the IBM Tivoli Storage Manager APIs on the iSeries server by entering the following command:

   ```
   CRTSAVF FILE(QGPL/QANSAPI)
   ```

2. Use an FTP session to download the APIs:
   a. On an OS/400 command line, enter the following command:

      ```
      FTP RMTSYS(FTP.SOFTWARE.IBM.COM)
      ```

      Note: This FTP server qualified host name may change over time. Contact IBM if you cannot successfully use the name shown here.

   b. For the login ID, enter `anonymous`. For the guest password, enter your e-mail address.
   c. Place the FTP session in binary mode. Enter:

      ```
      bin
      ```

   d. Go to the relevant directory:

      ```
      cd /storage/tivoli-storage-management/maintenance/client/v5r2/OS400/v520/
      ```

Note: While writing this redbook, we used OS/400 V5R2 and IBM Tivoli Storage Manager APIs V5.2.

e. List all files in this directory. Enter:

```
ls -l
```

Normally the two files, qansapi.file and readme.api, are shown.

f. Download the qansapi.file by using the **get** command:

```
get qansapi.file QGPL/QANSAPI (replace
```

g. Wait for the "`Transfer complete`" message. Then end the FTP session by typing:

```
quit
```

Now you have the IBM Tivoli Storage Manager APIs as a savefile (SAVF) QANSAPI in library QGPL on your system. You are ready to install these IBM Tivoli Storage Manager APIs on your iSeries server.

To install these IBM Tivoli Storage Manager APIs on your iSeries server, use the Restore Licensed Program (RSTLICPGM) OS/400 command. Because these APIs are available in English only, you must specify `LNG(2924)` in the RSTLICPGM command, if your system has another primary language installed. You install the IBM Tivoli Storage Manager APIs as IBM License Program Product 5733-197:

```
RSTLICPGM LICPGM(5733197) DEV(*SAVF) LNG(2924) SAVF(QGPL/QANSAPI)
```

Note: During installation, library QANSAPI and directory /usr/tivoli/tsm/client/api/bin in the integrated file system (IFS) are created on your system.

Verify that the installation is complete by either reviewing the job log (DSPJOBLOG) or Display Install History (using GO LICPGM option 50).

To set up IBM Tivoli Storage Manager APIs in an BRMS environment, see 9.1, "Setting up the IBM Tivoli Storage Manager server for BRMS to use IBM Tivoli Storage Manager APIs" on page 250.

Tip: With the iSeries Announcement from 05 September 2003, there is a new installation possibility for these IBM Tivoli Storage Manager APIs and other software, named *iSeries Enterprise Editions Installation Assistant* (5733-ED1). This option is for customers with iSeries Models 825 or higher with Enterprise Edition. Installation Assistant uses Virtual Media Installation (VMI). You can learn more about these and other iSeries announcements on the Web at:

`http://www-1.ibm.com/servers/eserver/iseries/announce/`

7.5 Using the Internet to order and install fixes

A newer interface to iSeries fixes includes ordering and installing of iSeries PTFs on an iSeries server. You can learn about all possible ways to order and install PTFs on the Web at either of the following Web sites:

- `http://www.ibm.com/eserver/series/support`

  Select **Fixes** from the navigator bar on the left.

- `http://www-912.ibm.com/supporthome.nsf/document/17403848`

When you reach the Fixes page, select the **PTF Ordering** link as shown in Figure 7-6. You can order and install the PTFs by clicking the Fix Central link also shown in Figure 7-6. This section explains how to order a fix over the Internet.

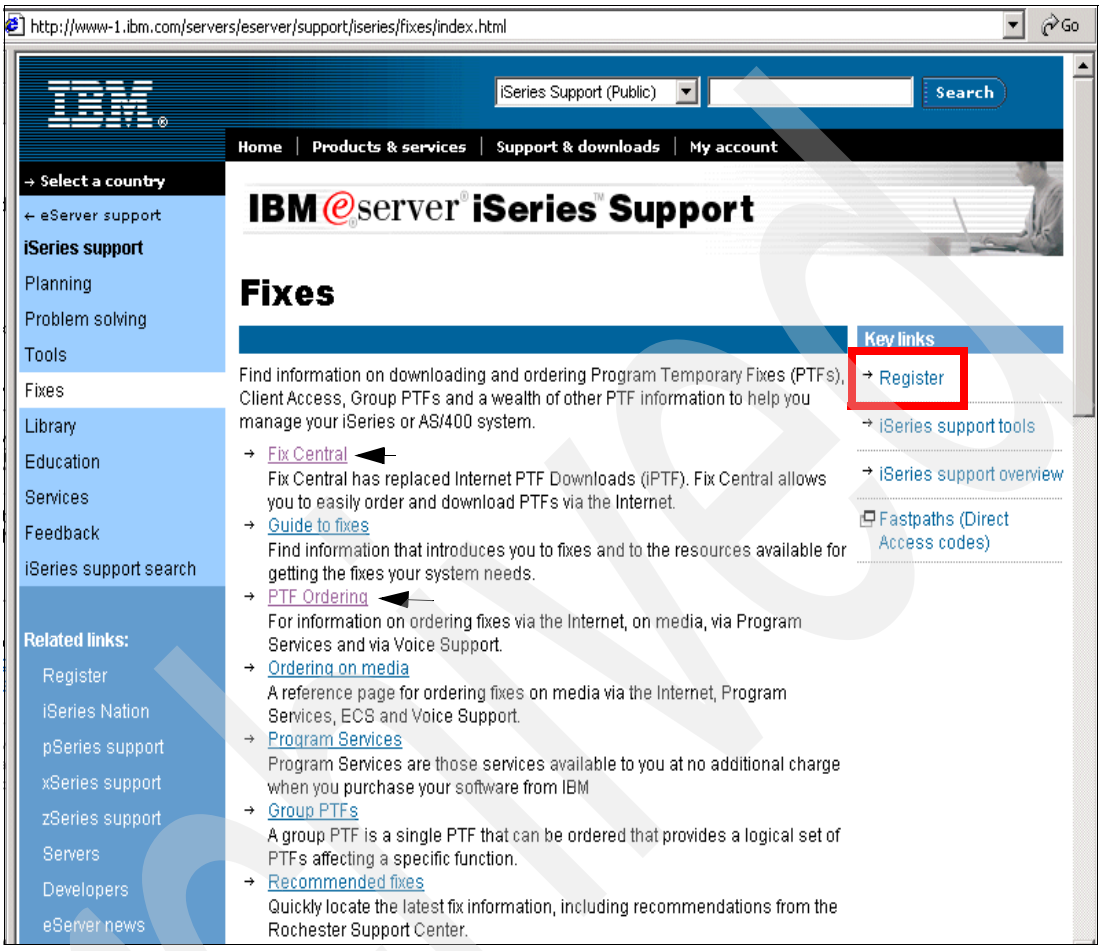

Figure 7-6 iSeries Fixes Web page showing PTF Ordering and Fix Central

7.5.1 Ordering and downloading PTFs over the Internet

This section describes a scenario for downloading iSeries fixes. The download options on the primary Fix Central (formerly called iPTF) Web page include:

- Single fixes
- Group fixes
- HYPER fixes
- Cumulative fixes
- Customized cumulative PTF packages
- Search for fixes
- View and edit saved fix orders

Click the **Fix Central** link in Figure 7-6 to see the page shown in Figure 7-7.

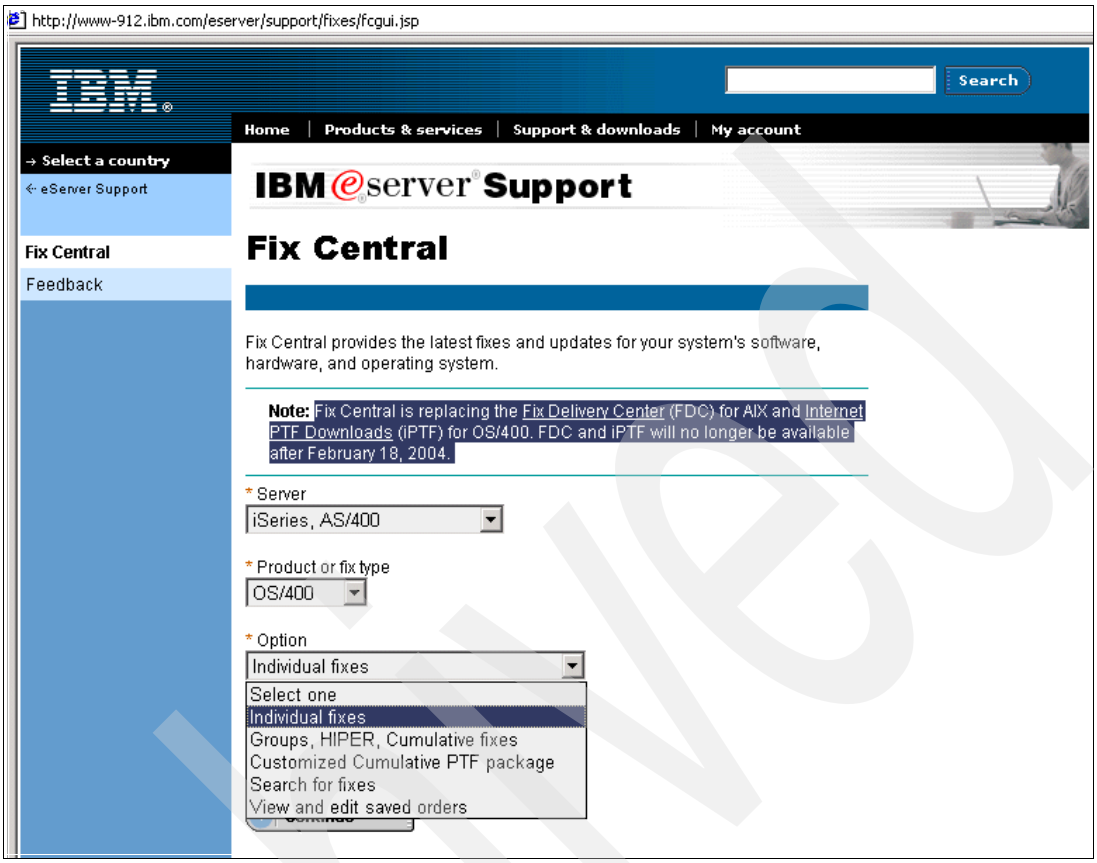

Figure 7-7 Fix Central options for iSeries

From the list of available options, we selected iSeries, AS/400, and OS/400 in this example. With the larger PTFs, groups, and cumulative fixes, you must use the new FTP download capability. You use the FTP function to also download the newer Customized Cumulative PTF Package option.

Before you can use the Fix Central functions, you must complete a set of registration steps.

Notes:

- To register, you must have a regular Support Line contract with IBM or be an IBM employee.
- While this redbook was being written, the Internet PTF (iPTF) terminology for iSeries PTF downloads was being reformatted and new Fix Central terminology was being introduced. Some of the page examples shows, starting out with Fix Central terminology, still show iPTF terminology as well. Consistent updated terminology will occur in 2004.

1. Register on the Registration Web page. To access this page, under the Key links area of the Fixes window (Figure 7-6 on page 144), click the **Register** link. During this process,

you are assigned a user ID and password. You must have the following information available:

- Your IBM customer number or, for an IBM representative, the IBM serial number or e-mailed ID.
- The serial numbers of all your iSeries servers or at least from one system, because you must also register the systems.

2. Check your network and system requirements for the download PTFs, which includes having TCP/IP with the FTP server up and running.
   - You can obtain the PTFs from the Internet using a 5250 command interface and FTP. You can also order PTFs using the Send PTF Order (SNDPTFORD) command. See the detailed description with all requirements on the Web at:

     `http://www-912.ibm.com/supporthome.nsf/document/27091721`
   - You can also use iSeries Navigator. To do so, you must install the iSeries Navigator plug-in *iPTF Get Fixes Utility*. For more details, see:

     `http://www-912.ibm.com/supporthome.nsf/document/27321011`

Now you can order and download the PTFs using the Internet.

For this redbook, we use an example of ordering the most current BRMS PTF SI09241, which is the newest PTF for BRMS V5R2M0 (5722-BR1), at the time this redbook was written. We followed these steps:

1. Using the initial Fix Central page in Figure 7-7, select **iSeries**, **AS/400**, **OS/400**, the **individual fixes** option, and release level **V5R2**. Click **Continue** (not shown).
2. A Security Information page opens. Read the text and select **Yes**.
3. A signon window opens. Enter your Fix Central user ID and password. Click **Continue**.
4. The Security Alert page opens. Click **Yes**.
5. The Select Fixes page (Figure 7-8) opens. Enter `SI09241` and click the **Add to my download list** link. You can enter multiple individual PTF numbers separated by a comma per use of the Add to my download list link.

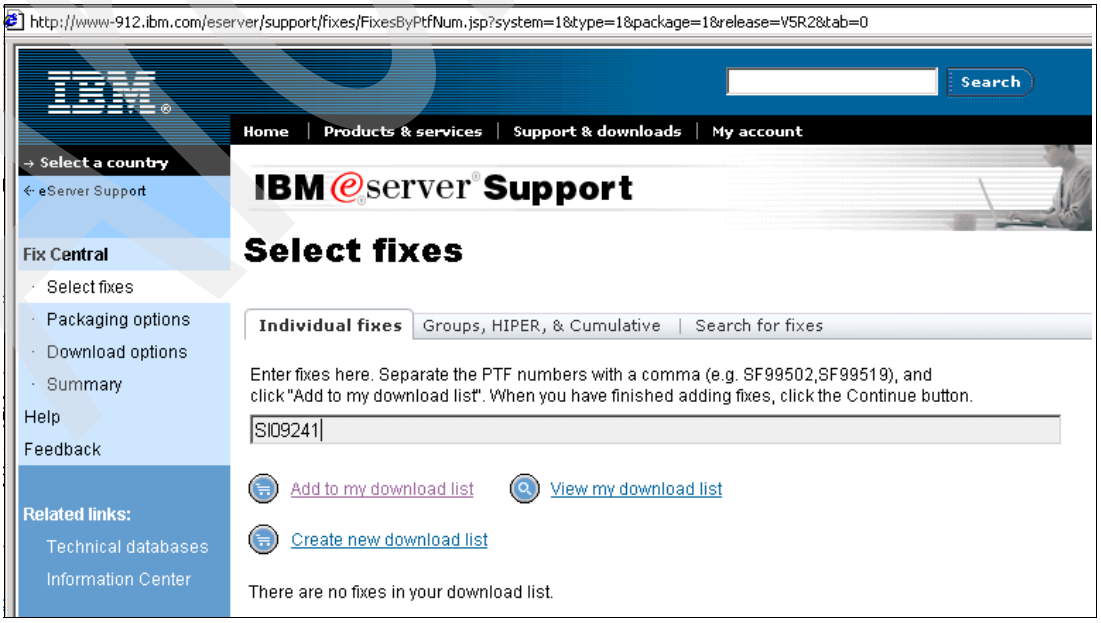

Figure 7-8 Select Fixes page

6. When you are done adding selected fixes (we use only one here), click **Continue**.
7. The Packaging options page (Figure 7-9) opens. Several options are already filled in. Carefully review the options before continuing. Use the links in the left navigation bar to find more detailed descriptions of the packaging considerations. In our example, we selected:
   - PTFS and Cover Letters
   - Include all requisite PTFS
   - For FTP Download or CD-ROM media...
   - Reorder the PTFs even if they exist on the system

   Click **Continue**.

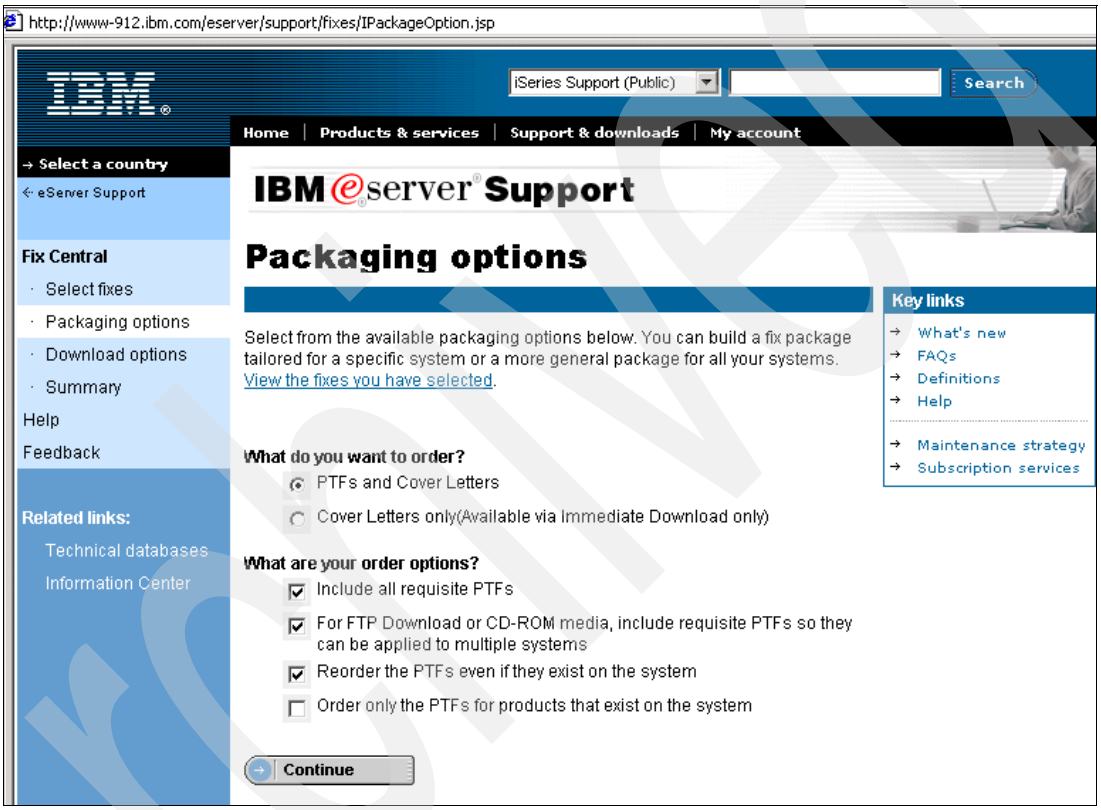

Figure 7-9 Fix download: Packaging options

8. The Delivery options page (Figure 7-10) opens. In our example, using SI09241, we chose:
   - For the delivery method, we selected **Download CD ROM image to FTP server**. We selected this option because we had experience that the fixes included with SI09241 are too large to download using the Immediate Download over the Internet option.

     Tip: You can order multiple PTFs with one order. Use care when selecting delivery options. Consider network speed and size of the PTFs that you are ordering.

     Fix Central (iPTF) allows you to download fixes via HTTP (which has a size limitation), FTP (which has a larger size limitation), or CD-ROM. For large PTFs, such as the BRMS PTF, group PTFs, or cumulative fixes, that you want electronically, you must use the FTP method. The HTTP method will fail due to the large size.

   - For Where is the target system installed?, we selected **Western Hemisphere: Central America...**

   Click **Continue**.

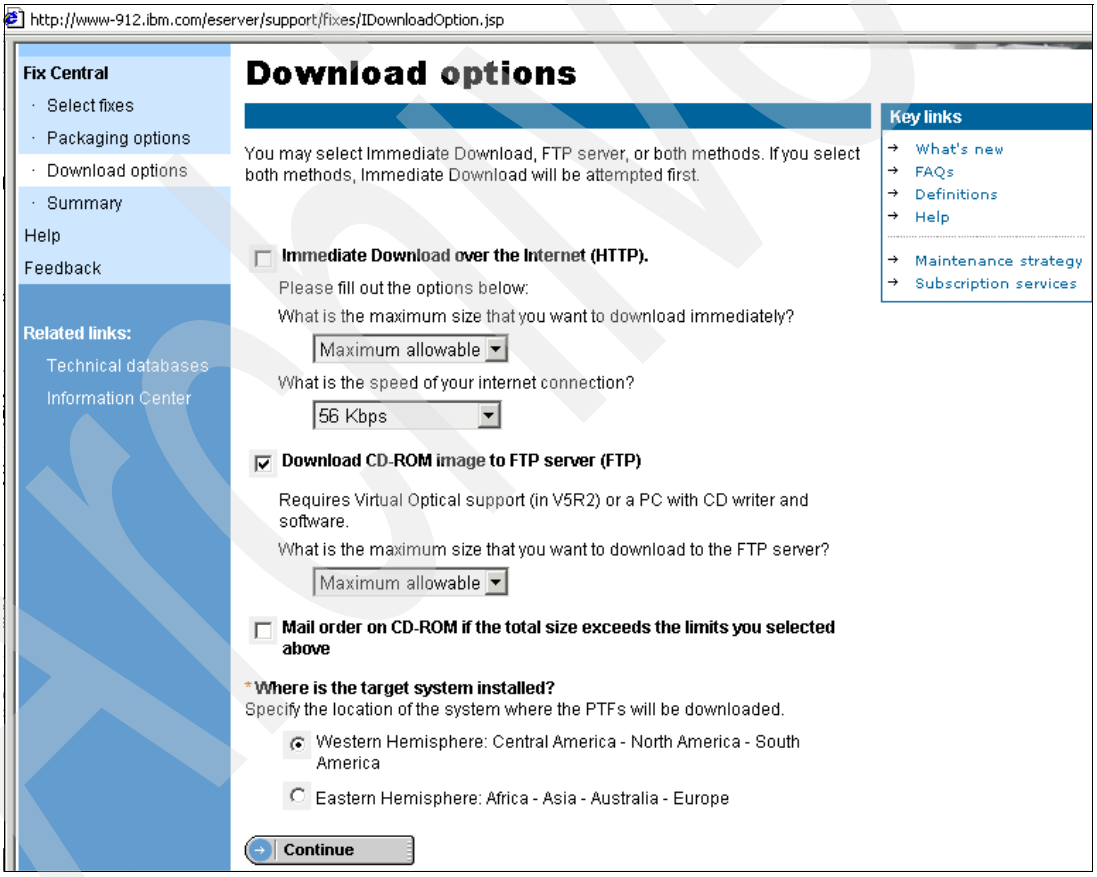

Figure 7-10 Fix download: Download options

9. An overlay page opens that discusses Internet security considerations. Click **Yes** to continue.
10. After a few seconds, another page (not shown) appears. On this page, enter:
    - The target iSeries fully qualified system name or its IP address
    - You user ID and password on that system

Optionally, select the check box indicating whether you want to view or update your shipping information.

Click **Next** on this page.

11. On the next page, click **YES** to accept the security certificate.
12. After a few seconds, you see a verification message that the contact information and e-mail address are correct. You may need to re-enter your e-mail address. Click **Next**.
13. After approximately 60 seconds, you see a summary page (not shown here). In our case, the summary page includes text that states the FTP server will be used and you will receive further instructions at your e-mail address.

    If you select immediate download and the set of PTFs was within the immediate download maximum size limit, you download and apply the PTFs on your target iSeries server now. When complete, the status is shown in your browser session.

    In our case, using the FTP server, we can close your browser until we receive and carry out the complete download instructions.
14. You receive two e-mail messages in your e-mail inbox. The first one confirms your PTF order. The second one contains detailed instructions for applying the ordered PTF to your system. Print this second e-mail message and review the instructions carefully.
15. Follow the instructions from this second e-mail, which includes FTP instructions and tips for using iSeries Navigator.

    We recommend that you create your own IFS directory for the PTFs you download from the Internet. In this example, we use the iSeries Navigator session to system Deber170 to define this new directory as ptfsv5r2m0add in the root directory. On the General page of the iSeries NetServer File Share Properties window (Figure 7-11), we define Share name as `PTFS`, Description as `ptfsv5r2m0add`, and for Access, select **Read/Write**.

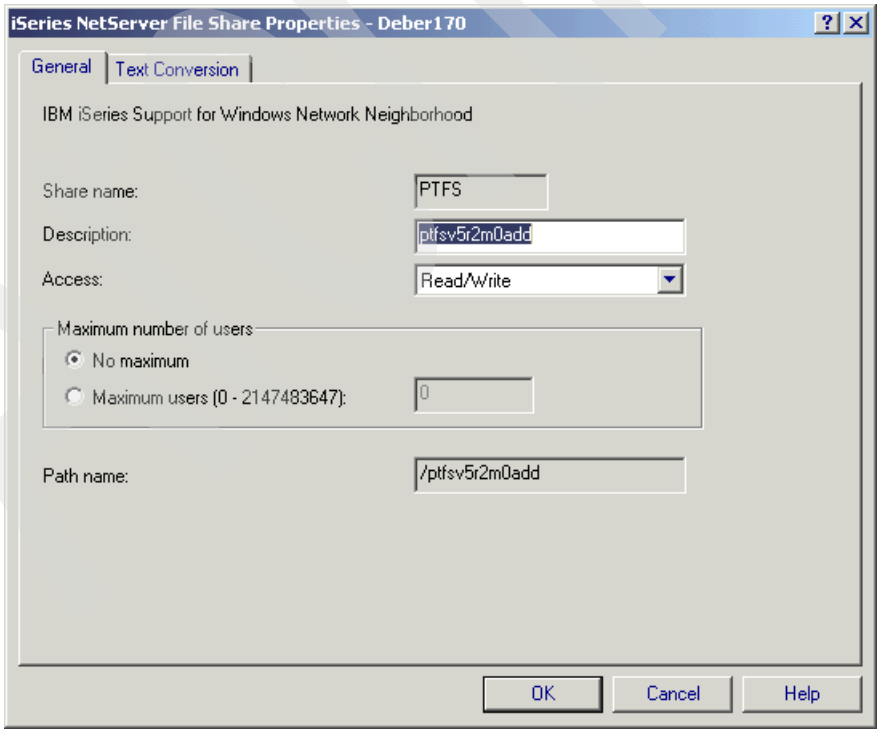

Figure 7-11 Shared IFS directory ptfsv5r2m0add

16. From your desktop, right-click **My Network Places** and select **Map Network Drive**. The Map Network Drive window (Figure 7-12) opens. Map the new directory to network drive T on your PC workstation as shown in the example.

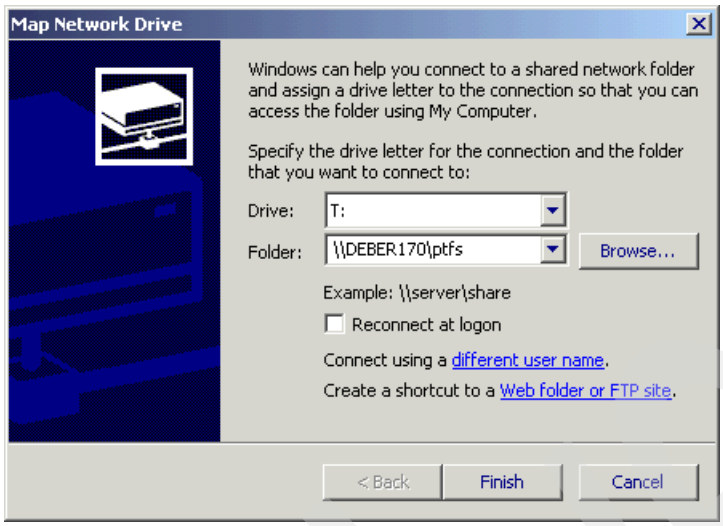

Figure 7-12 Mapping shared PTFs to drive T

17. Let us assume that you successfully ordered and downloaded to your system the .bin file for PTF SI09241, which in our example is iptf0030.bin. See Figure 7-13. The other file that is shown is ilst0030.txt, which is a readme file for this fix.

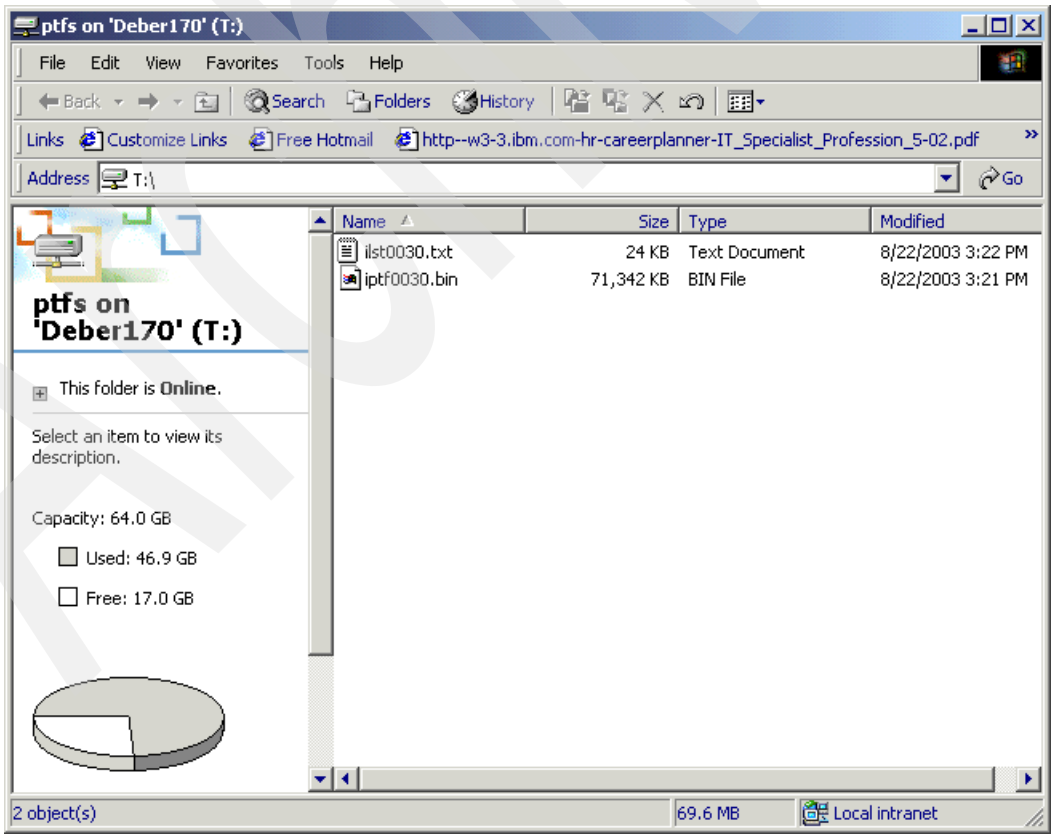

Figure 7-13 iptf0030.bin in drive T

Next you must load and apply the PTF to 5722BR1 BRMS V5R2. There are several interfaces to install (load and apply) one or more fixes on an iSeries server. They include:

– Using the 5250 GO PTF menu interface that includes several options such as Load a program temporary fix, Apply a program temporary fix, Install a program temporary fix from a list, and more. The best source of information is on the V5R2 Information Center at:

  `http://www.ibm.com/eserver/iseries/infocenter`

  In the Search field, enter **"**`fixes AND install`**"**. One of the first search items titled "Install fixes received electronically" provides a good overview of the steps required.

– Using the iSeries Navigator Install Fixes wizard by expanding **My Connections-> *system name*-> Configuration and Service-> Fixes Inventory**. Right-click a licensed program and select the **Install** menu option. For BRMS, you can select **5722BR1**. Follow the wizard interface instructions.

  In addition to Information Center documentation about this topic, consider the following Redbooks:

  - General Management Central fix inventory capabilities: *Managing OS/400 with Operations Navigator V5R1 Volume 1: Overview and More*, SG24-6226
  - Specific Management Central fix and fix inventory capabilities: *Managing OS/400 with Operations Navigator V5R1 Volume 3: Configuration and Service*, SG24-5951

The following section discusses a new method of installing fixes and PTFs, using the Virtual Media Installation option, introduced during V5R2.

7.5.2 Installing PTFs using Virtual Media Installation

Since OS/400 V5R2, the new VMI function became available. You can learn more about VMI on the iSeries Information Center at:

`http://publib.boulder.ibm.com/html/as400/infocenter.html`

This section uses this new VMI function to install downloaded PTFs, using our example PTF SI09241. We begin by creating the needed catalog objects. If these are already created on your system, you can use them. Otherwise continue with these steps, which you must perform from an OS/400 command line:

1. Create a virtual device, such as VRTOPT, or any name you want to call your virtual optical device.

   ```
   CRTDEVOPT DEVD(VRTOPT) RSRCNAME(*VRT) ONLINE(*NO) TEXT('xxx')
   ```

   This creates a device description VRTOPT with type 632B.

2. Vary on this newly created device description VRTOPT:

   ```
   VRYCFG CFGOBJ(VRTOPT) CFGTYPE(*DEV) STATUS(*ON)
   ```

3. Create an image catalog. In this example, we create an image catalog called PTFSV5R2M0, but you can name yours anything you want.

   ```
   CRTIMGCLG IMGCLG(PTFSV5R2M0) DIR('/ptfsv5r2m0add') CRTDIR(*NO) TEXT(fixImg) AUT(*USE)
   ```

   a. Set the CRTDIR parameter to *NO, because you use your IFS directory, where iptf0030.bin file is downloaded. See Figure 7-11 on page 149 and Figure 7-13.

   b. Use care when you enter the AUT parameter. We set it to *USE, but you can also set it to *EXCLUDE or *CHANGE. It depends on your organization's security policies.

4. Add an image catalog entry:

   ```
   ADDIMGCLGE IMGCLG(PTFSV5R2M0) FROMFILE(iptf0030.bin) TOFILE(iptf0030.bin)
   ```

   You add the iptf0030.bin file to image catalog PTFSV5R2M0. The system creates all needed pointers. In this example, the system adds the .bin file into the image catalog which is used for the PTF installation. See Figure 7-14.

```
                    Add Image Catalog Entry (ADDIMGCLGE)

Type choices, press Enter.

Image catalog  . . . . . . . . . > PTFSV5R2M0    Name
From optical device, or  . . . .                 Name
From image file  . . . . . . . . > 'iptf0030.bin'

To image file  . . . . . . . . .   'iptf0030.bin'



Image catalog index  . . . . . .   *AVAIL       1-64, *AVAIL
```

Figure 7-14 Adding an image catalog entry

5. In this example, we have only one PTF to install, so we load the image catalog:

   ```
   LODIMGCLG IMGCLG(PTFSV5R2M0) DEV(VRTOPT) OPTION(*LOAD)
   ```

6. Use the Work with Image Catalog Entries (WRKIMGCLGE) command to verify the image catalog status, which should be *Ready*. Also the iptf0030.bin file should be mounted. See Figure 7-15.

```
                      Work with Image Catalog Entries

Image Catalog  . . . . . . . . :   PTFSV5R2M0
Image Catalog Status . . . . :   Ready
Virtual optical device . . . :   VRTOPT
Directory  . . . . . . . . . . :   /ptfsv5r2m0add

Type options, press Enter.
  1=Add   2=Change   4=Remove   6=Mount   8=Load   9=Unload

  Opt   Index  Status      Image File Name
       *AVAIL
           1  Mounted     iptf0030.bin
```

Figure 7-15 Working with the image catalog entries

If you press F11, you see a modified screen (Figure 7-16), which shows the volume number.

```
           Work with Image Catalog Entries

Image Catalog  . . . . . :   PTFSV5R2M0
Image Catalog Status . . . . :   Ready
Virtual optical device . . . :   VRTOPT
Directory  . . . . . :   /ptfsv5r2m0add

Type options, press Enter.
  1=Add   2=Change   4=Remove   6=Mount   8=Load   9=Unload

  Opt   Index  Status      Volume
       *AVAIL
            1  Mounted     C4835657_01
```

Figure 7-16 Work with Image Catalog Entries after pressing F11

7. Install PTF SI09241 on your system. You do this by using GO PTF and selecting option 8. The only difference now is that, for the device parameter, you type in your newly defined virtual drive VRTOPT. This now uses the mounted volume C4835657_01, which we see under image catalog PTFSV5R2M0. For more details, see the readme file in our example file ilst0030.txt.
8. Verify that the PTF is temporarily applied:

   ```
   DSPPTF LICPGM(5722BR1)
   ```

   Figure 7-17 shows that the PTF is temporarily applied.

```
System:
Product ID  . . . . . :   5722BR1
IPL source  . . . . . :   ##MACH#B
Release of base option  . . . . . :   V5R2M0


Type options, press Enter.
  5=Display PTF details   6=Print cover letter   8=Display cover letter
     PTF                                                 IPL
Opt  ID       Status                                     Action
     SI09241  Temporarily applied                        None
     SI08486  Superseded                                 None
```

Figure 7-17 PTF SI09241

9. Perform VMI maintenance on your system by entering the following commands in the order shown:

   ```
   LODIMGCLG IMGCLG(PTFSV5R2M0) DEV(VRTOPT) OPTION(*UNLOAD)
   WRKIMGCLGE
   ```

   Select option 9 to unload the image catalog entry.

   ```
   RMVIMGCLGE IMGCLG(PTFSV5R2M0)IMGCLGIDX(1)
   ```

   Note: This command only removes the entry in your image catalog. File iptf0030.bin itself is still available.

   ```
   VRYCFG CFGOBJ(VRTOPT) CFGTYPE(*DEV) STATUS(*OFF)
   ```

Now the WRKIMGCLGE display should look like the example in Figure 7-18.

```
Image Catalog  . . . . . :   PTFSV5R2M0
Image Catalog Status . . . . :   Not ready
Virtual optical device . . . :
Directory  . . . . . :   /ptfsv5r2m0add

Type options, press Enter.
  1=Add   2=Change   4=Remove   6=Mount   8=Load   9=Unload

  Opt   Index  Status      Image File Name
       *AVAIL

  (No image catalog entries)
```

Figure 7-18 WRKIMGCLGE after VMI maintenance

Your system is now ready for your next VMI use.

Note: Future PTF installations using VMI will have fewer steps, because all catalog objects are now created. However, you can create numerous catalog objects but can only have one virtual optical. It can only be allocated to one image catalog at a time.

8

Backup Recovery and Media Services up and running

This chapter discusses how to get Backup Recovery and Media Services (BRMS) up and running after you install it. It covers the basics and intermediate level capabilities of BRMS.

As you read this chapter, note the following points:

- We frequently refer to 5250 interface commands. However, in most of our examples, we use the BRMS iSeries Navigator client as our primary interface.
- To shorten the chapter length, we show only the vital part of a window. We don't show such buttons as OK, Cancel, Help, Back, and Next (see Figure 8-1 for an example) since they are on almost every window when you are using the system. Instead we show them only when there is a special reason to do so.
- When you connect to the iSeries server using either the 5250 or the iSeries Navigator interface, use the help functions (F1 key for 5250 and Help button or ? mark icon for iSeries Navigator) for extensive additional information.

Figure 8-1 Buttons excluded from most windows in this chapter

8.1 BRMS operations

This section elaborates on most of the common BRMS issues. In the BRMS base product, objects may already be created to make it possible to take a full backup. The predefined setups are probably not what you want to run in production, but they give you a good starting point with a minimum amount of additional tailoring. We recommend that you begin using one of these predefined setups to quickly have a good level of protection. Then you can be sure that every object is backed up at least once.

To assist in your backup and recovery processes, BRMS keeps track of which objects you have not included in your backup strategy. Those left out are found in the BRMS log. In addition, there is a separate exception report.

Typically you see such BRM1570 messages as:

- Library AH is not included in save strategy.
- Library ALEKN is not included in save strategy.
- Library ANZFLTS is not included in save strategy.
- Library APILIB is not included in save strategy.
- Library AS0301LIB is not included in save strategy.

8.1.1 Policies

BRMS uses policies that define a set of standards. In many levels of definition within BRMS, you find the same parameter. If specified, BRMS selects the parameter value specified at the lowest level. If nothing is specified at a lower level, BRMS tries to find a value for that parameter at the next level until it reaches the top level for that parameter. A parameter's top level can be in any of the policies that are defined. An example is the weekly activity. Its ending point is the backup policy. Nothing is found about weekly activities in the highest level, which is the system policy.

Figure 8-2 shows how this works. It also shows a run-time priority order that is embedded. The selection order is:

1. Item overrides
2. Control groups
3. Backup, Archive, Recovery, Retrieve, Migration policies
4. System policy

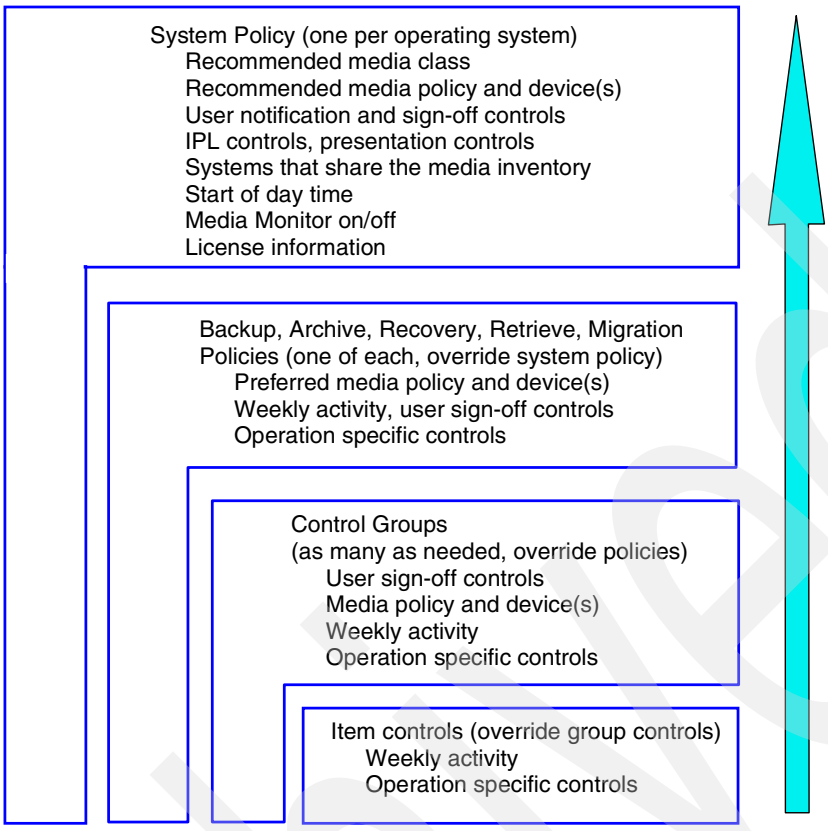

Figure 8-2 Control group priority order

At execution time, many of the following specifications can be overridden:

Note: As for all the other policies, some specifications are only found here. Others are defaults if not specified elsewhere.

- System policy
  - Should we sign off interactive users
  - Who is allowed to stay active
  - Ending subsystems
  - Presentation controls such as which is the first day of the week, etc.
  - During what time of day an IPL is allowed
  - When a backup day logically starts
  - Default media class
  - Default media policy
  - Default backup device
  - Network definitions
- Backup policy
  - Media policy
  - Backup devices
  - Default activity
    - Full backup
    - Incremental backup
    - No activity at all

  - Sign off parameters
    - How you do it
    - What time limit you give them
  - Save only the journal data or the whole object
  - Saving access paths
  - Target release
  - Clear contents of an object after it is saved
  - Precheck an object before the save begins
  - Append to media
  - End of tape option
  - IPL and how to do it
- Media policy
  - Retention type and how long a backup should be saved
  - Move policy used
  - Media class used
  - Save to a save file
  - Which ASP to use
  - Secure media from being displayed unless you have the required authority
- Move policy
  - Define how a tape volume moves between locations before being free for re-use
  - Where a tape volume waits before being re-used
  - Use of containers
  - Whether to verify tape movements before the tape inventory data base is updated
  - Calendar used
- Recovery policy
  - Default recovery device
  - End of tape option
  - Data base member option
  - Allow object differences
  - Document and folder naming rules
  - Restore to the same library or somewhere else
  - Which ASP to target
  - If also the system resource data base should be restored
- Archive policy
  - Very similar to the backup policy
  - Number of inactive days
  - Free storage on archive
  - etc.
- Retrieve policy
  - Has most of the same content as the recovery policy but is used for dynamically retrieving data that is forced from the system due to inactivity
  - Requires the Advanced Functions feature
  - Defines whether the used days time period should be reset after a restore
- Migration policy
  - Denoting items to a user ASP
  - Promoting them back
  - Selected by
    - Age
    - Size

- Creation date
- Last used
- Last changed

8.1.2 Setting up BRMS in logical order

Logical order is important when setting up BRMS. For example, when you create a setup, you cannot point to a BRMS object that does not yet exist. Instead, you typically start by creating your BRMS locations, by using the 5250 command interface.

However, since we use the BRMS iSeries Navigator client interface for most of the examples in this redbook, it is important to note that this graphical interface to BRMS functions often performs additional functions than what is apparent using the graphical interfaces. For example, creating a BRMS location is one of the functions that is not explicitly selected through the BRMS iSeries Navigator client.

Whether you choose the OS/400 command interface or iSeries Navigator interface, your setup is the same when it is completed.

Note: From a full function BRMS viewpoint, the OS/400 command interface provides interfaces to the full range of functions. The BRMS iSeries Navigator client interface provides an interface to almost all of the BRMS functions. We discuss some of these differences, depending on the topic being covered, throughout this redbook. However, for the most complete description, review *Backup Recovery and Media Services for iSeries*, SC41-5345.

8.1.3 Initializing BRMS

We recommend that you use the Initialize BRMS (INZBRM) command, although it is not required for you to do this. When you run this command, the initialization works much more smoothly when you perform the BRMS functions.

The INZBRM command performs several types of initialization:

- Initializes all major files and establishes default policies and control groups
- Starts the subsystem for networking in a multisystem environment
- Allows you to reset BRMS and re-initialize all major files and establish default policies and control groups
- Creates auxiliary storage pool (ASP) descriptions, depending on how many others exist, in addition to the system ASP

The INZBRM command can also add a system to a BRMS network group, using the Network feature.

INZBRM has an OPTION parameter with several option values and associated functions. For full details of its capabilities, enter the INZBRM command on a 5250 workstation. Press F4 to prompt and then, with the cursor positioned on the OPTION parameter, press F1 for help.

The OPTION parameter values used in this redbook are:

- ***DATA**: This is the starting point when you initialize BRMS. Default control groups, policies, and tables are built based on the characteristics of the system that is being initialized. In addition, new devices are added, and ASPs are configured.
- ***DEVICE**: Use this when you have changes in your tape environment. This value performs the same functions as *DATA and clears device and media library information. It also

re-initializes the BRMS files with the devices that are currently described on the system. Using the *DEVICE special value causes Communications Side Information (CSI) objects and Advanced Program-to-Program Communication (APPC) device information to be removed from the BRMS inventory if no APPC device entries by the same name are found. Using this value does not cause NET device information to be removed.

For a description of other OPTION parameter values (*NETSYS, *RESET, *SETAUT, *CHGSYSNAM), press F4 and use F1 (Help).

8.1.4 Media

Writing to, and reading from, tape media and managing that process has many considerations. This section addresses most of them when running under BRMS.

Important:

- Always initialize a tape volume using the same name as its outside label specifies. If you don't, you will experience some trouble. When using a tape library device with a barcode or any other kind of automatic reader, this is important. BRMS can read, but never write to, such a volume.
- Under normal operating conditions, BRMS protects a tape volume that contains active saved data from being overwritten. BRMS cannot provide this protection if an active tape volume is used in conjunction with the Save Storage (SAVSTG) command. This is due to the Media and Storage Extension (MSE) interfaces to BRMS not being active when you run the SAVSTG command. Never use active BRMS volumes if you use the SAVSTG command.
- To prevent calling for a volume that is not in an accessible tape location, do not allow that volume to expire.

Tape volume layout

BRMS uses OS/400 standard functions when reading and writing its tape volumes. That means a backup saved by BRMS looks exactly the same as though it was saved with the corresponding operating system command. The only exception is retention. BRMS writes all labels as permanent.

Only IBM Tivoli Storage Manager can restore a volume written by IBM Tivoli Storage Manager. After OS/400 data is saved to IBM Tivoli Storage Manager, IBM Tivoli Storage Manager must be up and running and BRMS must request IBM Tivoli Storage Manager to bring back the data.

Tape locations

When integrating BRMS and IBM Tivoli Storage Manager, you must consider carefully the subject of *tape location*. Tapes are physical media and must exist somewhere. The first logical step in BRMS is to define where you store your tape volumes, a tape location. What you setup depends how you need to move your tapes between these locations. You may be able to operate without this process and setup, but things will work more smoothly if you set up a location.

When you create locations, carefully consider when the location setup allows a volume to expire. When a volume's retention period is over, the volume is considered expired. It becomes a *scratch tape* and is then available for writing to. When a volume with expired retention is moved to a location that allows tapes to expire, BRMS does not automatically expire the tape.

There is one exception. If you use a tape library device with a barcode reader, BRMS automatically detects the volume and does the operation for you.

You expire tape volumes by using the Start Expiration for BRM (STREXPBRM) command, the Work with Media using BRM (WRKMEDBRM) option 7 on the volume number of the tape, or the Start Maintenance for BRMS (STRMNTBRM) command with the EXPMED parameter set to *YES.

Automatically created locations

These locations are automatically created when BRMS is initialized:

- *HOME which is an unspecified on-site location
- VAULT which is an unspecified off-site location
- TAPMLBxx if a tape libraries exist

Model location

Consider creating locations similar to this example. You can create locations with 10-character names that are meaningful to you. You can create as many locations as you need using Option 1 (Add) from the Work with Storage Locations display. To do this, you use the Work with Locations using BRMS (WRKLOCBRM) command. Here is an example set of locations:

- **COMPROOM**: Use this location for storage of active volumes being managed by a third-party courier or off-site vault.
- **FREE_TAPES**: Use this location for scratch tape volumes. Its name is intended to make it easier for the operators to find expired volumes. Such a location depends on your tape move setup. This can be in a specific place inside the ordinary tape library. Ideally, free volumes are returned to the tape library device if it can hold the volumes.
- **NOT_MOVED**: Use this location for volumes that do not move. Volumes can end up here in case the system policy Home location for media parameter points to NOT_MOVED. If you leave the default setup unchanged, they are placed in the *HOME/ location.
- **ARCHIVE**: Use this location for volumes with data that must be saved over an extended time period.
- **DO_NOT_USE**: Use this location for volumes indicating read/write problems but still holding active data. After a volume becomes inactive, destroy it and do not re-use its volume name.
- **LOST**: Use this location in case you lose track of what a tape volume was used for. In this case, you have provide a place for it so someone can decide what to do with it. This name can serve as a reminder to check any tapes in this location.

You can have a location for tapes sent to other companies. However, we recommend that you handle such volumes outside BRMS. In case of restore, BRMS calls the latest version of every object. It is not good if it points to a volume outside your control.

Home location

When tape volumes rotate between locations, the move policy specifies where they should return after the expiration time has passed by looking at the *Home location* prompt of the move policy assigned to the volume.

The home location of a move policy can have a value of *SYSPCY. This value indicates that the *Home location for media* prompt on the System Policy is used for the move policy home location. It can be convenient to specify a location named NOT_MOVED in the System Policy Home location for media prompt.

Backups that do not move as they should use the Home location for media prompt on the system policy and appear at that location.

As an alternative, consider pointing at the expired volumes (scratch) location.

Naming tape volumes

Consider the following guidelines when naming tape volumes:

- The maximum length for a volume name is six characters.
- Always initialize a tape volume using the same name that its outside label specifies. If you do not, you will experience trouble. This is important particularly when you are using a tape library device with a barcode or any other kind of automatic reader. BRMS can read, but never write to, such a tape volume.

  If there is no volume label, it does not matter what name you specify, as long as all volume names are unique.
- Under normal operating conditions BRMS protects a tape volume containing active saved data from being overwritten. BRMS cannot provide this protection if an active tape volume is used in conjunction with the Save Storage (SAVSTG) command. This is due to the MSE interfaces to BRMS not being active when the SAVSTG command is run. Never use active BRMS volumes if you use the SAVSTG command.
- BRMS uses an algorithm that tries to minimize the number of active tape volumes. That logic is not affected by volume names.

Storing tape volumes

There may be many aspects to physically store tape volumes. We recommend that you use:

- Active volumes: Alphabetically within a location
- Expired volumes (scratches): Randomly (no order but physically together)
- Long term or archive: Logically together

Media classes or media pools

Before you can add tape volumes, media classes (pools) must already exist.

General media classes

BRMS sets up media classes that correspond to the hardware it had available at the time of initialization. If you are satisfied, you do not need to do anything further. However, we set up an IBM Tivoli Storage Manager environment, so you have to create a specific IBM Tivoli Storage Manager media class.

Important: When there are tape device changes, run the INZBRM command with the *DEVICE option.

Specific media classes

Media classes can serve other purposes. For example, they can identify the kind of save or data you store. You can have a media class named Q2DC1WEEK, meaning a quarter-inch tape with a notation that says: “Only short saves in this media class (in this example up to a week)”. In your backups, you point to this class when doing short living saves. In this way, you avoid freezing tape volumes for an unnecessary length of time.

Important: A tape volume cannot expire until all of its retention days are passed and noted for a location that allows expiration.

A specific media class can also be defined to always target a set of volumes. Assume that you have log files that, for legal reasons, need to be stored over a long period of time and you want them to go to the same volume. After you create your media class, you add two tape volumes to the class. You may also need a media policy that points to this media class and need a control group that references the media policy. When it is time to go live, you initialize both volumes if necessary. Then you place one of them in your tape library device and the other one easily reachable outside. You may also find it practical to have a specific media location named for such volumes. When you back up files like this, BRMS only finds one available volume and places it at the end, one after the other. Sooner or later, the volume is full. When you reach the end of reel, you see a message stating that you have to mount next volume. You mount your prepared tape and continue. Of course, you then need to replace your spare with a new tape volume.

In cases similar to this one, it is important to remember that there is no need to keep track of any detailed information about what is on those volumes. Only those BRMS log files can be on the volumes. Also, there is no need to store the BRMS inventory files in such a backup job. In case of a restore, it is relatively easy to display the volume and determine in which sequence the number corresponds to a certain save date. Log files are normally not vital to running your business. Therefore, do not consume valuable disk space only for referencing them. You may never use this.

Media class for IBM Tivoli Storage Manager volumes

In BRMS, you need to set up a media class that corresponds to a device class in IBM Tivoli Storage Manager. See 6.2.5, “Defining the device class” on page 101. This is also needed when BRMS and IBM Tivoli Storage Manager share the same tape library.

Separating media when BRMS, IBM Tivoli Storage Manager share the same tape library

When an IBM Tivoli Storage Manager server is sharing a device that is also attached to an iSeries running BRMS, you must follow some considerations in regard to media:

- If IBM Tivoli Storage Manager is not going to use BRMS as its tape management program, you need to ensure that the tapes that IBM Tivoli Storage Manager uses are not enrolled within BRMS.
- If IBM Tivoli Storage Manager is going to use BRMS as its tape management program, you need to create a media class just for IBM Tivoli Storage Manager within BRMS. To create a media class within BRMS, you need to:

  a. On an OS/400 command line, enter the Work with Media Classes (`WRKCLSBRM`) command.

  b. Select option 1 to add a new media class as shown in Figure 8-3.

```
                          Work with Media Classes                    AS27

Position to . . . . . .              Starting characters

Type options, press Enter.
 1=Add   2=Change   3=Copy   4=Remove   5=Display   6=Work with media

Opt   Class       Density    Capacity    Text
 1    TSMSERVER
      ITSMLTO2    *ULTRIUM2 *DENSITY    ITSM server Ultrium2 volumes
      MLR3        *MLR3      *DENSITY    Entry created by BRM configuration
      QIC2DC      *QIC2DC    *DENSITY    Entry created by BRM configuration
      QIC2GB      *QIC2GB    *DENSITY    Entry created by BRM configuration
      QIC4DC      *QIC4DC    *DENSITY    Entry created by BRM configuration
      QIC4GB      *QIC4GB    *DENSITY    Entry created by BRM configuration
      QIC5010     *QIC5010   *DENSITY    Entry created by BRM configuration
      SAVSYS      *QIC4DC    *DENSITY    Entry created by BRM configuration
      TSM3590E    *MLR3      *DENSITY
      ULTRIUM1    *ULTRIUM1 *DENSITY    Entry created by BRM configuration
      ULTRIUM2    *ULTRIUM2 *DENSITY    Entry created by BRM configuration
                                                                      Bottom

F3=Exit    F5=Refresh    F12=Cancel
```

Figure 8-3 Creating a new media class for IBM Tivoli Storage Manager

c. Specify the tape density that you want to use with this media class and whether you want to share the media that is associated with this media class. Figure 8-4 shows the two parameters with which you should be concerned. You use the Shared media parameter only if your iSeries is in a BRMS network (using the Networking feature of BRMS). If you specify *YES for shared media and you are in a network, it allows other systems to use the media that are associated with that media class.

```
                              Add Media Class

 Type choices, press Enter.

 Media class . . . . . .   TSMSERVER    Name
 Density . . . . . .       *ULTRIUM2    F4 for list
 Media capacity  . . . . . .   *DENSITY     *DENSITY, Number nnnnn.nn
   Unit of measure . . . . . .               1=KB, 2=MB, 3=GB
 Mark for label print  . . . . . .   *NONE        *NONE, *MOVE, *WRITE
 Label size  . . . . . .   1            1=6 LPI, 2=8 LPI, 3=9 LPI
 Label output queue  . . . . . .   *SYSPCY      Name, *SYSPCY, *PRTF
   Library . . . . . .                         Name, *LIBL
 Shared media  . . . . . .   *YES         *YES, *NO
 Text  . . . . . .   ITSM server media class


                                                                    More...
 F3=Exit    F4=Prompt    F12=Cancel
```

Figure 8-4 Creating a media class with a specific parameters

Creating this media class allows IBM Tivoli Storage Manager to use BRMS-enrolled volumes.

Recommendations on hardware configuration sharing the same tape library

The ideal situation is to have BRMS and IBM Tivoli Storage Manager share the same tape library. To do this, we recommend that you use a minimum of three tape drives inside of the tape library. Because of this, you are limited to device type 3494, 3584, or 3583. The real minimum number of drives in a tape library is two for efficient implementation of IBM Tivoli Storage Manager's copy function.

However, you need to consider that, when IBM Tivoli Storage Manager is using the drives, BRMS cannot allocate them. For example, if you are using IBM Tivoli Storage Manager to migrate the data from disk to tape, it needs two drives to accomplish this. If at the same time you need to restore an object using BRMS, you need to wait until IBM Tivoli Storage Manager is done before restoring the object.

Note: You certainly can share a single tape drive (for example, a 3581) between BRMS and IBM Tivoli Storage Manager when IBM Tivoli Storage Manager is using BRMS as its tape manager. Of course, both products cannot use the same tape device at the same time. The product that starts performing its function first allocates the device until the function is finished.

We recommend that you use multiple drives to help with the IBM Tivoli Storage Manager reclamation function in IBM Tivoli Storage Manager. Otherwise, you must copy data from tape back to disk and then back to tape again (rather than tape to tape with multiple drives).

Although possible to set up, BRMS and IBM Tivoli Storage Manager should never share the same physical volumes. Even though you are pointing to the same media type, both need their own media class (or media pool as named in the iSeries Navigator).

Adding tape volumes

BRMS must know each volume of which it needs to keep track. It does not matter if BRMS itself will ever read or write those volumes. For handling purposes, they must be known and logically reside in one of the locations that is defined.

The command to add tape volumes is the Add Media to BRM (ADDMEDBRM) command. Then you point at a media class and location. You also specify whether you want the volume physically initialized.

When mounting new (or unknown) volumes in a tape library, take advantage of the tape library commands such as Work with Media Libraries (WRKMLBBRM), which makes adding easier.

Adding media information

You can add information from tapes coming out of BRMS. You can use the Add Media Information to BRM (ADDMEDIBRM) command to add file-level detail to the BRMS media inventory content volume information. The files, and the volumes that contain them, can be from another tape inventory or from another outside source. This command allows user applications or another volume management system to insert data (volume file descriptions) into the BRMS media content information for managing the volumes and their contents.

Copying media

If there is a need to always have the latest copy of an object immediately accessible for restore, then you must keep the current save in the tape drive. This is *not* good from a safety aspect. A better alternative is to copy the volume. You can do this at any time of the day, assuming you have enough tape drives available.

Copying volumes for certain applications is controlled from in the media policy. You may also use the Duplicate Media using BRM (DUPMEDBRM) command for individual copies.

Moving media

To have BRMS move media, you need to specify if and how long a tape volume should reside in a location. Assume you have a location that is ten minutes away called SUBOFFICE, and you want to store your hot tapes there for a week. Then return them to the computer room safe for the rest of the period. Your move policy can look like this:

- SUBOFFICE 7
- COMPSAFE *EXP

When expiration time is over

A tape volume can have many different datasets (files), each with its own expiration date. When the last dataset expires, the volume is considered a scratch. It can be re-used but is not a mount candidate until BRMS sets an *expiration flag*.

In this example, every volume with this move policy stays in SUBOFFICE seven days, but the time they spend in COMPSAFE varies depending on what was written to them. When the last expiration date is passed, nothing actually happens until BRMS runs a move task. In this case, you perform the following tasks:

1. Check whether the location allows the expiration flag to set.
   - Yes, the expiration flag is set.
   - No, the expiration flag will not go on even though the volume is essentially free.
2. Check whether the information over what is on the volume should be retained or deleted.
3. Print a report showing which volumes need to be moved.
4. Check whether a move verification is needed.
   - If not, BRMS inventory logically moves volumes to their new location.
   - If yes, an extra verification step is needed using the Verify Media Moves (VFYMOVBRM) command.

After a tape is expired, the next (last) location is determined by the move policy Home location parameter.

Moving volumes

To move tapes logically in BRMS, use the STRMNTBRM command and set the move media parameter to `*YES`. If you want to run the move manually, you use the MOVMEDBRM command or open the WRKMEDBRM display and use option 8 to move a volume.

When a move is performed and you want to run it for all locations, the move process validates that every volume is where it should be. For those that it can move automatically, it does by issuing a library device command. If you have a tape library, it ejects all tapes that should not be there. It does not matter if they are in the library because nothing is done after the last backup, or if you reinserted a volume for some reason. If it should not be there, it is forced out. Volumes that need a physical action are listed on the Volume Movement Report. It shows where the tapes should go.

Note: With a tape library, if you want some action to take place and you set VFYMOVBRM, refer to Informational Authorized Program Analysis Records (APAR) II09882, which you can search for on the Web at:

`http://www-912.ibm.com/n_dir/nas4apar.nsf/$$Search?openform`

Move verification

Tape volumes that require move verification do not appear in their new location until the VFYMOVBRM command has completed. This is an interactive command and you have to respond to each volume.

The example in Figure 8-5 shows that these volumes should be moved to location SUBOFFICE.

```
                        Verify Media Moves

 Type options, press Enter.  Press F16 to verify all.
    1=Verify   4=Cancel move   9=Verify and work with media


       Volume   Creation  Expiration               Move
 Opt   Serial    Date       Date      Location      Date      Container
  1    17AAC1    3-07-25   *PERM      SUBOFFICE     3-07-26   *NONE
  1    17AA2O    3-07-25   *PERM      SUBOFFICE     3-07-26   *NONE
  1    2C5536    3-07-25   *PERM      SUBOFFICE     3-07-26   *NONE
```

Figure 8-5 Verify Media Moves example

If you do not have the Move Media Report on hand and want to know their previous location (current logical location), you type:

```
WRKMEDBRM VOL(17AAC1 17AA2O 2C5536)
```

```
                           Work With Media

 Type options, press Enter.  Press F16 to verify all.
1=Add   2=Change   4=Remove   5=Display   6=Work with serial set   7=Expire
   8=Move   10=Reinitialize ...

       Volume   Creation  Expiration               Move
 Opt   Serial    Date       Date      Location      Date      Container
       17AAC1    3-07-25   *PERM      TAPMLB05      3-07-26   *NONE
       17AA2O    3-07-25   *PERM      TAPMLB05      3-07-26   *NONE
       2C5536    3-07-25   *PERM      TAPMLB05      3-07-26   *NONE
```

Figure 8-6 Work With Media example

Verify that Move is an option in the move policy.

Moving volumes manually

To move volumes manually, enter the WRKMEDBRM command and select option 8 to move a volume.

Making volumes available for reuse

If you are short of expired volumes, you can manually make volumes available. You do that by selecting option 7 on the WRKMEDBRM display.

Sometimes you are denied because other settings prohibit that. For example, you cannot expire a volume in a location that is specified as Allow Volumes to Expire = *NO. You must first move them to the correct place.

You can also change a volumes expiration date. However, be aware that a volume is not considered expired until the expiration flag is set.

You may run an extra STREXPBRM command just before you launch your backups in case someone forgot to actually expire the volumes that were moved or changed.

Move with calendars

BRMS allows you to use working and move calendars. Both these of these types of calendars specify days. You can also reference other calendars, such as a Holiday calendar, which holds the exception dates.

Assume the working days calendar holds Monday to Friday, and you have a pickup service Tuesday and Thursday. Then the move operation considers which moves actually can take place on a given day. In addition, you may have a Holidays calendar that tells on which dates not to perform a move even if it matches the other calendars.

Volume retention

BRMS always physically writes all tape labels as permanent. You cannot see the expiration date when you display a tape volume written by BRMS. Which volume and when a tape is considered expired is controlled strictly by the BRMS database. The purpose is to protect volumes from accidentally being overwritten if mounted outside of BRMS control.

Volume protection

When BRMS is in control, you may natively add to a volume owned by BRMS. However, you cannot overwrite or initialize it. Your attempt is cancelled with an error message.

Attention: BRMS cannot prohibit its volumes from being destroyed by the SAVSTG command.

Registering native saves

An expired BRMS volume may be used for native saves. BRMS notes what was written to the tape and registers a type *FILE entry in its inventory database.

Remember that the main purpose of backing up your data is the possibility to get it back if needed. BRMS always tries to show you the most recent copy of your system and its data as possible, regardless of how a backup was taken.

Automatically enrolling media

BRMS monitors every tape that is mounted. When it finds a volume is does not know, the message "`Volume xxxxx is not under media control`" is displayed. This is normal and you can ignore it unless you intend to use it in BRMS. If so, you have to add it. There is an option in the system policy to enroll any new volume in its database.

Attention: Consider the consequences carefully before turning this on.

You have the ability to select on which drives you want this function active. In the BRMS device description is the Auto enroll media field, which normally points to the System Policy. It can also be *YES or *NO.

Saving by generations (versions) instead of days

BRMS has the ability to store volumes by generations (versions) instead of days. We do not recommend this because of the way it works. LIBA, LIBC, and LIBC are saved in a control group. The first save is version 1, the next is version 2, and so on.

If LIBD is added to the control group, the next save is version 1 again. If the media policy says to retain five versions and only four versions were saved before library D was added, you never get the fifth version of libraries LIBA, LIBB, and LIBC unless LIB D is removed from the control group. This works the same way for removing a library or using generics and *ALLUSR etc. You may end up with tape volumes that never expire.

Attention: We do not recommend versioning unless you have a static group of libraries that you are saving. Saving by levels is excluded from the BRMS iSeries Navigator client.

Strange tape names

Tape cartridges that are mounted in a library device without a scanner (for example, a barcode reader) sometimes have these names:

- **NLTxxx Non-Labeled Tape**: This cartridge contains data written in a nonstandard tape label format.
- **CLNxxx Cleaning**: This cartridge is identified as a cleaning tape.
- **BLKxxx Blank**: This cartridge contains no data.
- **UNKxxx Unknown**: This cartridge was not identifiable.
- **IMPxxx Import**: Refers to the cartridge that is in the priority slot of the 3570 or 3590 Auto Cartridge Facility.
- **SLTxxx Slot**: Refers to the cartridge by slot number. *xxx* indicates a sequence number.

8.1.5 Single backups using BRMS commands

If you want to make a single backup of an object, library, or a library group, you may use one of the following BRMS backup commands:

- Save Object using BRM (SAVBRM)
- Save DLO using BRM (SAVDLOBRM)
- Save Folder List using BRM (SAVFLRLBRM)
- Save Library using BRM (SAVLIBBRM)
- Save Object using BRM (SAVOBJBRM)
- Save Objects by a List using BRM (SAVOBJLBRM)
- Save Savefiles using BRM (SAVSAVFBRM)
- Save System using BRM (SAVSYSBRM)

8.1.6 Regular backups using control groups

Regular backups are handled better by using control groups. Control groups contain parameters needed to manage the entire backup scenario.

8.1.7 Control groups and policies

Control groups are the preferred way to regularly back up your data since they have many advantages over single backups. As mentioned previously, from a recovery standpoint, it is not important to BRMS how you back up your data. BRMS always gives you a list of the backed up items to select from.

Control groups automatically created

The following control groups are automatically created:

- ***BKUGRP**: Backs up all user data
- ***SYSGRP**: Backs up all system data
- ***SYSTEM**: Backs up the entire system

Depending on which servers install, specific control groups are created for some of those servers. Some automatically created control groups cannot be altered, but they can be copied. For a complete copy of your system, they ignore any system-wide excludes that you set up.

Restriction: You cannot save anything from an independent auxiliary storage pool (IASP) unless you vary it on.

Control groups for you to create

Using the 5250 interface, a control group is a defined entity. The iSeries Navigator client is set up to create a natural flow, which means you also touch other things like policies.

Creating control groups is a huge concept, but it depends on what your backup and recovery looks like. In essence, you create a list of things you may want to back up, either by specific names, generic names, by a list, by type, or in the manner you find practical.

You can specify:

- The kind of data you want saved
- Day for day, line for line what you want to run
- Traditional iSeries objects such as libraries, files, programs, data areas, and so forth
- Spooled files
- All folders (document library objects (DLOs)) or separately via a list
- All objects in the integrated file system (IFS) or separately via a list
- The media you want via a media policy, which also specifies how long the retention period should be
- Whether you want to keep track of object-level information
- To use the save-while-active function
- Other commands or any local procedure that you want to embed via an exit
- Whether you intend to take a full backup or only data that is changed (full versus incremental)
- The day you want to back up specific items
- Whether you want to exclude specific things on certain days
- The media policy to address
- Whether you can run parallel saves
- What to do with active users
- Whether you want to place data (a file) at the back of an active tape volume or use a new tape media
- Other tape dependent information like density, compression, unload/rewind, etc.
- Which release you target
- Whether you want to restart the system after the backup is done
- What to do with active subsystems
- Whether you want to hold job queues
- Actions to be run before and after the actual backup steps

To help you design your backup control group, see “Consideration before you begin” on page 370.

Deleting a backup policy (control group) through the wizard

From the iSeries Navigator client, you do not find a control group. You work with Backup policies, so the wizard asks if it should also delete objects related to your backup policy.

Since a backup policy may use objects common to other Backup policies, use care before you respond to the following question. Although the item referred may not be in use right now, you may want to take advantage of it in the future.

In the example shown in Figure 8-7, you cannot select the Delete check box because the list it is referring to is in use by another backup policy.

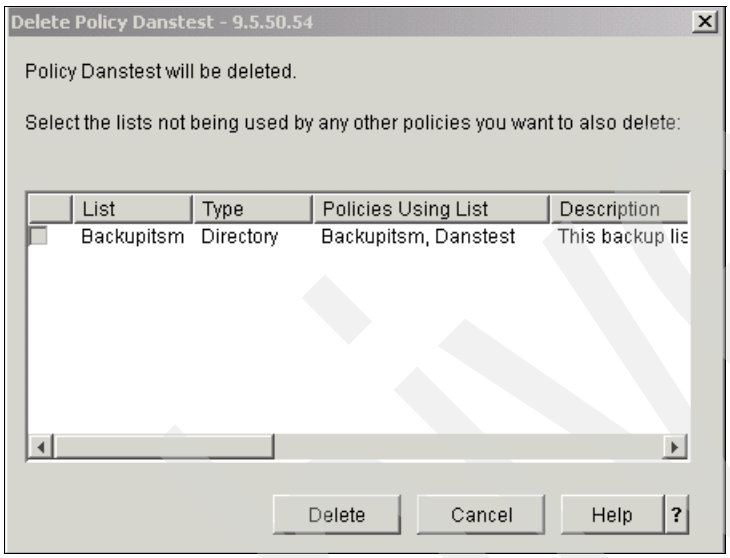

Figure 8-7 Deleting objects common to other Backup policies

General excludes

If you want to take advantage of the IBM-delivered control groups, but need to always exclude specific items, you may do so using the 5250 Backup policy menu interface. On a 5250 session, complete these steps:

1. Go to the Backup Planning menu by entering the following command:

   ```
   GO BRMBKUPLN
   ```

2. Enter option 1 (Backup planning).
3. Enter option 1 (Work with backup policy).
4. Enter option 2 (Work with items to omit from backup).
5. Before you take any further action, press F1 (Help) and F2 (Extended Help). Carefully review the help text.

Important: Work with help text for the items to omit from backup. As stated, carefully review the entire extended help text to understand the need to be careful when omitting (excluding) items. The following excerpt is the first part of this important help text:

> *"This display is used to add or remove backup items when processing the *ASPnn, *ALLUSR, and *IBM special values in a backup operation. For example, an entry for *ALLUSR excludes an item from being backed up when the *ALLUSR special value is specified in any control group."*

8.1.8 Full versus incremental backups

When you save your data, you can choose to save everything or to save only what changed. Both have advantages and disadvantages.

Full backups

The advantages of performing a full backup are:

- It's easy to restore since all objects are there.
- You only need one or a linked set of tape volumes.
- Restore time is quicker.
- It's the best choice if you do not have a tape library or must perform a manual restore.

The disadvantages of performing a full backup are:

- Backup time is longer.
- You need more tape volumes.
- You may find your backup jobs cancelled if scratch tapes are not available.

Incremental backups

Incremental backups are divided into:

- All changes since last full backup (cumulative incremental)
- All new changes (incremental)

The advantages of performing an incremental backup are:

- Backup time is in most cases considerably quicker.
- Many objects seldomly change.
- It decreases the amount of tape volumes needed for the backup.
- BRMS reverts to a full save if it finds an object that has not had a full backup even if you specify incremental.
- You do not run out of volumes that easily, even if you forget to fill up with scratches.

The disadvantages of performing an incremental backup are:

- More volumes are needed for recovery.
- Recovery time is longer.
- If you are using daily changes only (incr/incr), recovery can be lengthy and cumbersome.
- Incr/incr is not recommended unless you have a library device.
- If many objects in a library change, it is nearly equal to a full backup but still needs to be restored as an incremental save.

Restriction: A backup of a Domino database is always a full backup until Transactional logging is implemented in the Domino server.

8.1.9 New (expired) volume or appending to one containing active data

When you write to a tape, you can use a free volume or add it at the end of a volume that already contains active data. As in the previous discussion, there are both advantages and disadvantages.

New volume

The advantages of a new volume are:

- With one retention period only, the volume is not locked up by other backups.
- With data on different volumes, you can do concurrent restores.
- Cartridge damage only affects one save.

The disadvantages of a new volume are:

- Low volume saves can be an issue with tape cartridges that can store much data.
- You may need a tape library device that can hold many cartridges.
- Tape volume utilization is low (volumes only partially filled up).
- You need more tape volumes.
- You may find your backup jobs cancelled if scratches are not available.

Appending to a volume already holding active data

The advantages of appending to a volume that already holds active data are:

- Fewer tapes are needed.
- If no active volume found, BRMS chooses one that is expired.
- It decreases the amount of tape volumes needed for the backup.
- You do not run out of volumes that easily, even if you forget to fill up with scratch volumes.

The disadvantages of appending to a volume that already holds active data are:

- For certain tape devices, save and recovery time is longer, and sometimes much longer.
- Tapes may be locked if saves with different retention periods exist on the same volume.
- Restore needs to handle more volumes.
- Restore time is longer.
- You may need a tape library device to use this function.
- There is a sequence limit for tape labels.

8.1.10 Text fields are searchable

When you create your control groups, make sure to take advantage of the search function in BRMS that lets you find your data by searching its text fields. For example, assume you have a control group with a text field like “Dans stuff”. Then you find all backups containing “Dans stuff” by typing `WRKMEDBRM TEXT(Dans stuff)`.

You can also override that text field when you submit the job. Text is one of the fields in the Add Job Scheduler Entries (ADDJOBSCDE) command that plugs directly into the BRMS information database. This comes in handy when you use the same control group for different purposes.

8.1.11 Other tasks you should do

There are two additional recovery tasks you must set up: a recovery contacts (people) list and a recovery list that points to a recovery contact person.

Recovery contacts

You should create a list of which people to contact in case of recovery. You need to know who they are and how you reach them outside office hours.

You can find this information by using the `GO BRMS` command. On the window that opens, select **Recovery**. On the next window, select **Work with Recovery Contacts**.

Recovery list

When you are done setting up the people to contact, create the activity to be carried out to prepare for actually restoring your data. For each activity, you can point to the contact persons that you previously created.

You can find this information by using the GO BRMS command. On the window that opens, select **Recovery**. On the next window, select **Work with Recovery Activities**.

Add each recovery activity you previously defined. For each activity, enter a hierarchy of contact names and an activity sequence number compared to other recover activities.

The list shows the order of activities that are needed to produce the shortest recovery time possible. Many of the activities can and should be carried out in parallel.

8.1.12 BRMS and journaling

BRMS in itself is journaled, so you do not need to specify any settings. As long as you run BRMS maintenance on a regular basis, it cleans up itself.

However keep in mind that the journaled files used in your applications are not always backed up. When doing a full save, journaled files are always saved. When saving changed objects (an incremental save in BRMS), journaled files, by default, are not saved. If you want journaled files to be saved during incremental saves, you need to change the Journaled objects parameter in the control group attributes, or the backup policy, to *YES.

8.1.13 BRMS environment variables

There are several BRMS operating environment variables that must also be set up, as described in the following sections. These include specifying:

- The job scheduling technique to be used by BRMS
- The starting time of a typical work day and the first day of a work week
- Exactly when to perform a system restart (IPL)
- Whether users have to sign off during a backup
- The message queue that should receive BRMS session messages

Selecting job scheduler

You can select a job scheduler of choice by typing the `GO BRMS` command, selecting option `10` (Scheduling) and on the next display, selecting option `3` (Change job scheduler). The default is the OS/400 job scheduler and its associated command set. Alternatively, you can use the Change Job Scheduler BRM (CHGSCDBRM) command.

Start of day

Start of day is a parameter in the system policy. It is primarily used to define a “working day” rather than follow the ordinary clock, changing the day at midnight. Before you start using this parameter, you must clearly identify what you mean by referencing. For example, for a “Wednesday backup”, do you mean a backup taken early Wednesday morning, which in fact is the data from Tuesday? Or is it really Wednesday’s data you want?

Keep in mind that you will find different information depending on where you look. In most places in BRMS, but unfortunately not everywhere, you see the working day date. In the operating system-related information, such as job logs, tape volume labels, etc., you find the actual time and day the data was written.

Note that the job schedulers also follow the system clock and are not related to any BRMS start-of-day clock.

Allowing IPL

You may set up your control groups to automatically launch an IPL when completed. To protect accidental IPLs, parameters in the System control group allow you to specify between which hours an IPL is allowed.

This is convenient when backups are run outside of their normal running scheme. A BRM1100 message is posted stating "`Current time xx.yy is not within the limit of xx.yy to xx.yy`" and then this step is skipped.

With the 5250 interface, you set this from the Work with System Policy (WRKPCYBRM *SYS) panel. In the iSeries Navigator client, to change it, right-click the **Backup Recovery Media Services** folder and select **Global Policy Properties**. Then select the **Global Policy Properties Power Down** tab.

First day of a week

In Presentation controls under system policy, you can change which day identifies start of the week. The default is *SUN. Changing to another day is a 5250 interface option only. In iSeries Navigator client, Sunday is always the first column.

Users exempted from signing off

Again from the System Policy panel, you can select which users are allowed to stay active although your control group specifies all users must sign off. Using iSeries Navigator, this setting is in Global variables.

Message notification

Another function is to specify which message queue BRMS targets for its messages. The default is QSYSOPR. To change this, right-click the **Backup Recovery Media Services** folder and select **Global Policy Properties**. Then select the **Global Policy Properties Notification** tab.

8.1.14 Functional usage

Functional usage allows you to secure BRMS functionality from the iSeries users. For example, an administrator can set up control groups and policies for read only.

The Set User Usage for BRM (SETUSRBRM) command via the 5250 interface has more of an overall functionality. To set up a tailored environment, you use the BRMS iSeries Navigator client.

The outcome is not the same in every part of BRMS. Users that are excluded may find certain functions removed from the BRMS panels. If they try to use the underlying command directly, they receive an error message.

Default Functional usage is a parameter in the system policy.

With Version 5 Release 2, you can specify these functions:

- Basic BRMS functions
- Backup
- Recovery
- Archive
- Migration and migration information
- Retrieval
- Media and media information
- Specific control groups
- Specific policies
- Specific lists

For more information, see Chapter 11 in *Backup Recovery and Media Services for iSeries*, SC41-5345.

8.2 Performing a system backup

You must back up system-related data to tape. There is no alternative. If you do not do this, you have to use an old, but still valid, system backup to recover your system's data portion. The only other alternative is to use the distribution CDs. Both of these options normally lead to loss of vital data that has been altered. You may also lose code corrections (program temporary fixes (PTFs)).

Attention: The iSeries operating system is divided in two parts: the OS/400 and its microcode. The two parts interact closely so there is great risk in taking them from different backups. You cannot predictable what such a system may run into when production starts.

The simple way is to use a BRMS control group that is already included in the product. This assumes you have no special routines to take down your applications. If you have, make a copy of the control group, name it something meaningful, and edit it using the steps needed to bring down your applications in a proper manner.

A SAVSYS backup contains:

- Microcode
- Operating system
- System configuration
- User profiles and authorities

8.2.1 Using BRMS

When you use BRMS for your system backup, you can run it in either attended mode or unattended mode as explained in the following sections.

In attended mode

In attended mode, you follow these steps:

1. Sign on the system console with a user profile with *SAVSYS and *IOCFG authority.
2. Enter the `GO BRMS` command.
3. On the displays that follow, select the following options in the order shown:
   a. Select option `2` (Backup).
   b. Select option `2` (Perform backup)
   c. Select `*SYSGRP`.
4. Enter the following command:

```
STRBKUBRM CTLGRP(*SYSGRP)
```

Running unattended

To run BRMS in unattended mode, follow these steps:

1. Submit a job to a console for monitoring:

```
SBMJOB CMD(STRBKUBRM CTLGRP(*SYSGRP) SBMJOB(*CONSOLE)) JOB(SYSBACKUP) JOBQ)(QCTL)
SCDDATE(XXXXXX) SCDTIME(YYYYYY)
```

2. From the system console, sign on with a profile that has *SAVSYS and *IOCFG authority. Make sure the device does not sign you off automatically (QINACTITV timer) and that it does not have the QSYSOPR message queue in break mode.
3. Enter the `GO BRMS` command.

4. On the displays that follow, select the following options in the order shown:
   a. Select option 2 (Backup).
   b. Select option 4 (Start console monitor).
5. Leave the console in that state until the backup operation is complete.
6. To return the console to normal operation, you need to know the password for the user profile with which you signed on.

8.2.2 System backup outside BRMS

You can also perform a system backup outside of BRMS. Fortunately BRMS keeps track of such an operation, but do not consider this as a regular option if you can avoid it.

You can back up the system outside BRMS by following these steps:

1. Shut down your applications properly.
2. Shut down your communications if needed by using the Vary Configuration (VRYCFG) command ... STATUS(*OFF) or perform the vary off as an option from the Work with Configuration Status (WRKCFGSTS) command interface for your communication objects that are in varied on or active status.
3. Shut down your system to a restricted state by entering the following command:

   ```
   ENDSBS *ALL OPTION(*IMMED or *CNTRLD)
   ```

4. Make a tape drive ready and enter the Save System (SAVSYS) command. As an alternative, you can use a menu by entering:

   ```
   GO CMDSAV
   ```

   Then select option 19 (Save system).
5. Start up everything again.

8.2.3 Using SAVSTG

There is a way to save your entire system at one time, by using the SAVSTG command. However we do *not* recommend this. This method runs outside operating system control and is used by hardware customer engineers who are performing system upgrades. It gives them the ability to go back and quickly recover a system in case something goes wrong.

SAVSTG copies everything bit-by-bit to tape in big blocks. The advantage is that it is fast and easy. The disadvantage is that it can only come back “as is”. Single object restore is not possible. The system must be exactly as it was when you made the save. No changes to the configuration are allowed.

SAVSTG is not meant for backing up systems. It is an engineer’s tool.

Attention: Under normal operating conditions BRMS protects a tape volume containing active saved data from being overwritten. BRMS cannot provide this protection if an active tape volume is used in conjunction with the SAVSTG command. This is due to the MSE interfaces to BRMS not being active when the SAVSTG command is run. *Never* use active BRMS volumes if you use the SAVSTG command.

8.3 Maintenance

To operate your system smoothly, you need to run the STRMNTBRM command. We recommend that you run this command on a daily basis. Among other things, this command deletes overdue information, cleans up log files, and other housekeeping. It also prints the recovery reports, which are vital if you have to do recovery outside of BRMS. It also tells which volumes you need to get BRMS back in operation so you don't have to do everything manually.

On daily basis, you must manage the volumes that are holding information about all your saves. This information is automatically placed on tape after each backup job unless you deliberately prohibit it from doing so.

8.3.1 Saving your recovery reports

The recovery reports hold key information for getting your data back in case of disaster. Make sure you print and store these reports in a safe place. The most practical is perhaps to store them together with the daily volume holding the BRMS inventory files that is equally essential as the instructions. You can also send them to another system. Only make sure you really can access them in case disaster strikes.

8.3.2 Making sure everything works

There are a several ways to determine whether everything is working and that you did not miss a step. To do this, you can enter any of the following commands:

- WRKMEDIBRM SAVSTS(*ERROR): Unsuccessful saves
- DSPLOGBRM TYPE(*BKU) SEV(40): All messages higher than 40
- DSPLOGBRM TYPE(*BKU) MSGID(CPF3771): Some objects did not save
- DSPLOGBRM TYPE(*BKU) MSGID(CPF3761): Locked objects
- DSPLOGBRM TYPE(*BKU) MSGID(BRM15A7): Backup ended with errors
- DSPLOGBRM TYPE(*BKU) MSGID(CPF3741): Object xxxx did not save
- DSPLOGBRM TYPE(*BKU) MSGID(CPF3774): All objects from *xxxx* were not saved
- DSPLOGBRM TYPE(*BKU) MSGID(CPF3778): All objects were not saved (summary message)
- DSPLOGBRM PERIOD((*AVAIL *BEGIN)) MSGID(BRM1993): Write protected volumes
- STRMNTBRM: Prints the Save Strategy Exception report (QP1ALE)

  After STRMNTBRM, you can enter DSPLOGBRM MSGID(BRM1570) to find the same information.

- WRKMEDIBRM CTLGRP(*NONE): Finds objects that are not included in any control group

8.3.3 Removing deleted records from BRMS inventory

Over time, there are deleted records in the BRMS inventory database. On a regular basis, you should remove these records to save disk space.

With Version 5 Release 2, the BRMS STRMNTBRM maintenance command performs this cleanup.

8.4 Disaster recovery

What must be done in case of a disaster recovery depends on what happened, the time it happened, and the time and resources you have available. Basically you follow the recovery list, which identifies the preparation steps and who to contact. For the actual recovery, follow the Recovering Your Complete System and Recovery Volume Summary Report. Their print file names are QP1ARCY and QP1ARCY2 respectively. You can find examples in Appendix B, “Backup Recovery and Media Services reports” on page 375. Make sure you have access to the latest recovery reports.

You may run into a situation where you have no application to help you restore your system. Make sure that you always have access to the latest recovery reports. They contain every step in sequence to bring back your system in operation.

8.4.1 Files in wrong order

In the native part of an iSeries server, there are physical files. In addition there are logical files that reference those physical files. All objects and files are saved in alphabetic order. In a production system, you normally find files in one library reference files in other libraries. In an up and running system, that is acceptable. The system uses pointers to link to the correct record, but in case of disaster recovery, this sometimes causes a problem.

Restoring your data is also done in alphabetical order. A file that references a file that is not yet restored, does not restore since its pointers cannot be resolved. In this case, you receive a CPF3756 or a CPF3773 message.

In a disaster recovery situation, you do not want to run into such a situation. Therefore, plan for it in advance. The easiest way to know is to run a query over the file QADBFDEP in QSYS. Then check if the field BDFLIB is less than DBFLDP. If you find such relations, you must take precautions. To enhance the query, you can exclude system libraries in your selection. Cross referencing problems in those parts of the system is sorted out by the operating system.

To get around the files being in the wrong order, you can:

- Restore the affected files once more.
- Change the order for how you back up your libraries. That is you have a strict one-to-one relation and you do not have a cross-reference situation.
- Save the affected files one more time, and then BRMS makes sure they are restored last.
- If they are big, exclude and place them last in your backup or in a separate job.

8.5 Creating media classes or media pools

Every tape volume need to be linked to a media class. Therefore, before any volume can be added, media classes have to exist. In the iSeries Navigator client, they are named *media pools*.

Tape volumes must still be defined in BRMS for the data that cannot be placed on the IBM Tivoli Storage Manager server. For ease of operation, you should have a separate media class for managing the IBM Tivoli Storage Manager volumes. In case of disaster recovery, it is practical to have a media class to save the actual IBM Tivoli Storage Manager server environment.

We recommend that you at least have these three media classes:

- Data that has to go directly to tape
- Managing the IBM Tivoli Storage Manager volumes (safety aspect)
- Saving the IBM Tivoli Storage Manager environment (recovery aspect)

Note: When BRMS is initialized, it automatically creates media classes related to the hardware that is installed.

8.6 Creating a media class (pool)

To create a media class or media pool, follow the steps presented here. You can also refer to Chapter 6, “Next steps: Getting the IBM Tivoli Storage Manager server ready for production” on page 93, for more information.

Note: Using the BRMS 5250 interface mode, creating a media class is an option from the Work with Classes menu. It is not a command. You will not find an Add option under the iSeries Navigator client Media pools icon.

1. Launch the BRMS iSeries Navigator client and log on to the iSeries server.
2. Expand **Backup, Recovery and Media Services-> Media**. Select **Media Pools**.
3. In the right panel, right-click the media pool icon that matches your media type and select **New Based on** (see Figure 8-8).

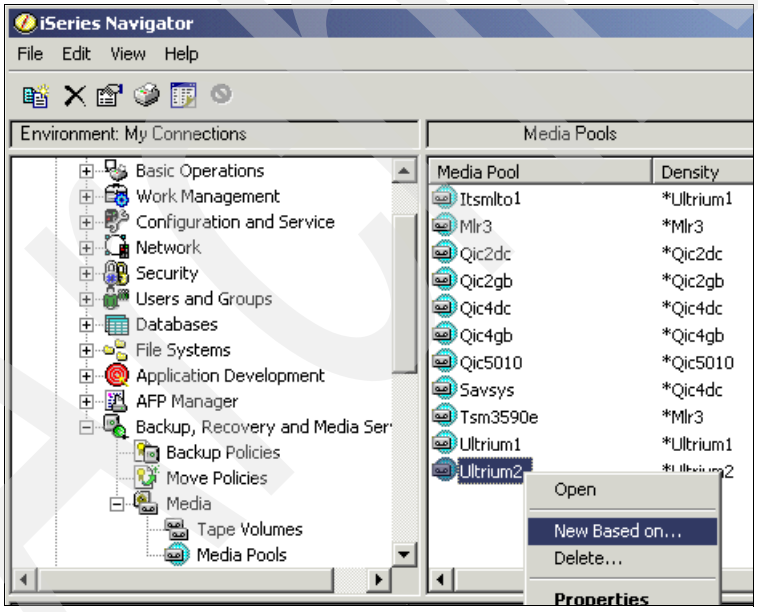

Figure 8-8 Selecting New Media Class based on for the media pool

4. In the New Media Pool Based on window (Figure 8-9), enter a name and description for the media pool.

   Note that you only select the Share media across systems option if you are in a BRMS network. When complete, click **OK**.

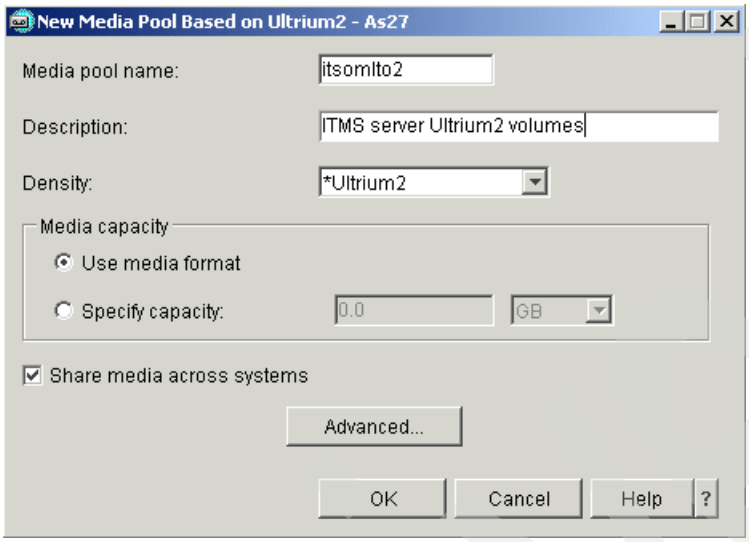

Figure 8-9 Creating a new media pool

5. You return to the Media Pools window shown in Figure 8-8. Press F5 to refresh the window.
6. Repeat this procedure until you create all your media pools.

8.7 Adding media to the pool

You now have a media pool and want to add media to it.

8.7.1 Adding media using a tape library device

To add media using a tape library device, follow these steps:

1. In iSeries Navigator, select **Backup, Recovery and Media Services-> Media-> Tape Volumes**. Right-click **Tape Volumes** and select **Add**. See Figure 8-10.

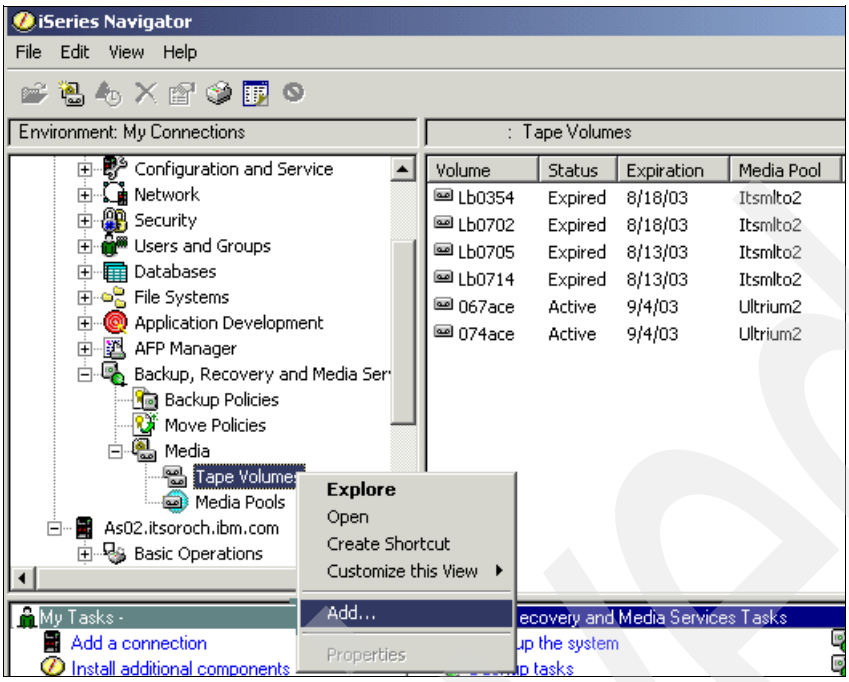

Figure 8-10 Selecting the option to add media

2. On the Welcome wizard window that opens, click **Next**.
3. In the Add Media - Select Media Pool window (Figure 8-11), select the pool that you created. Click **Next**.

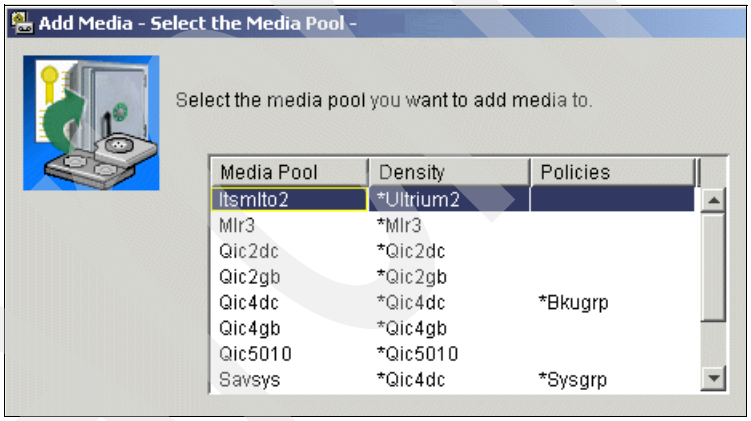

Figure 8-11 Add Media - Select the Media Pool window

Note: If you select a pool that does not have a library device, the next window does not appear. Then you must manually add tape volumes.

4. In this example, there is a tape library device. On the Add Media - Display Media Library Volumes window (Figure 8-12), select **Yes** and choose a library device if you have more than one. Click **Next**.

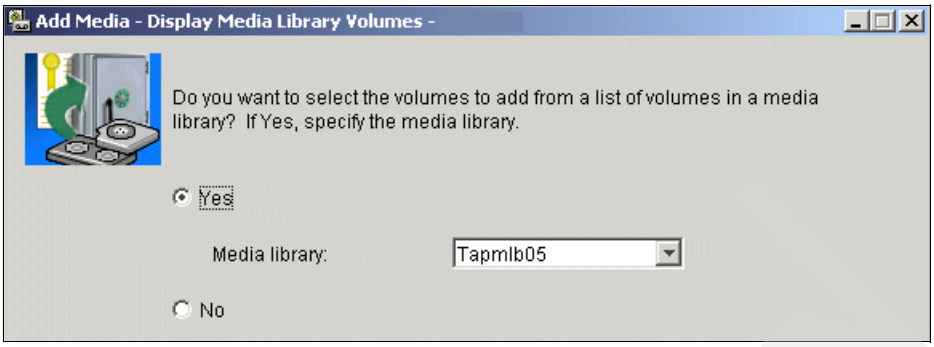

Figure 8-12 Add Media - Display Media Library Volumes window

5. After you physically insert your volumes, you can take advantage of the library. On the Add Media - Specify Media Library Category window (Figure 8-13), select **All inserted volumes**, which is the default (for example, those with the Category INSERTED). Click **Next**.

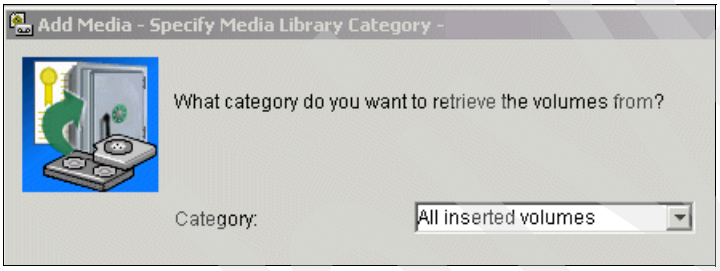

Figure 8-13 Add Media - Specify Media Library Category window

6. On the Add Media - Select Media Library volumes window (Figure 8-14), select each volume to add and click **Add**.

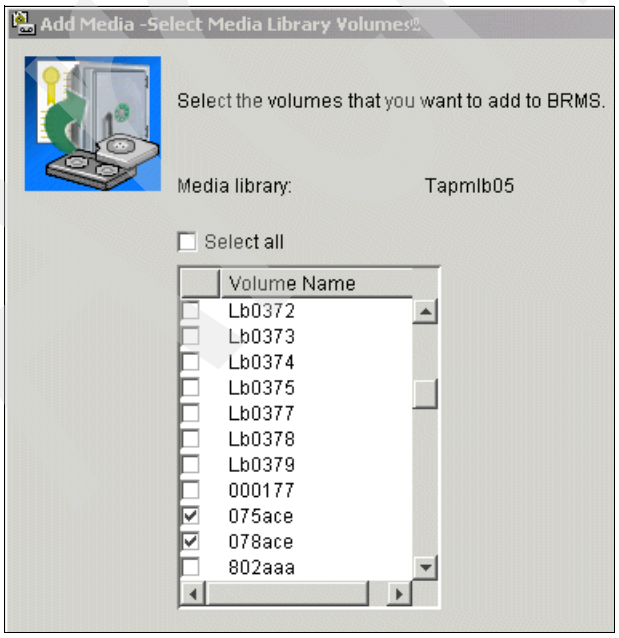

Figure 8-14 Add Media - Select Media Library Volumes window

7. The new volumes should be initialized. On the Add Media - Initialize Volumes window (Figure 8-15), select the volumes to initialize if required. Click **Next**.

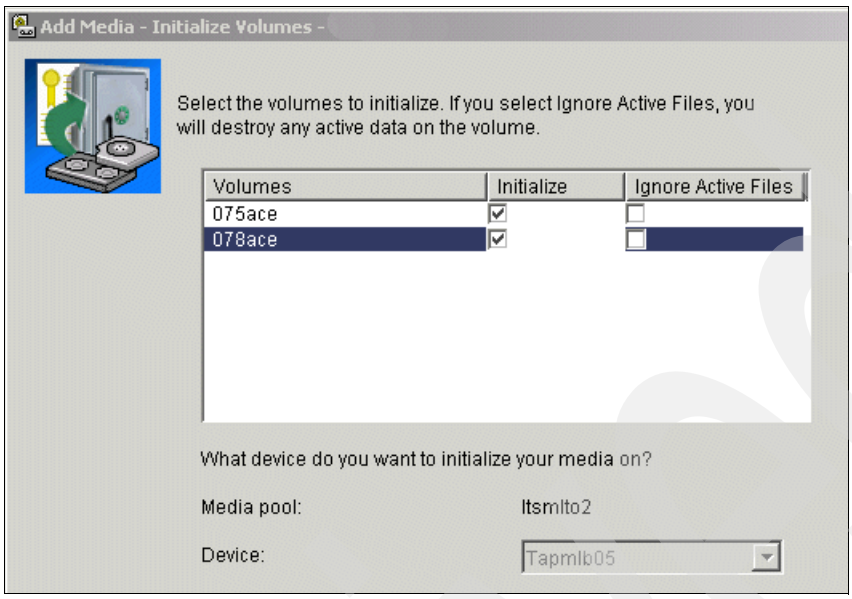

Figure 8-15 Add Media - Initialize Volumes window

8. On the Add Media - Summary window (Figure 8-16), review the summary details. If you change your mind about some of the details, you may click **Back** to change them. Since you are done adding media, click **Finish**.

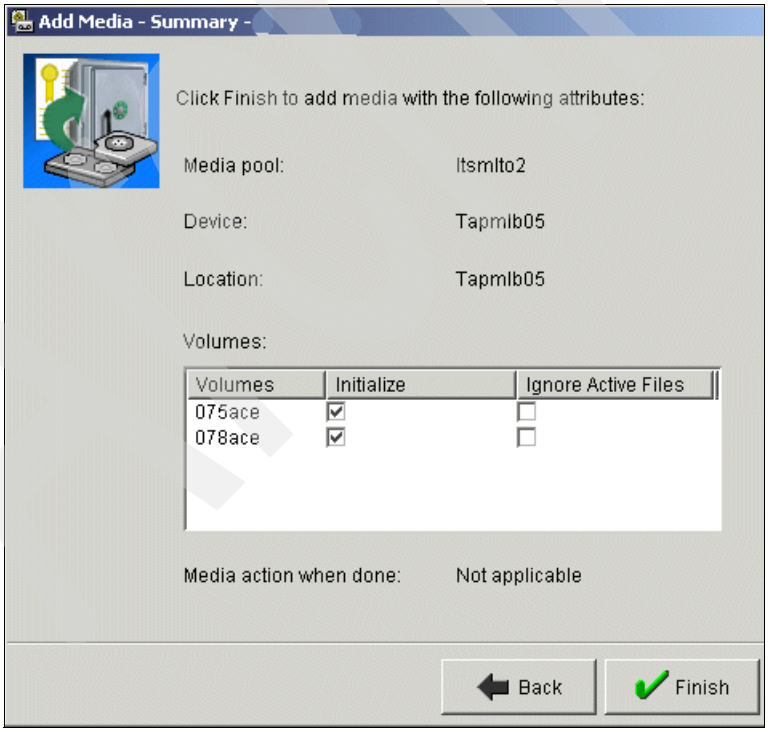

Figure 8-16 Add Media - Summary window

8.7.2 Removing media

To remove volumes from BRMS, follow these steps as shown in Figure 8-17:

1. Select **Backup, Recovery and Media Services-> Media-> Tape Volumes**.
2. Right-click **Tape volumes** and select **Remove Backup, Recovery and Media Services-> Media-> Tape Volumes**. Right-click **Tape Volumes** and select **Remove**.
3. Confirm the removal.

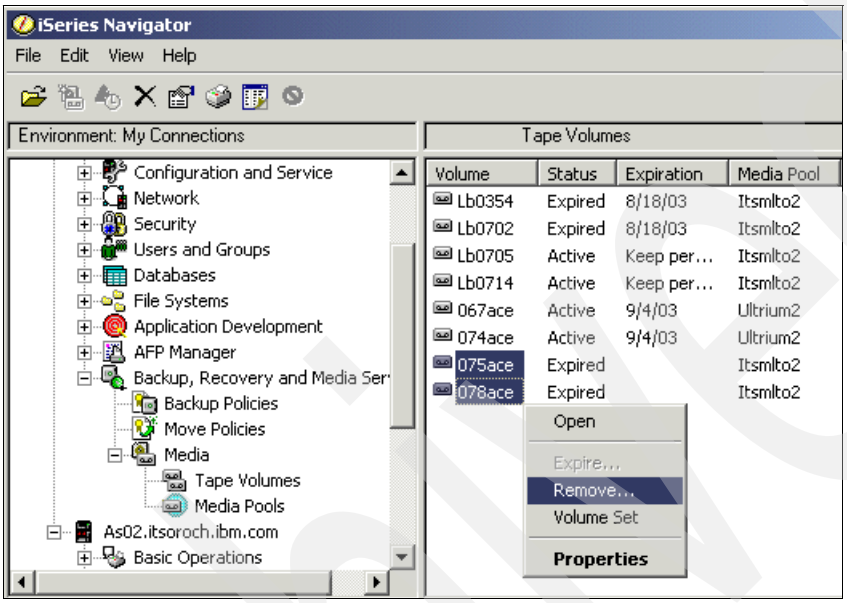

Figure 8-17 Removing media

8.7.3 Manually adding media

Adding volumes manually is essentially the same as adding them using a media library. The difference is that this time, you select *No* for a media library.

Note: Volumes do not have to exist when you add them. However, BRMS assumes that they exist in the location specified.

1. As shown in Figure 8-18, select **Backup, Recovery and Media Services-> Media-> Tape Volumes**. Right-click **Tape Volumes** and select **Add**.

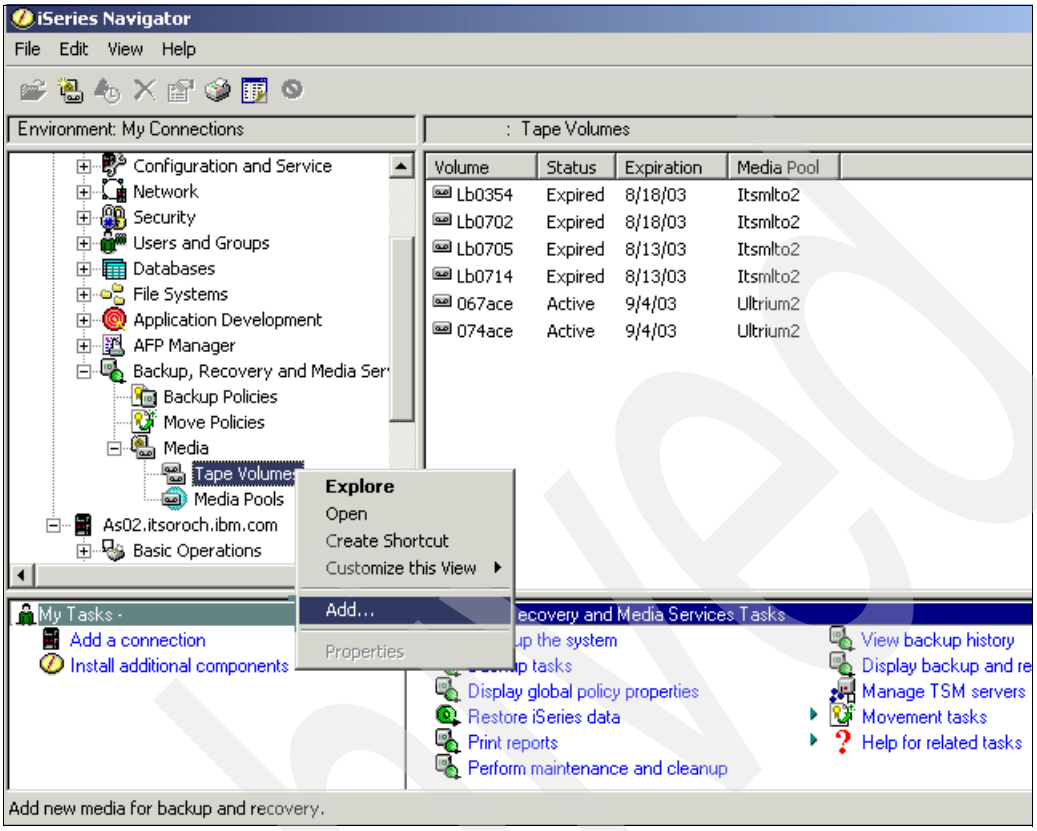

Figure 8-18 Adding media

2. On the Add Media - Select the Media Pool window (Figure 8-19), select your media pool. Click **Next**.

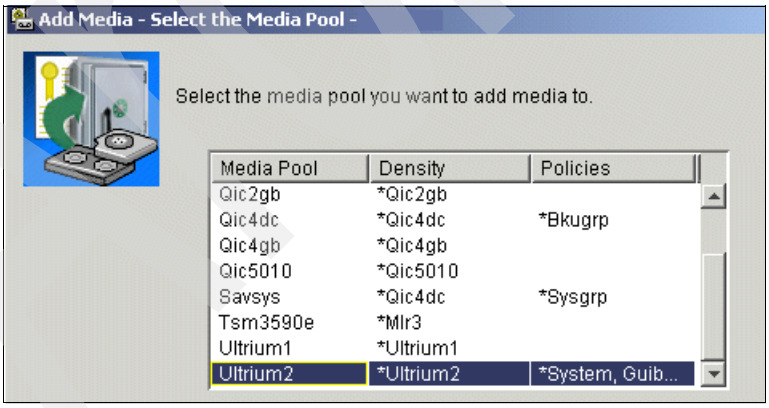

Figure 8-19 Add Media - Select the Media Pool window

3. On the Add Media - Add Volumes window (Figure 8-20), in the Volume name or prefix field, type the volume name or volume prefix characters. Click **Next**.

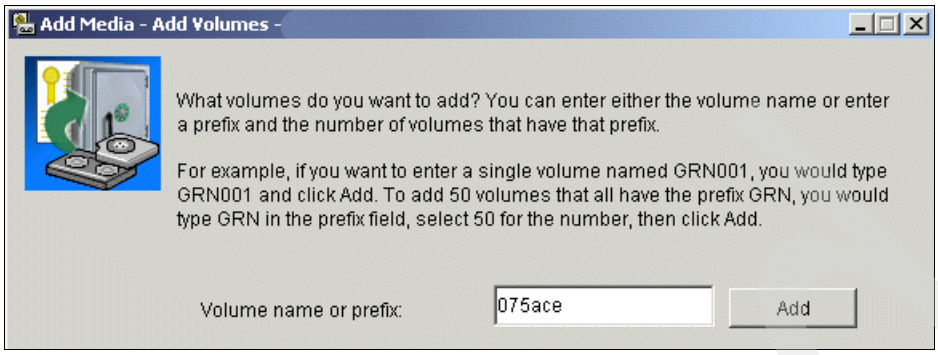

Figure 8-20 Add Media - Add Volumes manually window

4. After you add the volumes, you see a window that provides the option for you to initialize.
5. Follow and complete the steps for the remaining windows until you finish manually adding the media volumes.

8.8 Save scenario examples

This section presents two save examples. In one example, the IBM Tivoli Storage Manager environment is saved. In the other example, OS/400 data is saved.

8.8.1 IBM Tivoli Storage Manager server example

This example assumes that you have an IBM Tivoli Storage Manager server running in your iSeries server. To save the IBM Tivoli Storage Manager server environment, you must save:

- Two directories from IFS including their subdirectories:
  - /tsmvol (containing the data)
  - /usr/tivoli/tsm/server (containing the server code)
- The library where you created the CL or C programs for the tape exits needed. In our example, this is TSMEXITS, but it can be any name. Remember that IBM Tivoli Storage Manager can request tape volumes from BRMS.
- The IBM Tivoli Storage Manager program code library QTSM

  Since this is an IBM Program product, it is not selectable as a single entity. Either you can choose to save all program products within this job, or you can leave the QTSM library to be included in your system save. Remember, regardless of what you decide, BRMS always points out where you can find the latest copy.

Backup control group versus backup policy: The BRMS iSeries 5250 interface uses the term *backup control group*. The BRMS iSeries Navigator client uses the term *backup policy*.

Creating a link list pointing to /tsmvol and /usr/tivoli/tsm/server

First you must create a link list that points to /tsmvol and /usr/tivoli/tsm/server as explained here:

1. As shown in Figure 8-21, select **Backup, Recovery and Media Services-> Backup Policies**. Right-click **Backup Policies** and select **New Policy**.

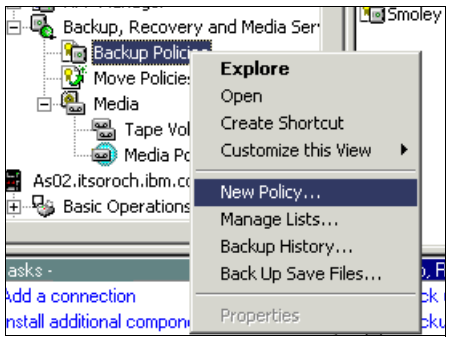

Figure 8-21 Selecting Backup policies-> New Policy

2. On the New Backup Policy - Backup Policy Name window (Figure 8-22), enter a name and description. Click **Next**.

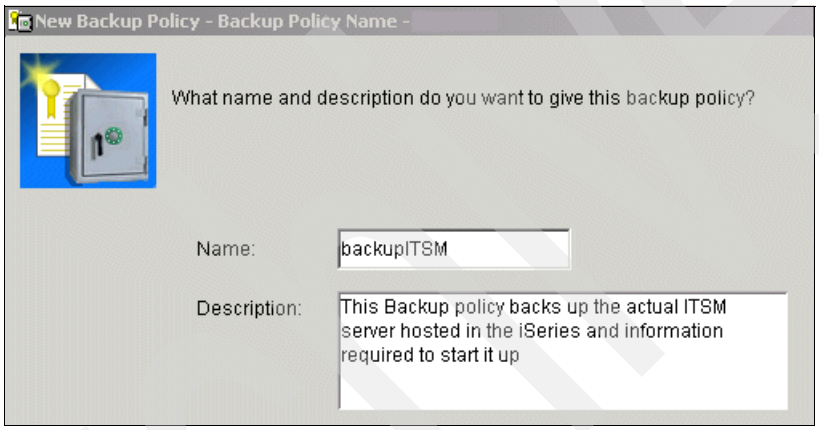

Figure 8-22 New Backup Policy - Backup Policy Name window

3. On the New Media Pool Based on window (Figure 8-23), enter a media pool name and description. Select the density. For Media capacity, select **Use media format**. Click **Next**.

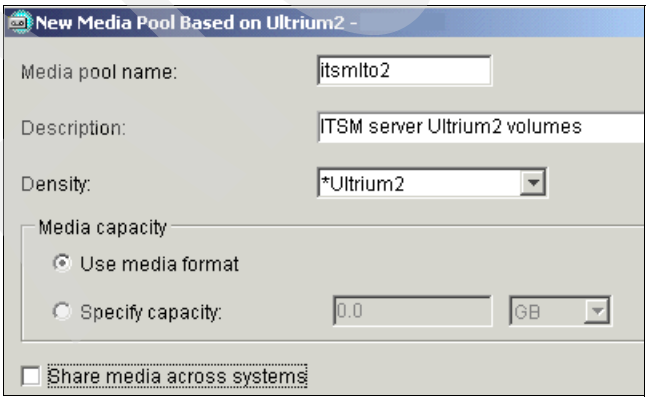

Figure 8-23 New Media Pool Based on window

4. On the New Backup Policy - Select Items for Backup window (Figure 8-24), from the IFS tree, select the directories **/tsmvol** and **/usr/tivoli/tsm/server** as shown. Click **Next**.

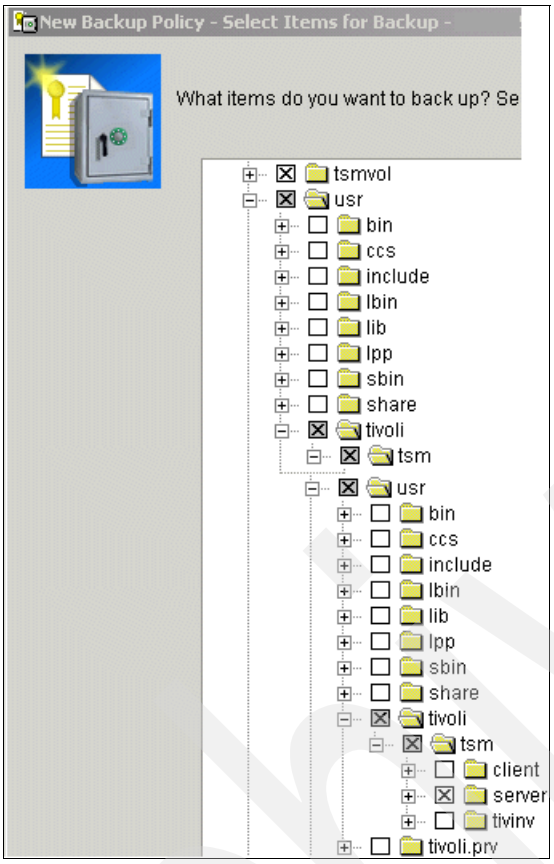

Figure 8-24 New Backup Policy - Select Items for Backup window

5. On the New Backup Policy - Create Directories List window (Figure 8-25), enter a name and description for the directory list. Select the **Include all subdirectories** option. Click **Next**.

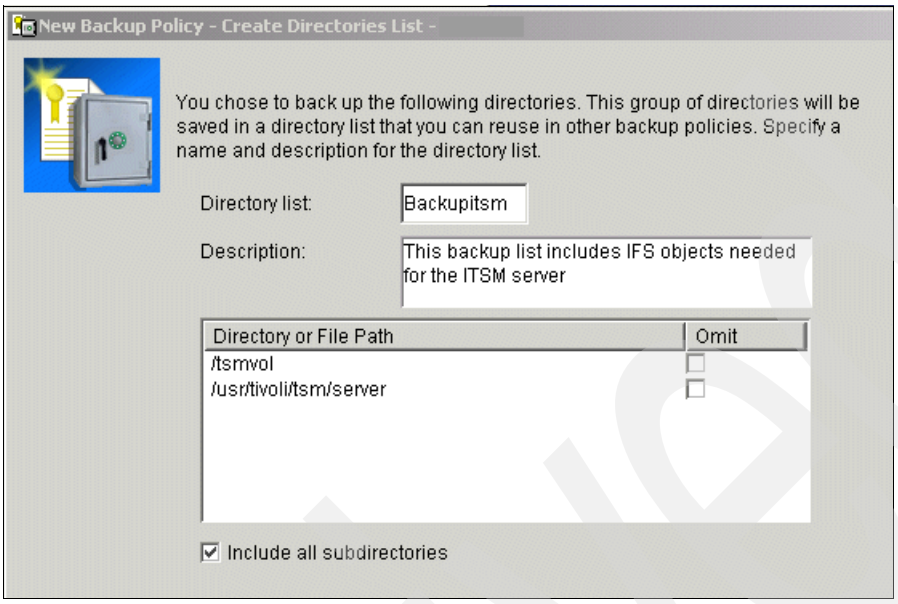

Figure 8-25 New Backup Policy - Create Directories List window

6. On the New Backup Policy - Backup Order window (Figure 8-26), confirm the items that you want to back up. Click **Next**.

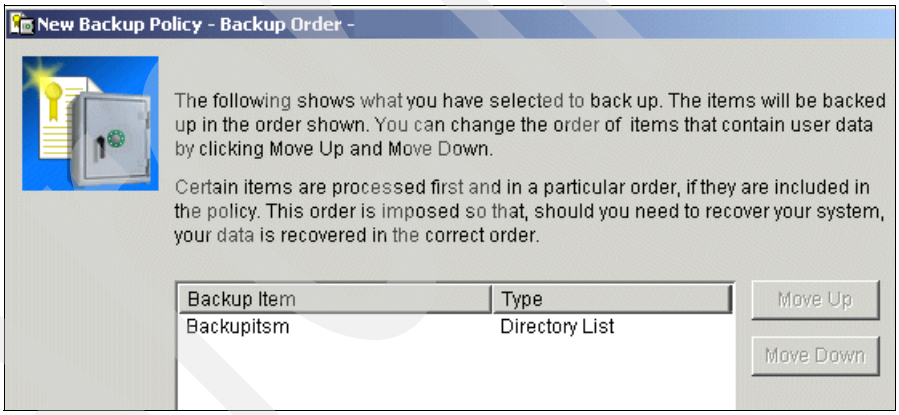

Figure 8-26 New Backup Policy: Backup Order

7. On the New Backup Policy - Backup Activity window (Figure 8-27), select whether you want a full backup, incremental backup, or both. In this example, we select **Full backup** and **Changes since last full backup (cumulative)**. Click **Next**.

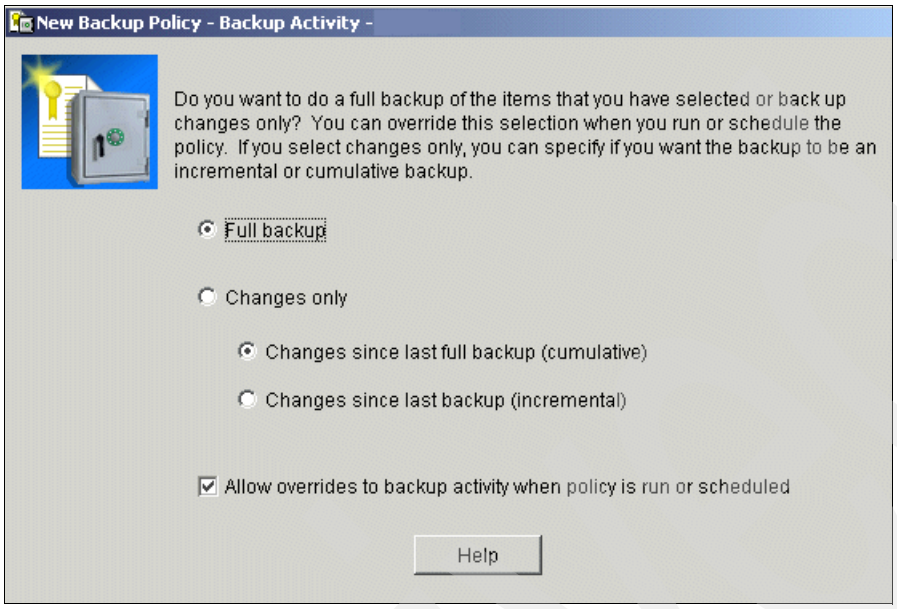

Figure 8-27 New Backup Policy - Backup Activity window

8. On the New Backup Policy - Media Retention window (Figure 8-28), specify the retention period. Click **Next**.

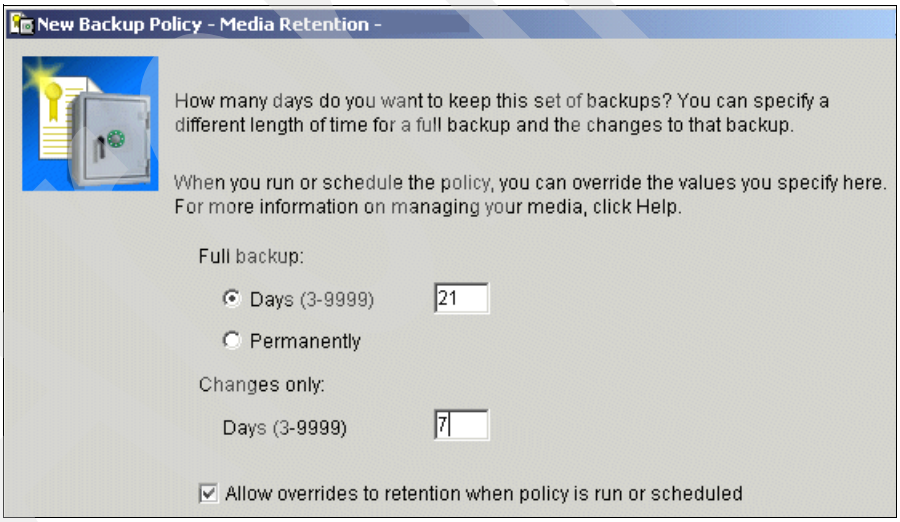

Figure 8-28 New Backup Policy - Media Retention window

9. On the New Backup Policy - Select Backup Devices window (Figure 8-29), follow these steps:

   a. Select a media policy.

> **Note:** Remember that we are not saving any data to be sent to the IBM Tivoli Storage Manager server, but the IBM Tivoli Storage Manager server itself. Therefore, we choose a suitable media pool for tape.

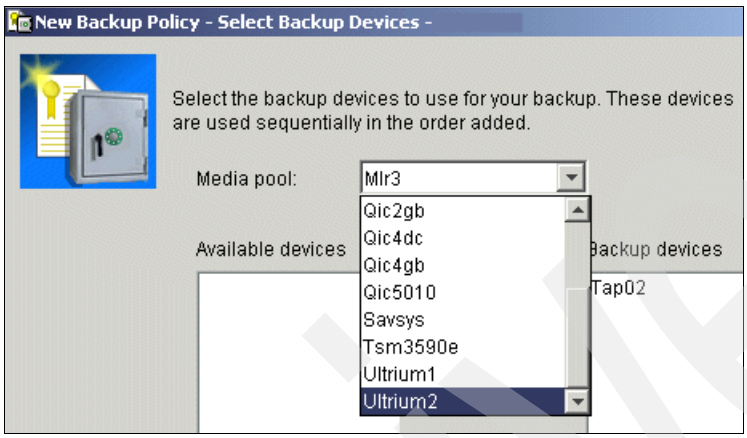

Figure 8-29 New Backup Policy - Select Backup Devices window (Part 1 of 2)

   b. Under Available devices, select a tape drive for this media pool and click **Add**. In this example, we selected **TAPMLB05** (our tape library device). See Figure 8-30.

   c. Click **Next**.

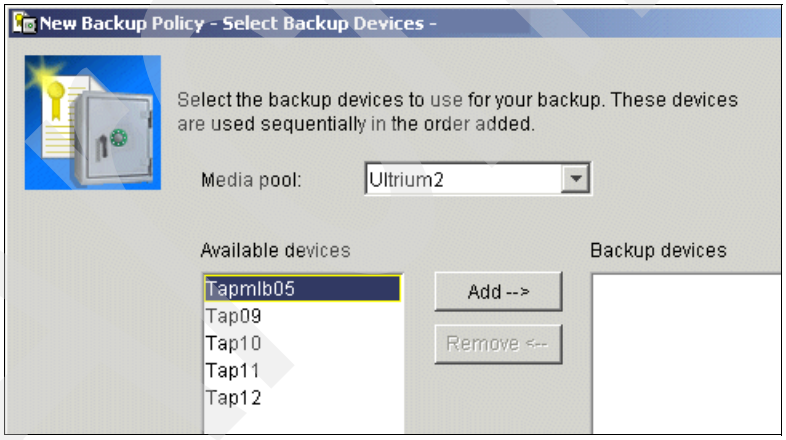

Figure 8-30 New Backup Policy - Select Backup Devices window (Part 2 of 2)

10. On the New Backup Policy - Add Media window (Figure 8-31), specify whether you want to add media. Click **Next**.

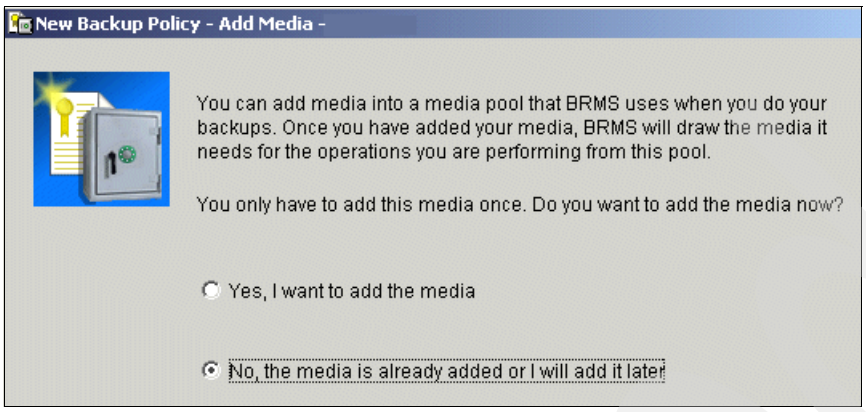

Figure 8-31 New Backup Policy - Add Media window

11. On the New Backup Policy - Summary window (Figure 8-32), review the summary details. Click **Back** if you need to make any changes, or click **Finish**.

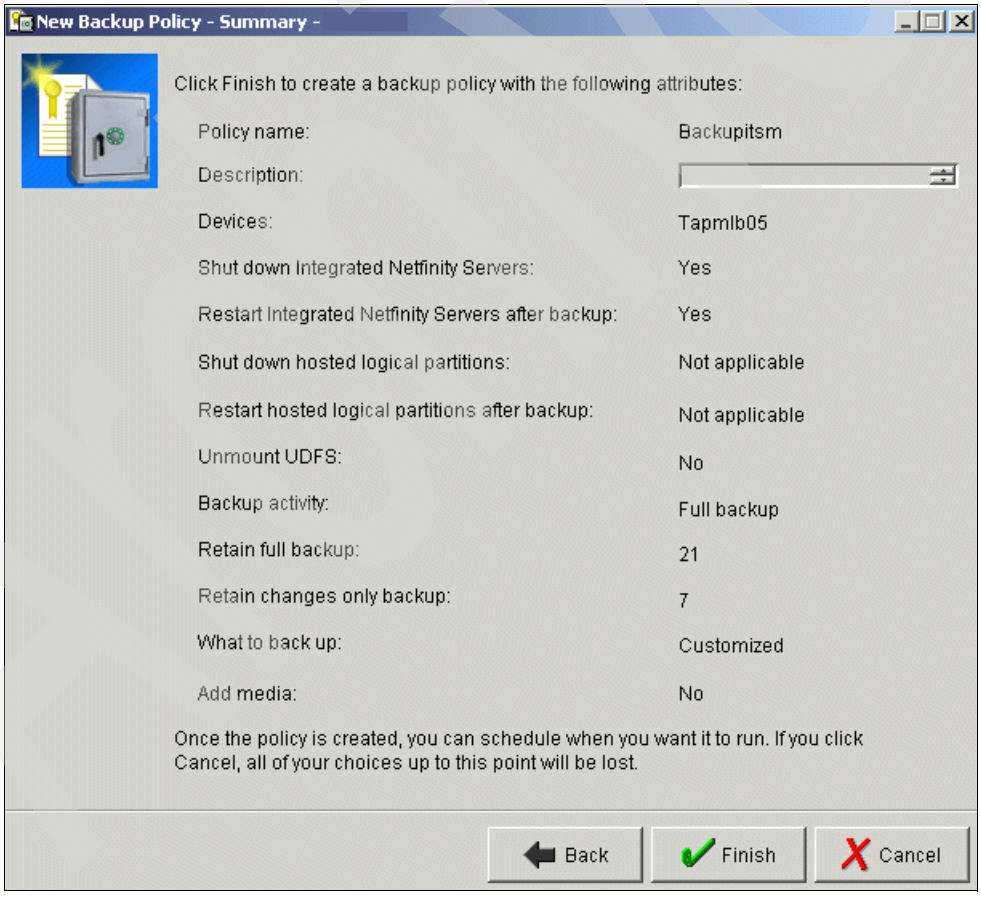

Figure 8-32 New Backup Policy - Summary window

Adding OS/400 library TSMEXITS to the backup policy

Next we add the iSeries user created library TSMEXITS to the backup policy (backup control group):

1. As shown in Figure 8-33, select **Backup, Recovery and Media Services-> Backup Policies**.
2. In the right panel, right-click the policy (**Backupitsm** in this example) and select **Properties**.

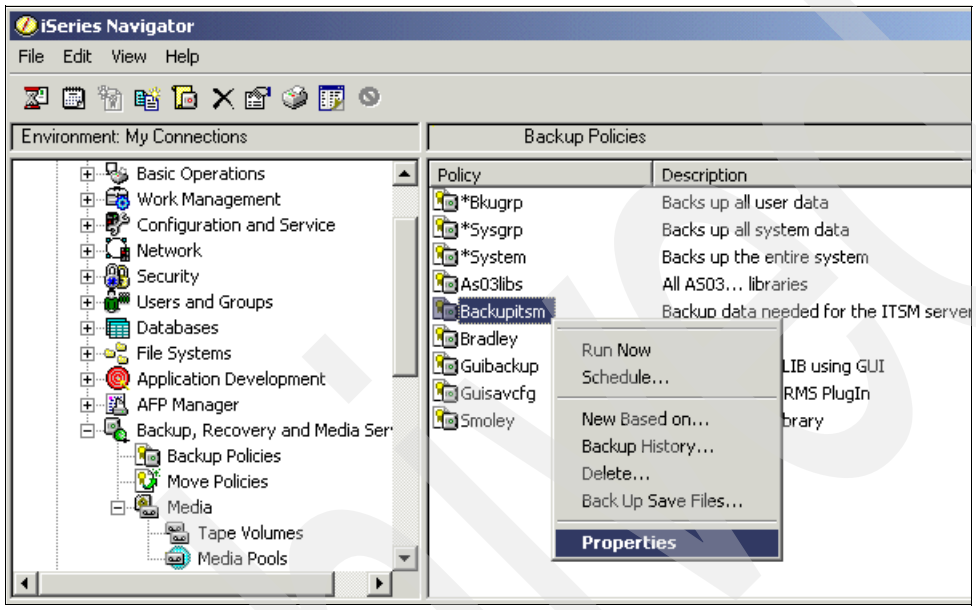

Figure 8-33 Selecting Backup Policies-> Properties

3. On the Properties window (Figure 8-34), click the **During** button.

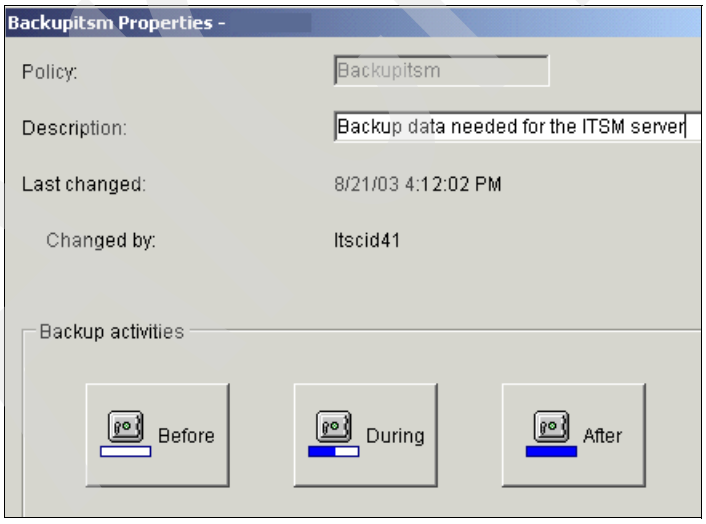

Figure 8-34 Properties window

4. On the Properties - During Backup window (Figure 8-35), click **Add** to add a new entry. In this example, the line that contains Backupitsm is highlighted. You also have the option to remove this entry.

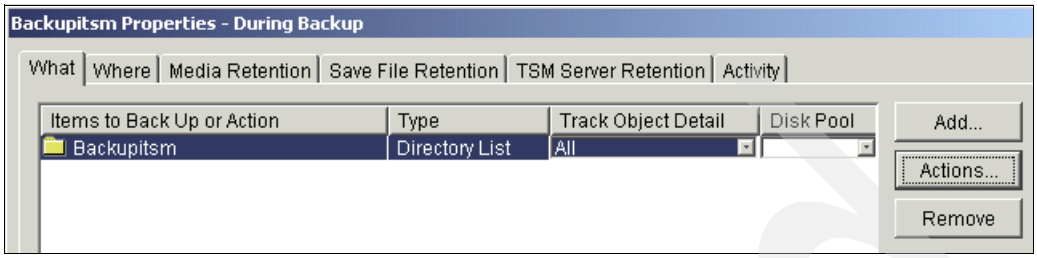

Figure 8-35 Properties - During Backup window

5. The Add button opens the Add Backup Items wizard. On the wizard window (not shown), we chose **Select specific items for backup**. Click **Next** to see the iSeries IFS folders.
6. On the Select Items for Backup window (Figure 8-36), scroll down and expand **QSYS.LIB**.

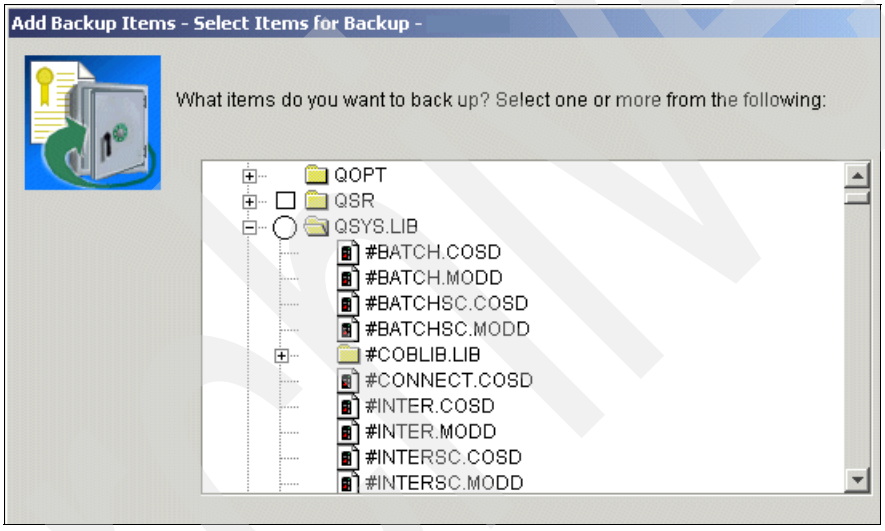

Figure 8-36 Add Backup Items - Select Items for Backup window (Part 1 of 2)

7. As shown in Figure 8-37, select the library **TSMEXITS.LIB**. Click **Next**.

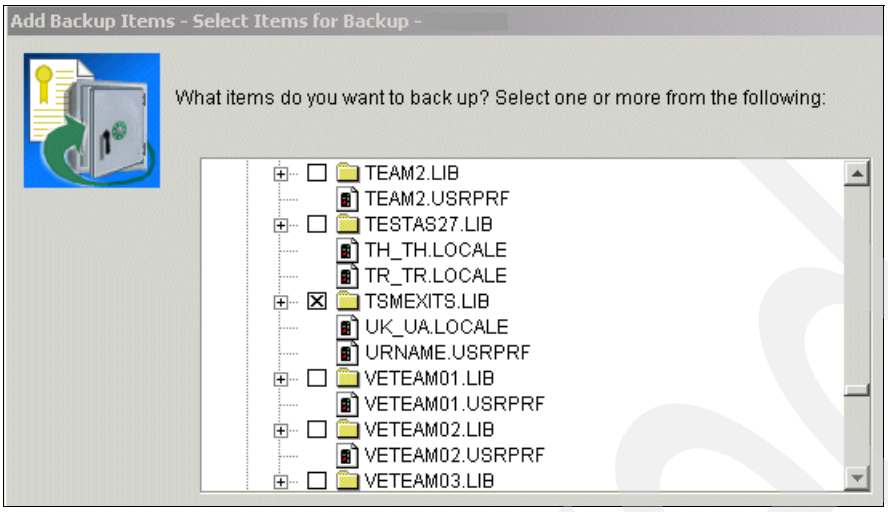

Figure 8-37 Add Backup Items - Select Items for Backup window (Part 2 of 2)

8. Review the Summary window (Figure 8-38). Click **Back** to modify your settings or click **Finish**.

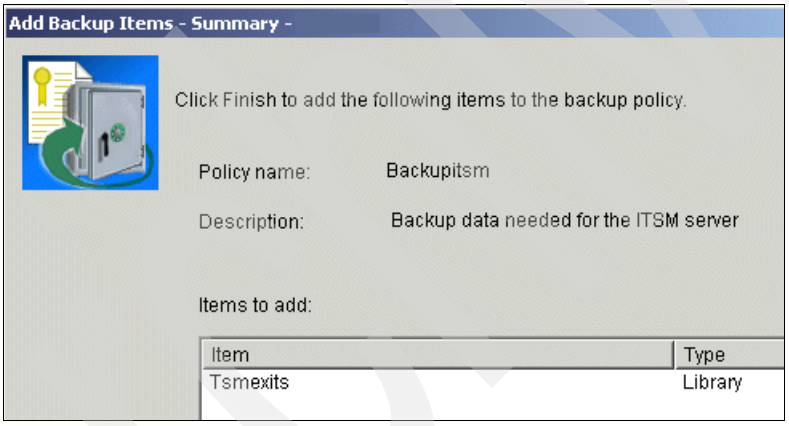

Figure 8-38 Add Backup Items - Summary window

9. On the Properties - During Backup window (Figure 8-39), you can see the Backupitsm item that we added. Click **OK** and you return to the Backupitsm Properties window (Figure 8-34 on page 194).

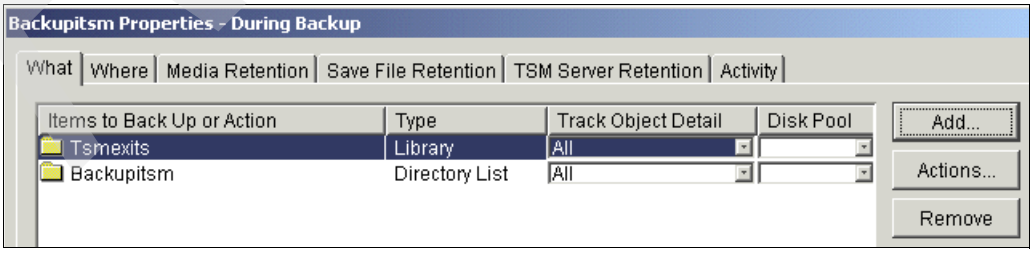

Figure 8-39 Backupitsm example: Properties - During Backup with the new item added

You are done with the During Backup activities. You may want to check the options on the other tabbed pages in case you want to change anything at this point.

The properties on the TSM Server Retention tab do not really apply, considering the following points:

- In this control group, we do not save data to the IBM Tivoli Storage Manager server to store it for us.
- The IBM Tivoli Storage Manager server is actually running on the iSeries server.
- We intend to save the IBM Tivoli Storage Manager server configuration.

Other actions to complete the backup policy

Now specify what to back up and what to consider. First, you must decide what to do before and after the actual save takes place.

1. On the Backupitsm Properties window (Figure 8-34 on page 194), click the **Before** button.
2. There is no need to sign off interactive users. However, make sure that none of the integrated or hosted servers are marked for shutdown. You need to run a job to take down the IBM Tivoli Storage Manager server before you can back it up.

   On the Backupitsm Properties - Before Backup window (Figure 8-40), enter the OS/400 command name. Click **OK** to return to the Backupitsm Properties window.

   Note: In our example, our command has no parameters. ENDTSMSRV is user created. If the command is outside your library list, you also have to specify where it is to be found. In our example, this is TSMEXITS/ENDTSMSRV.

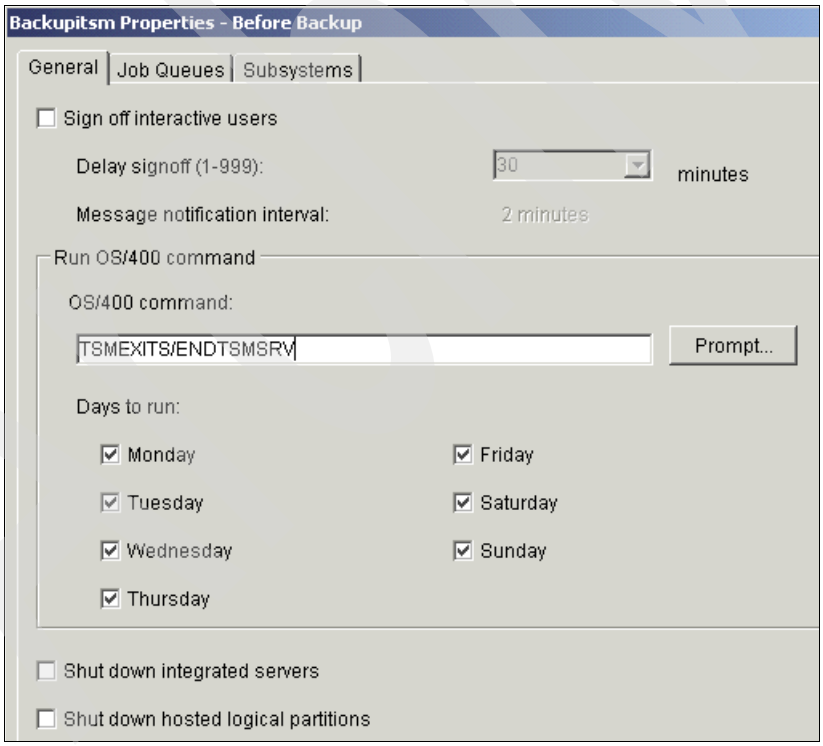

Figure 8-40 Properties - Before Backup window

3. On the Backupitsm Properties window (Figure 8-34 on page 194), click the **After** button.
4. You may only need to specify to start the IBM Tivoli Storage Manager server after the backup is finished. In the Backupitsm Properties - After Backup window (Figure 8-41), in

the OS/400 command field, type the name of the command that will start the IBM Tivoli Storage Manager server. Click **OK**.

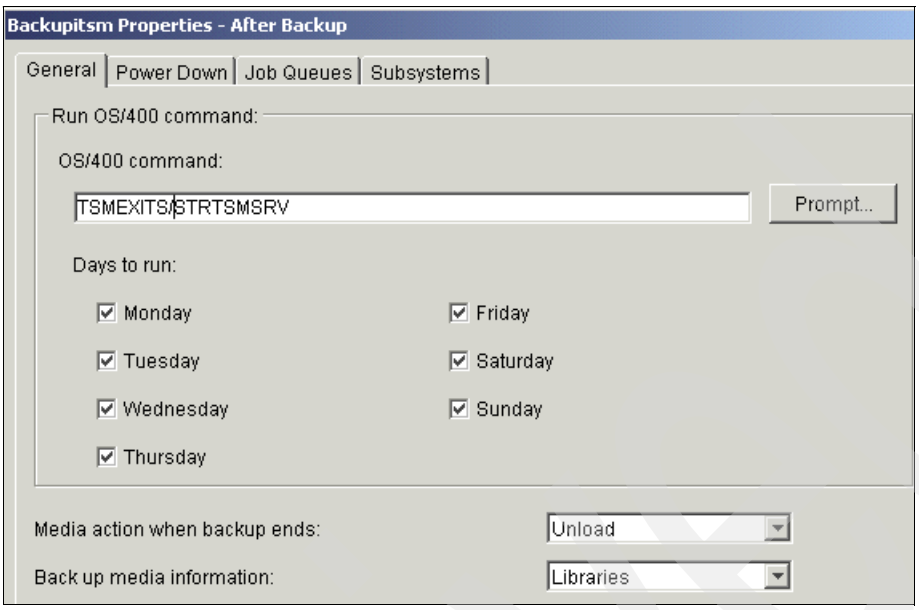

Figure 8-41 Properties - After Backup window

The control group is complete and ready to run. However, there is no move policy attached to it yet. If this setup is going to run regularly, attach a move policy. Since no locations are specified yet, it is too early to attach a move policy.

8.8.2 Saving native OS/400 data to an IBM Tivoli Storage Manager server

In this example, you create a control group that saves all AS03 libraries. You can do this either to tape or to an IBM Tivoli Storage Manager server.

Due to the BRMS iSeries Navigator client logic, it always starts creating an environment for tape. If at this point you do not have an IBM Tivoli Storage Manager server running, you must keep the setup for tape and skip steps 14 on page 206 through 17 on page 207. Later you can change the group from tape to IBM Tivoli Storage Manager.

Note: The BRMS iSeries Navigator client is not restricted to selecting one item at a time. You can do it all in one flow. This example only shows how to save a group of iSeries libraries.

1. As shown in Figure 8-42, select **Backup, Recovery and Media Services-> Backup Policies**.
2. Right-click **Backup Policies** and select **New Policy**.

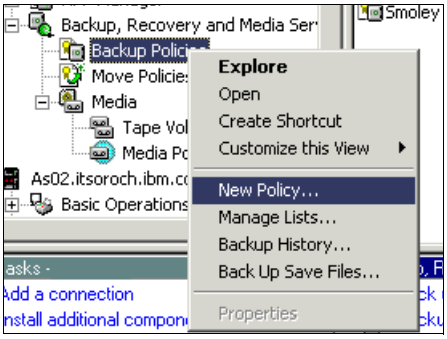

Figure 8-42 Selecting Backup Policies-> New Policy

3. On the New Backup Policy - Backup Policy Name window (Figure 8-43), enter a name and description. Click **Next**.

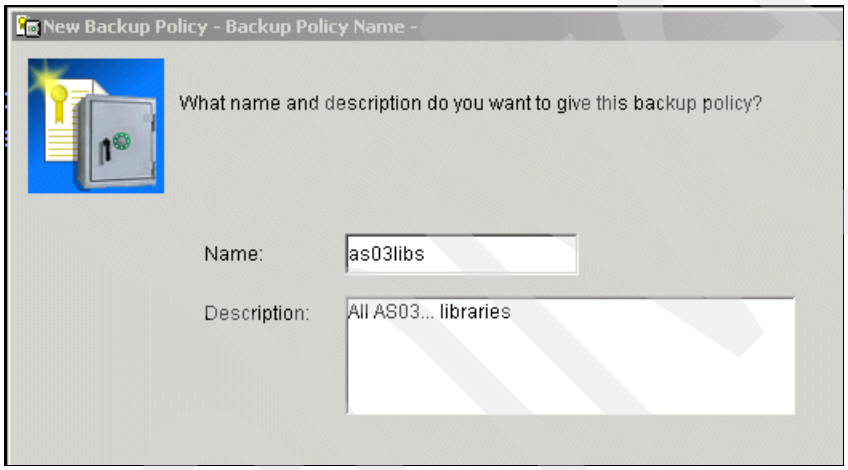

Figure 8-43 New Backup Policy - Backup Policy Name window

4. On the New Backup Policy - Select a Backup Strategy window (Figure 8-44), specify the type of data for the policy to back up. In this example, we selected **Back up a customized set of objects**. Click **Next**.

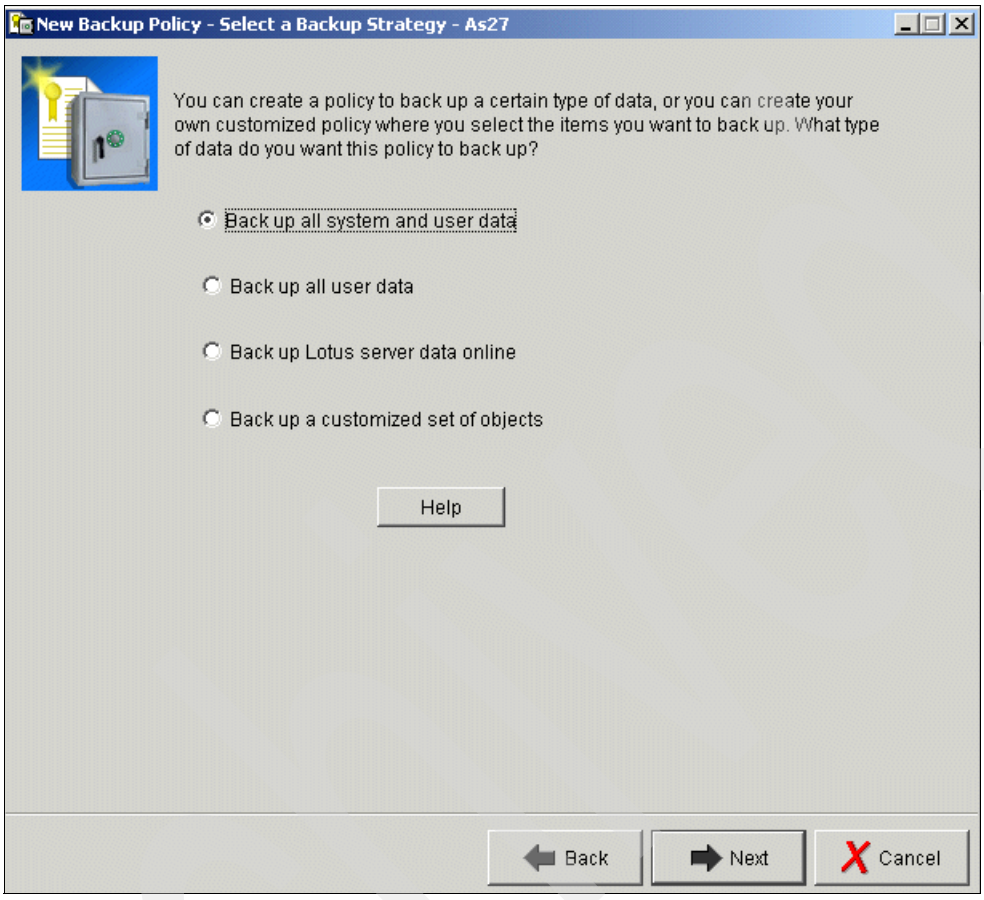

Figure 8-44 New Backup Policy - Select a Backup Strategy window

5. On the New Backup Policy - Customize IBM Data or User Data window (Figure 8-45), specify the type of information you want to back up. In this example, the AS03 libraries are user data so we selected **User data**. Click **Next**.

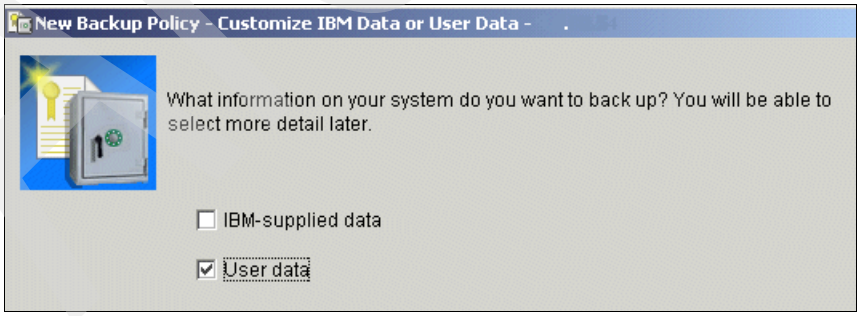

Figure 8-45 New Backup Policy - Customize IBM Data or User Data window

6. On the New Backup Policy - Customize User Data window (Figure 8-46), you can select the user data to back up or you can select specific items to backup up. Since we are saving a range of ordinary iSeries libraries, we selected the **Select specific items for backup** option. Click **Next**.

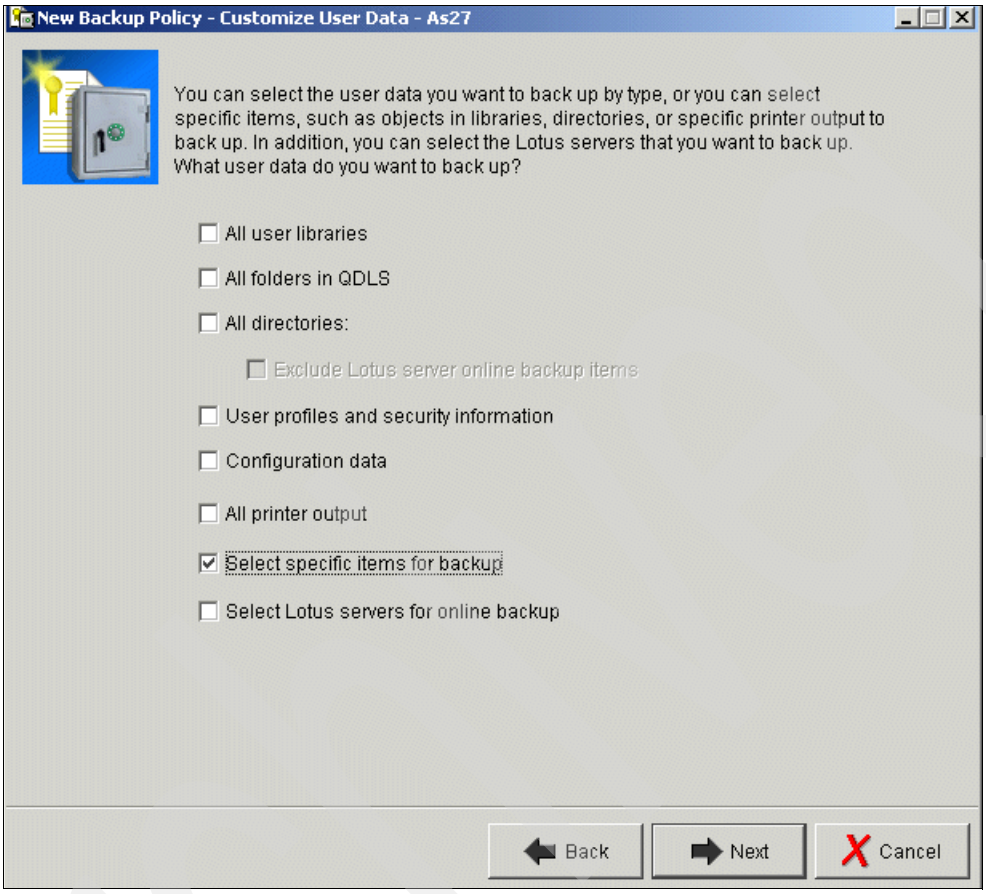

Figure 8-46 New Backup Policy - Customize User Data window

7. On the New Backup Policy - Select Items for Backup window (Figure 8-47), specify the items you want to back up. The objects that are presented only contains IFS objects. You can use this route and expand QSYS.LIB and select all the AS03 libraries. Alternatively you can click the **Specify Generics** button.

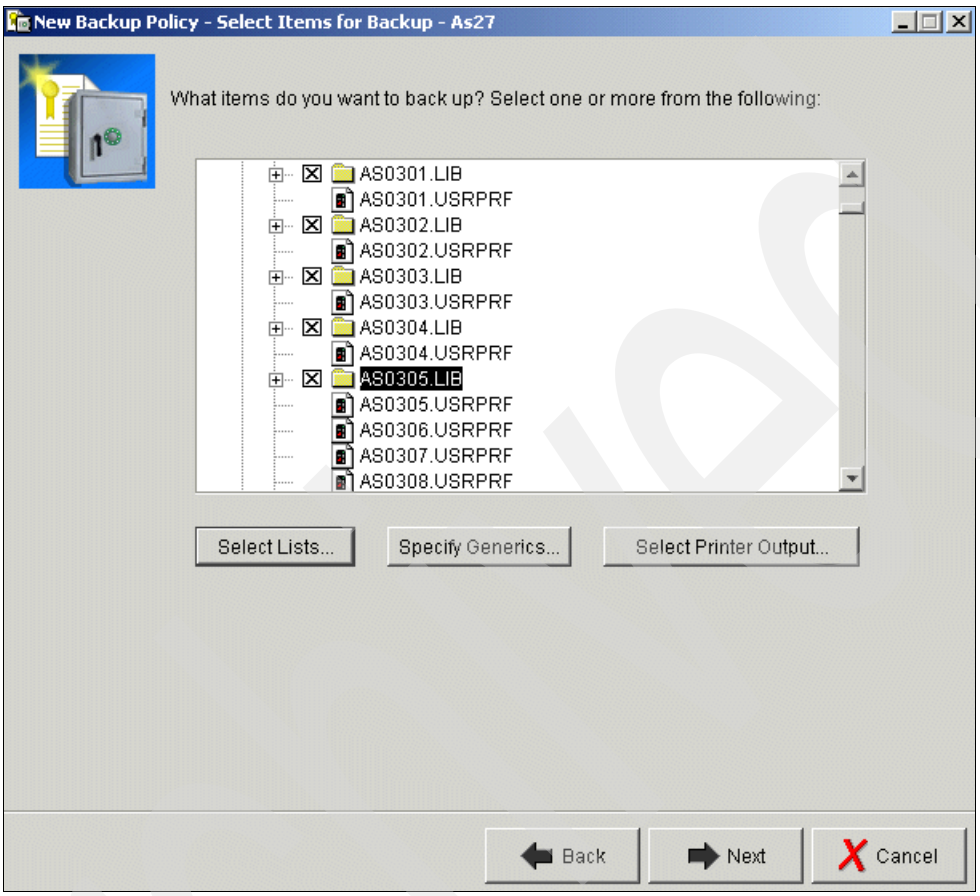

Figure 8-47 New Backup Policy - Select Items for Backup window

8. On the New Backup Policy - Specify Generics window (Figure 8-48), you select the generic name of the objects to back up or omit from the backup. In this example, we select **Libraries**. Click **OK**.

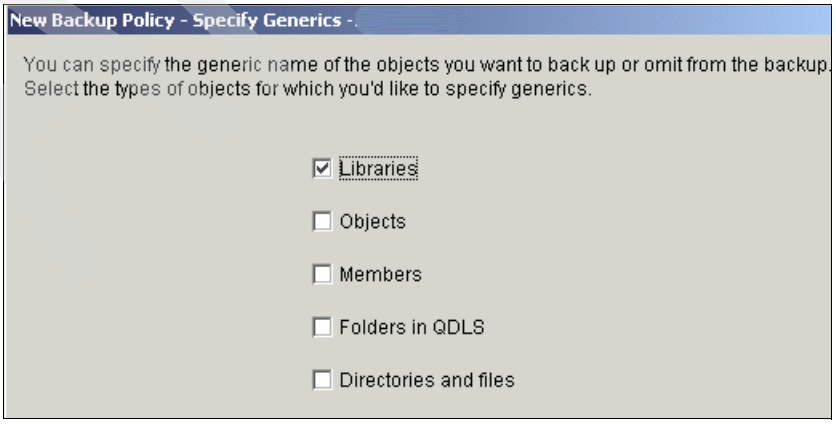

Figure 8-48 New Backup Policy - Specify Generics window

9. On the New Backup Policy - Specify Generics for Libraries window (Figure 8-49), enter the library prefix `AS03`. Click **Add**. AS03* is now placed in the generic library list area.

   You can enter other library prefixes and click **Add** each time. When you are finished adding the library entries, click **OK** and then click **Next**.

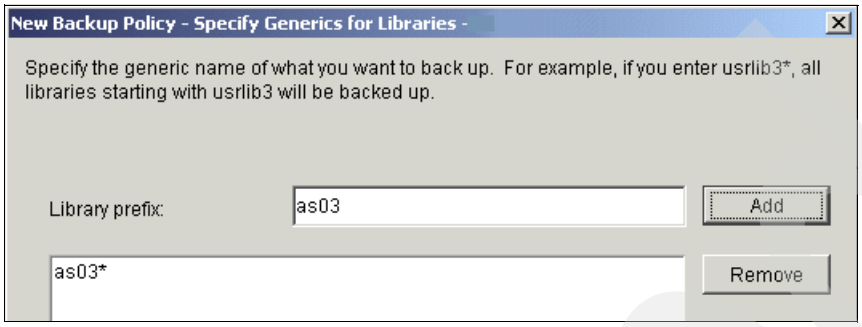

Figure 8-49 New Backup Policy - Specify Generics for Libraries window

10. On the New Backup Policy - Backup Order window (Figure 8-50), verify what you selected to back up. Click **Next**.

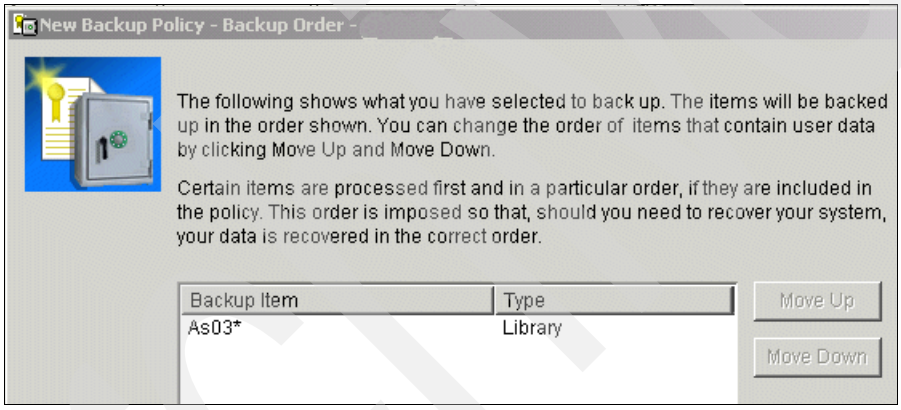

Figure 8-50 New Backup Policy - Backup Order window

11. On the New Backup Policy - Backup Activity window (Figure 8-51), select the type of backup you want, full or incremental. You may choose to not restrict this backup policy to always do what you specify here. In this example, we select **Allow overrides to backup activity when policy is run or scheduled**. Click **Next**.

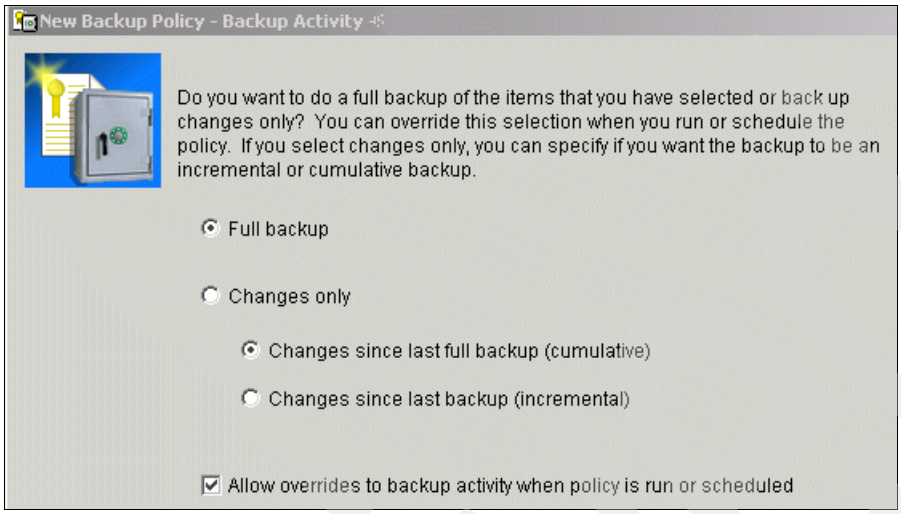

Figure 8-51 New Backup Policy - Backup Activity window

12. On the New Backup Policy - Media Retention window (Figure 8-52), specify the retention days. Again, select **Allow overrides to retention when policy is run or scheduled**. Click **Next**.

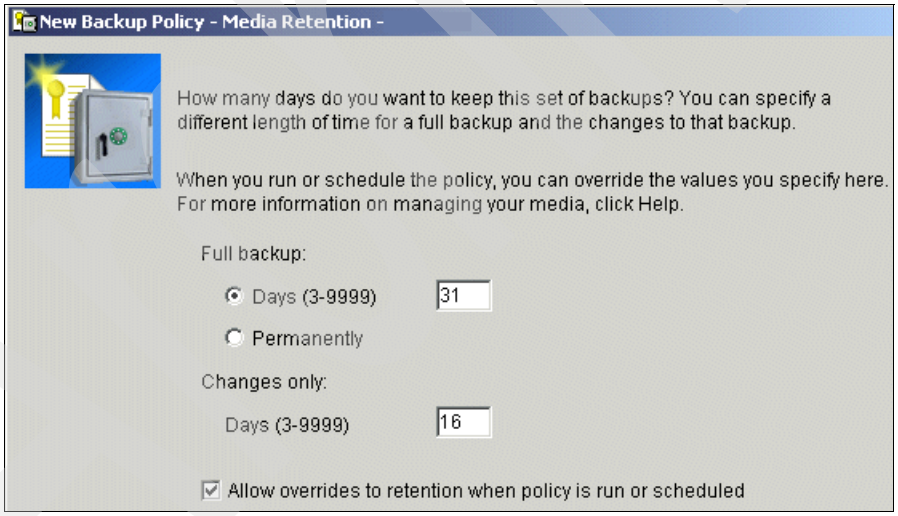

Figure 8-52 New Backup Policy - Media Retention window

Up to this point, creating a backup policy is the same for defining a backup policy for saving to OS/400 media and saving OS/400 data to an IBM Tivoli Storage Manager server. However, by selecting a media pool, BRMS chooses a different path before it returns to the main flow. You can select to:

- Store data on the IBM Tivoli Storage Manager server
- Store data directly to tape
- Store data in a save file

Note: More options are available. Depending on what is installed, you can find such options as archiving. Since this is a quick start guide, we do not explain this further.

Here, we create a backup to be sent to the IBM Tivoli Storage Manager server. Since we use the iSeries Navigator client, it bundles actions that we do not see. For that reason, we cannot select the IBM Tivoli Storage Manager server at this point. We must first use an existing media pool for tape. When the backup policy is created with all the linking needed, we have to change it to point at the IBM Tivoli Storage Manager server.

13. On the New Backup Policy - Select Backup Devices window (Figure 8-53), select the media pool.

Figure 8-53 New Backup Policy - Select Backup Devices window (Part 1 of 2)

As shown in Figure 8-54, under Available devices, select the device or devices to back up to and click **Add** to move them to the Backup devices pane. When you are finished, click **Next**.

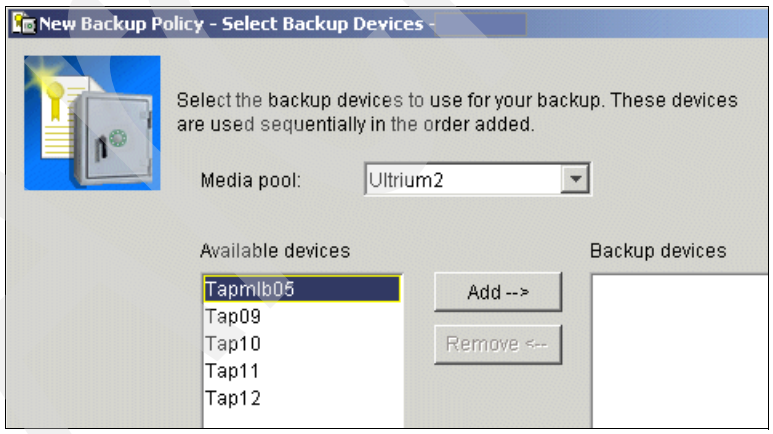

Figure 8-54 New Backup Policy - Select Backup Device window (Part 2 of 2)

14. On the New Backup Policy - Add Media window (Figure 8-55), specify whether you want to add the media now or later. We select **No, the media is already added or I will add it later**. You are done creating your backup policy. Click **Next**.

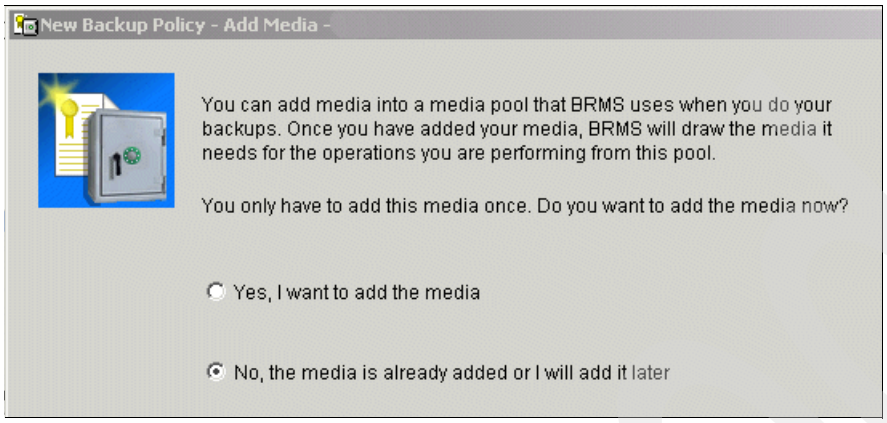

Figure 8-55 New Backup Policy - Add Media window

15. On the New Backup Policy - Summary window (Figure 8-56), click **Back** if you need to make changes or click **Finish** if you are done. Then you see window indicating that your backup policy is being created.

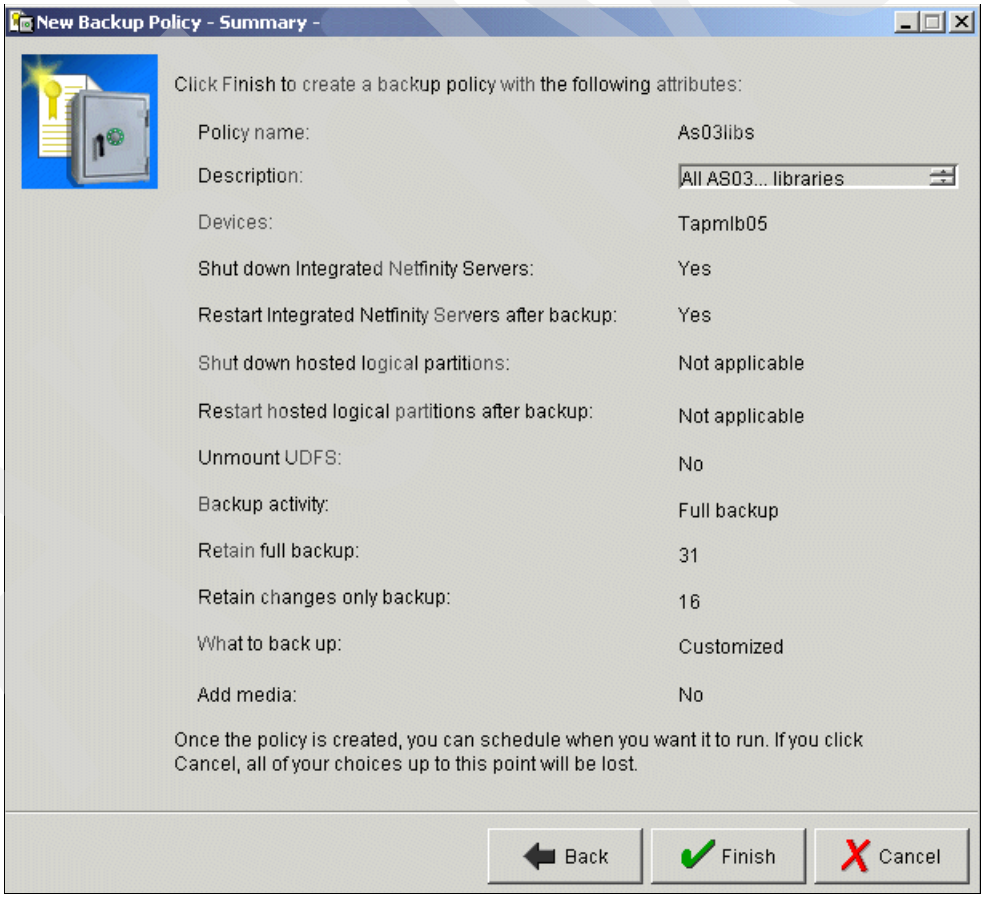

Figure 8-56 New Backup Policy - Summary window

16. After your backup policy is created, you see the New Backup Policy - Policy Created window (Figure 8-57). It shows the Run Now, Schedule, and Done buttons. In our example, we cannot run this policy since we have to make further adjustments to back up to an ITSM server. Click **Done**.

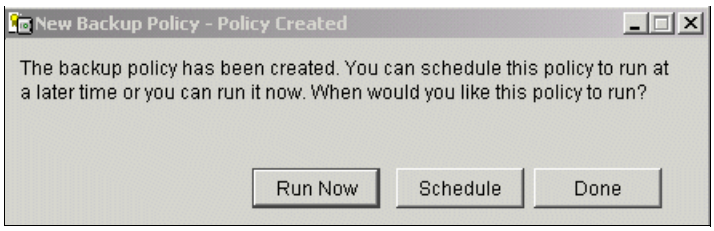

Figure 8-57 New Backup Policy - Policy Created window

17. You return to the main Backup Policies window. You have now defined:
    - What to back up
    - Where to back up
    - What program to call before and after the backup runs

    Press F5 to refresh the window.

Final adjustments

AS03 contains the production libraries, so we do not allow any users to stay active. We assume that there are no special considerations, so we can have BRMS bring the subsystem down and up again.

Currently our backup policy is pointing to a tape device and we need to make it point to an IBM Tivoli Storage Manager server. The following steps show how we change this. In this example, we assume that all interactive users run in the QINTER subsystem and that no special program is needed to bring down their applications. Therefore, we do not discuss holding job queues and other advanced possibilities.

Before the backup

Before the backup starts, follow these steps:

1. Select **Backup, Recovery and Media Services-> Backup Policies**.
2. In the right panel, select your policy (in this example, **As03libs**), right-click and select **Properties**.

3. On the As03libs Properties window (Figure 8-58), click the **Before** button.

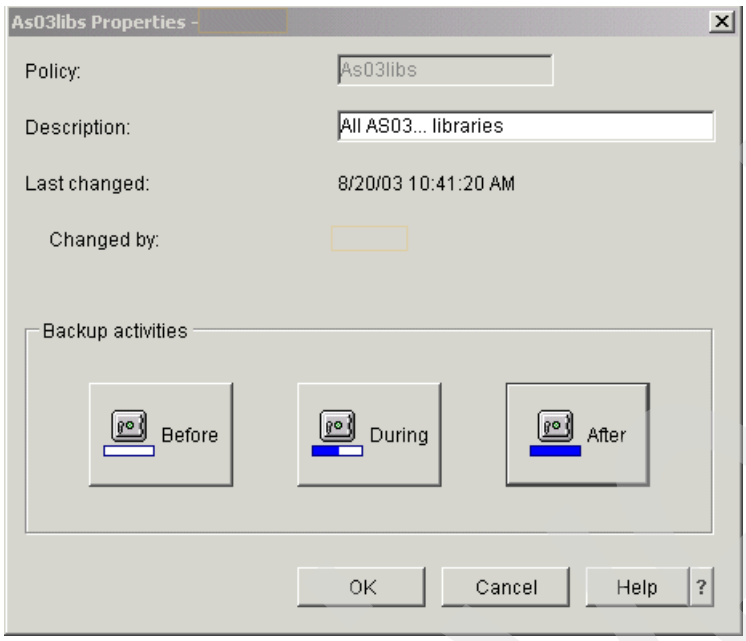

Figure 8-58 Final adjustments: Properties window

4. On the Properties - Before Backup window (Figure 8-59), on the General page, select **Sign off interactive users**. Deselect **Shut down integrated servers**, because you do not want that to happen.

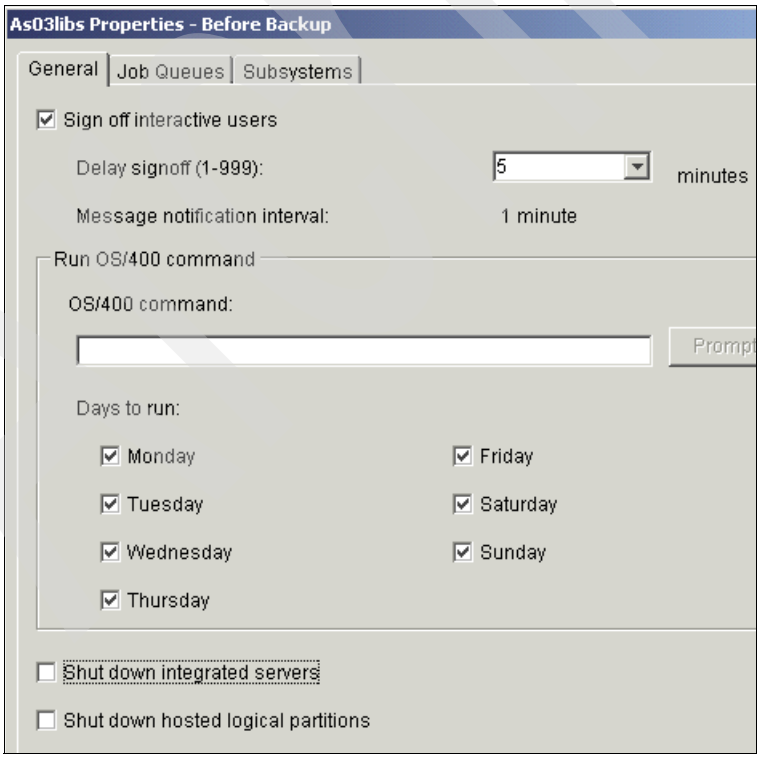

Figure 8-59 Final adjustments: Properties - Before Backup General page

5. Click the **Job Queues** tab.

6. On the Job Queues page (Figure 8-60), there is no job queue to hold, so we leave this page as is.

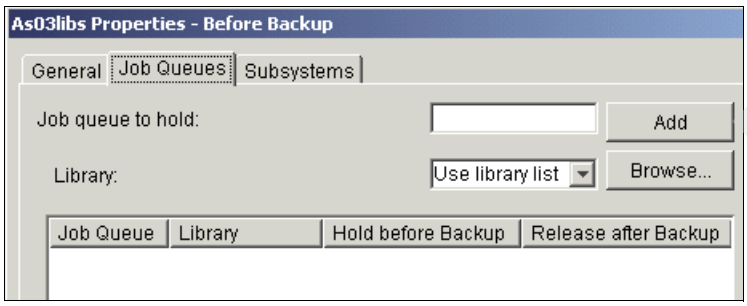

Figure 8-60 Final adjustments: Properties - Before Backup Job Queues page

7. Click the **Subsystems** tab.
8. You you want to shut down QINTER and give the users a chance to finish their job. Previously you gave them 5 minutes to sign off so there is no need for any *IMMEDIATE ending. On the Subsystems page (Figure 8-61), enter the subsystem name `QINTER`. In the Delay time for stop field, select **Delay until jobs end**. Click **Add**.

> **Tip:** By selecting Delay until job end, the subsystem does not have to wait that 5 minutes you allowed your users to stay active. After the last user signs off, the subsystem goes down.
>
> If you did not select the Sign off interactive users option on the General page, you must specify a value here or use *IMMEDIATE. Otherwise the subsystem waits until the last interactive user signs off.

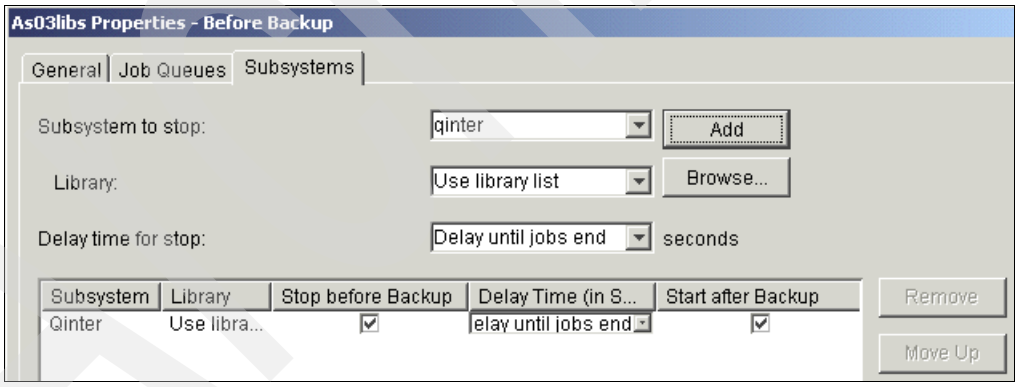

Figure 8-61 Final adjustments: Properties - Before Backup Subsystems page

This completes the Before button activities. Although you are setting the properties for the Before button, you will see what to do after the backup is finished (for example, the After tab). For ease of use, many of these tabs overlay each other.

During the backup

During the backup, you make the following selections:

1. On the Properties window (Figure 8-58 on page 208), click the **During** button.
2. The As03libs Properties - During Backup window (Figure 8-62) opens. You already specified what to back up, so this window shows what you selected.

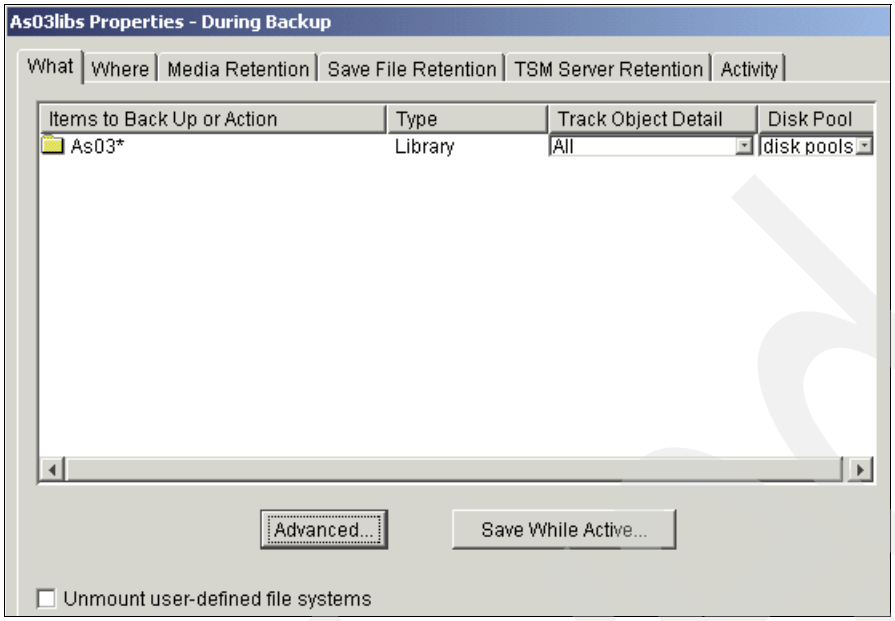

Figure 8-62 Final adjustments: Properties - During Backup What page

Click the **Advanced** button on the What page, which opens the window in Figure 8-63. Click **OK** and click **OK** again on the Properties - During Backup window.

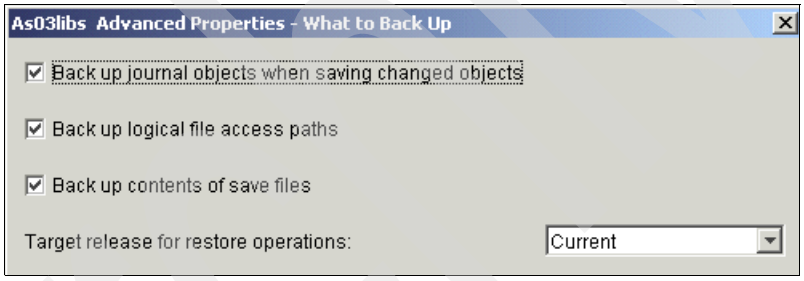

Figure 8-63 Final adjustments: Advanced Properties - What to Back Up window

3. You return to the Properties - During Backup window shown in Figure 8-64. Selecting the Where tab on this during backup window has several important parameters, including the Where to backup and the Append to available media parameters.

   If you are saving to tape, you already selected a tape device. However, on the *Where page*, you can change the selection and address another drive. Typically if you have a media library, you do not specify a specific drive but the tape library itself. You let the library select one for you. You can also use more than one tape drive to perform a parallel save. And you can specify an append here. This can be helpful for conserving tape volumes.

   Attention: Avoid placing objects in a tape volume that drastically extends its expiration date. The outcome may be the exact opposite to what you wanted to achieve. You may lock a whole volume only because of a single save.

   Our Backup policy is complete except for changing from a tape drive to the IBM Tivoli Storage Manager server. Click the **Where** tab.

4. On the Where page (Figure 8-64), for Where to back up, select **TSM server**.

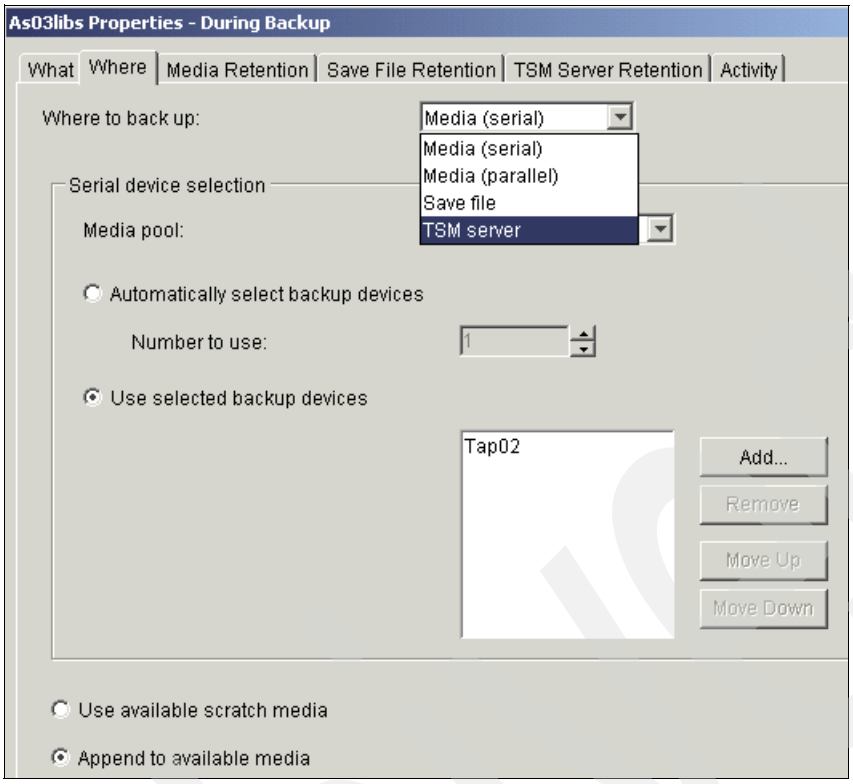

Figure 8-64 Final adjustments: Properties - During Backup Where page

5. Notice how the Where page changes after we select TSM server. Figure 8-65 shows the changes. Select your TSM server name. Under Full backups and Changes-only backups, select the connection name and storage location.

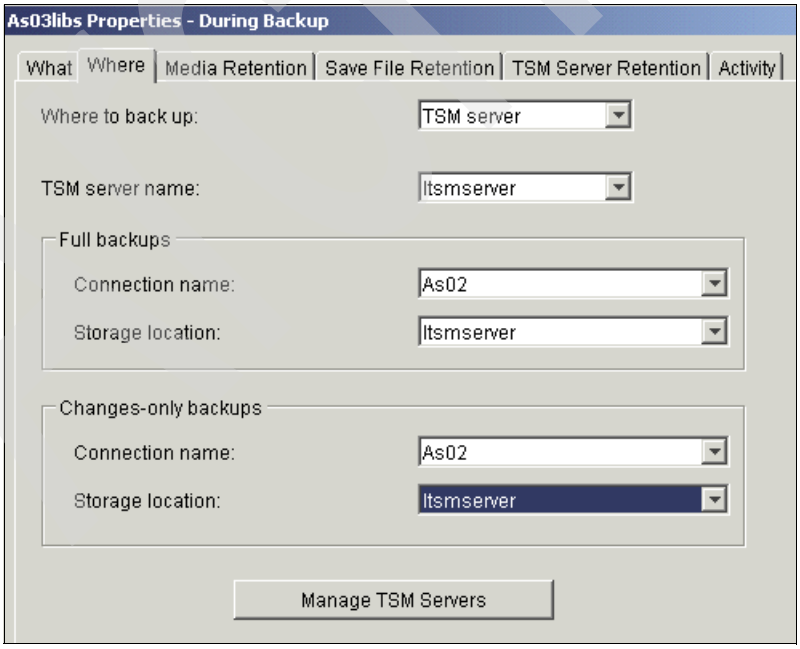

Figure 8-65 Final adjustments: Properties - During Backup Where page for TSM server

The Where tab window has a Manage TSM Servers button that you can use to manage all ITSM servers. If you are storing to tape, see the options that are specified in Figure 8-66.

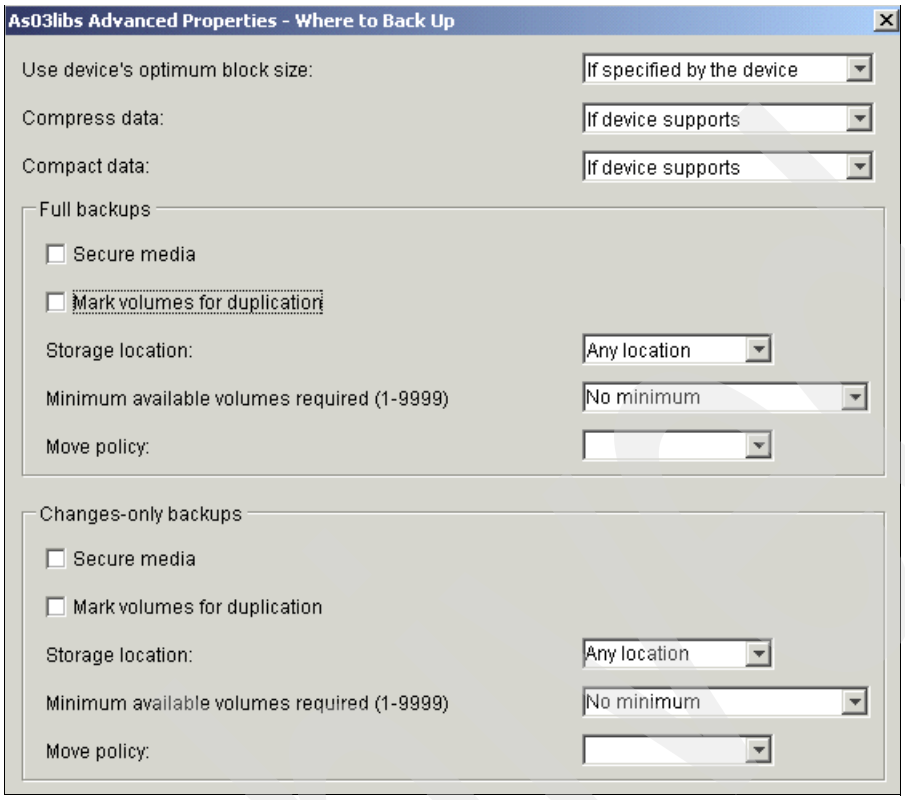

Figure 8-66 Final adjustments: Advanced Properties - Where to Back Up (tape)

6. Skip the Media Retention tab if you don't have any changes to the media retention periods. You can also skip the Save File Retention tab if you don't plan to save to savefiles in this setup.
7. Click the **TSM Server Retention** tab.
8. On the TSM Server Retention page (Figure 8-67), you must identify a TSM Management Class in the IBM Tivoli Storage Manager server. This name *must* match what is set up on the IBM Tivoli Storage Manager server. As shown in Figure 8-67, for TSM management class, we enter `brms`.

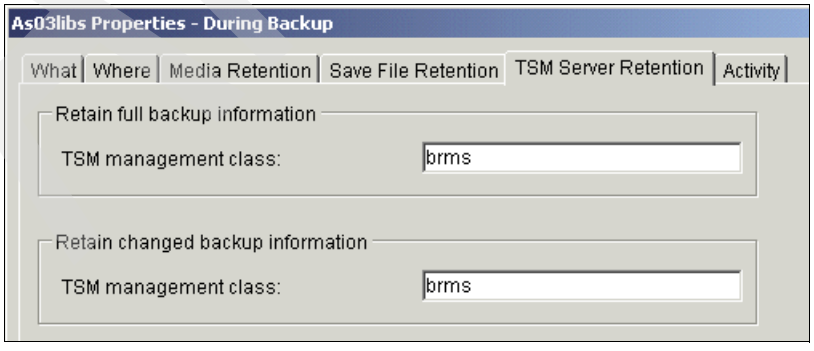

Figure 8-67 Final adjustments: Properties - During Backup TSM Server Retention page

9. Click the **Activity** tab. On this page, you specify whether you want a full or incremental backup. You also specify on which day you want to do it.

10. In this example, we use the customization function by clicking the **Customize** tab on the Activity window (not shown). On the first Activity window, select the customize type of backup activity and click the **Customize** button.

11. The Activity - Customize window (Figure 8-68) opens. In the lower part of the window, you see Legend for backup types. In this example, we assume full backups on Sunday, no backup on Saturday, and changes only for all other days. For each day, select the box until the correct icon as referenced by the legend as shown. Click **OK**.

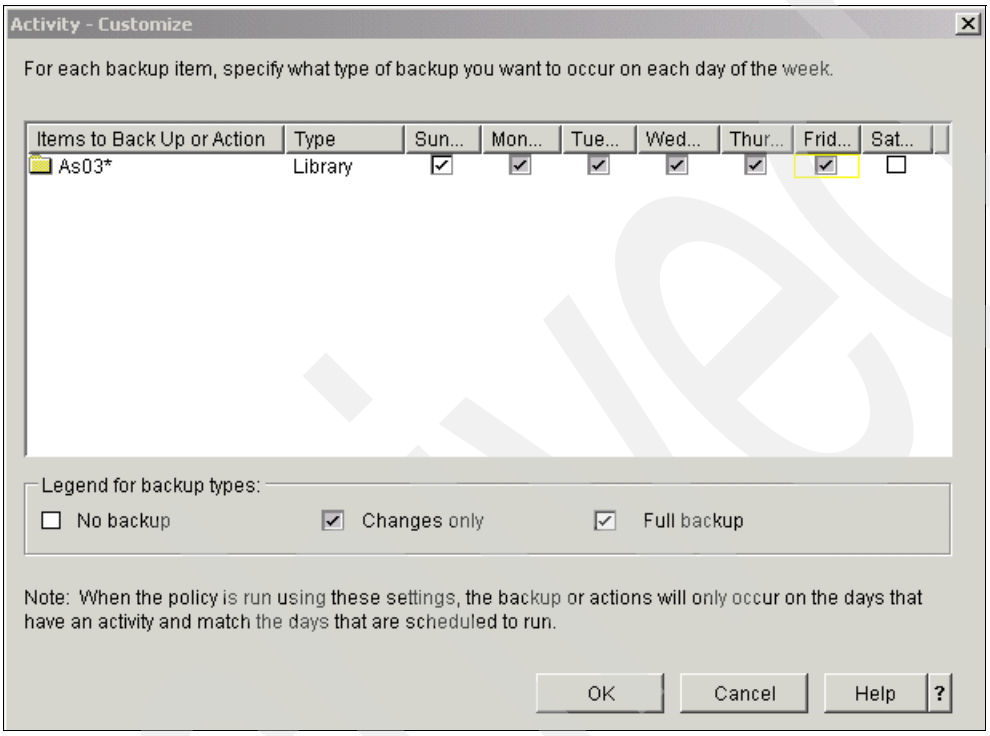

Figure 8-68 Final adjustments: Activity - Customize window

12. Click **OK** twice to return to the Properties window (Figure 8-58 on page 208). Remain on this window to select the After button for this backup policy, which is explained in the following section. You can click **OK** on the Properties window to return to the primary iSeries Navigator window, which shows all backup polices in a list within the right pane (similar to Figure 8-33 on page 194).

You are now finished setting the During Backup properties. You may go back and select more options if necessary.

After the backup

When setting up the after backup properties, keep in mind that some properties may have both before and after activities. For example, you may have a special program, reorganizing files, that you want to run and on specific days. The actual backup to be saved holds no deleted records, but on disk they still remain. Therefore, after the full backup on Sunday, you may want to start to reorganize the files before you let the users become active.

1. On the Properties window (Figure 8-58 on page 208), click the **After** button.
2. As shown in the General page in Figure 8-69, in this example, we reorganize a file named ACCOUNT in library AS03LIB4. We enter the command for this in the OS/400 command field.

For Backup media information, you can also determine the level of information that BRMS stores:

- In case you always perform a full library restore, select **Libraries** (unless you want information about each object in the library).
- If you need to restore a single object, select **Objects**.
- In case you run a long-term save for archiving and are not interested in wasting disk space with information you may never use, select **None**.

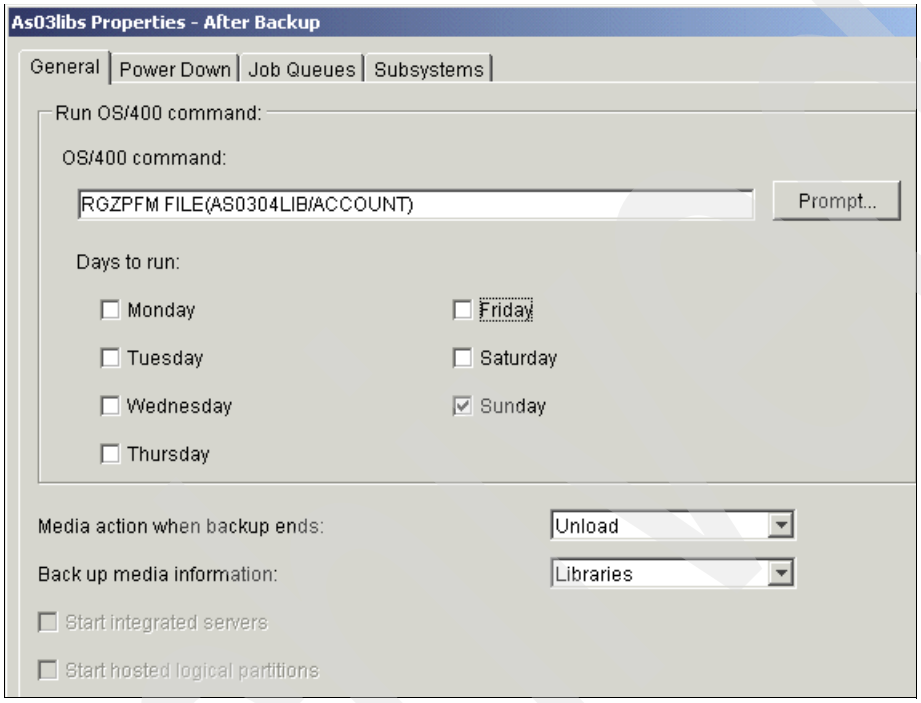

Figure 8-69 Final adjustments: Properties - After Backup General page

3. Click the **Power Down** tab.
4. On the Power Down page (Figure 8-70), you can choose to select the **Power down system after backup** option (IPL) and to specify how it is to be done.

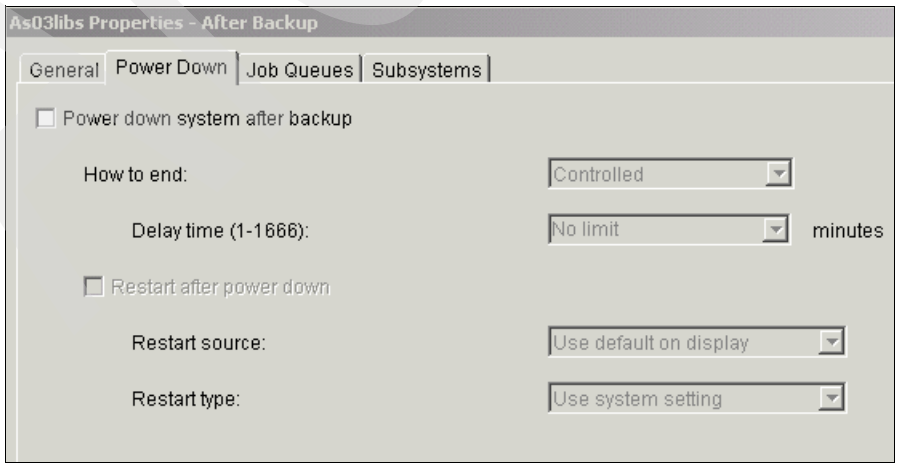

Figure 8-70 Final adjustments: Properties - After Backup Power Down page

5. Click **OK** to save your changes and return to the Properties window (Figure 8-58 on page 208). This completes the activities to be done before, during, and after the backup.
6. Click **OK**. Now you return to the BRMS iSeries Navigator client window.

Your backup policy is now ready to run. Since we expect that you are targeting an IBM Tivoli Storage Manager server, you do not need to worry about the actual media on which our backup is stored.

8.9 Locations

If your setup points to tape, you need to specify what you plan to do with the tape volumes that will result from your save. You also need to create locations and, via the move policy, define how long the volumes should stay in each place.

Launch the BRMS iSeries Navigator client and log on to the iSeries server.

8.9.1 Creating locations

When you store data in an IBM Tivoli Storage Manager server, you only need one location. That location is created during the process of setting up an IBM Tivoli Storage Manager server as explained in 9.2.3, “Follow-on steps using iSeries Navigator” on page 269, or 9.2.2, “Follow on steps using the 5250 interface” on page 265.

If you save to an IBM Tivoli Storage Manager server, the procedure ends here. However, for your convenience, we explain how to create locations using the iSeries Navigator client.

We discuss volumes without a move policy in “Home location” on page 161. We start with that location here.

1. As shown in Figure 8-71, select **Backup, Recovery and Media Services-> Move Policies**. Right-click **Move Policies** and select **Manage locations**.

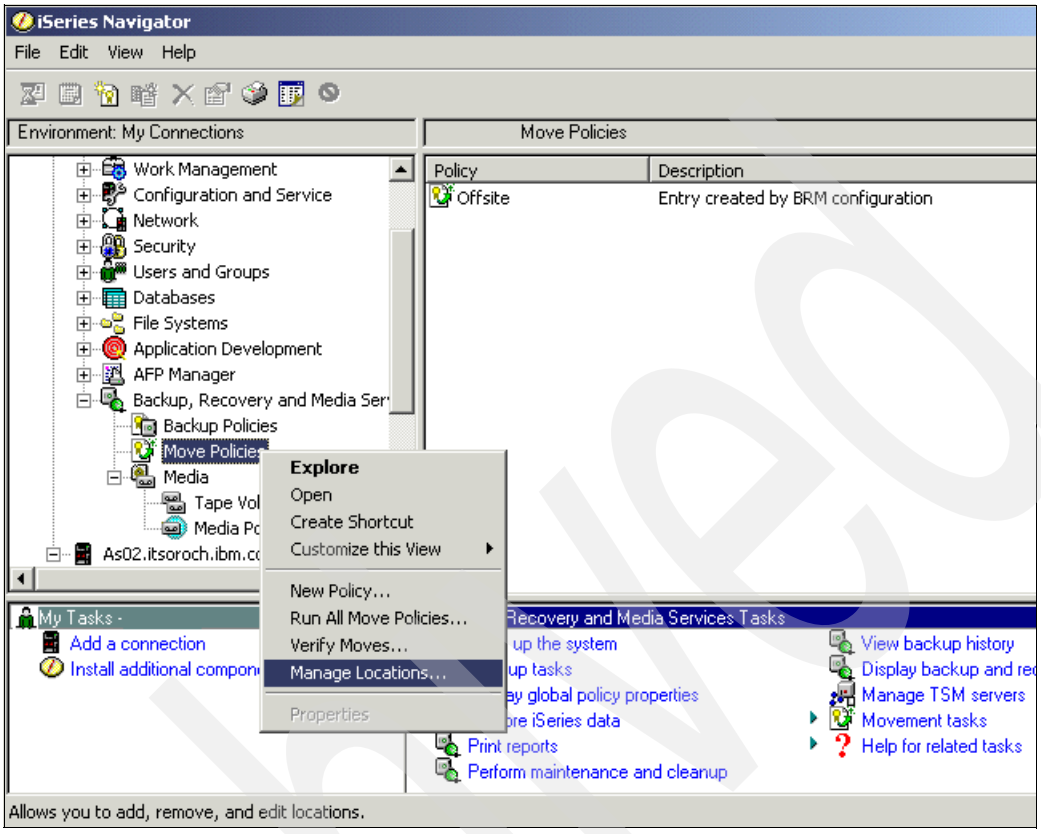

Figure 8-71 Selecting Move Policies-> Manage Locations

2. As shown in the Manage Locations window (Figure 8-72), if you have a tape library device, notice that it is already created. In this example, our tape library device is Tapmlb05.

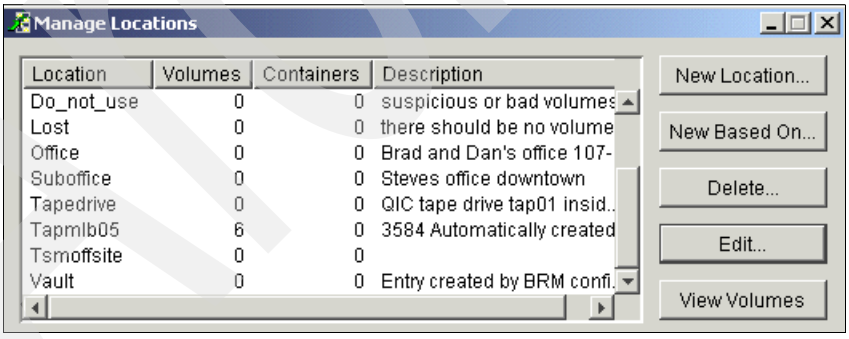

Figure 8-72 Manage Locations

a. Select your tape library. In this example, we select **Tapmlb05**. Click **Edit**.

b. In the Edit Storage Location window (Figure 8-73), notice that the Allow volumes to expire option is already selected. In this example, we replace the words “Automatically created” with `ITSM Server AS27` or something more meaningful.

c. Click **OK**.

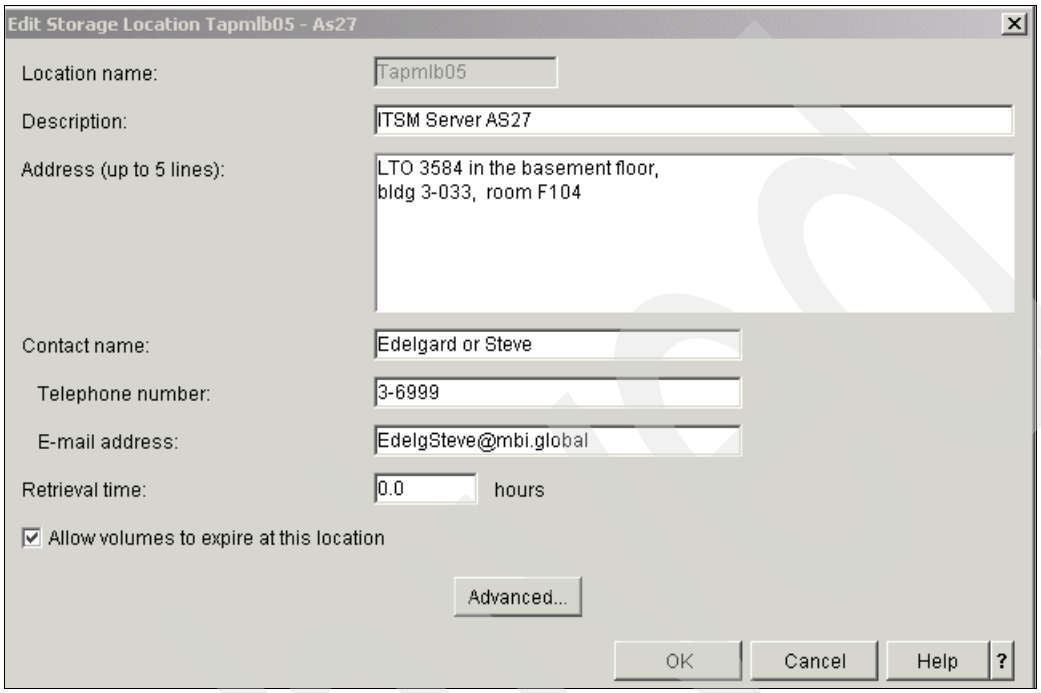

Figure 8-73 Edit Storage Location

3. On the Manage Locations window, click **New Location**.

4. On the New Storage Location window (Figure 8-74), create a new location called NOT_MOVED.

   a. In the Location name field, enter `not_moved`.
   b. Enter the description and address for this new location name.
   c. Enter a contact name in case you find volumes there.
   d. In the Retrieval time field, specify a retrieval time.
   e. Click **OK** to return to the Manage Locations window.

> **Retrieval time:** Specifying the retrieval time may seem to be a rather minor activity. However, it may play a key factor in case of disaster recovery. During such an event, you must perform several activities in parallel so that the recovery time is the shortest possible. If you do not specify any retrieval time, the recovery procedure assumes there is no wait time to consider and everything can be done in sequence without waiting.

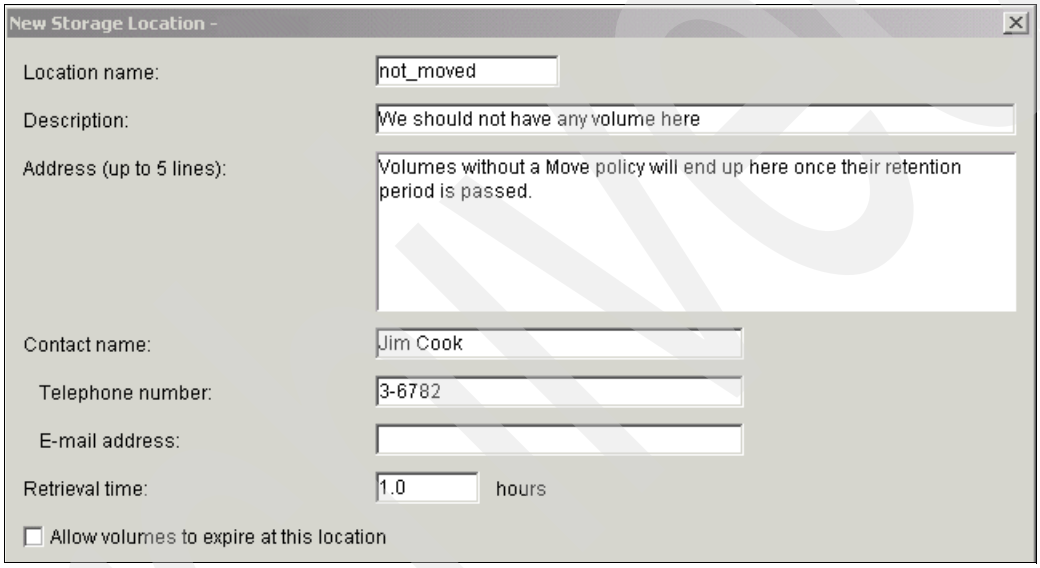

Figure 8-74 New Storage Location

Create all the other locations that you need in the same manner. Make sure that you correctly set the Allow volumes to expire option.

8.10 Move policy

Now that you have locations, you can create Move policies.

8.10.1 Creating a move policy

Move policies specify how long a tape volume should spend at a location before it is moved to the next location.

1. As shown in Figure 8-75, select **Backup, Recovery and Media Services-> Move Policies**. Right-click **Move Policies** and select **New Policy**.

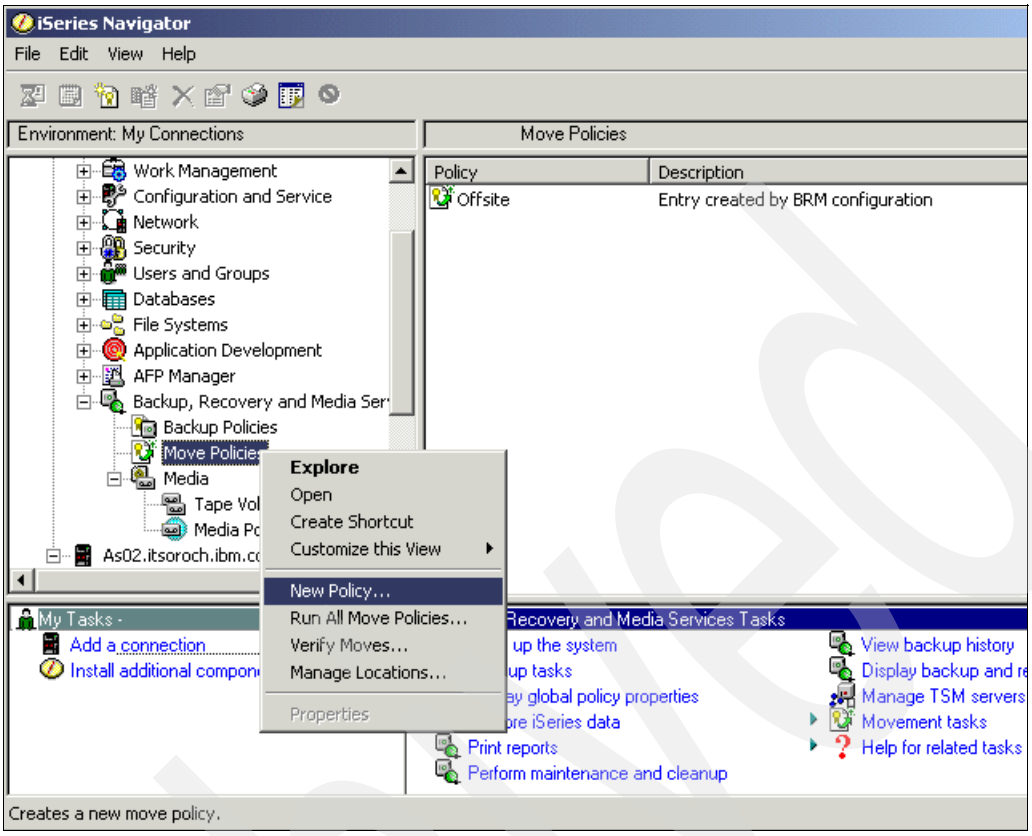

Figure 8-75 Selecting Move Policies-> New Policy

2. The New Move Policy wizard opens. Click **Next**.
3. The New Move Policy - Move Policy Name window (Figure 8-76) opens. In the Name field, enter a name for the move policy. In the Description field, describe what it does. Click **Next**.

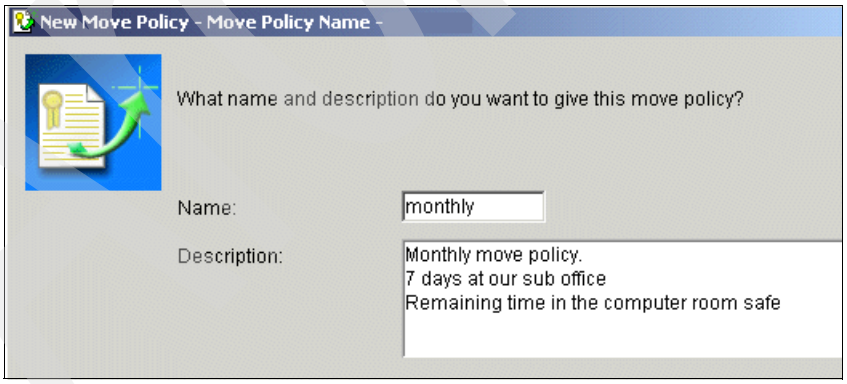

Figure 8-76 New Move Policy - Move Policy Name window

4. In the New Move Policy - Storage Locations window (Figure 8-77), add the locations you that need for your move policy. On this same window, you can also create new locations, using the Create New Location button, in case you forget some.

   In our example, we created the new Suboffice location. To select a location, find the location in the left Location/Description subwindow, select it, and click either the **Add Before** or **Add After** button.

   When you create a new location, use the **Help** button on the window (not shown) to understand each parameter.

   When you are finished selecting locations, click **Next**.

Figure 8-77 New Move Policy - Storage Locations window

5. On the New Move Policy - Duration window (Figure 8-78), for each location, enter the duration of how long a volume will stay at that location. Click **Next**.

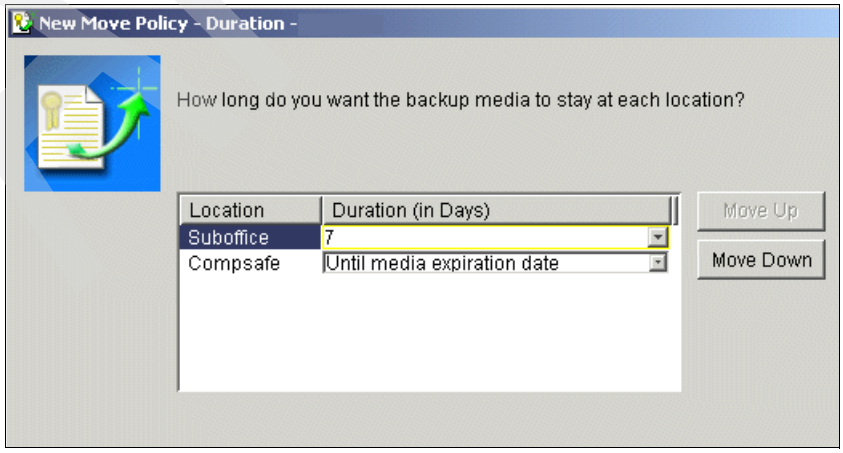

Figure 8-78 New Move Policy - Duration window

6. On the New Move Policy - Verify Moves window (Figure 8-79), specify whether you want to verify your moves. Click **Next**.

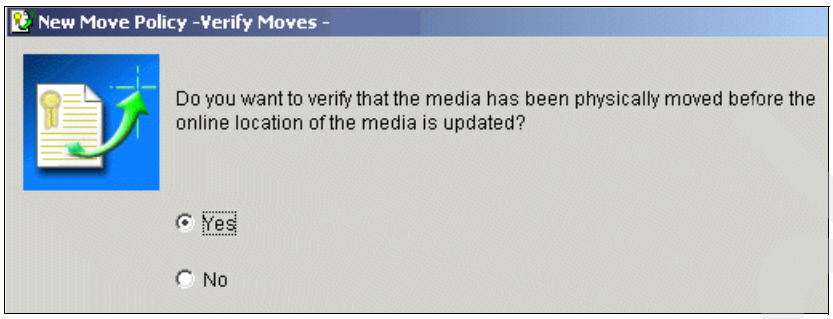

Figure 8-79 New Move Policy - Verify Moves window

The New Move Policy - Select Backup Policies window (Figure 8-80) opens.

The new move policy is complete. You can associate your move policy with any Backup policy already created as explained in the following section.

8.10.2 Attaching the move policy to the backup policies

The last step in creating a move policy is to attach the move policy to a backup policy. You also specify if you want to use the move policy for both full and incremental backups.

Note: If you start with a new installation, you find only the IBM-provided backup policies already listed.

1. Connect your backup policy to your move policy. You can use one move policy for several backup policies. And you can combine Full and Changes Only as necessary.

   On the New Move Policy - Select Backup Policies window (Figure 8-80), highlight your backup policy. Select how you want to use the new move policy: full, changes only, or both. Click **Next**.

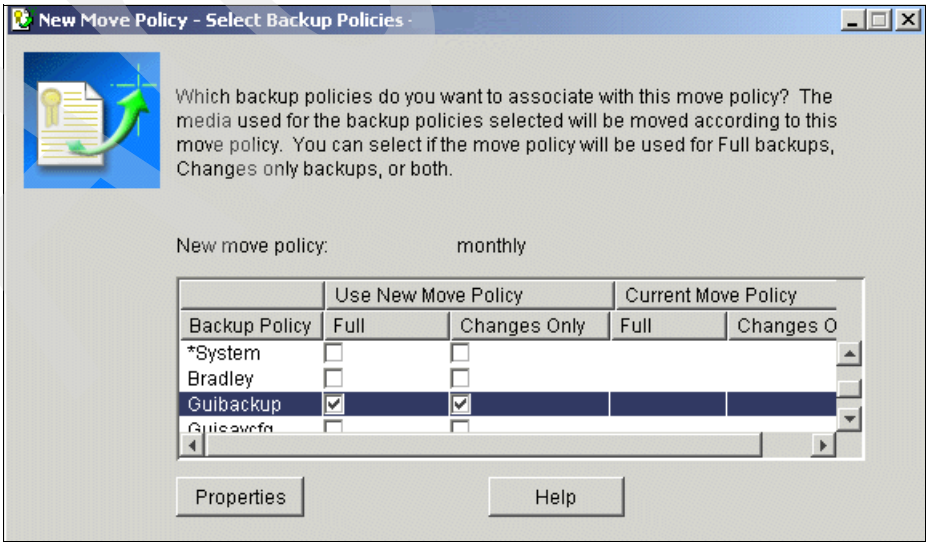

Figure 8-80 New Move Policy - Select Backup Policies window

2. On the New Move Policy - Summary window (Figure 8-81), review your policy and click **Finish**. If you need to make changes, click the **Back** button.

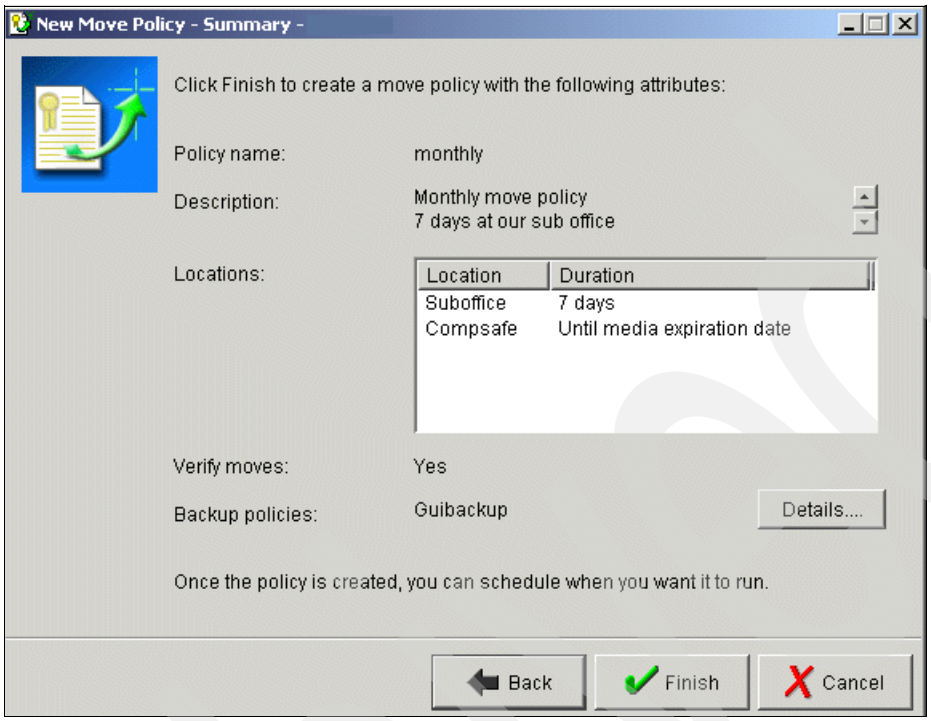

Figure 8-81 New Move Policy - Summary window

3. You attached your move policy to your backup policy. After a few seconds you see the Move Policy Created window (not shown) on which you can specify whether you want to run the policy now or later by using the click Schedule button. Or you can exit by clicking the Done button. In our example, we click **Done**.

In the following section, we run a backup that consists of saving our IBM Tivoli Storage Manager environment.

8.11 Running a save of your ITSM environment

Starting a save of the IBM Tivoli Storage Manager environment is a fairly easy task as explained in the following steps:

1. From the left pane in Figure 8-75 on page 219, select **Backup, Recovery and Media Services-> Backup Policies**.
2. In the right panel, select your backup policy (**Backupitsm**), right-click, and select **Run Now**. See Figure 8-82.

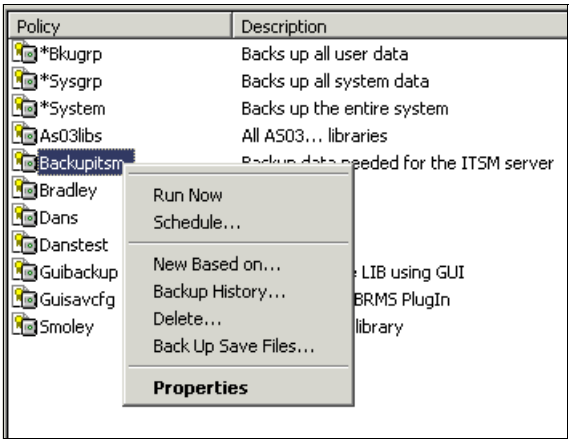

Figure 8-82 Choosing to run the backup policy now

3. The Backup Activity Override window (Figure 8-83) opens. It shows the **Use policy setting** and **Full** back up already selected. You can leave the setting as is or select the Override policy setting, which activates the window (not available in our example window) where you can select either Full or Changes only (not shown) from the list. We used **Use policy settings** in our example. Click **OK**.

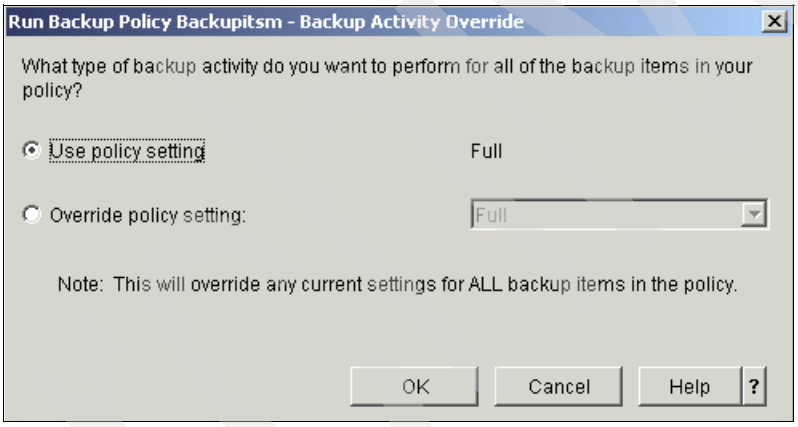

Figure 8-83 Run Backup Policy Backupitsm - Backup Activity Override window

4. The Run Backup Policy - Retention Override window (Figure 8-84) opens. On this window, you can choose one of the following actions:
   - Click **OK** to continue.
   - Click **Override policy settings**, which enables you to specify how long to retain any override settings you already made.
5. When you are finished with this second override window, click **OK**.
6. This runs the backup policy immediately as part of your iSeries Navigator session. If your are already logged on to the iSeries, the save automatically starts. If you are not logged onto the iSeries server, you must sign on to launch your save.

Alternatively you can schedule the backup using the Schedule menu option shown in Figure 8-82.

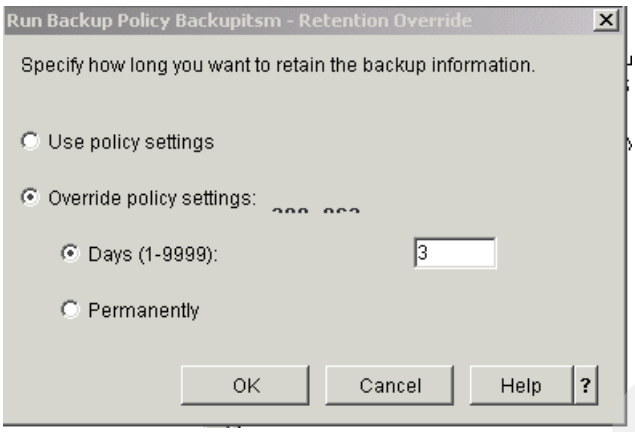

Figure 8-84 Run Backup Policy Backupitsm - Retention Override window

8.12 Running a native data backup

This example shows how to back up the AS03xxx libraries using the As03libs backup policy we created previously by performing the following steps:

1. In BRMS iSeries Navigator client, select **Backup, Recovery and Media Services-> Backup Policies**.
2. In the right panel, select your backup policy (**AS03libs**), right-click, and select **Run Now**. See Figure 8-85.

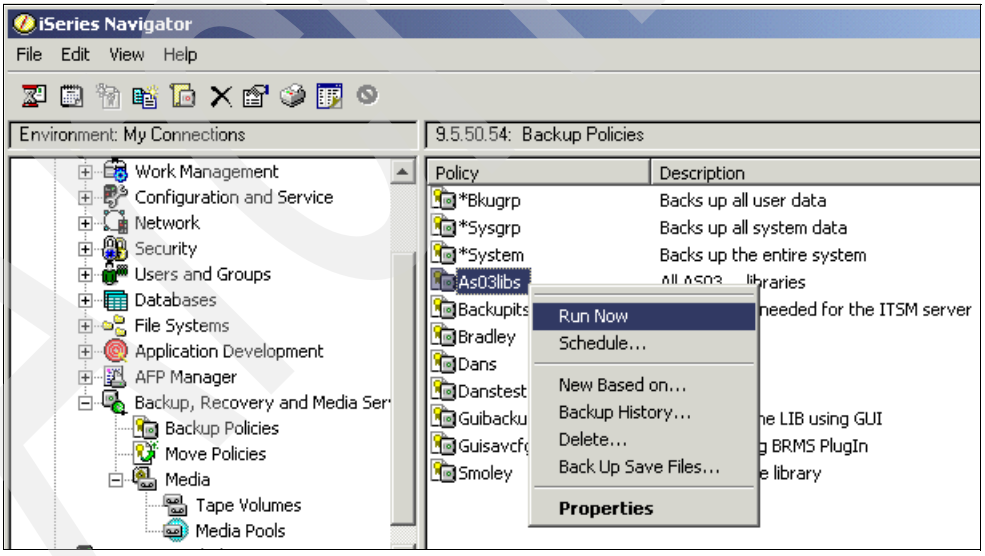

Figure 8-85 Selecting the backup policy to run

Note: This is the first time we ran this backup. It is Wednesday and we selected to back up changes only. BRMS does not allow this. We have not performed any full backup yet, so BRMS makes sure that we do that first, so the policy is automatically set to *Full*.

3. The first Backup Activity Override window (Figure 8-86) opens. We do not elaborate on the following window example steps because the override windows, steps, and possible override considerations are essentially identical to the ones described in 8.11, “Running a save of your ITSM environment” on page 222. We include an example of signing on to the iSeries servers.

   On the Run Backup Policy - Backup Activity Override window, select the type of backup activity you want to perform for all backup items. Click **OK**.

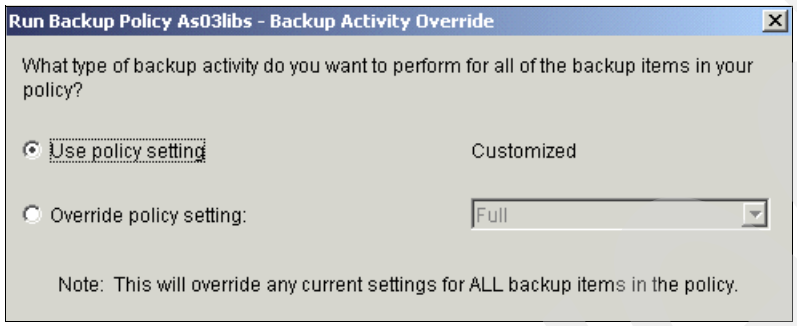

Figure 8-86 Run Backup Policy - Backup Activity Override window

4. On the Run Backup Policy - Retention Override window (Figure 8-87), specify the how long you want to retain the backup information. Click **OK**.

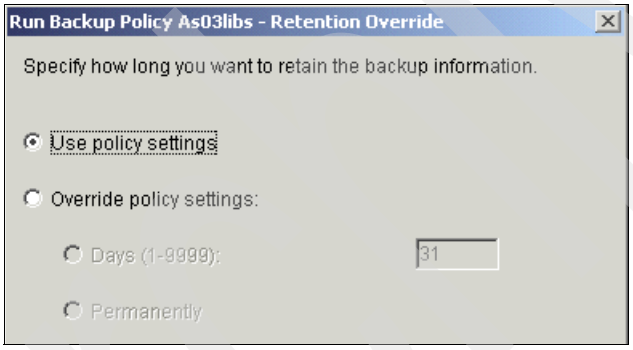

Figure 8-87 Run Backup Policy - Retention Override window

5. Sign on to the system, if necessary, by entering your user ID and password. Click **OK**.

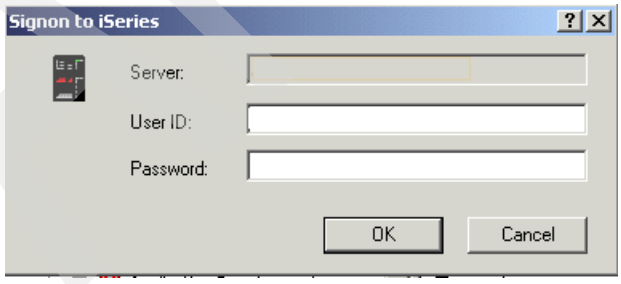

Figure 8-88 Signon to iSeries window

The backup job is now running.

8.13 Finding your backup job

To locate your backup job, follow these steps:

1. As shown in Figure 8-89, expand **Management Central-> Task Activity**. Select **Backup, Recovery and Media Services**.

   In the right panel, you can see that the As03libs job has the status of *Started*. Active users receive a message to sign off. If not they do not sign off, they are forced off.

   Attention: The way this is setup actually contains a pitfall. Active users that are excluded from signoff, such as a user signed on to the system console device (DSP01) or signed on as QSYSOPR and QSECOFR, keep QINTER waiting until they sign off.

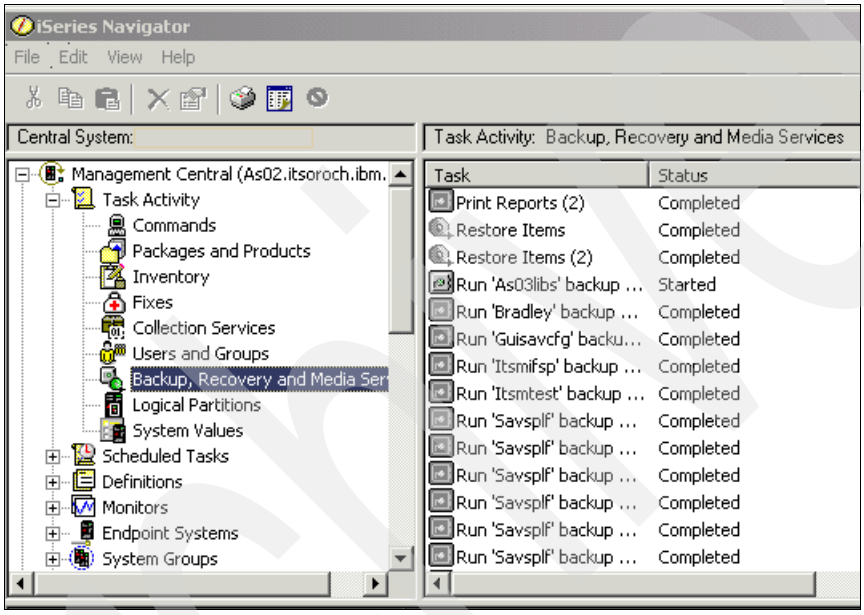

Figure 8-89 Management Central BRMS Task Activity

2. After the backup is completed, you can review the log. As shown in Figure 8-90, right-click the task and select **Backup and Recovery Log**.

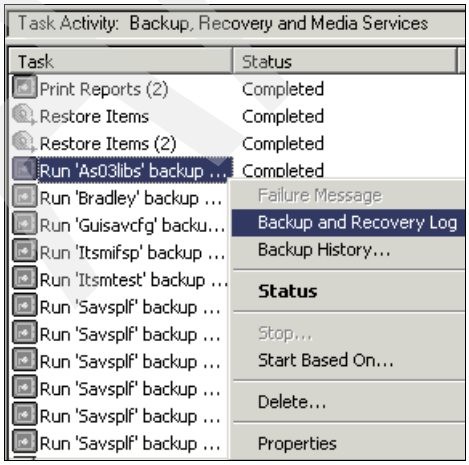

Figure 8-90 Selecting Backup and Recovery Log for AS03libs backup

3. On the Backup and Recovery Log - Include window (Figure 8-91), for Entry type, select **Backup**. Change the time and date if necessary. Click **OK**.

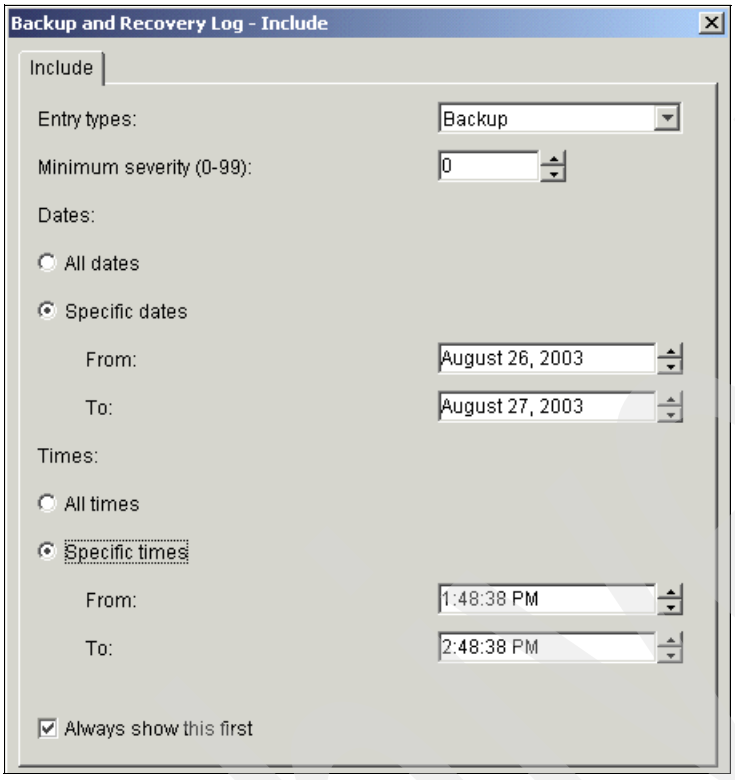

Figure 8-91 Backup and Recovery Log - Include window

4. A Backup and Recovery Log window (see the example in Figure 8-92) opens. Review the messages in the log. You can right-click a message ID to see more detailed message information.

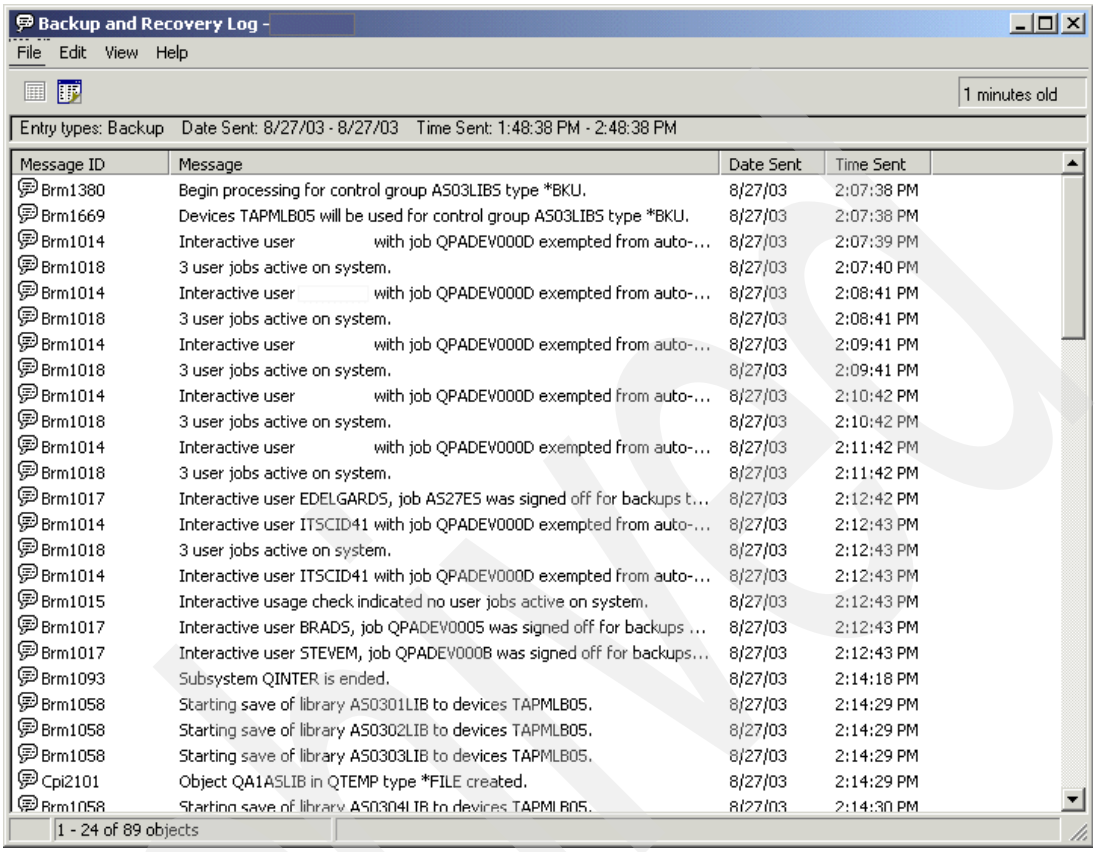

Figure 8-92 Backup and Recovery Log

5. You can check to see what was backed up. To do this, select the **AS03libs** task, right-click, and select **Backup History**.

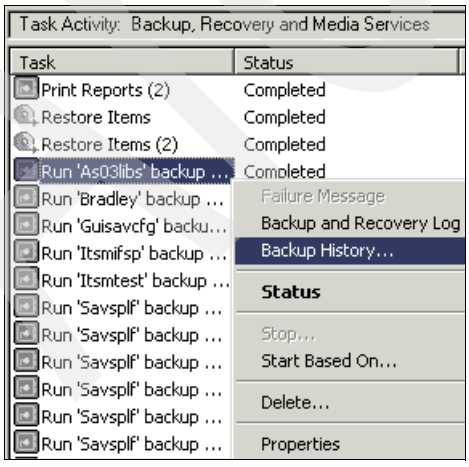

Figure 8-93 Selecting Backup History to see what was backed up

6. On the Backup History - Include window (Figure 8-94), you can see what was included in the backup. You can make changes to subset the history information that you will see. We

recommend that you select the **All** defaults as shown unless you have a specific reason to subset the history information you want to look at. When you finish determining what history information to include, click **OK**.

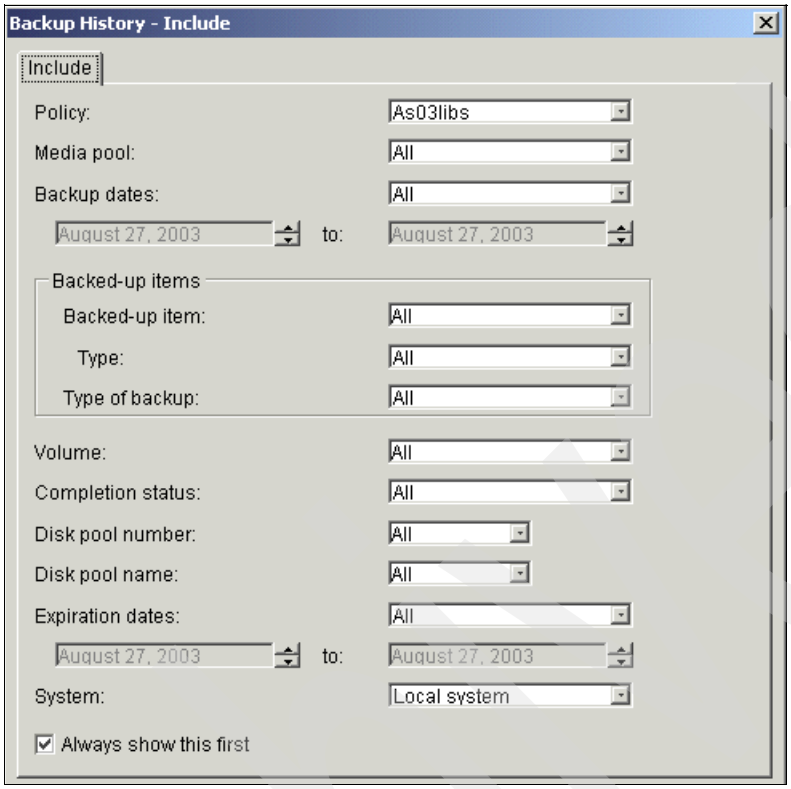

Figure 8-94 Backup History - Include for AS03libs

7. On the Backup History window (Figure 8-95), you can select an item for further details.

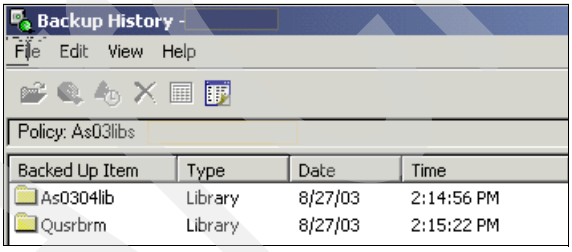

Figure 8-95 Backup History: Policy AS03libs

The Backup History window (Figure 8-96) now shows an example of the library As0304 objects that were saved.

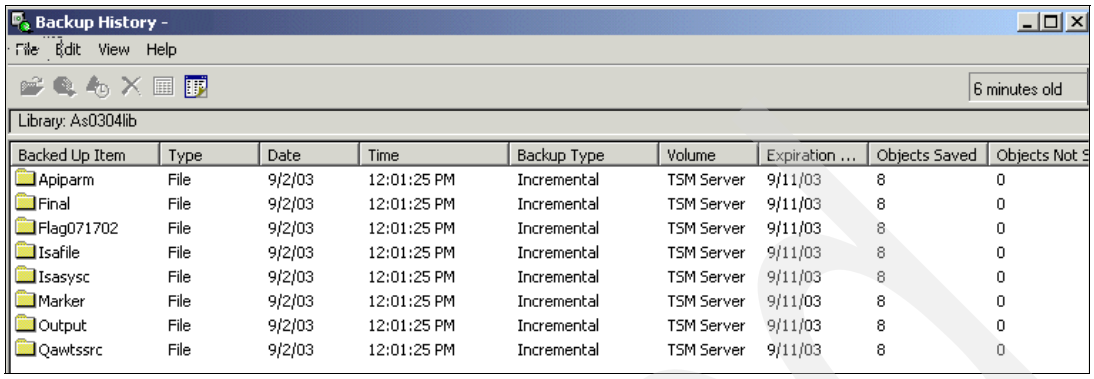

Figure 8-96 Detailed information in the Backup History window for policy AS03libs

This ends the backup (save) example scenarios.

8.14 Restore scenario examples

This section takes you through some restore scenarios.

8.14.1 Restoring the IBM Tivoli Storage Manager server environment

Restriction: At the time this redbook was written, the BRMS iSeries Navigator client is only usable for restoring single entities. If you want to revert to the backup policy used for the save and use it for restore, we recommend that you use the 5250 interface.

As mentioned earlier, the IBM Tivoli Storage Manager server environment consist of three parts. In this example, we restore one using iSeries Navigator.

Restoring the IBM Tivoli Storage Manager server using iSeries Navigator

In this example, we start with the iSeries Navigator window shown in Figure 8-97. We restore the directory /QOpenSys/usr/tivoli/tsm and its subdirectories:

1. Expand **My Connections-> *system name***. Select **Backup, Recovery and Media Services**, right-click, and select **Restore...**.

   Note: Alternatively, you can start this set of steps using the iSeries Navigator Taskpad area (showing Backup Recovery and Media Services Tasks). Select **Restore iSeries data** (circled in the lower pane in Figure 8-97). The succeeding windows launch the Restore wizard.

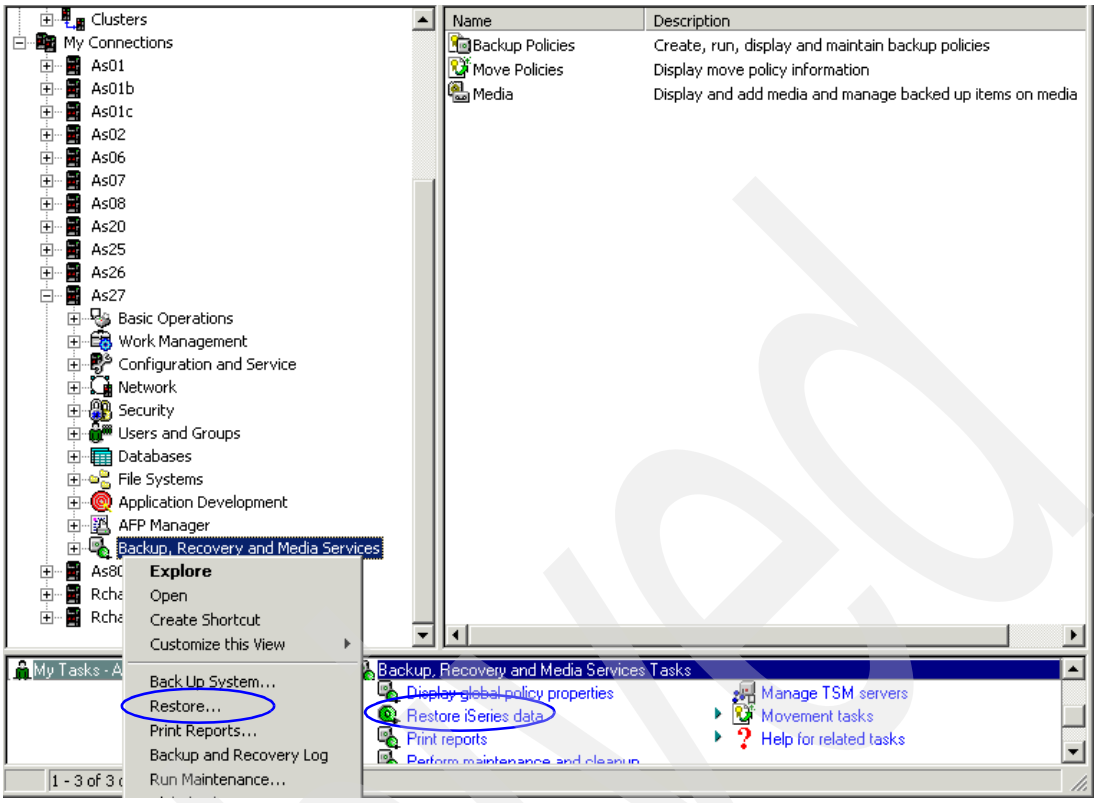

Figure 8-97 iSeries Navigator: Starting a restore function

2. The Restore wizard opens. On the first wizard window, click **Next**.
3. On the next window, select **Restore using backup history** and click **Next**.
4. The Select Type of Information window (Figure 8-98) opens. Select the **A directory or its files** option. Click **Next**.

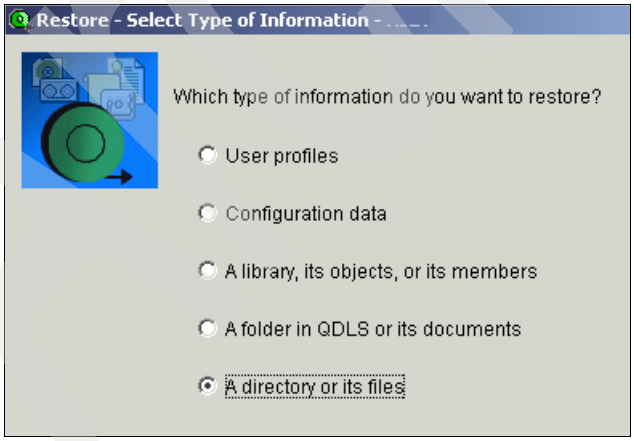

Figure 8-98 Restore - Select Type of Information window

5. On the next window (not shown), enter a directory path and click **Next**. Or click the **Browse** button. Figure 8-99 shows a portion of the Restore - Browse Directories window that opens. Select one or more backup history directories and click **OK**. If there is no backup history information, a window opens that informs you of this. In this example, we selected everything and clicked **OK**.

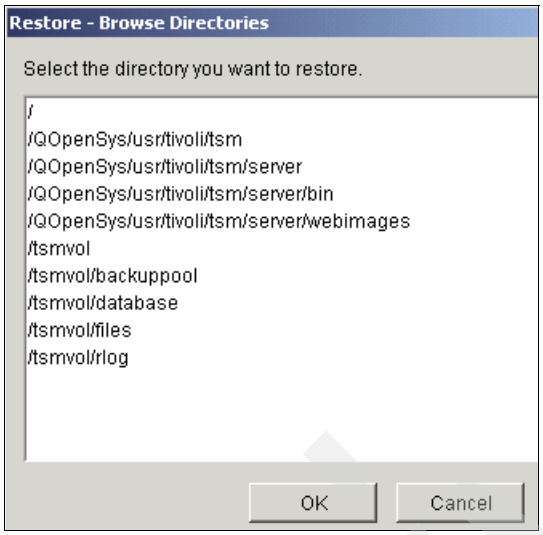

Figure 8-99 Restore - Browse Directories window

6. The Restore - Restore Entire Directory window (Figure 8-100) opens. Select the **Restore directory and all files** option and the **Include subdirectories** check boxes. Click **Next**.

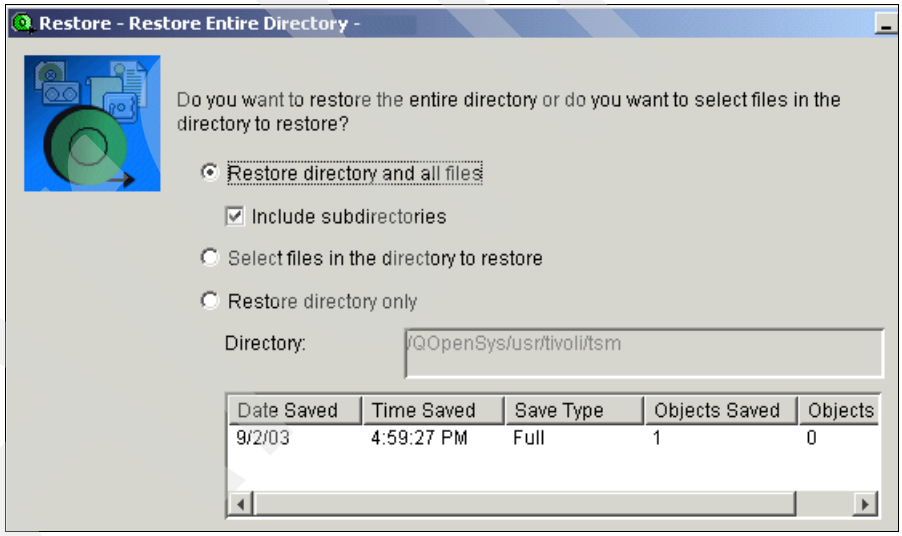

Figure 8-100 Restore - Restore Entire Directory window

7. In this example, we do not want to change location. On the Restore - Restore to Same Location window (Figure 8-101), select the **Yes, restore to same location** option. Click **Next**.

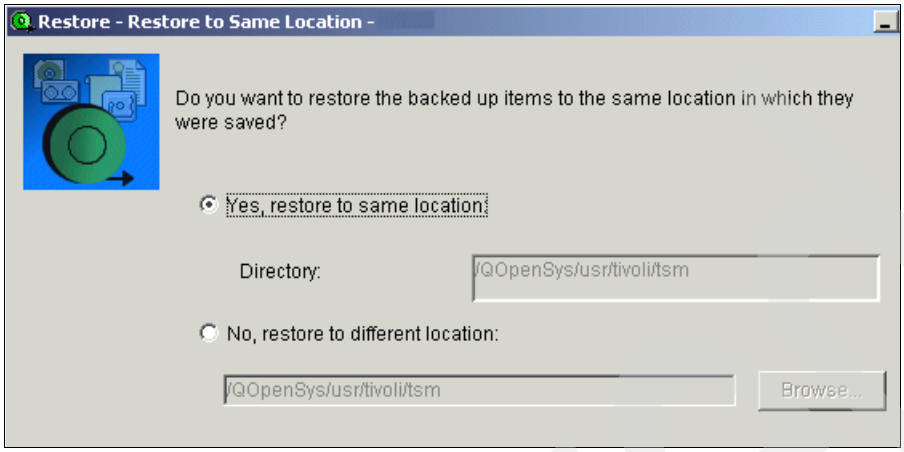

Figure 8-101 Restore - Restore to Same Location window

8. Since we have a tape library device, there is no value in selecting a specific tape drive on the next window. On the Restore - Use Backup History Device window (Figure 8-102), select **Yes, automatically select a device**. Click **Next**.

Figure 8-102 Restore - Use Backup History Device window

9. BRMS looks up the tape volume needed for the restore and places it in the Volumes needed field in the Restore - Summary window (Figure 8-103). Click the **Details** button to review the details and click **Finish**.

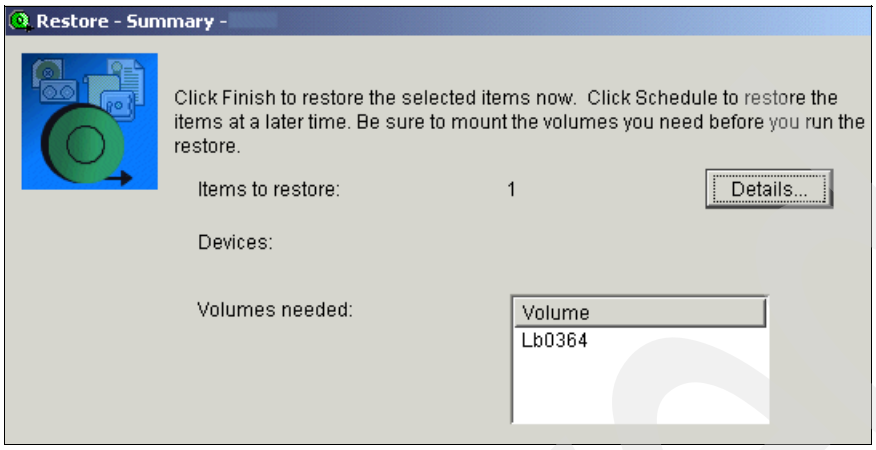

Figure 8-103 Restore - Summary window

If the volume is not in the tape library device, you must insert it. Otherwise you are finished. The restore starts. You must repeat these steps to restore everything.

Attention: The objects that you are about to restore are saved on the same physical tape volume. Make sure that you do not submit your restore jobs concurrently.

Restoring IBM Tivoli Storage Manager server using the 5250 interface

In this example, we use the 5250 interface and the backup policy used to save the IBM Tivoli Storage Manager server. In the 5250 interface, the iSeries Navigator backup policy is named *(backup) control group*.

We restore using our example backup control group defined via the iSeries Navigator client.

Important: Before you restore any IBM Tivoli Storage Manager data, make sure the IBM Tivoli Storage Manager server is ended.

We show examples interactively using the 5250 interface and as a batch job.

Interactively restoring the server using the latest save

To interactively restore your server using the latest save, follow these steps:

1. Stop the IBM Tivoli Storage Manager server as described in 5.1, “Starting and stopping the IBM Tivoli Storage Manager server” on page 54.
2. Enter the following command:

   ```
   STRRCYBRM OPTION(*CTLGRP) ACTION(*RESTORE) CTLGRP((BACKUPITSM))
   ```

3. On the Select Recovery Items display (Figure 8-104), press F9 to validate your recovery defaults.
4. On this same display, type option 1 for both items as shown or press F16 (select all) and press Enter.

```
                          Select Recovery Items

 Type options, press Enter.  Press F16 to select all.
   1=Select   4=Remove   5=Display   7=Specify object


     Saved                            Save   Volume                Exp    Objects
Opt  Item          Date     Time      Type   Serial   File Seq     Date   Saved
 1   TSMEXITS     9/02/03 16:59:08  *FULL  LB0364            1 10/03/03     19
 1   BACKUPITSM   9/02/03 16:59:27  *FULL  LB0364            2 10/03/03    343

                                                                        Bottom
 F3=Exit   F5=Refresh   F9=Recovery defaults   F12=Cancel
 F14=Submit to batch    F16=Select all
```

Figure 8-104 5250 restoring IBM Tivoli Storage Manager environment using the latest save

5. Follow the steps presented in the screens that follow. You see similar restore options as the ones explained in “Restoring the IBM Tivoli Storage Manager server using iSeries Navigator” on page 230. Reply to the options in a similar manner.
6. Start the IBM Tivoli Storage Manager server as explained in 5.1, “Starting and stopping the IBM Tivoli Storage Manager server” on page 54.

Interactively restoring the server using available saves

To restore your server using the available saves, follow these steps:

1. Stop the IBM Tivoli Storage Manager server as described in 5.1, “Starting and stopping the IBM Tivoli Storage Manager server” on page 54.
2. Enter the Work with Media BRM command:

   ```
   WRKMEDIBRM CTLGRP(BACKUPITSM)
   ```

3. The Work with Media Information display (Figure 8-105) opens. Type option 7 next to the items that you want to restore (TSMEXITS and BACKUPITSM in our example).

```
                        Work with Media Information

Position to Date . . . . .

Type options, press Enter.
  2=Change   4=Remove   5=Display   6=Work with media   7=Restore
  9=Work with saved objects

    Saved                              Save   Volume       File    Expiration
Opt Item             Date     Time     Type   Serial     Sequence     Date
    TSMEXITS        9/02/03 16:52:51 *FULL  LB0363            1   10/03/03
    BACKUPITSM      9/02/03 16:53:11 *FULL  LB0363            2   10/03/03
 7  TSMEXITS        9/02/03 16:59:08 *FULL  LB0364            1   10/03/03
 7  BACKUPITSM      9/02/03 16:59:27 *FULL  LB0364            2   10/03/03

                                                                      Bottom
```

Figure 8-105 5250 restore IBM Tivoli Storage Manager environment using available saves

4. Reply to the displays that follow to specify further restore information, according to your specific save activity.

5. When finished, start the IBM Tivoli Storage Manager server as described in 5.1, “Starting and stopping the IBM Tivoli Storage Manager server” on page 54.

Restoring the server as a batch job

To restore the server as a batch job, follow these steps:

1. End the IBM Tivoli Storage Manager server as we have previously described in 5.1, “Starting and stopping the IBM Tivoli Storage Manager server” on page 54.
2. Enter the OS/400 Submit Job (SBMJOB) command specifying in the command parameter the Start Recovery BRM command and its parameter values as shown in the following example. In our example, we use the control group ITSMSAVE and assign a meaningful job name (RESTORETSM) and the appropriate job schedule date and time parameter values. The job name enables us to see this backup job if any problem determination or normal job monitoring is necessary.

```
SBMJOB CMD(STRRCYBRM OPTION(*CTLGRP) ACTION(*RESTORE) CTLGRP((ITSMSAVE)))
JOB(RESTORETSM) LOG(4 00 *SECLVL) SCDDATE(XXXXXXXX) SCDTIME(YYYYYYYY)
```

3. Start the IBM Tivoli Storage Manager server when the restore is complete.

8.14.2 Restoring native OS/400 data

This example restores one object (FINAL) from one of the AS03 libraries (AS0304lib) that we saved earlier. This example follows other restore examples but includes additional options not previously shown.

Using the iSeries Navigator client, restoring data is a fairly easy and straightforward task when you start. Most of the parameter values you enter or option choices you make are also straightforward. In this book, we describe several restore examples.

We provide this example as a reference to show additional options. We expect that you followed our example backing up As03xxx libraries described in 8.8.2, “Saving native OS/400 data to an IBM Tivoli Storage Manager server” on page 198.

In this example, we use the Taskpad area with Backup Recovery and Media Services Tasks heading within the iSeries Navigator window shown in Figure 8-97 on page 231 to start this restore example.

1. Select **Restore iSeries data** as shown in Figure 8-106.

Figure 8-106 Restoring iSeries data using Management Central

2. The Restore - Welcome wizard window (Figure 8-107) opens. Click **Next**.

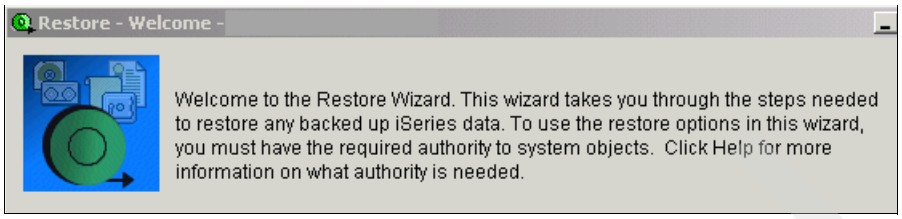

Figure 8-107 Restore Welcome Wizard

3. On the Restore - Restore from Backup History or Device window (Figure 8-108), select how you want to restore, by using backup history or by specifying media. We chose **Restore using backup history**. Click **Next**.

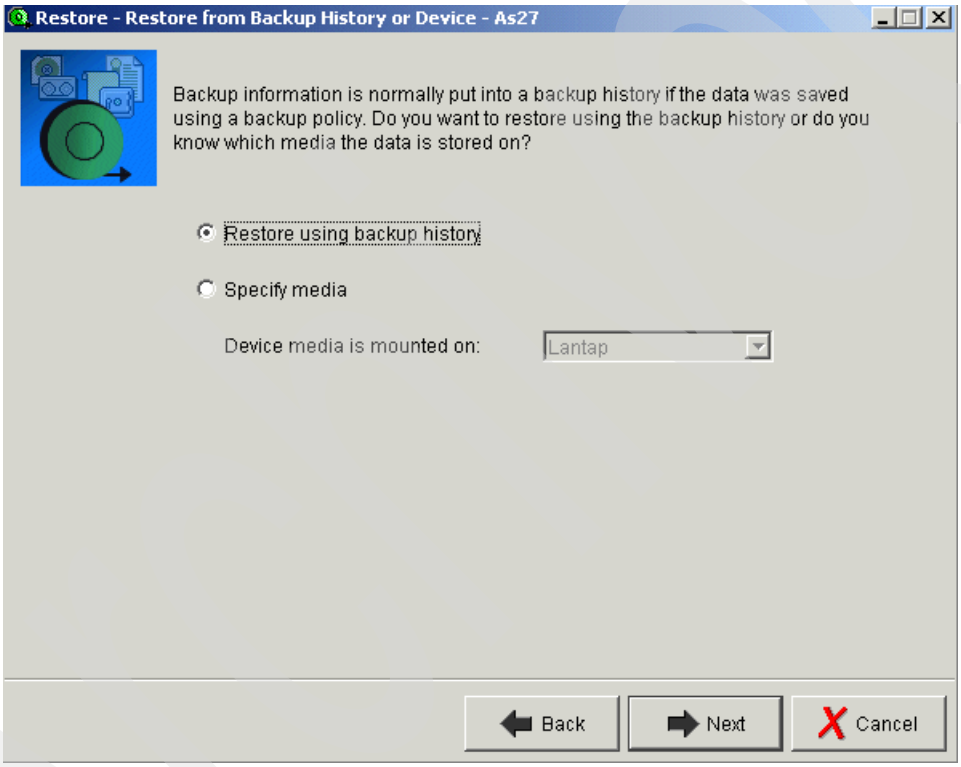

Figure 8-108 Restore - Restore from Backup History or Device window

4. On the Restore - Select Type of Information window (Figure 8-109), select the type of information you want to restore. The data we restore in this scenario is in library AS0304LIB. We select **A library, its objects, or its members**. Click **Next**.

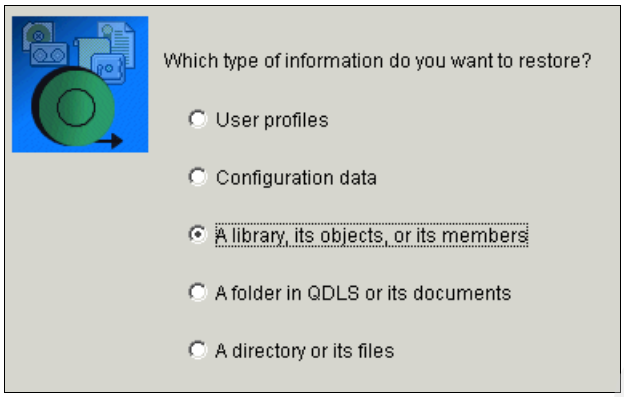

Figure 8-109 Restore - Select Type of Information window

5. On the Restore - Specify Library window (Figure 8-110), enter the name or use the Browse button to select from a list. In this example, click **Browse**.

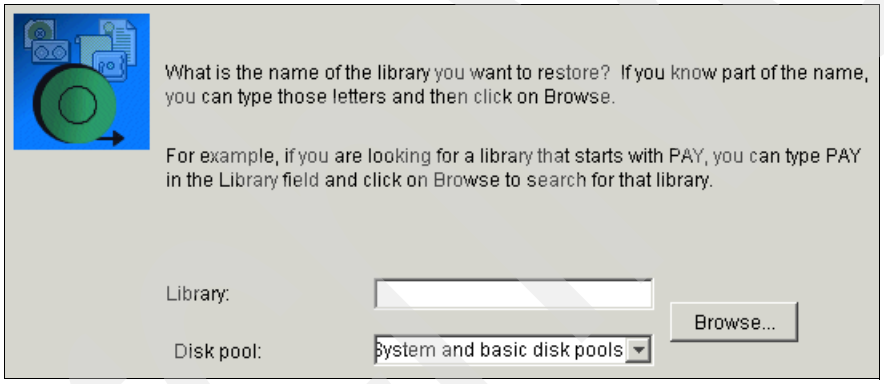

Figure 8-110 Restore - Specify Library window

6. On the Restore - Browse Libraries window (Figure 8-111), select library **As0304lib** from the list. Click **OK**.

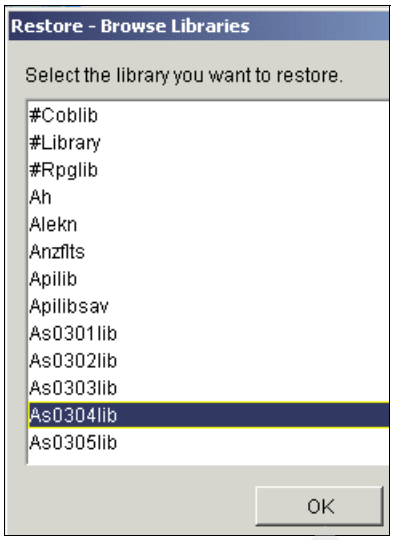

Figure 8-111 Restore - Browse Libraries window

7. Back on the Restore Specify Library window (Figure 8-112), you see that the library name is filled in. Click **Next**.

   In this example, we show the Disk Pool list for information purposes. We select the **System and disk base pools** option, but you can optionally specify **All disk pools**. The All disk pools option adds any optionally defined independent disk pools (also called IASPs), to the system and any optionally defined base (dependent ASPs) storage pools.

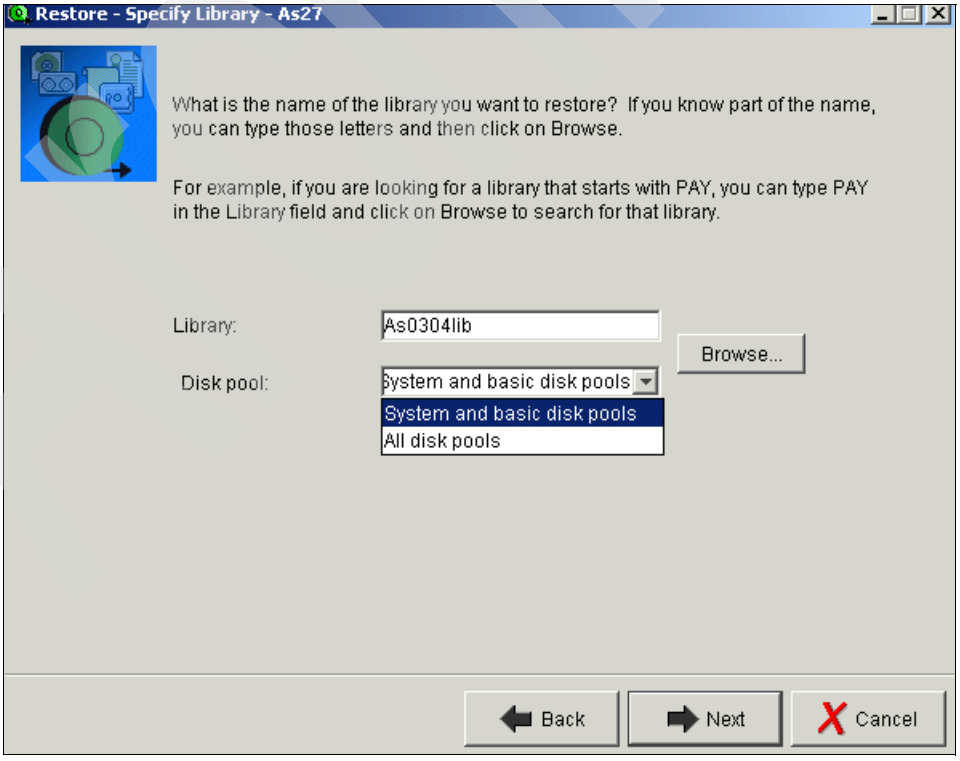

Figure 8-112 Restore - Specify Library window: Library field filled in

An IASP consists of a set of specific disk devices (arms) used to segregate specific data onto the storage pool containing these disk arms. This support is available for supporting multiple OS/400 DB2 UDB databases on a single iSeries server or for switching the entire IASP content to a second system or logical partition. This switching is part of a higher availability process available to iSeries customers.

Further discussion of IASP support is beyond the scope of this redbook. Refer to the following information sources for more information:

- `http://publib.boulder.ibm.com/pubs/html/as400/infocenter.html`

  Select your geographical region and V5R2 and language. In the Search field of the main Information Center page that opens, type `IASP` and click **GO**.

- *Backup Recovery and Media Services for iSeries*, SC41-5345

8. We want to select from a list of backups available. On the Restore - Specify the Saved Version to Restore window (Figure 8-113), select the option **Select the date to restore**. Click **Next**.

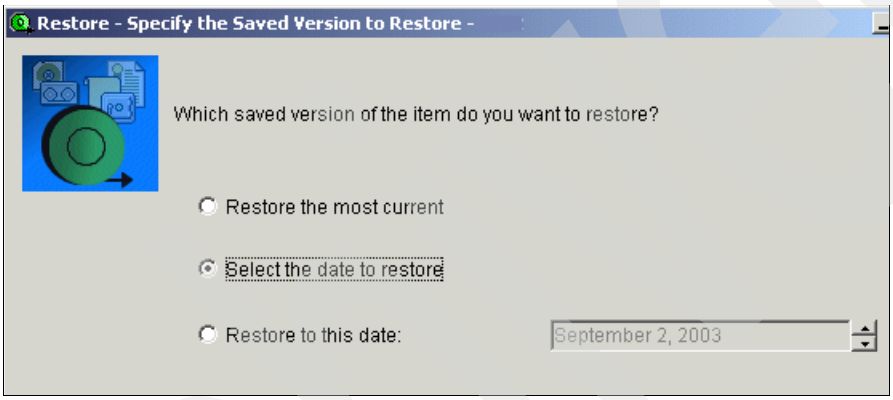

Figure 8-113 Restore - Specify the Saved Version to Restore window

9. As you can see on the Restore - Select the Date of the Save window (Figure 8-114), we selected the backup that was taken on 9/2/03 at 12:01 PM.

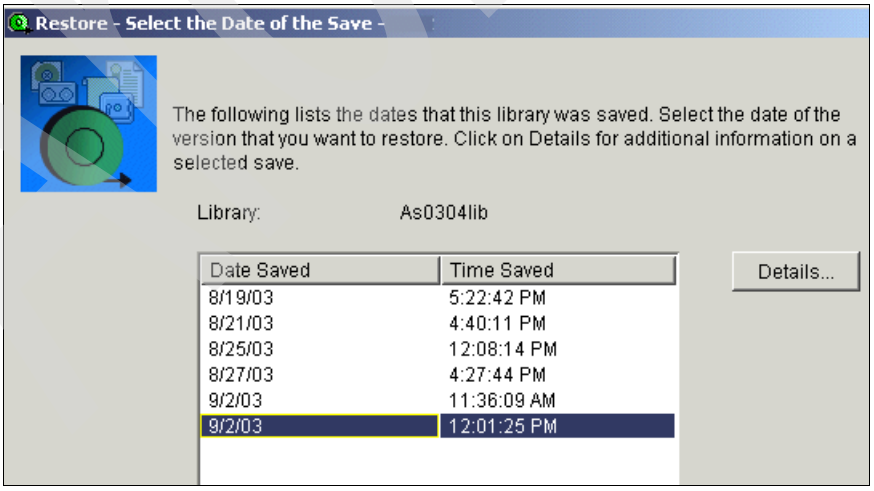

Figure 8-114 Restore - Select the Date of the Save window

Click the **Details** button, and you see the Backup Details window with the General and Media pages as shown in Figure 8-115.

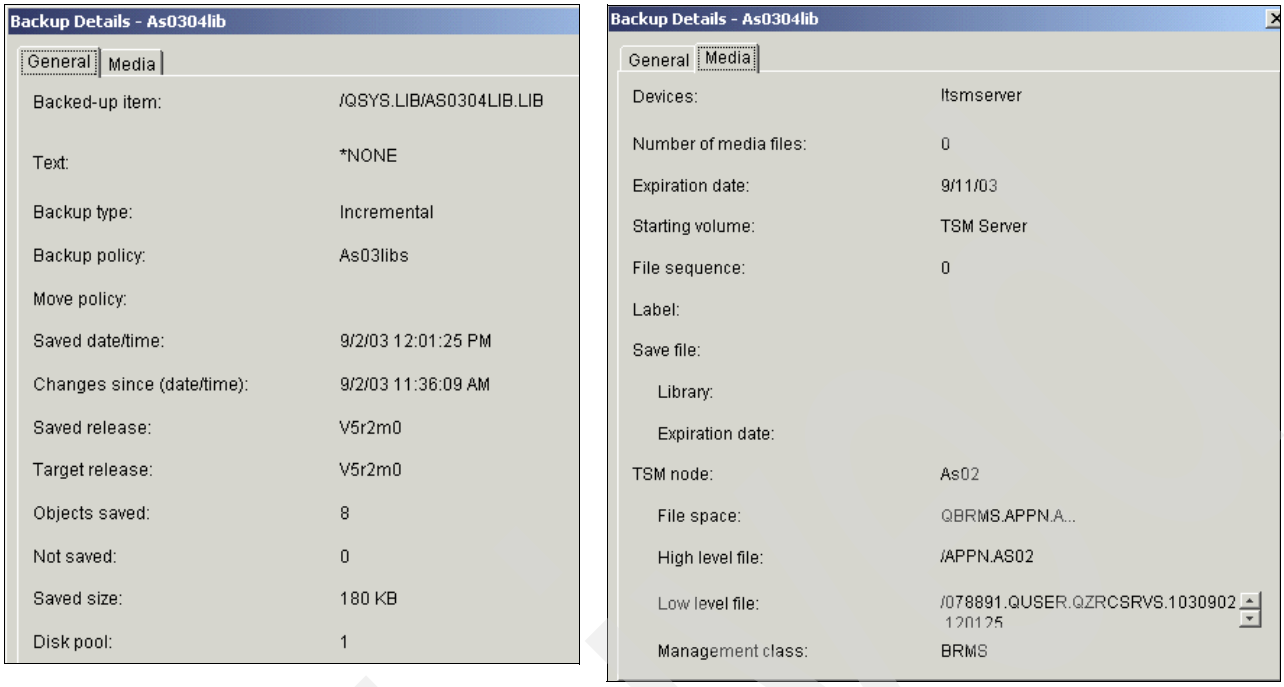

Figure 8-115 Backup Details for As0304lib

Click **OK**.

10. Back on the Restore - Select the Date of the Save window, click **Next**.
11. On the Restore - Restore Entire Library window (Figure 8-116), in our example, we select **Select objects in the library to restore** option.

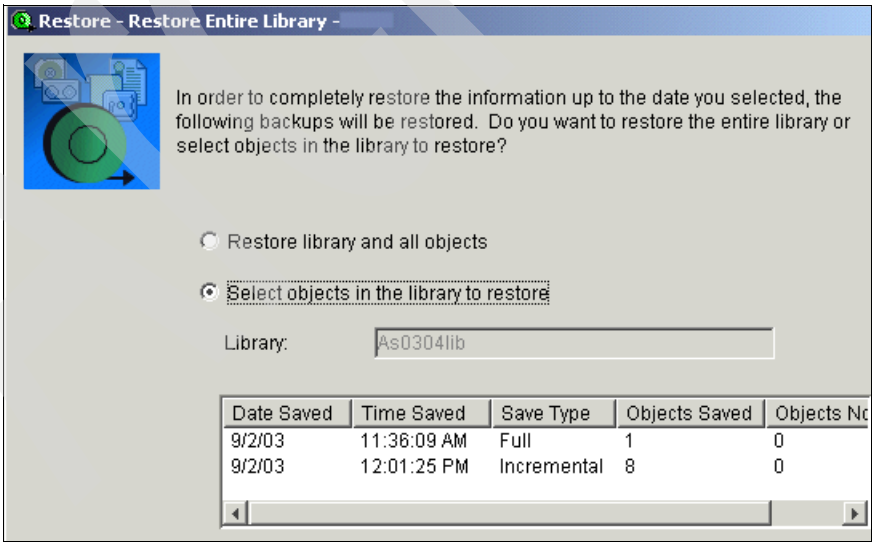

Figure 8-116 Restore - Restore Entire Library window

If no detailed information is available, you see the Restore - Specify Object or Member window (Figure 8-117). You must manually enter the information on this window.

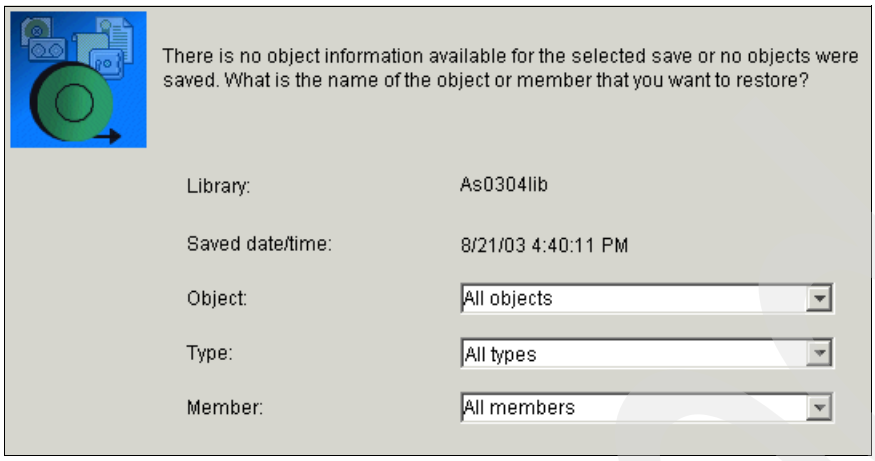

Figure 8-117 Restore - Specify Object or Member window

If there is detailed information, you see the list of objects shown in the Restore - Select Objects window showing each object, its object type, and its date saved information as shown in Figure 8-118. You can select one or more objects. In our example, we select **Final** and click **Next**.

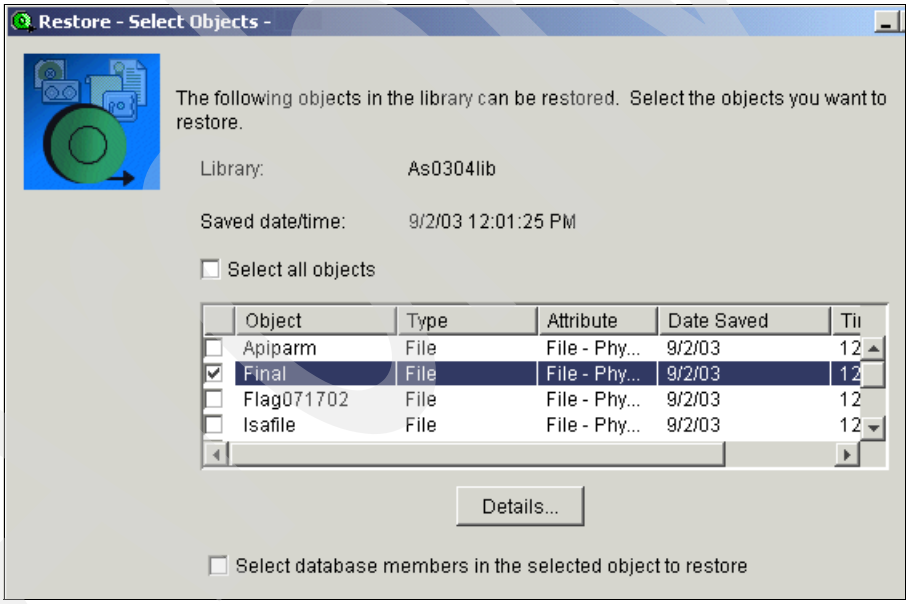

Figure 8-118 Restore - Select Objects window

12. The Restore - Restore to Same Location window (Figure 8-119) opens. You can change the target library if you desire. Click **Next**.

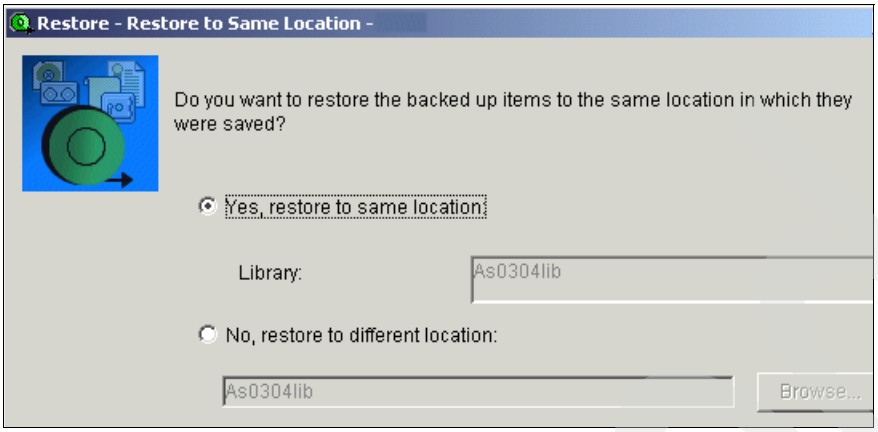

Figure 8-119 Restore - Restore to Same Library window

13. Using an IBM Tivoli Storage Manager server, the final window that you see is the Summary window (not shown).

For a reference, we provide the windows that open when you restore from tape. One way to follow this set of windows is to select **Specify media** on the window shown in Figure 8-108 on page 237. This opens the following sequence of tape device-related windows:

1. In the selecting a device window, select a tape device automatically or manually as shown in Figure 8-120. In our example, there are four tape devices and the tape library device (Tapmlb05) known to BRMS. We select **Tap09** (not shown).

   If you have only one tape device known to BRMS, the tape device and Volumes needed parameter may be on a different wizard window.

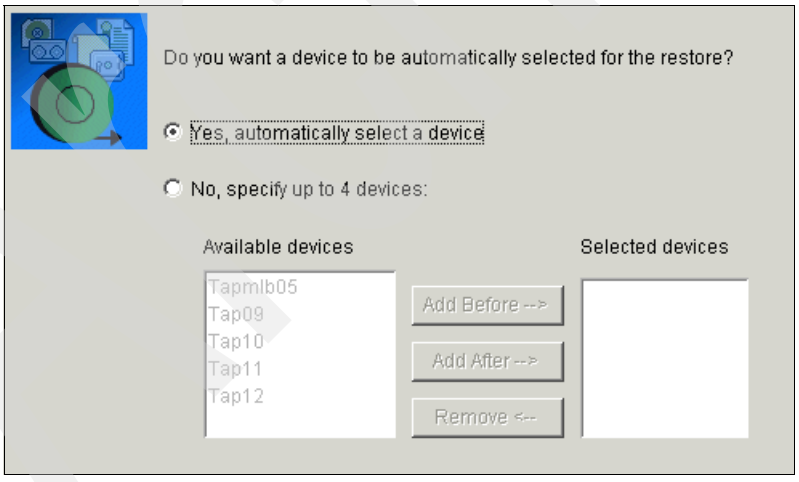

Figure 8-120 Restore: Selecting an available tape device

2. On the Restore-Summary window (Figure 8-121), you see that Tap09 is selected and BRMS has selected the volume.

   As shown in this Restore-Summary window, you see the Finish and Schedule buttons. You also see the Details and Advanced Options buttons. In this example, we select the **Advanced Options** button to show you the kinds of OS/400 restore functions and options that are available for the tape device and OS/400 objects when restoring through the BRMS iSeries Navigator client interface.

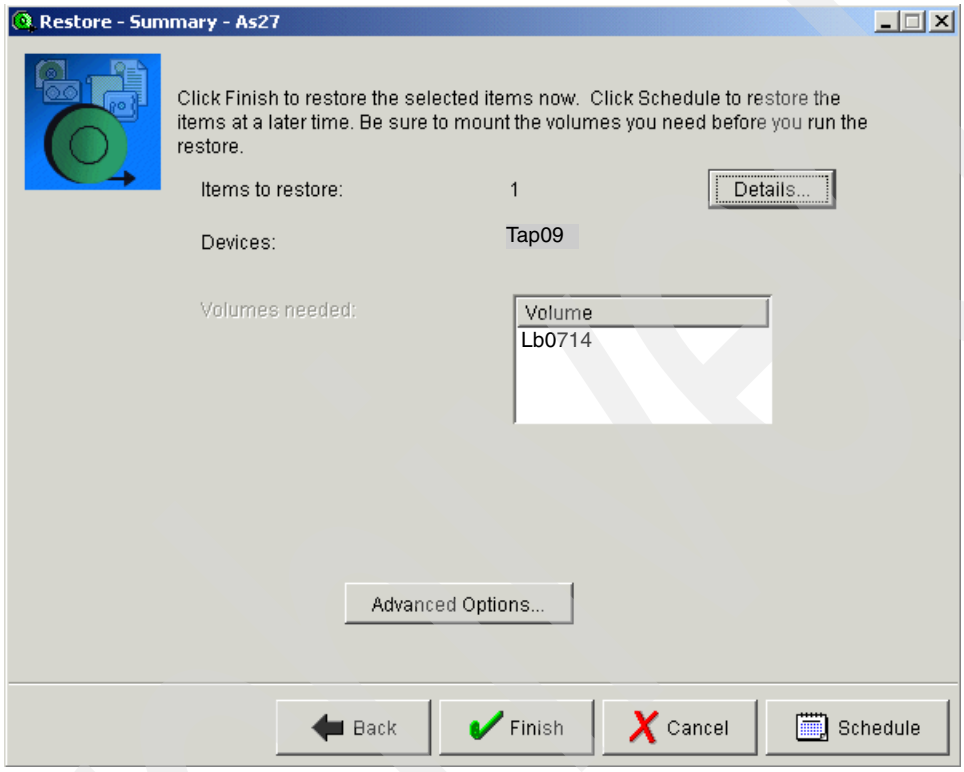

Figure 8-121 First Restore - Summary window

3. On the Restore - Advanced Options window (Figure 8-122), you can select the End of tape action, allow or not allow object differences (when restoring the same object name and type already existing on the system), and several database member restore options.

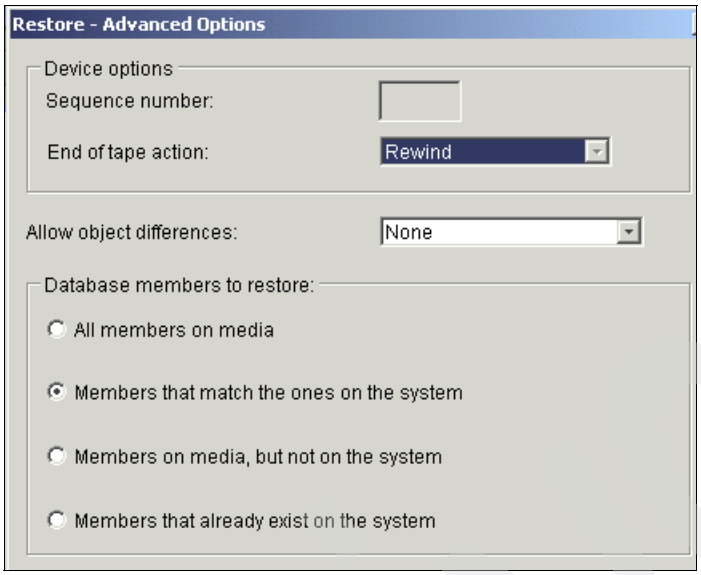

Figure 8-122 Restore: Advanced Options

4. When you are finished with these advanced options, click **OK** to return to the summary window shown again in Figure 8-123. You can click **Back** if you need to make changes, click **Schedule**, or click **Finish**. Clicking Finish starts the restore immediately.

   In our example, we click the **Schedule** button to show an example of BRMS restore using the Management Central interface to the OS/400 job scheduling function in Figure 8-124.

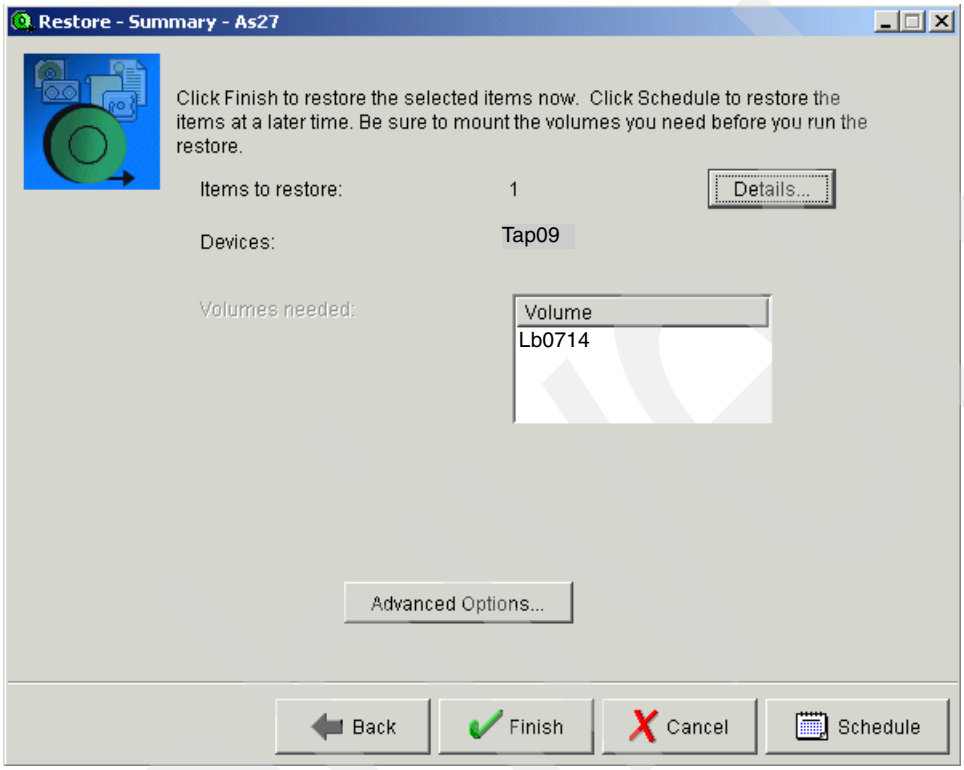

Figure 8-123 Second Restore - Summary window

5. Clicking the Schedule button opens the Management Central Scheduler window shown in Figure 8-124. You must enter the time, date, and whether there is a one-time restore or you want repetitive scheduling. The current system time and date are defaulted so be careful to specify the time and date values that are right for your operating environment.

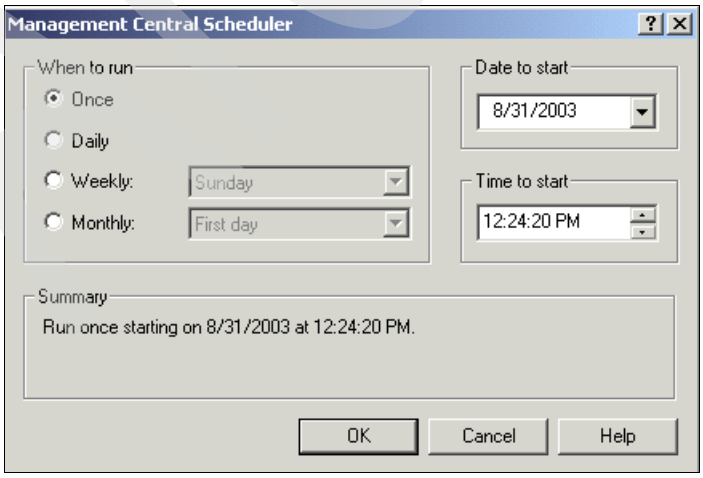

Figure 8-124 Restore - Management Central Scheduler window

Note: If you optionally installed the separately priced Advance Job Scheduler product (5722-JS1) and included it as an optional plug-in to your iSeries Navigator session, you see a different scheduling window than the one shown here.

When you are done specifying your scheduling information click **OK** and exit the Restore wizard.

8.14.3 Finding your restore results

This section discusses where, under OS/400, the restore function was performed and how you can validate that the restore function you ran completed successfully.

First, you may have run the restore immediately from the Restore - Summary window shown in Figure 8-121 on page 244 or scheduled it to run later (from the Restore - Summary window shown in Figure 8-123). When that function runs, it is performed within one of the OS/400 pre-started host server “central server jobs” with the prefix QZRCSRVS in subsystem QUSRWRK. You can see these jobs by issuing the Work with Subsystem Jobs (WRKSBSJOB) command for QUSRWRK or the Work with Active Jobs (WRKACTJOB) command (shown in Figure 8-125).

The job that runs the restore is determined at run time and may be any one of these prestarted jobs within IBM-provided subsystem QUSRWRK. When this function is performed, it sends status messages to message queue QSYSOPR, which identify the job doing the restore.

```
Opt  Subsystem/Job  User        Type  CPU %  Function        Status
_   QUSRWRK         QSYS        SBS      .0                 DEQW
_    QZRCSRVS       QUSER       PJ       .0                 TIMW
_    QZRCSRVS       QUSER       PJ       .0                 TIMW
_    QZRCSRVS       QUSER       PJ       .0                 TIMW
```

Figure 8-125 WRKACTJOB for subsystem QUSRWRK running BRMS restore example

To see the restore results using the BRMS iSeries Navigator client, complete the following steps. These steps are based on Figure 8-89 on page 226 as a reference, and the windows flow similar to those in 8.13, “Finding your backup job” on page 226.

1. At the top of the main iSeries Navigator window left pane, expand **Management Central-> Task Activity**. Click **Backup, Recovery and Media Services**.
2. In the right pane, view all the BRMS tasks that you started. Find your “Restore Items” entry as shown in our example in Figure 8-126. Note the information in the rightmost area (including Started and Last Changed columns).

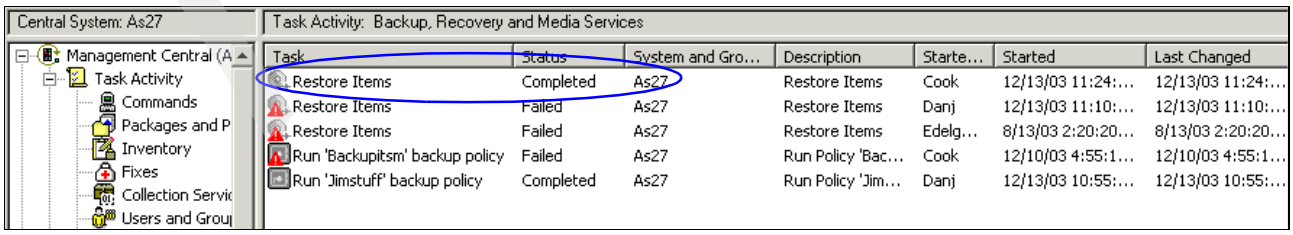

Figure 8-126 Management Central: BRMS activities restore example

3. Double-click your restore items entry and you see a Restore Items window (Figure 8-127). This tells you on what system the restore ran and its status (*Completed* means successful). Note, that as part of Management Central's capabilities you can schedule a restore (or original backup) to run on multiple systems. If you do, you see multiple systems and their status listed in the Restore Items window.

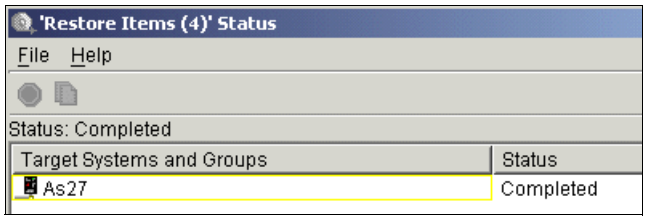

Figure 8-127 Management Central: Restored items

4. You return from the workstation back to the Task Activity: Backup, Recovery and Media Services right pane. Right-click your restore items entry and select **Backup and Recovery Log**. Click **OK**.
5. You see the details of your BRMS activity. Scroll down to find your appropriate time stamped restore entries. Using our AS0304lib library example, you see a message similar to the one shown in Figure 8-128 that lists the object or objects that are restored.

```
1 objects restored from AS0304LIB to AS0304LIB.
```

Figure 8-128 Restore BRMS log entry

This concludes our overview of getting BRMS up and running. We did not cover the complete set of backup and recovery capabilities available using the Backup, Recovery and Media Services, 5722-BR1, product. Refer to *Backup Recovery and Media Services for iSeries*, SC41-5345, for complete coverage.

Chapter 9, "Setting up an iSeries server as the Backup Recovery and Media Services Application Client" on page 249, provides more details about setting up and using BRMS as a client to the IBM Tivoli Storage Manager server, when the product IBM Tivoli Storage Manager for OS/400 PASE (5698-ISX) is installed and set up on an iSeries server.

9

Setting up an iSeries server as the Backup Recovery and Media Services Application Client

This chapter explains how to set up the IBM Tivoli Storage Manager server for Backup Recovery and Media Services (BRMS) to use IBM Tivoli Storage Manager application programming interfaces (APIs) and the BRMS environment for backup and restore to an IBM Tivoli Storage Manager server. It also takes you through save and restore scenarios using BRMS as an application client with an IBM Tivoli Storage Manager server.

In addition, this chapter explains full backup and restore for an iSeries considering the BRMS Application Client to an IBM Tivoli Storage Manager server. Plus it discusses Save While Active (SWA) implications and IBM Tivoli Storage Manager password management.

Although complete coverage of performance is beyond the scope of this redbook, this chapter provides performance scenarios. These scenarios use the BRMS Application Client to an iSeries IBM Tivoli Storage Manager server between two logical partitions (LPAR), using the Virtual Ethernet local area network (LAN) between partitions.

9.1 Setting up the IBM Tivoli Storage Manager server for BRMS to use IBM Tivoli Storage Manager APIs

You can use BRMS to save user data from an iSeries server to *any* IBM Tivoli Storage Manager server. You do this by using a BRMS component that is called the *BRMS Application Client*, which is part of the standard BRMS product. The BRMS Application Client communicates with the IBM Tivoli Storage Manager server through a special set of APIs.

There is no IBM Tivoli Storage Manager Backup-Archive Client type of product on the iSeries server. The BRMS Application Client provides several backup and archive client-like functions in relation to an IBM Tivoli Storage Manager server. These are sometimes referred to as an IBM *Tivoli Storage Manager client*. However, it is not an IBM Tivoli Storage Manager Backup-Archive Client. For general considerations, see 2.9, “System backup strategies to an IBM Tivoli Storage Manager server” on page 31.

This chapter assumes that you successfully installed BRMS on your iSeries, as described in 7.2, “Installing the BRMS software” on page 134. It also expects that you installed IBM Tivoli Storage Manager APIs (5733-197) on your iSeries server, as described in 7.4, “Downloading and installing no-charge IBM Tivoli Storage Manager APIs” on page 142.

Although it is not required, we strongly recommend that you define your own IBM Tivoli Storage Manager environment for an iSeries server. This assures that the IBM Tivoli Storage Manager server expires objects soon after they are deleted by BRMS. Also, IBM Tivoli Storage Manager copy-group retentions are not used.

IBM Tivoli Storage Manager server setup for an iSeries as the BRMS Application Client is different from setting up other IBM Tivoli Storage Manager Backup-Archive Clients and your own IBM Tivoli Storage Manager environment helps make this setup easier.

Each of the following tasks show the IBM Tivoli Storage Manager Web administrative client interface to perform the step, followed by the IBM Tivoli Storage Manager command interface. Perform these tasks on the IBM Tivoli Storage Manager server side. If you are not familiar with IBM Tivoli Storage Manager, consider asking your IBM Tivoli Storage Manager administrator to perform these steps. For more details about IBM Tivoli Storage Manager server in this book, see Chapter 5, “First steps: IBM Tivoli Storage Manager server basic configuration” on page 53.

Notes: In the steps in this chapter, we use the name “BRMS” for most of our IBM Tivoli Storage Manager definitions. In most cases, this is the required value for parameters that specifically enable the BRMS Application Client to work successfully to any IBM Tivoli Storage Manager server. Other BRMS-oriented chapters in this redbook identify when the value “BRMS” is required. To avoid any problems, use this value as shown in the examples in this chapter.

1. Define an IBM Tivoli Storage Manager domain.

   Using the IBM Tivoli Storage Manager Web administrative client interface tree structure, follow these steps:

   a. As shown in Figure 9-1, expand **Object view** and click **Policy Domains**.

   b. From the Operations list, select **Define Policy Domain**.

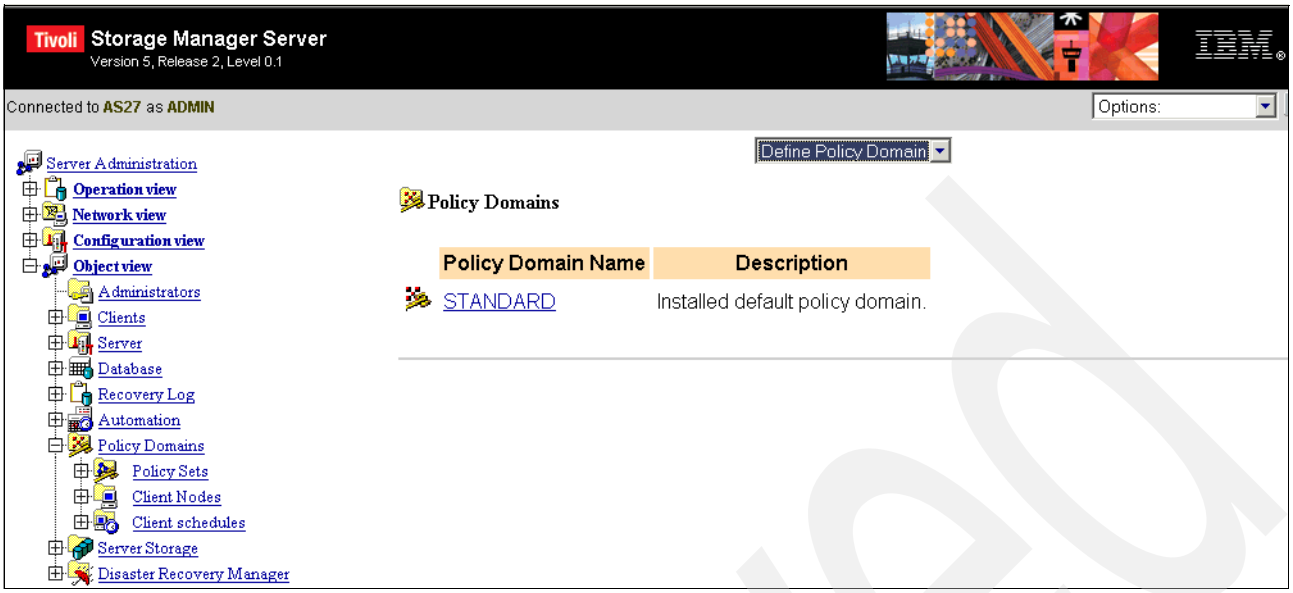

Figure 9-1 Policy Domain panel

c. The Policy Domains panel (Figure 9-2) opens.

   i. For Policy Domain Name, enter `BRMS`.
   ii. Enter a meaningful description.
   iii. For Backup Retention, change the default value from 30 to `365`.
   iv. For Archive Retention, change the default value from 365 to `0`.
   v. Click **Finish**.

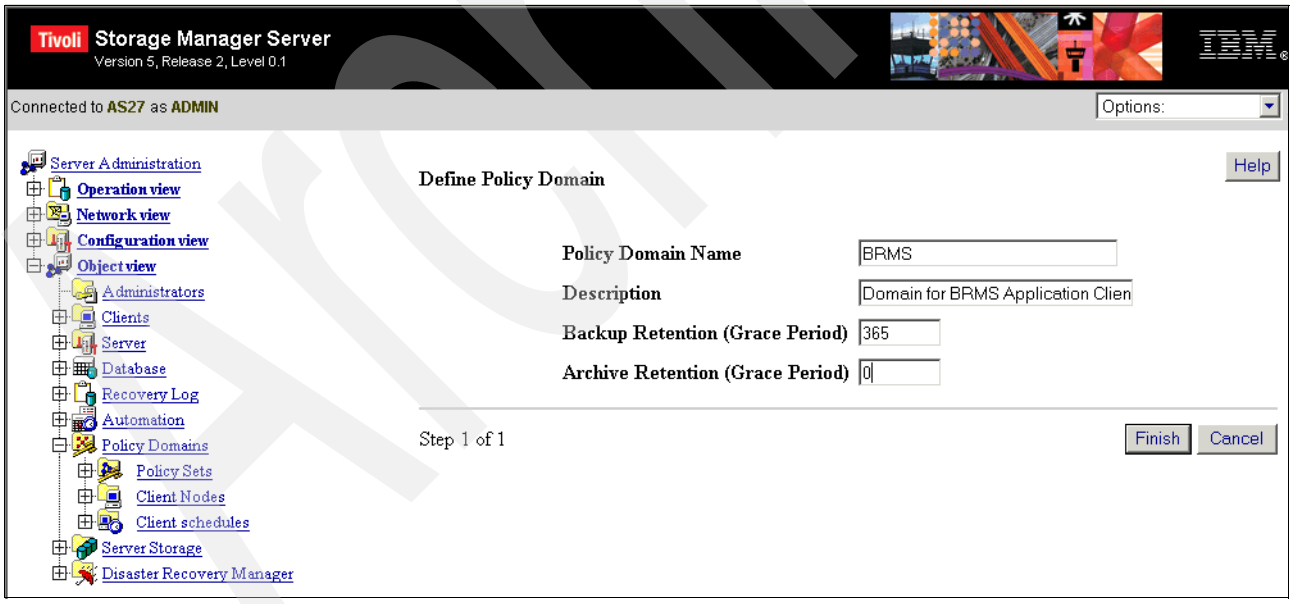

Figure 9-2 Define Policy Domain BRMS

Using the IBM Tivoli Storage Manager Web Server Command window, enter:

```
DEFine DOmain BRMS DESCription="Domain for BRMS Application Clients" BACKRETention=365
ARCHRETention=0
```

In both cases, you receive the message "`ANR1500I Policy domain BRMS defined`".

2. Define an IBM Tivoli Storage Manager policy set.

   Using the IBM Tivoli Storage Manager Web administrative client interface tree structure, follow these steps:

   a. Expand **Object view-> Policy Domains-> Policy Domains-> Policy Sets**.

   b. From the Operations list, select **Define Policy Set**.

   c. The Define Policy Set panel (Figure 9-3) opens.

      i. For Policy Domain Name, select **BRMS** in parameter. We created this domain in the previous step.

      ii. For Policy Set Name, type `BRMS`.

      iii. In the Description field, type your own text, for example `Policy Set for BRMS Application Client`.

      iv. Click **Finish**.

Figure 9-3 Define Policy Set BRMS

Using the IBM Tivoli Storage Manager Web Server Command window, enter:

```
DEFine POLicyset BRMS BRMS DESCription="Policy set for BRMS Application Clients"
```

In both cases, you see the message "`ANR1510I Policy set BRMS defined in policy domain BRMS`".

3. Define an IBM Tivoli Storage Manager management class.

   Using the IBM Tivoli Storage Manager Web administrative client interface tree structure, follow these steps:

   a. As shown in Figure 9-4, expand **Object view-> Policy Domains-> Policy Domains-> Policy Sets-> Management Classes**.

   b. From the Operations list, select **Define Management Class**.

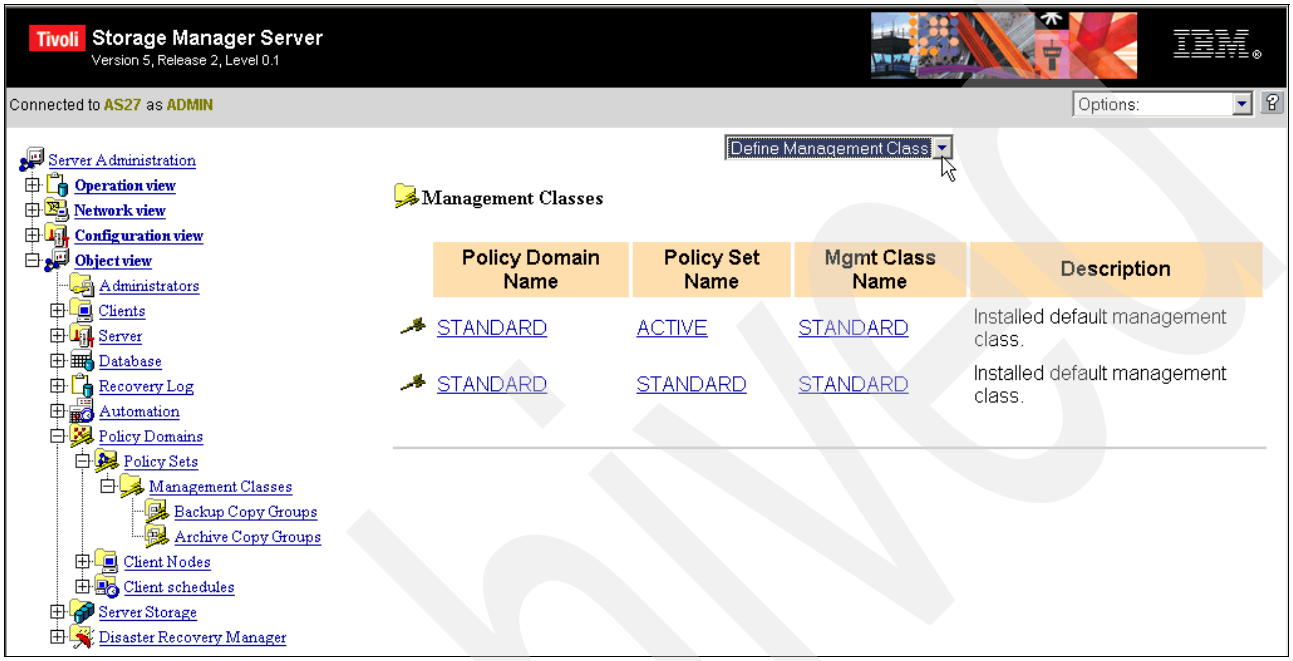

Figure 9-4 Management Classes panel

c. The Define Class Management panel (Figure 9-5) opens.

i. In the Policy Domain Name field, select **BRMS**.

ii. In the Policy Set Name field, select **BRMS**, which was created in the previous step.

iii. In the Mgmt Class Name field, type `BRMS`.

iv. In the Description field, enter meaningful text, for example, `Management Class for BRMS Application Clients`.

v. Leave the other parameters as the default values.

vi. Click **Finish**.

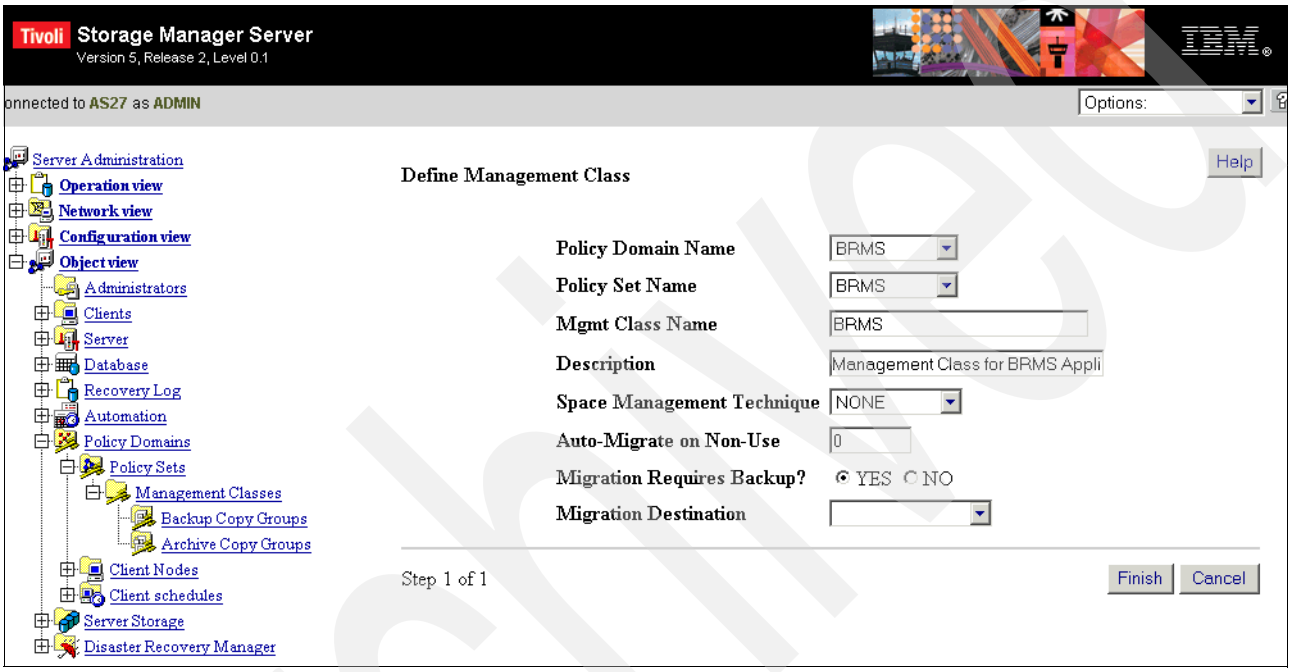

Figure 9-5 Define Management Class BRMS

Using the IBM Tivoli Storage Manager Web Server Command window, enter:

```
DEFine MGmtclass BRMS BRMS BRMS DESCription="Management Class for BRMS Application Clients"
```

In both cases, you see the message "`ANR1520I Management class BRMS defined in policy domain BRMS, set BRMS`".

4. Define an IBM Tivoli Storage Manager copy group.

Using the IBM Tivoli Storage Manager Web administrative client interface tree structure, follow these steps:

a. Expand **Object view-> Policy Domains-> Policy Sets-> Management Classes**. Select **Backup Copy Groups**.

b. From the Operations list, select **Define Backup Copy Groups**.

c. The Define Backup Copy Group panel (Figure 9-6) opens.

i. For the Policy Domain Name, Policy Set Name, and Management Class Name fields, select **BRMS**.

ii. For Copy Destination, select **BACKUPPOOL**.

iii. Change the following parameters from their defaults to values as indicated in parentheses:

- Versions Data Exists (2 to 1)
- Versions Data Deleted (1 to 0)
- Retain Extra Versions (30 to 0)
- Retain Only Version (60 to 0)

iv. Leave the other parameters with defaults.

v. Click **Finish**.

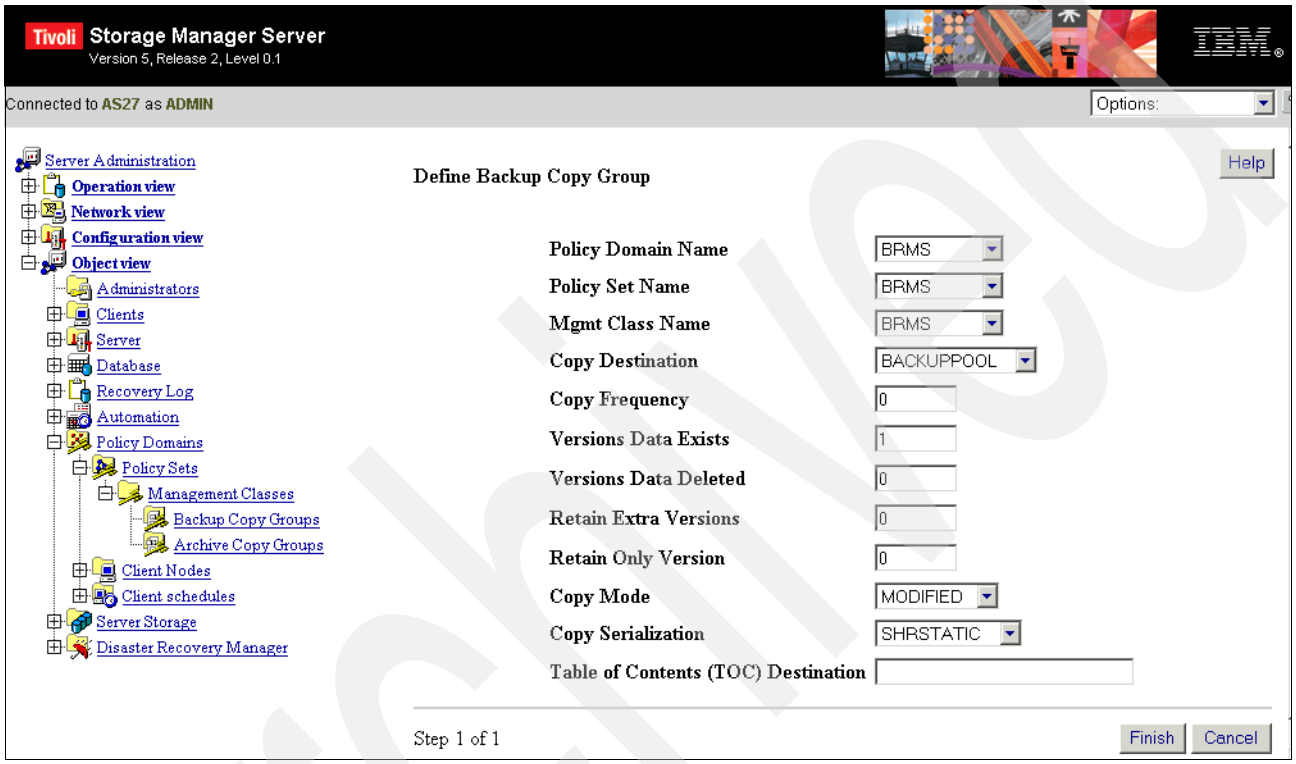

Figure 9-6 Define Backup Copy Group panel

Using the IBM Tivoli Storage Manager Web Server Command window, enter:

```
DEFine COpygroup BRMS BRMS BRMS STANDARD Type=Backup DESTination=BACKUPPOOL VEREXists=1
VERDeleted=0 RETExtra=0 RETOnly=0
```

In both cases, you see the message "`ANR1530I Backup copy group STANDARD defined in policy domain BRMS, set BRMS, management class BRMS`".

5. Assign the defined IBM Tivoli Storage Manager management class (for example, BRMS) as the default management class.

   Using the IBM Tivoli Storage Manager Web administrative client interface tree structure, follow these steps:

   a. Expand **Object view-> Policy Domains-> Policy Sets-> Management Classes**.

   b. From the list of defined management classes that appear in the right panel, select **BRMS** and, under Management Class Name, click **BRMS**.

c. The Management Classes panel (Figure 9-7) opens. From the Operations list, select **Assign as Default Management Class**. Review this panel and click **Finish**.

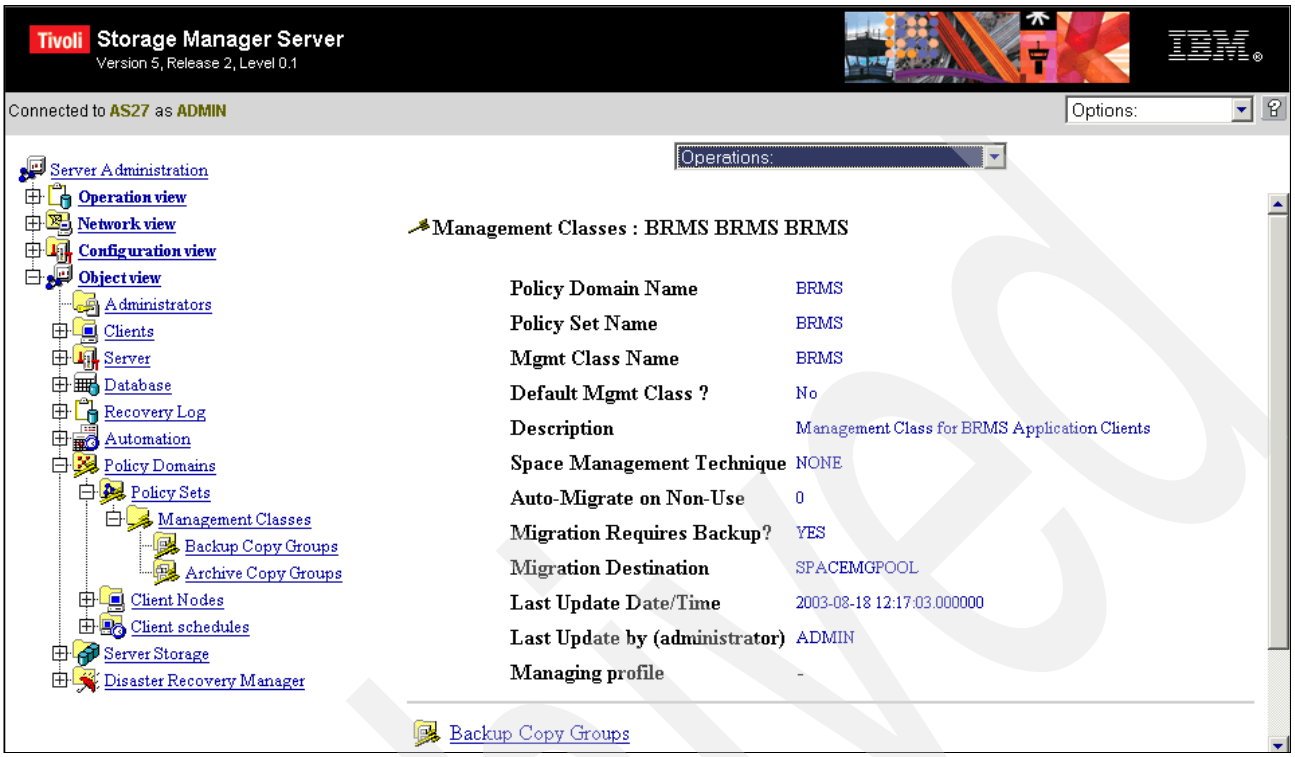

Figure 9-7 Assigning a management class BRMS as the default management class

Using the IBM Tivoli Storage Manager Web Server Command window, enter:

```
ASSign DEFMGmtclass BRMS BRMS BRMS
```

In both cases, you see the message "`ANR1538I Default management class set to BRMS for policy domain BRMS, set BRMS`".

Note: You can verify your management class, BRMS, by using the IBM Tivoli Storage Manager Web administrative client interface tree structure. The Default Management Class parameter should now be *Yes*, where it is shown in Figure 9-7 before the change.

6. Activate a policy set (for example, BRMS).

   Using the IBM Tivoli Storage Manager Web administrative client interface tree structure, follow these steps:

   a. Expand **Object view-> Policy Domains-> Policy Domains-> Policy Sets**.

   b. As shown in Figure 9-8, in the right panel, you see all defined policy sets. Under Policy Set Name, click **BRMS**.

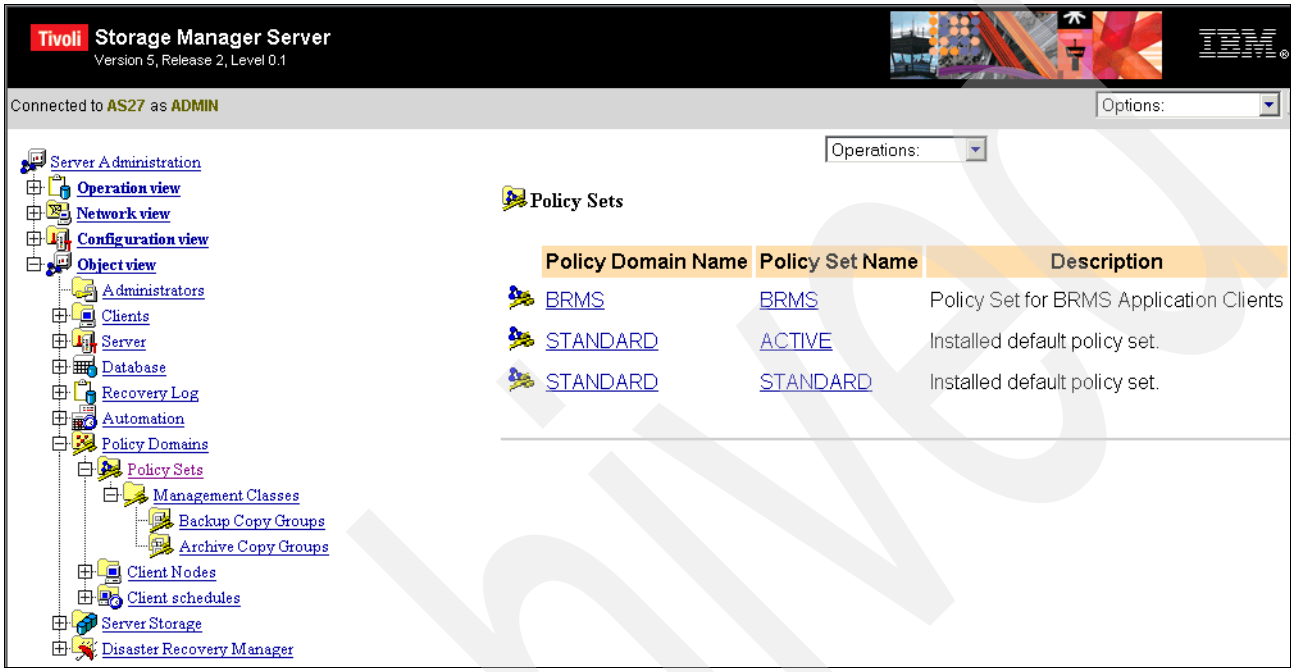

Figure 9-8 Policy Sets

c. The Policy Sets panel (Figure 9-9) opens. In the Operations list, select **Activate Policy Set**.

d. On the panel that appears, click **Finish**.

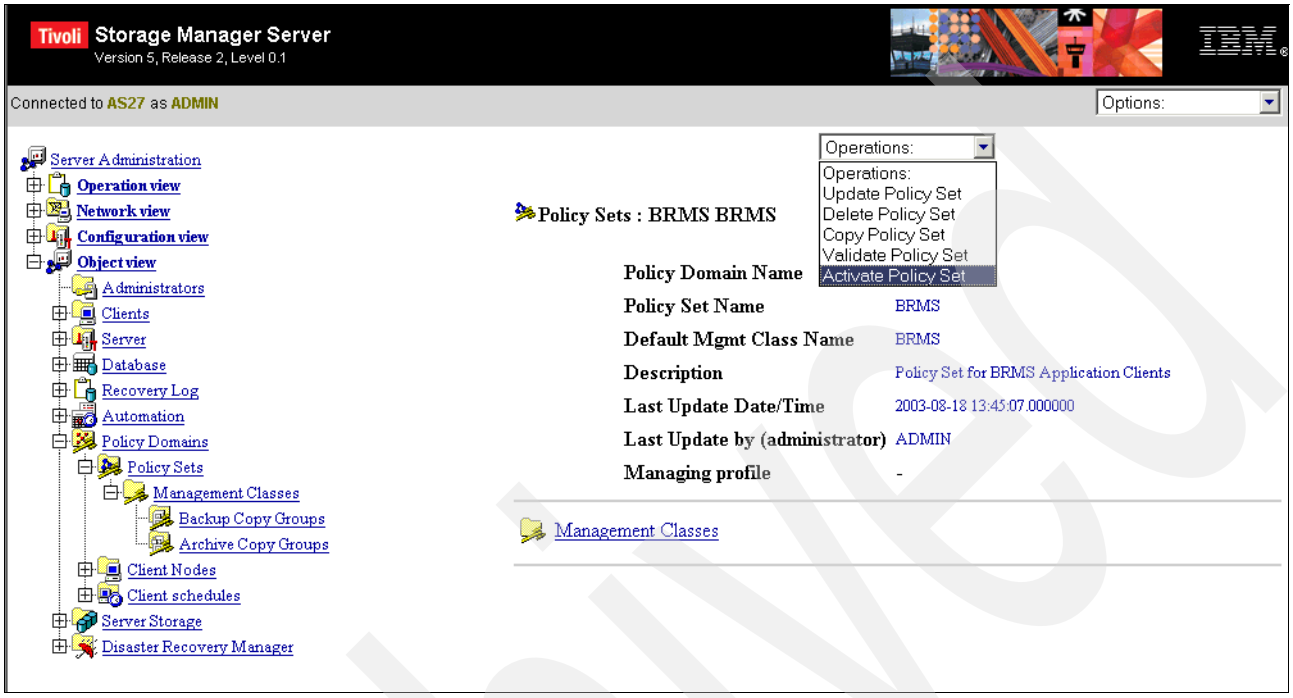

Figure 9-9 Activate Policy Set BRMS

Using the IBM Tivoli Storage Manager Web Server Command window, enter:

```
ACTivate POLicyset BRMS BRMS
```

In both cases, you see the following two messages:

```
ANR1554W DEFAULT Management class BRMS in policy set BRMS BRMS does not have an ARCHIVE
copygroup: files will not be archived by default if this set is activated.

ANR1514I Policy set BRMS activated in policy domain BRMS.
```

7. Register your iSeries as the IBM Tivoli Storage Manager node.

   For this iSeries server node registration, you must specify a node name and a password. If necessary determine with your IBM Tivoli Storage Manager administrator, the password rules for your IBM Tivoli Storage Manager environment and verify that your preferred node name is not already used for another node.

   After registration your iSeries server node counts as one IBM Tivoli Storage Manager license. See 5.3.3, “Registering IBM Tivoli Storage Manager licenses” on page 63.

   For our test environment (see Figure 1-3 on page 11), we use the following definitions:

   – iSeries `AS27` as IBM Tivoli Storage Manager server
   – iSeries `AS02` as IBM Tivoli Storage Manager client (BRMS Application Client)
   – IBM Tivoli Storage Manager server password rules as shown in Figure 9-10
   – IBM Tivoli Storage Manager Node name for our iSeries, `AS02`
   – Network communication protocol, `TCP/IP`

Communication protocol used: Normally TCP/IP is used. However Advanced Peer-to-Peer Network (APPN) is also supported for the BRMS Application Client. APPC/Advanced Program-to-Program Communication (APPC) was the original implementation.

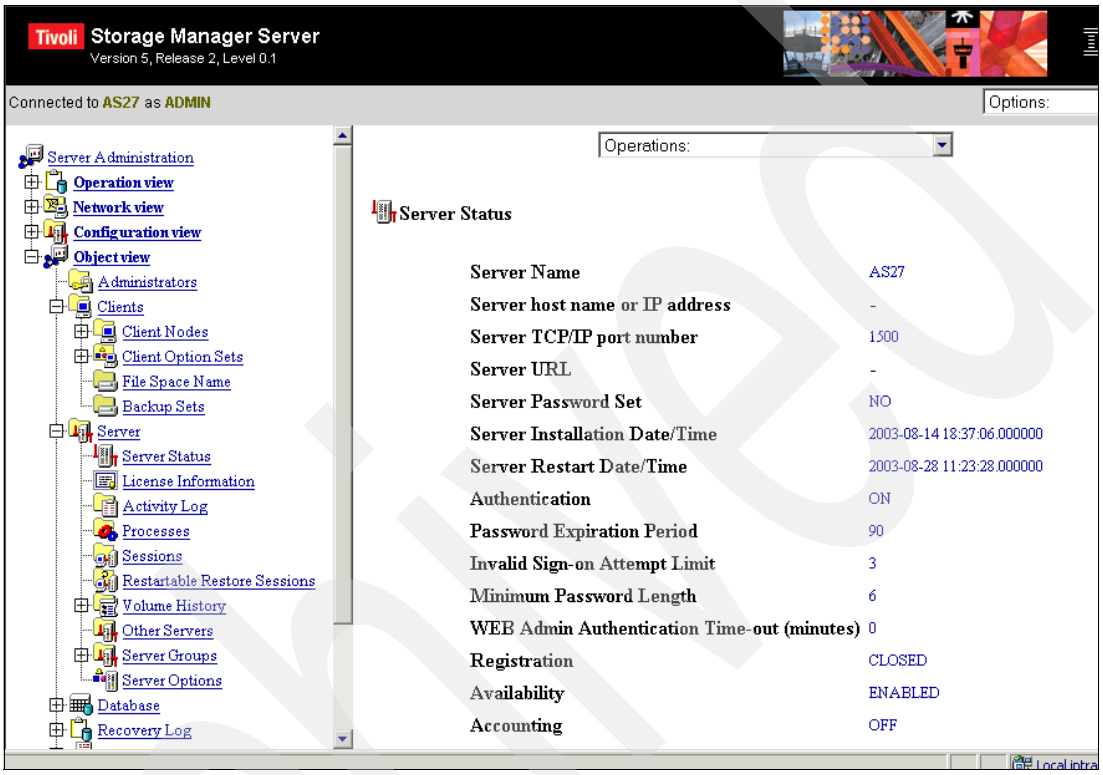

Figure 9-10 IBM Tivoli Storage Manager server password rules

8. Register your iSeries as an IBM Tivoli Storage Manager node.

   Using the IBM Tivoli Storage Manager Web administrative client interface tree structure, follow these steps:

   a. As shown in Figure 9-11, expand **Operation view-> Work with client nodes** and select **Register a new node**.

   b. The Register a new node panel opens:

      i. For Node Name, type the name, which is AS02 in our example.
      ii. Type the values for the Password and Contact fields.
      iii. In the in Policy Domain Name field, select **BRMS**.
      iv. For the Client compression setting, select **No**.
      v. For Backup Delete Allowed?, select **Yes**.
      vi. Leave all other parameters with defaults.
      vii. Scroll down and click **Finish**.

Figure 9-11 Register Node AS02

Using the IBM Tivoli Storage Manager Web administrative client interface Server Command window, enter:

```
Register Node AS02 password CONtact=text DOmain=BRMS COMPression=NO BACKDELete=Yes
```

In both cases, you see the following two messages:

```
ANR2060I Node AS02 registered in policy domain BRMS.
ANR2099I Administrative user id AS02 defined for OWNER access to node AS02.
```

You can use the IBM Tivoli Storage Manager Web administrative client interface tree structure to verify your IBM Tivoli Storage Manager node environment. As shown in Figure 9-12, you expand **Object view-> Clients-> Client Nodes**.

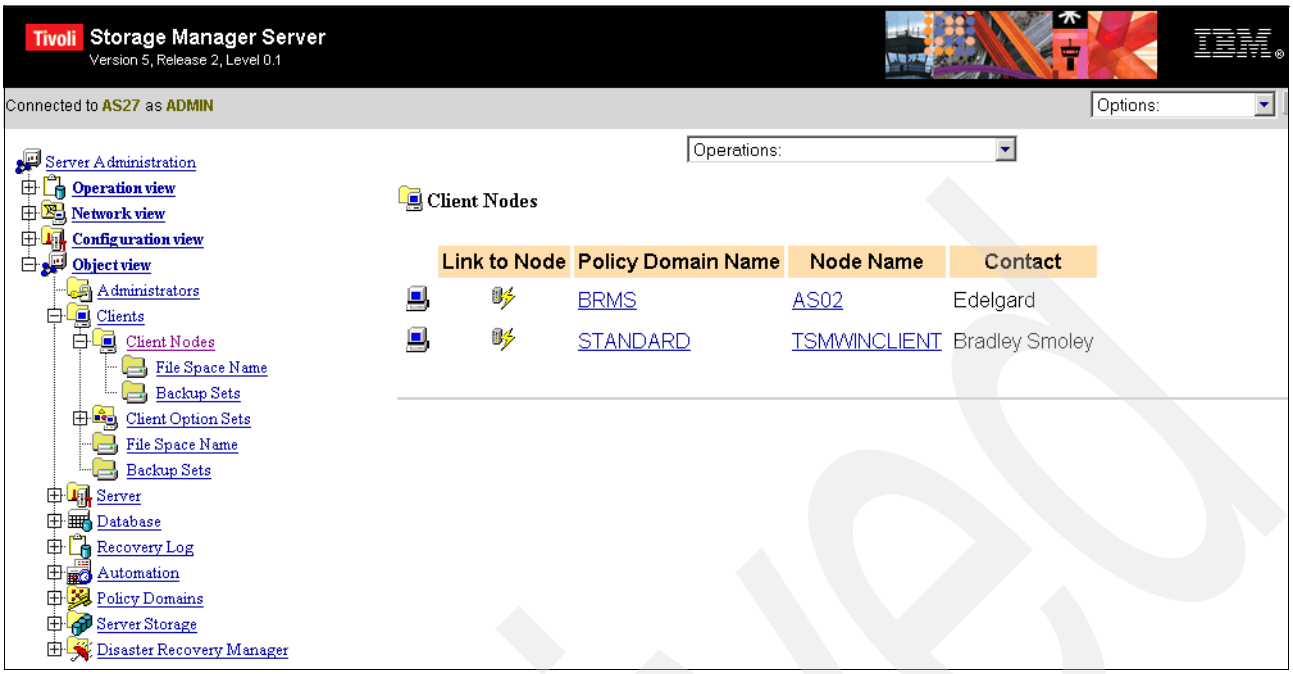

Figure 9-12 View from IBM Tivoli Storage Manager server over both clients in our test scenario

Important: Remember the following three definitions for the next section:

- The defined management class name, in our example `BRMS`
- The node name and password, in our example `AS02` with password `......`
- The kind of communication protocol, in our example `TCP/IP`

9.2 Setting up the BRMS environment for backup and restore to an IBM Tivoli Storage Manager server

Prior to reading this section, you must successfully install BRMS on your iSeries server as explained in 7.2, “Installing the BRMS software” on page 134. You must install the IBM Tivoli Storage Manager APIs (5733-197) on your iSeries, as explained in 7.4, “Downloading and installing no-charge IBM Tivoli Storage Manager APIs” on page 142. You must also perform all the tasks described in 9.1, “Setting up the IBM Tivoli Storage Manager server for BRMS to use IBM Tivoli Storage Manager APIs” on page 250.

When you complete these actions, you are ready to set up the BRMS environment for backup and restore to an IBM Tivoli Storage Manager server.

9.2.1 First steps

To set up BRMS Application Client, follow these steps first:

1. Set up an options file QOPTADSM in library QANSAPI using member MBR(APIOPT).

Note: The options file is used to specify some runtime environment parameters for the IBM Tivoli Storage Manager server. See 5.3.10, “IBM Tivoli Storage Manager server option file” on page 75, for more details.

2. Set up a *LOCALE object pointed to by OS/400 system value QLOCALE.
3. Set up environment variable DSMI_LOG.

Following the completion of these steps, we perform the follow-on setup steps that are shown using the following interfaces:

- The OS/400 5250 command interface (9.2.2, “Follow on steps using the 5250 interface” on page 265)
- The iSeries Navigator interface (9.2.3, “Follow-on steps using iSeries Navigator” on page 269)

Notes:

- Through 2003, using a non-QSYS.LIB option file is not supported in this BRMS Application Client environment.
- There are other scenarios, where using a non-QSY.LIB option file works. See *Domino 6 for iSeries Best Practices Guide*, SG24-6937, for an example.

1. Set up the options file QANSAPI/QOPTADSM MBR(APIOPT).
   a. Create this options file in library QANSAPI using the Create Source Physical File (CRTSRCPF) command:

      ```
      CRTSRCPF QANSAPI/QOPTADSM MBR(APIOPT)
      ```

   b. Edit the options file. For example, use the Start Programming Development Manager (STRPDM) command.
   c. On the display that opens, select option 3 (Work with members) and press Enter.
   d. On the next display, follow these steps:
      i. For the File parameter, type QOPTADSM. For the Library parameter, type QANSAPI.
      ii. Type option 2 (Edit) before member APIOPT.
      iii. Type at least the values shown in Figure 9-13 for the TCPSERVERADDRESS and NODENAME parameters.

Options file QANSAPI/QOPTADSM MBR(APIOPT) considerations: Enter the values for at least both the TCPSERVERADDRESS and NODENAME parameters. While writing this redbook, we determined that both of these parameters are mandatory for API Version 5.2 in combination with BRMS. Our experience when using OS/400 and BRMS V5.1 was that empty file member APIOPT was sufficient. See Figure 9-13. In cases where either this file member does not exist or is empty, we received the error message “`BRM2265 Errors occurred initiating session using device ITSMSERVER`” when attempting to use the BRMS Application Client and your job fails.

If you are *not* using default IBM Tivoli Storage Manager server port 1500, you must also modify the TCPPORT parameter in this options file.

```
*************** Beginning of data ************************************************************
*SERVERNAME            XXXX                                                          030819
*   COMMMETHOD         TCPIP                                                         030819
*   TCPPORT            1500                                                          030819
TCPSERVERADDRESS xxx.xxx.xxx.xxx                                                    030825
NODENAME              AS02                                                          030819
****************** End of data ********************************************************
```

Figure 9-13 File QANSAPI/QOPTADSM member APIOPT

iv. Press F3 (Exit) and type `Y` (Yes) in the Change/create member parameter. Press Enter.

Note: Do not change the default value for the program Type parameter in the Work with Members Using PDM display. The default type is “blank”. Leave this as blank. See Figure 9-14.

```
                     Work with Members Using PDM                    AS02

File  . . . . . .   QOPTADSM
  Library . . . .     QANSAPI             Position to  . . . . .

Type options, press Enter.
 2=Edit         3=Copy  4=Delete 5=Display       6=Print     7=Rename
 8=Display description  9=Save  13=Change text  14=Compile  15=Create module...

Opt  Member      Type        Text
     APIOPT
```

Figure 9-14 Type parameter is blank

2. Set the OS/400 system value parameter QLOCALE. Verify the Locale parameter in your user profile.

Tip: We recommend that you set system value QLOCALE appropriately as explained. Then set the Locale parameter of the user profile who normally runs BRMS operations to the IBM Tivoli Storage Manager servers to *SYSVAL. This technique prevents error messages, such as “`MCH3601 Pointer not set for location referenced`”, from appearing during backups to an IBM Tivoli Storage Manager server.

You can use other techniques to use the appropriate *LOCALE object, but our recommendation is less error prone.

a. Enter the OS/400 Work with System Values (WRKSYSVAL) command:

```
WRKSYSVAL QLOCALE
```

b. Enter option `5` (Display) to see the actual value, which is defaulted to *NONE.

c. Enter option 2 to change this value. On the Change System Value display (Figure 9-15), for a U.S. English environment, type /QSYS.LIB/en_US.LOCALE.

```
              Change System Value

System value . . . . . :   QLOCALE
Description  . . . . . :   Locale path name


Type choices, press Enter.

  Locale . . .   /QSYS.LIB/en_US.LOCALE
```

Figure 9-15 System value QLOCALE

Other QLOCALE examples: For examples of other language environments supported, use the locale object name format /QSYS.LIB/*xx_XX*.LOCALE, where *xx_XX* defines the language-specific locale object in library QSYS. Consider these example: de_DE (German), es_ES (Spanish), fr_FR (French), it_IT (Italian), ja_JP (Japanese), ko_KR (Korean), pt_BR (Brazilian Portuguese), zh_CN (Simplified Chinese), and zh_TW (Taiwan/Mandarin).

iSeries servers ship with a locale object for each of the supported languages. If OS/400 Option 21, Extended NLS Support, is installed, you can modify default locale object settings by editing language-specific locale source file members for file QLOCALESRC in library QSYSLOCALE.

For more information about OS/400 support for locales, see the iSeries V5R2 Information Center and search on "locale":

http://www.ibm.com/eserver/iseries/infocenter

For an overall description of locale support, scroll down through the search results and click the **Locale categories** link. Select the links listed under the Locale categories Web page.

d. Use the Display User Profile (DSPUSRPRF) command to verify that the LOCALE parameter value in your user profile specifies *SYSVAL. See Figure 9-16.

   Scroll down or page down the user profile. The Locale parameter is toward the bottom of the user profile information.

```
              Display User Profile - Basic

User profile . . . . . . . . . . . . . . . :   EDELGARDS
Locale job attributes  . . . . . . . . . . :   *SYSVAL

Locale . . . . . . . . . . . . . . . . . . :   *SYSVAL

User options . . . . . . . . . . . . . . . :   *NONE
```

Figure 9-16 DSPUSRPRF Locale parameter

3. Set the environment variable DSMI_LOG.

Although this is optional, we recommend that you set an environment variable DSMI_LOG for a path to the error log file dsierror.log. This speeds up any troubleshooting that you may need to perform.

Environment variables considerations: If you set up an iSeries server as the BRMS Application Client, you should set up only DSMI_LOG and no additional environment variables. This means you should ignore text about environment variables in the README.API file. You can find the README.API file on your iSeries under /usr/tivoli/tsm/client/api/bin or use the Internet. See 7.4, “Downloading and installing no-charge IBM Tivoli Storage Manager APIs” on page 142, for more information.

Use the OS/400 Add Environment Variable (ADDDENVVAR) command to define in the VALUE parameter, a target directory for this error log file, dsierror.log. We use the default API installation directory, /usr/tivoli/tsm/client/api/bin, as the path for error log file dsierror.log in our example. See 7.4, “Downloading and installing no-charge IBM Tivoli Storage Manager APIs” on page 142.

```
ADDENVVAR ENVVAR(DSMI_LOG) VALUE('/usr/tivoli/tsm/client/api/bin') level(*SYS)
```

Figure 9-17 shows the error log file dsierror.log content. For an interpretation of this log information, ask your IBM Tivoli Storage Manager server administrator.

```
Browse : /usr/tivoli/tsm/client/api/bin/dsierror.log
************Beginning of data**************
08/19/03   16:02:59 GetHostnameOrNumber(): gethostbyname(): errno = 0.
08/19/03   16:02:59 TcpOpen: Could not resolve host name.
08/19/03   16:02:59 sessOpen: Failure in communications open call. rc: -53
08/19/03   17:02:34 sessSendVerb: Error sending Verb, rc: -50
08/20/03   18:29:11 ANS1005E TCP/IP read error on socket = 1, errno = 3426,
                    reason : 'A connection with a remote socket was reset by
                              that socket.'.
08/28/03   10:12:41 sessRecvVerb(): Invalid verb received.
08/28/03   10:12:41 sessRecvVerb(): length=680f, verb=eb,magic=16
 ************End of Data********************
```

Figure 9-17 Error log file dsierror.log

The following two sections cover the same set of follow-on steps, using either the 5250 command interface or the iSeries Navigator interface. We recommend that you review both interfaces to determine which one you will normally use.

9.2.2 Follow on steps using the 5250 interface

Prior to completing the following steps, you must already be signed on to the iSeries server from the 5250 workstation. You must also finish the steps in 9.2.1, “First steps” on page 261. Next you follow these steps using a 5250 interface:

1. Create a BRMS storage location. In our example, we use `ITSMSERVER`.
   a. Enter the BRMS Work with Storage Locations (`WRKLOCBRM`) command.
   b. The BRMS storage locations display opens.
      i. In the Opt field, type `1` (Add).
      ii. In the Location parameter, type the name, of the new storage location, `ITSMSERVER` in our example.
      iii. Press Enter.
   c. The Add Storage Location display opens.

i. Optionally enter meaningful text into the address fields and the description field.
ii. Leave the other parameters as the defaults.
iii. Press Enter.

d. You should see the message "BRM1269: Location ITSMSERVER added".

2. Create a BRMS media policy. In our example, we use ITSM. See Figure 9-18 and Figure 9-19. The following steps use the IBM Tivoli Storage Manager management class (BRMS) specified in step 3 on page 253. They also use the iSeries IBM Tivoli Storage Manager "client" (AS02) and associated password specifications specified in step 7 on page 258:

a. Enter the BRMS Work with Policies using BRMS (WRKPCYBRM) command:

```
WRKPCYBRM TYPE(*MED)
```

b. On the Work with Media Policies display, in the Opt field, enter 1 (Add).

c. In the Policy field, type the new media policy name (ITSM in our example) and press Enter.

d. The Create Media Policy display opens.

i. For the Move policy, Media class, and Secure media parameters, enter the value *ADSM. This is the older product identifier that is also used for the newer IBM Tivoli Storage Manager product.

ii. For the Storage Location parameter, type ITSMSERVER. This corresponds to the name we used in the first step, which created the new storage location.

iii. Optionally you can leave the default vales or change following parameters on this page:

- Retention type: We leave the default value of 2.
- Retain media: We leave the default value of 35.

iv. In the Text parameter, enter a meaningful description for this ITSM media policy. We use Media Policy for ITSM in this example.

```
                        Create Media Policy

Type choices, press Enter.

  Media policy . . . . . .   ITSM          Name
  Retention type . . . . . .   2           1=Date, 2=Days,
                                           3=Versions, 4=Permanent
    Retain media . . . . . .   35          Date, Number
  Move policy  . . . . . .   *ADSM         Name, *NONE, *ADSM, F4
  Media class  . . . . . .   *ADSM         Name, *SYSPCY, *ADSM, F4
  Storage location . . . . .   ITSMSERVER   Name, *ANY, F4 for list
  Save to save file  . . . . .   *NO         *YES, *NO
    ASP for save files . . . . .   *SYSTEM  Name, *SYSTEM, 1-32
    Save file retention type . . . .   4     1=Date, 2=Days,
                                           3=Permanent, 4=None
      Retain save files  . . . . .   *NONE   Date, Number, *NONE
    ASP storage limit  . . . . .   *SYS      *SYS, 1-99
  Secure media . . . . . .   *ADSM         *YES, *NO, *ADSM
  Text . . . . . .   Media Policy for ITSM

                                                                More...
```

Figure 9-18 Create Media Policy ITSM (Part 1 of 2)

v. Page down to the next page and press Enter.

vi. Enter the following values as shown in Figure 9-19:

- TSM management class `BRMS`
- TSM node `AS02`
- TSM password for your node

If you leave a default value as the node name, for example `APPN.AS02`, this is useful only in a Systems Network Architecture (SNA)-based APPN environment.

vii. Press Enter.

e. Verify that you see the message "`BRM1171: Policy ITSM created`".

```
                          Create Media Policy

Type choices, press Enter.

  Required volumes . . . . . .   *NONE       *NONE, 1-9999
  Mark volumes for duplication .   *NO        *NO, *YES
  TSM management class . . . . .   BRMS
  TSM security:
    TSM node . . . . . . . . . .   AS02
    TSM password . . . . . . . .   *******
```

Figure 9-19 Create Media Policy ITSM (Part 2 of 2)

3. Create a BRMS device for your IBM Tivoli Storage Manager server. We use ITSMSERVER in our example and the TCP/IP protocol and IBM Tivoli Storage Manager server (AS27) as previously specified for our test environment (see Figure 1-3 on page 11).

> **IBM Tivoli Storage Manager server Internet address**: Assuming TCP/IP is being used in your environment, you need the Internet (IP) address of the IBM Tivoli Storage Manager server to perform the following steps. Ask your IBM Tivoli Storage Manager administrator for this information.

a. Enter the Work with BRMS Devices (`WRKDEVBRM`) command.

b. The Work with Devices display opens.

i. In the Opt field, enter `1` (Add).

ii. In the Device field, enter your IBM Tivoli Storage Manager server name, for example, `ITSMSERVER`.

iii. In the Category field, enter `*NET` (assuming you are using TCP/IP).

c. This opens the Add Net Device display (Figure 9-20).

i. For Location, enter `ITSMSERVER`.

ii. For Buffer Size, enter `512` (we choose the largest value in KB for improved performance).

iii. For Internet Address, `xxx.xxx.xxx.xxx`, enter the address of your IBM Tivoli Storage Manager server (in our example, this is the IP address for system AS27).

iv. Optionally, in the Text parameter, enter a meaningful description for this device. In our example, we use `ITSM Server Device`.

v. Leave the IBM Tivoli Storage Manager server's Internet port parameter as the default 1500. We assume that you are using the iSeries IBM Tivoli Storage

Manager server's default port of 1500 here. You can specify a different port if your IBM Tivoli Storage Manager server administrator chose a different port number.

vi. Press Enter.

```
                              Add Net Device

Net device  . . . . . . . . . . . :   ITSMSERVER

Type choices, press Enter.

Text  . . . . . . . . . . . . . . .   ITSM Server Device

Location  . . . . . . . . . . . . .   ITSMSERVER   Name, F4 for list

TSM file space  . . . . . . . . . .   *LCL

Buffer size . . . . . . . . . . . .   512          *DEVTYPE, 1-512 KB

Internet address  . . . . . . . . .   xxx.xxx.xxx.xxx
Internet port . . . . . . . . . . .    1500        1-65534
```

Figure 9-20 Add Net Device ITSMSERVER display

d. Verify that you receive the message "BRM1292: Device Entry ITSMSERVER added".

e. You can perform additional verification using the Display Physical File Member (DSPPFM) command for file QUSRBRM/QA1AOPT MBR(ITSMSERVER), which should be automatically created during the adding of the ITSMSERVER device. See Figure 9-21.

```
                      Display Physical File Member
File . . . . . :   QA1AOPT             Library  . . . . :   QUSRBRM
Member . . . . :   ITSMSERVER          Record . . . . . :   1
Control  . . . .                       Column . . . . . :   1
Find . . . . . .
*...+....1....+....2....+....3....+....4....+....5....+....6....+....7....+....8
000001030819COMMMETHOD TCPIP
000002030819COMPRESSALWAYS NO
000003030819COMPRESSION NO
000004030819TAPEPROMPT YES
000005030819TCPBUFFSIZE 512
000006030819TCPPORT 1500
000007030819TCPSERVERADDRESS xxx.xxx.xxx.xxx
                        ****** END OF DATA ******
```

Figure 9-21 DSPPFM FILE(QUSRBRM/QA1AOPT) MBR(ITSMSERVER)

Important: You need the following iSeries BRMS Application Client database files on your iSeries server that is defined as the BRMS Application Client to an IBM Tivoli Storage Manager server:

- QANSAPI/QOPTADSM MBR(APIOPT)
- QUSRBRM/QA1AOPT MBR(ITSMSERVER)

The member file name depends on the name you gave your IBM Tivoli Storage Manager server Device as a Net Device in BRMS. In our example, this is ITSMSERVER.

Now you are ready to use (with modifications) an existing BRMS backup control group for saves to IBM Tivoli Storage Manager server. Or you can create a new BRMS backup control group. See 9.3, “Save scenario example: Saving to an IBM Tivoli Storage Manager server” on page 277, for an example.

You may skip the following section if you do not want to use the iSeries Navigator interface. If this is the case, proceed to 9.3, “Save scenario example: Saving to an IBM Tivoli Storage Manager server” on page 277.

9.2.3 Follow-on steps using iSeries Navigator

Prior to reading this section, you must have installed BRMS iSeries Navigator client, as described in 7.3.1, “Installing the BRMS iSeries Navigator client” on page 137. You must also be signed on to the iSeries server from iSeries Navigator session. And you must complete the steps from 9.2.1, “First steps” on page 261.

You can define your iSeries as BRMS Application Client to an IBM Tivoli Storage Manager server using BRMS iSeries Navigator client interface.

IBM Tivoli Storage Manager server Internet address: Assuming TCP/IP is used in your environment, you need the Internet (IP) address of the IBM Tivoli Storage Manager server to perform the following steps. Ask your IBM Tivoli Storage Manager administrator for this information.

Perform the following steps:

1. Create a BRMS storage location. In our example, we use `ITSMSERVER`. Use Backup, Recovery and Media Services Tasks in the taskpad area.
   a. Expand **My Connections-> *system name*-> Backup, Recovery and Media Services**. In this example, *system name* is **AS02**, which is going to be used at the BRMS Application Client.

b. The Backup Policies, Move Policies, and Media items appear in the right pane (see Figure 9-22).

c. In the task pad area at the bottom of the window, click **Manage TSM servers**.

> **Note:** This section uses the acronym “TSM,” instead of IBM Tivoli Storage Manager, because TSM is the acronym used in the iSeries Navigator interface to the IBM Tivoli Storage Manager.

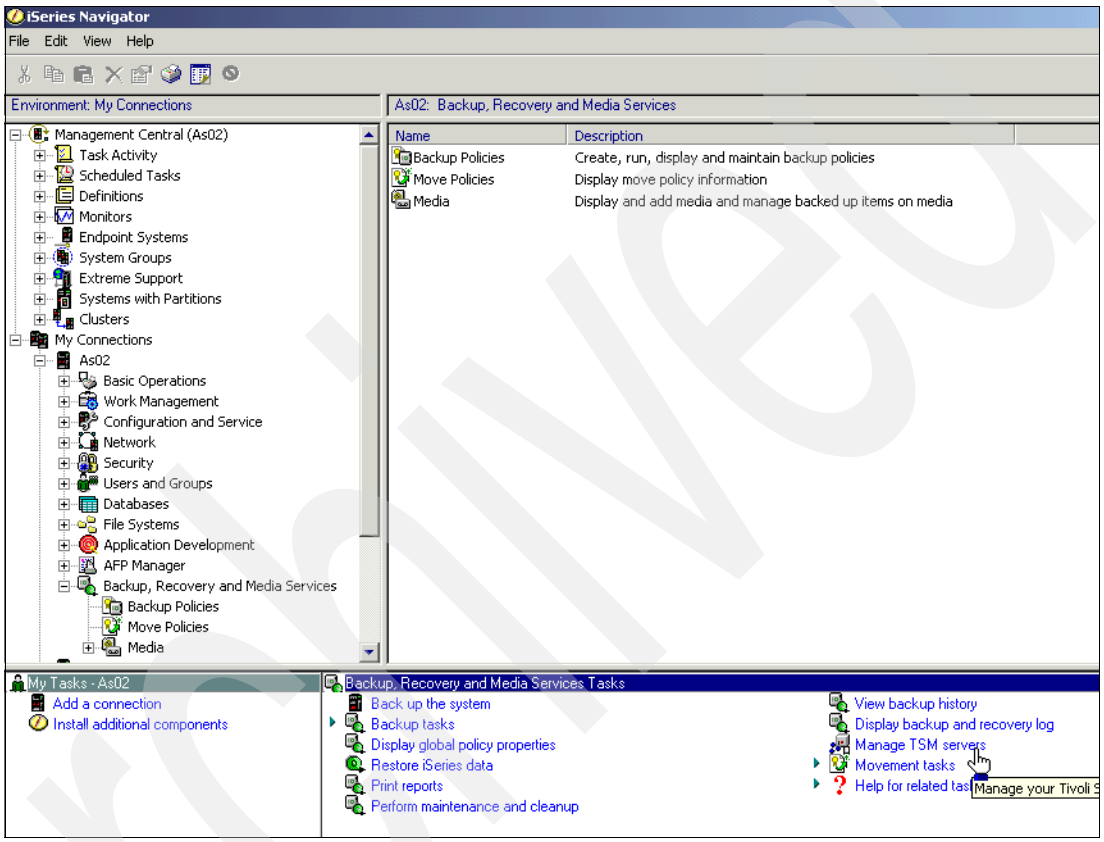

Figure 9-22 Manage TSM servers

2. The TSM Servers window (Figure 9-22) opens. Create a TSM server description. We use `ITSMServer` in this example.

> **Delete restriction**: Currently within the BRMS iSeries Navigator client interface you can "create" a new TSM server description. *However*, there is no delete TSM server or delete TSM server Connection Name interface. You can use the Delete function via the 5250 interface. Therefore, you should carefully select your TSM Server Description and Connection Name, described in the following steps.

   a. In the TSM Servers window, click **New Server**.

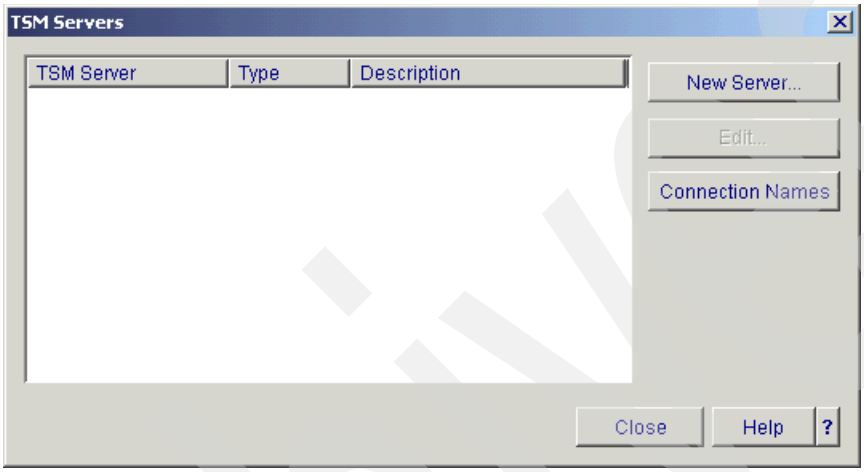

Figure 9-23 TSM Servers window

b. The New TSM Server window (Figure 9-24) opens. Define a new Net device by typing or verifying the following parameter values:

   i. For Net device, type `ITSMServer`.

   ii. For Type, select **TCP/IP**.

   iii. For Buffer size, type `512` (we choose the largest value in KB for improved performance)

   iv. For Internet address, type the `xxx.xxx.xxx.xxx` of your IBM Tivoli Storage Manager server. In our example, this is the IP address for system AS27.

   v. For Description, you can optionally enter a meaningful description for this device, for example, `ITSM Server Device`.

   vi. Leave IBM Tivoli Storage Manager server's Internet port parameter as the default 1500. We assume you are using the iSeries IBM Tivoli Storage Manager server's default port of 1500 here. You can specify a different port if your IBM Tivoli Storage Manager server's administrator chose a different port number or specify APPC if it is used instead of TCP.

   Note: The default value for Location is "Use TSM server name". In the Net device example, creating a new BRMS location results in the new TSM server named ITSMServer being automatically created. We verify this later.

   vii. Click **OK**.

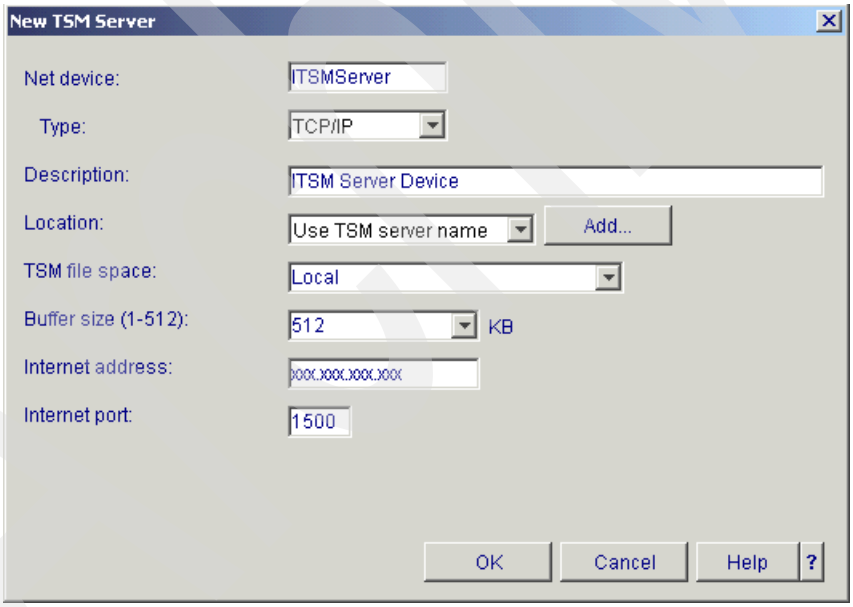

Figure 9-24 New TSM Server: Defining a net device

After the new server creation completes, you see a new entry in the TSM Servers window (Figure 9-25). In this case, whether the new TSM Server is in uppercase or lowercase is not important.

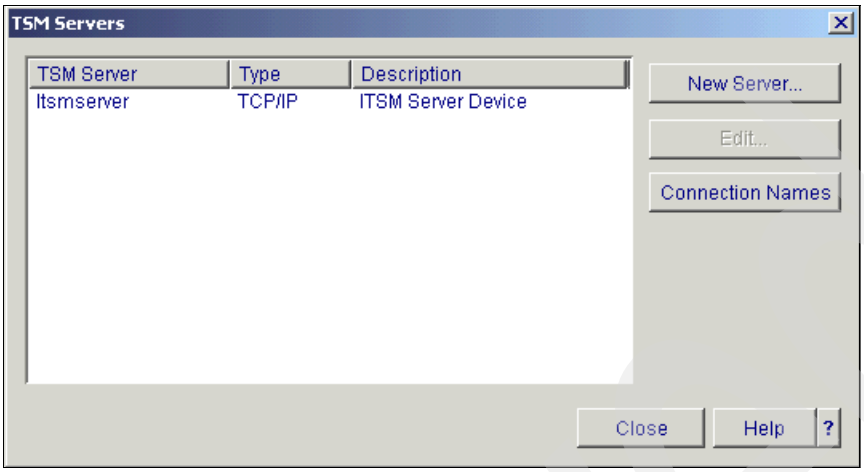

Figure 9-25 TSM Server Itsmserver is defined

3. Define a connection name (As02 in our example).
   a. Click the **Connection Names** button in the TSM Servers window, as shown in Figure 9-25.
   b. The Connection Names window (Figure 9-26) opens. The following steps use the IBM Tivoli Storage Manager management class (BRMS) specified in step 3 on page 253 and the iSeries IBM Tivoli Storage Manager “client” (AS02) and associated password specifications specified in step 7 on page 258.
      i. For Connection name, type your local system node name (AS02 in our example) or use the default (Use local system name).
      ii. For the Password and Confirm Password fields, type the same value.

      Important: In this case, use of uppercase and lowercase is very important. The password is case sensitive using the iSeries Navigator interface.

      iii. Click **OK**.

Figure 9-26 shows the newly defined connection (AS02) in the Connection Name box.

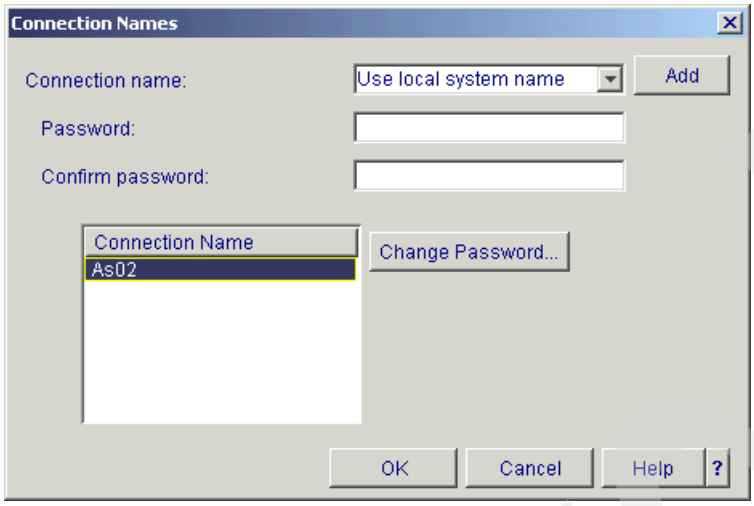

Figure 9-26 Connection Names - AS02 example

4. Verify that the BRMS Location (Itsmserver) is created.
   a. Using iSeries Navigator, expand **My Connections-> *system name* (AS02)-> Backup Recovery and Media Services**.
   b. In the lower right panel of iSeries Navigator (Figure 9-27), select **Backup, Recovery and Media Services Tasks**, expand **Movement Tasks** and select **Manage locations**.
   c. In the Manage Locations window (Figure 9-27), select the **Itsmserver** location and click the **Edit** button.

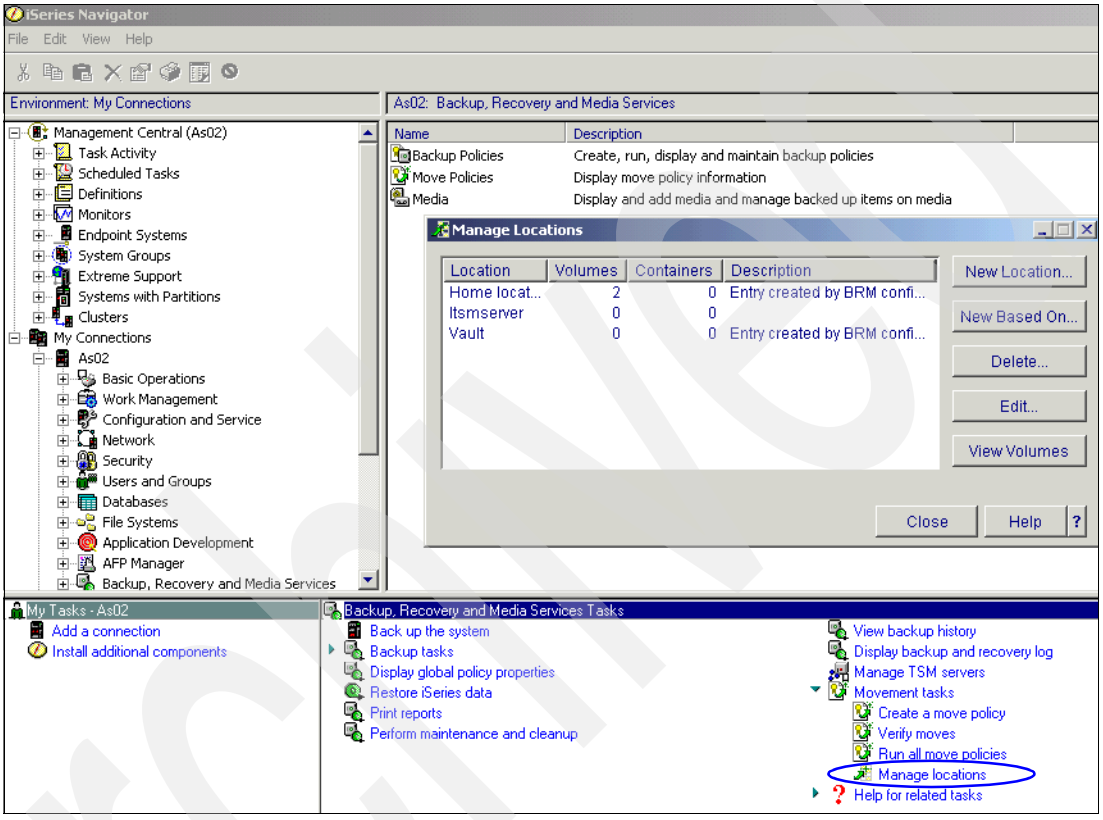

Figure 9-27 BRMS windows showing the BRMS location Itsmserver

d. The Edit Storage Location Itsmserver - AS02 window (Figure 9-28) opens. Notice that the Location name Itsmserver is not available. Enter any meaningful text into the Description, Address, and Contact name fields.

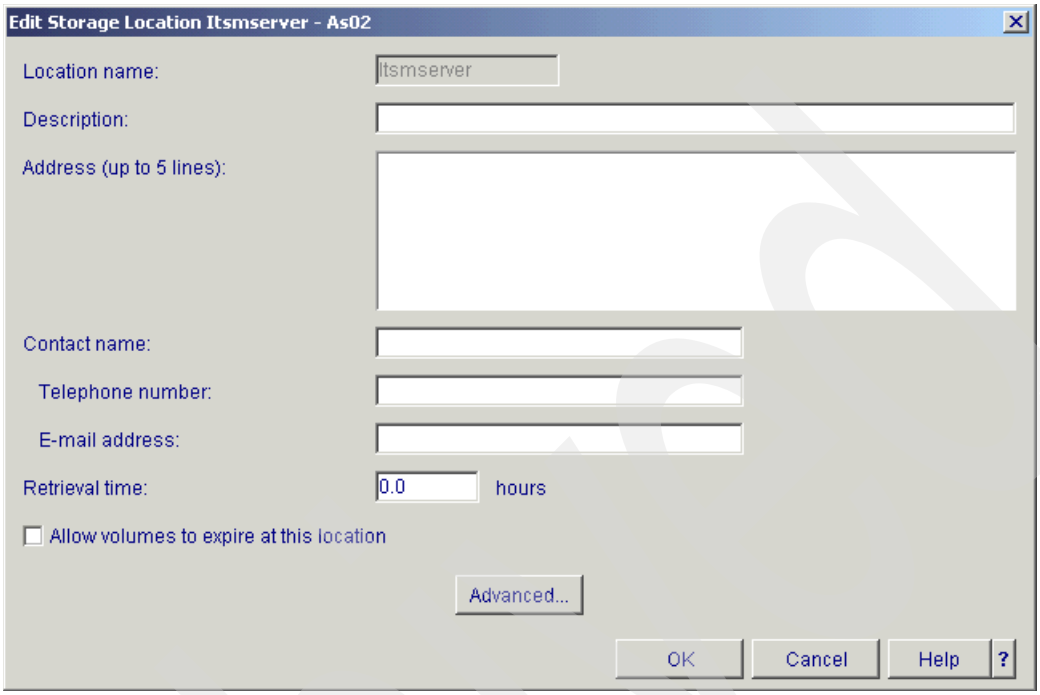

Figure 9-28 Edit Storage Location Itsmserver

Leave the Retrieval time and Allow volumes to expire at this location with their default values as shown. Remember you can use the Help button or help ? parameter function on any of these iSeries Navigator windows. Click the **Advanced** button

e. The Edit Storage Location Itsmserver - Advanced window (Figure 9-29) opens. In this example, we leave all default values at zero as shown. Zero values are valid because, in a BRMS location for an IBM Tivoli Storage Manager server, there is no media. The media is on the IBM Tivoli Storage Manager server system. Click **OK**.

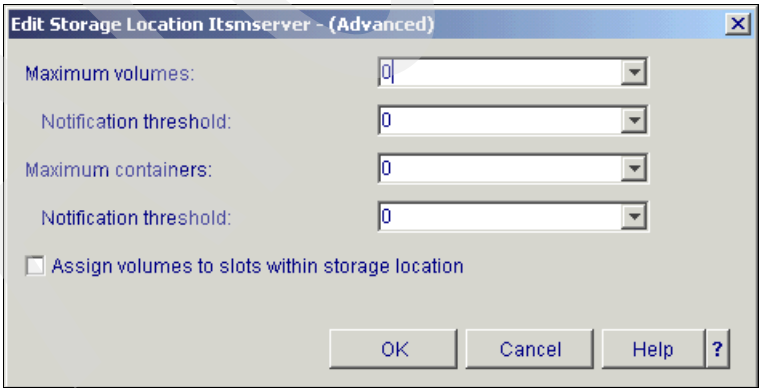

Figure 9-29 Edit Storage Location Itsmserver - (Advanced)

f. On the Edit Storage Location Itsmserver - AS02 window (Figure 9-28), click **OK**.

Verification of our BRMS location Itsmserver setup is finished. Now you are ready to modify a existing BRMS backup control group for saves to IBM Tivoli Storage Manager server or you

could create a new BRMS backup control group. See 9.3, “Save scenario example: Saving to an IBM Tivoli Storage Manager server” on page 277, for an example.

During your setup steps, the file QUSRBRM/QA1AOPT MBR(ITSMSERVER) on your iSeries server was created. Do not delete this file.

iSeries BRMS Application Client and database files: You need the following files on your iSeries server that is defined as the BRMS Application Client to an IBM Tivoli Storage Manager server:

- QANSAPI/QOPTADSM MBR(APIOPT)
- QUSRBRM/QA1AOPT MBR(ITSMSERVER)

The member file name depends on the name you gave your IBM Tivoli Storage Manager server Device as a Net Device in BRMS. In our example, this is ITSMSERVER.

9.3 Save scenario example: Saving to an IBM Tivoli Storage Manager server

Backup for data from the BRMS Application Client (iSeries server AS02 in this redbook) to an IBM Tivoli Storage Manager server (iSeries server AS27 in this redbook) is only possible using BRMS and not using IBM Tivoli Storage Manager. Because of this, we show two different ways to perform the save:

- Using 5250 interface
- Using BRMS iSeries Navigator client

The objects saved in the 5250 interface and the BRMS iSeries Navigator client topics are different. You should read both sections for maximum coverage of BRMS and IBM Tivoli Storage Manager integration for backup (save) functions.

9.3.1 Using the 5250 interface

Prior to reading this section, you must define a backup control group for user data, TESTSAVE in our example, as shown in Figure 9-30. Using the BRMS Work with Control Group (WRKCTLGBRM) command and selecting option 5 (Display) for TESTSAVE, you see a display similar to the one shown in Figure 9-30. In our example, this backup control group saves user library ITSMLIB.

```
                  Display Backup Control Group Entries            AS02

Group . . . . . . . . . . . : TESTSAVE
Default activity  . . . . . : *BKUPCY
Text  . . . . . . . . . . . : Backup of library ITSMLIB

                         Auxiliary   Weekly    Retain  Save      SWA
      Backup      List   Storage     Activity  Object  While     Message
Seq   Items       Type   Pool Device MTWTFSS   Detail  Active    Queue
  10  ITSMLIB            *SYSBAS     *DFTACT   *OBJ    *YES      SAVE
```

Figure 9-30 Backup control group entries for TESTSAVE

Here are BRMS details for some of the column headings in Figure 9-30:

- **Auxiliary Storage Pool Device**: Every OS/400 system comes with a system auxiliary storage pool. By default, all configured disk devices are assigned to this storage pool. And

all system and user data reside in this *system ASP*. Optionally an administrator can assign specific disk devices to either a user-defined dependent ASP (user ASP) or a user-defined *independent auxiliary storage pool* (IASP). Data and objects can be specifically placed into any of these non-system ASPs.

An IASP can be switched to another iSeries server as part of a high availability configuration. The term *SYSBAS represents the OS/400 *system auxiliary storage pool* and any, optionally defined, user ASPs. It does not include any IASPs.

In addition to the *SYSBAS *data space*, an IASP can be optionally added to an OS/400 job through either the appropriate job description object Initial ASP Group parameter or the OS/400 Set ASP Group (SETASPGRP) command. A job always has access to *SYSBAS. Optionally it can also have access to a single ASP group. Technically an IASP can consist of a primary IASP and one or more secondary IASPs.

Note that some OS/400 commands, such as the save and restore set of commands, may also support an ASP group-related parameter.

- **Weekly Activity**: The weekly activity for Monday through Sunday uses the default activity as defined elsewhere in BRMS
- **Retain Object Detail**: This column applies to the BRMS save Automatically backup media information parameter, which we more fully discuss in 9.5, “Full iSeries backup and restore on the BRMS Application Client” on page 312. *OBJ for the Automatically backup media information parameter says to keep full BRMS saved object-level information in a specific set of BRMS database files. This full level of information is required for a full iSeries system recovery using the BRMS recovery process. This level of information and its saving is analogous to saving the IBM Tivoli Storage Manager database so it can perform its full set of functions. For a summary of the IBM Tivoli Storage Manager database, see “IBM Tivoli Storage Manager database and recovery log” on page 35.
- **Save While Active**: *YES means that you can save the objects within library ITSMLIB while they are “active” (in use by some program). You can learn more about Save While Active in 2.5, “Save-while-active function” on page 25, and 9.6, “Save-while-active implications” on page 325.
- **SWA Message Queue**: This SWA message queue receives any important messages that occur during a save, while active jobs or programs may be accessing the object being saved.

Detailed coverage of BRMS capabilities is beyond the scope of this book. In this redbook, see the following chapters for overall BRMS capabilities:

- Chapter 2, “Backup Recovery and Media Services” on page 15
- Chapter 7, “Installing Backup Recovery and Media Services” on page 133
- Chapter 8, “Backup Recovery and Media Services up and running” on page 155

iSeries Backup Recovery and Media Services Version 5, SC41-5345, describes all BRMS capabilities, including the auxiliary storage pool (ASP) support.

It is important to note that this backup control group can be easily changed to a backup control group for saves to an IBM Tivoli Storage Manager server. Before we show this, however, we must understand our control group attributes from the backup control group TESTSAVE.

Follow these steps to modify this backup control group and perform the actual BRMS backup:

1. Enter the BRMS Work with Control Groups (`WRKCTLGBRM`) command.
2. On the display that appears, to view the backup control group attributes, enter option `8` next to TESTSAVE.

3. The Change Backup Control Group Attribute display opens. It shows the TESTSAVE control group attributes (see Figure 9-31 and Figure 9-32).

```
                    Change Backup Control Group Attributes

Group  . . . . . . . . . . . . . . . . : TESTSAVE

Type information, press Enter.

Media policy for:
  Full backups . . . . . . . . . . . . . FULL        Name, F4 for list
  Incremental backups  . . . . . . . . . FULL        Name, F4 for list
Backup devices . . . . . . . . . . . . . TAP02       Name, F4 for list



Parallel device resources:
  Minimum resources  . . . . . . . . . . *NONE       1-32, *NONE, *AVAIL
  Maximum resources  . . . . . . . . . .             1-32, *AVAIL, *MIN
Sign off interactive users . . . . . . . *NO         *YES, *NO, *BKUPCY
Sign off limit . . . . . . . . . . . . . *BKUPCY     0-999 minutes, *BKUPCY
Default weekly activity  . . . . . . . . *BKUPCY     MTWTFSS(F/I), *BKUPCY
Incremental type . . . . . . . . . . . . *BKUPCY     *CUML, *INCR, *BKUPCY

                                                                      More..
```

Figure 9-31 Backup control group attributes for TESTSAVE (Part 1 of 2)

```
                    Change Backup Control Group Attributes

Group  . . . . . . . . . . . . . . . . : TESTSAVE

Type information, press Enter.

Automatically backup
   media information  . . . . . . . . . *OBJ        *LIB, *OBJ, *NONE, *BKUPC
Save access paths  . . . . . . . . . . *BKUPCY     *YES, *NO, *BKUPCY
Save contents of save files  . . . . . *BKUPCY     *YES, *NO, *BKUPCY
Data compression . . . . . . . . . . . *BKUPCY     *DEV, *YES, *NO, *BKUPCY
Data compaction  . . . . . . . . . . . *BKUPCY     *DEV, *NO, *BKUPCY
Target release . . . . . . . . . . . . *BKUPCY     *CURRENT, *PRV, *BKUPCY
Clear  . . . . . . . . . . . . . . . . *BKUPCY     *NONE, *ALL...
Object pre-check . . . . . . . . . . . *BKUPCY     *YES, *NO, *BKUPCY
Append to media  . . . . . . . . . . . *BKUPCY     *YES, *NO, *BKUPCY
End of tape option . . . . . . . . . . *BKUPCY     *UNLOAD, *REWIND...
Journaled objects  . . . . . . . . . . *BKUPCY     *YES, *NO, *BKUPCY
Use optimum block size . . . . . . . . *BKUPCY     *BKUPCY, *DEV, *YES, *NO
Text . . . . . . . . . . . . . . . . . Backup of library ITSMLIB

                                                                    More...
```

Figure 9-32 Backup control group attributes for TESTSAVE (Part 2 of 2)

4. Verify what you must change to back up library ITSMLIB to an IBM Tivoli Storage Manager server using backup control group TESTSAVE. Complete the following checklist:
   a. Is a backup of ITSMLIB to an IBM Tivoli Storage Manager server allowed?

      Yes, because it is a user library and user data is allowed.

   b. Is a backup with Save While Active allowed?

      Yes, because we don't use *SYNCLIB, which is not allowed. See 9.6, "Save-while-active implications" on page 325.

5. Determine which backup control group attributes to change, referring to Figure 9-33 and Figure 9-34. We note the values that we entered for this example.
   a. **Media policy**: Specify `ITSM`, which was created in 9.2, "Setting up the BRMS environment for backup and restore to an IBM Tivoli Storage Manager server" on page 261.
   b. **Backup devices**: Specify `ITSMSERVER`, which was created in 9.2, "Setting up the BRMS environment for backup and restore to an IBM Tivoli Storage Manager server" on page 261.
   c. **Automatically backup media information**: Specify `*NONE`. To understand why we must specify *NONE here, see 9.5, "Full iSeries backup and restore on the BRMS Application Client" on page 312.

   Our changed backup control group attributes for TESTSAVE are now shown in Figure 9-33 and Figure 9-34.

```
                    Change Backup Control Group Attributes

Group  . . . . . . . . . . . . . . . . : TESTSAVE

Type information, press Enter.

Media policy for:
  Full backups . . . . . . . . . . . . . ITSM        Name, F4 for list
  Incremental backups  . . . . . . . . . ITSM        Name, F4 for list
Backup devices . . . . . . . . . . . . . ITSMSERVER  Name, F4 for list



Parallel device resources:
  Minimum resources  . . . . . . . . . . *NONE       1-32, *NONE, *AVAIL
  Maximum resources  . . . . . . . . . .             1-32, *AVAIL, *MIN
Sign off interactive users . . . . . . . *NO         *YES, *NO, *BKUPCY
Sign off limit . . . . . . . . . . . . . *BKUPCY     0-999 minutes, *BKUPCY
Default weekly activity  . . . . . . . . *BKUPCY     MTWTFSS(F/I), *BKUPCY
Incremental type . . . . . . . . . . . . *BKUPCY     *CUML, *INCR, *BKUPCY
```

Figure 9-33 Backup control group attributes for TESTSAVE after change (Part 1 of 2)

```
                    Change Backup Control Group Attributes

Group  . . . . . . . . . . . . . . . . . : TESTSAVE

Type information, press Enter.

Automatically backup
    media information  . . . . . . . . . . *NONE       *LIB, *OBJ, *NONE, *BKUPCY
Save access paths  . . . . . . . . . . . . *BKUPCY     *YES, *NO, *BKUPCY
Save contents of save files  . . . . . . . *BKUPCY     *YES, *NO, *BKUPCY
Data compression . . . . . . . . . . . . . *BKUPCY     *DEV, *YES, *NO, *BKUPCY
Data compaction  . . . . . . . . . . . . . *BKUPCY     *DEV, *NO, *BKUPCY
Target release . . . . . . . . . . . . . . *BKUPCY     *CURRENT, *PRV, *BKUPCY
Clear  . . . . . . . . . . . . . . . . . . *BKUPCY     *NONE, *ALL...
Object pre-check . . . . . . . . . . . . . *BKUPCY     *YES, *NO, *BKUPCY
Append to media  . . . . . . . . . . . . . *BKUPCY     *YES, *NO, *BKUPCY
End of tape option . . . . . . . . . . . . *BKUPCY     *UNLOAD, *REWIND...
Journaled objects  . . . . . . . . . . . . *BKUPCY     *YES, *NO, *BKUPCY
Use optimum block size . . . . . . . . . . *BKUPCY     *BKUPCY, *DEV, *YES, *NO
Text . . . . . . . . . . . . . . . . . . . Backup of library ITSMLIB

                                                                        More...
```

Figure 9-34 Backup control group attributes for TESTSAVE after change (Part 2 of 2)

6. Use this backup control group TESTSAVE for a backup of library ITSMLIB to our IBM Tivoli Storage Manager server. Activate this save job using the Start Backup with BRMS (STRBKUBRM) command:

   ```
   STRBKUBRM CTLGRP(TESTSAVE)
   ```

   In the STRBKUBRM command, we used SBMJOB(*YES) as the default value. This means that our job will run in batch. Press Enter. Job TESTSAVE is now running on AS02.

7. In addition to job TESTSAVE, which is now running on our iSeries AS02 in subsystem QBATCH, by default, on the IBM Tivoli Storage Manager server side (AS27 in our example), you see a session from the IBM Tivoli Storage Manager server administration point of view.

On AS27, use the IBM Tivoli Storage Manager server Web administrative client interface Server Command window and enter **`q ses`**. Click **Submit**. The session information for AS02 and any other currently active sessions as shown in Figure 9-35.

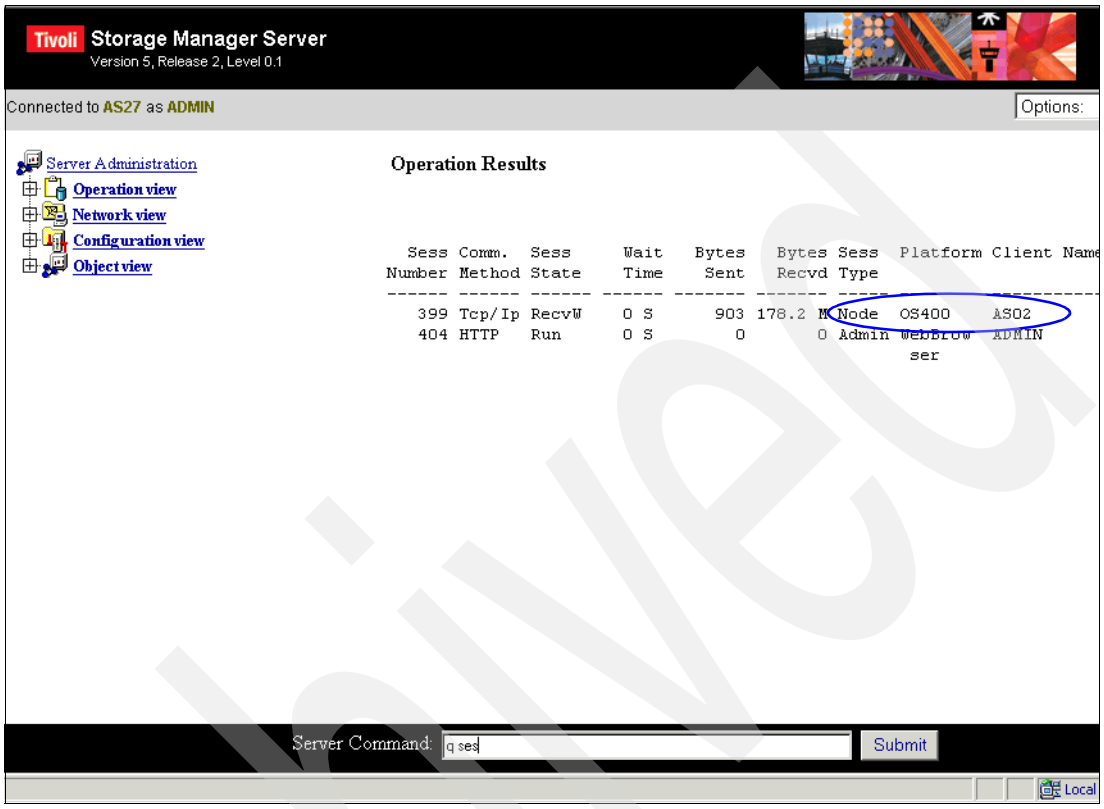

Figure 9-35 Query sessions for save from BRMS Application Client

8. Verify that the backup on AS02 completed successfully using the following two BRMS commands:

   a. Enter the Display BRM Log Information (DSPLOGBRM) command. You see a Display BRM Log Information display similar to the one shown in Figure 9-36.

```
                          Display BRM Log Information               AS02
10/08/03  12:23:56                                Position to . . . .  9/02/03

Begin processing for control group TESTSAVE type *BKU.        <----
Interactive users are allowed to stay active.
Starting save of library ITSMLIB to devices ITSMSERVER.
Object QA1ASLIB in QTEMP type *FILE created.
Control group TESTSAVE bypassed automatic save of media information.
Control group TESTSAVE type *BKU processing is complete.      <----
SAVEIFSP was registered as a function of BRMS.
Z030902002 was registered as a function of BRMS.
Z030902003 was registered as a function of BRMS.
SAVEIFSP was registered as a function of BRMS.
Data area Q1AKEYSPAC created in library QTEMP.
Data area Q1AKEYSPAC created in library QTEMP.
File FINAL in library AS0304LIB restored.
1 objects restored from AS0304LIB to AS0304LIB.
Volume BRM001 expired.
                                                                More... -
```

Figure 9-36 DSPLOGBRM example

The message "Control group TESTSAVE bypassed automatic save of media information." is normal, because we used the Automatically backup media information parameter with the value *NONE (Figure 9-34 on page 281).

Press Function key 1 (help) to see the message details for the messages indicated by the arrows. The details include time stamps. Using the time stamps, you can approximate the time it took to complete the backup function.

b. Enter the Work with Media using BRM (WRKMEDBRM) command.

As shown in Figure 9-37, library ITSMLIB is saved with Save Type *FULL and with Volume Serial *ADSM. This means that our backup to IBM Tivoli Storage Manager server AS27 was successful. For additional details, you can enter option 5 (Display) next to ITSMLIB in the Work with Media Information display (Figure 9-37).

Note: *ADSM is the old term for the IBM Tivoli Storage Manager server used in previous releases.

You can also select option 9 (Work with saved objects) to see a different set of additional information.

The value 0 for the File Sequence parameter is normal, because our backup target is an IBM Tivoli Storage Manager server and no tape.

```
                    Work with Media Information                    AS02

 Position to Date . . . . .

 Type options, press Enter.
   2=Change   4=Remove   5=Display   6=Work with media   7=Restore
   9=Work with saved objects

    Saved                              Save   Volume       File    Expiration
Opt Item            Date     Time      Type   Serial     Sequence     Date
    ITSMLIB         9/02/03 13:34:25 *FULL  *ADSM             0   10/07/03
                                                                        Bottom
```

Figure 9-37 Work with Media Information display

Notice that with either the DSPLOGBRM or WRKMEDIBRM commands, we received results information. We can gather more information using the WRKMEDIBRM command.

Later this chapter shows a restore for library ITSMLIB from IBM Tivoli Storage Manager server using this backup, created with the backup control group TESTSAVE.

9.3.2 Using BRMS iSeries Navigator client

Prior to reading this section, you must define a backup policy for user data, using the BRMS iSeries Navigator client. In this example, we use Saveifsp as shown in Figure 9-38.

Note: We do not provide details about general OS/400 and BRMS capabilities related to OS/400 system ASP and user-defined ASPs or save while active. However, you can specify these capabilities using the BRMS iSeries Navigator client interface. See the beginning of 9.3.1, "Using the 5250 interface" on page 277, for additional information about these subjects.

Using iSeries Navigator, follow these steps to perform a backup using the backup policy Saveifps:

1. Sign on to the iSeries server (AS20 in this example).
2. Expand **My Connections-> *server name* (AS02)-> Backup, Recovery and Media Services** and select **Backup Policies** as shown in Figure 9-38.
3. In Saveifsp, we defined a save one integrated file system (IFS) path (TSMAIXCLIENT) to a QIC tape, which is BRMS media. In this example, we modify this Saveifsp backup policy to back up to our IBM Tivoli Storage Manager server.

Tip: We recommend that you use the BRMS iSeries Navigator client to define backups where non-QSYS.LIB files (objects) in the IFS are saved. This is because using the BRMS iSeries Navigator client interface makes it easy to access, select, and specify the directory paths to back up these objects via the *Browse* option through IFS.

Using the Backup Policies window (Figure 9-38), right-click **Saveifsp** and select **Properties**.

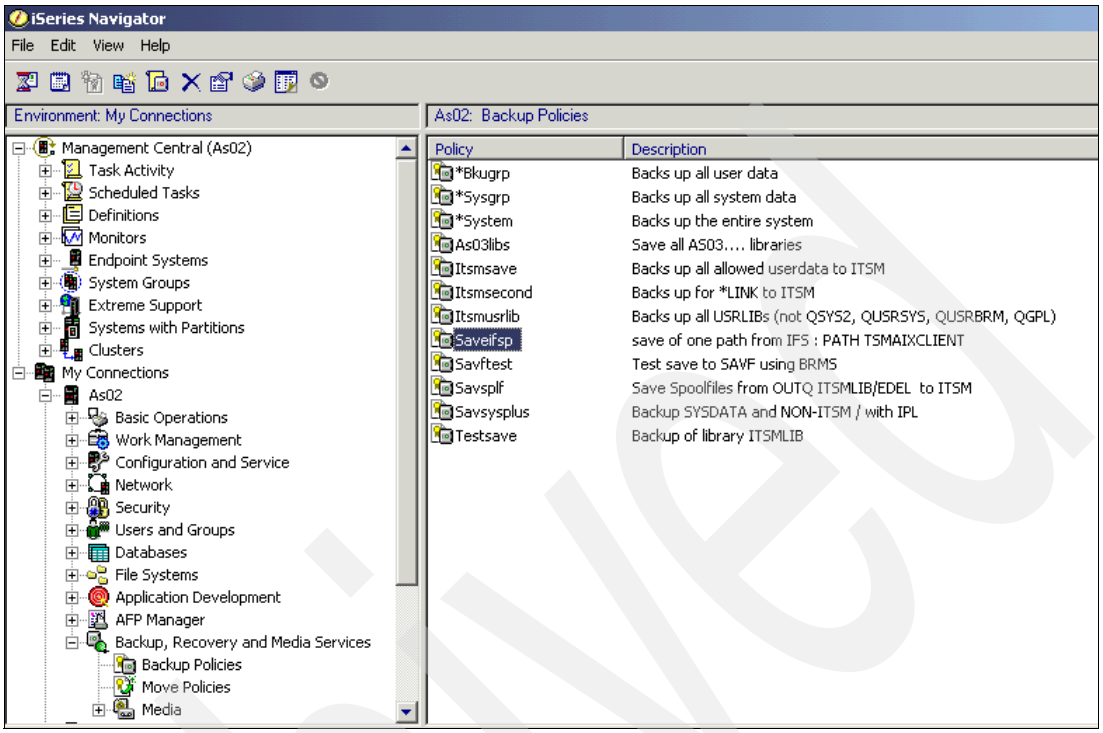

Figure 9-38 Backup policy Saveifsp on main iSeries Navigator window

4. The Saveifsp Properties window (Figure 9-39) opens. Click the **During** button.

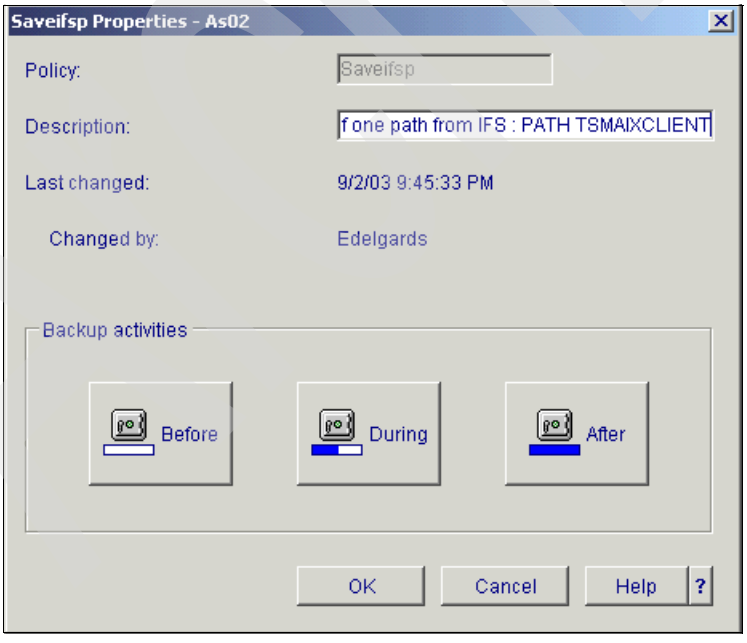

Figure 9-39 Saveifsp Properties window

5. In the Properties - During Backup window (Figure 9-41), verify what you must change, if anything, to back up the IFS objects using the Saveifsp backup policy. Complete the following steps:

   a. As shown in Figure 9-41, select **Saveifsp** and click the **Details** button for more information.

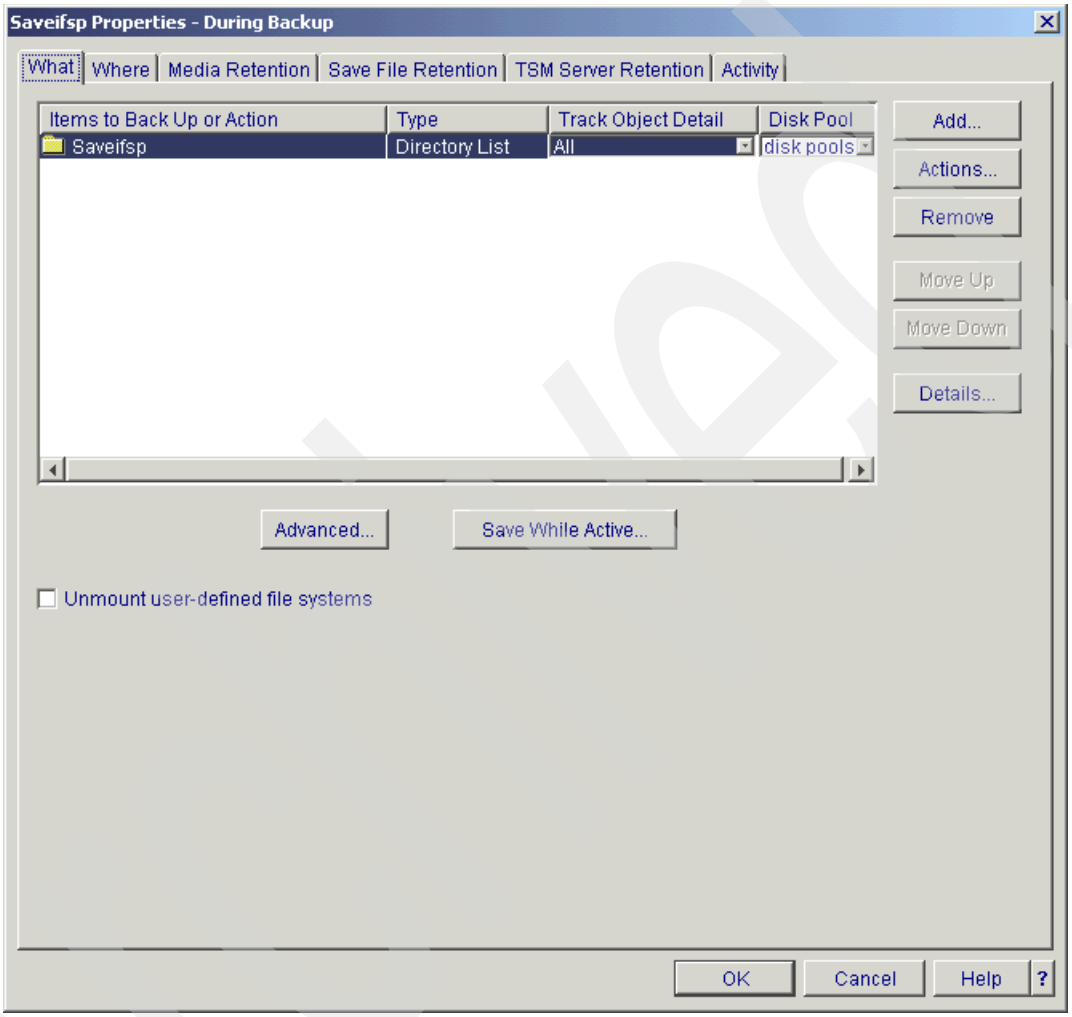

Figure 9-40 Saveifsp Properties - During Backup window

Does the backup of TMSAIXCLIENT directory include all subdirectories and files? Yes, as shown in the Details window (Figure 9-41), the Include parameter specifies **All directories and subdirectories**.

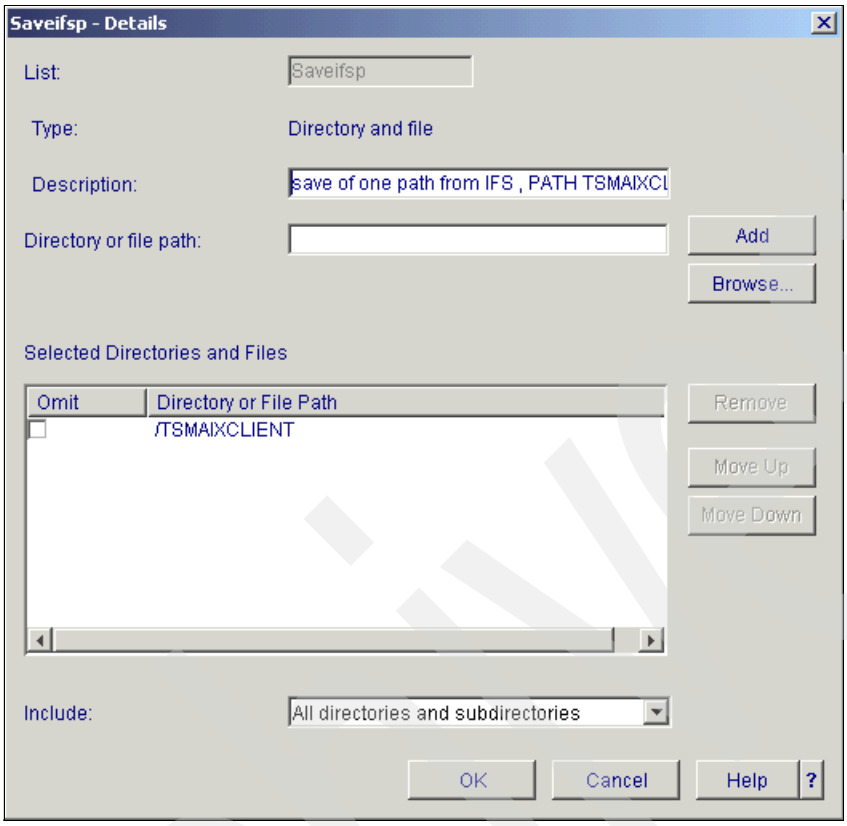

Figure 9-41 Saveifsp - Details window

You can add and remove directories and file paths using this window.

Review your selections. Click **Cancel** to return without making changes or click **OK** to include any changes (we are not making changes). You are back at the Saveifsp Properties - During Backup window (Figure 9-40).

b. Is backup with the Save While Active option allowed? On this window, click **Save While Active** to find out. This opens the Save While Active window shown in Figure 9-42. You see Yes specified for Save While Active and a Save message queue.

   In the windows that are not shown for this example, we selected the **Saveifsp** item, which enabled the Browse Message Queues button. From the browse list, we selected message queue Save in library QUSRBRM. See 9.6, “Save-while-active implications” on page 325, for more information about using a message queue.

   Since we added the Save message queue, click **OK**.

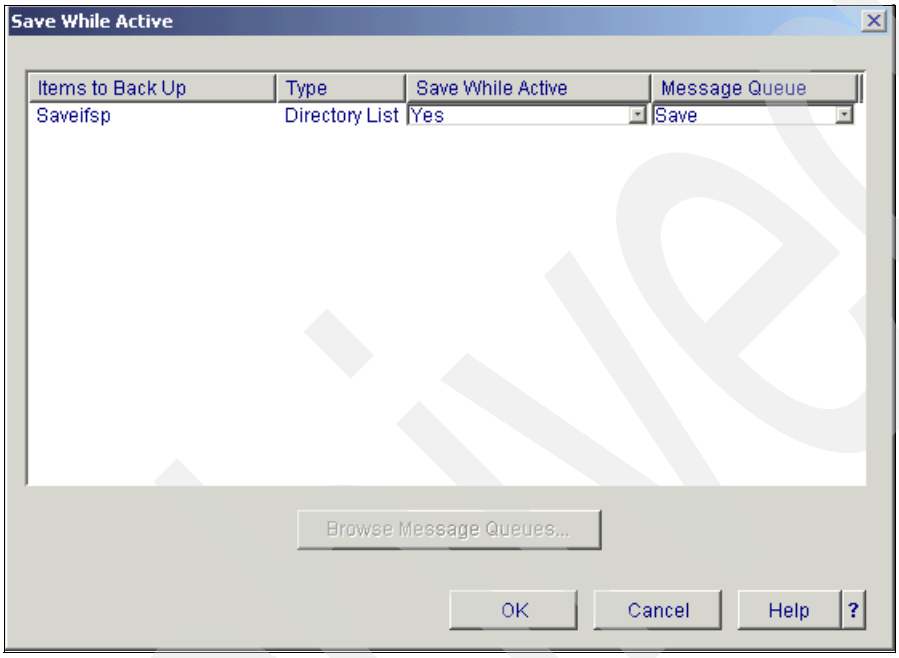

Figure 9-42 Save While Active window

6. You return to the Saveifsp Properties - During Backup window (Figure 9-40 on page 286). Which additional properties of the Saveifsp backup policy should we change?

   In Saveifsp Properties - During Backup window, click the **Where** tab.

   On the Where page (Figure 9-43), for the Where to back up setting, change the value from Media (serial) to another value. In this example, we select **TSM server**.

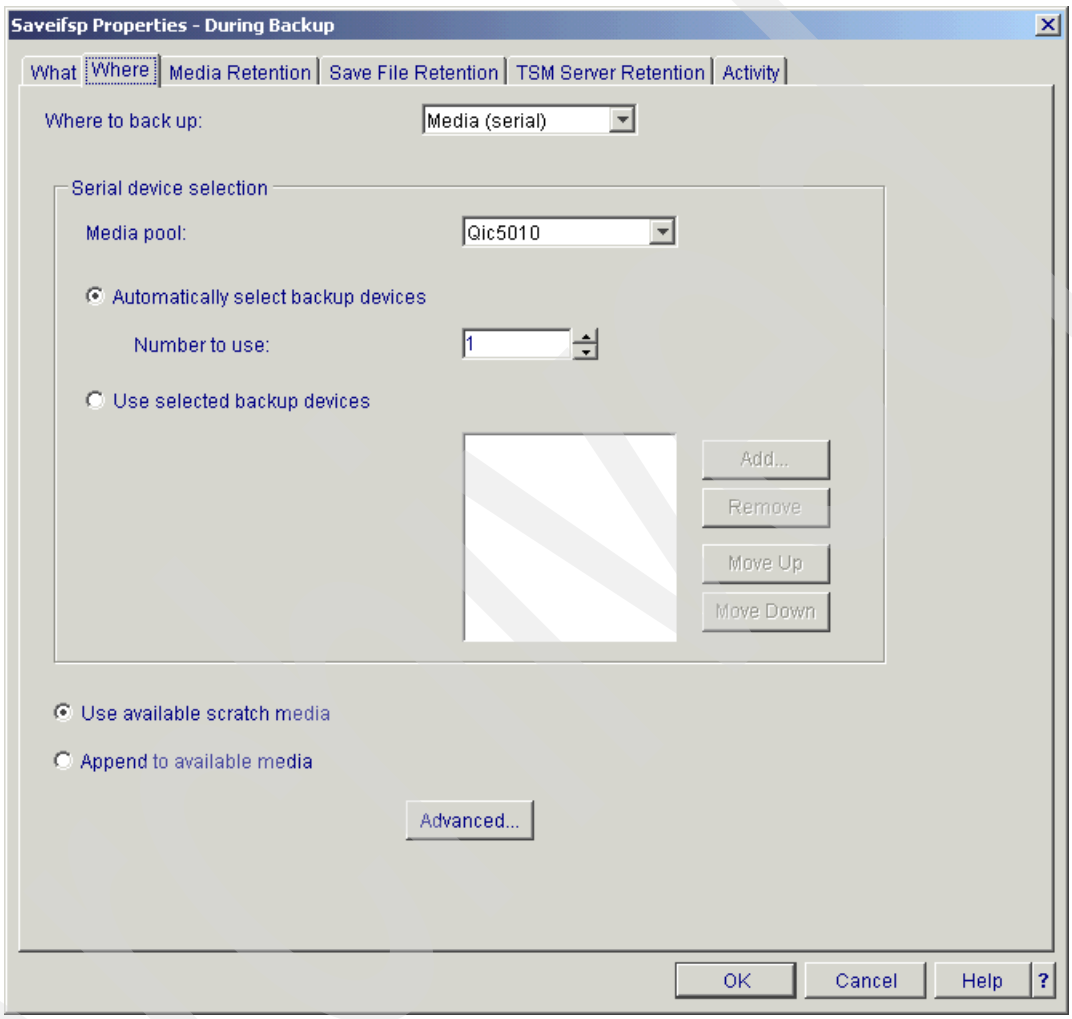

Figure 9-43 Where page before changing the Where to back up parameter

As shown in Figure 9-44, several other properties automatically change to reflect this value. Note the following values on the TSM server window:

- The TSM server name is **Itsmserver**.
- Under Full backups, Connection name is **AS02** and Storage location is **Any location**.
- Under Changes-only backups, Connection name is **As02** and Storage location is **Any location**.
- The Manage TSM Servers button is enabled.

The TMS server name and connection name values are those we specified during IBM Tivoli Storage Manager server name (Itsmserver) and connection name (AS02) definitions in 9.2.3, “Follow-on steps using iSeries Navigator” on page 269.

We leave these as specified defaults, but you can change them by clicking the **Manage TSM Servers** button.

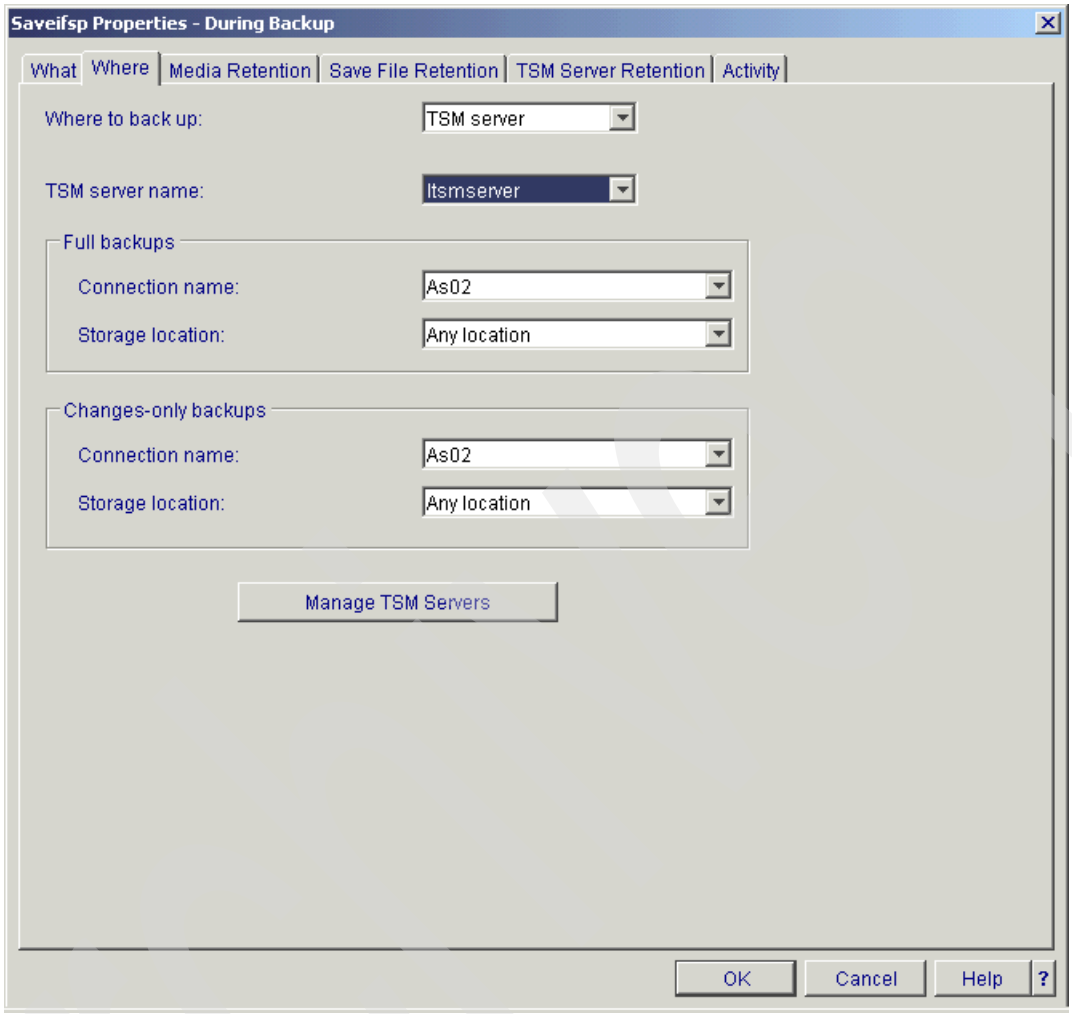

Figure 9-44 Where page after changing the Where to back up parameter

Attention: Do not click the OK button on the Saveifsp Properties - During Backup window yet. If you click OK too soon, you see the error message shown in Figure 9-45.

Figure 9-45 Error message

c. On Saveifsp Properties - During Backup window, click the **TSM Server Retention** tab.

d. On the TSM Server Retention page (Figure 9-46), you see empty fields for both TSM management class parameters. In this example, we enter `BRMS` for both TSM management class parameters. This is the management class that we defined in step 3 on page 253 to define an IBM Tivoli Storage Manager management class (Figure 9-5 on page 254).

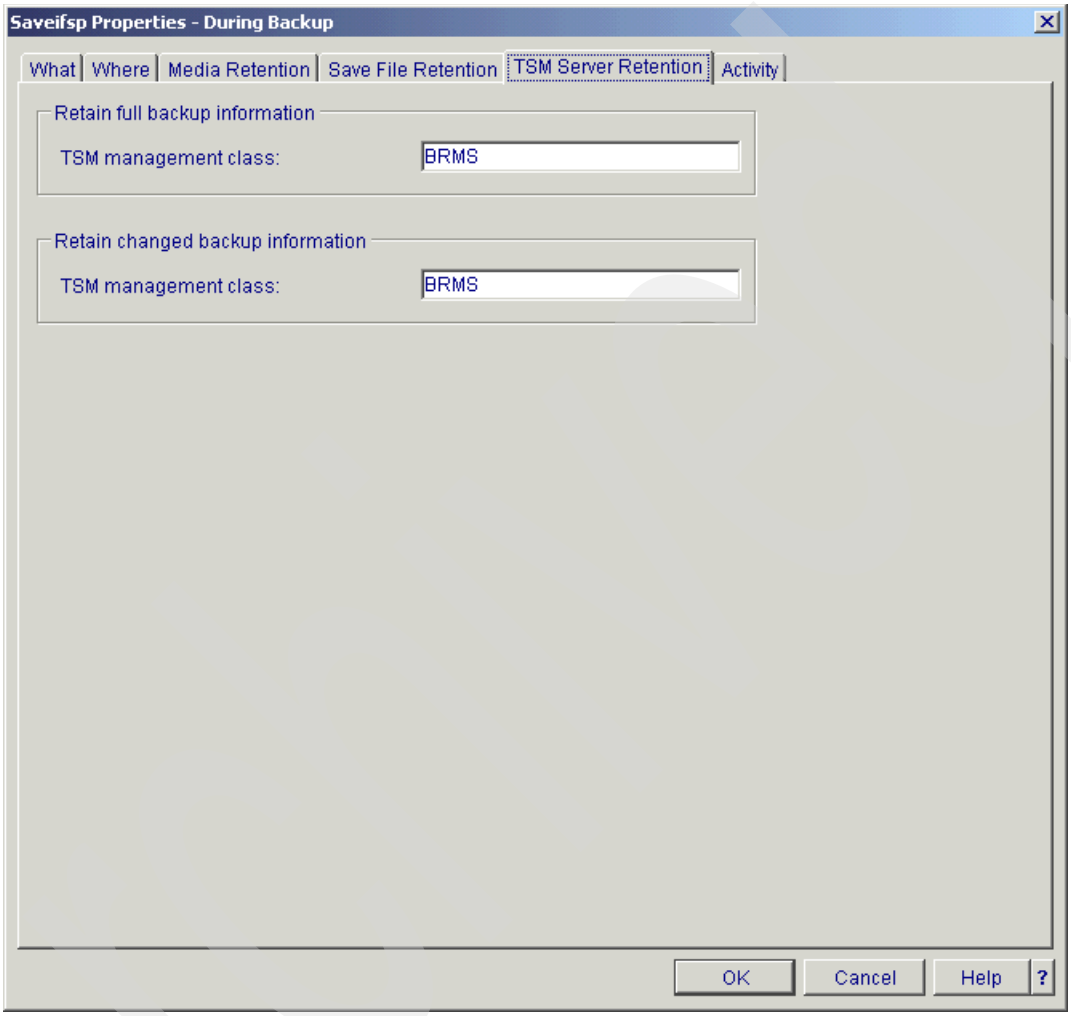

Figure 9-46 Entering the IBM Tivoli Storage Manager management class names

e. Click **OK** to save all your changes for the Saveifsp Properties - During Backup window.

7. You return to the main Saveifsp Properties window (Figure 9-39 on page 285). Click **OK** on this window.
8. You return to the main iSeries Navigator window, which shows BRMS backup policies in the right pane (Figure 9-38 on page 285).

Note: The BRMS iSeries Navigator client changes the Automatically backup media information parameter to *NONE when you change a backup policy from a tape device to an IBM Tivoli Storage Manager server. Therefore, you do not have to perform another step as when using the 5250 interface.

For additional information, see 9.5, “Full iSeries backup and restore on the BRMS Application Client” on page 312.

9. Use the Saveifsp backup policy to back up the IFS path TSMAIXCLIENT to the IBM Tivoli Storage Manager server. To activate this backup, in the Backup Policies window (Figure 9-38 on page 285), right-click the **Saveifsp** policy and select **Run Now**.

10. The Run Backup Policy Saveifsp - Backup Activity Override window (lower part of Figure 9-47) opens. You can run the policy as is or specify the overrides here. In this example, we run the policy unchanged. Click **OK**.

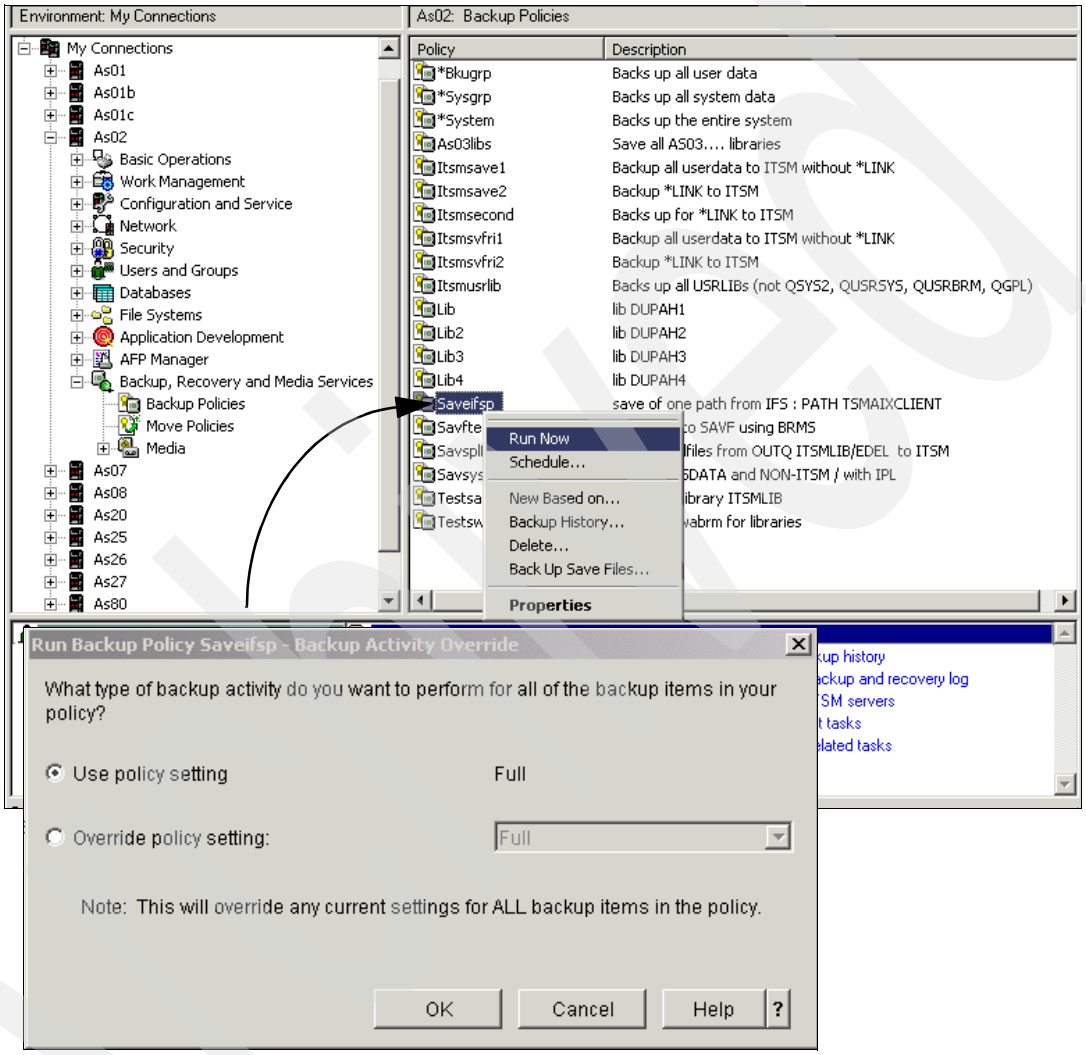

Figure 9-47 Running the backup policy with the iSeries Navigator client interface

11. The Run Backup Policy Saveifsp - Retention Overrides window opens (not shown). Click **OK**.

12. The the iSeries Navigator window opens showing your Management Central assigned backup activity name with instructions on how to find out its task activity status (using the next step). This means the task is running now. Click **OK** to return to your window showing Backup policies.

13. In iSeries Navigator as shown in Figure 9-48, expand **Management Central (As02)-> Task Activity-> Backup, Recovery and Media Services**. In the panel on the right, you see the BRMS task with a status of *Started*. After the backup successfully completes, you see the status *Completed*.

> **Tip:** It is possible that you may see a status of *Failed* (as shown in Figure 9-48 for a previous task). Typically this is because your Management Central central system is not correctly setup. To set up Management Central, see 7.3.1, “Installing the BRMS iSeries Navigator client” on page 137.

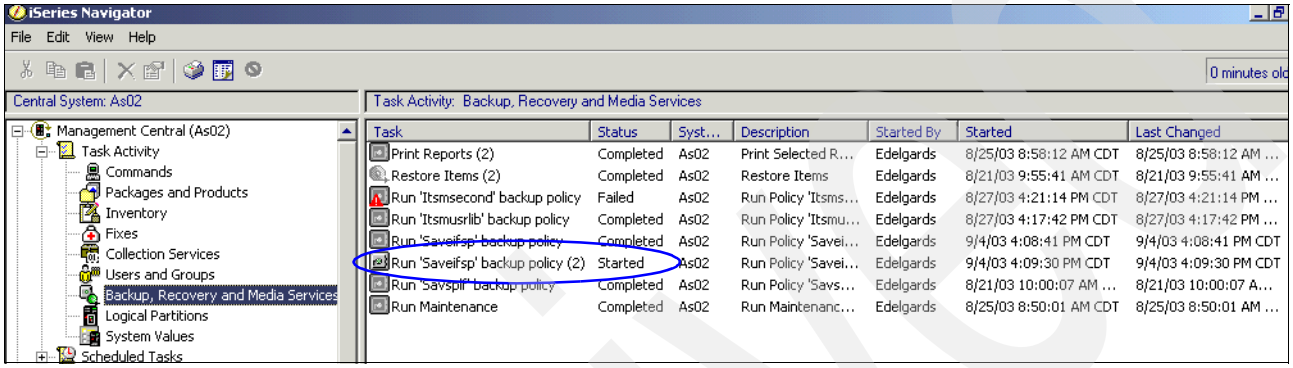

Figure 9-48 Task Saveifsp with the Started status in Management Central (As02)

14. While the backup job is running in OS/400 subsystem QBATCH (by default) on system AS02, you see the associated work happening on the IBM Tivoli Storage Manager server (AS27 in our example) as a node session from the IBM Tivoli Storage Manager server administration point of view.

    On AS27, in the IBM Tivoli Storage Manager server Web administrative client interface (Figure 9-49), in the Server Command window at the bottom of the page, enter:

    ```
    q ses
    ```

    Click **Submit**.

Figure 9-49 Using the q ses IBM Tivoli Storage Manager command to see the AS02 session

15. After the backup has completed (the Management Central Task Activity task status is *Completed*), verify the save results for Saveifsp backup policy, which backed up IFS path TSMAIXCLIENT and all its subdirectories and data.

    There are two ways to do this. You can start both ways using the Backup, Recovery and Media Services Tasks taskpad for system AS02, as shown in the bottom panel in Figure 9-50. To open this window, click **My Connections-> AS02-> Backup, Recovery and Media Services**.

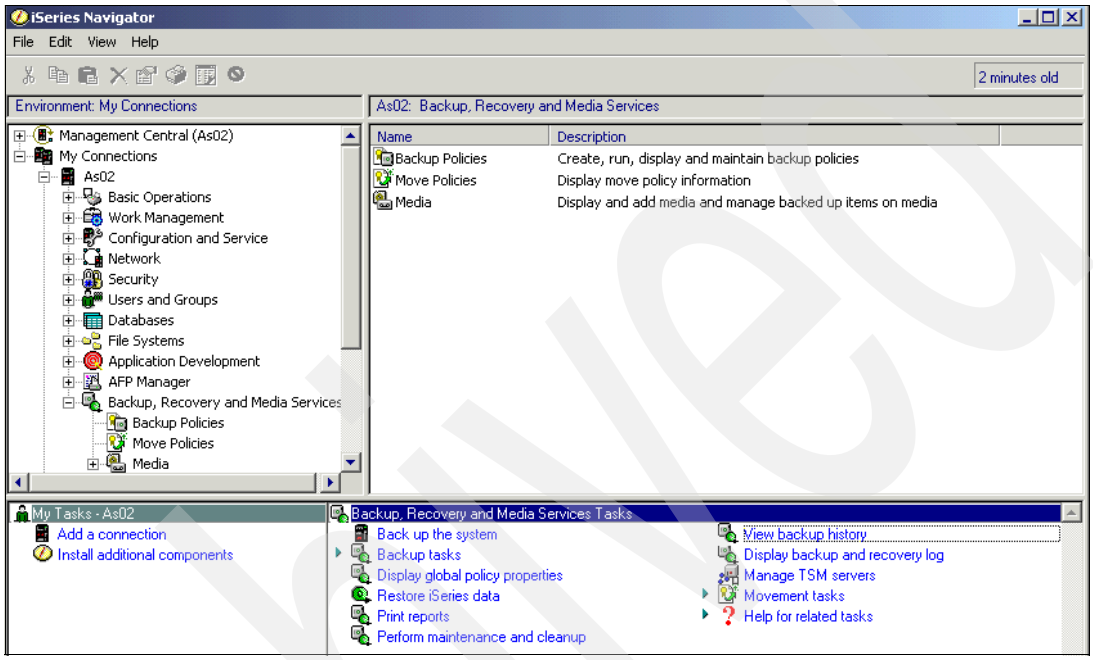

Figure 9-50 Backup, Recovery and Media Services Tasks

Then you can choose from one of the following ways to verify your save results:

– **View backup history**

i. Under Backup, Recovery and Media Services Tasks, click **View backup history** in the taskpad area.

ii. The Backup History-Include window (Figure 9-51) opens. For the Policy parameter, select **Saveifsp**. Depending on your environment, use the various include parameters to include history information for all backups or use the lists to selectively include history information to be shown. In our example, we selected to display **All** information about the local system from September 4 through September 12.

Click **OK**.

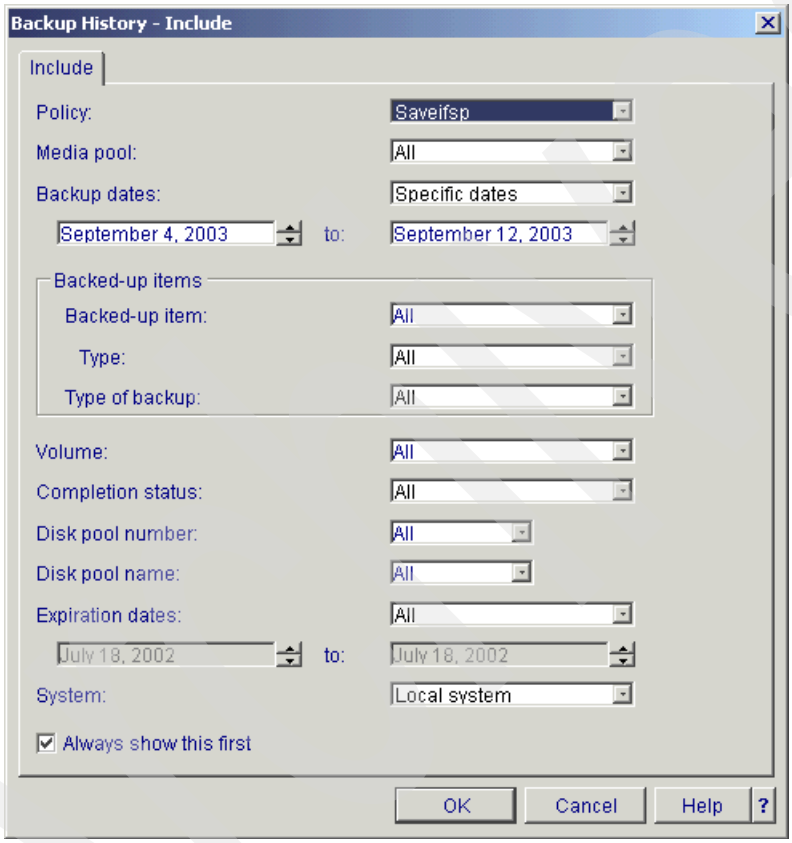

Figure 9-51 Backup History Parameter

f. Now you see an initial level of information in a window similar to the one shown in Figure 9-52. Under Backed Up Item, you can see summary information for Saveifsp. This information includes the time of running (3:58:09 PM), backup type (Full), the kind of volume (TSM Server), and the number of objects saved (124). Double-click **Saveifsp**.

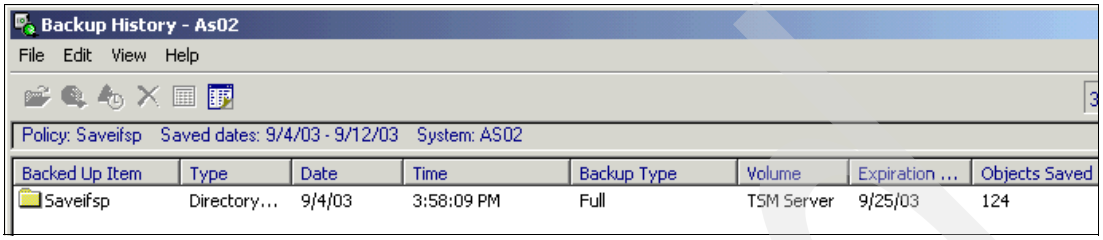

Figure 9-52 Backup History - AS02

g. The Backup History window in the background of Figure 9-53 opens, showing the next level of backup details of what was actually saved in the path TSMAIXCLIENT. You can see another lower level of backup history information for each backed up item. For example, we opened the background item /TSMAIXCLIENT to see the more detailed history information in the Backup History window shown in the lower right foreground in Figure 9-53.

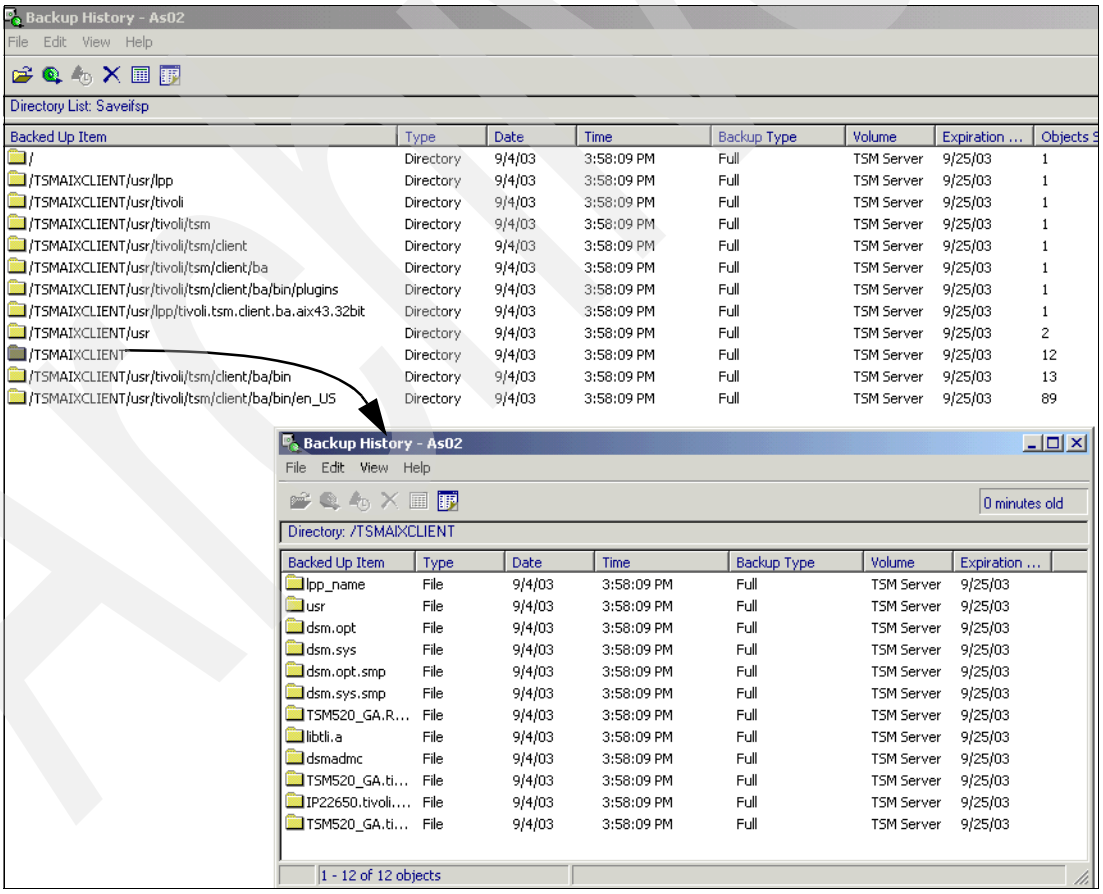

Figure 9-53 Backup History example

– **Display backup and recovery log**

The BRMS iSeries Navigator client has the capability to view the backup and recovery log. Here is a fast way to access this backup and recovery log for our save with backup policy Saveifsp.

i. From the Backup, Recovery and Media Services Tasks taskpad area (see Figure 9-50 on page 295), click **Display backup and recovery log**.

ii. The Backup and Recovery Log - Include window opens. Enter the actual dates in the From and To fields for the specific dates. Click **OK**.

iii. The Backup and Recovery Log - AS02 window (Figure 9-54) opens. This log can contain many entries. Review the messages area to find, for example, all eight entries associated with the Saveifsp backup. Note that, in this log, Saveifsp is shown in uppercase, SAVEIFSP.

It is normal to see the "`Brm1644 Control group SAVEIFSP bypassed automatic save of media information`." message. This is because the BRMS iSeries Navigator client automatically sets the Automatically backup media information parameter value to *NONE. See step 6 on page 281 to determine which backup control group attributes you must change. Also see 9.5, "Full iSeries backup and restore on the BRMS Application Client" on page 312.

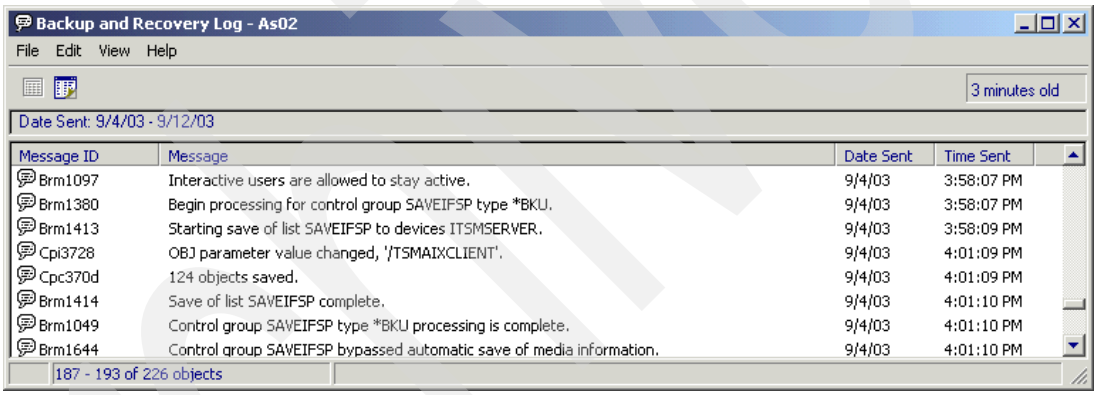

Figure 9-54 Backup and Recovery Log entries for SAVEIFSP

Click to select one of the messages for more details. In this example, we select **Cpc370d**.

iv. You see the Detailed Message Information window (Figure 9-55). Review the information and click **OK**.

Figure 9-55 Details for Message CPC370D

Regardless of the method you use to verify your save, you see similar information. Our backup for IFS path TSMAIXCLIENT with all subdirectories and files using backup policy Saveifsp with BRMS iSeries Navigator client was successful. Keep in mind that the View backup history method provides additional details.

Later, in 9.4.2, “Using BRMS iSeries Navigator client” on page 304, you see how to restore parts of IFS path TSMAIXCLIENT from our IBM Tivoli Storage Manager server using this backup, created with the Saveifsp backup policy.

9.4 Restore scenario example: Restoring from an IBM Tivoli Storage Manager server

It is important to understand that restoring data saved using the BRMS Application Client (AS02 in our examples) to an IBM Tivoli Storage Manager server (AS27 in our examples) can be done only through BRMS, not using IBM Tivoli Storage Manager. As in the save scenario examples, this section shows two different ways to perform the restore:

- Using the 5250 interface
- Using the BRMS iSeries Navigator client interface

9.4.1 Using 5250 interface

Prior to reading this section, you must have done a backup for user library ITSMLIB to IBM Tivoli Storage Manager server, using the backup control group TESTSAVE as described in 9.3.1, “Using the 5250 interface” on page 277. You must also have restores library ITSMLIB to AS02 from IBM Tivoli Storage Manager server on AS27, because library ITSMLIB was deleted but now must be used again on AS02.

We do the restore by using BRMS. There are several different ways using BRMS to perform this restore. We prefer to use the Work with Media Information (WRKMEDIBRM) command.

To restore library ITSMLIB from the IBM Tivoli Storage Manager server on AS27 to system AS02 perform following steps:

1. On AS02, enter the following command:

   ```
   WRKMEDIBRM LIB(ITSMLIB)
   ```

2. This opens the Work with Media Information display (Figure 9-56). Position the cursor to the most recent entry for ITSMLIB (September 9 at 18:01 in our example). Validate that this newest entry has the following values:
   - Save Type is *FULL. All objects in library ITSMLIB were backed up successfully.
   - Volume Serial is *ADSM. The backup was to an IBM Tivoli Storage Manager server and saved, which means that it was a successful backup of ITSMLIB.

   Enter option 7 (Restore) next to this IBM Tivoli Storage Manager entry. Press Enter.

   Note: We specify option 7 (Restore), because we want to restore the entire contents of library ITSMLIB. Option 9 (Work with saved objects) allows you to select specific objects of the saved ITSMLIB library to be restored.

```
                        Work with Media Information                 AS02

 Position to Date.. . . .

 Type options, press Enter.
   2=Change   4=Remove   5=Display   6=Work with media   7=Restore
   9=Work with saved objects

    Saved                              Save   Volume       File    Expiration
Opt Item              Date     Time    Type   Serial     Sequence     Date
    ITSMLIB         9/02/03 17:19:43 *FULL  *ADSM             0   10/07/03
    ITSMLIB         9/02/03 17:54:29 *FULL  *ADSM             0   10/07/03
    ITSMLIB         9/02/03 19:12:45 *FULL  *ADSM             0   10/07/03
    ITSMLIB         9/03/03 19:56:09 *FULL  *ADSM             0   10/08/03
    ITSMLIB         9/04/03 19:54:10 *FULL  *ADSM             0   10/09/03
    ITSMLIB         9/05/03 12:37:26 *FULL  *ADSM             0   10/10/03
    ITSMLIB         9/05/03 19:57:21 *FULL  *ADSM             0   10/10/03
    ITSMLIB         9/08/03 19:41:58 *FULL  *ADSM             0   10/13/03
    ITSMLIB         9/09/03 10:09:00 *FULL  *ADSM             0   10/14/03
7_  ITSMLIB         9/09/03 18:01:02 *FULL  *ADSM             0   10/14/03
                                                                      Bottom
```

Figure 9-56 Work with Media Information display for ITSMLIB

3. The Select Recovery Items display appears as shown in Figure 9-57. Note that option 1 (Select) is already entered for the ITSMLIB entry. Press Enter.

Tip: You can go directly to this Select Recovery Items display by using the Start Recovery using BRMS (STRRCYBRM) command as shown here:

```
STRRCYBRM OPTION(*LIB) ACTION(*RESTORE) LIB(ITSMLIB) USEADSM(*YES)
```

When you use this command, option 1 (Select) is not already entered next to ITSMLIB.

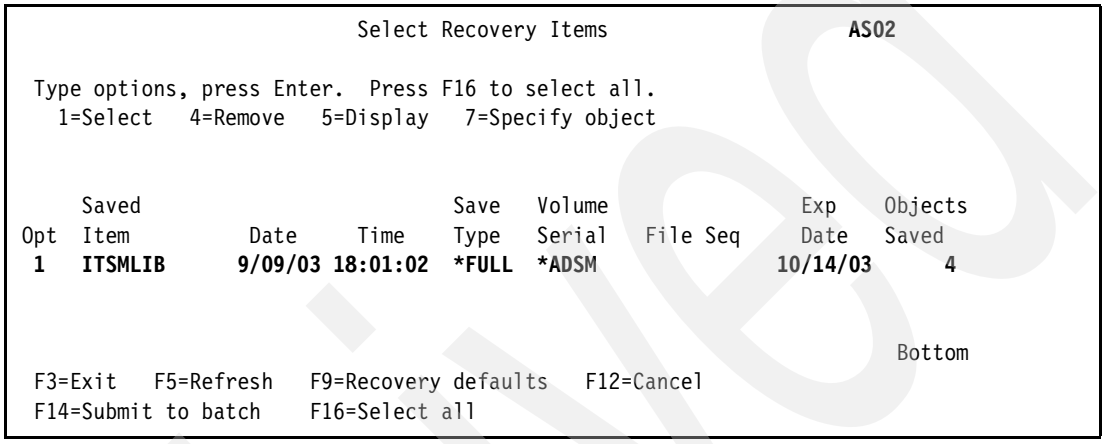

Figure 9-57 Select Recovery Items display

Note: Several items of information and other options are available through the Work with Media Information and the Select Recovery Items displays. When you use these interfaces, select the various options such as Function key 1 (F1) help, and the other function keys shown, for example on the bottom of the Select Recovery Items display. For example, you can perform a restore function in batch mode, by using F14 (Submit to batch).

4. The Display Recovery Items panel (outlined by “dots”) in Figure 9-58, overlays the Select Recovery Items display. Notice the “`Restoring library ITSMLIB from TSM (ADSM) device ITSMSERVER`.” message at the bottom of the display.

```
                          Select Recovery Items                    AS02
 .............................................................................
 :                        Display Recovery Items                   AS02      :
 :                                                                 15:36:48  :
 :    Remaining items . . . . :              1                               :
 :    Remaining objects . . . :              4                               :
 :    Remaining size  . . . . :        42.9548 M   100.0 %                   :
 :                                                                           :
 : Saved                      Save  Volume               Exp    Objects      :
 : Item         Date      Time    Type  Serial   File Seq     Date    Saved  :
 : ITSMLIB      9/09/03 18:01:02  *FULL *ADSM               10/14/03      4  :
 :                                                                           :
 :                                                                           :
 :                                                                           :
 :  Press ATTN key to cancel recovery after current item completes.          :
 :  Restoring library ITSMLIB from TSM (ADSM) device ITSMSERVER.             :
 :...........................................................................:
```

Figure 9-58 Display Recovery Items for library ITSMLIB

> **Important:** You must wait, until the Display Recovery Items display (Figure 9-58) changes from showing the “restoring library” message to showing the message “`4 objects restored from ITSMLIB to ITSMLIB`” (as shown in Figure 9-59).
>
> Place your 5250 cursor on this message and use F1 to see message CPC3703 details. We verify this restore of library ITSMLIB later in this section.

```
                         Work with Media Information                  AS02

 Position to Date . . . . .

 Type options, press Enter.
   2=Change   4=Remove   5=Display   6=Work with media   7=Restore
   9=Work with saved objects

    Saved                            Save   Volume       File    Expiration
Opt Item             Date     Time   Type   Serial     Sequence     Date
    ITSMLIB        9/02/03 17:54:29 *FULL  *ADSM             0   10/07/03
    ITSMLIB        9/02/03 19:12:45 *FULL  *ADSM             0   10/07/03
    ITSMLIB        9/03/03 19:56:09 *FULL  *ADSM             0   10/08/03
    ITSMLIB        9/04/03 19:54:10 *FULL  *ADSM             0   10/09/03
    ITSMLIB        9/05/03 12:37:26 *FULL  *ADSM             0   10/10/03
    ITSMLIB        9/05/03 19:57:21 *FULL  *ADSM             0   10/10/03
    ITSMLIB        9/08/03 19:41:58 *FULL  *ADSM             0   10/13/03
    ITSMLIB        9/09/03 10:09:00 *FULL  *ADSM             0   10/14/03
    ITSMLIB        9/09/03 18:01:02 *FULL  *ADSM             0   10/14/03
                                                                    Bottom

 F3=Exit   F5=Refresh   F11=Object detail   F12=Cancel
 4 objects restored from ITSMLIB to ITSMLIB.
```

Figure 9-59 Restore complete message CPC3703

As shown in 9.3, “Save scenario example: Saving to an IBM Tivoli Storage Manager server” on page 277, if you are fast enough, you can use the IBM Tivoli Storage Manager server Web administrative client interface Server Command window. In this field, you enter **q ses** (query sessions) to see on the IBM Tivoli Storage Manager server (on AS27) the status for all active IBM Tivoli Storage Manager server sessions, including this restore function.

In Figure 9-60, contrast the Session State *SendW* status for restore here with the Sess State *RecW* shown in Figure 9-35 on page 282 for the corresponding backup (save) of ITSMLIB.

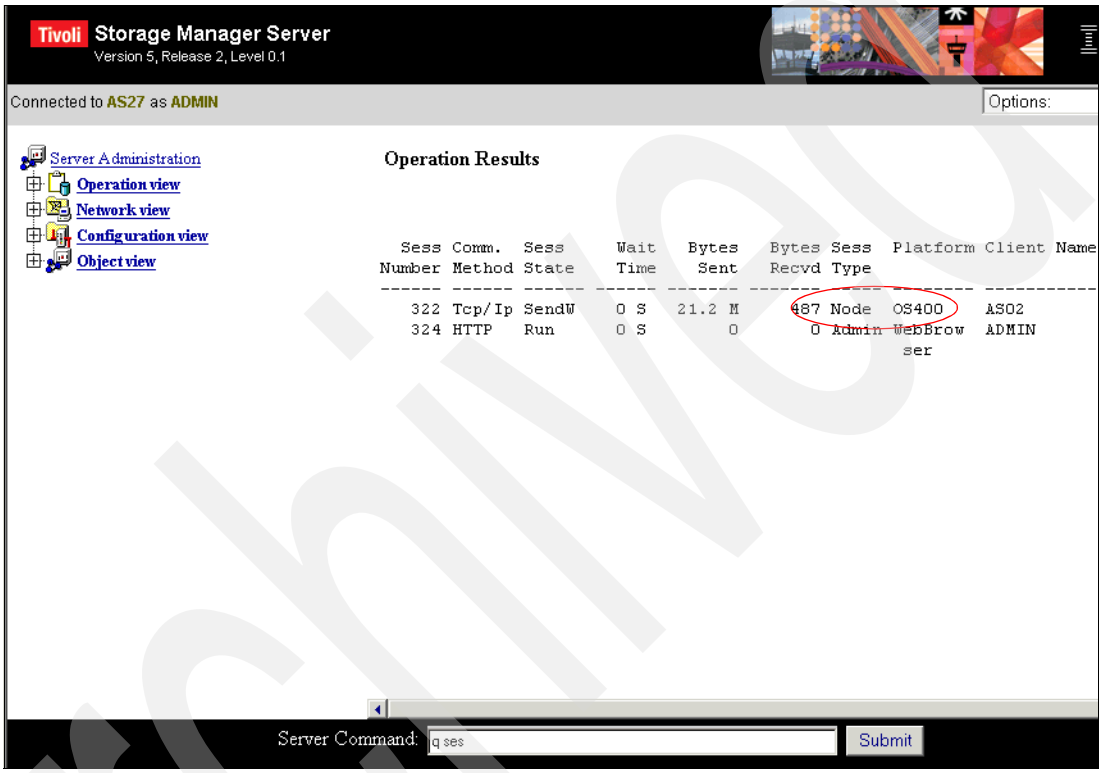

Figure 9-60 Query sessions for restore from BRMS Application Client

5. Verify the restore results. After the restore has completed, use the Display Object Description (DSPOBJD) command to verify that the ITSMLIB library exists and shows the latest time stamp of the restore:

   ```
   DSPOBJD OBJ(ITSMLIB) OBJTYPE(*LIB) DETAIL(*FULL)
   ```

   Scroll down to the display shown in Figure 9-61.

```
                    Display Object Description - Full
                                                                Library 1 of 1
Object . . . . . :   ITSMLIB          Attribute  . . . . . :   PROD
  Library  . . . . :     QSYS          Owner  . . . . . . :   COOK
Library ASP device . :   *SYSBAS       Primary group  . . . :   *NONE
Type . . . . . :   *LIB

Save/Restore information:
  Save date/time . . . . . :   09/09/03  18:01:02
  Save active date/time  . . . . . :   09/09/03  18:01:02
  Restore date/time  . . . . . :   09/10/03  16:26:59
  Save command . . . . . :   SAVLIB
  Device type  . . . . . :   Save file
  Save file  . . . . . :   QTEMP/QANE079704
```

Figure 9-61 Display Object Description for library ITSMLIB

9.4.2 Using BRMS iSeries Navigator client

Prior to reading this section, you must have done a backup for IFS path TSMAIXCLIENT to IBM Tivoli Storage Manager server using the save scenario with the BRMS iSeries Navigator client interface for backup policy saveifsp. See 9.3.2, “Using BRMS iSeries Navigator client” on page 284. You must also have restored the entire IFS path TSMAIXCLIENT with all subdirectories and all files to AS02 from IBM Tivoli Storage Manager server on AS27, because the entire TSMAIXCLIENT directory is deleted but now must be used again on AS02.

Each restore using BRMS iSeries Navigator client starts by selecting the Restore iSeries data in the Backup, Recovery and Media Services Tasks taskpad area. To access this taskpad area, click **My Connections-> AS02-> Backup, Recovery and Media Services** (Figure 9-62).

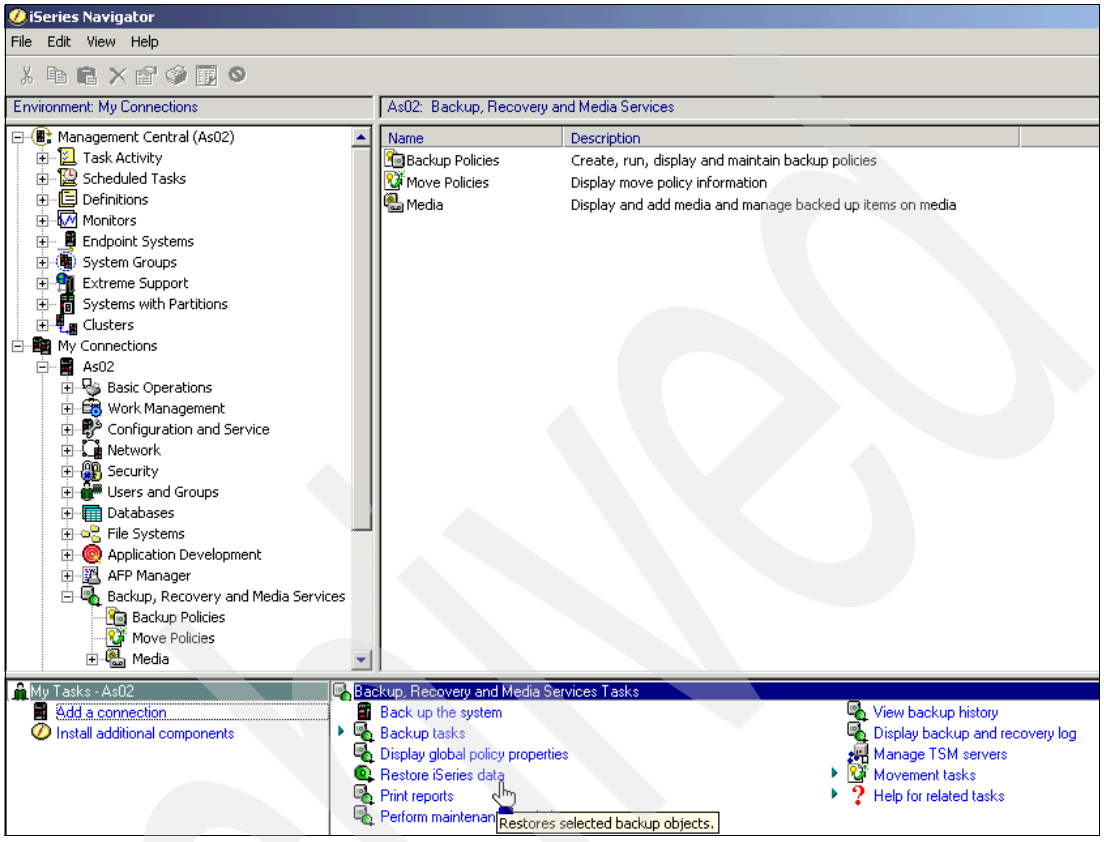

Figure 9-62 BRMS iSeries Navigator client: Restoring iSeries data

To restore the entire TSMAIXCLIENT path on system AS02 from the IBM Tivoli Storage Manager server on AS27, perform the following steps:

1. Under Backup, Recovery and Media Services Tasks, select **Restore iSeries data**.
2. On the Restore wizard Welcome window, read the text. Click the Help button if necessary. Then, click **Next**.

3. On the Restore - Restore from Backup History or Device - As02 window (Figure 9-63), leave the default as selected and click **Next**.

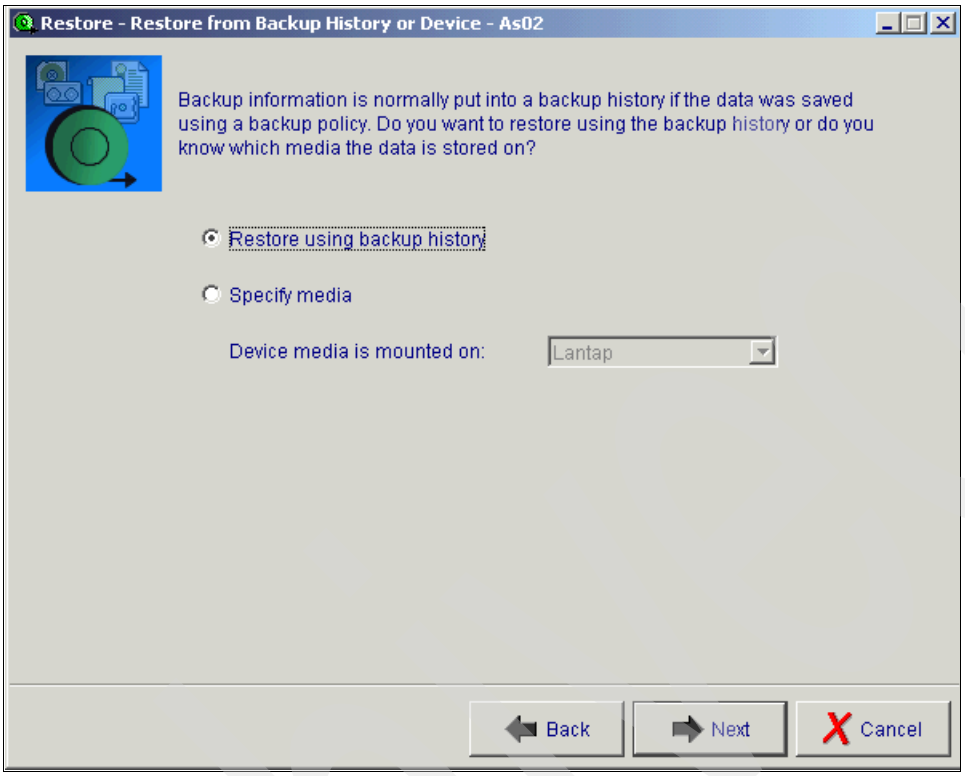

Figure 9-63 Restore from Backup History or Device window

4. On the Restore - Select Type of Information - As02 window (Figure 9-64), select **A directory or its files** and click **Next**.

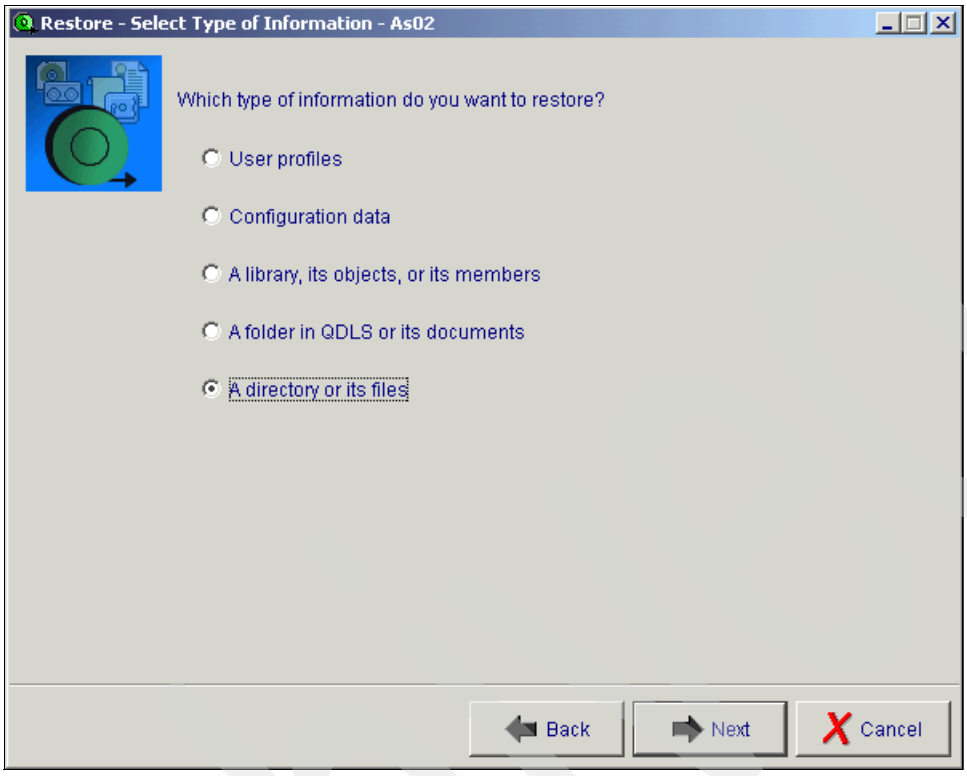

Figure 9-64 Select Type of Information window

5. On the Restore - Specify the Directory - As02 window (Figure 9-65), type the path name `/TSMAIXCLIENT` (path name must start with /) and click **Next**.

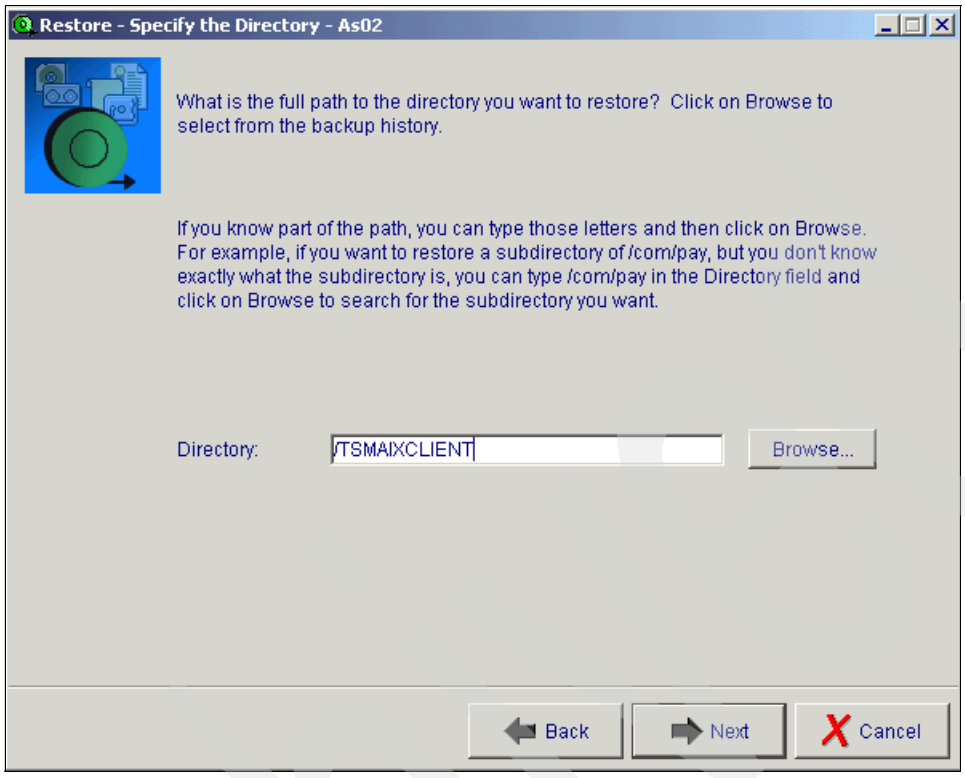

Figure 9-65 Specify the Directory window

6. On the Restore - Specify the Saved Version to Restore - As02 window (not shown), leave the default (Restore the most current). Click **Next**.

7. On the Restore - Restore Entire Directory - As02 window (Figure 9-66), you see a summary of all selections that were previously made and to which the backup (according to the Date Saved and Time Saved column values) will be restored. In this example, this is the full directory /TSMAIXCLIENT. Therefore, you select **Restore directory and all files** as well as **Include subdirectories**. Click **Next**.

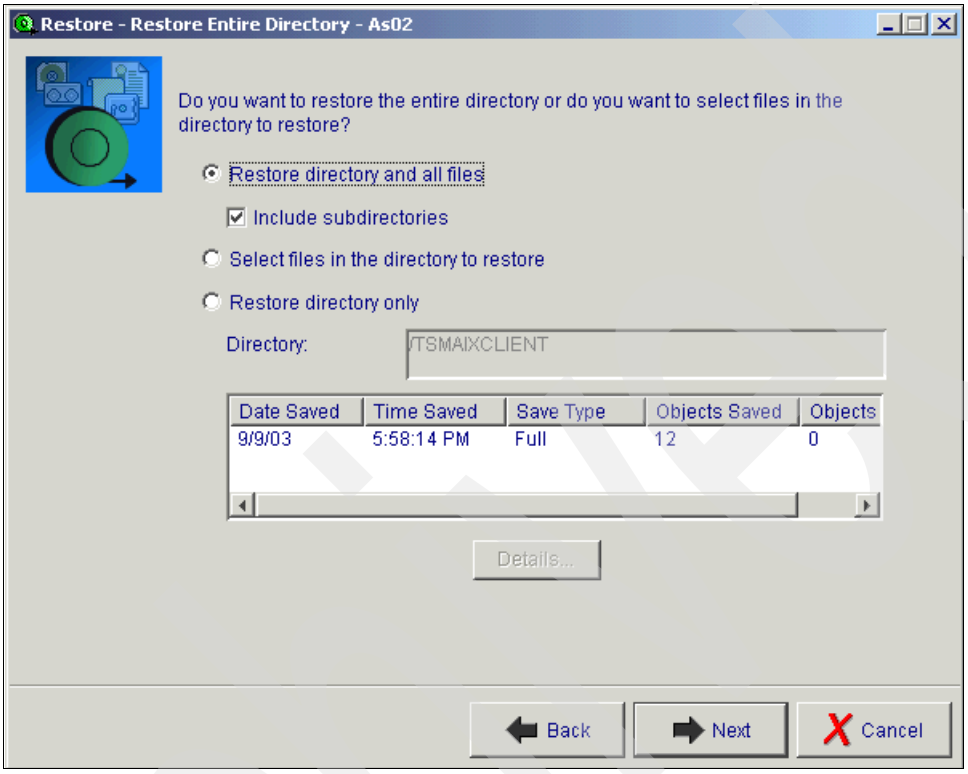

Figure 9-66 Restore Entire Directory window

8. On the Restore - Restore to Same Location - As02 window, leave the default as **Yes, restore to same location**. We select this option because, in our example path, /TSMAIXCLIENT does currently not exist and we want to restore it. Click **Next**.

9. On the Restore - Summary - As02 window (Figure 9-67), review the text, including the option to schedule the restore for a later time (Schedule button). Optionally you can click the **Details** button to see additional information. Notice that Volume needed is not available because we are restoring from an IBM Tivoli Storage Manager server, not a device. Click **Finish** to begin the restore now.

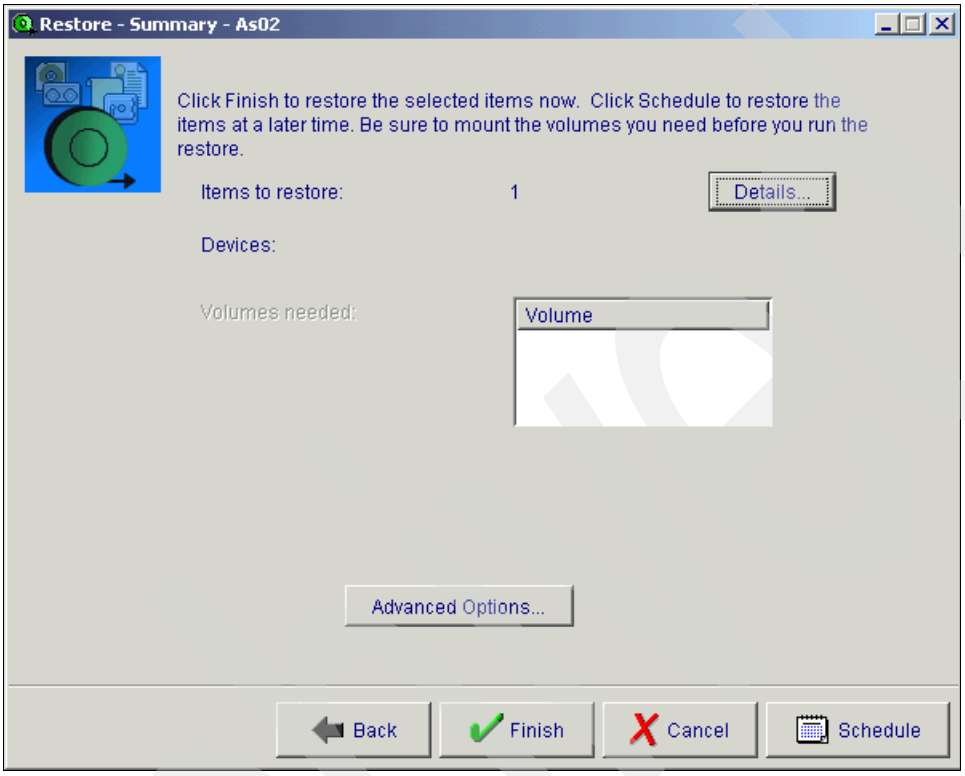

Figure 9-67 Summary window

10. The next window informs you about starting a Management Central task to do the Restore. Click **OK**.

11. You now return to the general iSeries Navigator window. In the left hierarchy tree pane, select **Management Central (As02)-> Task Activity-> Backup, Recovery and Media Services**. You see a task with the name Restore Items and status *Started*, as shown in Figure 9-68.

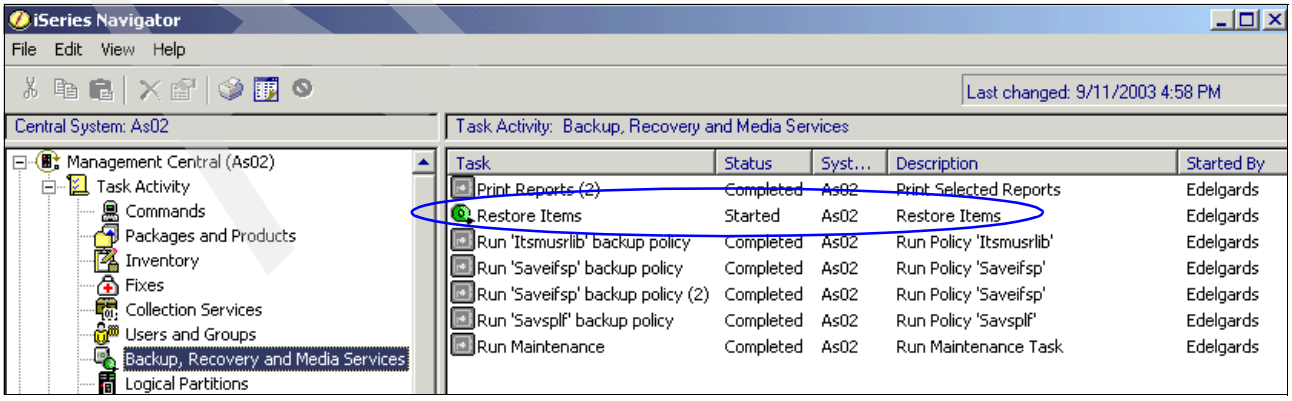

Figure 9-68 Management Central: Task Restore Items

12. During the restore, you can use the IBM Tivoli Storage Manager Web Administrative client interface to the IBM Tivoli Storage Manager server system (AS27) to see the session status with system AS02. As discussed in similar “in progress” situations earlier in this book, you can see this session and all other active sessions by entering the **q ses** command in the Server Command window of the browser interface. See session number 743 in Figure 9-69.

Figure 9-69 Query sessions for restore from AS27 to As02

After Restore is completed, the task status in Management Central (As02) changed from *Started* (see again Figure 9-68) to *Completed*.

13. There are several ways to validate a successful restore of the TSMAIXCLIENT path. As an example, we use the following two steps. If you see the path (directory/folder) TSMAIXCLIENT by using the As02 iSeries Navigator Integrated File System function, we know the restore was successful:

    a. On the main iSeries Navigator window, expand **My Connections-> As02-> File Systems-> Integrated File System**. Select the **Root** directory.

       Using the right pane, you can see a list of all directories and files in Root. You can see folder/directory TSMAIXCLIENT, as shown in Figure 9-70.

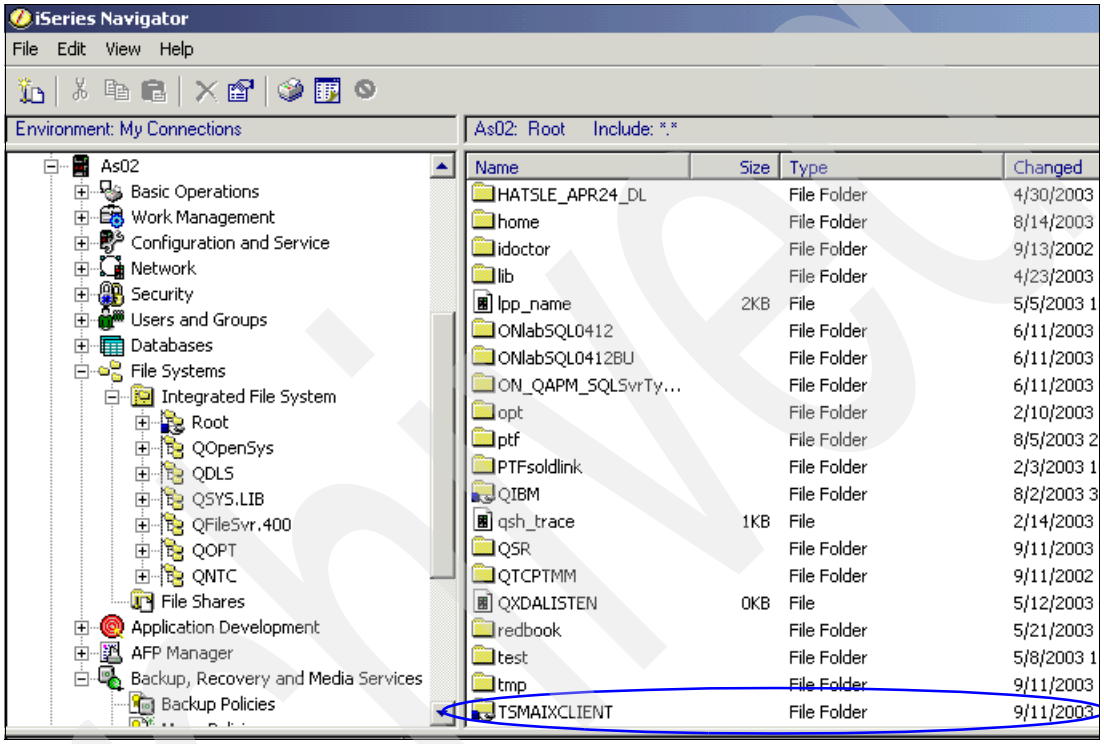

Figure 9-70 Restore of TSMAIXCLIENT was successful

Note the new restore date (11 September) under the Changed column. As it should be, this date is different from the Date Saved entry (09 September 2003) in Figure 9-66 on page 309.

We have now explained how to set up the BRMS Application Client to an IBM Tivoli Storage Manager server. We also included some save and restore scenarios. With the powerful functions in iSeries BRMS and IBM Tivoli Storage Manager server and client products, there are many more capabilities and ways to accomplish them. We cannot provide complete coverage of these methods. However, for an iSeries system recovery situation, you must understand the important considerations for recovering both user data and system data, when using both BRMS and IBM Tivoli Storage Manager server functions on that system.

9.5 Full iSeries backup and restore on the BRMS Application Client

This section presents full system backup and recovery considerations for an iSeries server (AS02), that has been performing the BRMS Application Client functions to an IBM Tivoli Storage Manager server (AS27 in our example network). You must consider both iSeries system data and user data that needs to be backed up to enable a full iSeries system recovery.

9.5.1 Full backup for system AS02

In our network, we use iSeries server AS02 as the BRMS Application Client to our IBM Tivoli Storage Manager server on iSeries server AS27. AS02 itself has no connected tape libraries, but it has its required (on all iSeries servers) an internal tape drive for media using a Quarter-inch Cartridge (QIC) tape device and its media. On selective 810 systems, this can be an internal VXA-2 tape device and its media. Using the internally attached VXA-2 80GB internal tape drive is a recent capability. This section uses the QIC tape device that has been available for several years.

For the backups to an IBM Tivoli Storage Manager server, our defined environment uses:

- Media policy ITSM
- Device ITSMSERVER
- Location ITSMSERVER

Prior to reading this section, you must be familiar with the information presented in this chapter up to this point. You should especially know the information in 9.2, “Setting up the BRMS environment for backup and restore to an IBM Tivoli Storage Manager server” on page 261.

The save strategy is to:

- Save all possible user data to an IBM Tivoli Storage Manager server.
- Save objects not allowed to be saved to an IBM Tivoli Storage Manager server (such as specific system data) to a local AS02 tape drive (our QIC tape drive). We operate under the important assumption that single QIC media is sufficient to contain all of this data.

Objects not allowed: These are objects that OS/400 does not allow to be backed up to an IBM Tivoli Storage Manager server. You cannot save iSeries system data to an IBM Tivoli Storage Manager server. Any user data that you can save to a save file, you can save to an IBM Tivoli Storage Manager server, except user data that is required to restore OS/400 to a base operating level. This includes:

- OS/400 security data
- iSeries configuration data
- IBM-supplied libraries and licensed program products: IBM-supplied libraries are considered this class of “user data” including QGPL, QUSRSYS, QUSRBRM, and BRMS media information.

Because backup of the specific IBM objects to an IBM Tivoli Storage Manager server is not allowed, we omit four libraries (QGPL, QSYS2, QUSRBRM, and QUSRSYS) from save type *ALLUSR using the 5250 command interface:

```
GO BRMBKUPCY
```

On this display, you select option 2 (Work with Items to Omit from Backup). This opens the Work with Items to Omit from Backup display (Figure 9-71).

```
                    Work with Items to Omit from Backup            AS02

Type options, press Enter.
   1=Add   4=Remove

Opt Type     Backup item

    *ALLUSR  QGPL
    *ALLUSR  QSYS2
    *ALLUSR  QUSRBRM
    *ALLUSR  QUSRSYS
```

Figure 9-71 Work with Items to Omit from Backup display

When you back up to an IBM Tivoli Storage Manager server, for each of the items listed, enter option 1 (Add). This adds the backup item to the omit backup item list. You can use F1 for online help in understanding this window.

If you forget to omit any one of these items, you see the BRMS message BRM2228 or BRM2250 when trying to perform a backup to an IBM Tivoli Storage Manager server of one of these not allowed objects.

In addition to the libraries QGPL, QSYS2, QUSRBRM, and QUSRSYS that are not allowed, there are OS/400-provided control group entries *SAVSYS, *SAVCFG, *SAVSECDTA, and *IBM that cannot be saved to an IBM Tivoli Storage Manager server.

We set up to save the entire AS02 system with five BRMS backup control groups:

- ITSMSAVE1
- ITSMSAVE2
- ITSMSVFRI1
- ITSMSVFRI2
- SAVSYSPLUS

Figure 9-72 shows these backup control groups along with others on our AS02 system.

```
                      Work with Backup Control Groups             AS02

Position to.. . . . .              Starting characters

Type options, press Enter
  1=Create    2=Edit entries    3=Copy      4=Delete   5=Display
  6=Add to schedule   8=Change attributes   9=Subsystems to process ...
                Full       Incr        Weekly
    Control     Media      Media       Activity
Opt Group       Policy     Policy      MTWTFSS  Text

    *BKUGRP     *BKUPCY    *BKUPCY     *BKUPCY  Backs up all user data
    *SYSGRP     SAVSYS     SAVSYS      *BKUPCY  Backs up all system data
    *SYSTEM     SYSTEM     SYSTEM      *BKUPCY  Backs up the entire system
    AS03LIBS    Z030902000 Z030902001  *BKUPCY  Save all AS03.... libraries
    ITSMSAVE1   ITSM       ITSM        *BKUPCY  Backup all userdata to ITSM
    ITSMSAVE2   ITSM       ITSM        *BKUPCY  Backup *LINK to ITSM
    ITSMSECOND  Z030827006 Z030827007  *BKUPCY  Backs up for *LINK to ITSM
    ITSMSVFRI1  ITSM       ITSM        *BKUPCY  Backup all userdata to ITSM
    ITSMSVFRI2  ITSM       ITSM        *BKUPCY  Backup *LINK to ITSM
    ITSMUSRLIB  Z030827004 Z030827005  *BKUPCY  Backs up all USRLIBs (not QSYS
    LIB         ITSM       ITSM        *BKUPCY  lib DUPAH1
    LIB2        ITSM       ITSM        *BKUPCY  lib DUPAH2
    LIB3        ITSM       ITSM        *BKUPCY  lib DUPAH3
    LIB4        ITSM       ITSM        *BKUPCY  lib DUPAH4
    SAVEIFSP    Z030902002 Z030902003  *BKUPCY  save of one path from IFS : PA
    SAVFTEST    SSAVF      SSAVF       *BKUPCY  Test save to SAVF using BRMS
    SAVSPLF     Z030821000 Z030821001  *BKUPCY  Save Spoolfiles from OUTQ ITSM
    SAVSYSPLUS  SAVSYS     SAVSYS      *BKUPCY  Backup SYSDATA and NON-ITSM /
    TESTSAVE    ITSM       ITSM        *BKUPCY  Backup of library ITSMLIB
    TESTSWA     SAVSYS     SAVSYS      *BKUPCY  test monswabrm for libraries
```

Figure 9-72 Backup control groups on AS02

ITSMSAVE1/ITSMSVFRI1 and ITSMSAVE2/ITSMSVFRI2 save nearly all user data to an IBM Tivoli Storage Manager server. SAVSYSPLUS saves all other data to a QIC tape using tape device TAP02 on AS02.

We created two backup control groups ITSMSAVE1 and ITSMSAVE2 from the backup control group ITSMSAVE (see 9.6, “Save-while-active implications” on page 325), because we run backups ITSMSAVE1 and ITSMSAVE2 as concurrent saves for a best performance. See 9.8, “Performance expectations” on page 329.

We also created backup control groups ITSMSVFRI1 (based upon ITSMSAVE1) and ITSMSVFRI2 (based upon ITSMSAVE2). These control groups have similar content but require different parameter values. ITSMSVFRI1 and ITSMSVFRI2 run only on Friday, and they do not use the save-while-active function. ITSMSAVE1 and ITSMSAVE2 both specify Save While Active.

In our local backup control group - SAVSYSPLUS, we include backing up the four *ALLUSR libraries (QGPL, QSYS2, QUSRBRM, and QUSRSYS) that we omitted earlier from our backup policy (Figure 9-71). In the Work with Backup Control Groups display (Figure 9-72) enter option 5 (Display) next to control group SAVSYSPLUS. Then you see the details of the Edit Backup Control Group Entries display (Figure 9-73).

```
                      Edit Backup Control Group Entries          AS02

Group . . . . . . . . . . . : SAVSYSPLUS
Default activity  . . . . . . *BKUPCY
Text  . . . . . . . . . . . . Backup SYSDATA and NON-ITSM / with IPL

Type information, press Enter.

                          Auxiliary   Weekly    Retain  Save      SWA
      Backup      List    Storage     Activity  Object  While     Message
Seq   Items       Type    Pool Device MTWTFSS   Detail  Active    Queue

  10  *EXIT                         *DFTACT
  20  *SAVSYS                       *DFTACT
  30  *IBM                          *DFTACT   *NO     *NO
  40  QGPL              *SYSBAS     *DFTACT   *YES    *NO
  50  QUSRSYS           *SYSBAS     *DFTACT   *YES    *NO
  60  QUSRBRM           *SYSBAS     *DFTACT   *YES    *NO
  70  QSYS2             *SYSBAS     *DFTACT   *YES    *NO
  80  *EXIT                         *DFTACT
```

Figure 9-73 Backup control group SAVSYSPLUS

See the detailed entries for backup control groups ITSMSAVE1 and ITSMSAVE2 in Figure 9-74 and Figure 9-75.

For the SWA Message Queue parameter, note the SAVE entry. SAVE is a message queue that we created in library QUSRBRM for all messages regarding checkpoint processes during save-while-active backup activities. The first entry *EXIT in ITSMSAVE1 clears this message queue for upcoming new backups.

You can read more about the save-while-active function for an iSeries as it applies to the BRMS Application Client to an IBM Tivoli Storage Manager server in 9.6, “Save-while-active implications” on page 325.

```
Group . . . . . . . . . . . : ITSMSAVE1
Default activity  . . . . . . *BKUPCY
Text  . . . . . . . . . . . . Backs up all userdata to ITSM without *LINK

Type information, press Enter.

                          Auxiliary   Weekly    Retain  Save      SWA
      Backup      List    Storage     Activity  Object  While     Message
Seq   Items       Type    Pool Device MTWTFSS   Detail  Active    Queue

  10  *EXIT                         *DFTACT
  20  *ALLUSR           *SYSBAS     *DFTACT   *YES    *YES      SAVE
  30  SAVSPL      *SPL              *DFTACT
  40  *ALLDLO                       *DFTACT   *NO     *NO
  50  *EXIT                         *DFTACT
```

Figure 9-74 Backup control group ITSMSAVE1

```
                Display Backup Control Group Entries              AS02

Group . . . . . . . . . . . : ITSMSAVE2
Default activity  . . . . . : *BKUPCY
Text  . . . . . . . . . . . : Backup *LINK to ITSM

                      Auxiliary   Weekly    Retain  Save      SWA
     Backup      List  Storage     Activity  Object  While     Message
Seq  Items       Type  Pool Device MTWTFSS   Detail  Active    Queue
  10 *EXIT                       *DFTACT
  20 *LINK            *ALLAVL    *DFTACT   *YES    *YES      SAVE
  30 *EXIT                       *DFTACT
```

Figure 9-75 Backup control group ITSMSAVE2

Our backup control groups ITSMSVFRI1 and ITSMSVFRI2 have the values as shown in Figure 9-76 and Figure 9-77.

```
                Display Backup Control Group Entries              AS02

Group . . . . . . . . . . . : ITSMSVFRI1
Default activity  . . . . . : *BKUPCY
Text  . . . . . . . . . . . : Backup all userdata to ITSM without *LINK

                      Auxiliary   Weekly    Retain  Save      SWA
     Backup      List  Storage     Activity  Object  While     Message
Seq  Items       Type  Pool Device MTWTFSS   Detail  Active    Queue
  10 *EXIT                       *DFTACT
  20 *ALLUSR          *SYSBAS    *DFTACT   *YES    *NO
  30 SAVSPL      *SPL            *DFTACT
  40 *ALLDLO                     *DFTACT   *NO     *NO
  50 *EXIT                       *DFTACT
```

Figure 9-76 Backup control group ITSMSVFRI1

```
                Display Backup Control Group Entries              AS02

Group . . . . . . . . . . . : ITSMSVFRI2
Default activity  . . . . . : *BKUPCY
Text  . . . . . . . . . . . : Backup *LINK to ITSM

                      Auxiliary   Weekly    Retain  Save      SWA
     Backup      List  Storage     Activity  Object  While     Message
Seq  Items       Type  Pool Device MTWTFSS   Detail  Active    Queue
  10 *EXIT                       *DFTACT
  20 *LINK            *ALLAVL    *DFTACT   *YES    *NO
  30 *EXIT                       *DFTACT
```

Figure 9-77 Backup Control Group ITSMSVFRI2

Details of the backup control group for ITSMSAVE1 are shown in Figure 9-78 and Figure 9-79. Notice that they are the same for ITSMSAVE2, ITSMSVFRI1, and ITSMSVFRI2.

```
                    Change Backup Control Group Attributes

Group  . . . . . . . . . . . . . . . . : ITSMSAVE1

Type information, press Enter.

Media policy for:
  Full backups . . . . . . . . . . . . . ITSM        Name, F4 for list
  Incremental backups  . . . . . . . . . ITSM        Name, F4 for list
Backup devices . . . . . . . . . . . . . ITSMSERVER  Name, F4 for list



Parallel device resources:
  Minimum resources  . . . . . . . . . . *NONE       1-32, *NONE, *AVAIL
  Maximum resources  . . . . . . . . . .             1-32, *AVAIL, *MIN
Sign off interactive users . . . . . . . *BKUPCY     *YES, *NO, *BKUPCY
Sign off limit . . . . . . . . . . . . . 0           0-999 minutes, *BKUPCY
Default weekly activity  . . . . . . . . *BKUPCY     MTWTFSS(F/I), *BKUPCY
Incremental type . . . . . . . . . . . . *BKUPCY     *CUML, *INCR, *BKUPCY

                                                                      More..
F3=Exit   F4=Prompt   F12=Cancel
```

Figure 9-78 Attributes ITSMSAVE1 same for ITSMSAVE2, ITSMSVFRI1, ITSMSVFRI2 (Part 1)

```
                    Change Backup Control Group Attributes

Group  . . . . . . . . . . . . . . . . : ITSMSAVE1

Type information, press Enter.

Automatically backup
    media information  . . . . . . . . . *NONE       *LIB, *OBJ, *NONE, *BKUPCY
Save access paths  . . . . . . . . . . . *BKUPCY     *YES, *NO, *BKUPCY
Save contents of save files  . . . . . . *BKUPCY     *YES, *NO, *BKUPCY
Data compression . . . . . . . . . . . . *BKUPCY     *DEV, *YES, *NO, *BKUPCY
Data compaction  . . . . . . . . . . . . *BKUPCY     *DEV, *NO, *BKUPCY
Target release . . . . . . . . . . . . . *BKUPCY     *CURRENT, *PRV, *BKUPCY
Clear  . . . . . . . . . . . . . . . . . *BKUPCY     *NONE, *ALL...
Object pre-check . . . . . . . . . . . . *BKUPCY     *YES, *NO, *BKUPCY
Append to media  . . . . . . . . . . . . *BKUPCY     *YES, *NO, *BKUPCY
End of tape option . . . . . . . . . . . *BKUPCY     *UNLOAD, *REWIND...
Journaled objects  . . . . . . . . . . . *BKUPCY     *YES, *NO, *BKUPCY
Use optimum block size . . . . . . . . . *BKUPCY     *BKUPCY, *DEV, *YES, *NO
Text . . . . . . . . . . . . . . . . . . Backs up all userdata to ITSM without *LINK
```

Figure 9-79 Attributes for ITSMSAVE1 same for ITSMSAVE2, ITSMSVFRI1, and ITSMSVFRI2 (Part 2)

Figure 9-80 and Figure 9-81 show the details of the backup control group for SAVSYSPLUS.

```
                    Change Backup Control Group Attributes

Group  . . . . . . . . . . . . . . . . : SAVSYSPLUS

Type information, press Enter.

Media policy for:
  Full backups . . . . . . . . . . . . . SAVSYS      Name, F4 for list
  Incremental backups  . . . . . . . . . SAVSYS      Name, F4 for list
Backup devices . . . . . . . . . . . . . TAP02       Name, F4 for list



Parallel device resources:
  Minimum resources  . . . . . . . . . . *NONE       1-32, *NONE, *AVAIL
  Maximum resources  . . . . . . . . . .             1-32, *AVAIL, *MIN
Sign off interactive users . . . . . . . *YES        *YES, *NO, *BKUPCY
Sign off limit . . . . . . . . . . . . . 0           0-999 minutes, *BKUPCY
Default weekly activity  . . . . . . . . *BKUPCY     MTWTFSS(F/I), *BKUPCY
Incremental type . . . . . . . . . . . . *BKUPCY     *CUML, *INCR, *BKUPCY

                                                                      More...
```

Figure 9-80 Backup control group attributes of SAVSYSPLUS (Part 1 of 2)

```
                    Change Backup Control Group Attributes

Group  . . . . . . . . . . . . . . . . : SAVSYSPLUS

Type information, press Enter.

Automatically backup
    media information  . . . . . . . . . *OBJ        *LIB, *OBJ, *NONE, *BKUPCY
Save access paths  . . . . . . . . . . . *BKUPCY     *YES, *NO, *BKUPCY
Save contents of save files  . . . . . . *BKUPCY     *YES, *NO, *BKUPCY
Data compression . . . . . . . . . . . . *BKUPCY     *DEV, *YES, *NO, *BKUPCY
Data compaction  . . . . . . . . . . . . *BKUPCY     *DEV, *NO, *BKUPCY

...more parameters not shown.....................................................

IPL after backup . . . . . . . . . . . . *YES        *YES, *NO, *BKUPCY
   How to end  . . . . . . . . . . . . . *BKUPCY     *CNTRLD, *IMMED, *BKUPCY
   Delay time, if *CNTRLD  . . . . . . . *BKUPCY     Seconds, *NOLIMIT
   Restart after power down  . . . . . . *BKUPCY     *YES, *NO, *BKUPCY
   IPL source  . . . . . . . . . . . . . *BKUPCY     *PANEL, A, B, *BKUPCY
```

Figure 9-81 Backup control group attributes SAVSYSPLUS (Part 2 of 2)

Saving backup media information: Run backup control group SAVSYSPLUS *after* ITSMSAVE2 and ITSMSVFRI2. This is because, in ITSMSAVE2 and ITSMSVFRI2, the Automatically backup media information parameter has to be *NONE (for example, as shown in Figure 9-79). Backup of BRMS media information (its detailed information to perform a complete iSeries recovery, if necessary) to an IBM Tivoli Storage Manager server is not allowed. See the “Objects not allowed” note box on page 313 for other objects that are not allowed when backing up to an IBM Tivoli Storage Manager server.

In the SAVSYSPLUS backup control group, the Automatically backup media information parameter specifies *OBJ as shown in Figure 9-81. This means “save object level details necessary for recovery”. Since SAVSYSPLUS saves to tape media on the local system, BRMS media information (contained within BRMS OS/400 database files) is backed up.

For a total system recovery, you need the latest version of BRMS media information. There are two options to accomplish this in our example:

- SAVSYSPLUS runs after ITSMSAVE2 and ITSMSVFRI2.
- Use the Save Media with BRMS (SAVMEDBRM) command after ITSMSAVE2 and ITSMSVFRI2 are completed. This command saves the latest version of media information to a local tape, which in our case is to a QIC tape.

The object detail recovery information is stored in BRMS database files in library QUSRBRM, such as QAO1AOB, QAO1AOD, QAO1AMB, QAO1ADI1, QAO1ADI2, and so on. See *Backup Recovery and Media Services for iSeries*, SC41-5345, for more information.

Full backup job scheduling considerations

Our weekly backup strategy for system AS02 includes using the OS/400 job scheduler. We defined the following activities using the Add Job Scheduler Entries (ADDJOBSCDE) and Work with Job Scheduler Entries (WRKJOBSCDE) commands, as shown in Figure 9-82, Figure 9-83, Figure 9-84, and Figure 9-85.

- Daily backup activities for Monday...Thursday (Figure 9-82 and Figure 9-83):
  - ITSMSAVE1 at 19:00 and ITSMSAVE2 at 19:05. This runs our backup for nearly all user data to our IBM Tivoli Storage Manager server as defined in Figure 9-74 and Figure 9-75.
  - SAVMEDIBRM at 23:00 to a QIC media, which we have in TAP02 and which is an expired BRMS media.
- Backup activities for Friday (Figure 9-82, Figure 9-84 and Figure 9-85):
  - ITSMSVFRI1 at 19:00 and ITSMSVFRI2 at 19:05. There is no SAVMEDIBRM at 23:00 because on Friday at 23:00 our SAVSYSPLUS is running, which also saves media information (as shown in Figure 9-81).

    For our SAVSYSPLUS job, we must have a QIC media in TAP02, which is an expired BRMS media. In addition, at the AS02 system console, we start the BRMS console monitor using GO BRMS option 20 Start console monitor. We do this because SAVSYSPLUS is submitted and must be submitted with value *CONSOLE for the SBMJOB parameter in the STRBKUBRM command (as shown in Figure 9-85). For details about SAVSYSPLUS, see Figure 9-73, Figure 9-80, and Figure 9-81.
  - After all backups from SAVSYSPLUS are completed, an initial program load (IPL) is performed. We defined this in the backup control group SAVSYSPLUS (Figure 9-81) by setting to *YES.

In both backup cases, we run BRMS maintenance using the Start Maintenance for BRMS (STRMNTBRM) command at 1:30 the next day, for each Monday through Thursday ITSMSAVE1 and ITSMSAVE2, and Friday ITSMSVFRI1 and ITSMSVFRI2 backup. For example, STRMNTBRM runs at 01:30 on Tuesday, following the Monday ITSMSAVE1 and ITSMSAVE2 backup, and on Saturday at 01:30 following the Friday ITSMSVFRI1 and ITSMSVFRI2 backup.

```
                      Work with Job Schedule Entries                AS02
                                                          09/09/03  11:48:27

Type options, press Enter.
  2=Change   3=Hold   4=Remove   5=Display details   6=Release
  8=Work with last submission    10=Submit immediately

                                                                      Next
                         -----Schedule------            Recovery    Submit
Opt  Job          Status  Date       Time      Frequency   Action     Date
     ITSMSAVE1     SCD    USER DEF   19:00:00  *WEEKLY     *SBMRLS    09/09/03
     ITSMSAVE2     SCD    USER DEF   19:05:00  *WEEKLY     *SBMRLS    09/09/03
     SAVMEDIBRM    SCD    USER DEF   23:00:00  *WEEKLY     *SBMRLS    09/09/03
     STRMNTBRM     SCD    USER DEF   01:30:00  *WEEKLY     *SBMRLS    09/10/03
     ITSMSVFRI1    SCD    *FRI       19:00:00  *WEEKLY     *SBMRLS    09/12/03
     ITSMSVFRI2    SCD    *FRI       19:05:00  *WEEKLY     *SBMRLS    09/12/03
     SAVSYSPLUS    SCD    *FRI       23:00:00  *WEEKLY     *SBMRLS    09/12/03
                                                                        Bottom
```

Figure 9-82 Job schedule entries for system AS02 backups using BRMS backup control groups

```
Job name . . . . . . . . . . . . > ITSMSAVE1     Name
Entry number . . . . . . . . . . > 001734        000001-999999, *ONLY
Command to run . . . . . . . . .   STRBKUBRM CTLGRP(ITSMSAVE1)

Frequency  . . . . . . . . . . .   *WEEKLY       *SAME, *ONCE, *WEEKLY...
Schedule date, or  . . . . . . .   *NONE         Date, *SAME, *CURRENT...
Schedule day . . . . . . . . . .   *MON          *SAME, *NONE, *ALL, *MON.
                                   *TUE
                                   *WED
             + for more values     *THU
Schedule time  . . . . . . . . .   '19:00:00'    Time, *SAME, *CURRENT
```

Figure 9-83 Details for scheduled job ITSMSAVE1, same for ITSMSAVE2 with time 19:05

```
 Job name . . . . . . . . . . . . > ITSMSVFRI1    Name
 Entry number . . . . . . . . . . > 001766        000001-999999, *ONLY
 Command to run . . . . . . . . .   STRBKUBRM CTLGRP(ITSMSVFRI1)
Frequency  . . . . . . . . . . .   *WEEKLY       *SAME, *ONCE, *WEEKLY...
 Schedule date, or  . . . . . . .   *NONE         Date, *SAME, *CURRENT...
 Schedule day . . . . . . . . . .   *FRI          *SAME, *NONE, *ALL, *MON...
              + for more values
 Schedule time  . . . . . . . . .   '19:00:00'    Time, *SAME, *CURRENT
```

Figure 9-84 Details for scheduled job ITSMSVFRI1, same for ITSMSVFRI2 with time 19:05

```
Job name . . . . . . . . . . . . > SAVSYSPLUS    Name
Entry number . . . . . . . . . . > 001732        000001-999999, *ONLY
Command to run . . . . . . . . .   STRBKUBRM CTLGRP(SAVSYSPLUS) SBMJOB(*CONSOLE)

Frequency  . . . . . . . . . . .   *WEEKLY       *SAME, *ONCE, *WEEKLY...
Schedule date, or  . . . . . . .   *NONE         Date, *SAME, *CURRENT...
Schedule day . . . . . . . . . .   *FRI          *SAME, *NONE, *ALL, *MON...
              + for more values
Schedule time  . . . . . . . . .   '23:00:00'    Time, *SAME, *CURRENT
```

Figure 9-85 Details for scheduled job SAVSYSPLUS

For recovery purposes, it is mandatory to print and have accessible BRMS maintenance reports for system AS02. For example, the QP1ARCY file name report is placed on output queue (OUTQ) QUSRSYS/BRMS on system AS02. In our network, this spooled output queue is defined as a remote OUTQ that is directed to system AS27 output queue QUSRSYS/BRMS. See Figure 9-86 for the definition of the remote output queue.

In our network, we verified that system AS27 is available daily around 2:00 to receive our spooled files from AS02. On AS02, the output queue QUSRSYS/BRMS is defined as the default OUTQ for user profile EDELGARDS.

All job scheduler entries were added using the user profile EDELGARDS. Therefore, all spooled file output, when the associated jobs run, normally goes to output queue QUSRSYS/BRMS on AS02, which is defined as a remote output queue to AS27.

To direct the spooled files to system AS27 and keep them available on AS02, we change the printer files attributes to specify SAVE(*YES), as shown in the Change Print File command:

```
CHGPRTF FILE(QBRM/*ALL) SAVE(*YES)
```

Important:

- You must run this command again after a BRMS release upgrade as the upgrade resets SAVE to *NO for these and other IBM-supplied print files.
- As documented in 2.8, “Full system recovery” on page 30, we recommend that you have the BRMS recovery reports, such as QP1ARCY, in two separate locations, one local and one off site, for disaster recovery purposes.

```
                Work with Output Queue Description                Page     1
5722SS1 V5R2M0  020719                              AS02      09/08/03  11:56:00
 Queue:   BRMS           Library:   QUSRSYS
 Status:
   Writer active  . . . . . . . . . . . :   Y
   Writer name(s) if active . . . . . . :   BRMS
   Output queue held  . . . . . . . . . :   N
 Maximum spooled file size:
   Number of pages  . . . . . . . . . . :   *NONE
   Starting time  . . . . . . . . . . . :
   Ending time  . . . . . . . . . . . . :
 Writers to autostart . . . . . . . . . :   1
 Display any file . . . . . . . . . . . :   *NO
 Job separators . . . . . . . . . . . . :   0
 Operator controlled  . . . . . . . . . :   *YES
 Order of files on queue  . . . . . . . :   *FIFO
 Data queue . . . . . . . . . . . . . . :   *NONE
   Library  . . . . . . . . . . . . . . :
 Authority to check . . . . . . . . . . :   *OWNER
 Remote system  . . . . . . . . . . . . :   *INTNETADR
 Remote printer queue . . . . . . . . . :   QUSRSYS/BRMS
 Queue for writer messages  . . . . . . :   QSYSOPR
   Library  . . . . . . . . . . . . . . :     *LIBL
 Connection type  . . . . . . . . . . . :   *IP
 Internet address . . . . . . . . . . . :   x.x.x.x
 Destination type . . . . . . . . . . . :   *OS400
 VM/MVS class . . . . . . . . . . . . . :
 FCB  . . . . . . . . . . . . . . . . . :
 Host print transform . . . . . . . . . :   *NO
 User data transform  . . . . . . . . . :   *NONE
   Library  . . . . . . . . . . . . . . :
 Manufacturer type and model  . . . . . :
 Workstation customizing object . . . . :
   Library  . . . . . . . . . . . . . . :
 Image configuration  . . . . . . . . . :   *NONE
 Destination options  . . . . . . . . . :   *NONE
 Print separator page . . . . . . . . . :   *NO
 User defined option  . . . . . . . . . :   *NONE
  User defined object:
   Object . . . . . . . . . . . . . . . :   *NONE
     Library  . . . . . . . . . . . . . :
   Object type  . . . . . . . . . . . . :
 User driver program  . . . . . . . . . :   *NONE
   Library  . . . . . . . . . . . . . . :
 Spooled file ASP . . . . . . . . . . . :   *SYSTEM
 Text description . . . . . . . . . . . :   outq for brms
            * * * * *   E N D   O F   L I S T I N G   * * * * *
```

Figure 9-86 Output queue QUSRSYS/BRMS on AS02

Operator activities for this weekly backup scenario summary

The BRMS activities related to our full system backup are:

- Monday through Friday using TAP02

  a. Change the QIC media for SAVMEDIBRM or SAVSYSPLUS. Remove BRMS QIC media with active data from the previous evening (Monday from Friday) from the tape device and replace it with expired BRMS QIC media.

b. Place the media with active data into a safe place together with recovery report.

- Friday on the system console

  Start the BRMS console monitor.

- Monday through Friday reports and backup process

  a. Verify the reports during BRMS maintenance created on AS02 and verify. The reports are on AS27 as well. Print the recovery report.

  b. Look for objects that should be saved but were not. Use the DSPLOGBRM and Display Job Log (DSPJOBLOG) (for the BRMS jobs) commands to do this.

  c. If a backup job ended abnormally or objects were not backed up, take action immediately to prevent this from continuing to happen. Change your backup strategy or processes, if necessary.

  d. Review the Save While Active message queue QUSRBRM/SAVE for important messages and take the appropriate action as soon as possible.

     In our example backup scenario on Monday morning, this message queue is empty, because there were no save-while-active backups on the previous Friday or Saturday.

9.5.2 Full system backup restore considerations

As stated earlier, a restore for an iSeries acting as the BRMS Application Client to an IBM Tivoli Storage Manager server is *not* done by IBM Tivoli Storage Manager server. It is done by BRMS on the iSeries client system.

From the BRMS view, this restore is a normal full system recovery just as it would be on other iSeries with BRMS not running as the BRMS Application Client to an IBM Tivoli Storage Manager server. You must have the recovery report and medias used from your latest backup available.

As mentioned previously, for a full system recovery, you need an actual save of BRMS media information. You did this either using our example backup control group SAVSYSPLUS or by using the SAVMEDIBRM command. See the “Saving backup media information” box immediately preceding “Full backup job scheduling considerations” on page 320.

Tip: Your recovery report (for example created during BRMS maintenance as spooled file QP1ARCY) shows the latest saved media information under “`STEP: Recover BRMS related media information`”. Consider these examples:

- If you use automatically backup media information from SAVSYSPLUS:

```
Saved            ----- ASP ------  Save     Save                  Sequence  Control    Volume
Item       Type  Name      Number  Date     Time    Objects Omit  Number    Group      Identifier
---------- ----- ---------- ----- -------- -------- ------- ----- --------- ---------- ----------
QUSRBRM    *QBRM *SYSBAS    00001  8/22/03 17:51:50      18             129 SAVSYSPLUS BRM002
```

- If you use SAVMEDIBRM:

```
Saved            ----- ASP ------  Save     Save                  Sequence  Control    Volume
Item       Type  Name      Number  Date     Time    Objects Omit  Number    Group      Identifier
---------- ----- ---------- ----- -------- -------- ------- ----- --------- ---------- ----------
QUSRBRM    *QBRM *SYSBAS    00001  8/25/03  9:16:29      18             130 *NONE      BRM002
```

For a complete recovery report example for system AS02, see “Full system recovery report to tape” on page 376.

For a full restore of system AS02, we must have our recovery report and one QIC media BRM00x or two QIC medias BRM00x from the latest backup.

We need *one* QIC media BRM00x, if our restore case is on Saturday. This is because we have our full system backup from Friday.

We need *two* QIC media BRM00x and BRM00y, if our restore case is from our Monday through Thursday backups. For example, we have the backup media for Wednesday, because then we have our full system backup from the Friday before on one BRM00x and our latest SAVMEDIBRM data on BRM00y.

Important: For complete system recovery of system AS02, we must follow exactly the steps in our recovery report. This report is one of the most outstanding aspects of the BRMS product. This is important regardless of whether BRMS backed up exclusively to attached tape media or ran as the BRMS Application Client to an IBM Tivoli Storage Manager server.

When backing up as the BRMS Application Client, before we perform the recover additional user libraries step, we must ensure that our connection to the backed up to IBM Tivoli Storage Manager server system AS27 is up and running. This is because, beginning with this step, our restore process must contact the IBM Tivoli Storage Manager server to gather data from it.

9.6 Save-while-active implications

The save-while-active synchronize libraries (*SYNCLIB) function is not supported when saving libraries to an IBM Tivoli Storage Manager server. When libraries are saved to an IBM Tivoli Storage Manager server, one save command is used to save each library, because internally OS/400 requires the save to be set up as a save to a save file. The *SYNCLIB value is ignored if it is specified. For details about *SYNCLIB, see 2.5, “Save-while-active function” on page 25.

Restriction: Because save-while-active *SYNCLIB is not supported in this environment, it makes no sense to use the Monitor Save While Active (MONSWABRM) command. The MONSWABRM command reviews the save-while-active message queue and looks for the message indicating the end of library synchronization. When synchronization is detected, you can issue a command to the system. You can use the MONSWABRM command as an exit (*EXIT) special value in a control group during backup processing.

In summary, because we do not have messages about the end of library synchronization, the monitoring of these messages provides no additional value.

Although save-while-active *SYNCLIB is not supported, Save While Active without *SYNCLIB is supported for the BRMS Application Client to an IBM Tivoli Storage Manager server. Remember that Save While Active for non-library IFS objects in this IBM Tivoli Storage Manager environment is supported.

An option to consider is to define a dedicated message queue, for example SAVE in QUSRBRM, to see all messages about checkpoint processing during Save While Active and verify the contents of this message queue. As shown in Figure 9-87, we created the backup control group ITSMSAVE on system AS02, which backups nearly all user data to our IBM Tivoli Storage Manager server on AS27. Inside this backup control group, we use Save While Active for all user libraries (*ALLUSR) and for IFS backup (*LINK).

Messages about checkpoint processing of the detail backup items are sent to message queue QUSRBRM/SAVE. Because we want to have only actual messages for the latest backup in this message queue, we define in item sequence number 10 *EXIT CLRMSGQ

QUSRBRM/SAVE. This enables our message queue to be cleared before a backup starts running, so it contains only new messages when viewed. For related information, see 9.5.1, “Full backup for system AS02” on page 313.

```
                  Display Backup Control Group Entries           AS02

Group . . . . . . . . . . . : ITSMSAVE
Default activity  . . . . . : *BKUPCY
Text  . . . . . . . . . . . : Backs up all allowed userdata to ITSM

                       Auxiliary   Weekly    Retain  Save      SWA
     Backup      List  Storage     Activity  Object  While     Message
Seq  Items       Type  Pool Device MTWTFSS   Detail  Active    Queue
  10 *EXIT                       *DFTACT
  20 *ALLUSR           *SYSBAS   *DFTACT   *YES    *YES      SAVE
  30 SAVSPL      *SPL            *DFTACT
  40 *ALLDLO                     *DFTACT   *NO     *NO
  50 *LINK             *ALLAVL   *DFTACT   *YES    *YES      SAVE
  60 *EXIT                       *DFTACT
```

Figure 9-87 Backup control group ITSMSAVE

During backup, or after they have completed, we can use the DSPMSG command for MSGQ(QUSRBRM/SAVE) to verify checkpoint processing messages. Figure 9-88 shows an example.

```
                            Display Messages
                                                        System:   AS02
Queue . . . . . :   SAVE                  Program . . . . :   *DSPMSG
  Library . . . :     QUSRBRM               Library . . . :
Severity  . . . :   00                    Delivery  . . . :   *HOLD

Type reply (if required), press Enter.
  Save-while-active checkpoint processing for library WA19LIB complete.
  Save-while-active checkpoint processing for library WA20LIB complete.
  Save-while-active checkpoint processing for library WA21LIB complete.
  Save-while-active checkpoint processing for library WA22LIB complete.
  Save-while-active checkpoint processing for library WA23LIB complete.
  Save-while-active checkpoint processing for library WA24LIB complete.
  Save-while-active checkpoint processing for library WA25LIB complete.
  Save-while-active checkpoint processing for library WBL complete.
  Save-while-active checkpoint processing for library WDSCLAB complete.
  Save-while-active checkpoint processing for library WEBLIB complete.
  Save-while-active checkpoint processing for library WHOLESALE complete.
  Save-while-active checkpoint processing for library YANTZI complete.
  Save-while-active checkpoint processing complete.
```

Figure 9-88 Messages CPI3710 for libraries and CPI3712 or IFS

Figure 9-89 and Figure 9-90 show message details for the messages in bold in Figure 9-88. You can view these details by positioning the 5250 cursor to the message and pressing F1.

```
                        Additional Message Information

Message ID . . . . . :   CPI3710       Severity . . . . . :   00
Message type . . . . . :   Information
Date sent  . . . . . :   08/25/03      Time sent  . . . . . :   14:35:07

Message . . . . :   Save-while-active checkpoint processing for library WBL
  complete.
Cause . . . . . :   The checkpoint processing required to save library WBL has
  been completed.  The library can be used.  However, some objects may be in
  use while save-while-active processing is completing.
```

Figure 9-89 Message CPI3710 for libraries

```
                        Additional Message Information

Message ID . . . . . :   CPI3712       Severity . . . . . :   00
Message type . . . . . :   Information
Date sent  . . . . . :   08/25/03      Time sent  . . . . . :   16:50:01

Message . . . . :   Save-while-active checkpoint processing complete.
Cause . . . . . :   The checkpoint processing required to save all the objects
  has completed. The objects can be used by most applications. However, while
  save-while-active processing is completing, some applications may find some
  objects in use.
```

Figure 9-90 Message CPI3712 for IFS

This completes our coverage of full system backup (save) and recovery (restore) when using the BRMS Application Client to an IBM Tivoli Storage Manager server.

9.7 Setting up IBM Tivoli Storage Manager password management

IBM Tivoli Storage Manager password support requires management to continue successful operation after several months. If you installed an actual version of the IBM Tivoli Storage Manager OS/400 Client API (Version 4, Release 2, Level 1 or later), you can use the PASSWORDACCESS GENERATE client option. This option allows a new IBM Tivoli Storage Manager password to be automatically created by IBM Tivoli Storage Manager when the current password expires. This section explains the recommended technique for doing this while maintaining the security level that is intended.

In our test environment, we start with the default IBM Tivoli Storage Manager password expiration value of 90 days on our IBM Tivoli Storage Manager server on system AS27. See Figure 9-10 on page 259 for the password-related IBM Tivoli Storage Manager server values.

Perform the following actions to enable this function in the BRMS Application Client. These steps describe an interim solution until the function can be more fully integrated into the end-user interface.

1. Create a source physical file named QA1AGENPWD in the QUSRBRM library with a member named NODENAMES, using the command:

   ```
   CRTSRCPF FILE(QUSRBRM/QA1AGENPWD) RCDLEN(92) MBR(NODENAMES)
   ```

2. Change the owner of file QUSRBRM/QA1AGENPWD to user profile QBRMS using the command:

   ```
   CHGOBJOWN OBJ(QUSRBRM/QA1AGENPWD) OBJTYPE(*FILE) NEWOWN(QBRMS)
   ```

3. Revoke any current public authorities to file QUSRBRM/QA1AGENPWD using the command:

   ```
   RVKOBJAUT OBJ(QUSRBRM/QA1AGENPWD) OBJTYPE(*FILE) USER(*PUBLIC) AUT(*ALL)
   ```

4. Grant *USE public authority to file QUSRBRM/QA1AGENPWD using the command:

   ```
   GRTOBJAUT OBJ(QUSRBRM/QA1AGENPWD) OBJTYPE(*FILE) USER(*PUBLIC) AUT(*USE)
   ```

5. Use the OS/400 STRPDM command and edit member NODENAMES. Add an entry for a node name that you want enabled for PASSWORDACCESS GENERATE. In our example, this is system AS02. The inserted node name must follow these rules as shown in Figure 9-91:
   - The node name must match the node name used in the media policy. In our case, this is media policy IBM Tivoli Storage Manager, as shown in Figure 9-19 on page 267.
   - Left justify the node name in the record.
   - Use uppercase when you enter the node name.

```
 Columns . . . :    1  80                    Edit                 QUSRBRM/QA1AGENPWD
 SEU==>                                                             NODENAMES
FMT ** ...+... 1 ...+... 2 ...+... 3 ...+... 4 ...+... 5 ...+... 6 ...+... 7 ...+... 8
       ****************** Beginning of data *****************************************
0001.00 AS02                                                                  030912
       ****************** End of data *******************************************
```

Figure 9-91 QUSRBRM/QA1AGENPWD file with one entry AS02 in member NODENAMES

How automating the password update works

When the BRMS Application (IBM Tivoli Storage Manager) Client requires a connection to the IBM Tivoli Storage Manager server, BRMS checks for the existence of file QUSRBRM/QA1AGENPWD. Using that file, the application client attempts to locate the node name from the current media policy in the NODENAMES member.

If the node name is found, BRMS submits the PASSWORDACCESS GENERATE client option when it starts the session with the IBM Tivoli Storage Manager server. The automatic password management is under the control of the IBM Tivoli Storage Manager APIs and the IBM Tivoli Storage Manager server. BRMS does not manage the passwords when the PASSWORDACCESS GENERATE client option is used.

The IBM Tivoli Storage Manager created passwords are stored in the /etc/adsm/TSM.PWD file. To simplify recovery, make sure this file is backed up regularly to tape media and not to IBM Tivoli Storage Manager server. In our example, we back up this file to a QIC tape, which is an expired BRMS media, in drive TAP02 at system AS02 and not to IBM Tivoli Storage Manager server AS27.

Figure 9-92 shows what you see if you use OS/400 command Work with Links (WRKLNK) command and enter option 5 to display file TSM.PWD.

```
  Browse : /etc/adsm/TSM.PWD
  Record :       1   of       2 by  18                      Column :    1     70 by 131
 Control :

....+....1....+....2....+....3....+....4....+....5....+....6....+....7....+....8....+...
.
 ************Beginning of data*************************************************************
This file contains an encrypted TSM password, do not change or delete.
 Õ                    NULLDSMSERVAS02AS02ª÷ä6eªÄ
 ************End of Data*******************************************************************
```

Figure 9-92 /etc/adsm/TSM.PWD for node AS02

9.8 Performance expectations

The subject of performance expectations of the IBM Tivoli Storage Manager server running under OS/400 PASE on the iSeries and the BRMS Application Client running to any IBM Tivoli Storage Manager server covers a wide range of possible configurations and test scenarios. Complete coverage of this topic is certainly beyond the scope of this redbook.

This section documents some OS/400 partition-to-partition test results. However, it does not address the complete set of possible LAN network topology configuration and various IBM Tivoli Storage Manager Backup-Archive Clients. It is clear that the topology of an actual LAN network (bridges, routers, LAN traffic congestion while saving or restoring, and other server and client activities) greatly affects throughput when saving or restoring. While writing this redbook, we focused on iSeries LPAR partition-to-partition scenarios using the iSeries virtual LAN between partitions. We also had discussions with developers who work on BRMS and the IBM Tivoli Storage Manager server on iSeries.

Based on that experience, consider the following statements. Then see the examples of our iSeries partition-to-partition virtual LAN scenarios:

- Extensive performance testing of IBM Tivoli Storage Manager server V5.2 under OS/400 PASE was underway. Some results were becoming available. In those available test results, in general, using similar processing power series and iSeries servers, the AIX and OS/400 PASE IBM Tivoli Storage Manager servers achieved similar throughput.
- Test results showing that the iSeries BRMS Application Client to an AIX IBM Tivoli Storage Manager server is completed are available from the following Web site:

  http://www-1.ibm.com/servers/eserver/iseries/service/brms/adsmperf.htm

As stated previously, we document our non-scientific performance test results. We do this using OS/400 library and IFS objects backed up between V5R2 BRMS Application Client in one iSeries partition and an IBM Tivoli Storage Manager V5.2 Server under OS/400 PASE in another iSeries partition.

First we give some general performance-related tips, followed by our test results:

- **TCP/IP configuration and statements**

  a. We used the 1 Gbps Virtual Ethernet LAN between the two partitions. This eliminated any network “noise” or bridge or router limitations. We used very large IP buffers between partitions. On a physical LAN, if possible, you should use the 1 Gbps capacity

and the large buffers, assuming you network topology and hardware (switches and routers) supports these capacities. We discuss the buffer size in a following tip.

b. Determine the maximum network performance.

We used basic file-to-file FTP in both directions between the IBM Tivoli Storage Manager server partition (AS01) and the BRMS Application Client partition (AS01C) to determine maximum throughput. Do this in your physical LAN environment with the actual files you want backed up.

Partition to partition, our FTP test results were between 35 GB/hr and 36 GB/hr independent of direction.

c. Use the iSeries TCP/IP performance tips as documented in Chapter 5 in the *iSeries Performance Capabilities Reference Guide*, available on the Web at:

http://www-1.ibm.com/servers/eserver/iseries/perfmgmt/resource.htm

- **BRMS Application Client environment**

The following tuning was made on both the iSeries IBM Tivoli Storage Manager server and BRMS Application Client partitions.

– Buffer Size in BRMS Net Device

We recommend that you use 512 (KBPS) for Buffer Size when defining the BRMS Net Device. Use the WRKDEVBRM command and select option 5 (Display) to verify this for our device ITSMSERVER, as shown in Figure 9-93.

Net Device Buffer Size: This parameter specifies the buffer size in KB for the device. This buffer size allows you to control the amount of storage that is allocated by the IBM Tivoli Storage Manager (ADSM) Application Client APIs for server communication and data exchange. The maximum value is 512 KB.

```
                          Display Net Device

Net device  . . . . . . . . . . . :   ITSMSERVER

Text  . . . . . . . . . . . . . . :   ITSM Server Device

Location  . . . . . . . . . . . . :   ITSMSERVER

TSM file space  . . . . . . . . . :   *LCL

Buffer size . . . . . . . . . . . :   512

Internet address. . . . . . . . . :   x.x.x.x
Internet port . . . . . . . . . . :    1500
```

Figure 9-93 Buffer size in BRMS Net Device

– Data area QUSRBRM/Q1ATSMSIZE

Part of the initial processing starting a backup is for the system to calculate the amount of space to allocate for all the objects to be backed up according to the specified OS/400 library or path. By doing your own size estimation, you can significantly speed up this process by using a specific BRMS data area.

Create data area QUSRBRM/Q1ATSMSIZE for better *IFS backup size estimation* to back up IFS data using BRMS to an IBM Tivoli Storage Manager server:

```
CRTDTAARA DTAARA(QUSRBRM/Q1ATSMSIZE) TYPE(*CHAR) LEN(8)
CHGDTAARA DTAARA(QUSRBRM/Q1ATSMSIZE (1 8)) VALUE('000xxxxx')
```

The size (VALUE parameter) is in MB. In our test scenario, we created this data area at system AS01C as shown in Figure 9-94. The VALUE parameter value should be the size of largest IFS backup. If you are saving your IFS user data with *LINK, then this value must be the total size of your IFS user data.

The IBM Tivoli Storage Manager server uses this value to estimate space for this backup, normally in the BACKUPPOOL disk pool. Note that, on the iSeries IBM Tivoli Storage Manager server side, our backup goes directly to tape using the BACKUPLTO pool, if our BACKUPPOOL is not large enough.

For more details about these IBM Tivoli Storage Manager definitions, see 6.3, “IBM Tivoli Storage Manager advanced storage” on page 105.

In our test scenario, we determined the right size for the VALUE parameter in two steps:

i. Determine the current size of IFS user data to be backed up. In our environment, it was 12.2 GB. Use the Retrieve Disk Information (RTVDSKINF) command and then run the Print Disk Information command against the RTVDSKINF collected data:

   ```
   PRTDSKINF RPTTYPE(*OBJ) OBJ(*ALL) OBJTYPE(*DIR)
   ```

ii. Estimate the future total size of IFS user data. In our environment, this is 15 GB.

   We used 15360 MB (15 GB) as the value for the Value parameter as shown in Figure 9-94.

```
                          Display Data Area
                                                        System:   ASOC
Data area . . . . . . . :   Q1ATSMSIZE
  Library . . . . . . . :     QUSRBRM
Type  . . . . . . . . . :   *CHAR
Length  . . . . . . . . :   8
Text  . . . . . . . . . :

         Value
Offset    *...+....1....+....2....+....3....+....4....+....5
   0     '00015360'
```

Figure 9-94 Data area QUSRBRM/Q1ATSMSIZE

- **General BRMS performance tips**
  - There are two parameters in Backup Control Group, which have influence on performance:
    - Save While Active
    - Retain Object Detail

    For maximum performance, do not use these parameters, if possible.
  - Concurrent backups: Concurrent BRMS backups to an IBM Tivoli Storage Manager server are also possible. This means, for example, that you can run more than one backup job using BRMS at the same time. This reduces backup time. Also for restore, using BRMS from an IBM Tivoli Storage Manager server with concurrent jobs is supported.

For more details about concurrent backups and restores, see *Backup Recovery and Media Services for iSeries*, SC41-5345.

- **iSeries IBM Tivoli Storage Manager server for OS/400 PASE performance**

  Performance for backup and restore operations on each IBM Tivoli Storage Manager client (including the BRMS Application Client) also depends on IBM Tivoli Storage Manager server performance capabilities. Because of this, you need must apply PTF MF30245 on your iSeries IBM Tivoli Storage Manager server and set an associated storage pool attribute. You can learn more about this PTF and storage pool attribute in 6.3.8, “IBM Tivoli Storage Manager disk storage pool performance improvements” on page 112.

  We implemented all of these performance enhancement tips in our test scenarios.

Our test results

We followed our own tips previously described in our test environment. We used examples to document our test results.

- Test environment:
  - 1 Gb Ethernet network, TCP/IP
  - Two partitions on an iSeries: AS01C as BRMS Application Client and AS01 as the IBM Tivoli Storage Manager server
- BRMS Save Rate using BRMS Application Client on AS0C to IBM Tivoli Storage Manager server at AS01:
  - One backup job between 25 and 30 GB/hr
  - Two concurrent backup jobs: averaged between 36 GB/hr and 38 GB/hr
  - Four concurrent backup jobs: averaged approximately 76 GB/hr
- BRMS Restore Rate using BRMS Application Client on AS0C to IBM Tivoli Storage Manager server at AS01:
  - One restore job running as an interactive (5250) job, approximately 17 GB/hr
  - One restore job running as an OS/400 batch job, approximately 17 GB/h

Tip: We used BRMS logging activity to determine our start and end backup times to achieve our throughput rates. On the BRMS Application Client partition or system, we used the WRKLNK command to browse the /tmp/brms/performance file. See the bold file entries shown in Figure 9-95.

```
09/11/03 13:38 017897 E  q1aOL  Q1ARBK()-Start of processing for control group ITSMIFS
09/11/03 13:38 017897 E  q1aOL  Q1ARBK()-Start of pre-processing.
09/11/03 13:38 017897 E  q1aOL  Q1ARBK()-Start save of *LINK         *ALLAVL
09/11/03 14:02 017897 E  q1aOL  QaneSava()-TSM transfer rate : 28.0080 gigabytes/hour
09/11/03 14:02 017897 E  q1aOL  Q1AXSAV()-Start of output file processing.
09/11/03 14:02 017897 E  q1aOL  Q1AXSAV()-Processed 0000019997 records.
09/11/03 14:02 017897 E  q1aOL  Q1AXSAV()-End of output file processing.
09/11/03 14:02 017897 E  q1aOL  Q1ARBK()-Start of post-processing.
09/11/03 14:02 017897 E  q1aOL  Q1ARBK()-End of processing for control group ITSMIFS
================================================================================
09/12/03 17:29 017999 E  q1aOL  Q1ARBK()-Start of processing for control group LIBS
09/12/03 17:29 017999 E  q1aOL  Q1ARBK()-Start of pre-processing.
09/12/03 17:29 017999 E  q1aOL  Q1ARBK()-Start save of DUPAH11   *SYSBAS
09/12/03 17:30 017999 E  q1aOL  QaneSava()-TSM transfer rate : 30.6753 gigabytes/hour
09/12/03 17:30 017999 E  q1aOL  Q1ARSTHS()-Start of output file processing.
09/12/03 17:30 017999 E  q1aOL  Q1ARSTHS()-End of output file processing.
09/12/03 17:30 017999 E  q1aOL  Q1ARBK()-Start of post-processing.
09/12/03 17:30 017999 E  q1aOL  Q1ARBK()-End of processing for control group LIBS
================================================================================
09/12/03 17:43 017975 E  q1aOL  QaneRsta()-TSM transfer rate : 17.3827 gigabytes/hour
================================================================================
09/12/03 17:51 018000 E  q1aOL  QaneRsta()-TSM transfer rate : 17.3827 gigabytes/hour
```

Figure 9-95 Stream file /tmp/brms/performance

Watch for more complete performance test results on the Tivoli Storage Manager Web site:

http://www-3.ibm.com/software/tivoli/products/

When you reach this site, select **Tivoli Storage Manager**.

Part 4

Advanced topics for Backup Recovery and Media Services, IBM Tivoli Storage Manager

This part provides details about the following topics regarding Backup Recovery and Media Services (BRMS) and IBM Tivoli Storage Manager integration:

- Sharing of devices and media resources
- Backup Recovery and Media Services troubleshooting and tips
- IBM Tivoli Storage Manager troubleshooting and tips

10

Backup Recovery and Media Services movement of IBM Tivoli Storage Manager media

Backup Recovery and Media Services (BRMS) has the ability to control its media movement through the use of move policies. Tape media can be sent to an off-site location for a specific time or until the volumes reach the end of their retention period. To simplify media movements, you can control the movement of volumes from both products through BRMS by using some simple interface programs we wrote. From an iSeries operator point of view, you can use one screen to move both BRMS and IBM Tivoli Storage Manager volumes.

The process is simple. Each day, these OS/400 programs check with the IBM Tivoli Storage Manager server to see if there are any IBM Tivoli Storage Manager tapes to be moved off site or on site. If there are any IBM Tivoli Storage Manager tapes to be moved off site, then a BRMS move policy is assigned to them and the volume location is set to OFFSITE within IBM Tivoli Storage Manager. Since these tapes now have a BRMS move policy attached to them, you can eject them from a tape library and move them off site like any normal BRMS save.

If there are IBM Tivoli Storage Manager tapes to be moved on site, then you update and delete the tapes in IBM Tivoli Storage Manager. BRMS sees all IBM Tivoli Storage Manager tapes with an expiration date of *PERM. When theses volumes are removed from IBM Tivoli Storage Manager, this automatically expires the media in BRMS. Now theses tapes are expired in BRMS, so you use the normal BRMS media movement to recall the tapes and bring them back on site.

This chapter provides an example of how to control IBM Tivoli Storage Manager movement of media using a backup BRMS. The movement is based on sample interface programs that are not supported by IBM. This chapter shows how you can simplify media movement by integrating the movement of IBM Tivoli Storage Manager media through BRMS when both products are installed on the same iSeries server. Several customers are using programs successfully that are similar to the sample programs described here.

10.1 Sample programs for IBM Tivoli Storage Manager, BRMS media movement

The movement of IBM Tivoli Storage Manager tapes within BRMS is based on two user-created commands from the sample code supplied with this redbook.

Important: The sample interface programs provided in this redbook are not supported by IBM and are intended only to show how you can simplify media movement when both BRMS and IBM Tivoli Storage Manager are installed on the same iSeries server. You can download the sample source code as explained in Appendix D, “Additional material” on page 411.

- **Run TSM Command (RUNTSMCMD)**

  This command (see Figure 10-1) allows you to run IBM Tivoli Storage Manager administrative commands from the OS/400 5250 interface. The sample source code for this command or is located in “Running an IBM Tivoli Storage Manager server command from OS/400” on page 402.

```
                          RUN TSM COMMAND (RUNTSMCMD)

Type choices, press Enter.

TSM COMMAND TO BE RUN  . . . . .    ____________________________________
____________________________________________________________________________
____________________________________________________________________________
_____________________________________
```

Figure 10-1 RUNTSMCMD display

- **Start Maintenance for ITSM (STRMNTTSM)**

  This command allows the movement of IBM Tivoli Storage Manager database tapes and IBM Tivoli Storage Manager copy tapes. Then, you can run the BRMS MOVMEDBRM command. See Figure 10-2 for an example of the STRMNTTSM command prompts.

```
                      Start Maintenance for ITSM (STRMNTTSM)

Type choices, press Enter.

ITSM Database Tapes to Offsite     *YES          *YES, *NO
ITSM Copypool Tapes to Offsite     *YES          *YES, *NO
ITSM Expired  Tapes to Onsite  .   *YES          *YES, *NO
ITSM Database Device Class . . .   ___________   Character value
ITSM Copy Storage Pool Name  . .   ______________________________
BRMS Move Policy for ITSM  . . .   TSMOFFSITE    Character value
Run MOVMEDBRM for ITSM tapes . .   *YES          *YES, *NO
```

Figure 10-2 STRMNTTSM display

The STRMNTTSM command contains the following programs:

- STRMNTTSM: To interface to the following programs
- TSMDBBOFF: Checks for IBM Tivoli Storage Manager database backups to be sent off site

– TSMCPYOFF: Checks for IBM Tivoli Storage Manager Copypool tapes to be sent off site
– TSMVOLON: Checks for any expired IBM Tivoli Storage Manager tapes to be moved on site
– MOVMEDTSM: Runs the BRMS MOVMEDBRM command for all IBM Tivoli Storage Manager tapes

You can find the sample source code of these commands in “Sample code for the STRMNTTSM command and programs” on page 404. Compile and place these commands in a user library. In our example, we placed these commands in library TSMEXITS. This is the same library that was used for the tape library exit programs in 6.2.2, “Creating IBM Tivoli Storage Manager and BRMS exit programs” on page 98.

To compile the source code for these programs, you must create a temporary work physical file named TSMTAPE. You can delete this file after the programs are compiled. If you compile the programs interactively, then create the file in QTEMP using the command:

```
CRTPF FILE(QTEMP/TSMTAPE) RCDLEN(133)
```

10.2 Configuring BRMS for IBM Tivoli Storage Manager media movement

This section explains how to create a new BRMS location and move policy for off-site IBM Tivoli Storage Manager tape volumes. You can also use existing BRMS definitions if you have them. We decided to create new ones to help segregate the BRMS and IBM Tivoli Storage Manager media.

10.2.1 Creating a new BRMS location

To create a new BRMS location, follow these steps:

1. From an OS/400 command line, enter:

   ```
   WRKLOCBRM
   ```

2. On the display that appears, type 1 and press Enter to create a new location.
3. On the Add Storage Location display, follow these steps:
   a. Enter a location name and any contact details if you prefer.
   b. Change the Allow volumes to expire parameter to *YES. Leave all other fields with their default values.
   c. Press Enter to create the BRMS location.

   In our example, we created new BRMS location called TSMOFFSITE.

10.2.2 Creating a new BRMS move policy

Use the following steps to create a new BRMS move policy:

1. On an OS/400 command line, enter the following command and press Enter:

   ```
   WRKPCYBRM *MOV
   ```

2. On the display that appears, in the Opt field, type 1 (Create). In the Policy field, enter a name for the new policy. Then press Enter. In our example, we also used TSMOFFSITE for the move policy name.

3. On the Create Move Policy display (Figure 10-3), enter the values for Home location, Verify moves, Location, and Duration.

   The Home location is the location that you want the IBM Tivoli Storage Manager media returned to when the tape expires. In our example, we specified *ORIGIN which, returns the media to the same location it was moved from.

   The Verify moves parameter is used if you want to check which tapes are to be moved off site before you actually move them. We left the default value of *YES.

   For Location and Duration, enter a sequence number for the location that your media will move to and the duration (how long the tapes will remain off site). We used BRMS location TSMOFFSITE for our location entry and *EXP for the duration. Since all IBM Tivoli Storage Manager media has an expiration date of *PERM, the value *EXP ensures that our IBM Tivoli Storage Manager tapes remain off site until they are expired. At that point, BRMS then asks for them to be returned on site.

   Leave all other fields with their default values. Press Enter to store the policy values and then Enter again create the BRMS move policy.

```
                              Create Move Policy                        AS27

Move policy  . . . . . .  TSMOFFSITE
Home location  . . . . .  *ORIGIN      Name, *SYSPCY, *ORIGIN, F4 list
Use container  . . . . .  *NO          *YES, *NO
Verify moves . . . . . .  *YES         *YES, *NO
Calendar for working days  . . .  *ALLDAYS     Name, *ALLDAYS, F4 for list
Calendar for move days . . . . .  *ALLDAYS     Name, *ALLDAYS, F4 for list
Text . . . . . .  ITSM Offsite location for DB + COPY tapes

Type choices, press Enter.

  Seq    Location      Duration
   10    TSMOFFSITE    *EXP

F3=Exit    F4=Prompt    F5=Refresh    F12=Cancel
```

Figure 10-3 Create Move Policy display for BRMS

10.3 IBM Tivoli Storage Manager volume status before running STRMNTTSM

You should run the STRMNTTSM command each morning after the IBM Tivoli Storage Manager copy tapes are created and the IBM Tivoli Storage Manager database backup is completed. In our test environment, this was run after the IBM Tivoli Storage Manager administration command schedule “DAILY_MAINT” finished.

Before you run the STRMNTTSM command, you can check the current status of the IBM Tivoli Storage Manager media. The following examples shows how to see which IBM Tivoli Storage Manager volumes are moved when you run the STRMNTTSM command. This section is intended for informational purposes only since the STRMNTTSM command does this work for us.

- IBM Tivoli Storage Manager database backups

  You can enter the **query volhist** command in the IBM Tivoli Storage Manager Web administrative client interface Server Command window to see all IBM Tivoli Storage Manager database backups. In our example, we entered the following command:

  ```
  query volhist type=dbb
  ```

  Figure 10-4 shows the status of two IBM Tivoli Storage Manager database backups. LB0354 has a Volume Location set to OFFSITE and LB0705 has a blank Volume Location. From this panel, you can see that volume LB0705 is ready to be moved to the disaster recovery location.

Figure 10-4 Web administrative client interface: Query volhist command

- IBM Tivoli Storage Manager copypool tapes ready to be moved off site

  To see the status of all copy storage pool volumes ready to be moved off site, you can use the **query volume** command in the IBM Tivoli Storage Manager Web administrative client interface Server Command window. We entered the following command:

  ```
  query volume stg=copylto access=READW,READO
  ```

  Here *copylto* is the name of our copy storage pool defined in 6.3.7, “Creating a copy storage pool” on page 111. Figure 10-5 shows copypool volume LB0702. This is the only copy storage pool volume on site. It is ready to be moved off site.

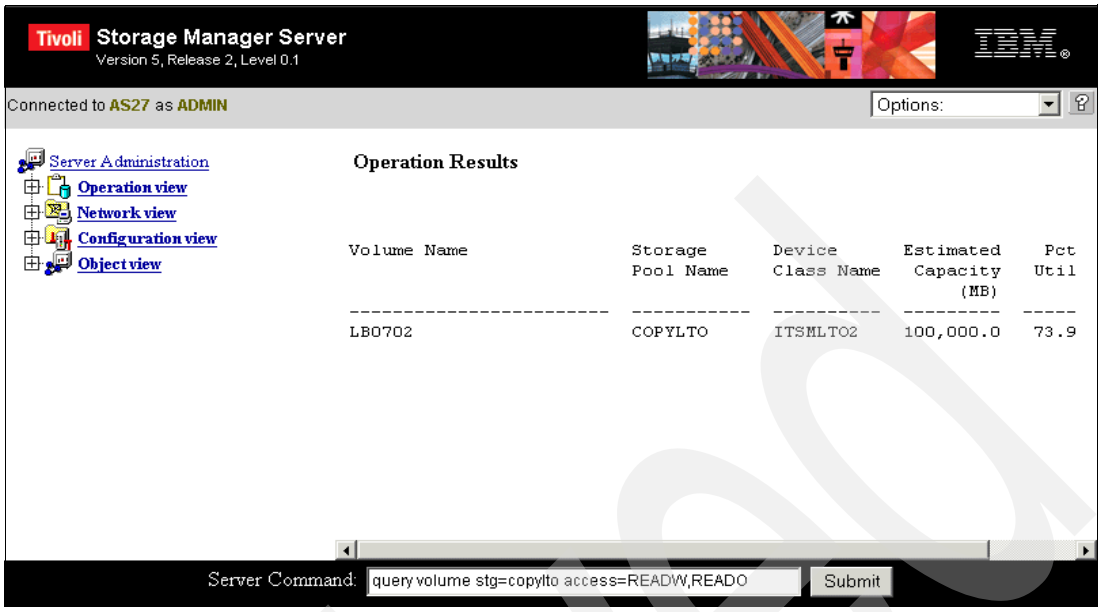

Figure 10-5 Web administrative client interface: Querying volume on site

- IBM Tivoli Storage Manager expired copypool tapes ready to be moved back on site

  To see the status of all copy storage pool volumes ready to be moved back on site, you can enter the **`query volume`** command again in the IBM Tivoli Storage Manager Web administrative client interface Server Command window. We entered the following command:

  ```
  query volume stg=copylto access=OFFSITE status=empty
  ```

  Again, *copylto* is the name of our copy storage pool defined in 6.3.7, “Creating a copy storage pool” on page 111. Figure 10-6 shows copypool volumes LB0379 and LB0714, which are empty and ready to be returned on site.

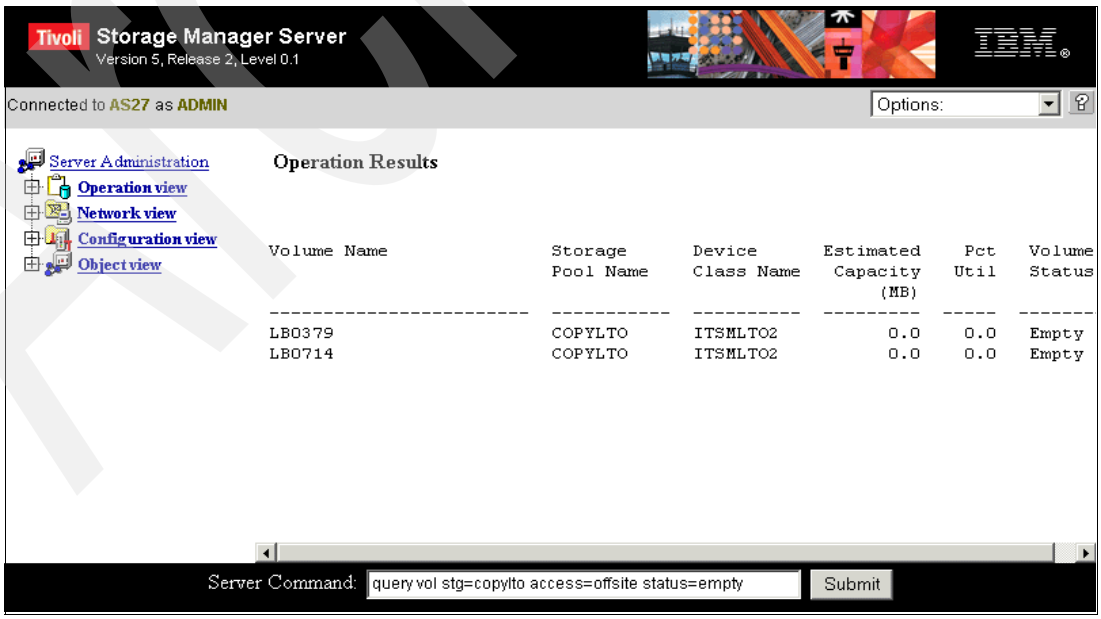

Figure 10-6 Web administrative client interface: Querying volume off site

Figure 10-7 shows the Work with Media using BRM (WRKMEDBRM) status of the BRMS tapes before you run the STRMNTTSM command. Here we can see the two tapes LB0702 (copytape) and LB0705 (database backup) in location TAPMLB05 (these are the tapes to be moved off site). Notice that the empty tapes, LB0379 and LB0714 (copytapes), are in the TSMOFFSITE location and are not yet expired in BRMS. These tapes expire when you run the STRMNTTSM command.

```
                              Work With Media
                                                          System:   AS27
Position to  . . . . .               Starting characters
Type options, press Enter.
  1=Add   2=Change   4=Remove   5=Display   6=Work with serial set   7=Expire
  8=Move   10=Reinitialize ...

     Volume            Creation Expiration            Move     Media      Dup
Opt  Serial    Expired   Date      Date    Location   Date     Class      Sts

     LB0375            09/02/03  *PERM     TAPMLB05   *NONE    ITSMLT02
     LB0379            09/02/03  *PERM     TSMOFFSITE 09/04/03 ITSMLT02
     LB0702            09/05/03  *PERM     TAPMLB05   09/03/03 ITSMLT02
     LB0705            09/05/03  *PERM     TAPMLB05   09/03/03 ITSMLT02
     LB0714            08/31/03  *PERM     TSMOFFSITE 09/04/03 ITSMLT02
     067ACE            08/27/03  *PERM     TAPMLB05   08/25/03 ITSMLT02
     078ACE     *YES   09/03/03  11/11/94  TAPMLB05   09/04/03 ITSMLT02
                                                                    Bottom
Parameters or command:
===>
F3=Exit   F4=Prompt   F5=Refresh   F11=Volume system   F12=Cancel   F17=Top
F18=Bottom   F23=More options
```

Figure 10-7 Work with Media display before running the STRMNTTSM command

10.4 Running the STRMNTTSM command

In this example, we move any IBM Tivoli Storage Manager database backups or copypool tapes off site and return any expired volumes on site. Figure 10-8 shows the available parameters of the STRMNTTSM command.

```
                        Start Maintenance for ITSM (STRMNTTSM)

Type choices, press Enter.

ITSM Database Tapes to Offsite     *YES          *YES, *NO
ITSM Copypool Tapes to Offsite     *YES          *YES, *NO
ITSM Expired  Tapes to Onsite  .   *YES          *YES, *NO
ITSM Database Device Class . . .   ___________    Character value
ITSM Copy Storage Pool Name  . .   ________________________________
BRMS Move Policy for ITSM  . . .   TSMOFFSITE    Character value
Run MOVMEDBRM for ITSM tapes . .   *YES          *YES, *NO
```

Figure 10-8 STRMNTTSM display

You must run the command in batch. You can schedule it using the OS/400 job scheduler or submit it manually using the OS/400 Submit Job (SBMJOB) command.

We use ITSMLTO2 for the IBM Tivoli Storage Manager device class for the database backups, COPYLTO for our copy storage pool name, and TSMOFFSITE for the BRMS move policy name. You normally replace these values with your own definitions. We submit the STRMNTTSM command using the following OS/400 SBMJOB command:

```
SBMJOB CMD(STRMNTTSM TSMDBBOFF(*YES) TSMCPYOFF(*YES) TSMVOLON(*YES) MEDIACLS(ITSMLTO2)
CPYPOOL(COPYLTO) BRMMOVPCY(TSMOFFSITE) MOVMEDBRM(*YES)) JOB(STRMNTTSM) JOBQ(QBATCH)
```

If you select to run the BRMS MOVMEDBRM from the STRMNTTSM command, then a BRMS volume movement report is produced. The report shown in Figure 10-9 was generated when we submitted the STRMNTTSM command. This report details the media movement within BRMS. Here you can see the database (LB0705) and copytape (LB0702) volumes moving from TAPMLB05 to TSMOFFSITE. You can also see the two empty copytape volumes (LB0379 and LB0714) returning to TAPMLB05 from TSMOFFSITE.

```
5722BR1 V5R2M0 020906            Volume Movement Report
  Volume  Volume  Expiration  Media      Pend  Current     Move      Next
  Serial  Slot    Date        Class      Vfy   Location    Date      Location
  LB0379          11/11/94    ITSMLTO2   Y     TSMOFFSITE   9/05/03  TAPMLB05
  LB0702          *PERM       ITSMLTO2   Y     TAPMLB05     9/03/03  TSMOFFSITE
  LB0705          *PERM       ITSMLTO2   Y     TAPMLB05     9/03/03  TSMOFFSITE
  LB0714          11/11/94    ITSMLTO2   Y     TSMOFFSITE   9/05/03  TAPMLB05
    Total volumes moved  . . . . . . . . . . :       4
    Total volumes not moved  . . . . . . . . :       0
```

Figure 10-9 MOVMEDBRM report created by the STRMNTTSM command

In 10.2, “Configuring BRMS for IBM Tivoli Storage Manager media movement” on page 339, we defined the BRMS move policy to verify any tape movements before updating the BRMS media information. To confirm our tape movements, we enter the BRMS VFYMOVBRM command on an OS/400 command line. Then you see the Verify Media Moves display (Figure 10-10). In this example, we typed 1 next to the media being moved to the off-site location TSMOFFSITE. Then we pressed Enter to verify the move.

Attention: Depending on the setting of the BRMS QA1PRM data area, media may be ejected when you enter either the MOVMEDBRM or VFYMOVBRM commands. See 4.1.5 “Moving media” in *Backup Recovery and Media Services for OS/400: A Practical Approach*, SG24-4840, for details about BRMS media movement. Or refer to Informational Authorized Program Analysis Records (APAR) II09882 by searching for it on the Web at:

http://www-912.ibm.com/n_dir/nas4apar.nsf/$$Search?openform

The two tapes returning to the TAPMLB05 location (as shown in Figure 10-10) *must* be physically placed inside the tape library before their move can be verified.

```
                                Verify Media Moves                              AS27

Type options, press Enter.  Press F16 to verify all.
   1=Verify   4=Cancel move   9=Verify and work with media

      Volume   Creation  Expiration               Move
Opt   Serial    Date       Date      Location      Date      Container
      LB0379    9/02/03   11/11/94   TAPMLB05      9/05/03   *NONE
 1    LB0702    9/05/03   *PERM      TSMOFFSITE    9/05/03   *NONE
 1    LB0705    9/05/03   *PERM      TSMOFFSITE    9/05/03   *NONE
      LB0714    8/31/03   11/11/94   TAPMLB05      9/05/03   *NONE
                                                                    Bottom

F3=Exit   F5=Refresh   F12=Cancel   F16=Verify all
```

Figure 10-10 VFYMOVBRM after the STRMNTTSM command is run

Figure 10-11 shows the final status of the WRKMEDBRM information after we returned the two off-site volumes (LB0379 and LB0714) to our 3584 tape library and verified the media movement in BRMS. Here you can see that the returned media is now expired in BRMS and can be reused by IBM Tivoli Storage Manager.

```
                              Work With Media
                                                        System:   AS27
Position to  . . . . .              Starting characters
Type options, press Enter.
  1=Add   2=Change   4=Remove   5=Display   6=Work with serial set   7=Expire
  8=Move   10=Reinitialize ...

     Volume           Creation Expiration          Move     Media      Dup
Opt  Serial    Expired   Date      Date    Location   Date     Class      Sts

     LB0375            09/02/03  *PERM     TAPMLB05   *NONE    ITSMLT02
     LB0379     *YES   09/02/03  11/11/94  TAPMLB05   09/05/03 ITSMLT02
     LB0702            09/05/03  *PERM     TSMOFFSITE 09/05/03 ITSMLT02
     LB0705            09/05/03  *PERM     TSMOFFSITE 09/05/03 ITSMLT02
     LB0714     *YES   08/31/03  11/11/94  TAPMLB05   09/05/03 ITSMLT02
     067ACE             08/27/03  *PERM     TAPMLB05   08/25/03 ITSMLT02
     078ACE     *YES    09/03/03  11/11/94  TAPMLB05   09/04/03 ITSMLT02
                                                                  Bottom
Parameters or command:
===>
F3=Exit   F4=Prompt   F5=Refresh   F11=Volume system   F12=Cancel   F17=Top
F18=Bottom   F23=More options
```

Figure 10-11 WRKMEDBRM after the VFYMOVBRM for all media

If you press F11 three times, you can see the volume text for each media in BRMS. Figure 10-12 shows the text for the newly moved tapes. Notice that the STRMNTTSM command updated the volume text to show which tapes are database or copy storage pool volumes. This information can be useful in a disaster recovery situation.

```
                                Work With Media
                                                              System:      AS27
Position to  . . . . .              Starting characters
Type options, press Enter.
  1=Add   2=Change   4=Remove   5=Display   6=Work with serial set   7=Expire
  8=Move   10=Reinitialize ...

     Volume
Opt  Serial    Text

     LB0375    *NONE
     LB0379    *NONE
     LB0702    ITSM COPY Tape
     LB0705    ITSM Database Backup
     LB0714    *NONE
     067ACE    *NONE
     078ACE    *NONE
                                                                      More...
Parameters or command:
===>
F3=Exit   F4=Prompt    F5=Refresh   F11=Volume information   F12=Cancel
F17=Top   F18=Bottom   F23=More options
```

Figure 10-12 Volume text from the WRKMEDBRM command

11

Troubleshooting Backup Recovery and Media Services

Backup Recovery and Media Services (BRMS) has many tools that can assist in troubleshooting problems. This chapter discusses some of the documentation that is necessary to gather for further problem determination, typically with assistance from IBM service personnel.

11.1 Logs on the iSeries used for BRMS troubleshooting and problem determination

The iSeries has numerous logs and message queues that aid in problem determination and diagnostics. With BRMS, there are three logs that you typically examine to find information about a BRMS job.

11.1.1 Job logs

If the job is interactive, then look at your interactive job log:

1. Enter the Display Job Log (DSPJOBLOG) command.
2. Press F10 to view all messages.
3. Press F5 to refresh the messages.

The job log always starts at the bottom so you need to page up or press F17 (Top) to reach the top. Figure 11-1 shows the job log of an interactive job.

```
                              Display All Messages
                                                                System:      AS27
Job . . :   QPADEV0005    User . . :   BRADS         Number . . . :   062426

3 > RSTLICPGM LICPGM(5733197) DEV(*SAVF) SAVF(SMOLEY/TSMAPI)
    OBJ parameter value changed, /usr/tivoli/tsm/client/api.
    OBJ parameter value changed, /usr/tivoli/tsm/client/api.
    Objects from save file QM.0003 in QTEMP not restored.
    Specified file for restore operation not found.
    Product 5733197 option *BASE release *FIRST processing not complete.
    *PGM objects for product 5733197 option *BASE release *FIRST not restored.
    Objects for product 5733197 option *BASE release *FIRST not restored.
3 > dspjoblog
3 > qsh
    Object QPOZTRML type *DTAQ created in library QTEMP.
    New QSH session started.
    Object QPOZTRML in QTEMP type *DTAQ deleted.
    Command ended normally with exit status 127.
                                                                          More...
Press Enter to continue.

F3=Exit   F5=Refresh   F12=Cancel   F17=Top   F18=Bottom
```

Figure 11-1 Interactive job log

To see the message identifier, place your cursor on the message and press F1. Then you see and Additional Message Information display similar to the example in Figure 11-2.

```
                        Additional Message Information

Message ID . . . . . :   CPD0030       Severity . . . . . :   30
Message type . . . . . :   Diagnostic
Date sent  . . . . . :   08/18/03      Time sent  . . . . . :   14:36:14

Message . . . . :   Command SAVDOMBRM in library *LIBL not found.
Cause . . . . . :   If a library was not specified, the command was not found
  in the libraries in the library list. If a library was specified, the
  command was not found there. One of the following special values may have
  been used to specify the library:
  *LIBL - The command was not found in the libraries in the library list
  *NLVLIBL - The command was not found in the national language version
    libraries in the system library list.
  *SYSTEM - The command was not found in library QSYS.
Recovery  . . . :   Change the command name or correct the library name, and
  then try the command again.

                                                                       Bottom
Press Enter to continue.

F3=Exit   F6=Print   F9=Display message details   F12=Cancel
F21=Select assistance level
```

Figure 11-2 Additional message information display from the interactive job log

You can search an interactive job log. Simply enter the DSPJOBLOG command with OUTPUT(*PRINT). This creates a spooled file that you can search if needed as shown in Figure 11-3.

```
                                  Display Spooled File
File  . . . . . :   QPJOBLOG                                          Page/Line   1/1
Control . . . . .                                                     Columns     1 - 130
Find  . . . . . .
*...+....1....+....2....+....3....+....4....+....5....+....6....+....7....+....8....+....9....+....0....+....1....+....2....+....3
 5722SS1 V5R2M0 020719                Display Job Log                 AS27  08/18/03 15:53:12          Page    1
  Job name . . . . . :   QPADEV0005      User  . . . . . :   BRADS        Number . . . . . :   062426
  Job description  . . . . . :   QDFTJOBD        Library . . . . . :   QGPL
MSGID      TYPE                 SEV  DATE      TIME           FROM PGM     LIBRARY     INST     TO PGM      LIBRARY     INST
CPF1124    Information          00   08/18/03  08:57:07.188128  QWTPIIPP     QSYS        05D4     *EXT                    *N
                                  Message . . . . :   Job 062426/BRADS/QPADEV0005 started on 08/18/03 at
                                    08:57:07 in subsystem QINTER in QSYS. Job entered system on 08/18/03 at
                                      08:57:07.
CPF2415    Escape               40   08/18/03  08:57:09.650112  QMHGSD       QSYS        076C     QCMD        QSYS        0178
                                  Message . . . . :   End of requests.
                                  Cause . . . . . :   This message is sent to the program which runs the RETURN
                                     command.
*NONE      Request                 08/18/03  08:58:54.881352  QUICMD       QSYS        045F     QUICMD      QSYS        045F
                                  Message . . . . :  -wrksysval qstrup
*NONE      Request                 08/18/03  08:59:00.144576  QUICMD       QSYS        045F     QUICMD      QSYS        045F
                                  Message . . . . :  -wrksysval qst*
*NONE      Request                 08/18/03  08:59:14.228000  QPTKYPRC                 *N       QUICMD      QSYS        045F
                                  Message . . . . :  -WRKPGM
*NONE      Request                 08/18/03  08:59:20.352976  QUICMD       QSYS        045F     QUICMD      QSYS        045F
                                                                                                                    More...
```

Figure 11-3 Interactive job log in a spooled file

If the job is a batch job, then look for the job log in your joblog output queue. On many OS/400 systems, this is set up to be output queue QEZJOBLOG.

If you cannot find the correct job log, try to find it using the Work with Submitted Jobs (WRKSBMJOB) command for the user profile that ran the job.

You can also use the Work with User Jobs (WRKUSRJOB) command for the user profile that submitted the job.

11.1.2 History log

The history log is a high-level log. It does not contain a lot of information, but can usually point you in the right direction. To access the history log, enter the Display Log (DSPLOG) command. Figure 11-4 shows an example of a history log and its contents. As with the interactive job log, you can find additional information about the messages by placing your cursor on the message and pressing F1. History logs have a size limit. When that limit is reached, they are moved into library QSYS with a name of QHST*xxxxxxx* (where *xxxxxxx* is a number with a letter at the end). You can view them by entering the Display Physical File Member (DSPPFM) command.

```
                          Display History Log Contents

TCP/IP connection to remote system 9.5.92.48 closed, reason code 2.
TCP/IP connection to remote system 9.5.92.48 closed, reason code 2.
TCP/IP connection to remote system 9.5.92.48 closed, reason code 2.
TCP/IP connection to remote system 9.5.92.48 closed, reason code 2.
TCP/IP connection to remote system 9.5.92.48 closed, reason code 2.
Job 062419/DHQB/ANZDFTPWD5 submitted for job schedule entry ANZDFTPWD5 number
Job 062419/DHQB/ANZDFTPWD5 started on 08/18/03 at 01:00:00 in subsystem QBATC
Job 062419/DHQB/ANZDFTPWD5 ended on 08/18/03 at 01:00:01; 1 seconds used; end
Job 062419/DHQB/ANZDFTPWD5 completed normally on 08/18/03 at 01:00:01.
TCP/IP connection to remote system 9.5.92.48 closed, reason code 2.
TCP/IP connection to remote system 9.5.92.48 closed, reason code 2.
TCP/IP connection to remote system 9.5.92.48 closed, reason code 2.
TCP/IP connection to remote system 9.5.92.48 closed, reason code 2.
TCP/IP connection to remote system 9.5.92.48 closed, reason code 2.
TCP/IP connection to remote system 9.5.92.48 closed, reason code 2.
TCP/IP connection to remote system 9.5.92.48 closed, reason code 2.
TCP/IP connection to remote system 9.5.92.48 closed, reason code 2.
                                                                      More...
Press Enter to continue.

F3=Exit   F10=Display all   F12=Cancel
```

Figure 11-4 Contents of a history log

11.1.3 BRMS log

The BRMS log is a combination of the history log and job log. It only contains messages that deal with BRMS. To access the BRMS log, you enter the Display Log BRMS (DSPLOGBRM) command. Then you see a display similar to the Display BRM Log Information example in Figure 11-5. Each day is separate. If you want to see a specific date, change the date in the upper right corner. You can also see additional information about the messages by placing your cursor on the message and pressing F1.

```
                        Display BRM Log Information                    AS27
 8/18/03  16:00:16                              Position to . . . .  8/18/03

------------------------------  8/18/03 ----------------------------------
ITSMLTO2 was registered as a function of BRMS.
Volume LB0354 expired.
Volume LB0702 expired.
Volume LB0354 changed.
Volume LB0702 changed.
Volume LB0705 changed.
Volume LB0714 changed.
Operation canceled by user reply.

                                                                       Bottom
Press Enter to continue.

F3=Exit      F5=Refresh     F12=Cancel     F17=Top     F18=Bottom
```

Figure 11-5 BRMS log

11.2 Flight recorders on the iSeries for BRMS

BRMS developers developed a way to track what the code is doing step by step. This method is used for hard-to-determine problems and are new logs are called *BRMS flight recorders*. There are also flight recorders referred to as *tape flight recorders*. Since BRMS allows users to use tape libraries, tape flight recorders are usually needed for problem diagnostics.

BRMS flight recorders are stream files inside of a directory in the integrated file system (IFS). The files are located in directory /tmp/brms as shown in Figure 11-6. There are five different files into which BRMS places the information:

- Performance
- Install
- Flightrec
- Qbrms
- Flightrec.bku

```
Directory: /tmp/brms
Position to :              Record :       1  of 5
New File :
2=Edit  4=Delete File   5=Display  6=Path Size   9=Recursive Delete

pt Name                Size       Owner       Changed         Used            CCSID or Symbolic Link
   performance            256K  QBRMS       08/18/03 12:17  08/18/03 12:17     CCSID =    37
   qbrms                5,632K  QBRMS       08/18/03 12:18  08/18/03 12:18     CCSID =    37
   flightrec.bku          512K  QBRMS       07/08/03 18:12  08/13/03 05:06     CCSID =    37
   flightrec              512K  QBRMS       08/18/03 16:14  08/18/03 16:14     CCSID =    37
   install                 16K  QBRMS       08/13/03 09:21  08/13/03 09:21     CCSID =    37

                                                                                                Bottom

F3=Exit    F12=Cancel   F16=Sort    F17=Position to   F22=Display entire field
```

Figure 11-6 BRMS flight recorder directory display

To gather the flight recorders to get them to your support representative, save the BRMS flight recorders:

1. Create a savefile (SAVF):

   ```
   CRTSAVF QGPL/BRMSFLIGHT
   ```

2. Save the directory /tmp/brms into the savefile created above:

   ```
   SAV DEV('/qsys.lib/qgpl.lib/brmsflight.file') OBJ(('/tmp/brms'))
   ```

This saves all of the BRMS files needed for further problem determination. There are size limits for these files and they wrap. If you are experiencing problems, save the BRMS flight recorders immediately after the failure.

Tape flight recorders are more complicated then the BMRS flight recorders and wrap very quickly. The tape flight recorders are a set of user spaces that contain files that developers can run tools against to debug the problem.

1. To access the tape flight recorders, enter the following command as soon as the tape drive fails:

   ```
   Call QTADMPDV TAPxx
   ```

   Here *TAPxx* is the name of your tape drive/tape library.

2. Create a savefile:

   ```
   CRTSAVF QGPL/TAPEFLIGHT
   ```

3. Enter the Work Problem (WRKPRB) command. This takes you to a listing of problems as shown in Figure 11-7. On the right side, you see a problem description that states QTADMPDV - TAPxxx. This is the output that development needs.
4. Enter option 8 next to the problem with the description QTADMPDV - TAPxxx.
5. Select option 32 to save the Authorized Program Analysis Records (APAR) library. This does a Save Library (SAVLIB) of the problem library that was created by the call QTADMPDV. Save this to the SAVF you created above. Then contact your support representative.

All of this information is needed to diagnose BRMS-related problems.

```
                            Work with Problems
                                                              System:      AS27
Position to . . . . . .                  Problem ID

Type options, press Enter.
  2=Change   4=Delete   5=Display details    6=Print details
  8=Work with problem   9=Work with alerts   12=Enter text


Opt  Problem ID  Status         Problem Description
     0323056524  READY          QTADMPDV - TAPMLB05
     0322636380  OPENED         Unable to establish a network link on Ethernet
     0322636375  OPENED         Unable to establish a network link on Ethernet
     0322636370  OPENED         Unable to establish a network link on Ethernet
     0322636309  READY          *Attention* Tape device or tape library TAPMLB
     0322636304  READY          *Attention* Tape device or tape library TAPMLB
     0322636300  READY          *Attention*  Contact your hardware service pro
     0322636299  READY          *Attention*  Contact your hardware service pro
     0322636297  READY          *Attention*  Hardware service may be required.
     0322635025  READY          Storage subsystem configuration error.
                                                                        More...
F3=Exit      F5=Refresh   F6=Print list     F11=Display dates and times
F12=Cancel   F16=Report prepared problems   F24=More keys
```

Figure 11-7 Work with Problems main display

11.3 Other debug and problem determination items

When you encounter a BRMS problem, gather the job's call stack. To access the call stack, work with the job that is having the problem by using the WRKJOB command. On the Work with Job display, select option 11 as shown in Figure 11-8.

```
                              Work with Job
                                                              System:      AS27
Job:   QPADEV000F     User:   BRADS          Number:   062574

Select one of the following:

     1. Display job status attributes
     2. Display job definition attributes
     3. Display job run attributes, if active
     4. Work with spooled files

    10. Display job log, if active or on job queue
    11. Display call stack, if active
    12. Work with locks, if active
    13. Display library list, if active
    14. Display open files, if active
    15. Display file overrides, if active
    16. Display commitment control status, if active
                                                                        More...
Selection or command
===> 11
```

Figure 11-8 Accessing the call stack of your job

Then you see the active call stack like the example in Figure 11-9.

```
                              Display Call Stack
                                                                System:   RCHAS27
Job:   QPADEV000F     User:   BRADS          Number:   062574

Thread:   00001F63

       Program
Rqs    or
Lvl    Procedure   Library     Statement        Instruction
       QCMD        QSYS                            0488
       QUICMENU    QSYS                            00C2
  1    QUIMNDRV    QSYS                            055F
  2    QUIMGFLW    QSYS                            04BA
  3    QUICMD      QSYS                            048A

                                                                        Bottom
F3=Exit        F10=Update stack   F11=Display activation group   F12=Cancel
F16=Job menu   F17=Top   F18=Bottom   F22=Display entire name
```

Figure 11-9 Active call stack example

BRMS also has a trace function located inside of the BRMS system policy. Use this parameter only if a support center representative requests you to turn it on. If this is left turned on, it can create a large file, which in turn can fill up your system. To access the BRMS system policy, issue the following command:

```
WRKPCYBRM *SYS
```

This opens the system policy, from which you have eight options. Select option 1 to change system policy. Figure 11-10 shows the system policy and parameter that turns the trace on and off.

```
 V5R2M0                  Change System Policy                        AS27

Type choices, press Enter.

 Media policy . . . . . . . . . . . . . . . FULL          Name, F4 for list
 Devices  . . . . . . . . . . . . . . . . . TAP02         Name, F4 for list


 Home location for media  . . . . . . . . . *HOME         Name, F4 for list
 Media class  . . . . . . . . . . . . . . . QIC4DC        Name, F4 for list
 Sign off interactive users . . . . . . . . *NO           *YES, *NO
 Sign off limit . . . . . . . . . . . . . .  30          0-999 minutes
 Output queue . . . . . . . . . . . . . . . *PRTF         Name, *PRTF
   Library  . . . . . . . . . . . . . . .                 Name, *LIBL
 Day start time . . . . . . . . . . . . . .  0:00:00     Time
 Media monitor  . . . . . . . . . . . . . . *YES          *YES, *NO
 Shared inventory delay . . . . . . . . . .   60         30-9999 seconds
 Auto enroll media  . . . . . . . . . . . . *NO           *NO, *YES
 Trace  . . . . . . . . . . . . . . . . . . *NO           *NO, *YES
 Default usage. . . . . . . . . . . . . . . *YES          *NO, *YES

F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel
```

Figure 11-10 BRMS system policy with the Trace parameter turned on

11.4 BRMS program temporary fixes needed

BRMS requires a PTF level to work efficiently. Also, with each BRMS PTF, development enhances the BRMS flight recorder and other debugging tools. We recommend that you have the most current cumulative PTF package, Hiper, the group PTF, database group PTFs, backup and recovery group PTF, and BRMS PTF. To find the PTF numbers that are needed, see the following Web site:

http://www-912.ibm.com/s_dir/slkbase.nsf/recommendedfixes

This Web site is kept current and contains the recommended PTFs for a large set of iSeries licensed program products (LPP).

For additional information about PTFs, see 7.5, “Using the Internet to order and install fixes” on page 143.

12

Troubleshooting IBM Tivoli Storage Manager for OS/400 PASE

The IBM Tivoli Storage Manager server has many tools that can assist in troubleshooting problems. This chapter discusses some of these tools to help with problem determination.

12.1 IBM Tivoli Storage Manager activity log

The first place to look when performing any kind of problem determination is the IBM Tivoli Storage Manager server activity log. This log records all the servers activity and can be compared to the iSeries system history log (QHST).

You can query the IBM Tivoli Storage Manager activity log from the IBM Tivoli Storage Manager Web administrative client interface tree structure or the IBM Tivoli Storage Manager Web Server Command window. If you do not specify any parameters with this command, all messages generated in the last hour are displayed.

- Using the IBM Tivoli Storage Manager Web administrative client interface tree structure, follow these steps:

  a. Expand **Object view** and select **Server-> Activity Log**.

  b. You see the panel in Figure 12-1. To help tailor your search, you can use various fields on this panel. Enter the following search requirements and click **Finish**:

     - **Begin Date**: This value specifies the beginning date of the range for messages to be displayed. You can enter the date in your system's date format. You can also enter a value of `TODAY` for the current date or, for example, `-3` to display all message from three days ago.
     - **Begin Time**: This value specifies the beginning time of the range for messages to be displayed. You can enter the time in your system's time format. You can also enter a value of `NOW` for the current time or, for example, `-02:00` to view all message from two hours ago.
     - **End Date**: This value specifies the beginning date of the range for messages to be displayed. You can use the same format as the Begin Date parameter.
     - **End Time**: This value specifies the beginning time of the range for messages to be displayed. You can use the same format as the Begin Time parameter.
     - **Message number**: If you know the IBM Tivoli Storage Manager message number, enter the number here without the ANR prefix.
     - **Search string**: This specifies a text string that you want to search for in the activity log. Enclose the string expression in quotation marks if it contains blanks. You can use text and a wildcard character to specify this string. For example, to search the activity log for failures, we can enter the word `fail` to search all the messages in the log.
     - **Originator**: You can choose to query displays messages logged by the server (SERVER), client (CLIENT), or both (ALL). If you specify CLIENT, you can use the following subparameters to further restrict your query:
       - Node Name: This displays messages logged for a particular node. For example, we could enter AS02 to search for all messages for our test Backup Recovery and Media Services (BRMS) Application Client.
       - Client Owner: Displays messages logged for a particular owner.
       - Schedule Name: Displays messages logged by a particular scheduled client activity.
       - Policy Domain Name: This parameter is used to display messages logged for a particular policy domain to which a named schedule belongs. Again you can enter BRMS here to display all messages for the test BRMS Application Client.
       - Session: This is used to specify messages logged from a particular client session number.

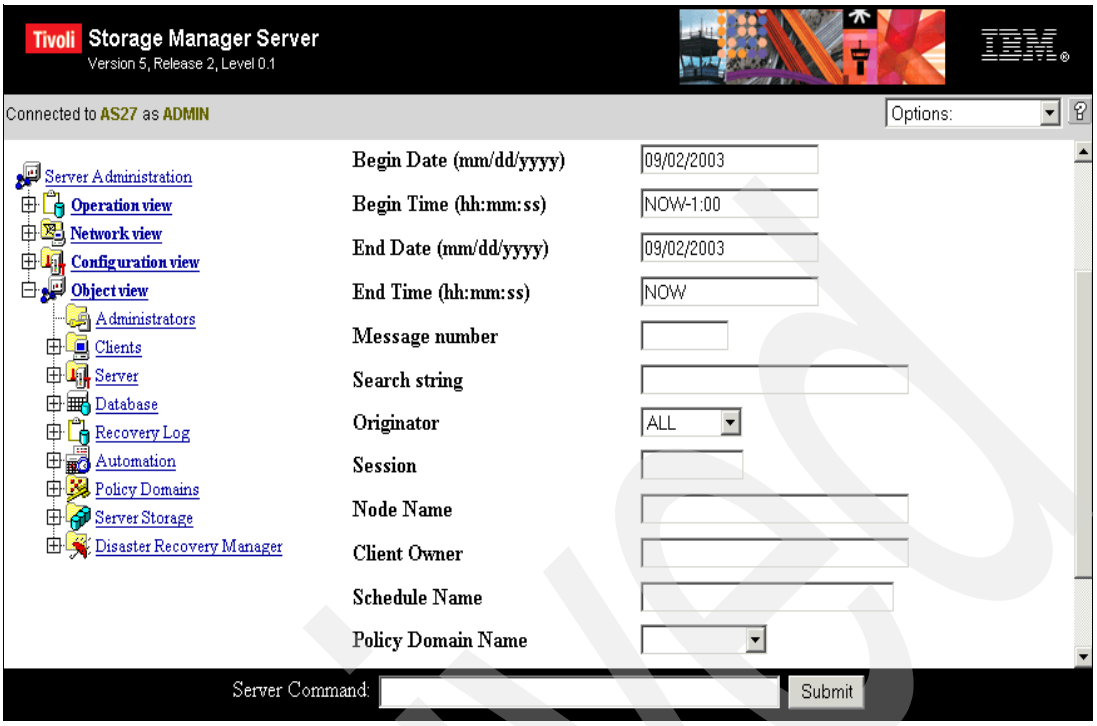

Figure 12-1 Web administrative client interface: Querying the activity log

- Using the IBM Tivoli Storage Manager Web Server Command window, you can enter either of the following commands to display the IBM Tivoli Storage Manager servers activity log:

  ```
  query actlog
  q act
  ```

  For example, to dispay all failed messages from midnight two days ago until now, you can use the command syntax:

  ```
  q act begindate=-2 begintime=00:00 search=fail
  ```

  The following section explains how to use the IBM Tivoli Storage Manager help command to see all possible parameter available with this command. You can also refer to Chapter 5 “Administrative Commands” in the *IBM Tivoli Storage Manager for OS/400 PASE - Administrator’s Reference Guide*, GC23-4695.

12.2 Using the IBM Tivoli Storage Manager help command

You can use the IBM Tivoli Storage Manager **help** command to access the IBM Tivoli Storage Manager help menu system. It displays help about IBM Tivoli Storage Manager commands or IBM Tivoli Storage Manager messages.

- Display help information using the help menu

  a. In the IBM Tivoli Storage Manager Server Command window, enter the command:

     ```
     help
     ```

  b. Click **Submit**.

  c. Then you see the panel shown in Figure 12-2. To see help information about one of the topics that is listed, enter the IBM Tivoli Storage Manager command **help** followed by

the menu number. For example, to see information about Entering Administrative Commands, you enter:

```
help 2
```

Figure 12-2 Web administrative client interface help command

- Display help information about IBM Tivoli Storage Manager commands

  If you know an IBM Tivoli Storage Manager command and need to know what syntax is required, or if you need, for example, to see all the query commands that are available in IBM Tivoli Storage Manager, use the IBM Tivoli Storage Manager **`help`** command.

  You can use the following example to list all **`set`** commands that are available to the IBM Tivoli Storage Manager server:

  ```
  help set
  ```

  You can use the following example to see the syntax for the **`q actlog`** command:

  ```
  help q actlog
  ```

- Display help for IBM Tivoli Storage Manager messages

  If you know the IBM Tivoli Storage Manager message number, you can enter the number part of the message without the ANR prefix after the **`help`** command. Then you can see the message details. For example, to see details about the "`ANR1404W Scratch volume mount request denied - mount failed`" message, enter:

  ```
  help 1404
  ```

  Then you see the resulting panel as shown in Figure 12-3.

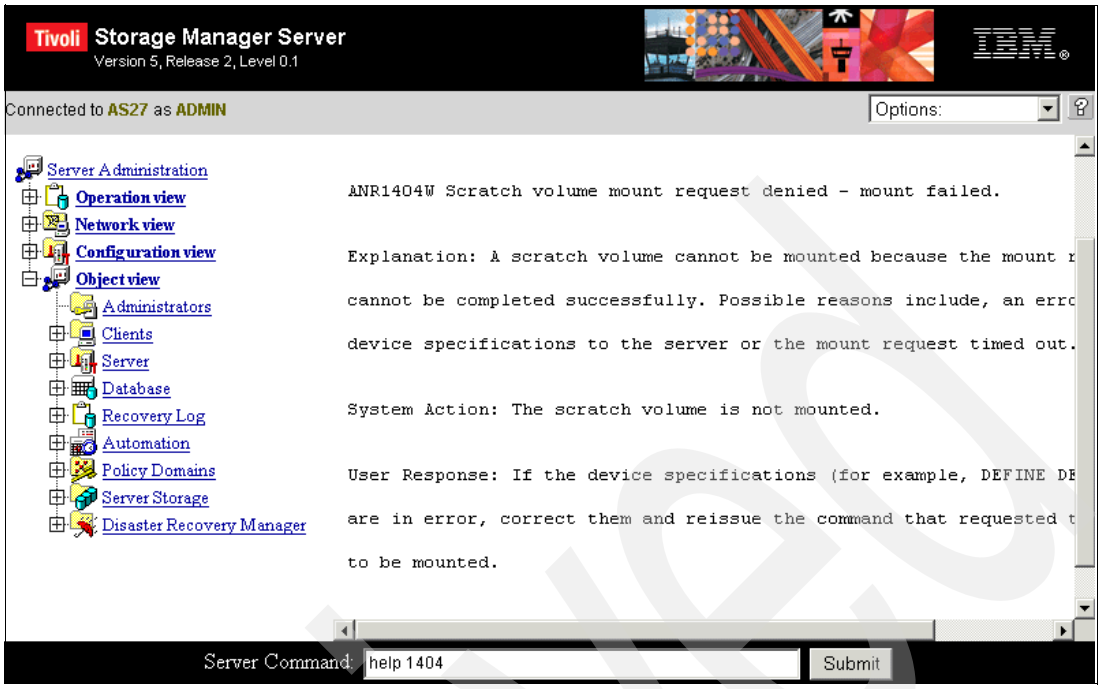

Figure 12-3 Web administrative client interface help for a message number

12.3 IBM Tivoli Storage Manager message format

IBM Tivoli Storage Manager messages are constructed in three parts. The first part of the message is three characters long and represents where the message originated. The next four numbers are the real message number. The last character shows the type of message. Consider this example:

```
ANR 1404 W
```

The three most common message prefixes are:

- ANE: Messages that begin with prefix ANE and are in range 4000 through 4999 originate from the backup-archive client.
- ANR: Messages that begin with prefix ANR originate from the server.
- ANS: Messages that begin with prefix ANS are from one of the following clients:
  - Administrative clients
  - Application program interface clients
  - Backup–archive clients
  - Space Manager (HSM) clients
  - Data Protection for Lotus Notes®

The available message suffixes are:

- I= Information
- E = Error
- S = Severe Error
- W = Warning
- K = Kernel message that originates from the HSM client

Message number ANR1404W can be as interpreted as server warning message 1404.

For a complete list of all IBM Tivoli Storage Manager message numbers, refer to *IBM Tivoli Storage Manager Messages*, GC32-0767, supplied with the IBM Tivoli Storage Manager software.

12.4 Forcing the IBM Tivoli Storage Manager server to end

If the IBM Tivoli Storage Manager server is hung and cannot be ended using the normal IBM Tivoli Storage Manager **halt** command, then we recommend that you use the following alternatives (in order) to end the IBM Tivoli Storage Manager server.

12.4.1 Ending IBM Tivoli Storage Manager from within OS/400 PASE

Use the following steps to end the IBM Tivoli Storage Manager server from within OS/400 Portable Application Solutions Environment (PASE):

1. Start an OS/400 PASE session. Enter the following command from an OS/400 command line:

   ```
   call qp2term
   ```

2. On the shell command line, enter the AIX command:

   ```
   ps -ef
   ```

   This command is like the OS/400 Work with Active Jobs (WRKACTJOB) for OS/400 PASE. Figure 12-4 shows the resulting display from this command. Here you can see the IBM Tivoli Storage Manager server running with process ID 776.

```
                          /QOpenSys/usr/bin/-sh

  $
> ps -ef
       UID PID PPID   C    STIME    TTY  TIME CMD
      itsm 776   1   0 16:04:33      -  0:03 /usr/tivoli/tsm/server/bin/dsmserv
      itsm 780 779   0 16:05:38      -  0:00 /QOpenSys/usr/bin/-sh -i
      itsm 781 780   0 16:05:43      -  0:00 ps -ef
  $

===> kill -11 776

F3=Exit     F6=Print   F9=Retrieve   F11=Truncate/Wrap
F13=Clear   F17=Top    F18=Bottom    F21=CL command entry
```

Figure 12-4 OS/400 PASE ps -ef command

3. To end the IBM Tivoli Storage Manager server, use the AIX **kill** command:

   ```
   kill -11 776
   ```

   In this example, *776* is our process number. You should replace this number with your own process number using the **ps -ef** command.

   The **kill** command should end your IBM Tivoli Storage Manager server and place a core dump file (called a *core* on AIX) in the IBM Tivoli Storage Manager server's IFS directory. This file can be useful for IBM Tivoli Storage Manager support personnel in analyzing the cause of your IBM Tivoli Storage Manager server hang. In our example, the core dump file /usr/tivoli/tsm/server/bin/core was created.

4. When the IBM Tivoli Storage Manager server is ended, you may have to delete the IBM Tivoli Storage Manager server lock file from the IFS before you restart the IBM Tivoli

Storage Manager server. If you are sure that the IBM Tivoli Storage Manager server is ended, you can delete this file from the IBM Tivoli Storage Manager servers directory. In this example, we delete the lock file by entering the following OS/400 command:

```
RMVLNK OBJLNK('/usr/tivoli/tsm/server/bin/adsmserv.lock')
```

12.4.2 Ending the IBM Tivoli Storage Manager server for OS/400 PASE with the ENDJOB command

To end the IBM Tivoli Storage Manager server using the OS/400 End Job (ENDJOB) command, follow these steps:

1. Start an OS/400 PASE session. Enter the following command:

   ```
   call qp2term
   ```

2. On the shell command line, enter the following AIX command to find the process ID of the IBM Tivoli Storage Manager server:

   ```
   ps -ef
   ```

   In the example shown in Figure 12-5, you can see that the IBM Tivoli Storage Manager server is running with process ID 791.

```
                                /QOpenSys/usr/bin/-sh
$
 > ps -ef
        UID PID PPID   C    STIME    TTY  TIME CMD
       itsm 791   1   0 16:40:45      -  0:03 /usr/tivoli/tsm/server/bin/dsmserv
       itsm 801 779   0 16:55:21      -  0:00 /QOpenSys/usr/bin/-sh -i
       itsm 802 801   0 16:55:29      -  0:00 ps -ef
   $
 > system qsh "cmd('getjobid 791')"
   Process identifier 791 is 063454/ITSM/TSMPASESRV
   QSH0005: Command ended normally with exit status 0.
   $

===>
 F3=Exit     F6=Print   F9=Retrieve   F11=Truncate/Wrap
 F13=Clear   F17=Top    F18=Bottom    F21=CL command entry
```

Figure 12-5 OS/400 PASE getjobid command

3. Entered the following shell command to find the OS/400 job name and number of the active IBM Tivoli Storage Manager server:

   ```
   system qsh "cmd('getjobid 791')"
   ```

   In this example, we used process number 791. You should replace this number with your own process number using the **ps -ef** command.

4. End the IBM Tivoli Storage Manager server by using the ENDJOB command from an OS/400 command line. In this example, we entered the following OS/400 command:

   ```
   ENDJOB JOB(063454/ITSM/TSMPASESRV) OPTION(*IMMED)
   ```

   Replace the job name and number of the one you received in the previous step.

12.4.3 Ending the IBM Tivoli Storage Manager server for OS/400 PASE with the ENDJOBABN command

You can only use the End Job Abnormal (ENDJOBABN) command 10 minutes after the you enter the ENDJOB command. Use the following example to end the IBM Tivoli Storage Manager server using the OS/400 ENDJOBABN command:

1. Retrieve the OS/400 job name and number for the IBM Tivoli Storage Manager server as in the previous exercise.
2. End the IBM Tivoli Storage Manager server by using the ENDJOBABN command from an OS/400 command line. In this example, we entered the following OS/400 command:

   ```
   ENDJOBABN JOB(063454/ITSM/TSMPASESRV)
   ```

   Replace the job name and number with the one you received with the **`system qsh "cmd('getjobid 791')"`** shell command.

12.5 Displaying your IBM Tivoli Storage Manager server configuration

You can display your complete IBM Tivoli Storage Manager server configuration by using the **`query system`** command. The **`query system`** command combines all the IBM Tivoli Storage Manager commands in Table 12-1 together in one display. This information can be useful for your organization, disaster recovery, or for IBM Tivoli Storage Manager support personnel.

Table 12-1 IBM Tivoli Storage Manager commands combined using the query system command

IBM Tivoli Storage Manager command	Function
QUERY ASSOCIATION	Displays the clients associated with one or more schedules
QUERY COPYGROUP	Displays the attributes of a copy group
QUERY DB	Displays allocation information about the database
QUERY DBVOLUME	Displays information about device classes
QUERY DEVCLASS	Displays information about policy domains
QUERY DOMAIN	Displays information about policy domains
QUERY LOG	Displays allocation information about the recovery log
QUERY LOGVOLUME	Displays information about log volumes
QUERY MGMTCLASS	Displays information about management classes
QUERY OPTIONS	Displays information about server options
QUERY PROCESS	Displays information about background processes
QUERY SCHEDULE	Displays information about schedules
QUERY SESSION	Displays information about all active administrative and client sessions
QUERY STATUS	Displays the settings of server parameters
QUERY STGPOOL	Displays information about storage pools
QUERY VOLUME	Displays information about storage pool volumes

12.6 IBM Tivoli Storage Manager support Web page

The IBM Tivoli Storage Manager support Web page provides links to all your support needs. Here you can find the latest information about releases, Authorized Program Analysis Records (APARs), supported devices, support flashes, client/server requirements, documentation, etc. You can find the IBM Tivoli Storage Manager support Web page at:

http://www-3.ibm.com/software/sysmgmt/products/support/IBMTivoliStorageManager.html

This redbook discusses related Tivoli Storage Manager fix information in 4.4, “Downloading IBM Tivoli Storage Manager for OS/400 PASE fixes” on page 48.

Part 5

Appendixes

The appendixes in this part offer additional assistance when backing up and recovering with the Backup Recovery and Media Services and IBM Tivoli Storage Manager on OS/400 Portable Application Solutions Environment (PASE) products:

- Appendix A, “General backup and recovery considerations” on page 369, offers a list of questions as a starting point to assist you in developing your own iSeries backup and recovery processes for your environment.
- Appendix B, “Backup Recovery and Media Services reports” on page 375, contains examples of BRMS recovery reports for a:
  - Full system backup to tape
  - Full system backup to tape and an ITSM server

  The BRMS recovery reports are one of the highlights of the product that users consider invaluable. The content of these reports clearly identifies the steps to perform a recovery, based on a specific BRMS-initiated backup that is already performed. While a complete description of the kinds of information that are contained in any such report is beyond the scope of this redbook, you can review the text within these sample reports for a good understanding of how BRMS helps you recover, step by step.
- Appendix C, “AIX administrative client in OS/400 PASE sample programs” on page 399, contains a source listing of a set of pSeries (AIX) IBM Tivoli Storage Manager client programs and explains how to download them. iSeries programs using these AIX IBM Tivoli Storage Manager client programs can provide additional integration of IBM Tivoli Storage Manager for OS/400 PASE server functions that are not directly available in current BRMS and IBM Tivoli Storage Manager products. Examples using these programs are included in 6.2.2, “Creating IBM Tivoli Storage Manager and BRMS exit programs” on page 98, and 10.1, “Sample programs for IBM Tivoli Storage Manager, BRMS media movement” on page 338.

  You can download programs using these AIX IBM Tivoli Storage Manager programs as part of this redbook as described in Appendix D, “Additional material” on page 411.

- Appendix D, “Additional material” on page 411, shows how to download the programs used in this redbook that use the pSeries (AIX) IBM Tivoli Storage Manager client programs.

A

General backup and recovery considerations

This appendix provides general backup and recovery considerations for backing up your data. Use this information as a basic checklist to develop and test your backup and recovery processes. Most of the items considered are not specific to only the iSeries server.

Consideration before you begin

No one seems to have discovered the perfect backup solution even if you think you have. It may be that the combination of Backup Recovery and Media Services (BRMS) and IBM Tivoli Storage Manager, the focus of this redbook, is still not the complete solution for you.

Before you start implementing your backup and recovery processes, be sure to review this appendix.

A way to evaluate your backup and recovery plan is to forget about your current plans. Start over and see how much your current plan actually protects you. The most vital questions are:

- What consequences will there be if we lose data?
- For how long can we run our business without key data?

These are not easy questions to answer. However, when you can, you will have a pretty good idea what you have to do.

For everything, there is a cost. For example, is the cost of protecting us up to the last minute of data change higher than losing the business for a given time period? You must sort out these types of considerations before you start determining how you save the data itself.

There are other things that you may lose, such as your data systems, your wiring, your site, your personnel, etc., that can hurt your business. This is outside the scope of this redbook. But nevertheless, you have to have a plan for such situations.

When you have an idea of understanding the business impact, then you need to sort out the kind of resources you can afford and the people you have available (or need).

Your personnel plays a key role in securing your data. You have the best person in place today, but you cannot be sure that you have them tomorrow. Good advice says to keep everything as simple and straightforward as possible so you are not in the hand of experts, which can turn out to be costly from several aspects.

You may think all this is too much and say, “OK. I'll take the cost and go for the highest protection possible for a mirrored system.” This may shield you from many things, but not from everything. Remember that most data losses are due to human errors and bad application coding, not by faulty equipment. For example, in a mirrored environment, if a user deletes a file, within seconds it is deleted in your backup system as well. How do you recover from that without a backup copy?

For some reason, bad things have a tendency to happen at the worst possible point in time. Be sure you have good, up-to-date documentation and that the people involved know where the documentation is and are trained to use it. Recovery time is *vital*.

Table A-1 lists questions to ask yourself and includes space for you to record your answer and any action plan for each question.

Table A-1 General backup and recovery questions checklist

Question	Answer	Action plan
What data can we afford to lose? ► Application_____ ► Application_____ ► Application_____ ► _____ _____		
What is more important, easy backup or easy restore?		
What is most important, a fast backup or fast restore?		
Some backups require that the system or application is not active. ► Can we accept that? ► When? ► For how long (time)?		
Who does the backups?		
Who is going to do the restore, anyone or is there a need for a professional?		
At restore, will we allow special routines or must everything be as automatic as possible?		
Is there an absolute point in time when we have to be up and running after a disaster? Exactly what has to be in operation?		
What is going to be backed up?		
When will we perform the backup?		
Will we spread the backups over time?		
Will we always back up the same thing?		
Will we take full backups or only the part that is changed?		
Where will we physically store our backups?		
How do we access our backup media in case there is need of an urgent restore?		
Who verifies that everything works as planned?		

Question	Answer	Action plan
If there are malfunctions, who makes the decision regarding what to do? Do the start recovery activities? Where do they start?		
How high is the system or key object utilization (busyness) when we want to back up?		
Is it possible to make backups in parallel?		
Is it possible to perform restores in parallel?		
What is the exact last point in time a backup must be finished? What do we do if it isn't?		
How much data in the integrated file system (IFS) do we need to back up?		
Is Domino installed?		
Do any other servers in the iSeries need backup? ► Which?_____ ► _____		
Do our applications need a special stop program before we can back them up? ► Which? _____ ► _____ ► _____ ► _____		
Do we need to save printed output? Which listings? ► _____ ► _____ ► _____ ► _____ ► _____ ► _____ ► _____		
How long will we keep our backups?		
Do we intend to use backup generations? Consider not using this option in BRMS since there are several drawbacks and it is only available through the 5250 interface.		

Question	Answer	Action plan
What kind of detail information do we require in terms of object information? How long must we keep that information about that detailed level? **Attention**: Detail information requires significantly more disk space and extends the backup time.		
Will there be backups that will be saved for a considerable length of time? Do we require the backup application to keep track of those as well?		
Note that system backups must go to directly to tape.	There is no way around this. You must back up to tape.	
Do we have access to a library device of any kind, such as the 3582? If we don't, consider getting one. Use of these class of devices can expedite backup and recovery processing.		
If the iSeries is partitioned, we may have to share tape devices. (You must have a way to share the drive between the partitions.) Can we move the tape device easily or does it require planning?	This is important in an IBM Tivoli Storage Manager environment.	
Is there an alternate power source available? Consider getting one. Evaluate how long is must be able to keep the system up and running. Do not forget the other equipment needed to keep the business alive.		

After the evaluation

After your evaluation, try your steps and actions. Keep in mind the following considerations:

- Do not forget the most important thing: Test recovery! The result may not be what you hoped for. A paper only plan is worth nothing until tested and proven.
- Practice recovery regularly.
- Sign up for at least one Business Recovery Session at least once a year.
- Experience has shown that Recovery testing has a tendency to be pushed aside by “more important” tasks. Schedule a date and stay with it as close as possible.
- The first time you can plan what you are about to do in good order and see what surprises you have. Remember to follow your written instructions exactly. You may have to perform several test recoveries before it works to your satisfaction.
- The final test comes when letting someone else cause a problem without warning you in advance. Of course, that does not mean that someone should physically unplug your data system, but merely come in and say, for example, “We had a disaster 10 minutes ago. You must have the following applications up and running within *xx* hours from now”. This leads to several possible actions. Some can be single threaded. Some can be done in parallel. The exact scenario has to be more specific than that, but it is good to keep in mind.

IBM has availability services that can assist you in setting up and testing backup and recovery procedures that are sufficient for your production environment.

B

Backup Recovery and Media Services reports

This appendix contains the Backup Recovery and Media Services (BRMS) full system recovery report. BRMS recovery reports are a blue print used to recover a complete system if a disaster or some other problem makes the system unusable. A full system recovery report is generated as spooled file QP1ARCY.

This appendix shows two examples of recovery reports:

- Full system recovery report to tape
- Full system recovery report to tape and IBM Tivoli Storage Manager server

You can review the text within a report to understand the kinds of things that BRMS does and what it tells you to do step by step.

Full system recovery report to tape

The report in Example B-1 shows a sample recovery report generated by Backup Recovery and Media Services when saving to an attached tape drive. In our case, the full backup for system AS27 was made to tape library IBM 3584.

Example: B-1 Full system recovery report to tape for system AS27

```
5722BR1 V5R2M0 020906        Recovering Your Entire System                      AS27
*************************************************************************************************
Selection Criteria
Option . . . . . . . . . . . . . : *SYSTEM
Start date and time  . . . . . . : *BEGIN   *AVAIL
Ending date and time . . . . . . : *END     *AVAIL
Use save files . . . . . . . . . : *NO
Use TSM  . . . . . . . . . . . . : *NO
Auxiliary storage pool . . . . . :
System name  . . . . . . . . . . : AS27
Volume location  . . . . . . . . : *ALL
Library to omit  . . . . . . . . : *DELETE
*********************
***** ATTENTION *****
*********************
This report excludes objects saved to either save files or TSM servers.
Media information is available for either one or both of these media
types. The report may not show the latest level of saved items.
Verify whether you should run the report again including this media.
*************************************************************************************************
The following report is to be used in conjunction with the "Backup and
Recovery" book, SC41-5304, to assist with recovery from failures.
*************************************************************************************************
When recovering your system, refer to the section on "Recovering
after a Complete Loss" under chapter "Selecting the Right Recovery
Strategy" in the "Backup and Recovery" book, and the details shown
below to determine which recovery steps should be taken and the media
needed for each step.
For information about BRMS recoveries using a Media Library Device refer
to the "Backup Recovery and Media Services for OS/400: A Practical Approach",
SG24-4840, and the "Automated Tape Library
Planning and Management" book, SC41-5309.
If you have logical files, and based-on physical and logical files
are in different libraries refer to the section on "Restoring Logical
Files" in the "Backup and Recovery" book for important restore
considerations before proceeding with recovery.
If you use journaling refer to the section on "Restoring Journals and
Journal Receivers" in the "Backup and Recovery" book for important
restore considerations before proceeding with recovery.
restore considerations before proceeding with recovery.
You can use the Start date/time, Stop date/time and Duration fields
to record the time it takes to test or perform your recovery.
A value of *SYSBAS for ASP Name refers to saved items backed up from
the system (1) or basic user (2-32) auxiliary storage pools.
A value of *TSM for Volume Identifier refers to saved items backed
up to Tivoli Storage Manager (TSM) servers.
*************************************************************************************************
STEP: Recover Licensed Internal Code
   Start date/time _________________  Stop date/time _________________  Duration _________________
         Use media as shown below and the procedure for "Recovering the
```

```
        Licensed Internal Code" in the "Backup and Recovery" book.
        __ Use "Option 2" if you are recovering to a different system or if
           you are recovering to a system with user ASP(s) or if you are
           recovering to the same system with a different release.
        __ Use "Option 3" if you are recovering to the same release and same
           system or you are recovering a logical partition to another logical
           partition.
--- Attention ----------------------------------------------------
        If you are using a media library device, you will need to use either
        standalone, automatic or manual mode, or use the device move media
        function to load the media volume containing the *SAVSYS saved item.
        Refer to the device documentation if you are not familiar with these
        device modes or functions.
        ------------------------------------------------------------------
   Saved            ----- ASP ------  Save     Save                  Sequence  Control    Volume
   Item       Type  Name      Number  Date     Time    Objects Omit  Number    Group      Identifier
   ---------- ----- ---------- ----- -------- -------- ------- ----- --------- ---------- ----------
__ *SAVSYS    *FULL *SYSBAS    00001  8/14/03 16:58:46       0              1 *SYSTEM    LB0702
********************************************************************************************************
STEP: Recover operating system
   Start date/time ________________  Stop date/time ________________  Duration ________________
        Use the media shown below and the procedure for "Restoring the Operating
        System using the Complete Restore Method", as detailed in the "Backup
        and Recovery" book.
        After sign on, display and change the following system values before
        continuing with the recovery.
To do so, run the following command:
           WRKSYSVAL
        __ Use option 5=Display to show the current system value setting.
        __ Record the current setting for use after recovery is complete.
        __ Use option 2=Change to change the system value to the new setting.
        ------------------------------------------------------------------
           System value   Current setting    New setting
           QALWOBJRST     ________________   *ALL
           QFRCCVNRST     ________________   0
           QIPLTYPE       ________________   2
           QJOBMSGQFL     ________________   *PRTWRAP
           QJOBMSGQMX     ________________   30 (minimum, 64 recommended)
           QPFRADJ        ________________   2
           QVFYOBJRST     ________________   1
        ------------------------------------------------------------------
        After changing the system values, sign off using the following command:
           SIGNOFF LOG(*LIST)
        Using a newly created password, sign back on as QSECOFR for the new
system values to take effect.
   Saved            ----- ASP ------  Save     Save                  Sequence  Control    Volume
   Item       Type  Name      Number  Date     Time    Objects Omit  Number    Group      Identifier
   ---------- ----- ---------- ----- -------- -------- ------- ----- --------- ---------- ----------
__ *SAVSYS    *FULL *SYSBAS    00001  8/14/03 16:58:46       0              1 *SYSTEM    LB0702
********************************************************************************************************
STEP: Setting up standalone or media library devices for recovery
   Start date/time ________________  Stop date/time ________________  Duration ________________
        If you are using a media library device and automatic configuration was
        enabled, you can now use the media library device to automate recovery.
        --- Attention ------------------------------------------------
        To perform automated recovery using a media library device, you must
        have performed the save with the media library device enabled for
        library operations.
        ------------------------------------------------------------------
        --- Attention ------------------------------------------------
```

```
        If you are using a 3494 Media Library for recovery, you will need to
 configure and set up the communications necessary to control the
        cartridge loader.
-----------------------------------------------------------------
        For recovery using the device as a media library (TAPMLBxx):
        __ A. Unload the media volume containing the *SAVSYS saved item from
              the device.
        __ B. Load all the volumes needed for the recovery (including the
              *SAVSYS volume) in the media library.
        __ C. Set the media library device for library operations. Refer to
              the device documentation if you are not familiar with enabling
              the device for library operations.
        __ D. Use the following command to verify that the status of the
              media library device is VARIED ON.
                 WRKMLBSTS
        __ E. Use Option 4=Allocate resource to set the current allocation of
              the media library resources to ALLOCATED.
        For recovery using the device as a stand alone device (TAPxx):
        __ A. Retrieve all volumes needed for recovery. If you are using an
              automatic cartridge loader, insert the volumes in the loader in
              the required sequence.
__ B. Enter the following command:
                 WRKDEVD DEVD(*TAP)
        __ C. Use Option 8=Work with status to verify that the status of the
              device you are using is VARIED ON.
*****************************************************************************************************
STEP: Recover the BRMS product and associated libraries
   Start date/time ________________  Stop date/time ________________  Duration ________________
        The BRMS product and associated libraries must be recovered before
        you can use the product to perform other recovery operations.
        To prevent messages that are not related to the recovery from
        interrupting the recovery process, run the following command:
           CHGMSGQ MSGQ(QSYSOPR) DLVRY(*NOTIFY) SEV(99)
        Use the following command to see which tape devices are configured:
           WRKCFGSTS CFGTYPE(*DEV) CFGD(*TAP)
        Or use the following command to see which media library devices are
        configured:
           WRKCFGSTS CFGTYPE(*DEV) CFGD(*TAPMLB)
        Run the following command for each of the libraries listed below
        specifying the saved-item, the device name of the standalone drive or
media library you are using, and the volume identifiers and sequence
        numbers listed.
        For type *FULL use the command:
RSTLIB SAVLIB(saved-item) DEV(device-name)
                 VOL(volume-identifier) SEQNBR(sequence-number)
        For type *CUML or *INCR use the command:
           RSTOBJ OBJ(*ALL) SAVLIB(saved-item) DEV(device-name)
                 VOL(volume-identifier) SEQNBR(sequence-number)
   Saved              ----- ASP ------  Save     Save                  Sequence  Control    Volume
   Item       Type  Name      Number  Date     Time     Objects Omit  Number    Group      Identifier
   ---------- ----- ---------- ----- -------- -------- ------- ----- --------- ---------- ----------
__ QBRM       *FULL *SYSBAS    00001  8/14/03 17:09:05   1,193              44 *SYSTEM    LB0702
__ QMSE       *FULL *SYSBAS    00001  8/14/03 17:09:05       7              89 *SYSTEM    LB0702
__ Q1ABRMSF   *FULL *SYSBAS    00001  8/14/03 17:09:05       1             127 *SYSTEM    LB0702
__ Q1ABRMSF01 *FULL *SYSBAS    00001  8/14/03 17:09:05       3             128 *SYSTEM    LB0702
__ QUSRBRM    *FULL *SYSBAS    00001  8/14/03 17:45:44     197             533 *SYSTEM    LB0702
*****************************************************************************************************
STEP: Recover BRMS related media information
Start date/time ________________  Stop date/time ________________  Duration ________________
        You must recover this information for the BRMS product to accurately
```

```
        guide you through the remaining recovery steps.
        Run the following command for each of the libraries listed below
        specifying the saved-item, the device name of the standalone drive or
        media library you are using, and the volume identifiers and sequence
        numbers listed.
           RSTOBJ OBJ(*ALL) SAVLIB(saved-item) DEV(device-name)
                  VOL(volume-identifier) SEQNBR(sequence-number)
   Saved            ----- ASP ------  Save     Save                  Sequence  Control    Volume
   Item       Type  Name      Number  Date     Time    Objects Omit  Number    Group      Identifier
   ---------- ----- ---------- ----- -------- -------- ------- ----- --------- ---------- ----------
__ QUSRBRM    *QBRM *SYSBAS    00001  8/14/03 18:28:57      12             536 *SYSTEM    LB0702
*************************************************************************************************
STEP: Initialize BRMS functional authority information
   Start date/time ________________  Stop date/time ________________  Duration ________________
        You must perform this step to initialize BRMS functional authorities.
        Use the following command to register all BRMS functional authority
        resources with the OS/400 functional authority manager.
           INZBRM OPTION(*SETAUT)
        Use the following command to assure the QSECOFR user profile has
        authority to use the managed functional authority resources.
           SETUSRBRM USER(QSECOFR) USAGE(*ADMIN)
*************************************************************************************************
STEP: Update system name in BRMS media information
   Start date/time ________________  Stop date/time ________________  Duration ________________
        You must update the system name in the saved BRMS media information
        if you are recovering to a system or logical partition with a system
        name that is different from the system name of the save.
        To do so, run the following command:
           INZBRM OPTION(*CHGSYSNAM) PRVSYSNAM(previous-name) NEWSYSNAM(new-name)
*************************************************************************************************
STEP: Initialize BRMS device and media library information
   Start date/time ________________  Stop date/time ________________  Duration ________________
        You must initialize the BRMS device and media library information.
        Use the following command to clear and initialize the BRMS device and
        media library information with the tape and media library devices
        currently configured on the system:
           INZBRM OPTION(*DEVICE)
        INZBRM OPTION(*DEVICE) resets some device information to the BRMS
        supplied defaults. Review the BRMS device information using the
        following command:
           WRKDEVBRM
        Update the BRMS device information with any changes necessary to
        continue with your recovery.
*************************************************************************************************
STEP: Recover user profiles
   Start date/time ________________  Stop date/time ________________  Duration ________________
        You should restore a current version of your user profiles.
        To do so, run the following command:
           STRRCYBRM OPTION(*SYSTEM) ACTION(*RESTORE)
        --- Attention ------------------------------------------------------
        Press F9 (Recovery defaults) on the Select Recovery Items display.
        Ensure the tape device name or media library device name that you are
        using is correct.
        --------------------------------------------------------------------
        --- Attention ------------------------------------------------------
        If recovering to a different system or recovering a logical partition
        to another logical partition, you must specify the following:
           __ *ALL on the Allow object differences (ALWOBJDIF) parameter
           __ *ALL on the Data base member option (MBROPT) parameter
           __ *NONE on the System resource management (SRM) parameter
```

```
        ------------------------------------------------------------------
        Select and recover the following saved item(s) on the "Select Recovery
        Items" display using the specified volume(s).
   Saved            ----- ASP ------  Save     Save                  Sequence  Control    Volume
   Item       Type  Name      Number  Date     Time    Objects Omit  Number    Group      Identifier
   ---------- ----- ---------- ----- -------- -------- ------- ----- --------- ---------- ----------
__ *SAVSECDTA *FULL *SYSBAS    00001  8/14/03 16:58:46     869              35 *SYSTEM    LB0702
*******************************************************************************************************
STEP: Change QSECOFR user profile password
   Start date/time ___________________  Stop date/time ___________________  Duration ___________________
        If you do not know the password for the restored QSECOFR user profile,
        use the following command to change the password now:
           CHGUSRPRF USRPRF(QSECOFR) PASSWORD (new-password)
*******************************************************************************************************
STEP: Recover BRMS required system libraries
   Start date/time ___________________  Stop date/time ___________________  Duration ___________________
        You must restore specific system libraries before you can use BRMS to
        perform other recovery steps.
        If the "Select Recovery Items" display is not shown and you are
        performing a complete system restore, run the following command:
           STRRCYBRM OPTION(*RESUME)
        Otherwise, run the following command(s):
           STRRCYBRM OPTION(*SYSTEM) ACTION(*RESTORE)
        Select and recover the following saved item(s) on the "Select Recovery
        Items" display using the specified volume(s).
   Saved            ----- ASP ------  Save     Save                  Sequence  Control    Volume
   Item       Type  Name      Number  Date     Time    Objects Omit  Number    Group      Identifier
   ---------- ----- ---------- ----- -------- -------- ------- ----- --------- ---------- ----------
__ QGPL       *FULL *SYSBAS    00001  8/14/03 17:20:52     459             292 *SYSTEM    LB0702
__ QUSRSYS    *FULL *SYSBAS    00001  8/14/03 17:20:52   2,449             299 *SYSTEM    LB0702
__ QSYS2      *FULL *SYSBAS    00001  8/14/03 17:20:52     131             296 *SYSTEM    LB0702
*******************************************************************************************************
STEP: Recover configuration data
   Start date/time ___________________  Stop date/time ___________________  Duration ___________________
        You should restore a current version of your system configuration.
        If the "Select Recovery Items" display is not shown and you are
        performing a complete system restore, run the following command to
        continue:
           STRRCYBRM OPTION(*RESUME)
        Otherwise, run the following command(s):
           STRRCYBRM OPTION(*SYSTEM) ACTION(*RESTORE)
        Select and recover the following saved item(s) on the "Select Recovery
        Items" display using the specified volume(s).
   Saved            ----- ASP ------  Save     Save                  Sequence  Control    Volume
   Item       Type  Name      Number  Date     Time    Objects Omit  Number    Group      Identifier
   ---------- ----- ---------- ----- -------- -------- ------- ----- --------- ---------- ----------
__ *SAVCFG    *FULL *SYSBAS    00001  8/14/03 16:58:46     290              36 *SYSTEM    LB0702
   Start date/time ___________________  Stop date/time ___________________  Duration ___________________
        You must reset the BRMS device and media library information.
        Use the following command to clear and initialize the BRMS device and
        media library information with the tape and media library devices
        currently configured on the system:
           INZBRM OPTION(*DEVICE)
        INZBRM OPTION(*DEVICE) resets some device information to the BRMS
        supplied defaults. Review the BRMS device information using the
        following command:
           WRKDEVBRM
        Update the BRMS device information with any changes necessary to
        continue with your recovery.
*******************************************************************************************************
```

```
STEP: Recover by control group
   Start date/time _________________  Stop date/time _________________  Duration _________________
         Depending on your recovery strategy, you may choose to restore your
         system by control groups.
         --- Attention ------------------------------------------------------
         Recovery by control group requires knowledge of the data saved by the
         control group and of the system resources needed to complete this
         type of recovery.
         --------------------------------------------------------------------
         If you do not want to recover by control group, continue with "Step:
         Recover all remaining system and user data".
         Otherwise, run the following command to retrieve the list of control
         groups, then select and sequence the control groups to be recovered:
            STRRCYBRM OPTION(*CTLGRP) ACTION(*RESTORE) CTLGRP(*SELECT)
         --- Attention ------------------------------------------------------
         Press F9 (Recovery defaults) on the Select Recovery Items display.
         Ensure the tape device name or media library device name that you are
         using is correct.
         --------------------------------------------------------------------
         Press F16 to select all recovery items.
         Otherwise, select the individual items you need to recover.
         Use the media listed on the "Select Recovery Items" display.
         After the saved items are recovered, continue with the step following
         "STEP: Recover objects in directories".
         --- Attention ------------------------------------------------------
         If you have logical files whose based-on physical files are in a
         different library, you must restore all based-on physical files
         before you can restore the logical file.
         --------------------------------------------------------------------
         --- Attention ------------------------------------------------------
         If you use journaling, the libraries containing the journals must be
         restored before restoring the journaled files.
         --------------------------------------------------------------------
*****************************************************************************************************
STEP: Recover all remaining system and user data
   Start date/time _________________  Stop date/time _________________  Duration _________________
         You may now select to recover all of the data on your system.
         To do so, run the following command:
            STRRCYBRM OPTION(*RESUME)
         --- Attention ------------------------------------------------------
         Press F9 (Recovery defaults) on the Select Recovery Items display.
         Ensure the tape device name or media library device name that you are
         using is correct.
         --------------------------------------------------------------------
         Press F16 to select all recovery items.
         After the saved items are recovered, continue with the step following
         "STEP: Recover objects in directories".
         Otherwise, continue with the following step.
*****************************************************************************************************
STEP: Recover IBM product libraries
   Start date/time _________________  Stop date/time _________________  Duration _________________
         You should restore the current version of your IBM libraries.
         If you are performing a complete system restore, run the following
         command to continue:
            STRRCYBRM OPTION(*RESUME)
         Otherwise, run the following command(s):
            STRRCYBRM OPTION(*IBM) ACTION(*RESTORE)
         Select and recover the following saved item(s) on the "Select Recovery
         Items" display using the specified volume(s).
   Saved            ----- ASP ------  Save     Save                 Sequence  Control    Volume
```

```
   Item       Type  Name      Number  Date     Time     Objects Omit  Number    Group      Identifier
   ---------- ----- ---------- ----- -------- -------- ------- ----- --------- ---------- ----------
__ #COBLIB    *FULL *SYSBAS    00001  8/14/03 17:09:05      82              38 *SYSTEM    LB0702
__ #RPGLIB    *FULL *SYSBAS    00001  8/14/03 17:09:05      55              39 *SYSTEM    LB0702
__ QADM       *FULL *SYSBAS    00001  8/14/03 17:09:05       1              40 *SYSTEM    LB0702
__ QADMBKUP   *FULL *SYSBAS    00001  8/14/03 17:09:05      12              41 *SYSTEM    LB0702
__ QADMDISTP  *FULL *SYSBAS    00001  8/14/03 17:09:05       6              42 *SYSTEM    LB0702
__ QASE5      *FULL *SYSBAS    00001  8/14/03 17:09:05      83              43 *SYSTEM    LB0702
__ QCAEXP     *FULL *SYSBAS    00001  8/14/03 17:09:05      17              45 *SYSTEM    LB0702
__ QCAP3      *FULL *SYSBAS    00001  8/14/03 17:09:05      15              46 *SYSTEM    LB0702
__ QCA400W    *FULL *SYSBAS    00001  8/14/03 17:09:05       8              47 *SYSTEM    LB0702
__ QCBL       *FULL *SYSBAS    00001  8/14/03 17:09:05      74              48 *SYSTEM    LB0702
*******************************************************************************************************
STEP: Recover user libraries
   Start date/time ________________  Stop date/time ________________  Duration ________________
         You should restore the current version of your user libraries.
         If you are performing a complete system restore, run the following
         command to continue:
            STRRCYBRM OPTION(*RESUME)
         Otherwise, run the following command(s):
            STRRCYBRM OPTION(*ALLUSR) ACTION(*RESTORE)
         Select and recover the following saved item(s) on the "Select Recovery
         Items" display using the specified volume(s).
         --- Attention --------------------------------------------------
         If you have logical files whose based-on physical files are in a
         different library, you must restore all based-on physical files
         before you can restore the logical file.
         ----------------------------------------------------------------
         --- Attention --------------------------------------------------
         If you use journaling, the libraries containing the journals must be
         restored before restoring the journaled files.
         ----------------------------------------------------------------
   Saved            ----- ASP ------  Save     Save                 Sequence  Control    Volume
   Item       Type  Name      Number  Date     Time     Objects Omit  Number    Group      Identifier
   ---------- ----- ---------- ----- -------- -------- ------- ----- --------- ---------- ----------
__ #LIBRARY   *FULL *SYSBAS    00001  8/14/03 17:20:52       2            130 *SYSTEM    LB0702
__ AH         *FULL *SYSBAS    00001  8/14/03 17:20:52       5            131 *SYSTEM    LB0702
__ ALEKN      *FULL *SYSBAS    00001  8/14/03 17:20:52       4            132 *SYSTEM    LB0702
__ BANKDATA   *FULL *SYSBAS    00001  8/14/03 17:20:52       2            174 *SYSTEM    LB0702
__ BOATS      *FULL *SYSBAS    00001  8/14/03 17:20:52      31            175 *SYSTEM    LB0702
__ CASETUP    *FULL *SYSBAS    00001  8/14/03 17:20:52      19            176 *SYSTEM    LB0702
__ CA01LIB    *FULL *SYSBAS    00001  8/14/03 17:20:52       1            177 *SYSTEM    LB0702
__ DUPQGPL    *FULL *SYSBAS    00001  8/14/03 17:20:52     175            239 *SYSTEM    LB0702
__ DXXSAMPLES *FULL *SYSBAS    00001  8/14/03 17:20:52      38            240 *SYSTEM    LB0702
__ EJSADMIN4  *FULL *SYSBAS    00001  8/14/03 17:20:52      69            241 *SYSTEM    LB0702
__ EXAMP40AE  *FULL *SYSBAS    00001  8/14/03 17:20:52      35            242 *SYSTEM    LB0702
__ QDSNX      *FULL *SYSBAS    00001  8/14/03 17:20:52       3            291 *SYSTEM    LB0702
__ QMPGDATA   *FULL *SYSBAS    00001  8/14/03 17:20:52      64            293 *SYSTEM    LB0702
__ QPFRDATA   *FULL *SYSBAS    00001  8/14/03 17:20:52      41            294 *SYSTEM    LB0702
__ QRCL       *FULL *SYSBAS    00001  8/14/03 17:20:52       2            295 *SYSTEM    LB0702
__ QUSRDIRDB  *FULL *SYSBAS    00001  8/14/03 17:20:52     256            297 *SYSTEM    LB0702
__ QUSRINFSKR *FULL *SYSBAS    00001  8/14/03 17:20:52       1            298 *SYSTEM    LB0702
__ ROSHANT    *FULL *SYSBAS    00001  8/14/03 17:20:52       5            300 *SYSTEM    LB0702
__ RSTDUPQGPL *FULL *SYSBAS    00001  8/14/03 17:20:52     175            301 *SYSTEM    LB0702
*******************************************************************************************************
STEP: Recover document library objects
   Start date/time ________________  Stop date/time ________________  Duration ________________
         You should restore the current version of your documents, folders and mail.
         If you are performing a complete system restore, run the following
         command to continue:
```

```
            STRRCYBRM OPTION(*RESUME)
         Otherwise, run the following command(s):
            STRRCYBRM OPTION(*ALLDLO) ACTION(*RESTORE)
         Select and recover the following saved item(s) on the "Select Recovery
         Items" display using the specified volume(s).
         --- Attention ------------------------------------------------------
         When you recovery Document Library Objects (DLOs), the system updates
         the search index database information for these DLOs. If the recovery
         fails, the error message may instruct you to run reclaim on the DLOs.
         To do so, run the following command:
            RCLDLO DLO(*ALL)
         After the reclaim, try the DLO recovery again.
         --------------------------------------------------------------------
   Saved            ----- ASP ------  Save     Save                  Sequence  Control    Volume
   Item       Type  Name      Number  Date     Time    Objects Omit  Number    Group      Identifier
   ---------- ----- ---------- ----- -------- -------- ------- ----- --------- ---------- ----------
__ *ALLDLO    *FULL *SYSBAS    00001  8/14/03 17:46:00      29             534 *SYSTEM    LB0702
*****************************************************************************************************
STEP: Recover objects in directories
   Start date/time ________________  Stop date/time ________________  Duration ________________
         You should restore the current version of your objects in directories.
         If you are performing a complete system restore, run the following
         command to continue:
            STRRCYBRM OPTION(*RESUME)
         Otherwise, run the following command(s):
            STRRCYBRM OPTION(*LNKLIST) ACTION(*RESTORE)
         Select and recover the following saved item(s) on the "Select Recovery
         Items" display using the specified volume(s).
   Saved            ----- ASP ------  Save     Save                  Sequence  Control    Volume
   Item       Type  Name      Number  Date     Time    Objects Omit  Number    Group      Identifier
   ---------- ----- ---------- ----- -------- -------- ------- ----- --------- ---------- ----------
__ *LINK      *FULL *SYSBAS    00001  8/14/03 17:46:09 179,468             535 *SYSTEM    LB0702
*****************************************************************************************************
STEP: Recover spooled files for all ASPs
   Start date/time ________________  Stop date/time ________________  Duration ________________
         If spooled files were saved, restore your spooled files using the
         following command:
            WRKSPLFBRM
         Press F16 to select all recovery items.
         Otherwise, select the individual items you need to recover.
         Use the media listed on the "Select Recovery Items" display.
*****************************************************************************************************
STEP: Special Recovery Processing
   Start date/time ________________  Stop date/time ________________  Duration ________________
         IBM iSeries Integration for Windows Server (5722-WSV)
         If iSeries Integration for Windows Server was installed when your
         system was saved and has been restored to the system, perform the
         following steps:
         If the Windows servers were VARIED OFF during the save, perform these
         recovery steps:
         __ a. Add the links for each server description using the following
               command:
                  ADDNWSSTGL NWSSTG(server-storage-name)
                             NWSD(server-description-name)
         __ b. Vary on your Windows servers using the following command:
                  WRKCFGSTS CFGTYPE(*NWS)
Select option 1 to vary on each server.
*****************************************************************************************************
STEP: Special Recovery Processing
   Start date/time ________________  Stop date/time ________________  Duration ________________
```

```
         Recovering Linux servers in a logical partition.
         If Linux servers were running in a logical partition and were VARIED
         OFF when the system was saved, perform these recovery steps:
         __ a. Add the links for each server description using
               the following command:
                  ADDNWSSTGL NWSSTG(server-storage-name)
                             NWSD(server-description-name)
         __ b. Vary on each Linux server using the following command:
                  WRKCFGSTS CFGTYPE(*NWS)
               Select option 1 to vary on each server.
*****************************************************************************************************
STEP: Special Recovery Processing
   Start date/time _________________  Stop date/time _________________  Duration _________________
         IBM Content Manager OnDemand for iSeries (5722-RD1)
         If Content Manager OnDemand for iSeries was installed when your
         system was saved and has been restored to the system, use the
         following commands to enable journaling:
         __ a. CALL QRDARS/QRLCSTRJ PARM('RLC')
         __ b. CALL QRDARS/QRLCSTRJ PARM('RLR')
__ c. CALL QRDARS/QRLCSTRJ PARM('RLO')
*****************************************************************************************************
STEP: Apply journal changes
   Start date/time _________________  Stop date/time _________________  Duration _________________
         To determine if you need to apply journal changes, refer to the
         section "Determining Whether You Need to Apply Journaled Changes"
         under chapter "Restoring Changed Objects and Applying Journaled
         Changes" as detailed in the "Backup and Recovery" book.
*****************************************************************************************************
STEP: Recover authorization information
   Start date/time _________________  Stop date/time _________________  Duration _________________
         You should recover authorization information if user profiles
         were recovered in an earlier step.
         --- Attention -----------------------------------------------------
         Each of these operations can be a long running process.
         -------------------------------------------------------------------
         --- Attention -----------------------------------------------------
         Some authorities may not be restored if the system is not running in
         restricted state.
         -------------------------------------------------------------------
         To restore authorities to objects, run the following command:
            RSTAUT USRPRF(*ALL)
         To restore authority information saved by BRMS for basic user auxiliary
         pools (2-32), run the following command:
            RSTAUTBRM USRASP(*ALLUSR)
*****************************************************************************************************
STEP: Verify system information
   Start date/time _________________  Stop date/time _________________  Duration _________________
         You should verify your system information.
         If you ran either of the following commands after the save, additional
         reports were created that enable you to verify your system information:
            STRRCYBRM PRTSYSINF(*YES)
            STRMNTBRM PRTSYSINF(*YES)
         If you are using distribution media to restore your system, then you
         should use these reports to re-create the system information as
         as detailed in the "Backup and Recovery" book.
*****************************************************************************************************
STEP: Apply PTFs
   Start date/time _________________  Stop date/time _________________  Duration _________________
         Re-apply PTFs that were applied since your last save of system data.
*****************************************************************************************************
```

```
STEP: Print joblog
   Start date/time _____________________  Stop date/time _____________________  Duration _____________________
         You should print the joblog.
         To do so, run the following command:
            DSPJOBLOG JOB(*) OUTPUT(*PRINT)
         Review the job logs or output from your recovery processing
         to ensure that all recovery steps completed successfully.
********************************************************************************************************
STEP: Reset system values
   Start date/time _____________________  Stop date/time _____________________  Duration _____________________
         Use the commands and recorded values in "Step: Recover operating
         system" to change the system values to the original setting or to a
         new value that meets your desired policy.
********************************************************************************************************
STEP: Perform IPL
   Start date/time _____________________  Stop date/time _____________________  Duration _____________________
         Return system to normal mode and IPL using the following command:
            PWRDWNSYS OPTION(*IMMED) RESTART(*YES)
********************************************************************************************************
STEP: Special Recovery Processing
   Start date/time _____________________  Stop date/time _____________________  Duration _____________________
         IBM iSeries Integration for Windows Server (5722-WSV)
         If iSeries Integration for Windows Server was installed when your
         system was saved and has been restored to the system, perform the
         following steps:
         If the Windows servers were VARIED ON during the save, perform these
         recovery steps:
         __ a. Vary off any Windows servers that are VARIED ON using the
               following command:
                  WRKCFGSTS CFGTYPE(*NWS)
               Select option 2 to vary off each server.
         __ b. Create any needed Network Storages using the following command:
                  CRTNWSSTG NWSSTG(server-storage-name)
         __ c. Add the links for each server description using the following
               command:
                  ADDNWSSTGL NWSSTG(server-storage-name)
                             NWSD(server-description-name)
         __ d. Vary on your Windows servers using the following command:
                  WRKCFGSTS CFGTYPE(*NWS)
               Select option 1 to vary on each server.
         __ e. Restore the Windows server data using the following command and
               the volumes listed in "STEP: Recover objects in directories":
                  RST OBJ('/QNTC')
                                * * * * *  E N D  O F  L I S T I N G  * * * * *
```

Full system recovery report to tape and IBM Tivoli Storage Manager server

The report in Example B-2 shows a recovery report generated by BRMS when saving to an attached tape drive and an IBM Tivoli Storage Manager server. In our case, a full backup for system AS02 was made to tape and IBM Tivoli Storage Manager server. For better reading of this report, we enhanced page numbers with “of 19”, because the QP1ARCY spooled file for system AS02 has 19 pages in total.

Example: B-2 Full system recovery report to tape and IBM Tivoli Storage Manager server for system AS02

```
5722BR1 V5R2M0 020906        Recovering Your Entire System AS02
                                                          8/26/03   8:55:45    Page 1 of 19
*************************************************************************************************
Selection Criteria
Option . . . . . . . . . . . . . : *SYSTEM
Start date and time  . . . . . . : *BEGIN   *AVAIL
Ending date and time . . . . . . : *END     *AVAIL
Use save files . . . . . . . . . : *YES
Use TSM  . . . . . . . . . . . . : *YES
Auxiliary storage pool . . . . . :
System name  . . . . . . . . . . : AS02
Volume location  . . . . . . . . : *ALL
Library to omit  . . . . . . . . : *DELETE
*************************************************************************************************
The following report is to be used in conjunction with the "Backup and
Recovery" book, SC41-5304, to assist with recovery from failures.
*************************************************************************************************
When recovering your system, refer to the section on "Recovering
after a Complete Loss" under chapter "Selecting the Right Recovery
Strategy" in the "Backup and Recovery" book, and the details shown
below to determine which recovery steps should be taken and the media
needed for each step.
For information about BRMS recoveries using a Media Library Device refer
to the "Backup Recovery and Media Services for OS/400: A Practical Approach"
redbook, SG24-4840, and the "Automated Tape Library
Planning and Management" book, SC41-5309.
If you have logical files, and based-on physical and logical files
are in different libraries refer to the section on "Restoring Logical
Files" in the "Backup and Recovery" book for important restore
considerations before proceeding with recovery.
If you use journaling refer to the section on "Restoring Journals and
Journal Receivers" in the "Backup and Recovery" book for important
restore considerations before proceeding with recovery.
You can use the Start date/time, Stop date/time and Duration fields
to record the time it takes to test or perform your recovery.
A value of *SYSBAS for ASP Name refers to saved items backed up from
the system (1) or basic user (2-32) auxiliary storage pools.
A value of *TSM for Volume Identifier refers to saved items backed
up to Tivoli Storage Manager (TSM) servers.
*************************************************************************************************
5722BR1 V5R2M0 020906        Recovering Your Entire System AS02
                                                          8/26/03   8:55:45    Page 2 of 19
STEP: Recover Licensed Internal Code
   Start date/time _________________  Stop date/time _________________  Duration _________________
         Use media as shown below and the procedure for "Recovering the
         Licensed Internal Code" in the "Backup and Recovery" book.
         __ Use "Option 2" if you are recovering to a different system or if
            you are recovering to a system with user ASP(s) or if you are
            recovering to the same system with a different release.
         __ Use "Option 3" if you are recovering to the same release and same
            system or you are recovering a logical partition to another logical
            partition.
         --- Attention -----------------------------------------------------
         If you are using a media library device, you will need to use either
         standalone, automatic or manual mode, or use the device move media
         function to load the media volume containing the *SAVSYS saved item.
         Refer to the device documentation if you are not familiar with these
         device modes or functions.
         -------------------------------------------------------------------
```

```
   Saved            ----- ASP ------  Save     Save                  Sequence  Control    Volume
   Item       Type  Name      Number  Date     Time    Objects Omit  Number    Group      Identifier
   ---------- ----- ---------- -----  -------- --------  -------  ----- --------- ---------- ----------
__ *SAVSYS    *FULL *SYSBAS    00001  8/25/03 17:50:59       0               1 SAVSYSPLUS BRM001
*****************************************************************************************************
STEP: Recover operating system
   Start date/time ____________________  Stop date/time ____________________  Duration ________________
         Use the media shown below and the procedure for "Restoring the Operating
         System using the Complete Restore Method", as detailed in the "Backup
         and Recovery" book.
         After sign on, display and change the following system values before
         continuing with the recovery.
         To do so, run the following command:
            WRKSYSVAL
         __ Use option 5=Display to show the current system value setting.
         __ Record the current setting for use after recovery is complete.
         __ Use option 2=Change to change the system value to the new setting.
         ---------------------------------------------------------------------
            System value   Current setting    New setting
            QALWOBJRST     ________________    *ALL
            QFRCCVNRST     ________________    0
5722BR1 V5R2M0 020906        Recovering Your Entire System AS02
                                                          8/26/03   8:55:45    Page 3 of 19
            QIPLTYPE       ________________    2
            QJOBMSGQFL     ________________    *PRTWRAP
            QJOBMSGQMX     ________________    30 (minimum, 64 recommended)
            QPFRADJ        ________________    2
            QVFYOBJRST     ________________    1
         ---------------------------------------------------------------------
         After changing the system values, sign off using the following command:
            SIGNOFF LOG(*LIST)
         Using a newly created password, sign back on as QSECOFR for the new
         system values to take effect.
   Saved            ----- ASP ------  Save     Save                  Sequence  Control    Volume
   Item       Type  Name      Number  Date     Time    Objects Omit  Number    Group      Identifier
   ---------- ----- ---------- -----  -------- --------  -------  ----- --------- ---------- ----------
__ *SAVSYS    *FULL *SYSBAS    00001  8/25/03 17:50:59       0               1 SAVSYSPLUS BRM001
*****************************************************************************************************
STEP: Setting up standalone or media library devices for recovery
   Start date/time ____________________  Stop date/time ____________________  Duration ________________
         If you are using a media library device and automatic configuration was
         enabled, you can now use the media library device to automate recovery.
         --- Attention ---------------------------------------------------
         To perform automated recovery using a media library device, you must
         have performed the save with the media library device enabled for
         library operations.
         ---------------------------------------------------------------------
         --- Attention ---------------------------------------------------
         If you are using a 3494 Media Library for recovery, you will need to
         configure and set up the communications necessary to control the
         cartridge loader.
         ---------------------------------------------------------------------
         For recovery using the device as a media library (TAPMLBxx):
         __ A. Unload the media volume containing the *SAVSYS saved item from
               the device.
         __ B. Load all the volumes needed for the recovery (including the
               *SAVSYS volume) in the media library.
         __ C. Set the media library device for library operations. Refer to
               the device documentation if you are not familiar with enabling
               the device for library operations.
```

```
        __ D. Use the following command to verify that the status of the
              media library device is VARIED ON.
                 WRKMLBSTS
5722BR1 V5R2M0 020906        Recovering Your Entire System AS02
                                                              8/26/03   8:55:45    Page 4 of 19
        __ E. Use Option 4=Allocate resource to set the current allocation of
              the media library resources to ALLOCATED.
        For recovery using the device as a stand alone device (TAPxx):
        __ A. Retrieve all volumes needed for recovery. If you are using an
              automatic cartridge loader, insert the volumes in the loader in
              the required sequence.
        __ B. Enter the following command:
                 WRKDEVD DEVD(*TAP)
        __ C. Use Option 8=Work with status to verify that the status of the
              device you are using is VARIED ON.
*************************************************************************************************
STEP: Recover the BRMS product and associated libraries
   Start date/time ___________________  Stop date/time ___________________  Duration _____________
        The BRMS product and associated libraries must be recovered before
        you can use the product to perform other recovery operations.
        To prevent messages that are not related to the recovery from
        interrupting the recovery process, run the following command:
           CHGMSGQ MSGQ(QSYSOPR) DLVRY(*NOTIFY) SEV(99)
        Use the following command to see which tape devices are configured:
           WRKCFGSTS CFGTYPE(*DEV) CFGD(*TAP)
        Or use the following command to see which media library devices are
        configured:
           WRKCFGSTS CFGTYPE(*DEV) CFGD(*TAPMLB)
        Run the following command for each of the libraries listed below
        specifying the saved-item, the device name of the standalone drive or
        media library you are using, and the volume identifiers and sequence
        numbers listed.
        For type *FULL use the command:
           RSTLIB SAVLIB(saved-item) DEV(device-name)
                  VOL(volume-identifier) SEQNBR(sequence-number)
        For type *CUML or *INCR use the command:
           RSTOBJ OBJ(*ALL) SAVLIB(saved-item) DEV(device-name)
                  VOL(volume-identifier) SEQNBR(sequence-number)
   Saved            ----- ASP ------  Save     Save                  Sequence  Control    Volume
   Item       Type  Name      Number  Date     Time    Objects Omit  Number    Group      Identifier
   ---------- ----- ---------- ----- -------- -------- ------- ----- --------- ---------- ----------
5722BR1 V5R2M0 020906        Recovering Your Entire System AS02
                                                              8/26/03   8:55:45    Page 5 of 19
__ QBRM       *FULL *SYSBAS    00001  8/25/03 18:10:38   1,190              43 SAVSYSPLUS BRM001
__ QMSE       *FULL *SYSBAS    00001  8/25/03 18:10:38       7              79 SAVSYSPLUS BRM001
__ Q1ABRMSF   *FULL *SYSBAS    00001  8/25/03 18:10:38       1             123 SAVSYSPLUS BRM001
__ Q1ABRMSF01 *FULL *SYSBAS    00001  8/25/03 18:10:38       4             124 SAVSYSPLUS BRM001
__ QUSRBRM    *FULL *SYSBAS    00001  8/25/03 18:35:48     202             127 SAVSYSPLUS BRM001
*************************************************************************************************
STEP: Recover BRMS related media information
   Start date/time ___________________  Stop date/time ___________________  Duration _____________
        You must recover this information for the BRMS product to accurately
        guide you through the remaining recovery steps.
        Run the following command for each of the libraries listed below
        specifying the saved-item, the device name of the standalone drive or
        media library you are using, and the volume identifiers and sequence
        numbers listed.
           RSTOBJ OBJ(*ALL) SAVLIB(saved-item) DEV(device-name)
                  VOL(volume-identifier) SEQNBR(sequence-number)
   Saved            ----- ASP ------  Save     Save                  Sequence  Control    Volume
```

```
   Item       Type  Name      Number  Date     Time     Objects Omit  Number    Group      Identifier
   ---------- ----- --------- ----- -------- -------- ------- ----- --------- ---------- ----------
__ QUSRBRM    *QBRM *SYSBAS    00001  8/25/03 18:53:01      18             129 SAVSYSPLUS BRM001
********************************************************************************************************
STEP: Initialize BRMS functional authority information
   Start date/time ____________________  Stop date/time ____________________  Duration ____________________
         You must perform this step to initialize BRMS functional authorities.
         Use the following command to register all BRMS functional authority
         resources with the OS/400 functional authority manager.
            INZBRM OPTION(*SETAUT)
         Use the following command to assure the QSECOFR user profile has
         authority to use the managed functional authority resources.
            SETUSRBRM USER(QSECOFR) USAGE(*ADMIN)
********************************************************************************************************
STEP: Update system name in BRMS media information
   Start date/time ____________________  Stop date/time ____________________  Duration ____________________
         You must update the system name in the saved BRMS media information
5722BR1 V5R2M0 020906        Recovering Your Entire System AS02
                                                              8/26/03   8:55:45    Page 6 of 19
         if you are recovering to a system or logical partition with a system
         name that is different from the system name of the save.
         To do so, run the following command:
            INZBRM OPTION(*CHGSYSNAM) PRVSYSNAM(previous-name) NEWSYSNAM(new-name)
********************************************************************************************************
STEP: Initialize BRMS device and media library information
   Start date/time ____________________  Stop date/time ____________________  Duration ____________________
         You must initialize the BRMS device and media library information.
         Use the following command to clear and initialize the BRMS device and
         media library information with the tape and media library devices
         currently configured on the system:
            INZBRM OPTION(*DEVICE)
         INZBRM OPTION(*DEVICE) resets some device information to the BRMS
         supplied defaults. Review the BRMS device information using the
         following command:
            WRKDEVBRM
         Update the BRMS device information with any changes necessary to
         continue with your recovery.
********************************************************************************************************
STEP: Recover user profiles
   Start date/time ____________________  Stop date/time ____________________  Duration ____________________
         You should restore a current version of your user profiles.
         To do so, run the following command:
            STRRCYBRM OPTION(*SYSTEM) ACTION(*RESTORE)
         --- Attention --------------------------------------------------
         Press F9 (Recovery defaults) on the Select Recovery Items display.
         Ensure the tape device name or media library device name that you are
         using is correct.
         ----------------------------------------------------------------
         --- Attention --------------------------------------------------
         If recovering to a different system or recovering a logical partition
         to another logical partition, you must specify the following:
            __ *ALL on the Allow object differences (ALWOBJDIF) parameter
            __ *ALL on the Data base member option (MBROPT) parameter
            __ *NONE on the System resource management (SRM) parameter
5722BR1 V5R2M0 020906        Recovering Your Entire System AS02
                                                              8/26/03   8:55:45    Page 7 of 19
         ----------------------------------------------------------------
         Select and recover the following saved item(s) on the "Select Recovery
         Items" display using the specified volume(s).
   Saved            ----- ASP ------  Save     Save                 Sequence  Control    Volume
```

```
   Item       Type  Name      Number  Date     Time     Objects Omit  Number    Group      Identifier
   ---------- ----- --------- ------ -------- -------- ------- ----- --------- ---------- ----------
__ *SAVSECDTA *FULL *SYSBAS    00001  8/25/03 17:50:59     237              35 SAVSYSPLUS BRM001
********************************************************************************************************
STEP: Change QSECOFR user profile password
   Start date/time ___________________  Stop date/time ___________________  Duration ___________________
         If you do not know the password for the restored QSECOFR user profile,
         use the following command to change the password now:
            CHGUSRPRF USRPRF(QSECOFR) PASSWORD (new-password)
********************************************************************************************************
STEP: Recover BRMS required system libraries
   Start date/time ___________________  Stop date/time ___________________  Duration ___________________
         You must restore specific system libraries before you can use BRMS to
         perform other recovery steps.
         If the "Select Recovery Items" display is not shown and you are
         performing a complete system restore, run the following command:
            STRRCYBRM OPTION(*RESUME)
         Otherwise, run the following command(s):
            STRRCYBRM OPTION(*SYSTEM) ACTION(*RESTORE)
         Select and recover the following saved item(s) on the "Select Recovery
         Items" display using the specified volume(s).
   Saved            ----- ASP ------  Save     Save                 Sequence  Control    Volume
   Item       Type  Name      Number  Date     Time     Objects Omit  Number    Group      Identifier
   ---------- ----- --------- ------ -------- -------- ------- ----- --------- ---------- ----------
__ QGPL       *FULL *SYSBAS    00001  8/25/03 18:35:17     637            125 SAVSYSPLUS BRM001
__ QUSRSYS    *FULL *SYSBAS    00001  8/25/03 18:35:35   1,693            126 SAVSYSPLUS BRM001
__ QSYS2      *FULL *SYSBAS    00001  8/25/03 18:35:50     131            128 SAVSYSPLUS BRM001
********************************************************************************************************
STEP: Recover configuration data
   Start date/time ___________________  Stop date/time ___________________  Duration ___________________
5722BR1 V5R2M0 020906        Recovering Your Entire System AS02
                                                                  8/26/03   8:55:45    Page 8 of 19
         You should restore a current version of your system configuration.
         If the "Select Recovery Items" display is not shown and you are
         performing a complete system restore, run the following command to
         continue:
            STRRCYBRM OPTION(*RESUME)
         Otherwise, run the following command(s):
            STRRCYBRM OPTION(*SYSTEM) ACTION(*RESTORE)
         Select and recover the following saved item(s) on the "Select Recovery
         Items" display using the specified volume(s).
   Saved            ----- ASP ------  Save     Save                 Sequence  Control    Volume
   Item       Type  Name      Number  Date     Time     Objects Omit  Number    Group      Identifier
   ---------- ----- --------- ------ -------- -------- ------- ----- --------- ---------- ----------
__ *SAVCFG    *FULL *SYSBAS    00001  8/25/03 17:50:59     137              36 SAVSYSPLUS BRM001
********************************************************************************************************
STEP: Reset BRMS device and media library information
   Start date/time ___________________  Stop date/time ___________________  Duration ___________________
         You must reset the BRMS device and media library information.
         Use the following command to clear and initialize the BRMS device and
         media library information with the tape and media library devices
         currently configured on the system:
            INZBRM OPTION(*DEVICE)
         INZBRM OPTION(*DEVICE) resets some device information to the BRMS
         supplied defaults. Review the BRMS device information using the
         following command:
            WRKDEVBRM
         Update the BRMS device information with any changes necessary to
         continue with your recovery.
********************************************************************************************************
```

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STEP: Recover IBM product libraries
   Start date/time ___________________  Stop date/time ___________________  Duration _________________
         You should restore the current version of your IBM libraries.
         If you are performing a complete system restore, run the following
         command to continue:
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                                                                    8/26/03   8:55:45    Page 9 of 19
         STRRCYBRM OPTION(*RESUME)
         Otherwise, run the following command(s):
            STRRCYBRM OPTION(*IBM) ACTION(*RESTORE)
         Select and recover the following saved item(s) on the "Select Recovery
         Items" display using the specified volume(s).
   Saved             ----- ASP ------  Save     Save                  Sequence  Control    Volume
   Item       Type  Name      Number  Date     Time     Objects Omit  Number    Group      Identifier
   ---------- ----- ---------- -----  -------- -------- ------- ----- --------- ---------- ----------
__ #COBLIB    *FULL *SYSBAS    00001  8/25/03 18:10:38      82              38 SAVSYSPLUS BRM001
__ #RPGLIB    *FULL *SYSBAS    00001  8/25/03 18:10:38      55              39 SAVSYSPLUS BRM001
__ QANSAPI    *FULL *SYSBAS    00001  8/25/03 18:10:38       9              40 SAVSYSPLUS BRM001
__ QAPTL      *FULL *SYSBAS    00001  8/25/03 18:10:38      94              41 SAVSYSPLUS BRM001
__ QASE5      *FULL *SYSBAS    00001  8/25/03 18:10:38      83              42 SAVSYSPLUS BRM001
__ QBUILDSS1  *FULL *SYSBAS    00001  8/25/03 18:10:38       2              44 SAVSYSPLUS BRM001
__ QCAEXP     *FULL *SYSBAS    00001  8/25/03 18:10:38      16              45 SAVSYSPLUS BRM001
__ QCAP3      *FULL *SYSBAS    00001  8/25/03 18:10:38      14              46 SAVSYSPLUS BRM001
__ QCA400W    *FULL *SYSBAS    00001  8/25/03 18:10:38       9              47 SAVSYSPLUS BRM001
__ QCBL       *FULL *SYSBAS    00001  8/25/03 18:10:38      74              48 SAVSYSPLUS BRM001
__ QCBLLE     *FULL *SYSBAS    00001  8/25/03 18:10:38      10              49 SAVSYSPLUS BRM001
__ QCBLLEP    *FULL *SYSBAS    00001  8/25/03 18:10:38       9              50 SAVSYSPLUS BRM001
__ QCE3       *FULL *SYSBAS    00001  8/25/03 18:10:38       6              51 SAVSYSPLUS BRM001
__ QCLE       *FULL *SYSBAS    00001  8/25/03 18:10:38      13              52 SAVSYSPLUS BRM001
__ QCPPLE     *FULL *SYSBAS    00001  8/25/03 18:10:38      27              53 SAVSYSPLUS BRM001
__ QCXXN      *FULL *SYSBAS    00001  8/25/03 18:10:38      13              54 SAVSYSPLUS BRM001
__ QDB2MS     *FULL *SYSBAS    00001  8/25/03 18:10:38       2              55 SAVSYSPLUS BRM001
__ QDEVTOOLS  *FULL *SYSBAS    00001  8/25/03 18:10:38     214              56 SAVSYSPLUS BRM001
__ QDIRSRV2   *FULL *SYSBAS    00001  8/25/03 18:10:38       4              57 SAVSYSPLUS BRM001
__ QEJBAS5    *FULL *SYSBAS    00001  8/25/03 18:10:38     190              58 SAVSYSPLUS BRM001
__ QFNTCPL    *FULL *SYSBAS    00001  8/25/03 18:10:38   1,529              59 SAVSYSPLUS BRM001
__ QGPLTEMP   *FULL *SYSBAS    00001  8/25/03 18:10:38       1              60 SAVSYSPLUS BRM001
__ QGY        *FULL *SYSBAS    00001  8/25/03 18:10:38     109              61 SAVSYSPLUS BRM001
__ QHLPSYS    *FULL *SYSBAS    00001  8/25/03 18:10:38     315              62 SAVSYSPLUS BRM001
__ QHTTP      *FULL *SYSBAS    00001  8/25/03 18:10:38       3              63 SAVSYSPLUS BRM001
__ QHTTPSVR   *FULL *SYSBAS    00001  8/25/03 18:10:38     179              64 SAVSYSPLUS BRM001
__ QICSS      *FULL *SYSBAS    00001  8/25/03 18:10:38      44              65 SAVSYSPLUS BRM001
__ QINMEDIA   *FULL *SYSBAS    00001  8/25/03 18:10:38      26              66 SAVSYSPLUS BRM001
__ QINPRIOR   *FULL *SYSBAS    00001  8/25/03 18:10:38       1              67 SAVSYSPLUS BRM001
__ QINSYS     *FULL *SYSBAS    00001  8/25/03 18:10:38       1              68 SAVSYSPLUS BRM001
__ QIWA2      *FULL *SYSBAS    00001  8/25/03 18:10:38      25              69 SAVSYSPLUS BRM001
__ QIWE       *FULL *SYSBAS    00001  8/25/03 18:10:38      30              70 SAVSYSPLUS BRM001
__ QIWR       *FULL *SYSBAS    00001  8/25/03 18:10:38       7              71 SAVSYSPLUS BRM001
__ QIWS       *FULL *SYSBAS    00001  8/25/03 18:10:38     140              72 SAVSYSPLUS BRM001
__ QJAVA      *FULL *SYSBAS    00001  8/25/03 18:10:38      43              73 SAVSYSPLUS BRM001
__ QJT400     *FULL *SYSBAS    00001  8/25/03 18:10:38      15              74 SAVSYSPLUS BRM001
__ QLBL       *FULL *SYSBAS    00001  8/25/03 18:10:38      79              75 SAVSYSPLUS BRM001
__ QMQM       *FULL *SYSBAS    00001  8/25/03 18:10:38     392              76 SAVSYSPLUS BRM001
__ QMQMJAVA   *FULL *SYSBAS    00001  8/25/03 18:10:38      10              77 SAVSYSPLUS BRM001
__ QMQMSAMP   *FULL *SYSBAS    00001  8/25/03 18:10:38       8              78 SAVSYSPLUS BRM001
__ QMWAS_RCHA *FULL *SYSBAS    00001  8/25/03 18:10:38      17              80 SAVSYSPLUS BRM001
__ QMWAS_RC00 *FULL *SYSBAS    00001  8/25/03 18:10:38      14              81 SAVSYSPLUS BRM001
__ QMWAS_RC01 *FULL *SYSBAS    00001  8/25/03 18:10:38      16              82 SAVSYSPLUS BRM001
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__ QMWAS_RC02 *FULL *SYSBAS    00001  8/25/03 18:10:38      12             83 SAVSYSPLUS BRM001
__ QMWAS_RC03 *FULL *SYSBAS    00001  8/25/03 18:10:38      16             84 SAVSYSPLUS BRM001
__ QMWAS_RC04 *FULL *SYSBAS    00001  8/25/03 18:10:38      15             85 SAVSYSPLUS BRM001
__ QMWAS_RC05 *FULL *SYSBAS    00001  8/25/03 18:10:38      12             86 SAVSYSPLUS BRM001
__ QMWAS_RC06 *FULL *SYSBAS    00001  8/25/03 18:10:38      12             87 SAVSYSPLUS BRM001
__ QMWAS_RC07 *FULL *SYSBAS    00001  8/25/03 18:10:38      13             88 SAVSYSPLUS BRM001
__ QMWAS_RC08 *FULL *SYSBAS    00001  8/25/03 18:10:38      12             89 SAVSYSPLUS BRM001
__ QMWAS_RC09 *FULL *SYSBAS    00001  8/25/03 18:10:38      13             90 SAVSYSPLUS BRM001
__ QMWAS_RC10 *FULL *SYSBAS    00001  8/25/03 18:10:38      12             91 SAVSYSPLUS BRM001
__ QMWAS_RC11 *FULL *SYSBAS    00001  8/25/03 18:10:38      13             92 SAVSYSPLUS BRM001
__ QMWAS_RC12 *FULL *SYSBAS    00001  8/25/03 18:10:38      12             93 SAVSYSPLUS BRM001
__ QNTAP      *FULL *SYSBAS    00001  8/25/03 18:10:38      63             94 SAVSYSPLUS BRM001
__ QPASE      *FULL *SYSBAS    00001  8/25/03 18:10:38       6             95 SAVSYSPLUS BRM001
__ QPDA       *FULL *SYSBAS    00001  8/25/03 18:10:38     416             96 SAVSYSPLUS BRM001
__ QPEXDATA   *FULL *SYSBAS    00001  8/25/03 18:10:38      73             97 SAVSYSPLUS BRM001
__ QPFR       *FULL *SYSBAS    00001  8/25/03 18:10:38     280             98 SAVSYSPLUS BRM001
__ QPYRTJW    *FULL *SYSBAS    00001  8/25/03 18:10:38     111             99 SAVSYSPLUS BRM001
__ QQALIB     *FULL *SYSBAS    00001  8/25/03 18:10:38       8            100 SAVSYSPLUS BRM001
__ QQFTEMP    *FULL *SYSBAS    00001  8/25/03 18:10:38      38            101 SAVSYSPLUS BRM001
__ QQRYLIB    *FULL *SYSBAS    00001  8/25/03 18:10:38      41            102 SAVSYSPLUS BRM001
__ QRPG       *FULL *SYSBAS    00001  8/25/03 18:10:38      45            103 SAVSYSPLUS BRM001
__ QRPGLE     *FULL *SYSBAS    00001  8/25/03 18:10:38      12            104 SAVSYSPLUS BRM001
__ QRPGLEP    *FULL *SYSBAS    00001  8/25/03 18:10:38       9            105 SAVSYSPLUS BRM001
__ QRPG38     *FULL *SYSBAS    00001  8/25/03 18:10:38      37            106 SAVSYSPLUS BRM001
__ QSECURITY  *FULL *SYSBAS    00001  8/25/03 18:10:38       3            107 SAVSYSPLUS BRM001
__ QSHELL     *FULL *SYSBAS    00001  8/25/03 18:10:38      93            108 SAVSYSPLUS BRM001
__ QSMP       *FULL *SYSBAS    00001  8/25/03 18:10:38       3            109 SAVSYSPLUS BRM001
__ QSPTLIB    *FULL *SYSBAS    00001  8/25/03 18:10:38     165            110 SAVSYSPLUS BRM001
__ QSQL       *FULL *SYSBAS    00001  8/25/03 18:10:38     155            111 SAVSYSPLUS BRM001
__ QSVDSTRPS  *FULL *SYSBAS    00001  8/25/03 18:10:38       4            112 SAVSYSPLUS BRM001
__ QSVMSS     *FULL *SYSBAS    00001  8/25/03 18:10:38     278            113 SAVSYSPLUS BRM001
__ QSYSCGI    *FULL *SYSBAS    00001  8/25/03 18:10:38       2            114 SAVSYSPLUS BRM001
__ QSYSDIR    *FULL *SYSBAS    00001  8/25/03 18:10:38      54            115 SAVSYSPLUS BRM001
__ QSYSINC    *FULL *SYSBAS    00001  8/25/03 18:10:38      46            116 SAVSYSPLUS BRM001
__ QSYSV4R5M0 *FULL *SYSBAS    00001  8/25/03 18:10:38   2,329            117 SAVSYSPLUS BRM001
__ QSYSV5R1M0 *FULL *SYSBAS    00001  8/25/03 18:10:38   2,196            118 SAVSYSPLUS BRM001
__ QTCP       *FULL *SYSBAS    00001  8/25/03 18:10:38     265            119 SAVSYSPLUS BRM001
__ QUSRTEMP   *FULL *SYSBAS    00001  8/25/03 18:10:38       1            120 SAVSYSPLUS BRM001
__ QYPBASE    *FULL *SYSBAS    00001  8/25/03 18:10:38      25            121 SAVSYSPLUS BRM001
__ QYPINT     *FULL *SYSBAS    00001  8/25/03 18:10:38      85            122 SAVSYSPLUS BRM001
********************************************************************************************************
STEP: Verify system information
   Start date/time _________________  Stop date/time _________________  Duration _________________
         You should verify your system information.
         If you ran either of the following commands after the save, additional
         reports were created that enable you to verify your system information:
            STRRCYBRM PRTSYSINF(*YES)
            STRMNTBRM PRTSYSINF(*YES)
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         If you are using distribution media to restore your system, then you
         should use these reports to re-create the system information as
         as detailed in the "Backup and Recovery" book.
********************************************************************************************************
STEP: Print joblog
   Start date/time _________________  Stop date/time _________________  Duration _________________
         You should print the joblog.
         To do so, run the following command:
            DSPJOBLOG JOB(*) OUTPUT(*PRINT)
         Review the job logs or output from your recovery processing
```

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         to ensure that all recovery steps completed successfully.
********************************************************************************************************
STEP: Perform IPL
   Start date/time _____________________  Stop date/time _____________________  Duration _________________
         Return system to normal mode and IPL using the following command:
            PWRDWNSYS OPTION(*IMMED) RESTART(*YES)
********************************************************************************************************
STEP: Recover additional user libraries
   Start date/time _____________________  Stop date/time _____________________  Duration _________________
         You should restore the current version of your user libraries saved
         from auxiliary storage pool devices or saved to TSM servers.
         If you are performing a complete system restore, run the following
         command to continue:
            STRRCYBRM OPTION(*RESUME)
         Otherwise, run the following command(s):
            STRRCYBRM OPTION(*ALLUSR) ACTION(*RESTORE) USEADSM(*YES)
            STRRCYBRM OPTION(*ASP) ACTION(*RESTORE) ASP(auxiliary-storage-pool-name)
         Select and recover the following saved item(s) on the "Select Recovery
         Items" display using the specified volume(s).
         --- Attention ------------------------------------------------------
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         If you have logical files whose based-on physical files are in a
         different library, you must restore all based-on physical files
         before you can restore the logical file.
         --------------------------------------------------------------------
         --- Attention ------------------------------------------------------
         If you use journaling, the libraries containing the journals must be
         restored before restoring the journaled files.
         --------------------------------------------------------------------
   Saved            ----- ASP ------  Save     Save                  Sequence  Control    Volume
   Item       Type  Name      Number  Date     Time     Objects Omit  Number    Group      Identifier
   ---------- ----- ---------- ----- -------- -------- ------- ----- --------- ---------- ----------
__ #LIBRARY   *FULL *SYSBAS    00001  8/25/03 12:00:05       2              0 ITSMSAVE   *TSM
__ AH         *FULL *SYSBAS    00001  8/25/03 12:00:10      44              0 ITSMSAVE   *TSM
__ ALEKN      *FULL *SYSBAS    00001  8/25/03 12:07:42       5              0 ITSMSAVE   *TSM
__ ANZFLTS    *FULL *SYSBAS    00001  8/25/03 12:07:50      10              0 ITSMSAVE   *TSM
__ APILIB     *FULL *SYSBAS    00001  8/25/03 12:07:52      56              0 ITSMSAVE   *TSM
__ APILIBSAV  *FULL *SYSBAS    00001  8/25/03 12:08:01      51              0 ITSMSAVE   *TSM
__ AS0301LIB  *FULL *SYSBAS    00001  8/25/03 12:08:09       1              0 ITSMSAVE   *TSM
__ AS0302LIB  *FULL *SYSBAS    00001  8/25/03 12:08:11       1              0 ITSMSAVE   *TSM
__ AS0303LIB  *FULL *SYSBAS    00001  8/25/03 12:08:12       1              0 ITSMSAVE   *TSM
__ AS0304LIB  *FULL *SYSBAS    00001  8/25/03 12:08:14       1              0 ITSMSAVE   *TSM
__ AS0305LIB  *FULL *SYSBAS    00001  8/25/03 12:08:15       1              0 ITSMSAVE   *TSM
__ AS0306LIB  *FULL *SYSBAS    00001  8/25/03 12:08:17       1              0 ITSMSAVE   *TSM
__ AS0307LIB  *FULL *SYSBAS    00001  8/25/03 12:08:18       1              0 ITSMSAVE   *TSM
__ AS0308LIB  *FULL *SYSBAS    00001  8/25/03 12:08:20       1              0 ITSMSAVE   *TSM
__ AS0309LIB  *FULL *SYSBAS    00001  8/25/03 12:08:21       1              0 ITSMSAVE   *TSM
__ AS0310LIB  *FULL *SYSBAS    00001  8/25/03 12:08:23       1              0 ITSMSAVE   *TSM
__ AS0311LIB  *FULL *SYSBAS    00001  8/25/03 12:08:24       1              0 ITSMSAVE   *TSM
__ AS0312LIB  *FULL *SYSBAS    00001  8/25/03 12:08:26       1              0 ITSMSAVE   *TSM
__ AS0313LIB  *FULL *SYSBAS    00001  8/25/03 12:08:28       1              0 ITSMSAVE   *TSM
__ AS0314LIB  *FULL *SYSBAS    00001  8/25/03 12:08:29       1              0 ITSMSAVE   *TSM
__ AS0315LIB  *FULL *SYSBAS    00001  8/25/03 12:08:31       1              0 ITSMSAVE   *TSM
__ AS0316LIB  *FULL *SYSBAS    00001  8/25/03 12:08:32       1              0 ITSMSAVE   *TSM
__ AS0317LIB  *FULL *SYSBAS    00001  8/25/03 12:08:34       1              0 ITSMSAVE   *TSM
__ AS0318LIB  *FULL *SYSBAS    00001  8/25/03 12:08:35       1              0 ITSMSAVE   *TSM
__ AS0319LIB  *FULL *SYSBAS    00001  8/25/03 12:08:37       1              0 ITSMSAVE   *TSM
__ AS0320LIB  *FULL *SYSBAS    00001  8/25/03 12:08:38       1              0 ITSMSAVE   *TSM
__ AS0321LIB  *FULL *SYSBAS    00001  8/25/03 12:08:40       1              0 ITSMSAVE   *TSM
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__ AS0322LIB  *FULL *SYSBAS    00001  8/25/03 12:08:41       1              0 ITSMSAVE   *TSM
__ AS0323LIB  *FULL *SYSBAS    00001  8/25/03 12:08:43       1              0 ITSMSAVE   *TSM
__ AS0324LIB  *FULL *SYSBAS    00001  8/25/03 12:08:44       1              0 ITSMSAVE   *TSM
__ AS0325LIB  *FULL *SYSBAS    00001  8/25/03 12:08:46       1              0 ITSMSAVE   *TSM
__ AS0326LIB  *FULL *SYSBAS    00001  8/25/03 12:08:47       1              0 ITSMSAVE   *TSM
__ AS0327LIB  *FULL *SYSBAS    00001  8/25/03 12:08:49       1              0 ITSMSAVE   *TSM
__ AS0328LIB  *FULL *SYSBAS    00001  8/25/03 12:08:50       1              0 ITSMSAVE   *TSM
__ AS0329LIB  *FULL *SYSBAS    00001  8/25/03 12:08:52       1              0 ITSMSAVE   *TSM
__ AS0330LIB  *FULL *SYSBAS    00001  8/25/03 12:08:53       1              0 ITSMSAVE   *TSM
__ BERESTET   *FULL *SYSBAS    00001  8/25/03 12:08:55       4              0 ITSMSAVE   *TSM
__ BOATS      *FULL *SYSBAS    00001  8/25/03 12:09:50      31              0 ITSMSAVE   *TSM
__ CASETUP    *FULL *SYSBAS    00001  8/25/03 12:09:54      19              0 ITSMSAVE   *TSM
__ CASETUPNW  *FULL *SYSBAS    00001  8/25/03 12:09:57       2              0 ITSMSAVE   *TSM
__ CA01LIB    *FULL *SYSBAS    00001  8/25/03 12:09:58       1              0 ITSMSAVE   *TSM
__ CA02LIB    *FULL *SYSBAS    00001  8/25/03 12:09:59       1              0 ITSMSAVE   *TSM
__ CA03LIB    *FULL *SYSBAS    00001  8/25/03 12:10:01       1              0 ITSMSAVE   *TSM
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__ CA04LIB    *FULL *SYSBAS    00001  8/25/03 12:10:03       1              0 ITSMSAVE   *TSM
__ CA05LIB    *FULL *SYSBAS    00001  8/25/03 12:10:04       1              0 ITSMSAVE   *TSM
__ CA06LIB    *FULL *SYSBAS    00001  8/25/03 12:10:06       1              0 ITSMSAVE   *TSM
__ CA07LIB    *FULL *SYSBAS    00001  8/25/03 12:10:07       1              0 ITSMSAVE   *TSM
__ CA08LIB    *FULL *SYSBAS    00001  8/25/03 12:10:08       1              0 ITSMSAVE   *TSM
__ CA09LIB    *FULL *SYSBAS    00001  8/25/03 12:10:10       1              0 ITSMSAVE   *TSM
__ CA10LIB    *FULL *SYSBAS    00001  8/25/03 12:10:11       1              0 ITSMSAVE   *TSM
__ COOK       *FULL *SYSBAS    00001  8/25/03 12:10:13       2              0 ITSMSAVE   *TSM
__ EWPROJ50   *FULL *SYSBAS    00001  8/25/03 12:10:17      92              0 ITSMSAVE   *TSM
__ IBMRAC     *FULL *SYSBAS    00001  8/25/03 12:10:24      15              0 ITSMSAVE   *TSM
__ IBMWEBF    *FULL *SYSBAS    00001  8/25/03 12:10:54      90              0 ITSMSAVE   *TSM
__ IBMWEBO    *FULL *SYSBAS    00001  8/25/03 12:11:13     127              0 ITSMSAVE   *TSM
__ IBMWEBUPDT *FULL *SYSBAS    00001  8/25/03 12:11:26       2              0 ITSMSAVE   *TSM
__ IDOCINST   *FULL *SYSBAS    00001  8/25/03 12:11:28       6              0 ITSMSAVE   *TSM
__ IDOCSBA    *FULL *SYSBAS    00001  8/25/03 12:11:29       6              0 ITSMSAVE   *TSM
__ IDOCSJW    *FULL *SYSBAS    00001  8/25/03 12:11:31       7              0 ITSMSAVE   *TSM
__ IDOCSPA    *FULL *SYSBAS    00001  8/25/03 12:11:34       8              0 ITSMSAVE   *TSM
__ IDOCSVR    *FULL *SYSBAS    00001  8/25/03 12:11:48       8              0 ITSMSAVE   *TSM
__ ISALIB     *FULL *SYSBAS    00001  8/25/03 12:12:04      36              0 ITSMSAVE   *TSM
__ ITSMLIB    *FULL *SYSBAS    00001  8/25/03 12:12:07       4              0 ITSMSAVE   *TSM
__ I2S_VWEBF4 *FULL *SYSBAS    00001  8/25/03 12:12:35      53              0 ITSMSAVE   *TSM
__ JDWRK      *FULL *SYSBAS    00001  8/25/03 12:12:44      19              0 ITSMSAVE   *TSM
__ LIB6600    *FULL *SYSBAS    00001  8/25/03 12:12:48      21              0 ITSMSAVE   *TSM
__ LIB6601    *FULL *SYSBAS    00001  8/25/03 12:12:51      19              0 ITSMSAVE   *TSM
__ LIB6801    *FULL *SYSBAS    00001  8/25/03 12:12:54      44              0 ITSMSAVE   *TSM
__ LIB6961    *FULL *SYSBAS    00001  8/25/03 12:13:02      64              0 ITSMSAVE   *TSM
__ LIB6961DEU *FULL *SYSBAS    00001  8/25/03 12:13:09       9              0 ITSMSAVE   *TSM
__ LIB6961ENG *FULL *SYSBAS    00001  8/25/03 12:13:11       9              0 ITSMSAVE   *TSM
__ LIB6961FIN *FULL *SYSBAS    00001  8/25/03 12:13:12       9              0 ITSMSAVE   *TSM
__ LILA       *FULL *SYSBAS    00001  8/25/03 12:13:14       2              0 ITSMSAVE   *TSM
__ MANN       *FULL *SYSBAS    00001  8/25/03 12:13:15       2              0 ITSMSAVE   *TSM
__ MRK        *FULL *SYSBAS    00001  8/25/03 12:13:16      16              0 ITSMSAVE   *TSM
__ NEWITSMLIB *FULL *SYSBAS    00001  8/25/03 12:13:18       3              0 ITSMSAVE   *TSM
__ ONLABZZ    *FULL *SYSBAS    00001  8/25/03 12:13:41      10              0 ITSMSAVE   *TSM
__ PFREXP     *FULL *SYSBAS    00001  8/25/03 12:16:15     165              0 ITSMSAVE   *TSM
__ PR6961     *FULL *SYSBAS    00001  8/25/03 12:21:37      43              0 ITSMSAVE   *TSM
__ PTDV       *FULL *SYSBAS    00001  8/25/03 12:21:42       9              0 ITSMSAVE   *TSM
__ QDSNX      *FULL *SYSBAS    00001  8/25/03 12:21:44       3              0 ITSMSAVE   *TSM
__ QMPGDATA   *FULL *SYSBAS    00001  8/25/03 12:22:06      57              0 ITSMSAVE   *TSM
__ QPFRDATA   *FULL *SYSBAS    00001  8/25/03 14:16:57       4              0 ITSMSAVE   *TSM
__ QRCL       *FULL *SYSBAS    00001  8/25/03 14:16:59       2              0 ITSMSAVE   *TSM
__ QUSRDIRDB  *FULL *SYSBAS    00001  8/25/03 14:17:03     157              0 ITSMSAVE   *TSM
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__ QUSRINFSKR *FULL *SYSBAS    00001  8/25/03 14:17:13       1              0 ITSMSAVE   *TSM
__ RCIBOL     *FULL *SYSBAS    00001  8/25/03 14:17:16      51              0 ITSMSAVE   *TSM
__ RETAILSTOR *FULL *SYSBAS    00001  8/25/03 14:17:49      28              0 ITSMSAVE   *TSM
__ ROSHANT    *FULL *SYSBAS    00001  8/25/03 14:17:53       5              0 ITSMSAVE   *TSM
__ SAMP6961   *FULL *SYSBAS    00001  8/25/03 14:17:56      65              0 ITSMSAVE   *TSM
__ SMOLEY     *FULL *SYSBAS    00001  8/25/03 14:18:02       5              0 ITSMSAVE   *TSM
__ SMTRACE    *FULL *SYSBAS    00001  8/25/03 14:19:07   1,356              0 ITSMSAVE   *TSM
__ SQELIB     *FULL *SYSBAS    00001  8/25/03 14:19:46       2              0 ITSMSAVE   *TSM
__ SURVEY     *FULL *SYSBAS    00001  8/25/03 14:19:47       6              0 ITSMSAVE   *TSM
__ SYSIBM     *FULL *SYSBAS    00001  8/25/03 14:19:50      44              0 ITSMSAVE   *TSM
__ TRADEAH    *FULL *SYSBAS    00001  8/25/03 14:19:54      33              0 ITSMSAVE   *TSM
__ TRADEB     *FULL *SYSBAS    00001  8/25/03 14:20:53      33              0 ITSMSAVE   *TSM
__ TRADESF    *FULL *SYSBAS    00001  8/25/03 14:21:00      33              0 ITSMSAVE   *TSM
__ TRADEXX    *FULL *SYSBAS    00001  8/25/03 14:21:11      37              0 ITSMSAVE   *TSM
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                                                          8/26/03   8:55:45    Page 14 of 19
__ TRADE4OAE  *FULL *SYSBAS    00001  8/25/03 14:21:16      35              0 ITSMSAVE   *TSM
__ VNCSAVF    *FULL *SYSBAS    00001  8/25/03 14:33:30      13              0 ITSMSAVE   *TSM
__ WASTOOLS   *FULL *SYSBAS    00001  8/25/03 14:34:00      82              0 ITSMSAVE   *TSM
__ WA01LIB    *FULL *SYSBAS    00001  8/25/03 14:34:28       2              0 ITSMSAVE   *TSM
__ WA02LIB    *FULL *SYSBAS    00001  8/25/03 14:34:29       1              0 ITSMSAVE   *TSM
__ WA03LIB    *FULL *SYSBAS    00001  8/25/03 14:34:31       1              0 ITSMSAVE   *TSM
__ WA04LIB    *FULL *SYSBAS    00001  8/25/03 14:34:32       1              0 ITSMSAVE   *TSM
__ WA05LIB    *FULL *SYSBAS    00001  8/25/03 14:34:34       1              0 ITSMSAVE   *TSM
__ WA06LIB    *FULL *SYSBAS    00001  8/25/03 14:34:36       1              0 ITSMSAVE   *TSM
__ WA07LIB    *FULL *SYSBAS    00001  8/25/03 14:34:37       1              0 ITSMSAVE   *TSM
__ WA08LIB    *FULL *SYSBAS    00001  8/25/03 14:34:39       1              0 ITSMSAVE   *TSM
__ WA09LIB    *FULL *SYSBAS    00001  8/25/03 14:34:40       1              0 ITSMSAVE   *TSM
__ WA10LIB    *FULL *SYSBAS    00001  8/25/03 14:34:42       1              0 ITSMSAVE   *TSM
__ WA11LIB    *FULL *SYSBAS    00001  8/25/03 14:34:43       1              0 ITSMSAVE   *TSM
__ WA12LIB    *FULL *SYSBAS    00001  8/25/03 14:34:45       1              0 ITSMSAVE   *TSM
__ WA13LIB    *FULL *SYSBAS    00001  8/25/03 14:34:46       1              0 ITSMSAVE   *TSM
__ WA14LIB    *FULL *SYSBAS    00001  8/25/03 14:34:48       1              0 ITSMSAVE   *TSM
__ WA15LIB    *FULL *SYSBAS    00001  8/25/03 14:34:50       1              0 ITSMSAVE   *TSM
__ WA16LIB    *FULL *SYSBAS    00001  8/25/03 14:34:51       1              0 ITSMSAVE   *TSM
__ WA17LIB    *FULL *SYSBAS    00001  8/25/03 14:34:53       1              0 ITSMSAVE   *TSM
__ WA18LIB    *FULL *SYSBAS    00001  8/25/03 14:34:54       1              0 ITSMSAVE   *TSM
__ WA19LIB    *FULL *SYSBAS    00001  8/25/03 14:34:56       1              0 ITSMSAVE   *TSM
__ WA20LIB    *FULL *SYSBAS    00001  8/25/03 14:34:57       1              0 ITSMSAVE   *TSM
__ WA21LIB    *FULL *SYSBAS    00001  8/25/03 14:34:59       1              0 ITSMSAVE   *TSM
__ WA22LIB    *FULL *SYSBAS    00001  8/25/03 14:35:00       1              0 ITSMSAVE   *TSM
__ WA23LIB    *FULL *SYSBAS    00001  8/25/03 14:35:02       1              0 ITSMSAVE   *TSM
__ WA24LIB    *FULL *SYSBAS    00001  8/25/03 14:35:03       1              0 ITSMSAVE   *TSM
__ WA25LIB    *FULL *SYSBAS    00001  8/25/03 14:35:05       1              0 ITSMSAVE   *TSM
__ WBL        *FULL *SYSBAS    00001  8/25/03 14:35:06       6              0 ITSMSAVE   *TSM
__ WDSCLAB    *FULL *SYSBAS    00001  8/25/03 14:35:10      13              0 ITSMSAVE   *TSM
__ WEBLIB     *FULL *SYSBAS    00001  8/25/03 14:35:12       3              0 ITSMSAVE   *TSM
__ WHOLESALE  *FULL *SYSBAS    00001  8/25/03 14:35:15      13              0 ITSMSAVE   *TSM
__ YANTZI     *FULL *SYSBAS    00001  8/25/03 14:35:17       3              0 ITSMSAVE   *TSM
*****************************************************************************************************
STEP: Recover additional document library objects
   Start date/time _________________  Stop date/time _________________  Duration _________________
         You should restore the current version of your documents, folders,
         and mail saved to TSM servers
         If you are performing a complete system restore, run the following
         command to continue:
            STRRCYBRM OPTION(*RESUME)
         Otherwise, run the following command(s):
            STRRCYBRM OPTION(*ALLDLO) ACTION(*RESTORE) USEADSM(*YES)
         Select and recover the following saved item(s) on the "Select Recovery
```

```
         Items" display using the specified volume(s).
         --- Attention --------------------------------------------------------
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         When you recovery Document Library Objects (DLOs), the system updates
         the search index database information for these DLOs. If the recovery
         fails, the error message may instruct you to run reclaim on the DLOs.
         To do so, run the following command:
            RCLDLO DLO(*ALL)
         After the reclaim, try the DLO recovery again.
         ----------------------------------------------------------------------
   Saved            ----- ASP ------  Save     Save                  Sequence  Control    Volume
   Item       Type  Name      Number  Date     Time    Objects Omit  Number    Group      Identifier
   ---------- ----- ---------- ----- -------- -------- ------- ----- --------- ---------- ----------
__ *ALLDLO    *FULL *SYSBAS    00001  8/25/03 14:36:23      30               0 ITSMSAVE   *TSM
*************************************************************************************************
STEP: Recover additional directories and file
   Start date/time ___________________  Stop date/time ___________________  Duration _______________
         You should restore the current version of your directories and files
         saved from auxiliary storage pool devices or saved to TSM servers.
         If you are performing a complete system restore, run the following
         command to continue:
            STRRCYBRM OPTION(*RESUME)
         Otherwise, run the following command(s):
            STRRCYBRM OPTION(*LNKLIST) ACTION(*RESTORE) USEADSM(*YES)
         Select and recover the following saved item(s) on the "Select Recovery
         Items" display using the specified volume(s).
   Saved            ----- ASP ------  Save     Save                  Sequence  Control    Volume
   Item       Type  Name      Number  Date     Time    Objects Omit  Number    Group      Identifier
   ---------- ----- ---------- ----- -------- -------- ------- ----- --------- ---------- ----------
__ *LINK      *FULL *SYSBAS    00001  8/25/03 14:36:30 137,125              0 ITSMSAVE   *TSM
*************************************************************************************************
STEP: Recover spooled files for all ASPs
   Start date/time ___________________  Stop date/time ___________________  Duration _______________
         If spooled files were saved, restore your spooled files using the
         following command:
            WRKSPLFBRM
         Press F16 to select all recovery items.
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                                                              8/26/03   8:55:45    Page 16 of 19
         Otherwise, select the individual items you need to recover.
         Use the media listed on the "Select Recovery Items" display.
*************************************************************************************************
STEP: Special Recovery Processing
   Start date/time ___________________  Stop date/time ___________________  Duration _______________
         IBM iSeries Integration for Windows Server (5722-WSV)
         If iSeries Integration for Windows Server was installed when your
         system was saved and has been restored to the system, perform the
         following steps:
         If the Windows servers were VARIED OFF during the save, perform these
         recovery steps:
         __ a. Add the links for each server description using the following
               command:
                  ADDNWSSTGL NWSSTG(server-storage-name)
                             NWSD(server-description-name)
         __ b. Vary on your Windows servers using the following command:
                  WRKCFGSTS CFGTYPE(*NWS)
               Select option 1 to vary on each server.
         If the Windows servers were VARIED ON during the save, perform these
         recovery steps:
```

```
        __ a. Vary off any Windows servers that are VARIED ON using the
              following command:
                 WRKCFGSTS CFGTYPE(*NWS)
              Select option 2 to vary off each server.
        __ b. Create any needed Network Storages using the following command:
                 CRTNWSSTG NWSSTG(server-storage-name)
        __ c. Add the links for each server description using the following
              command:
                 ADDNWSSTGL NWSSTG(server-storage-name)
                            NWSD(server-description-name)
        __ d. Vary on your Windows servers using the following command:
                 WRKCFGSTS CFGTYPE(*NWS)
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                                                          8/26/03   8:55:45    Page 17 of 19
        Select option 1 to vary on each server.
        __ e. Restore the Windows server data using the following command and
              the volumes listed in "STEP: Recover objects in directories":
                 RST OBJ('/QNTC')
********************************************************************************************
STEP: Special Recovery Processing
   Start date/time _________________  Stop date/time _________________  Duration _________________
        Recovering Linux servers in a logical partition.
        If Linux servers were running in a logical partition and were VARIED
        OFF when the system was saved, perform these recovery steps:
        __ a. Add the links for each server description using
              the following command:
                 ADDNWSSTGL NWSSTG(server-storage-name)
                            NWSD(server-description-name)
        __ b. Vary on each Linux server using the following command:
                 WRKCFGSTS CFGTYPE(*NWS)
              Select option 1 to vary on each server.
********************************************************************************************
STEP: Special Recovery Processing
   Start date/time _________________  Stop date/time _________________  Duration _________________
        IBM Content Manager OnDemand for iSeries (5722-RD1)
        If Content Manager OnDemand for iSeries was installed when your
        system was saved and has been restored to the system, use the
        following commands to enable journaling:
        __ a. CALL QRDARS/QRLCSTRJ PARM('RLC')
        __ b. CALL QRDARS/QRLCSTRJ PARM('RLR')
        __ c. CALL QRDARS/QRLCSTRJ PARM('RLO')
********************************************************************************************
STEP: Apply journal changes
   Start date/time _________________  Stop date/time _________________  Duration _________________
        To determine if you need to apply journal changes, refer to the
5722BR1 V5R2M0 020906        Recovering Your Entire System AS02
                                                          8/26/03   8:55:45    Page 18 of 19
        section "Determining Whether You Need to Apply Journaled Changes"
        under chapter "Restoring Changed Objects and Applying Journaled
        Changes" as detailed in the "Backup and Recovery" book.
********************************************************************************************
STEP: Recover authorization information
   Start date/time _________________  Stop date/time _________________  Duration _________________
        You should recover authorization information if user profiles
        were recovered in an earlier step.
        --- Attention ------------------------------------------------------
        Each of these operations can be a long running process.
        --------------------------------------------------------------------
        --- Attention ------------------------------------------------------
        Some authorities may not be restored if the system is not running in
```

```
         restricted state.
         ------------------------------------------------------------------
         To restore authorities to objects, run the following command:
            RSTAUT USRPRF(*ALL)
         To restore authority information saved by BRMS for basic user auxiliary
         pools (2-32), run the following command:
            RSTAUTBRM USRASP(*ALLUSR)
********************************************************************************************************
STEP: Apply PTFs
   Start date/time _________________  Stop date/time _________________  Duration _________________
         Re-apply PTFs that were applied since your last save of system data.
********************************************************************************************************
STEP: Print joblog
   Start date/time _________________  Stop date/time _________________  Duration _________________
         You should print the joblog.
         To do so, run the following command:
            DSPJOBLOG JOB(*) OUTPUT(*PRINT)
         Review the job logs or output from your recovery processing
         to ensure that all recovery steps completed successfully.
5722BR1 V5R2M0 020906        Recovering Your Entire System AS02
                                                              8/26/03   8:55:45    Page 19 of 19
********************************************************************************************************
STEP: Reset system values
   Start date/time _________________  Stop date/time _________________  Duration _________________
         Use the commands and recorded values in "Step: Recover operating
         system" to change the system values to the original setting or to a
         new value that meets your desired policy.
********************************************************************************************************
STEP: Perform IPL
   Start date/time _________________  Stop date/time _________________  Duration _________________
         Return system to normal mode and IPL using the following command:
            PWRDWNSYS OPTION(*IMMED) RESTART(*YES)
                                 * * * * *  E N D  O F  L I S T I N G  * * * * *
```

C

AIX administrative client in OS/400 PASE sample programs

This appendix provides examples for porting and using the IBM Tivoli Storage Manager AIX administrative client with OS/400 Portable Application Solutions Environment (PASE). Using the IBM Tivoli Storage Manager administrative client on the iSeries server gives you more flexibility and control of the IBM Tivoli Storage Manager server for OS/400 PASE.

Important: The contents of this appendix are not supported by IBM. However, several customers are using versions of the programs provided here.

This appendix follows the example to install the IBM @server pSeries (AIX) IBM Tivoli Storage Manager client in OS/400 PASE. The iSeries server doesn't have a native IBM Tivoli Storage Manager administration client similar to other operating systems. A solution is to port the AIX IBM Tivoli Storage Manager client code to OS/400 PASE. Although this is not supported by IBM, it allows us to create interface programs between BRMS and IBM Tivoli Storage Manager.

Note: At the time of writing this redbook, the IBM Tivoli Storage Manager V5R2 AIX client code could not be ported to OS/400 PASE. All the examples in this redbook use the IBM Tivoli Storage Manager AIX V516 client code.

This appendix also provides sample Command Language Program (CLP) code to show how you can incorporate this function into your own IBM Tivoli Storage Manager server for OS/400 PASE environment.

Downloading the IBM Tivoli Storage Manager V516 client code

The following example explains how to download the V516 IBM Tivoli Storage Manager AIX client. Most of the commands that are used are case sensitive. Therefore, you must type them exactly as shown.

1. On the OS/400 command line of the IBM Tivoli Storage Manager server, enter the following command:

   ```
   FTP RMTSYS(FTP.SOFTWARE.IBM.COM)
   ```

2. Enter `anonymous` for the login ID. Then enter your e-mail address as the guest password.
3. Place the File Transfer Protocol (FTP) session into binary mode by typing:

   ```
   bin
   ```

4. You may have to change the FTP session to use the integrated file system (IFS) naming convention rather than OS/400 library/file.member format by typing:

   ```
   namefmt 1
   ```

   You receive the following messages:

   ```
   500 'SITE NAMEFMT 1': command not understood
   Client NAMEFMT is 1.
   ```

   A 500 message from the UNIX FTP server is received because the command was not understood. The second message acknowledges that the new iSeries client is now using format 1.

5. Change to the IBM Tivoli Storage Manager V516 client code directory by entering the command:

   ```
   cd /storage/tivoli-storage-management/maintenance/client/v5r1/AIX/AIX64bit/v5 16/
   ```

6. Change the local iSeries directory to root by entering:

   ```
   lcd /
   ```

7. Download the V516 IBM Tivoli Storage Manager client code by typing the following command:

   ```
   get IP22651.tivoli.tsm.client.ba.aix51.64bit
   ```

8. End the FTP session by typing **`quit`** or pressing F3.

Installing the IBM Tivoli Storage Manager V516 client code

To install the IBM Tivoli Storage Manager client code, you must use the AIX **`restore`** command in OS/400 PASE.

1. Start an OS/400 PASE interactive session on the iSeries server by entering the following command:

   ```
   call qp2term
   ```

2. Change to the root directory by typing:

   ```
   cd /
   ```

3. Restore the IBM Tivoli Storage Manager client code by entering the following AIX command:

   ```
   restore -xf IP22651.tivoli.tsm.client.ba.aix51.64bit
   ```

   Press Enter when you receive the "`Please mount volume 1 ...`" message.

This command restores the AIX client code to the IFS directory /usr/tivoli/tsm/client/ba/bin/.

Configuring the IBM Tivoli Storage Manager V516 client code

Before you can use the IBM Tivoli Storage Manager administrative client, you must first configure two IBM Tivoli Storage Manager option files that are used by the IBM Tivoli Storage Manager administrative client. Two sample option files are provided in the IBM Tivoli Storage Manager client directory. You must first copy these files and then edit them.

1. Start an OS/400 PASE interactive session by typing the following command:

   ```
   call qp2term
   ```

2. Change to the IBM Tivoli Storage Manager clients directory by typing:

   ```
   cd /usr/tivoli/tsm/client/ba/bin
   ```

3. Copy the two sample IBM Tivoli Storage Manager option files by entering the commands:

   ```
   cp dsm.opt.smp dsm.opt
   cp dsm.sys.smp dsm.sys
   ```

4. Press F21 to use the OS/400 command line.

5. Use the EDTF OS/400 command to edit the two option files.

   a. For dsm.opt, enter:

      ```
      EDTF STMF('/usr/tivoli/tsm/client/ba/bin/dsm.opt')
      ```

      Uncomment the SErvername entry. Insert your IBM Tivoli Storage Manager server name. We used AS27 for our IBM Tivoli Storage Manager server (see Example C-1). Press F3 to save and exit the file editor.

Example: C-1 Editing the dsm.opt file

```
************************************************************************
* Tivoli Storage Manager                                               *
*                                                                      *
* Sample Client User Options file for AIX and SunOS (dsm.opt.smp)      *
************************************************************************

*  This file contains an option you can use to specify the TSM
*  server to contact if more than one is defined in your client
*  system options file (dsm.sys).  Copy dsm.opt.smp to dsm.opt.
*  If you enter a server name for the option below, remove the
*  leading asterisk (*).

************************************************************************

SErvername       A27
```

   b. For dsm.sys, enter:

      ```
      EDTF STMF('/usr/tivoli/tsm/client/ba/bin/dsm.sys')
      ```

      Uncomment the SErvername entry. Insert your IBM Tivoli Storage Manager server name. We used AS27 for our IBM Tivoli Storage Manager server. Replace the TCPServeraddress entry with localhost (see Example C-2). Press F3 to save and exit the file editor.

Example: C-2 Editing the dsm.sys file

```
************************************************************************
* Tivoli Storage Manager                                               *
*                                                                      *
* Sample Client System Options file for AIX and SunOS (dsm.sys.smp)    *
************************************************************************

*  This file contains the minimum options required to get started
*  using TSM.  Copy dsm.sys.smp to dsm.sys.  In the dsm.sys file,
*  enter the appropriate values for each option listed below and
*  remove the leading asterisk (*) for each one.

*  If your client node communicates with multiple TSM servers, be
*  sure to add a stanza, beginning with the SERVERNAME option, for
*  each additional server.

************************************************************************

SErvername  AS27
   COMMmethod         TCPip
   TCPPort            1500
   TCPServeraddress   localhost
```

6. Press F12 to return to the OS/400 PASE interactive session.
7. Use the AIX **dsmadmc** command to start an IBM Tivoli Storage Manager administrative command interface with the IBM Tivoli Storage Manager server. The **dsmadmc** command on the iSeries can only be used in batch mode to perform individual commands due to the limitations of the OS/400 PASE terminal.

   The **dsmadmc** command uses the following syntax:

   ```
   dsmadmc -id=uuuu -pa=pppp xxxxx xxxxxx
   ```

   Here *uuuu* is an IBM Tivoli Storage Manager administrator user ID, *pppp* is the IBM Tivoli Storage Manager administrators password, and *xxxx xxxx* is the IBM Tivoli Storage Manager command you want to issue.

   To test the IBM Tivoli Storage Manager administrative interface, you must be in the IBM Tivoli Storage Manager clients directory (/usr/tivoli/tsm/client/ba/bin)

   For example, to query the IBM Tivoli Storage Manager storage configuration we entered the following command:

   ```
   dsmadmc -id=admin -pa=yourpassword query stg
   ```

   For further information about the **dsmadmc** command, see Chapter 3, “Using the Command - Line Interface” in *IBM Tivoli Storage Manager for OS/400 PASE Administrator’s Reference*, GC23-4695.

Running an IBM Tivoli Storage Manager server command from OS/400

This section explains how to create an OS/400 command (RUNTSMCMD) that can submit IBM Tivoli Storage Manager server commands to the IBM Tivoli Storage Manager server for OS/400 PASE. A prime candidate for this type of program is ending the IBM Tivoli Storage Manager server in batch.

Important: The program must have an IBM Tivoli Storage Manager administrative user and password hardcoded in the program. Make sure that the program and command are adequately secured by OS/400 security to ensure that only the authorized people are allowed to use this function.

Adding a new administrator to IBM Tivoli Storage Manager

In our example, we created a new IBM Tivoli Storage Manager administrator called *auto_operator*, which is used to run all IBM Tivoli Storage Manager commands from the OS/400 RUNTSMCMD command. To add a new administrator to the IBM Tivoli Storage Manager server, enter the following commands from the IBM Tivoli Storage Manager Web Server Command window:

```
register admin auto_operator  ibmrochester
grant authority auto_operator classes=system
```

Sample code for the RUNTSMCMD command

You can use the sample code shown in Example C-3 to compile into the RUNTSMCMD command.

Important: The code in Example C-3 is case sensitive. You must type the directory references in lowercase as shown in this example.

Example: C-3 Sample RUNTSMCMD CLP code

```
PGM        PARM(&TSMCMD)
 /**/
 DCL VAR(&CMD) TYPE(*CHAR) LEN(230)
 DCL VAR(&TSMCMD) TYPE(*CHAR) LEN(180)
 DCL VAR(&SHELL) TYPE(*CHAR) LEN(25) +
               VALUE('/QOpenSys/usr/bin/ksh')
 DCL VAR(&ACCESS) TYPE(*CHAR) LEN(50) +
           VALUE('dsmadmc -id=auto_operator -pa=ibmrochester')
 DCL VAR(&NULL) TYPE(*CHAR) LEN(1) VALUE(X'00')
 /**/
 CHGVAR VAR(&CMD) VALUE(&ACCESS *CAT &TSMCMD)
 CHGVAR VAR(&CMD) VALUE(&CMD *TCAT &NULL)
 CHGVAR VAR(&SHELL) VALUE(&SHELL *TCAT &NULL)
 /**/

 CHGCURDIR  DIR('/usr/tivoli/tsm/client/ba/bin')
/**/
 CALL       PGM(QP2SHELL) PARM(&SHELL &CMD)
/**/
ENDPGM
```

You can use the sample command source shown in Example C-4 to create the RUNTSMCMD command linked to the previously created RUNTSMCMD program.

Example: C-4 Sample RUNTSMCMD command

```
CMD        PROMPT('RUN TSM COMMAND')
  PARM       KWD(TSMCMD) TYPE(*CHAR) LEN(180) RSTD(*NO) +
               PROMPT('TSM COMMAND TO BE RUN')
```

Ending the IBM Tivoli Storage Manager server from a batch program

You can use the RUNTSMCMD command to end the IBM Tivoli Storage Manager server for OS/400 PASE. The following example ends the IBM Tivoli Storage Manager server by passing the IBM Tivoli Storage Manager server command HALT. You can add this command to a BRMS control group exit to end the IBM Tivoli Storage Manager server before you save and restart IBM Tivoli Storage Manager:

```
RUNTSMCMD TSMCMD(HALT)
```

Sample code for the STRMNTTSM command and programs

The following sections contain sample code for the STRMNTTSM programs and commands. They also provides sample code for the TSMDBBOFF, TSMVOLON, TSMCPYOFF, and MOVMEDTSM programs.

Sample code for STRMNTTSM program

```
/*-------------------------------------------------------------------*/
/* Program STRMNTTSM                                                 */
/*-------------------------------------------------------------------*/

             PGM        PARM(&TSMDBBOFF &TSMCPYOFF &TSMVOLON +
                          &MEDIACLS &CPYPOOL &BRMMOVPCY &MOVMEDTSM)
/**/
             DCL        VAR(&TSMDBBOFF) TYPE(*CHAR) LEN(4)
             DCL        VAR(&TSMCPYOFF) TYPE(*CHAR) LEN(4)
             DCL        VAR(&TSMVOLON)  TYPE(*CHAR) LEN(4)
             DCL        VAR(&MEDIACLS)  TYPE(*CHAR) LEN(10)
             DCL        VAR(&CPYPOOL)   TYPE(*CHAR) LEN(30)
             DCL        VAR(&BRMMOVPCY) TYPE(*CHAR) LEN(10)
             DCL        VAR(&MOVMEDTSM) TYPE(*CHAR) LEN(4)
/**/
/*-------------------------------------------------------------------*/
/**/
             IF         COND(&TSMDBBOFF = '*YES') THEN(DO)
/**/
             CALL       PGM(TSMDBBOFF) PARM(&BRMMOVPCY &MEDIACLS)
             MONMSG     MSGID(CPF0000)
/**/
             ENDDO
/*-------------------------------------------------------------------*/
             IF         COND(&TSMCPYOFF = '*YES') THEN(DO)
/**/
             CALL       PGM(TSMCPYOFF) PARM(&BRMMOVPCY &CPYPOOL)
             MONMSG     MSGID(CPF0000)
/**/
             ENDDO
/**/
/*-------------------------------------------------------------------*/
```

```
/**/
            IF         COND(&TSMVOLON = '*YES') THEN(DO)
/**/
            CALL       PGM(TSMVOLON) PARM(&CPYPOOL)
            MONMSG     MSGID(CPF0000)
/**/
            ENDDO
/*-------------------------------------------------------------------*/
/**/
            IF         COND(&MOVMEDTSM = '*YES') THEN(DO)
/*-------------------------------------------------------------------*/
/* Delay job 1 mins to allow for TSM to update BRMS files before  */
/* running the BRMS MOVMEDBRM command                             */
/*-------------------------------------------------------------------*/
            DLYJOB     DLY(60)
/**/
            CALL       PGM(MOVMEDTSM) PARM(&BRMMOVPCY)
            MONMSG     MSGID(CPF0000)
/**/
            ENDDO
/**/
            ENDPGM
```

Sample code for the STRMNTTSM command

```
CMD        PROMPT('Start Maintenance for ITSM')
PARM       KWD(TSMDBBOFF) TYPE(*CHAR) LEN(4) RSTD(*YES) +
             DFT(*YES) VALUES('*YES' '*NO') +
             PROMPT('ITSM Database Tapes to Offsite')
PARM       KWD(TSMCPYOFF) TYPE(*CHAR) LEN(4) RSTD(*YES) +
             DFT(*YES) VALUES('*YES' '*NO') +
             PROMPT('ITSM Copypool Tapes to Offsite')
PARM       KWD(TSMVOLON) TYPE(*CHAR) LEN(4) RSTD(*YES) +
             DFT(*YES) VALUES('*YES' '*NO') +
             PROMPT('ITSM Expired  Tapes to Onsite')
PARM       KWD(MEDIACLS) TYPE(*CHAR) LEN(10) RSTD(*NO) +
             PROMPT('ITSM Database Device Class')
PARM       KWD(CPYPOOL) TYPE(*CHAR) LEN(30) RSTD(*NO) +
             PROMPT('ITSM Copy Storage Pool Name')
PARM       KWD(BRMMOVPCY) TYPE(*CHAR) LEN(10) RSTD(*NO) +
             DFT(TSMOFFSITE) PROMPT('BRMS Move Policy +
             for ITSM')
PARM       KWD(MOVMEDBRM) TYPE(*CHAR) LEN(4) RSTD(*YES) +
             DFT(*YES) VALUES('*YES' '*NO') +
             PROMPT('Run MOVMEDBRM for ITSM tapes')
```

Sample code for the TSMDBBOFF program

```
/*-------------------------------------------------------------------*/
/* Program TSMDBBOFF                                                 */
/*-------------------------------------------------------------------*/
/*                                                                   */
            PGM        PARM(&BRMMOVPCY &MEDIACLS)
            DCLF       FILE(QTEMP/TSMTAPE)

            DCL        VAR(&BRMMOVPCY) TYPE(*CHAR) LEN(10)
            DCL        VAR(&MEDIACLS) TYPE(*CHAR) LEN(10)
            DCL        VAR(&TAPE) TYPE(*CHAR) LEN(6)
            DCL        VAR(&DEVCLASS) TYPE(*CHAR) LEN(10)
```

```
             DCL        VAR(&LOCATION) TYPE(*CHAR) LEN(10)

             DCL        VAR(&CMD1) TYPE(*CHAR) LEN(180) +
                          VALUE('"select +
                          volume_name,devclass,location from +
                          volhistory where type=''BACKUPFULL'' > +
                          /tmp/tsmdbboff.txt"')
             DCL        VAR(&CMD2) TYPE(*CHAR) LEN(180) VALUE('"upd +
                               volh xxxxxx  devc=xxxxxxxxxx +
                               location=''OFFSITE''"')
              CHGCURDIR  DIR(/)
              MONMSG     MSGID(CPF0000)

/*-------------------------------------------------------------------*/
/* Remove temp work files from IFS                                   */
/*-------------------------------------------------------------------*/

              RMVLNK     OBJLNK('/tmp/tsmdbboff.txt')
              MONMSG     MSGID(CPF0000)

/*-------------------------------------------------------------------*/
/* Create temp work files                                          */
/*-------------------------------------------------------------------*/
/*                                                                   */
              CRTPF      FILE(QTEMP/TSMTAPE) RCDLEN(133)
              MONMSG     MSGID(CPF0000)
/*                                                                   */
              CPYTOSTMF  +
                       FROMMBR('/QSYS.LIB/QTEMP.LIB/TSMTAPE.FILE/T+
                         SMTAPE.MBR') TOSTMF('/tmp/tsmdbboff.txt') +
                         STMFOPT(*REPLACE)
              MONMSG     MSGID(CPF0000)
/*                                                                   */
/*-------------------------------------------------------------------*/
/* Query ITSM for DB backups ready to move offsite                   */
/*-------------------------------------------------------------------*/
/*                                                                   */
              RUNTSMCMD  TSMCMD(&CMD1)
              MONMSG     MSGID(CPF0000)

              CPYFRMSTMF FROMSTMF('/tmp/tsmdbboff.txt') +
                           TOMBR('/QSYS.LIB/QTEMP.LIB/TSMTAPE.FILE/TSM+
                           TAPE.MBR') MBROPT(*REPLACE) STMFCODPAG(819)
              MONMSG     MSGID(CPF0000) EXEC(GOTO CMDLBL(ENDPGM))

/*-------------------------------------------------------------------*/
/* Assign BRMS move policy to ITSM database tapes and update the  */
/* the location parameter in ITSM                                    */
/*-------------------------------------------------------------------*/
START:       RCVF
             MONMSG     MSGID(CPF0864) EXEC(GOTO CMDLBL(ENDPGM))
/**/
             CHGVAR     VAR(&TAPE) VALUE(%SST(&TSMTAPE 1 6))
             CHGVAR     VAR(&DEVCLASS) VALUE(%SST(&TSMTAPE 24 10))
             CHGVAR     VAR(&LOCATION) VALUE(%SST(&TSMTAPE 45 10))
/**/
             IF         COND((&MEDIACLS *EQ &DEVCLASS) *AND +
                          (&LOCATION *EQ '         ')) THEN(DO)
/**/
             CHGMEDBRM  VOL(&TAPE) MEDCLS(*SAME) +
```

```
                        MOVPCY(&BRMMOVPCY) TEXT('ITSM Database +
                        Backup')
            MONMSG      MSGID(CPF0000)
 /**/
            CHGVAR      %SST(&CMD2 11 6) &TAPE
            CHGVAR      %SST(&CMD2 24 10) &DEVCLASS
 /**/
            RUNTSMCMD   TSMCMD(&CMD2)
            MONMSG      MSGID(CPF0000)
 /**/
             ENDDO
             GOTO       CMDLBL(START)
 /*                                                                 */
  ENDPGM:        RETURN
 /*-----------------------------------------------------------------*/
 ENDPGM
```

Sample code for the TSMVOLON program

```
/*-----------------------------------------------------------------*/
/* Program TSMVOLON                                                */
/*-----------------------------------------------------------------*/
            PGM         PARM(&CPYPOOL)
/*                                                                 */
            DCLF        FILE(QTEMP/TSMTAPE)
            DCL         VAR(&CPYPOOL) TYPE(*CHAR) LEN(10)
            DCL         VAR(&STGPOOL) TYPE(*CHAR) LEN(10)
            DCL         VAR(&TAPE) TYPE(*CHAR) LEN(6)

            DCL         VAR(&CMD1) TYPE(*CHAR) LEN(180) +
                          VALUE('"select +
                          volume_name,stgpool_name,status from +
                          volumes where +
                          stgpool_name=''xxxxxxxxxxxxxxxxxxxxxxxxxxxx+
                          xx'' and access =''OFFSITE'' and +
                          status=''EMPTY'' > /tmp/tsmvolon.txt"')
            DCL         VAR(&CMD2) TYPE(*CHAR) LEN(180) +
                          VALUE('update vol xxxxxx acc=readwrite')

            CHGCURDIR   DIR(/)
            MONMSG      MSGID(CPF0000)

/*-----------------------------------------------------------------*/
/* Remove temp work files from IFS                                 */
/*-----------------------------------------------------------------*/

            RMVLNK      OBJLNK('/tmp/tsmvolon.txt')
            MONMSG      MSGID(CPF0000)

/*-----------------------------------------------------------------*/
/* Create temp work files                                        */
/*-----------------------------------------------------------------*/
/*                                                                 */
            CRTPF       FILE(QTEMP/TSMTAPE) RCDLEN(133)
            MONMSG      MSGID(CPF0000)
/*                                                                 */
            CPYTOSTMF   +
                          FROMMBR('/QSYS.LIB/QTEMP.LIB/TSMTAPE.FILE/T+
                          SMTAPE.MBR') TOSTMF('/tmp/tsmvolon.txt') +
                           STMFOPT(*REPLACE)
```

```
             MONMSG     MSGID(CPF0000)
/*                                                                 */
/*-----------------------------------------------------------------*/
/* Query ITSM for Copy tapes to be moved back onsite               */
/*-----------------------------------------------------------------*/
/*                                                                 */
             CHGVAR     %SST(&CMD1 74 30) &CPYPOOL
/*                                                                 */
             RUNTSMCMD  TSMCMD(&CMD1)
             MONMSG     MSGID(CPF0000)

             CPYFRMSTMF FROMSTMF('/tmp/tsmvolon.txt') +
                          TOMBR('/QSYS.LIB/QTEMP.LIB/TSMTAPE.FILE/TSM+
                          TAPE.MBR') MBROPT(*REPLACE) STMFCODPAG(819)
             MONMSG     MSGID(CPF0000) EXEC(GOTO CMDLBL(ENDPGM))

/*-----------------------------------------------------------------*/
/* Update any empty offsite copy tapes to readwrite to delete from*/
/*  ITSM and expire in BRMS                                        */
/*-----------------------------------------------------------------*/
 START:      RCVF
             MONMSG     MSGID(CPF0864) EXEC(GOTO CMDLBL(ENDPGM))
/**/
             CHGVAR     VAR(&TAPE) VALUE(%SST(&TSMTAPE 1 6))
             CHGVAR     VAR(&STGPOOL) VALUE(%SST(&TSMTAPE 24 30))
/**/
             IF         COND(&CPYPOOL *EQ &STGPOOL) THEN(DO)
/**/
             CHGVAR     %SST(&CMD2 12 6) &TAPE
/**/
             RUNTSMCMD  TSMCMD(&CMD2)
             MONMSG     MSGID(CPF0000)
/**/
             ENDDO
/**/
             GOTO       CMDLBL(START)
/*                                                                 */
 ENDPGM:       RETURN
/*-----------------------------------------------------------------*/
ENDPGM
/
```

Sample code for the TSMCPYOFF program

```
/*-----------------------------------------------------------------*/
/* Program TSMCPYOFF                                               */
/*-----------------------------------------------------------------*/
             PGM        PARM(&BRMMOVPCY &CPYPOOL)
/*                                                                 */
             DCLF       FILE(QTEMP/TSMTAPE)
             DCL        VAR(&BRMMOVPCY) TYPE(*CHAR) LEN(10)
             DCL        VAR(&CPYPOOL) TYPE(*CHAR) LEN(10)
             DCL        VAR(&STGPOOL) TYPE(*CHAR) LEN(10)
             DCL        VAR(&TAPE) TYPE(*CHAR) LEN(6)

             DCL        VAR(&CMD1) TYPE(*CHAR) LEN(180) +
                          VALUE('"select +
                          volume_name,stgpool_name,access from +
                          volumes where +
                          stgpool_name=''xxxxxxxxxxxxxxxxxxxxxxxxxxxx+
```

```
                    xx'' and access <> ''OFFSITE'' > +
                    /tmp/tsmcpyoff.txt"')
          DCL       VAR(&CMD2) TYPE(*CHAR) LEN(180) +
                    VALUE('update vol xxxxxx acc=offsite +
                    location=''OFFSITE''')

          CHGCURDIR DIR(/)
          MONMSG    MSGID(CPF0000)

/*--------------------------------------------------------------------*/
/* Remove temp work files from IFS                                    */
/*--------------------------------------------------------------------*/

          RMVLNK    OBJLNK('/tmp/tsmcpyoff.txt')
          MONMSG    MSGID(CPF0000)

/*--------------------------------------------------------------------*/
/* Create temp work files                                          */
/*--------------------------------------------------------------------*/
/*                                                                    */
          CRTPF     FILE(QTEMP/TSMTAPE) RCDLEN(133)
          MONMSG    MSGID(CPF0000)
/*                                                                    */
          CPYTOSTMF +
                      FROMMBR('/QSYS.LIB/QTEMP.LIB/TSMTAPE.FILE/T+
                      SMTAPE.MBR') TOSTMF('/tmp/tsmcpyoff.txt') +
                      STMFOPT(*REPLACE)
           MONMSG    MSGID(CPF0000)
*                                                                   */
/*--------------------------------------------------------------------*/
/* Query ITSM for Copy tapes to be moved  offsite                     */
/*--------------------------------------------------------------------*/
/*                                                                    */
           CHGVAR    %SST(&CMD1 74 30) &CPYPOOL
/*                                                                    */
           RUNTSMCMD TSMCMD(&CMD1)
           MONMSG    MSGID(CPF0000)

           CPYFRMSTMF FROMSTMF('/tmp/tsmcpyoff.txt') +
                      TOMBR('/QSYS.LIB/QTEMP.LIB/TSMTAPE.FILE/TSM+
                      TAPE.MBR') MBROPT(*REPLACE) STMFCODPAG(819)
           MONMSG    MSGID(CPF0000) EXEC(GOTO CMDLBL(ENDPGM))
/*--------------------------------------------------------------------*/
/* Assign move policy to ITSM COPY tapes in BRMS and update the       */
/* copy tapes in ITSM                                                 */
/*--------------------------------------------------------------------*/
 START:    RCVF
           MONMSG    MSGID(CPF0864) EXEC(GOTO CMDLBL(ENDPGM))
/**/
           CHGVAR    VAR(&TAPE) VALUE(%SST(&TSMTAPE 1 6))
           CHGVAR    VAR(&STGPOOL) VALUE(%SST(&TSMTAPE 24 30))
/**/
           IF        COND(&CPYPOOL *EQ &STGPOOL) THEN(DO)
/**/
           CHGMEDBRM VOL(&TAPE) MEDCLS(*SAME) MOVPCY(&BRMMOVPCY) +
                      TEXT('ITSM COPY Tape')
           MONMSG    MSGID(CPF0000)
/**/
           CHGVAR    %SST(&CMD2 12 6) &TAPE
/**/
```

```
            RUNTSMCMD  TSMCMD(&CMD2)
            MONMSG     MSGID(CPF0000)
/**/
            ENDDO
/**/
            GOTO       CMDLBL(START)
/*                                                                 */
 ENDPGM:        RETURN
/*-----------------------------------------------------------------*/
ENDPGM
```

Sample code for the MOVMEDTSM program

```
/*-----------------------------------------------------------------*/
/* Program MOVMEDTSM                                               */
/*-----------------------------------------------------------------*/
            PGM        PARM(&BRMMOVPCY)
            DCL        VAR(&BRMMOVPCY) TYPE(*CHAR) LEN(10)
/*-----------------------------------------------------------------*/

            MOVMEDBRM  MOVPCY(&BRMMOVPCY) MEDCLS(*ALL) SYSNAME(*LCL)
            MONMSG     MSGID(CPF0000)
/*                                                                 */

/*-----------------------------------------------------------------*/
            RETURN
/*-----------------------------------------------------------------*/
            ENDPGM
```

D

Additional material

This redbook refers to additional material that you can downloaded from the Internet as explained in this appendix. This additional material is an OS/400 save file that contains OS/400 user-written commands, programs, and source files for the commands and programs used as:

- Exit programs in 6.2.2, “Creating IBM Tivoli Storage Manager and BRMS exit programs” on page 98
- Commands and programs in 10.1, “Sample programs for IBM Tivoli Storage Manager, BRMS media movement” on page 338

Locating the Web material

The Web material associated with this redbook is available in softcopy on the Internet from the IBM Redbooks Web server. Point your Web browser to:

```
ftp://www.redbooks.ibm.com/redbooks/SG247031
```

Alternatively, you can go to the IBM Redbooks Web site at:

```
ibm.com/redbooks
```

Select the **Additional materials** and open the directory that corresponds with the redbook form number, SG247031.

Using the Web material

The additional Web material that accompanies this redbook includes the following file:

File name	*Description*
TSMEXITSC.savf	This save file contains the commands, programs, and associates source file in compressed format for library TSMEXITS.

System requirements for downloading the Web material

The following system configuration is recommended. The save file and restored library take a relatively small amount of disk storage minimal processing power to run.

- **Hard disk space**: On the iSeries, the received save file requires 325 KB. The restored library and its objects use slightly less than 1.2 MB.
- **Operating system**: OS/400 V5R2 and IBM Tivoli Storage Manager Server for OS/400 PASE V5.2. V5.1.5 should also work, but it was not tested.
- **Processor**: Any iSeries model.
- **Memory**: The minimum memory of any iSeries model.

How to use the Web material

This section explains how to use this material. It is followed by a detailed example of using the Windows operating system File Transfer Protocol (FTP) function to upload the PC file to the iSeries.

1. Create a subdirectory (folder) on your workstation, and download the save file to this folder. It should have a file type of .savf.
2. Use FTP to transfer the save file from the PC folder to the iSeries server.
3. Use the OS/400 Restore Library (RSTLIB) command for library TSMEXITS, which is contained within this save file, named TSMEXITSC. After the library is restored, follow the instructions on how to use objects as described in the following sections:
   a. IBM Tivoli Storage Manager exit programs used by Backup Recovery and Media Services (BRMS), described in 6.2.2, “Creating IBM Tivoli Storage Manager and BRMS exit programs” on page 98.
   b. User-written programs that enable a BRMS interface to manage both BRMS and IBM Tivoli Storage Manager server tape media movement, used throughout Chapter 10, “Backup Recovery and Media Services movement of IBM Tivoli Storage Manager media” on page 337.
   c. The source programs and their dependence on AIX software available only through the series IBM Tivoli Storage Manager AIX V516 client, as described in Appendix C, “AIX administrative client in OS/400 PASE sample programs” on page 399.

Using Windows FTP to transmit the TSMEXITSC save file to the iSeries

There are several different FTP and DOS command syntaxes to perform the file transfer. This section uses the example the worked for us. After you have the save file (tsmexitsc.savf) on the PC, complete these steps:

1. From your iSeries 5250 session, create a save file in a library of your choice (we use QGPL in this example):

```
CRTSAVF FILE(QGPL/TSMEXITSC) TEXT('Receive SG247031 save file’)
```

2. From your PC, open a DOS prompt window and use FTP to transmit the save file to the iSeries server (AS01, in our example), using the following commands:

```
ftp <your iSeries server name or IP address>
respond to the prompt with your <OS/400 user profile>
respond to the prompt with your <OS/400 user profile password>
bin
cd /qsys.lib
put tsmexitsc.savf qgpl.lib/tsmexitsc.file (replace
you set status messages until the transfer has completed
quit
```

Figure D-1, starting at *ftp as01*, shows a complete successful transfer example.

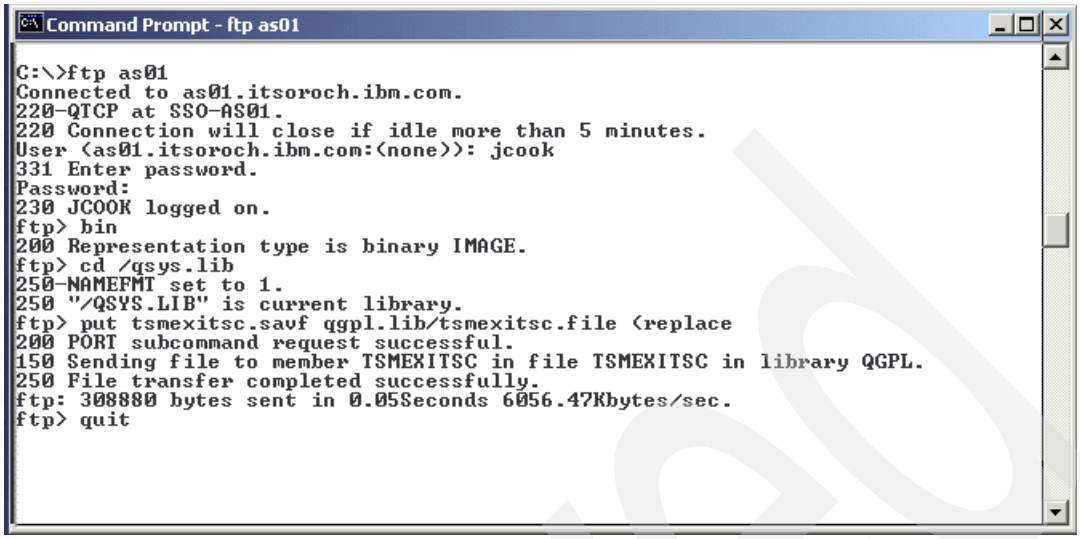

Figure D-1 FTP example transferring an iSeries save file from a PC to an iSeries server

Remember to use the OS/400 Restore Library (RSTLIB) command for library TSMEXISTS:

```
RSTLIB SAVLIB(TSMEXITS) DEV(*SAVF) SAVF(QGPL/TSMEXITSC)
```

Related publications

The publications listed in this section are considered particularly suitable for a more detailed discussion of the topics covered in this redbook.

IBM Redbooks

For information about ordering these publications, see “How to get IBM Redbooks” on page 416. Note that some of the documents referenced here may be available in softcopy only.

- *Backup Recovery and Media Services for OS/400: A Practical Approach*, SG24-4840
- *IBM Tivoli Storage Management Concepts*, SG24-4877
- *IBM Tivoli Storage Manager Implementation Guide*, SG24-5416
- *A Practical Guide to Implementing Tivoli Storage Manager on AS/400*, SG24-5472
- *Managing OS/400 with Operations Navigator V5R1 Volume 3: Configuration and Service*, SG24-5951
- *Managing OS/400 with Operations Navigator V5R1 Volume 1: Overview and More*, SG24-6226
- *LPAR Configuration and Management: Working with IBM @server iSeries Logical Partitions*, SG24-6251
- *Tivoli Storage Manager Version 5.1 Technical Guide*, SG24-6554
- *Backup Recovery and Media Services for OS/400: More Practical Information*, REDP0508

Other publications

These publications are also relevant as further information sources:

- *IBM Tivoli Storage Manager for OS/400 PASE Administrator’s Guide*, GC23-4694
- *IBM Tivoli Storage Manager for OS/400 PASE - Administrator’s Reference Guide*, GC23-4695
- *IBM Tivoli Storage Manager for OS/400 PASE Quick Start*, GC23-4696
- *Backup and Recovery*, SC41-5304
- *Job Scheduler for OS/400*, SC41-5324
- *Backup Recovery and Media Services for iSeries*, SC41-5345
- *Hierarchical Storage Management Use*, SC41-5351

Online resources

These Web sites and URLs are also relevant as further information sources:

- Latest on IBM Tivoli Storage Manager products
  - http://www-3.ibm.com/software/tivoli/products/storage-mgr/platforms.html
  - http://www-3.ibm.com/software/sysmgmt/products/support/IBMTivoliStorageManager.html
- A BRMS self-study guide

  http://www-1.ibm.com/servers/eserver/iseries/service/brms/pdf/StudentGuide52.pdf
- Latest BRMS information, including backing up Domino on iSeries

  http://www-1.ibm.com/servers/eserver/iseries/service/brms/
- iSeries Enterprise Edition packaged software

  http://www-1.ibm.com/servers/eserver/iseries/hardware/editions/
- iSeries Announcements

  http://www-1.ibm.com/servers/eserver/iseries/announce/
- IBM Tivoli support Web page

  http://www-3.ibm.com/software/sysmgmt/products/support/IBMTivoliStorageManager.html
- *iSeries Performance Capabilities Reference Guide*

  http://www-1.ibm.com/servers/eserver/iseries/perfmgmt/resource.htm

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Integrating Backup Recovery and Media Services and IBM Tivoli Storage Manager

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Integrating Backup Recovery and Media Services and IBM Tivoli Storage Manager

on the IBM @server iSeries Server

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In a multiplatform environment with iSeries servers, you can use the two products independently of each other. Or you can integrate them to achieve powerful capabilities to back up and recover mission-critical data and applications. Based on iSeries V5R2 BRMS and V5.2 of IBM Tivoli Storage Manager, this IBM Redbook presents:

- An overview of BRMS and IBM Tivoli Storage Manager terminology, constructs, and capabilities
- Examples of getting BRMS and IBM Tivoli Storage Manager server up and running on your iSeries server, and setting up your iSeries server as the BRMS Application Client to an IBM Tivoli Storage Manager server running on the iSeries server
- Troubleshooting guidance and tips for integrating BRMS and IBM Tivoli Storage Manager server on the iSeries server
- iSeries user programs and OS/400 commands to help an iSeries system operator to manage integrated BRMS and IBM Tivoli Storage Manager server functions via a single user interface

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