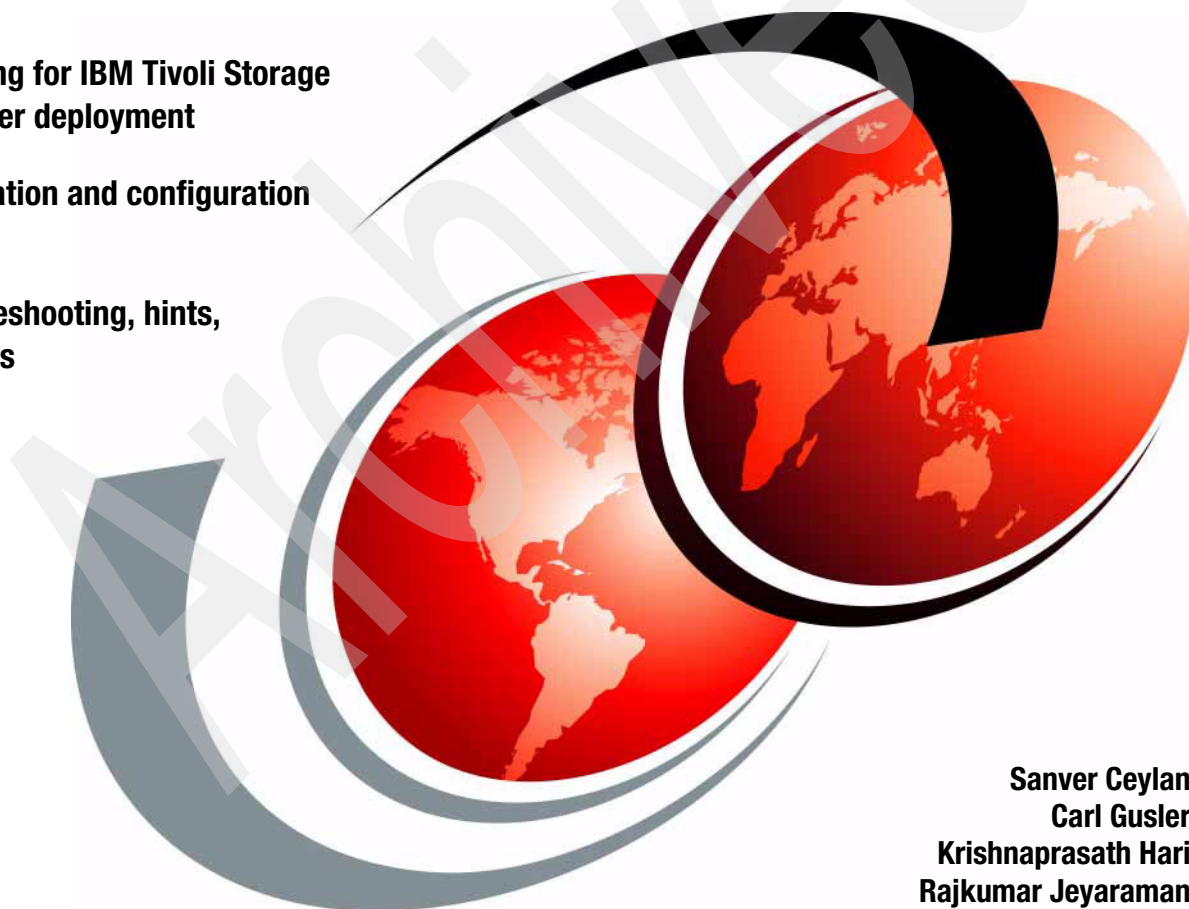**IBM**

Deployment Guide for IBM Tivoli Storage Manager V5.3

Planning for IBM Tivoli Storage Manager deployment

Installation and configuration

Troubleshooting, hints, and tips

Sanver Ceylan
Carl Gusler
Krishnaprasath Hari
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Redbooks

IBM

International Technical Support Organization

Deployment Guide for IBM Tivoli Storage Manager V5.3

October 2005

Note: Before using this information and the product it supports, read the information in "Notices" on page vii.

First Edition (October 2005)

This edition applies to Version 5, Release 3, Modification 1 of IBM Tivoli Storage Manager.

Contents

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Preface

The objective of this IBM® Redbook is to provide broad instructions about deploying the IBM Tivoli® Storage Manager (TSM) to various environments.

Readers should have general knowledge about communication network architecture and design, basic sizing of the Tivoli Storage Manager database, and basic pool management of TSM servers.

This document is intended to be read and used by pre-sales systems engineers and services personnel to build customized deployment of the Tivoli Storage Manager. A significant amount of knowledge of Tivoli Storage Manager is expected, and ideally the reader should have attended TSM basic and advanced training classes.

The reader should be familiar with the following topics:

► Storage management concepts
► Network topologies
► Distributed systems architectures and configuration

This book is a valuable addition to, and can be read in conjunction with, the existing product documentation. See "Other publications" on page 181 for the entire list of these documents.

The team that wrote this redbook

This book was produced by a team of specialists from around the world working at the International Technical Support Organization, Austin Center.

The team, from left: Krishnaprasath, Carl, Sanver, and Rajkumar

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He holds a Masters degree in Software Engineering from Birla Institute of Technology and Science, a premium institute in India.

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Introduction to IBM Tivoli Storage Manager

In this chapter we provide an overview of Tivoli Storage Manager concepts. This includes a high-level technical introduction to Tivoli Storage Manager, its architecture, and base concepts. The following topics are discussed:

► Tivoli Storage Manager overview
► Tivoli Storage Manager architecture
► Features of IBM Tivoli Storage Manager Extended Edition
► Solution design for disaster recovery purposes
► Tivoli Storage Manager complementary products
► Key changes in Version 5.3

1

1.1 IBM Tivoli Storage Manager

Tivoli Storage Manager, now a part of the IBM TotalStorage Open Software Family, is a strong management application built for the enterprise. Tivoli Storage Manager provides a solution for data protection, archiving, disaster recovery planning, space management, database and application protection bare machine recovery, and record retention. The product also automates storage management tasks by eliminating labor-intensive and cost-intensive manual procedures for backup, archive, and recovery.

1.1.1 Tivoli Storage Manager overview

Tivoli Storage Manager is the core product of the IBM Tivoli Storage Management product set. It provides a solution for distributed data and storage management in an enterprise network environment. Tivoli Storage Manager protects and manages data from more then 13 operating system platforms, covering mobile, desktop, and server systems over the entire distributed world. It supports hundreds of storage devices (including disk, tape, and optical) as well as LAN, WAN, and SAN infrastructures.

The base functions provided by Tivoli Storage Manager and its complementary products are as follows:

► Data protection (periodic backup and restore as well as disaster recovery):

– In operational backup and restore of data, the backup process creates a copy of the data to protect against the operational loss or destruction of file or application data. The customer defines how often to back up (frequency) and how many numbers of copies (versions) to hold.

The restore process places the backup copy of the data back into a customer-designated system or workstation.

– Disaster recovery means all activities required to organize, manage, and automate the recovery process from a major loss of IT infrastructure and data across the enterprise. It includes processes to move data off-site into a secure vault location, to rebuild IT infrastructure, and to reload data successfully in an acceptable time frame.

► Data resource management (vital record retention, archive, and retrieval):

– The archive process creates a copy of a file or a set of files representing an end point of a process for long-term storage. Files can remain on the local storage media or can be deleted. The customer controls how long (via the retention period) an archive copy is to be retained.

– The retrieval process locates the copies within the archival storage and places them back into a customer-designated system or workstation.

► Space management (or hierarchical storage management):

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

The solution is network based, which means that these functions are available to the whole network environment. Administration costs are minimized by centralization of all of the management of Tivoli Storage Manager components.

1.1.2 Tivoli Storage Manager architecture

Tivoli Storage Manager is a client/server architecture as seen in Figure 1-1.

Tivoli Storage Manager (TSM) clients are the workstations, file servers, mobile computers, and other machines in a customer's environment that must have their data protected. TSM client software is installed on these machines.
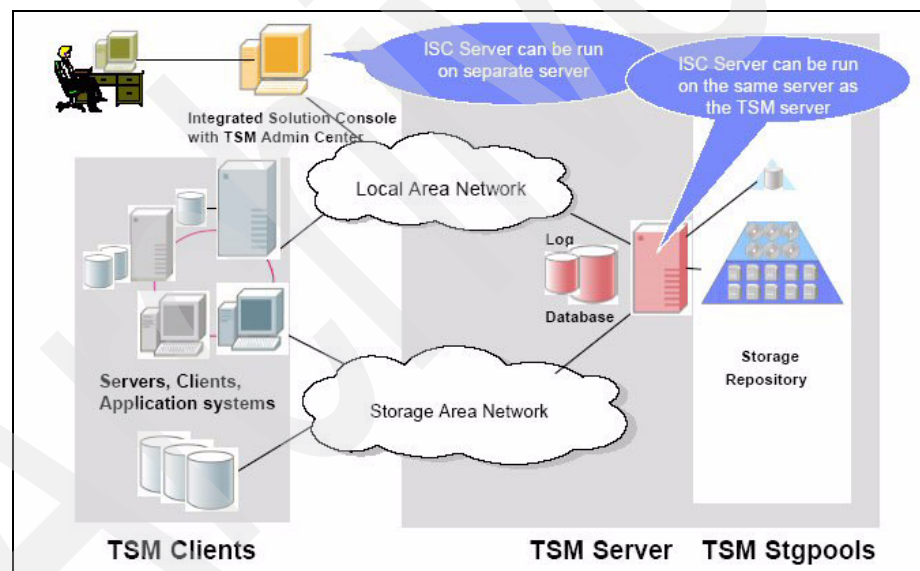
Figure 1-1   Tivoli Storage Manager architecture

Tivoli Storage Manager server is the "brains" of backup and archive with a unique architecture that empowers it. It is based on a relational database and transaction log. The database and transaction log track metadata, what is backed up, where it is stored, and what are the policies, schedules, and administrators.

The transaction log enables a two-phase commit, which protects the integrity of the database and allows for interrupted backups and restores to be restarted. The relational database empowers Tivoli Storage Manager to perform tasks that are not possible when you use a flat file master catalog to track metadata. For example, the relational database can:

► Move data from one type of storage pool to another
► Retroactively update backed-up data when a policy changes
► Track files down to the file level
► Schedule any type of client or administrative process
► Reclaim expired dead space on tapes

The TSM client sends its data to the TSM server either by the LAN or by the SAN. Most backups occur through schedules, but clients are can perform on-demand backups whenever they want. Clients are can also perform their own restores. Tivoli Storage Manager has a new Administration Center that comes with V5.3 and can be installed either on the same machine with TSM server or on a separate machine.

The actual data that the client sends over is stored in the storage pools. Tivoli Storage Manager is unique in the fact that the storage pools can form a storage hierarchy made up of any of more than 500 supported devices. This allows for flexibility, longevity, and, most important, fast backups and fast restores.

Most businesses back up their data initially to disk storage. This allows for hundreds of clients to back up at the same time. Then, based on policies, the data migrates in a fashion that expedites restores to tape or CD. When the data migrates, all data belonging to one client is moved together to the next pool. By keeping all of that data together, restores are faster because not as much tape positioning is needed. This migration process can also accommodate movement to collocated tapes, which further expedite restores by just having one user's data on them.

The environment can be firewall protected, and you will still want to be able to use the GUI interfaces of a TSM client. Tivoli Storage Manager allows individual configuration of nearly every TCP port that it uses for communication:

► TCP/IP port:

   To enable the Backup/Archive client, command line Administrative Client, and the scheduler to run outside a firewall, the port specified by the tcpport server option must be opened by the firewall administrator. This port is set on the client and the server using the `tcpport` option. The setting must be the same on the client and server. The default TCP/IP port is 1500.

► TCP/IP ports for the remote workstation:

The two TCP/IP ports for the remote workstation client must be opened. Use the webports option in the remote workstations option file to specify these ports. If you do not specify the values for the webports option, the default zero (0) causes TCP/IP to randomly assign two free port numbers.

1.1.3 Tivoli Storage Manager server

One of the principal architectural components of the TSM server is its built-relational database. The Tivoli Storage Manager database was especially designed for the task of managing data, and it implements zero-touch administration.

All policy information, logging, authentication and security, media management, and object inventory are managed through this database.

Most of the fields are externalized through Tivoli Storage Manager high-level administration commands, `SQL SELECT` statements, or for reporting purposes, by using an ODBC driver. Obviously, this database is fully protected with software mirroring, roll-forward capability, and its own management and online backup and restore functions.

For storing the managed data, the Tivoli Storage Manager server manages a storage repository. The storage repository can be implemented in a hierarchy using any combination of supported media or magnetic or optical disk, tape, and robotic storage devices, which are locally connected to the server system or are accessible through a SAN. To take advantage of SAN technology, the TSM server has features that dynamically share SAN-connected, automated tape library systems among multiple TSM servers, as well as providing (as an option) LAN-free and server-free backup.

1.1.4 IBM Tivoli Storage Manager Backup/Archive client

Data is sent to the TSM server using the IBM Tivoli Storage Manager Backup/Archive client and complementary Tivoli and non-IBM/Tivoli products. These products work with the Tivoli Storage Manager server base product to ensure that the data you need to store is managed as defined.

The Tivoli Storage Manager Backup/Archive client, which is included with the server, provides the operational backup and archival function. The client implements the patented progressive backup methodology, adaptive subfile backup technology, and unique record retention methods for backup and archive functions.

The Backup/Archive clients are implemented as multi-session clients, which means that they are able to take advantage of the multi-threading capabilities of modern operating systems.

1.1.5 Tivoli Storage Manager storage agent

The IBM Tivoli Storage Manager storage agent supports LAN-free backup solutions using a SAN infrastructure. The storage agent dynamically shares SAN connected tape libraries and disks with the TSM server, and it has the ability to write and read large amount of client data directly to and from server-owned storage media. This gives a great opportunity for lowering the back-up window, reducing the traffic on the LAN, and reducing the utilization of the TSM server.

1.1.6 IBM Tivoli Storage Manager Extended Edition

The Extended Edition of Tivoli Storage Manager expands on the features and possibilities of the Basic Edition described in the previous section.

Tivoli Storage Manager Extended Edition expands on the data backup/restore and the managed data archive/retrieve capabilities of the basic Tivoli Storage Manager by adding disaster planning capability, Network Data Management Protocol (NDMP) control for network-attached storage (NAS) filers, and support for large tape libraries.

Disaster recovery manager

Disaster recovery manager (DRM) is a feature of Tivoli Storage Manager Extended Edition. It coordinates and automates the process of recovering from a disaster, and provides for extended off-site media management, automated restore of the TSM server, and managed client recovery. It complements the already implemented robust protection features of Tivoli Storage Manager and automates many already facilitated protection functions.

DRM automatically captures information required to recover the TSM 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 and helps ensure quick recovery of data after a disaster.

DRM also 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, no matter whether it is a manual or electronic vault, so your data can be located easily if disaster strikes.

Disaster recovery planning

This facilitates even more detailed tracking of the additional copies of your backed-up, archived, and space-managed data that Tivoli Storage Manager creates for safekeeping at an off-site location. Tivoli Storage Manager Extended Edition also prepares and keeps up to date a text file with detailed recovery steps and automated computer-scripts—the "recovery plan." Should a disaster strike and destroy your storage and computers, this plan and the off-site data copies will get your business back up and running quickly.

NDMP support for Network Attached Storage (NAS)

Tivoli Storage Manager Extended Edition uses Network Data Management Protocol (NDMP) to perform high-performance, scalable backups and restores. The backups and restores minimize network traffic and transfer data outboard of the Tivoli Storage Manager client and server.

Tivoli Storage Manager enables data backup and restore on NAS devices that support NDMP Version 3.0. Full or differential backups can be performed at a directory or file system level, including snapshots that are stored as either file systems or subdirectories. Restores can be performed of an entire file system or selected files and directories within the file system. Multiple backup and restore operations can be performed in parallel.

Currently, NDMP for full or differential backups can be performed at a directory or file system level, including snapshots that are stored as either file systems or subdirectories to a Tivoli Storage Manager server running on AIX, Sun Solaris, HP-UX, Linux®, or Windows. This uses NDMP to back up a full file system image and to restore an entire file system image. After a full backup image has been created, subsequent backups can be differential images. A differential image consists of all of the files that have changed since the previous full image backup. The restore of a differential image automatically restores the differential image after the appropriate full image has been restored. Backup and restore operations can be scheduled using the administrative command scheduler.

During backup and restore operations, data flows directly between the tape drive and the Network Attached Storage (NAS) appliance. NDMP operations can be performed using SCSI or ACSLS tape libraries. Additionally, 349X tape libraries may be used with some NAS devices. Refer to the Tivoli Storage Manager device support Web page and your NAS vendor's documentation for complete NDMP device support.

NDMP for NAS backup works with either a SCSI-attached tape device local to the NAS appliance, or with a SAN-attached SCSI or ACSLS device that can be shared with the TSM server. Drives must be supported by both the NAS appliance and the NAS operating system. Drives can be dedicated to NDMP operations from a single NAS file server or can be shared. Multiple NAS

appliances can share tape resources if they have FC access to the drive and if backups are performed via the same TSM server. Depending on the configuration, drives can be shared with LAN-free backup/restore operations.

Database and application online protection

This feature protects a wide range of application data via the protection of the underlying databases and application management systems holding that data. This module automates data protection tasks and enables database and application servers to continue running their primary applications while they back up and restore data to and from offline storage.

Data retention

IBM Tivoli Storage Manager for Data Retention helps manage and simplify the retrieval of the ever-increasing amount of data that organizations must retain for strict records retention regulations. Many regulations demand archiving of records, e-mails, design documents, and other data for many years, in addition to requiring that the data is not changed or deleted.

Bare machine recovery

This feature backs up and automatically restores the operating system structures needed to rebuild the operating system, as well as data files. It schedules regular operating system backups so a recovery brings back the latest information.

1.2 Solution design for disaster recovery purposes

Disaster recovery must be part of every storage management solution. Tivoli Storage Manager Extended Edition offers serious disaster recovery management functions and solutions in addition to daily backup management.

In this section we discuss the types of the contingency plans, disaster recovery plans, and tier levels of disaster recovery solutions.

For more information about disaster recovery, refer to the *IBM TotalStorage Business Continuity Solutions Guide*, SG24-6547.

1.2.1 Types of contingency plans

IT Contingency Planning represents a broad scope of activities designed to sustain and recover critical IT services following an emergency. IT Contingency Planning fits into a broader emergency preparedness environment that includes recovery planning and organizational and business process continuity.

In general, universally accepted definitions for contingency planning and related planning areas have not been available. To provide a common basis of understanding regarding IT Contingency Planning, this section identifies several other types of plans and describes their purpose.

Business Continuity Planning (BCP)

Business Continuity Planning confronts the likelihood of a disaster, how the disaster interrupts the business process, and how the business can continue in operation. The cause of the interruption does not matter; what matters is gaining management control and processing capacity just after the interruption.

Business Recovery Plan (BRP)

The BRP (also Business Resumption Plan) addresses the restoration of business processes after an emergency. The BRP is similar to the BCP, but unlike that plan, the BRP typically lacks procedures to ensure continuity of critical processes throughout an emergency or disruption.

Continuity of Operations Plan (COOP)

The COOP focuses on restoring an organization's (usually the headquarters element) essential functions at an alternate site and performing those functions for up to 30 days before returning to normal operations.

Incident Response Plan (IRP)

The Incident Response Plan establishes procedures to address cyberattacks against an organization's IT server and workstation systems. These procedures are designed to enable security personnel to identify, mitigate, and recover from malicious computer incidents, such as unauthorized access to a system or data, denial of service, or unauthorized changes to system hardware or software (such as malicious logic—a virus, worm, or Trojan horse).

Occupant Emergency Plan (OEP)

The OEP provides the response procedures for occupants of a facility in the event of a situation posing a potential threat to the health and safety of personnel, the environment, or property. Such events include fire, hurricane, criminal attack, and medical emergency. OEPs are developed at the facility level, specific to the geographic location and structural design of the building.

Disaster Recovery Plan (DRP)

As suggested by its name, the Disaster Recovery Planapplies to major events that deny access to the normal facility for an extended period. Frequently, the Disaster Recovery Plan refers to an IT-focused plan designed to restore operability of the target system, application, data, or computer facility at an

alternate site after an emergency. The plan's scope may overlap that of an IT Contingency Plan; however, the Disaster Recovery Plan is narrower in scope and does not address minor disruptions that do not require relocation.

1.2.2 Disaster Recovery Plan

The primary objective of disaster recovery is to protect the organization in the event that all or part of its operations and computer services are rendered unusable. Disaster recovery is the process of reacting to a disaster by being able to provide computing services from another location. In most cases, the countermeasures you employ to be able to recover from a disaster are entirely different from the solution you use to achieve continuous availability.

A Disaster Recovery Plan establishes the procedures and actions to be done when on the verge of a disaster. A disaster recovery solution can be the salvation of the enterprise and the origin of the whole disaster recovery initiative. For that reason, it is fundamental that you be able to manage an incident successfully, assisted with a high-quality plan.

To summarize, the Disaster Recovery Plan refers to a coordinated strategy involving plans, procedures, and technical measures that enable the recovery of IT systems, operations, and data after a disruption.

Disaster Recovery Plan overview

A Disaster Recovery Plan is a comprehensive statement of consistent actions to be taken before, during, and after a disaster. The planning should be documented and tested to ensure the continuity of operations and availability of critical resources in the event of a disaster.

The Disaster Recovery Plan applies to all (usually catastrophic) events that deny access to the normal facility for an extended period, as the orderly shutdown of a facility due to a one-day long fixing of the energy cables. As we said previously, Disaster Recovery Plan refers to an IT-focused plan designed to restore operability of the target system, application, data, or computer facility at an alternate site after an emergency.

1.2.3 Seven tiers of recovery

The seven tiers of disaster recovery solutions (Figure 1-2 on page 11) offer a simple methodology to define your current service level, the current risk, and the target service level and target environment.
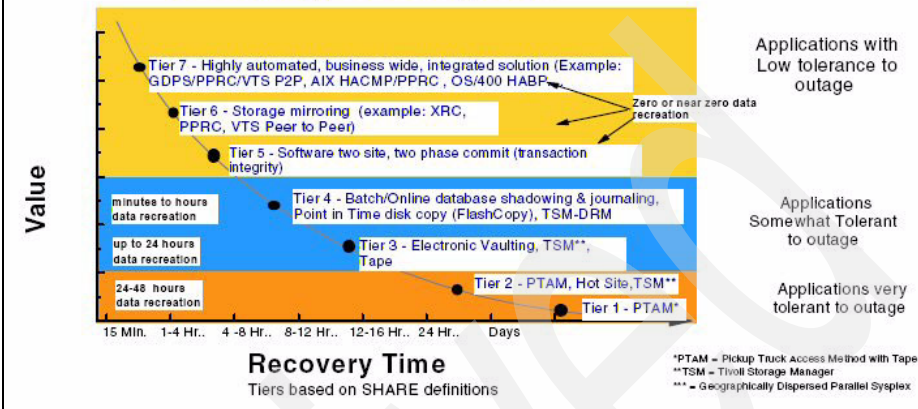
Figure 1-2   Disaster recovery tiers

Tier 0: no off-site data

Businesses with a Tier 0 disaster recovery solution have no Disaster Recovery Plan.

- ► There is no saved information, no documentation, no backup hardware, and no contingency plan.
- ► Typical recovery time: The length of recovery time in this instance is unpredictable. In fact, it may not be possible to recover at all.

Tier 1: data backup with no hot site

Businesses that use Tier 1 disaster recovery solutions back up their data at an off-site facility. Depending on how often backups are made, they are prepared to accept several days to weeks of data loss, but their backups are secure off-site. However, this Tier lacks the systems on which to restore data.

Tier 2: data backup with a hot site

Businesses using Tier 2 disaster recovery solutions make regular backups on tape. This is combined with an off-site facility and infrastructure (known as a hot site) in which to restore systems from those tapes in the event of a disaster. This tier of solution still results in the need to re-create several hours to days worth of data, but it is less unpredictable in recovery time.

Tier 3: electronic vaulting

Tier 3 solutions utilize components of Tier 2. Additionally, some mission-critical data is electronically vaulted. This electronically vaulted data is typically more current than that shipped via PTAM. As a result there is less data recreation or loss after a disaster occurs.

Tier 4: point-in-time copies

Tier 4 solutions are used by businesses who require both greater data currency and faster recovery than users of lower tiers. Rather than relying largely on shipping tape, as is common on the lower tiers, Tier 4 solutions incorporate more disk-based solutions. Several hours of data loss is still possible, but it is easier to make such point-in-time (PIT) copies with greater frequency than data can be replicated through tape-based solutions.

Tier 5: transaction integrity

Tier 5 solutions are used by businesses with a requirement for consistency of data between production and recovery data centers. There is little to no data loss in such solutions; however, the presence of this functionality is entirely dependent on the application in use.

Tier 6: zero or little data loss

Tier 6 disaster recovery solutions maintain the highest levels of data currency. They are used by businesses with little or no tolerance for data loss and who need to restore data to applications rapidly. These solutions have no dependence on the applications to provide data consistency.

Tier 7: highly automated, business-integrated solution

Tier 7 solutions include all of the major components of a Tier 6 solution with the additional integration of automation. This enables a Tier 7 solution to ensure consistency of data above that which is granted by Tier 6 solutions. Additionally, recovery of the applications is automated, allowing for restoration of systems and applications much faster and more reliably than would be possible through manual disaster recovery procedures.

For detailed information, see the *IBM TotalStorage Business Continuity Solutions Guide*. SG24-6547.

1.3 Tivoli Storage Manager complementary products

Tivoli Storage Manager can be integrated with several optional applications that together form a powerful integrated storage management solution, including:

► IBM Tivoli Storage Manager for Space Management
► IBM Tivoli Storage Manager for Storage Area Networks
► IBM Tivoli Storage Manager for System Backup and Recovery
► IBM Tivoli Storage Manager for Data Protection product family

1.3.1 IBM Tivoli Storage Manager for Space Management

IBM Tivoli Storage Manager for Space Management provides hierarchical storage management to automatically migrate rarely accessed files to alternate storage without disrupting the most frequently used files in local storage.

Migrated files are automatically and transparently recalled to primary storage when needed by applications or users, freeing administrators and users from manual filing tasks.

Suppose that a certain percentage of your data is inactive and has not been accessed in weeks or months. If so, IBM Tivoli Storage Manager for Space Management (formerly known as hierarchical storage management, or HSM) can automatically move inactive data to less-expensive offline storage or near-line storage, freeing online disk space for more important active data. It migrates the files and recalls them automatically when they are needed.

1.3.2 IBM Tivoli Storage Manager for Storage Area Network

IBM Tivoli Storage Manager for Storage Area Network enables your SAN-connected TSM servers and client computers to make maximum use of their direct network connection to storage. This software extension enables both servers and client computers to make the bulk of their backup/restore and archive/retrieve data transfers over the SAN instead of the LAN, either directly to tape or to the Tivoli Storage Manager disk storage pool. This ability greatly reduces the impact of data protection on the LAN while also reducing CPU utilization on both client and server.

The core functions of IBM Tivoli Storage Manager for Storage Area Network are:

► LAN-free backup and restore
► SAN-connected tape library

1.3.3 Tivoli Storage Manager for backup and recovery

IBM Tivoli Storage Manager for System Backup and Recovery (SysBack™) provides a flexible backup method for AIX systems to help protect data and provide bare machine recovery capabilities. It offers a comprehensive system backup, restore, and reinstallation tool. SysBack is a simple-to-use, yet highly effective, tool. Any feature may be executed from either the AIX command line or by using the SMIT menu interface.

For Windows platforms, bare machine recovery can be achieved with the IBM Tivoli Storage Manager Backup/Archive client's Automated System Recovery capability.

In addition, Windows, Sun, and Linux bare machine recovery can be done with Cristie Bare Machine Recovery. This integrates directly with Tivoli Storage Manager to provide operating system recovery for these platforms.

1.3.4 Tivoli Storage Manager for data protection

Tivoli Storage Manager provides data protection for a wide variety of applications, databases, mail, and hardware, ensuring that data is safe and secure no matter where it is located or how it is stored. These products interface directly with the applications using their backup-certified utilities and interfaces, simplifying online backup and restore procedures. These products are described in the following sections.

IBM Tivoli Storage Manager for Application Servers

IBM Tivoli Storage Manager for Application Servers (formerly Tivoli Data Protection for WebSphere® Application Servers) is a software module that works with Tivoli Storage Manager to better protect the infrastructure and application data and improve the availability of WebSphere Application Servers.

IBM Tivoli Storage Manager for Databases

IBM Tivoli Storage Manager for Databases is a software module designed to work with Tivoli Storage Manager to protect a wide range of application data through the protection of the underlying database management systems holding that data. IBM Tivoli Storage Manager for Databases exploits the various backup-certified utilities and interfaces provided for Oracle, Microsoft® SQL Server, and Informix®.

This same functionality is included in the IBM DB2® Universal Database™ package and Informix Dynamic Server, enabling them to work directly with Tivoli Storage Manager without the need to buy any additional modules.

IBM Tivoli Storage Manager for Hardware

IBM Tivoli Storage Manager for Hardware improves the data protection of business-critical databases and Enterprise Resource Planning (ERP) applications that require 24x7 availability.

IBM Tivoli Storage Manager for Mail

IBM Tivoli Storage Manager for Mail is a software module for Tivoli Storage Manager that automates the data protection of e-mail servers running either Lotus Domino or Microsoft Exchange. This module utilizes the APIs provided by e-mail application vendors to perform online backups without shutting down the e-mail server and improve data-restore performance. As a result, it can help protect the growing amount of new and changing data that should be securely backed up to help maintain Domino and Exchange application availability 24x7x365.

IBM Tivoli Storage Manager for Enterprise Resource Planning

IBM Tivoli Storage Manager for Enterprise Resource Planning is a software module that works with Tivoli Storage Manager to better protect infrastructure and application data and improve the availability of SAP R/3 servers.

1.4 Key changes in Version 5.3

The following features and functions have been added to Tivoli Storage Manager Version 5.3.

1.4.1 ACSLS library support enhancements

Library support has been enhanced to enable the sharing of ACSLS libraries. This implementation will provide the basic support to share ACSLS libraries across Tivoli Storage Manager servers in the same way that SCSI libraries are shared. Support for LAN-free data movement using libraries that are controlled by StorageTek's ACSLS interface has also been provided.

1.4.2 Activity log management

The activity log can now be managed based either on maximum size for the log or retention time. The new option for size-based activity log management gives administrators greater control over the amount of space the activity log occupies. Additional information about the activity log is now displayed when the server status is queried.

1.4.3 Collocation by group

Collocation by group is now supported. Groups of nodes can be defined, and the server can then collocate data based on these groups. Benefits can include:

► Reduce unused tape capacity by allowing more collocated data on individual tapes.

► Minimize mounts of target volumes.

► Minimize database scanning and reduce tape passes for sequential-to-sequential transfer.

For newly defined storage pools, the default storage pool collocation setting is now GROUP.

1.4.4 Communications options

There is now a shared memory communications option between the Tivoli Storage Manager server for Windows and the Backup/Archive client for Windows. It can be used to perform backups, archives, restores, and retrieves. You can also enable the shared memory communication protocol in the Windows storage agent for communication with the Windows Backup/Archive client.

1.4.5 Database reorganization

Periodically reorganizing the Tivoli Storage Manager server's database can improve performance. A new command has been added enabling administrators to determine the estimated space saved by reorganization of the database. The process can be queried to monitor the command's progress and, when finished, the results can be viewed by querying the database in detailed format.

1.4.6 Disk-only backup

Disk-only backup has been enhanced to take advantage of the inexpensive disk storage currently available in the market. Improvements to sequential-access FILE device type and random-access DISK device class storage include:

► The ability to create large, sequential-access FILE-type storage pools using a single FILE device-class definition that specifies two or more directories.

► The ability to create and format FILE- or DISK device-type volumes in a single step.

► The ability to use enhanced space trigger functionality to automatically allocate space for private volumes in sequential-access FILE device type and random-access DISK device class storage pools. This will reduce the potential for disk fragmentation and maintenance overhead.

1.4.7 Enhancements for server migration

Administrators can now control and schedule routine server operations by scheduling the migration or reclamation command to run during convenient server activity times. The number of processes for migration and reclamation is also enhanced to allow multiple processes for the operations. These new features allow for better utilization of available tape drives and FILE volumes.

1.4.8 IBM 3592 WORM (Write Once Read Many) support

Tivoli Storage Manager now supports the 3592 WORM tape device.

1.4.9 Increased block size for writing to tape

The maximum transfer length for all host bus adapters has increased. The block size used by the Tivoli Storage Manager server on Windows for writing data to certain types of tape drives has also increased. Increasing the transfer length increases the rate at which data is processed for backups, archives, restores, and retrieves. The maximum supported transfer length is now 256 KB.

1.4.10 LAN-free environment configuration

Enhancements have been made that enable you to quickly determine whether your LAN-free environment has been configured correctly. You can request validation for one client node and one storage agent. When validation is requested, a detailed report is generated explaining why the storage pool is or is not LAN-free capable. As a result, you can determine if a setting or configuration issue on the server is preventing LAN-free data movement.

1.4.11 NDMP operations

NDMP operations for backup of NAS file servers have been enhanced to support the following functions:

► Directory-level backup of NAS data, which enables the division of a file system backup operation among several NDMP backup operations as well as several tape drives. This enhancement will reduce backup and restore times.

► NDMP Directory Level Backup enables Tivoli Storage Manager to back up user-created snapshots that are stored as subdirectories, specifically Network Appliance snapshots.

1.4.12 New interface to manage servers: Administration Center

The Administration Center is a Web-based interface that can be used to centrally configure and manage IBM Tivoli Storage Manager Version 5.3 servers. This new interface replaces the administrative Web interface. The Administration Center is installed as an IBM Integrated Solutions Console component. The Integrated Solutions Console enables you to install components provided by multiple IBM applications and access them from a single interface. See the Installation Guide for installation information.

1.4.13 SCSI library enhancements

You can now define a 3592 drive to an SCSI library.

1.4.14 Simultaneous write inheritance improvements

With the simultaneous write function, you can write data simultaneously to primary storage pools and up to three copy storage pools, increasing your level of data protection and reducing the time required for storage pool backup. In Version 5.3, when a data storage operation switches from a primary storage pool to the next primary storage pool in the storage pool hierarchy, the next storage pool inherits the list of copy storage pools and the value of the COPYCONTINUE parameter from the primary storage pool. One benefit of this design is that it reduces the likelihood that mount points have to be released and reacquired when the server switches from one primary storage pool to another.

1.4.15 Support for multiple Tivoli Storage Manager client nodes

Backup from multiple nodes to be stored as a single target node in the server database is now allowed. With the consolidation of data under a single target node on the server, directories and files can be easily found when restore operations are necessary. It is also no longer necessary for physical machines to share password files, because now password management and Tivoli Storage Manager server authentication is handled by clients (independent of relationships with other nodes).

1.4.16 Tivoli Storage Manager scheduling flexibility

IBM Tivoli Storage Manager schedule capability now allows for more useful calendar-type administrative and client scheduling. There is now the flexibility to schedule most repetitive items and even some holidays, such as these:

- ► Run on the last Friday of every month
- ► Run on the first Sunday of every quarter
- ► Run on every day in the last week of the year

1.5 Summary

We have discussed the overview, architecture, complementary products, and new functions of Tivoli Storage Manager. Now we are moving on to the planning, sizing, and designing functions.

2

Planning and sizing for deployment

This chapter includes information about initial requirements, planning, and sizing considerations before implementing IBM Tivoli Storage Manager:

In this chapter we discuss about the following topics:

► Tivoli Storage Manager hardware requirements
► Tivoli Storage Manager software requirements
► Design and planning best practices

2.1 Tivoli Storage Manager system requirements

In this section we discuss the hardware and software requirements needed to install and configure IBM Tivoli Storage Manager Extended Edition Version 5.3.

2.1.1 Windows environment requirements

On Windows, the Tivoli Storage Manager server requires the following hardware and software.

- ► Software requirements:
  - – Microsoft Windows 2003 Server

    Standard, Enterprise, or Datacenter Edition
  - – 32-bit Microsoft Windows 2003 Server

    Enterprise or Datacenter Edition
  - – 64-bit Microsoft Windows 2000 Server

    Advanced Server or Datacenter Server
- ► Web browser requirements
  - – You need a Web browser to log on and use the console. The browser can be installed on the same or a separate system. These browsers are supported:
    - • Microsoft Internet Explorer® 6.x (Windows systems only)
    - • Mozilla 1.0.2, Mozilla 1.3, and Mozilla 1.4
    - • Netscape 6.2 and Netscape 7

    Your browser must support the server codepage. If not, the panels may be unreadable. If your browser meets these requirements but does not correctly display an IBM Tivoli Storage Manager Web-based interface, consider trying a different browser.
- ► Hardware requirements
  - – Intel® Pentium® compatible processor or multi-processor based computer
  - – At least 110 MB of free disk storage (for a typical installation)
  - – 128 MB (256 MB is recommended) memory
  - – At least one of the following features (installed by default with the current Windows operating systems):
    - • Named Pipes
    - • TCP/IP

2.1.2 UNIX environment requirements

On UNIX, the TSM server requires the following hardware and software.

AIX environment

► Software requirements

IBM AIX: AIX 5L™ 5.1 or later (32-bit or 64-bit), or AIX 5.2 (32-bit or 64-bit) and AIX 5.3 (32-bit or 64-bit)

► Hardware requirements:

– RISC System/6000® or pSeries® computer
– At least 200 MB of free disk storage (for a typical installation)
– 1 GB of memory
– TCP/IP connection

HP UX environment

► Software requirements

The HP PA-RISC machine must have operating system 11iv1 with the most current maintenance levels installed. The HP Itanium® machine must have operating system 11iv2 with the most current maintenance levels installed. If the maintenance levels are older than September 2000, the Tivoli Storage Manager server will not run properly.

► Hardware requirements

– HP Series 9000 or later machine
– 100 MB of free disk storage
– 256 MB of memory
– Communication method installed and activated (default: shared memory)

Sun Solaris environment

► Software requirements

Sun Solaris 8 or 9 running in 64-bit mode

► Hardware requirements

– Sun Ultra™ Sparc machine (architecture is sun4u)

– 100 MB of free disk storage in the install directory

– 128 MB of main memory

– The file system containing the /var/tmp directory has a minimum of 75 MB of free disk space

– TCP/IP installed and activated (TCP/IP is the default communication method)

2.1.3 Linux environment requirements

On Linux, the TSM server requires the following hardware and software:

Linux X86 (IA32 architecture)

► Software requirements

  – Red Hat Enterprise Linux 3

  – SUSE LINUX Enterprise Server 8/United Linux 1.0 - Service Pack 3 or higher

  – SUSE LINUX Enterprise Server 9v Version 2.2.5-213 or higher of the GNU C libraries installed on the Tivoli Storage Manager machine.

► Hardware requirements

  – An i686 symmetric multiprocessor (SMP), or uniprocessor (UP)

  – 256 MB of RAM

  – 72 MB hard disk space (includes full install, 9 MB recovery log, 17 MB database); add 6 MB for each additional language support package

► Communication protocol

  – TCP/IP, standard with Linux

  – Shared Memory Protocol (with Tivoli Storage Manager V5.3 Linux x86 Client).

Linux zSeries

For Tivoli Storage Manager server on Linux zSeries® (s390x 64-bit architecture):

► Hardware requirements

  – A zSeries 900, 800, or T-Rex server with either native LPARs or VM guests. 64-bit LPARs and VM guests are supported. Both 31-bit and 64-bit LPARs and VM guests are supported by the storage agent to perform LAN-free operation.

  – 256 MB of RAM.

  – 72 MB hard disk space (includes full install, 9 MB recovery log, 17 MB database). Add 6 MB for each additional language support package.

► Software requirements

  – Red Hat Enterprise Linux 3

  – SUSE LINUX Enterprise Server 8/United Linux 1.0 - Service Pack 3 or higher

► SUSE LINUX Enterprise Server 9v Version 2.2.5-213 or higher of the GNU C libraries installed on the Tivoli Storage Manager machine.

- Communication Protocol:
  - TCP/IP, standard with Linux
  - Shared Memory Protocol (with Tivoli Storage Manager V5.3 zSeries Client)

Linux pSeries

For Tivoli Storage Manager server on Linux pSeries (ppc64 architecture):

- Hardware and software
  - One of the following IBM systems:
    - RS/6000® 44P Model 170, 44P Model 260, 44P Model 270
    - pSeries 610, pSeries 620, pSeries 630, pSeries 640, pSeries 660, pSeries 670, pSeries 690

    Up-to-date information about hardware requirements can be found at:

    http://www.ibm.com/servers/eserver/iseries/linux
  - 256 MB of RAM
  - 128 MB hard disk space (includes full install, 9 MB recovery log, 17 MB database). Add 6 MB for each additional language support package.
- Operating system requirements
  - Red Hat Enterprise Linux 3
  - SUSE LINUX Enterprise Server 8/United Linux 1.0 - Service Pack 3 or higher
  - SUSE LINUX Enterprise Server 9v GNU C libraries
  - For SUSE LINUX Enterprise Server 8, Version 2.2.5-108 or higher
  - For SUSE LINUX Enterprise Server 9 and Red Hat Linux 3, Version 2.3.3-98
- Communication protocol
  - TCP/IP, standard with Linux
  - Shared Memory Protocol (with Tivoli Storage Manager V5.3 pSeries Client)

Linux iSeries

For Tivoli Storage Manager server on Linux iSeries™ (ppc64 architecture)

- Hardware and software
  - Any system with a POWER5™ processor

    Up-to-date information about hardware requirements can be found at:

    http://www.ibm.com/servers/eserver/iseries/linux

- 256 MB of RAM
- 128 MB hard disk space (includes full install, 9 MB recovery log, 17 MB database); add 6 MB for each additional language support package

► Operating system requirements

- Red Hat Enterprise Linux 3
- SUSE LINUX Enterprise Server 9v Version 2.3.3-98 or higher of the GNU C libraries installed on the Tivoli Storage Manager machine

► Communication protocol

- TCP/IP, standard with Linux
- Shared Memory Protocol (with Tivoli Storage Manager V5.3 iSeries Client)

2.2 IBM Integrated Solution Center and Administration Center requirements

The Administration Center is installed as an IBM Integrated Solutions Console (ISC) component. The Integrated Solutions Console enables you to install components provided by multiple IBM applications and access them from a single interface.

The Tivoli Storage Manager server can require a large amount of memory, network bandwidth, and processor resources. In most cases, the server performs best when other applications are not installed on the same system. If the system meets the combined requirements for the server and the Administration Center (for example, it has at least 2 GB of physical memory), it can support both applications.

You may plan to use the Administration Center to manage an environment with a large number of servers or administrators; then you should consider installing the Administration Center on a separate system.

2.2.1 Software requirements

These are the software requirements for various platforms:

► Windows

- Windows 2000 Professional, Server with SP4, Windows 2000 Advanced Server with SP4.
- Windows 2003 Standard, Windows 2003 Enterprise, Windows 2003 Datacenter.

- CPU speeds: Speeds of late model, mid-range to high-end servers are recommended. Pentium 800 MHz or equivalent at a minimum. Production environments should consider the Pentium 4 processor at 1.4GHz or higher.

  - Physical memory: 512 MB or more for runtime installations.

  - File system: NTFS file system is recommended.

► AIX:

  - AIX 5.1 with ML4.

  - AIX 5.2 with ML1 + APAR IY44183.

  - AIX 5.3.

  - RS/6000 at 450MHz at a minimum; production environments should consider higher speeds.

  - Physical memory: 512 MB or more.

► Linux:

  - CPU speeds of late model, mid-range to high-end servers are recommended. Pentium 800MHz or equivalent at a minimum. Production environments should consider the Pentium 4 processor at 1.4GHz or higher.

  - Physical memory: 512 MB or more for runtime installations.

  - SUSE LINUX Enterprise Server (SLES) 8 Powered by United Linux 1.0 on Intel.

► Solaris:

  - Solaris 8.

  - Ultra 60 at 450MHz at a minimum; Sun Blade™ 2000 workstation at 1 GHz or higher is recommended.

  - Physical memory: 512 MB or more.

2.2.2 Hardware requirements

The machine hosting the Administration Center and Integrated Solutions Console requires the following capabilities:

► To install the console on a system for the first time, the user needs 982 MB to satisfy the installation program disk space check. Also needed are an additional 679 MB in the /tmp directory (which is also checked during the installation), as well as 500 MB for the completed installation.

► Equal to double the user's physical memory is required. At a minimum, this should be at least equal to the physical memory.

- ► Network adapter and connection to a physical network that can carry IP packets; for example, Ethernet, token-ring, and ATM Static IP address.

- ► Configured fully qualified host name. Integrated Solutions Console must be able to resolve an IP address from its fully qualified host name. To verify that the host name is configured correctly, the user can issue the `ping` command from a command line.

- ► The IBM Tivoli Storage Manager Administration Center Web interface for the server and a Web client interface for client machines require a Java™ Swing-capable (at JRE 1.4.1) Web browser:
  - – MS Internet Explorer 6.0, or later with Java Plug-in 1.4.1
  - – Mozilla 1.6, or later

2.3 Design and planning best practices

The following represents the design points that are usually addressed during the architectural process.

Transport recommendations

Tivoli Storage Manager is a network backup/archive application. As such, data must move from the clients to the server over some sort of network transport. There are several popular choices for transports, including LAN and SAN. Although he or she may not provide detailed networking infrastructure recommendations, a Tivoli Storage Manager administrator will usually evaluate the different types of transports and make recommendations on the most appropriate transport (LAN versus SAN) and on the network infrastructure that is required to meet backup-and-restore requirements.

Placement of TSM server hardware and libraries

All Tivoli Storage Manager clients must interact, to some degree, with a Tivoli Storage Manager server. At the very least, they must send and receive the information about the files they are working with (metadata) to the database on the TSM server. In the case of traditional LAN-based backup and restore, they must also send the actual data back and forth to the TSM server.

Given the speed and cost of the LAN and WAN connections, the Tivoli Storage Manager administrator will need to recommend how many TSM servers there should be and where they should be located. Oftentimes it will be necessary to place TSM server hardware on the same LAN with the clients they service in order to minimize LAN traffic and ensure timely backups and restores.

Number of Tivoli Storage Manager server instances

There are some limits and best practices for sizing a TSM server instance. In particular, the sizes of the Tivoli Storage Manager database and recovery log must be carefully planned and monitored to ensure that the system operates efficiently. A Tivoli Storage Manager administrator can estimate the size of the database using certain formulas to keep client metadata at a reasonable size so that the system does not bog down during backups and other database-related transactions.

Sizing recommendations for server hardware

Even though Tivoli Storage Manager is a piece of software, its architecture is intimately tied to the hardware on which it runs. In its simplest terms, a TSM server is the focal point for running the database that stores metadata and, in a LAN environment, moving the data from the client to the storage subsystem. The speed of the CPU, disk subsystem, backplane, and other components of the TSM server are critical factors in determining how much data can be backed up and restored in a given time period. As such, the Tivoli Storage Manager administrator must recommend the proper server hardware to support the amount of data that it is being used to manipulate.

Sizing for tape drives, libraries and optical media

Data that is backed or archived using Tivoli Storage Manager must ultimately be stored on some non-volatile media. Usually, this is some sort of tape storage that is housed in an automated tape library, but it can also include optical media, disks, or any other storage device that one can imagine. The Tivoli Storage Manager administrator must determine how much storage is required by using the retention policies and disaster recovery policies. In addition, the administrator must evaluate the speed of the storage to determine whether backup and restore time requirements can be met.

High-level storage pool configuration and sizing

A storage pool is just a collection of like media in Tivoli Storage Manager. When data is backed up, it flows through a storage pool hierarchy which typically starts with disk and then moves to less expensive (slower) media such as tape or optical. The Tivoli Storage Manager administrator will need to recommend the appropriate size of each of these pools and the type of media used for each.

Feature usage and backup methodology recommendations

Tivoli Storage Manager provides for many different methodologies for doing backups and many different features. Part of a Tivoli Storage Manager administrator's responsibility is to match requirements with the most appropriate features of Tivoli Storage Manager so that expectations can be met. The plethora of different ways to do backups are too numerous to fully discuss here, but we will

discuss best practices for some of the product's more important and lesser-known features.

2.3.1 Critical inputs to the Tivoli Storage Manager architecture process

The following items are critical inputs to the architectural design of IBM Tivoli Storage Manager.

How much data will the solution support?

In order to effectively design a Tivoli Storage Manager solution, you must understand how much data will be supported by the solution. If the solution is doing backups, the data must be able to be moved from the client nodes to the server on a nightly basis, so all of the equipment and infrastructure must be sized accordingly. Most important, any or perhaps all servers in the environment must be able to be restored in a time frame that meets expectations.

The total amount of data that must be backed up and restored is a critical factor in the design because the TSM server, LAN/WAN transports, disk, and tape subsystems must all be sized to handle the amounts of data that will be backed up and restored. Typically, the cost of these items is the most expensive part of the Tivoli Storage Manager solution. It's critical that they are sized in a manner that minimizes expense while meeting backup and recovery needs.

What types of data will the solution support?

The question of "types of data" is, in many ways, related to how much data will be backed up and restored. Certain types of data (such as file system data) lend themselves to the IBM Tivoli Storage Manager Incremental Forever strategy, which helps to minimize the amount of data that must be moved when doing a backup. Other types of data (for example, database and mail data) typically require periodic full backups and many organizations do a full backup each time to allow for quicker restoration.

What are the retention policies?

The Tivoli Storage Manager server must store data that is backed up and archived. The length of time an organization chooses to store this data directly affects the total amount of disk and tape-based storage that is necessary in order to retain it and the cost of the solution. The retention policies that are set in Tivoli Storage Manager will determine the amount of media that is necessary for storage. Typically, retention policies are used to determine the amount of hard disk space or the size of the tape library that is needed.

How fast is the data growing?

When designing a Tivoli Storage Manager solution, you must consider data growth. Although a Tivoli Storage Manager solution might be appropriate for the short term, unplanned and uncontrolled data growth can quickly cause the solution to become untenable. There have been cases where the amount of data in an environment can double in a year or less, and unless this data is accounted for, it can cause incomplete backups and slow restorations.

2.3.2 What are your backup and restore service level agreements?

Service Level Agreements (SLAs) are critical to the design and architecture of a backup/restore solution. There is a direct relationship between how fast you want data backed up and restored and the cost you will pay for the hardware to support the solution. Faster networks and storage media inevitably cost more.

It is critical that during the design process, a Tivoli Storage Manager administrator obtain input and business requirements for backup and restore time frames. These inputs will be used in the design process to determine the type of equipment that is needed to support the solution.

Table 2-1 on page 32 describes the data that, ideally, would be obtained for each server to be included in a Tivoli Storage Manager architecture.

Table 2-1   IBM Tivoli Storage Manager server architecture data

Item	Comments
Server Name	Useful for documentation process
Operating System	What OSs are necessary to support in the environment and what features are available on the client?
Type/Network Speed	How fast can the system transmit data over the network?
Backup Window	How much time do I have to back up the system on a nightly basis?
Restore Window	How long to I have to restore the system? Keep in mind that I may need to restore the whole system, not just part of it.
Estimated Growth	How fast is the data on the system growing?
Amount of Data	How much data is on the system?
Type of Data	What type of data is on the system? Is it file system data or database data?
Retention Policy	How long does data from the system have to be kept?
Nightly Change	What percentage of the data changes on a nightly basis? For file systems using an incremental forever.

Obtaining inputs for the architectural process

If the Tivoli Storage Manager environment is small enough, the inputs described above should be easy enough to gather by hand. In a large, dynamic environment, however, these inputs can be challenging to obtain. There are several ways to facilitate gathering this information.

First, it should be noted that several of the inputs lend themselves to be applied globally throughout the Tivoli Storage Manager environment. SLAs and retention policies can be established and promoted on a company-wide basis. In addition, nightly change can be estimated based on the backup methodology used. For example, it is safe to assume that most incremental file system backups will include only about 10% of the total data on a system. And, of course, full backups of databases and file systems will include 100% of the total data.

Another option is to use one of several tools on the market that can help facilitate gathering server-specific information about storage usage and growth. IBM TotalStorage Productivity Center for Data (TPC for Data) is one such product. TPC for Data scans computers and provides a centralized manager that can be used to track individual server file and disk usage, growth patterns, and total data

usage throughout an environment. This information can be used directly by the Tivoli Storage Manager administrator as inputs to the architectural process.

As you go through the architectural process, however, you will likely find it impossible to gather all required inputs for a Tivoli Storage Manager architecture with 100% accuracy. Do not let the perfect be the enemy of the good. If you do not have an input or it is impractical to get it, substitute a reasonable assumption. As an example, suppose you do not know how fast data is growing in your environment. A typical assumption would be 10%-30% per year.

It is important to revisit both your concrete inputs and your assumptions on a regular basis. Doing so enables you to reevaluate and adjust your assumptions, refresh your real data, and determine how the Tivoli Storage Manager architecture should be updated to account for those changes. Just as inputs that go into producing an architecture are rarely static, the architectural solution you produce based on those inputs will require ongoing revision and refinement.

2.3.3 Architectural design considerations and best practices

After you have gathered the input information you need, you should use it to put together a solution. The following sections provide basic guidance and best practices for designing a Tivoli Storage Manager solution.

Workload calculations

An important consideration for designing the overall Tivoli Storage Manager solution is the total amount of data that the TSM server will need to support for backup or restore over a particular time frame.

> **Best practices:**
>
> ► Calculate the amount of data a TSM server will have to accommodate during its nightly backup window and ensure that the hardware can reasonably accommodate the data.
>
> ► Calculate the amount of data that will be restored from a disaster recovery TSM server and ensure that the hardware will meet DR recovery SLAs.

As an example, we can calculate the workload for a TSM server in a theoretical environment. The environment has the following systems that we must back up:

► 20 file servers
  – Each server has 60 GB of file data
  – Incremental Forever Backup with a change of approximately 10%
  – 6-hour backup window

- ► 4 DB servers
  - – Each server has 100 GB of database data
  - – Full backups with a change of 100%
  - – 6-hour backup window

So doing the calculation for backup workload, each night we will need to back up:

$$(60 \times 20 \times .10) + (100 \times 4 \times 1) = 520GB$$

And dividing that by the time allowed for the backup:

$$\frac{520GB}{6Hr} \approx 86.6\frac{GB}{Hr}$$

So the network interfaces, drives, TSM server, and all other infrastructure must to handle this amount of data in order to meet SLAs for this environment.

Note that this type of calculation does not only apply to backups. It can and should be done for disaster recovery restores and single system restores.

LAN/WAN transports

The performance of your network backup solution will be no better than the performance of your network. You must consider expected and real performance of your network when you are designing a Tivoli Storage Manager solution.

> **Best practices:**
>
> ► Assume 40%-80% of total theoretical throughput for a TCP/IP adapter or protocol.
>
> ► Be careful of the CPU usage and real throughput of faster TCP/IP protocols (such as would). They often do not even perform close to the 80% rule.
>
> ► Measure LAN throughput outside of Tivoli Storage Manager with simple protocols such as FTP. This will provide a true picture of how a network is performing.

As an example, calculate theoretical network throughput using Fast Ethernet and a 40% efficiency:

$$\frac{100Mb}{s} \times \frac{1B}{8b} \times \frac{1GB}{1024MB} \times \frac{60s}{1\min} \times \frac{60\min}{1Hr} \times .4 \approx 18\frac{GB}{Hr}$$

Using this type of calculation, you can calculate the anticipated throughput for any network transport. Table 2-2 shows the most common throughputs.

Table 2-2   Common throughputs

Technology	Mb/s	Assume speed
Ethernet	10 Mb/s	2 GB/hr @ 40% efficiency
Fast Ethernet	100 Mb/s	18 GB/hr @ 40% efficiency
Gigabit Ethernet	1000 Mb/s	180 GB/hr @ 40% efficiency
T1	1.54 Mb/s	.5 GB/hr @ 80% efficiency
T3	45 Mb/s	16 GB/hr @ 80% efficiency

Using this table, your own calculations, and any real testing you may have done, you can validate the amount of data you need to move to backup and restore (backup and restore workload) against your SLAs and your network transports. Obviously, if the network will not meet your SLAs, either the SLAs must be relaxed or the network must be improved.

LAN-Free data movement (SAN backup and restore)

IBM Tivoli Storage Manager for Storage Area Networks allows for Tivoli Storage Manager backups and restores to be sent over the SAN instead of the LAN.

Best practices:

▶ When planning for LAN-Free, remember that file metadata must still be sent over the LAN.

▶ Tivoli Storage Manager clients with lots of small files (for example, file server type systems) often perform better over the LAN than over a SAN. LAN-Free is most appropriate and cost-effective for systems with large files and large amounts of data (such as Database and Mail).

▶ Evaluate the cost of would. It may be more cost effective and easier to manage than a backup SAN.

IBM Tivoli Storage Manager for Storage Area Networks allows for Tivoli Storage Manager backups and restores to be sent over the SAN instead of the LAN. In Tivoli Storage Manager, this is called *LAN-Free*. This is somewhat of a misnomer because only the data moves across the SAN; the metadata (such as information about what's being backed up) still moves across the LAN (Figure 2-1).
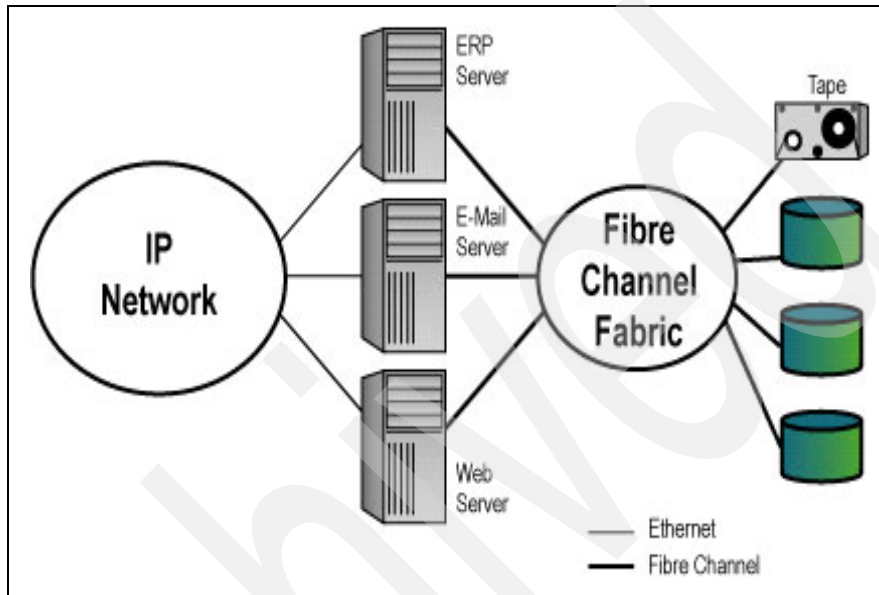

Figure 2-1

When designing a Tivoli Storage Manager solution, it is important to understand that this metadata can add overhead to a LAN-Free backup. Even though the data is streaming over the SAN to the tape or disk, the metadata still goes to the Tivoli Storage Manager server using whatever LAN protocol and speed are being used. As you might imagine, as the amount of metadata grows, the LAN-Free backup speed will approach the speed of LAN-based backup.

Experience has shown that systems with large files (greater than 10 MB, on average) and large amounts of data (greater than 50 GB) are good candidates for LAN-Free backup, while systems with numerous small files (average size in KB) often perform better using traditional LAN-based backups. Examples of the former include databases, mail systems, and ERP systems; examples of the latter are traditional file and print type servers.

Tivoli Storage Manager database

The Tivoli Storage Manager database is critical to the operation of the entire Tivoli Storage Manager environment. Systems with poorly designed TSM

databases tend to run very poorly and rarely meet expectations. When planning a Tivoli Storage Manager environment, you should plan enough instances of Tivoli Storage Manager to keep the size of each TSM database reasonable.

Best practices:
- ► Do not let the Tivoli Storage Manager database get too large. A good general rule is 120 GB or so, but there is no "magic" number. When expiration, database restores, and other Tivoli Storage Manager admin processes take too long and client restores become too slow, it is too big.
- ► Consider using Tivoli Storage Manager internal software mirroring. It is the fastest and most reliable.
- ► Spread Tivoli Storage Manager volumes over as many physical disks as possible.
- ► Use smaller DB volume sizes (for example, 4-8 GB), as they will improve Tivoli Storage Manager and database performance.

Database size

Several methodologies can be used to predict the size of the of the Tivoli Storage Manager database. The first and the easiest is this general rule: Given an environment consisting of mixed size files, a typical Tivoli Storage Manager database will be 3-5% of the total amount of data in the environment. As an example, suppose you are backing up 20 servers with 60 GB of file data each. The calculations show:

$$60GB \times 20 = 1200GB \text{ of data}$$

and

3-5% of 1200 GB = 36-60 GB TSM DB size

Another way to estimate the size of the Tivoli Storage Manager database is to back into it using the total amount of data and average file size. Table 2-3 summarizes the amount of space each file/object uses in the database.

Table 2-3   File sizes

Description	Size
Initial File/Object Backup	600 bytes
Each Addition Version	200 bytes
Copy Storage Pool Copy	200 bytes

Using this information in the previous example, if you back up 20 servers with 60 GB of file data each, and assume you have one copy pool and wish to keep 15 versions of the file. Also assume that the files on these systems are small and have an average file size of 100 KB each. Then we can calculate the estimated size of the Tivoli Storage Manager database as follows:

$$20 \times 60GB \times \frac{1024MB}{1GB} = 1228800MB \text{ of total data to back up}$$

Calculate the number of files by dividing by the average file size.

$$\frac{1228800MB}{.1} \approx 12,288,000 \text{ or 12.3 million files}$$

With 1 copy pool and 15 versions, you have

$$\{12,288,000 \times (1x600)\} + \{12,288,000 \times (29x200)\} \approx 73.24GB \text{ total db size.}$$

Database performance

Database performance is a critical factor in design and operation of a Tivoli Storage Manager solution. In this area, there are certain typical performance recommendations for any database, and some that are peculiar to the Tivoli Storage Manager database.

As with any database, the faster the disk used for the database the better. Spreading the database over as many physical disks as possible allows for better performance because multiple disk heads can be seeking, reading, and writing simultaneously.

Counter to conventional thinking, however, several design ideas are peculiar to Tivoli Storage Manager. First, our lab measurements and customer experiences have shown Tivoli Storage Manager internal software database mirroring to be a very efficient means of providing database redundancy—often more so than "lesser" hardware redundancy.

And finally, due to locking and threading information in the Tivoli Storage Manager server code, smaller logical database volumes tend to perform better than the larger ones. This is primarily due to Tivoli Storage Manager server code locking and threading considerations.

2.3.4 Server hardware

The Tivoli Storage Manager server is critical to the overall Tivoli Storage Manager infrastructure and design. But it is important to understand where it influences the solution and where its part makes little or no difference. TSM servers with copious CPU, disk, or RAM resources often do not meet performance expectations.

> **Best practices:**
> ► Choose a TSM server platform and model based on cost, expendability, current OS knowledge, and ability to move data.
> ► Ensure that the bus/backplane of the system you choose is capable of handling the data workload and the expansion cards necessary to connect I/O devices.
> ► Consider higher CPU counts and speeds for systems that make extensive use of Gigabit Ethernet.

As to the operating system and server platform, for the specific task of running Tivoli Storage Manager server processes, one operating system seldom has inherent advantages over another. All of the supported platforms can do an adequate job running the TSM server code as long as the hardware is sized appropriately. And there is no inherent advantage to connecting TSM clients to a like server (for example, a Windows client to a Windows server); Tivoli Storage Manager is designed to connect any platform client to any platform server.

When choosing a TSM server platform and model, the most important aspect is the overall data workload the system will have to support—in a word, I/O. How much data will move into and out of the system and can the system support it?

An overall discussion of server hardware platforms for the myriad systems that Tivoli Storage Manager supports (AIX, Solaris, HP-UX, Windows, z/OS®, and OS/400®) is beyond the scope of this book. However, there are some general rules to keep in mind as you choose distributed server hardware:

► A Tivoli Storage Manager server usually has from two to four CPUs per Tivoli Storage Manager instance. Processing the TCP/IP stack in a LAN backup environment takes significant CPU, so the more high-speed network cards (for example, Gig/E) you have, the more CPU you will need.

► Tivoli Storage Manager is not a "RAM hungry" application. A good starting point for any modern distributed server OS is 2 GB of RAM. Add 1 to 2 GB for each Tivoli Storage Manager instance that the system will host.

► Backplane speed and number of expansion slots are critical considerations. Remember that most of what a Tivoli Storage Manager server does is take

data in through the network and write it to storage devices (such as disk and tape). Use your data workload calculations to determine how many LAN adapters you'll need and how many drives you'll have to support. Ensure that the system you choose has enough slots to meet the need for LAN, SCSI, and Fibre Channel Cards. Make sure you're not shortchanging yourself; "cheap" systems and "expensive" ones can differ widely in bus speed, expandability, and I/O capabilities.

2.3.5 Number of server instances and placement

As part of the design process, an administrator will need to decide how many instances of the Tivoli Storage Manager server must be used and the placement of each. (An instance of Tivoli Storage Manager is defined as a database, recovery log, and all the database contents that define the policies a client uses when it connects.) TSM server instances can share the same computer hardware and libraries using server-to-server communications and library sharing, or they can be installed on completely separate hardware.

Best practices:

► Choose the number of and location for TSM server instances based on workload, network infrastructure, database size, and the ability of the hardware to connect to storage.

► If multiple instances are needed to due to database size, consider running multiple instances of Tivoli Storage Manager on the same physical server.

Database size and performance is the primary driver of the number of server instances a Tivoli Storage Manager solution will need. As described in "Database size" on page 37, if the size of the Tivoli Storage Manager database is such that performance expectations cannot be met, then multiple instances of Tivoli Storage Manager should be used to accommodate the client data.

The location of TSM servers in the enterprise is primarily driven by the network connection speed between sites. An administrator should use workload calculations and LAN/WAN transport speeds to determine whether backups and restores are feasible over a WAN connection. If not, then a TSM server will have to be deployed so that the data will not have to flow over the WAN.

When determining the feasibility of Tivoli Storage Manager clients accessing the Tivoli Storage Manager server over a WAN, consider both backup and restore workload. For file system backups, Tivoli Storage Manager can do incremental forever backups, which significantly reduce the amount of data that has to be moved. Even though this can make WAN backup feasible, restores might not be because certain situations may call for a full system restore.

2.3.6 Disk storage pools

Tivoli Storage Manager has long supported using disks as a backup medium. Primarily due to cost, the traditional Tivoli Storage Manager design uses disks as a cache for file-based backups. Data is migrated daily from disk to a less expensive medium such as tape.

Best practices:

► Have enough disk storage pool space to store one night's file system backup. Send large file backups directly to tape.

► Consider using the cache=yes parameter on disk storage pools to decrease restore time.

► If you migrate data to tape on a daily basis, consider using unmirrored disks for storage pools. Although this introduces some risk of loss, it may be mitigated by cost savings and the time the data stays on the disk.

► If you are planning to use disk as a long-term storage medium, carefully consider the total cost, reliability, and how you will move the data off-site.

► This is the recommended type for disk-only backups.

Although not an absolute necessity, it is considered best practice to have a disk storage pool that can hold a night's backup. This prevents contention for the drives holding the disk pool because data is being written only during the night, and, if desired, allows one night's backup to be cached on disk in the event it has to be restored the next day. The cache parameter can be set to Yes on disk-based storage pools to cause files to remain on disk until space is needed for further backups. This can significantly improve restore performance for recently backed-up files.

As the cost of per megabyte of disk has gone down, many Tivoli Storage Manager designs have added more disk to the solution. Many designers are interested in designing systems that use no tape at all, and save all backed up data to disk.

This sort of data should be kept on a file-type device class, not a disk-type (even if a disk-type is the initial destination). Disk-type pools become fragmented if data is retained for extended periods of time, and other enhancements to the file-type class are meant to address this type of configuration.

Tivoli Storage Manager supports a "tapeless" configuration through the use of disk storage pools or a device class of type file. When deciding whether to use only disk for backup/archive storage, consider the following caveats:

► Do a realistic analysis of the total amount of storage you will need using your data retention policies, total data, and growth expectations. Evaluate the cost of tape versus the cost of disk for storing all of your data.

► Make sure that you invest in a disk technology that can permanently store the data. If the device can fail (and all devices can, whether RAID, mirrored, or whatever), consider using a copy storage pool for data redundancy.

► Carefully consider the cost and technical feasibility of getting the data off-site for disaster recovery purposes. Tape cartridges are portable. If you use disk, you will need to move the data nightly over a network transport. How much will that transport cost and can it accommodate the nightly data workload?

In the following sections, we discuss the calculations for estimating the size of a tape library to support a Tivoli Storage Manager solution. Similar calculations can be used to determine the total disk storage needed to support an environment.

2.3.7 Tape drives

Most Tivoli Storage Manager designs incorporate tape and tape drives as the ultimate long-term storage locations for backups and archives. Therefore, it is important to understand the performance characteristics of tape drives and tapes when designing a Tivoli Storage Manager solution.

Best practices:

► When using tape storage pools, a Tivoli Storage Manager server should have access to no less than two drives.

► For architecture calculation purposes, assume only 80% of maximum, uncompressed throughput for a tape drive.

► Be prepared to do restores while other administrative operations are happening on the system or when drives are broken.

► Carefully consider card and bus throughput when attaching tape drives to systems. Most protocol/tape combinations can accommodate two or three tape drives per card.

► When using Fibre Channel/SAN attached tape drives and disks, do not mix disk and tape traffic on the same HBA.

When planning for tape drive throughput and tape capacity, it is best to be conservative. Although drives can perform close to and better than their compressed rating, typically their performance is far less than this in reality. We

use 80% of native uncompressed throughput ratings and 150% of native capacity ratings for theoretical calculations of drive throughput and tape capacity. Table 2-4 summarizes those calculations for some popular tape drives.

Table 2-4   Tape drive calculations

Tape drive	Native speed (MB/s)	Native capacity (GB)	Assumed speed (GB/HR)	Assumed capacity (GB)
IBM LTO Gen 1	15	100	42	150
IBM LTO Gen 2	35	200	98	300
IBM LTO Gen 3	80	400	224	600
IBM 3590-E1A	14	40	39	60
IBM 3590-H1A	14	60	39	90
IBM 3592	40	300	112	450
STK T9840C	30	40	84	60
STK T9940C	30	200	84	300
Sony AIT-3	12	100	33	150

Whether you use the table above or your own calculations, it is critical when designing a Tivoli Storage Manager solution to measure the backup and potential restore workload against the speed of your tape solution. In our earlier example, for instance, we calculated that we needed to move 86.6 GB/HR to meet SLAs. So based on the theoretical numbers above, a solution that is capable of that data movement would take three LTO Gen 1 tape drives.

In addition to calculating backup workload, an architect must also consider administrative processes and potential restores when deciding how many tape drives a system needs. Each day, off-site copies of tapes must be made and reclamation must occur. A potential restore of a large system could also require multiple drives to meet SLAs.

A detailed discussion of specific I/O protocol speeds is beyond the scope of this book. However, you should understand the speeds of the drive you choose and recommendations for system connectivity. As a general rule, most hardware vendors recommend no more than two to three tape drives per interface card and, if using Fibre Channel, that tape traffic be separated from disk traffic.

2.3.8 Tape libraries

Tivoli Storage Manager was designed with automation in mind, specifically the use of automated tape libraries. The best and easiest way to run a Tivoli Storage Manager library is to keep all on-site data in the library so that tapes can be mounted automatically when needed for restores, backups, reclamation, and other Tivoli Storage Manager administration processes.

> **Best practices:**
> - ► Size your tape library so that it can accommodate all of your on-site data, two to four database backups, scratch tapes, and 6 to 12 months of growth.
> - ► When calculating library capacity, assume 1.5x data compression and 65% tape utilization.

Here is an example of calculating the number of slots required in a library that uses the data from the workload calculations with some additional information on retention policies and growth.

The environment has the following systems that we must back up:

- ► 20 file servers
    - – Each server has 60 GB of file data
    - – Incremental Forever backup with a change of approximately 10%
    - – 6-hour backup window
- ► 4 DB servers
    - – Each server has 100 GB of database data
    - – Full backups with a change of 100%
    - – 6-hour backup window

Data must be kept for 32 days. Growth in the environment is approximately 10% per year. To compute total data storage (assuming no on-site copy storage pool), we use the following multiplication:

{(20x60x1)+(20x60x.1x31)}+(32x4x100)

{1200+3720}+12800=17720

For this example that we use LTO Gen 2 tapes. Using the 65% rule and 1.5x compression, we can assume that tapes in the library will hold an average of 195 GB. This results in:

17720/195 = 91 tapes

So about 91 tapes are required. Adding room for 10% growth, five database backups, and 10 scratch tapes, we can choose a library with 115 or more slots.

It is best to choose a library that can be expanded easily so that future data growth can be accommodated without a complete library replacement.

2.3.9 Small file performance

Systems with lots of small files (for example, 100 GB of 100 KB files) can be a backup system's worst problem. All storage devices will perform worse when reading and writing small blocks of data than when reading and writing large blocks of data. As you are developing SLAs for systems, you should account for such issues to avoid overcommitting on backup or restore times.

> **Best practices:**
>
> ► When agreeing on SLAs, remember that restore performance is often dependent on the tape technology and the speed a client can write small files to the disk.
>
> ► For systems with many small files, strongly consider alternate storage and backup methodologies to improve performance:
>
>   – Image Backup
>   – Server Collocation by Group, Node, or Filespace

Remember that when using its base functionality of incremental backup and file level restore, Tivoli Storage Manager is just making calls to the operating system to enumerate the files for backup and write them for restore. Although the Tivoli Storage Manager client might be somewhat faster due to multithreading, it will not be "orders of magnitude" faster than the OS. Test-copy a set of files to and from the client disk using native OS utilities such as cp, tar, or Microsoft Backup. Use this information to establish a baseline for Tivoli Storage Manager. Many times, the bottleneck with small file operations is reading from or writing to the client disk. The only way to improve performance here is to improve client disk performance—not to change hardware on the backup system.

Tivoli Storage Manager does have some features that will significantly improve small file restore performance. Specifically, assuming that client disk write operations are an issue, the IBM Tivoli Storage Manager image backup feature can usually restore a full disk drive much faster than file-by-file restore. The downside to using this feature is that you must restore the whole disk and cannot restore a single file to the client. Usually, when designing the solution for a system with many small files, architects choose to combine image backup with incremental to achieve quick restore in case of total loss and file-level granularity.

Finally, it should be noted that restore speed for small files will only be as good as the organization of data on the tapes (assuming that you are using tape backup). The default for Tivoli Storage Manager storage pools is to co-mingle data from multiple systems on the same volume. When using an incremental forever methodology, this can cause backup data to become fragmented across volumes, which, in turn, can increase restore times. Collocation causes backup data from a specific system or set of systems or filespace to be kept together on a volume, thus decreasing fragmentation and improving restore times.

Beginning at Tivoli Storage Manager V5.3, three types of collocation are available: collocation by group, collocation by node, and collocation by filespace. Each of these methodologies for grouping files is described in Table 2-5, along with its pros and cons.

Table 2-5   Collocation types

Collocation type	Description	Pros	Cons
None	Tivoli Storage Manager default. Files backed up from multiple nodes are commingled on tapes. The location is completely dependent on when the data was written. TSM optimizes the writing of data to tape to maximize the amount of data stored on a tape and the time it takes to write the data.	Best possible backup times Most efficient use of tape space Fewest tape mounts during the backup	Trades restore efficiency for backup efficiency May need numerous mounts and seeks to restore an entire system of small files
Collocation by group	Nodes are grouped on tape in user-defined groups. Groups can be defined to reduce tape waste while still preventing data from becoming too fragmented.	Reduces restore times by decreasing data fragmentation and mounts Still allows for efficient use of tape Reasonable number of tape mounts during a backup	Requires figuring out optimum node-to-group assignment Can cause some tape waste Increases backup and/or migration time due to increased mounts

Collocation type	Description	Pros	Cons
Collocation by node	Each node is assigned its own tape or set of tapes.	Reduces restore times by decreasing data fragmentation and mounts	Can waste a significant amount of tape (and library slots) if nodes are considerably smaller than tape size Will increase backup and/or migration time due to increased mounts Can work against multisession restore
Collocation by filespace	Each filespace is assigned its own tape or set of tapes.	Reduces restore times by decreasing data fragmentation and mounts	Can waste a significant amount of tape (and library slots) if file spaces are considerably smaller than tape size Will increase backup and/or migration time due to increased mounts Can work against multisession restore

What version of collocation is the right one to use? There is no universal answer. Each one has a different cost associated with it in terms of hardware and benefit in terms of restore times. As a general rule, when storing small files on tape, you do not want them spread out over too many tapes. This usually leads to some sort of collocation by group for most systems where you allocate enough systems to the group to fill up one or more tapes. You might also use collocation by filespace or node for systems that have large numbers of small files and large amounts of data (large file servers).

It should also be noted that the same collocation methodology does not necessarily have to be used for all nodes on a Tivoli Storage Manager server. Some more important ones might ultimately store their data in collocated pools, and less important ones might forgo collocation to reduce backup times and save money on tapes and tape drives.

2.4 Summary

In this chapter we have focused on planning and sizing issues before the implementation of the products.

3

Installation and configuration

This chapter describes the installation instructions for installing the IBM Tivoli Storage Manager server and related components for our PoC demonstration scenario.

The instructions given in this chapter are very detailed. These instructions are not the only way to install Tivoli Storage Manager and its related prerequisites, and are meant to be followed to successfully install and set up a Tivoli Storage Manager environment for both Windows and AIX platforms.

► Windows environment installation
► UNIX environment installation
► ISC and Admin center installation

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3.1 Installing in small-medium Windows environments

Installing Tivoli Storage Manager includes the following activities:

1. Installing the Tivoli Storage Manager server and related components on the server machine.

2. Installing Tivoli Storage Manager client code on every machine that will transfer data to Tivoli Storage Manager server-managed storage.

Before you install Tivoli Storage Manager, ensure that the prerequisites mentioned in Chapter 2 are followed properly.

3.1.1 Tivoli Storage Manager installation packages

Before installing Tivoli Storage Manager, you should be familiar with:

► The Windows operating system running on the TSM server machine

► The operating systems running on any TSM client machines

► Storage devices that will be available to Tivoli Storage Manager

► Communication protocols installed on your client and server machines

► Any special system configurations you plan to use, such as Microsoft Active Directory or Microsoft Cluster Server (MSCS)

3.1.2 Tivoli Storage Manager installation steps

Tivoli Storage Manager installation package contains the following components:

► Tivoli Storage Manager server component
► Tivoli Storage Manager licenses
► Tivoli Storage Manager backup-archive client
► Tivoli Storage Manager device drivers
► Tivoli Storage Manager language pack
► Tivoli Storage Manager operational reporting

Apart from these components, you can also install the optional Tivoli Storage Manager ODBC driver, which enables reporting applications to export data from Tivoli Storage Manager Database and customize it for your needs. We do not cover these reporting products in this book.

It is always recommended that you install the products in the above sequence.

Note: Tivoli Storage Manager does not allow installation of both the server component and storage agent component on the same machine.

3.1.3 Installing Tivoli Storage Manager server

To install the TSM server, follow these steps:

1. Insert the Tivoli Storage Manager Windows Server CD. Click **Tivoli Storage Manager Server**. The Choose Setup Language dialog appears.

2. Accept the default or select a language for the Tivoli Storage Manager installation dialogs and click **OK**.

> **Note:** This selection only specifies a language for the Tivoli Storage Manager installation dialogs. Full product language support can be specified by selecting the **Custom installation** option (later in this installation sequence) in the Tivoli Storage Manager Server InstallShield Wizard.

3. The Tivoli Storage Manager Server CD browser screen appears.

> **Note:** Click **View Release Notes** to open the readme file for this Tivoli Storage Manager release. This file contains the most current product information, including any installation or configuration instructions not covered by Tivoli Storage Manager publications.

Click **Install Products**.
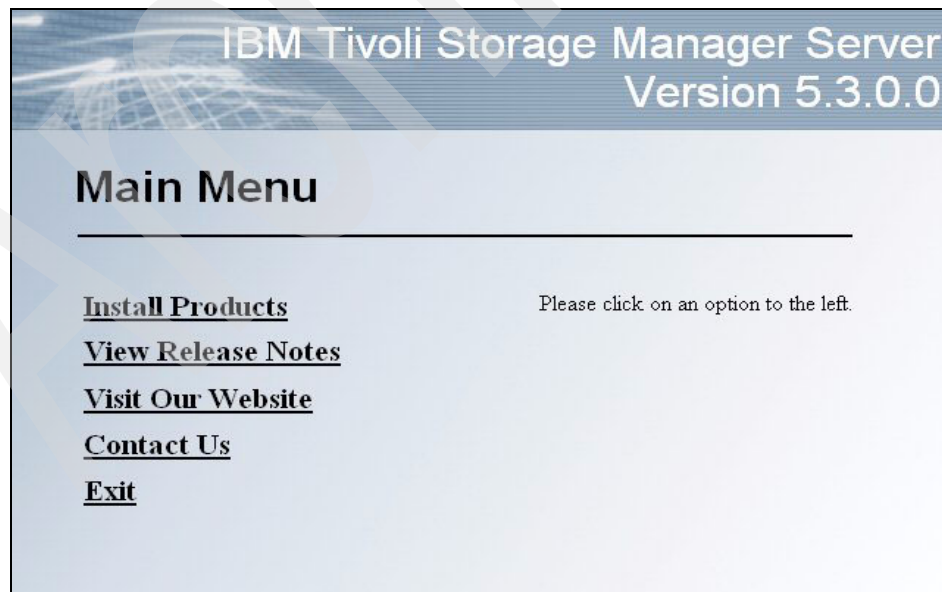
Figure 3-1   Installation main menu

4. The Install Products dialog appears. Click **TSM Server**.
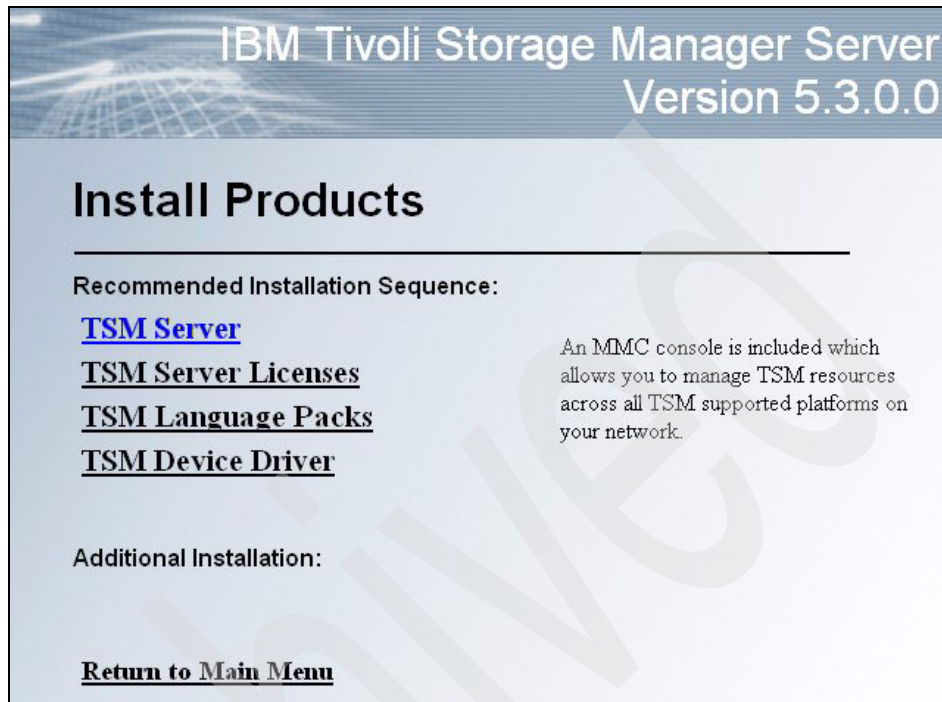
Figure 3-2   Install Products menu

5. The InstallShield Wizard window appears. Click **Next**.
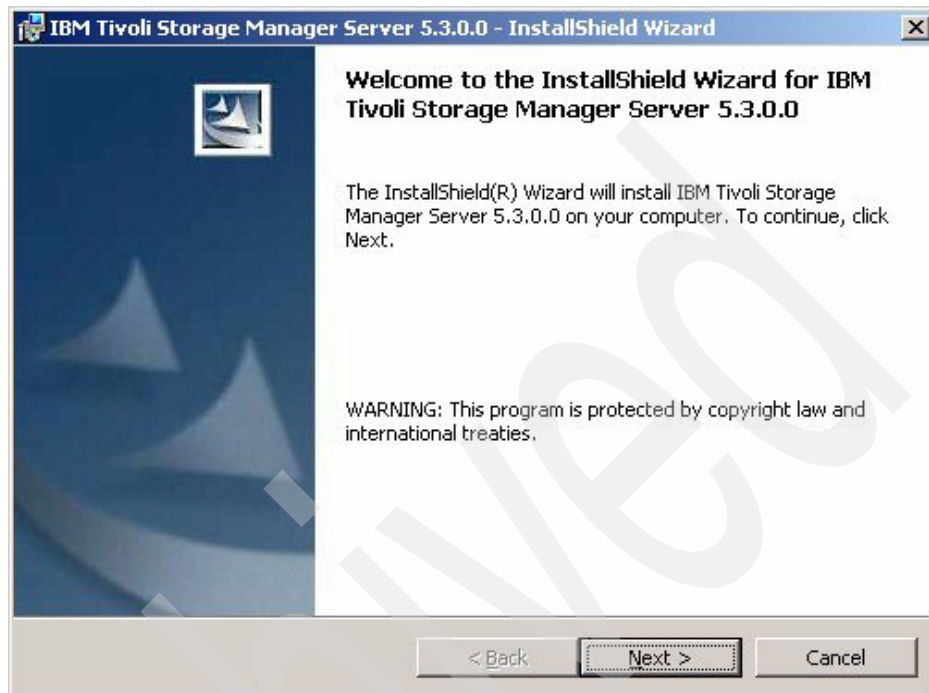
Figure 3-3   InstallShield Wizard welcome

6. The License Agreement window appears. Read the license agreement and accept the agreement. Click **Next**.
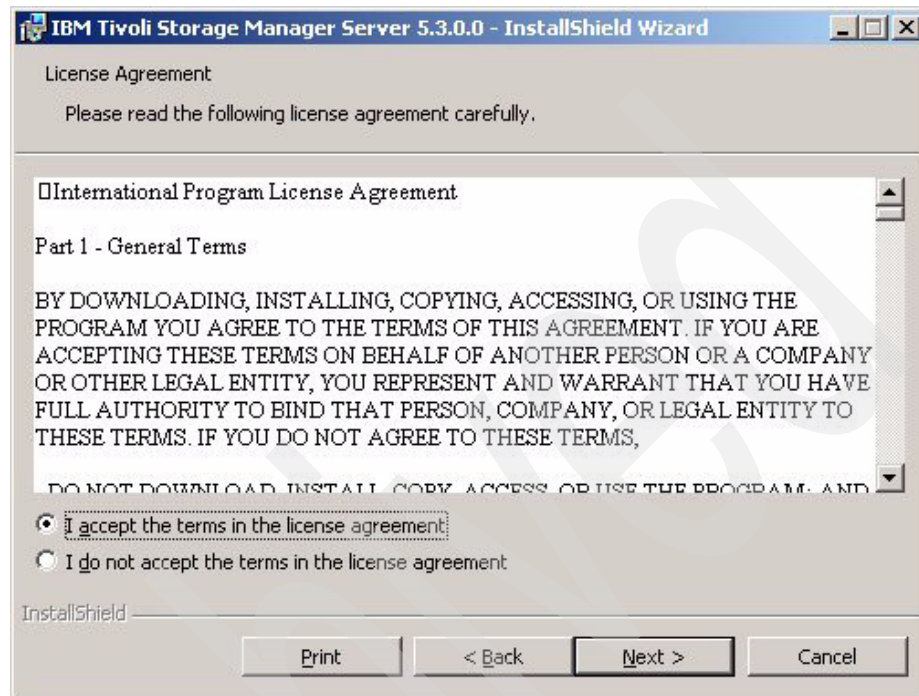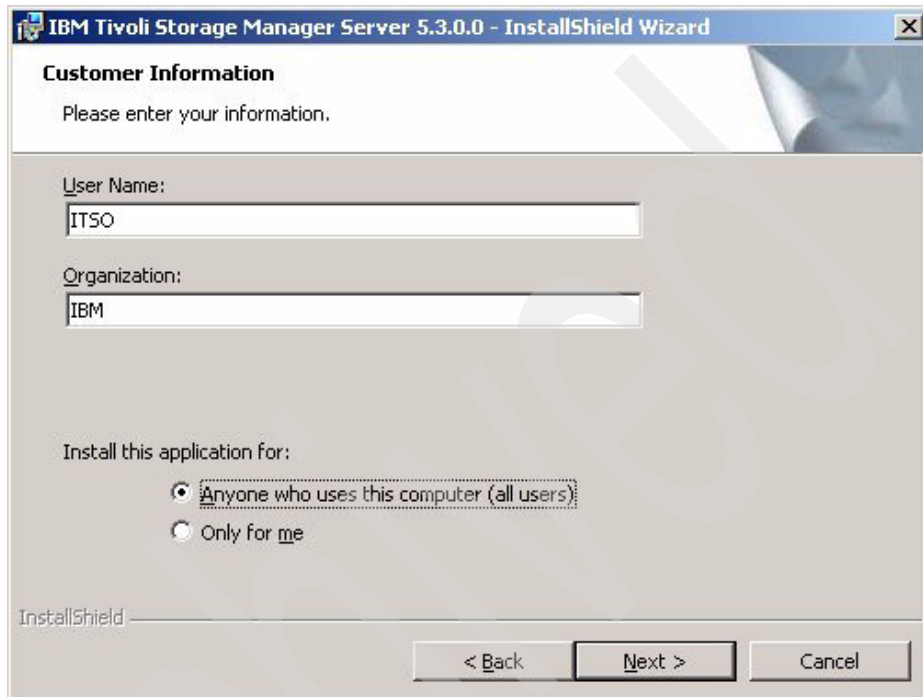
Figure 3-4   License agreement

7. The Customer Information window appears. Enter the user information and Organization information and select one of the options under Install this application for. Click **Next**.

Figure 3-5   Customer Information window

8. The Setup Type dialog box appears. Select **Complete** or **Custom**, and click
   Next.

Figure 3-6   Choosing Setup type

9. Choosing Custom offers options such as selecting product language support, deselecting other Tivoli Storage Manager components, and choosing the installation path. When you have made your choices, click **Next**.
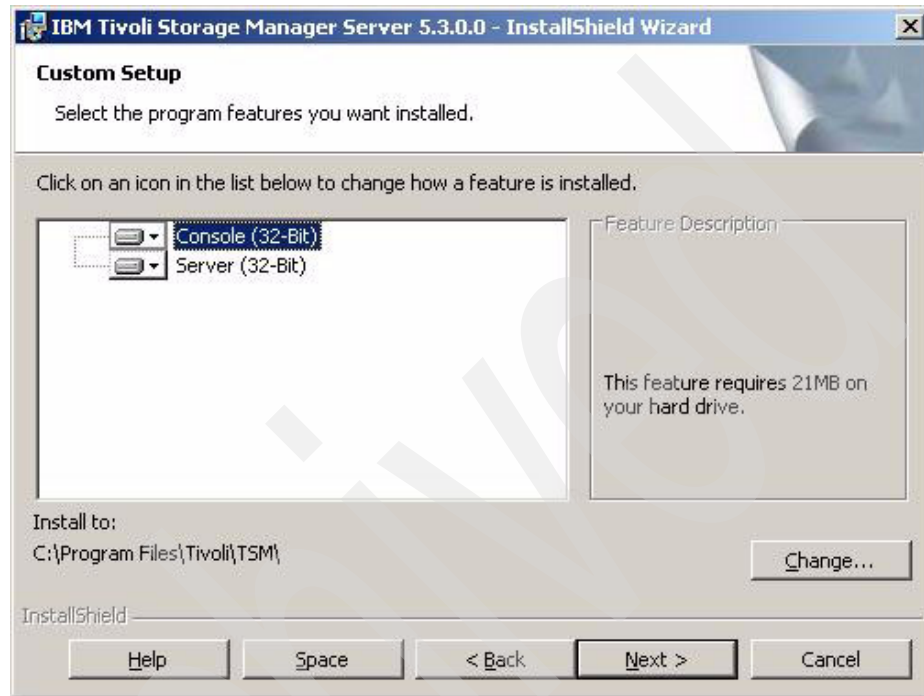
Figure 3-7   Custom setup options

10.The Ready to Install the Program window appears. Click **Install**.
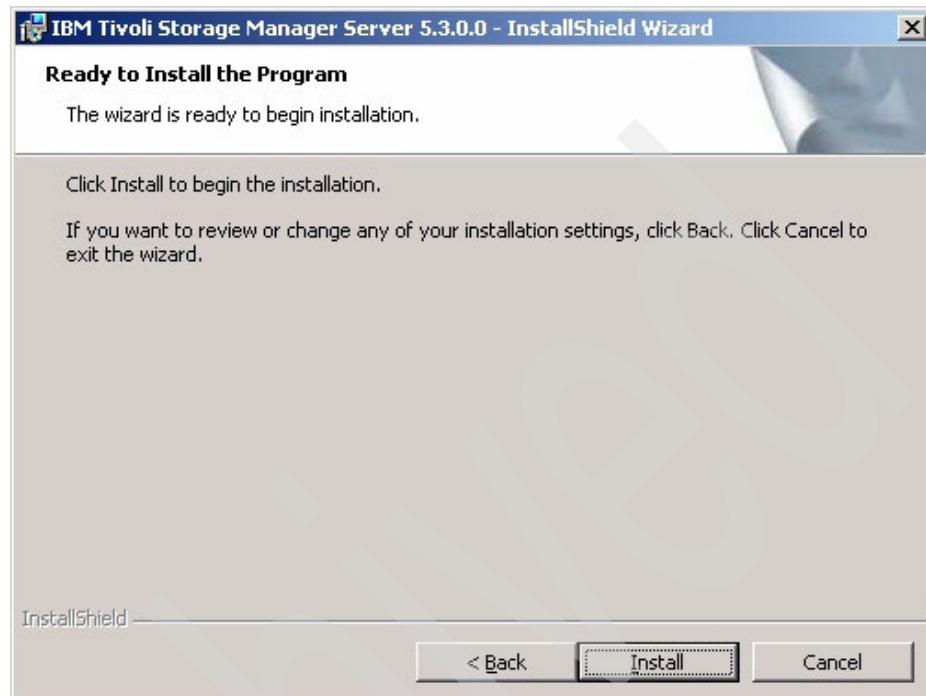
Figure 3-8   Installation begins

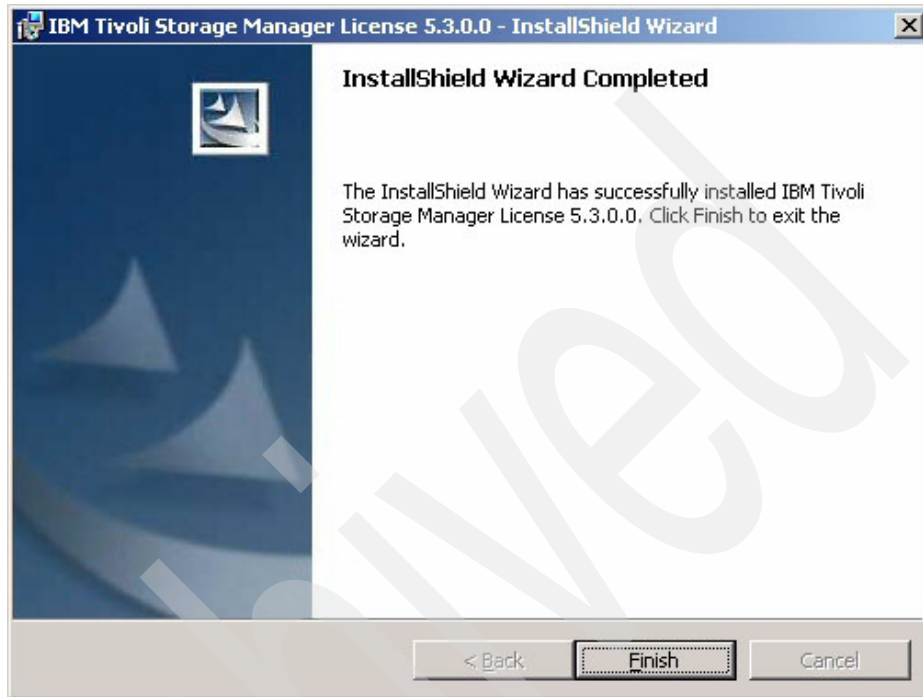11.A progress indicator appears. After the installation completes, the InstallShield Wizard Completed dialog appears. Click **Finish**.

Figure 3-9   Installation completes

A dialog prompting you to restart your computer might appear. If you are not prompted, no restart is required.

3.1.4 Installing Tivoli Storage Manager licenses

To install Tivoli Storage Manager licenses, follow these steps:

1. When server installation is complete, return to the Install Products window and select **TSM Licenses**.

Figure 3-10   Server License installation
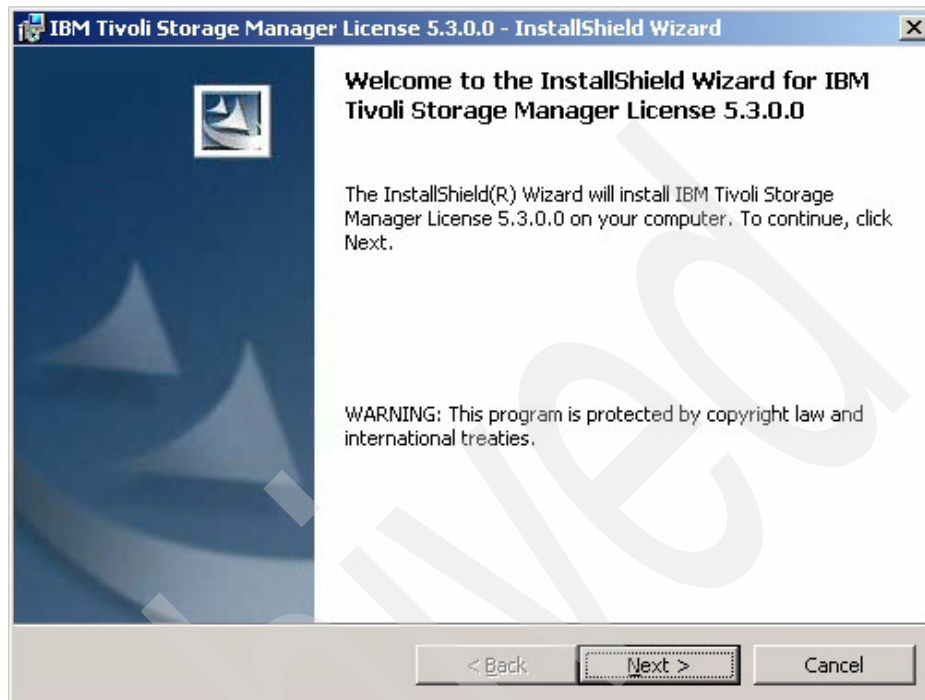
2. The InstallShield Wizard appears. Click **Next**.

Figure 3-11   License welcome screen

3. The Customer Information window appears. Enter the customer name and the organization for whom the license is purchased, and select one of the buttons under Install this application for. Click **Next**.

4. The Setup Type dialog box appears. Select either **Complete** or **Custom** setup type.

> **Note:** If you want to change the default installation directory, choose Custom. Otherwise the InstallShield will choose the default location for installing the files, which is normally your system drive.
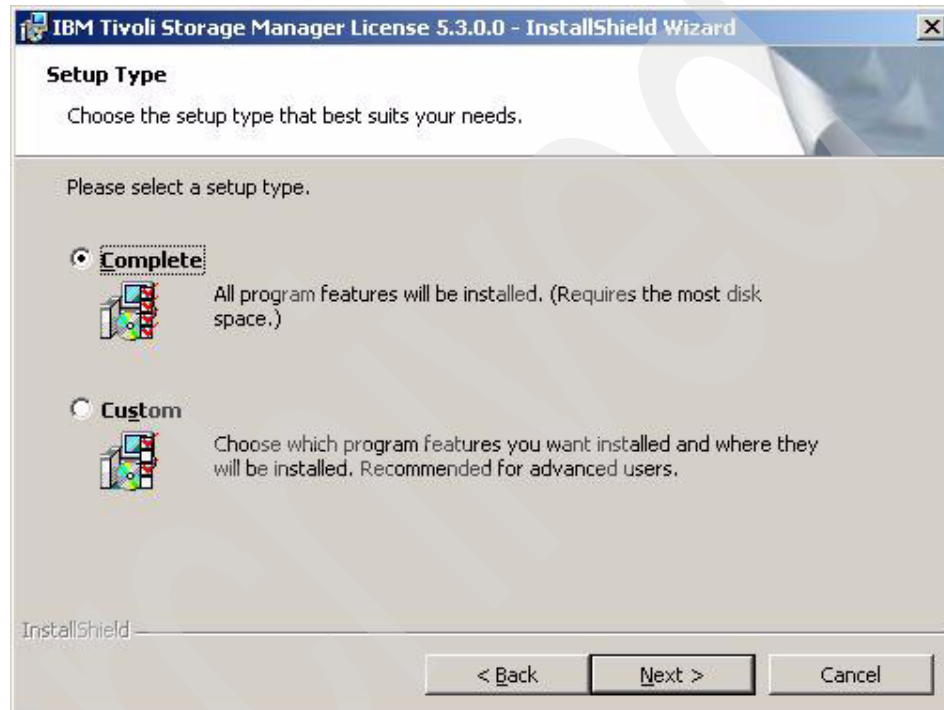

Figure 3-12   Choosing setup type

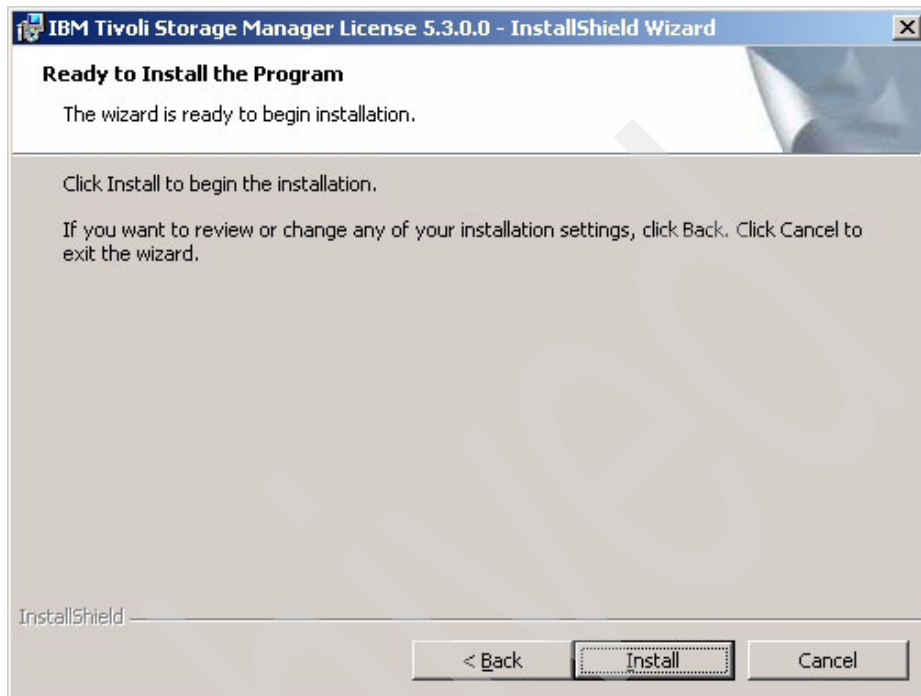5. The Ready to Install window appears. Click **Install**.

Figure 3-13   License installation begins

6. After the installation is finished, the InstallShield Wizard Completed dialog appears. Click **Finish**. No restart is required unless it is explicitly requested.

3.1.5 Installing Tivoli Storage Manager backup-archive client locally

It is always a best practice to install Tivoli Storage Manager Backup-Archive client on the Tivoli Storage Manager server machine. This helps you to validate the TSM server you configured for the first time. To install Tivoli Storage Manager Backup-Archive client, see *IBM Tivoli Storage Manager for Windows Backup-Archive Clients Installation and User's Guide Version 5.3*, GC32-0788.

3.1.6 Installing Tivoli Storage Manager device drivers

1. On the Tivoli Storage Manager Install Products window, select **TSM Device Driver**.

2. Click **Tivoli Manager Device Drivers**.

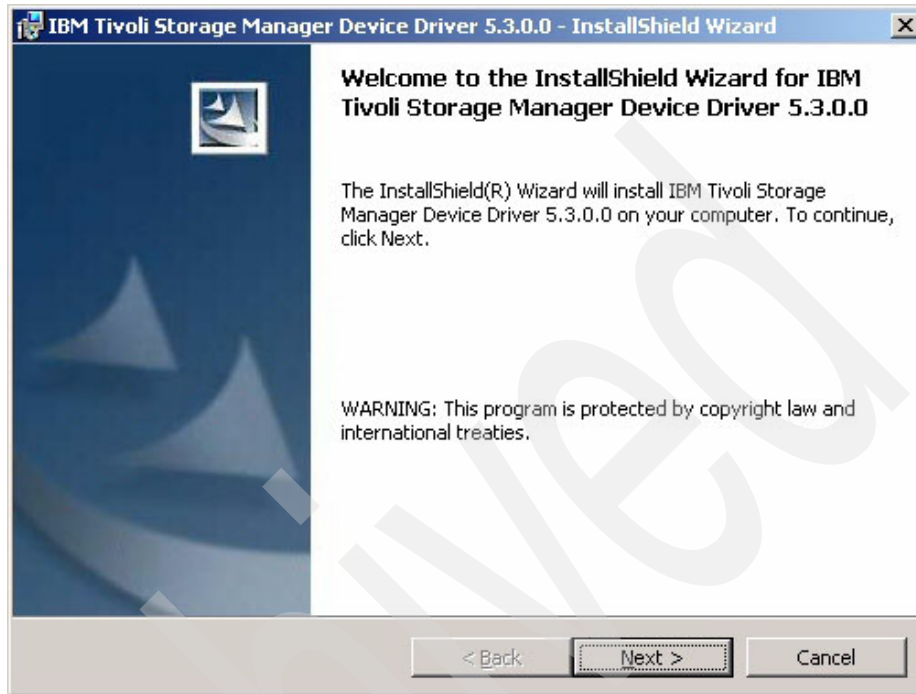3. The InstallShield Wizard appears. Click **Next**.

Figure 3-14   Device Driver installation wizard

4. The Customer Information window appears. Enter the user and customer information in the respective boxes and select one of the options under Install this application for. Click **Next**.

5. The Setup Type box appears. Select either **Complete** or **Custom** type installation, and click **Next**.

> **Note:** If you want to change the default installation directory, then select custom and go to the next screen and change the installation directory. If you do not want to change the installation directory, then select complete option.
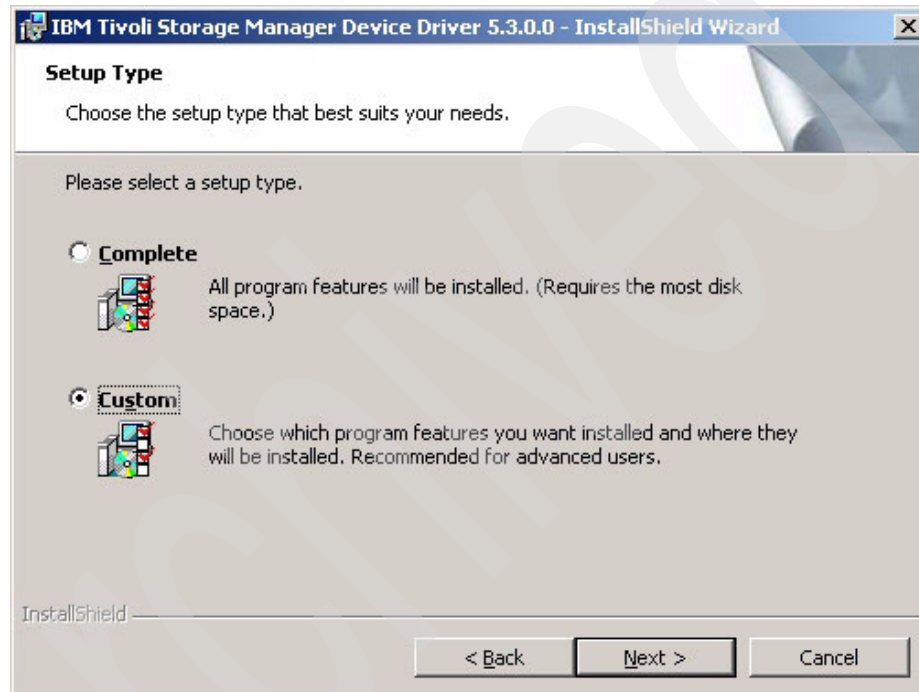

Figure 3-15   Choosing setup type for device driver

6. The Ready to Install window appears. Click **Install** to start installation.

7. A progress indicator is shown, and when the installation completes, the
    InstallShield Wizard Completed window appears. Click **Finish**. A restart
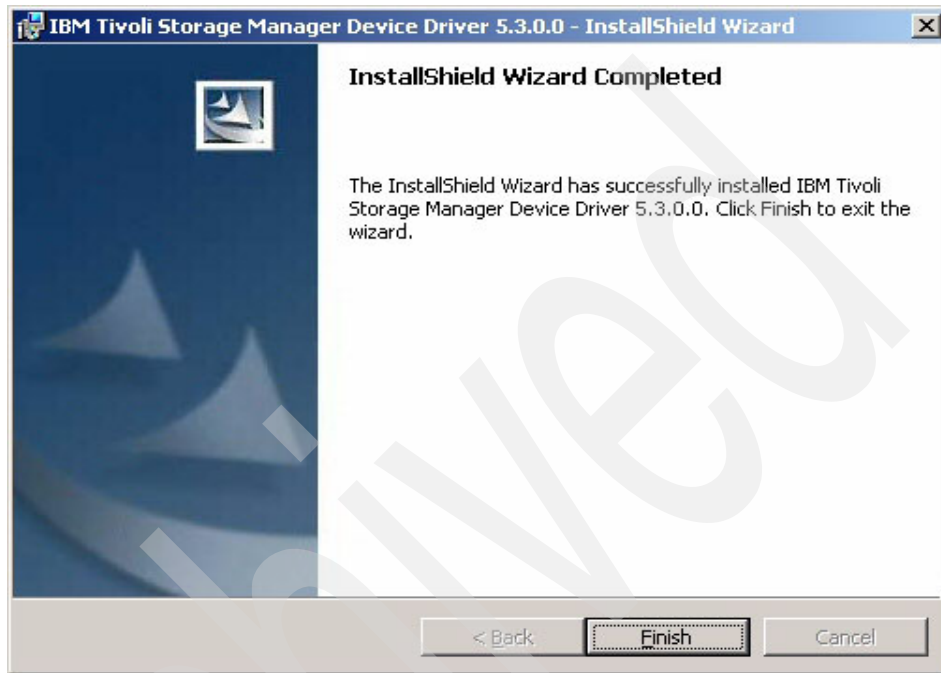   server dialog box appears.

Figure 3-16   Installation complete

3.2 Configuration in small/medium Windows environment

The IBM Tivoli Storage Manager for Windows server provides a graphical
interface called the Tivoli Storage Manager Console, which includes a set of
wizards that help you configure and manage your Tivoli Storage Manager
system. One or more of these wizards is presented each time you add a new
Tivoli Storage Manager server instance. You can choose from two wizard-based
configuration paths: standard and minimal.

► Standard configuration

    Choose the standard configuration option to initialize and configure a server.
    A series of wizards is presented in sequence to guide you through the initial
    configuration process. This is the recommended configuration path for setting
    up a functional production environment.

► Minimal configuration

Choose this option to quickly initialize a Tivoli Storage Manager server instance and perform a test backup of data located on the Tivoli Storage Manager server machine. This configuration enables you to evaluate basic functions quickly.

All Tivoli Storage Manager configuration and management tasks can be performed using the command-line interface, but the wizards are the preferred method for initial configuration. You can return to individual wizards after the initial configuration to update settings and perform management tasks. Refer to the *IBM Tivoli Storage Manager for Windows Installation Guide,* GC32-1602, for more information about configuration and management wizards.

This section contains an overview of the wizard-based initial configuration process and instructions for performing the initial configuration.

3.2.1 Overview of initial configuration

This section provides overview information for both standard and minimal configuration options.

Standard configuration

During the standard configuration process, wizards help you perform the following commonly required tasks:

► Analyze drive performance to determine best location for Tivoli Storage Manager server components

► Initialize the Tivoli Storage Manager server

► Apply Tivoli Storage Manager licenses

► Configure Tivoli Storage Manager to access storage devices

► Prepare media for use with Tivoli Storage Manager

► Register Tivoli Storage Manager client nodes

► Define schedules to automate Tivoli Storage Manager client tasks

Additional configuration wizards can help you perform these optional tasks:

► Configure Tivoli Storage Manager for use in a Microsoft Cluster Server (MSCS) environment

► Configure Tivoli Storage Manager for use in a Windows registry Active Directory environment

► Create a remote Tivoli Storage Manager for Windows client configuration package

The standard initial configuration process does not include all Tivoli Storage Manager features, but it does produce a functional Tivoli Storage Manager system that can be further customized and tuned. The default settings suggested by the wizards are appropriate for use in many cases.

Minimal configuration

During the minimal configuration process, a wizard helps you initialize a Tivoli Storage Manager server instance. Open client registration is enabled, so Tivoli Storage Manager client nodes can automatically register themselves with the server. The following objects are also created on the server machine:

► A client options file

  If a Tivoli Storage Manager client is not installed locally, the required directory structure will be created. If a client options file already exists, it will be backed up before the new file is created. TCP/IP communication is enabled for the client and server.

► A file device

  A file device is drive space designated for use as a virtual storage device. Standard files are used to represent individual media volumes. Data is written to file volumes sequentially, as if they were tape volumes. When a new file volume is required, a 25 MB file is automatically created. When file volumes are emptied, they are automatically deleted. Because the minimal configuration option does not provide for storage device configuration, default backup and archive storage pools are configured to send their data to the file device.

Although the wizards simplify the configuration process by hiding some of the detail, a certain amount of Tivoli Storage Manager knowledge is still required to create and maintain a typically complex storage management environment.

Configuring Tivoli Storage Manager enterprise administration

The initial configuration process configures a single server. If you have purchased the Enterprise administration feature and plan to configure a network of servers, you must perform additional tasks.

Stopping the initial configuration

You can click Cancel to exit any wizard panel. A dialog will appear, asking whether you want to mark the current wizard task as complete. You can click Yes to continue to the next wizard, or No to exit the initial configuration process. However, canceling during initial configuration can produce unexpected results. The preferred method is to complete the entire wizard sequence, then restart an individual wizard to make any configuration changes.

Performing the initial configuration

If you intend to configure Tivoli Storage Manager for use in a Microsoft Cluster Server (MSCS) environment, you must complete certain tasks before you begin the initial configuration of the Tivoli Storage Manager server.

After you have installed Tivoli Storage Manager:

1. Double-click the Tivoli Storage Manager Management Console icon on the desktop to open the Tivoli Storage Manager Console window.

Figure 3-17   Tivoli Storage Manager management console

2. Expand the IBM Tivoli Storage Manager tree in the left pane until the local machine name is displayed.

3. Right-click the local machine name and select **Add a New Tivoli Storage Manager Server**.

> **Note:** The Health Monitor can also be used to add a new TSM server.

4. The Initial Configuration Task List is displayed. Select **Standard configuration** or **Minimal configuration** and click **Start**.

> **Note:** If a Tivoli Storage Manager server instance already exists on the local machine, you will be prompted to confirm that you want to create and configure a new server instance. Be careful to create only the server instances you require. In most cases, only one server instance is necessary.

Configuration tasks

The Initial Configuration Environment Wizard is the first wizard in the standard configuration sequence. This wizard consists of a Welcome page and a series of input pages that help you perform the following tasks:

1. First input page

   Choose whether configuration tips are automatically displayed during the initial configuration process. This additional information can be helpful for new Tivoli Storage Manager users.

2. Second input page

   Choose to configure Tivoli Storage Manager in a standalone or network environment. Table 3-1 describes these environments.

Table 3-1   Environment description

Tivoli Storage Manager environment	Description
Standalone	A Tivoli Storage Manager backup-archive client and TSM server are installed on the same machine to provide storage management for only that machine. There are no network-connected TSM clients. Client-server communication will be configured automatically.
Network	A TSM server is installed. The backup-archive client is optionally installed on the same machine. You are licensed to install network-connected TSM clients on remote machines. You must configure communications between the remote clients and the server.

Results

The information you provide in this wizard will be used to customize upcoming wizards to reflect your preferences and storage environment.

3.2.2 Performance configuration wizard

The performance configuration environment wizard consists of a welcome page and a series of input pages that prompt you for input as shown in Figure 3-18.

1. First input page

   Estimate how many clients the Tivoli Storage Manager server will support and the typical size of files to be stored.

   For small and medium environments, choose **2-49**, and for larger environments choose **50 or more**.

   If your environment has a larger number of small-sized files, then choose **mostly small files**. If your environment has mostly larger-sized files, choose the second radio button. If you do not know what to choose, select the third option, which is an even mix of small and large files.

Figure 3-18   Describing the Tivoli Storage Manager environment

2. Second input page

   Tivoli Storage Manager analyzes local drives to determine the best location for initial Tivoli Storage Manager server volumes (Figure 3-19 on page 72).
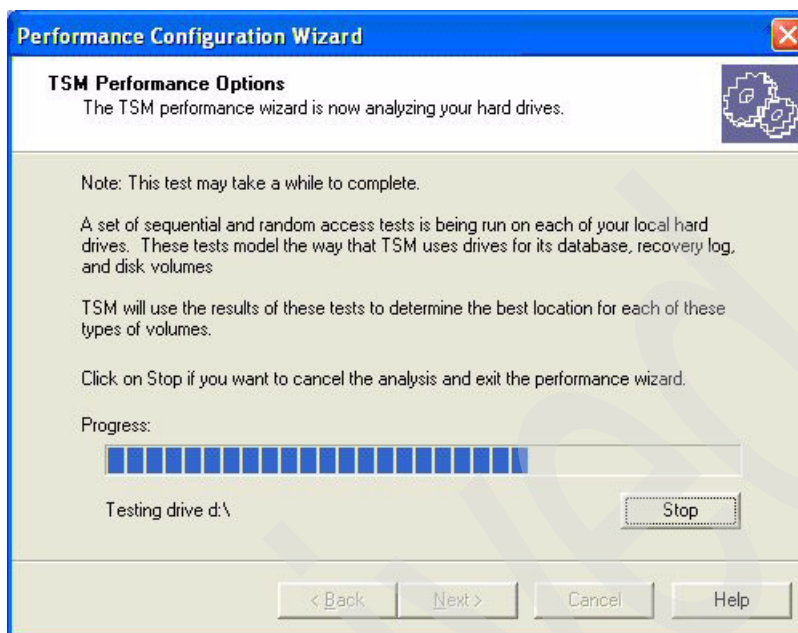
Figure 3-19   Searching for the best drive

Results

The information you provide in this wizard, along with the results of an automated analysis of local drives, are used to determine the best location for three important Tivoli Storage Manager volumes (Table 3-2). The term *volume* is used here to refer to space allocated in server random access storage.

Table 3-2   Overview of volumes

Volume	Description
Database	Stores information needed for server operations and information about client data that has been backed-up or archived.
Recovery Log	Stores information about pending database updates until they are committed.
Disk Storage Pool	Stores client data in server disk space. This data can be kept on the server or migrated to another storage resource.

Preferred locations for these Tivoli Storage Manager volumes will be displayed in the Server Initialization Wizard, which appears later in the initial configuration sequence. Use the wizard to modify the volume locations and default sizes.

3.2.3 Server initialization wizard

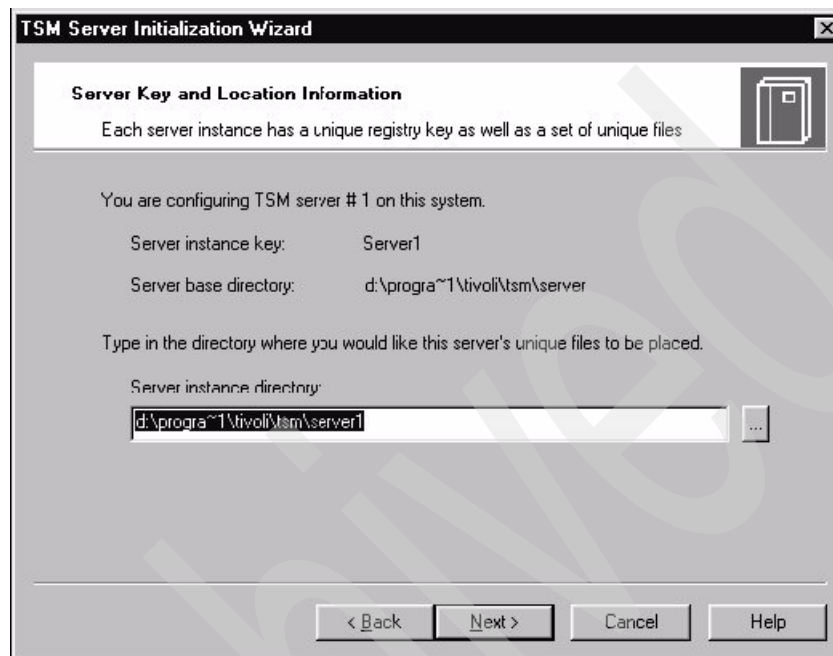In this section we explain the steps to initialize Tivoli Storage Manager servers.

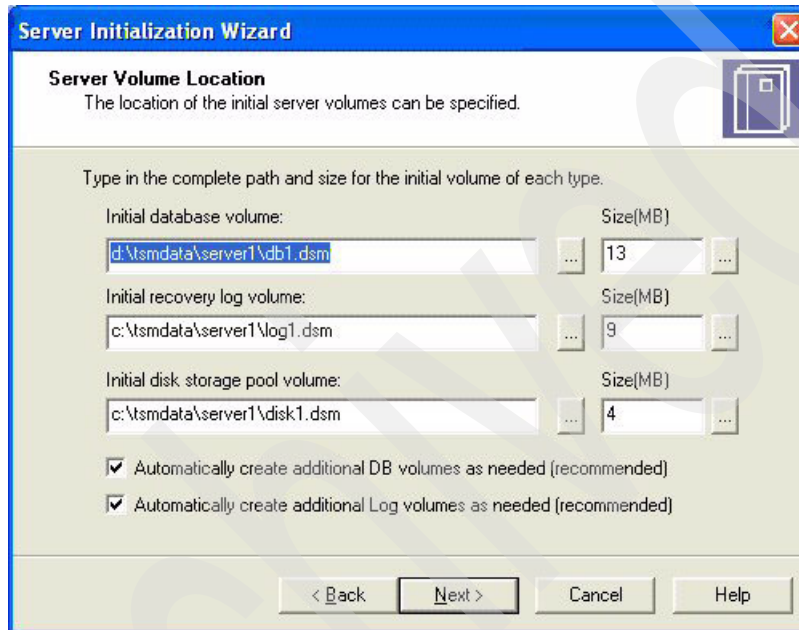*Figure 3-20   Starting server initialization*

Configuration tasks

The Server Initialization Wizard is the only wizard that appears during the minimal configuration process. It also appears as part of the standard configuration wizard sequence. This wizard consists of a Welcome page and a series of input pages that help you perform the following tasks.

1. First input page

   Choose a directory to store files unique to the Tivoli Storage Manager server instance you are currently configuring.

2. Second input page

   Choose directories for initial database, recovery log, and disk storage pool volumes. The default locations are preferred, based on the results of the Performance Configuration Wizard analysis. Choose whether to dynamically extend the size of the database and recovery log by adding volumes as necessary.

Figure 3-21   Database configuration options

3. Third input page

   Choose a logon account for the Tivoli Storage Manager server service, and choose whether the service is started manually or automatically.

4. Fourth input page

   Choose a name and password for the Tivoli Storage Manager server. Some Tivoli Storage Manager features require a server password.

5. If a Microsoft cluster server is detected during the standard configuration process, you will be prompted to configure Tivoli Storage Manager for use in a clustered environment. Select **Yes** to start the Cluster Configuration Wizard. Before you set up a cluster for use with Tivoli Storage Manager, you need to do some planning and ensure that your hardware is supported.

   Note: The minimal configuration process does not support cluster configuration.

Results

When you complete the Server Initialization Wizard, Tivoli Storage Manager:

► Initializes the server database and recovery log.

► Creates the database, recovery log, and disk storage pool initial volumes.

  Server Initialization Wizard default settings specify the following initial volume sizes (by default, additional volumes will be dynamically added to extend the database and recovery log as required):

  – A 13 MB database volume (db1.dsm). The database size is largely determined by the amount of client data managed by the server. As you add clients, the database size can increase.

  – A 9 MB recovery log volume (log1.dsm). The recovery log size depends on the database size, and will increase accordingly.

  – A 4 MB storage pool volume (data1.dsm).

► Creates two default schedules: DAILY_INCR and WEEKLY_INCR. You can use the Scheduling Wizard to work with these schedules or create others.

► Registers a local administrative client with the server. This client is used to provide access to the administrative Web interface and server command-line interface. The client is named `admin`, and its default password is `admin`. To ensure system security, it is recommended that you change this password.

Initialization results are recorded in the initserv.log file in the server directory. If you have problems starting the server after initialization, check this log file for error statements. If you contact technical support for help, you may be asked to provide this file.

3.2.4 License wizard

You need a license package to run Tivoli Storage Manager.

Figure 3-22   Setting the license option

> **Note:** The License Wizard will not appear if you have not installed the Tivoli Storage Manager license package.

The license package is a required Tivoli Storage Manager component. If the License Wizard does not appear:

1. Complete the configuration wizard sequence.
2. Restart the CD browser and install the license package.
3. Return to the Tivoli Storage Manager Console, expand the tree for the Tivoli Storage Manager server you are configuring, and click **Wizards**.
4. Select **License Configuration** from the wizards displayed in the right pane and restart this wizard to register the licenses you have purchased.

For more information, refer to 3.1, "Installing in small-medium Windows environments" on page 50.

IBM Tivoli Storage Manager base license support consists of:

► One local backup-archive client
► An unlimited number of administrative clients
► Enterprise Administration support
► Server-to-server virtual volume support
► Network communication support

You can use the License Wizard to apply these licenses and any additional Tivoli Storage Manager licenses you have purchased. If you are not sure which additional features you are licensed for, or how many users, check your Tivoli Storage Manager purchase invoice. If this information is unavailable, use the wizard to select and apply the minimum licensing you require, and then purchase any additional licensing later.

Note: Licensing terminology refers to client nodes as managed systems. A managed system is a client or server machine that will use Tivoli Storage Manager client code to transfer data to the Tivoli Storage Manager server. Managed System for SAN includes LAN support, so only one managed system license is required for each client node.

Configuration tasks

The License Wizard consists of a Welcome page and one input page that helps you select and apply the license options you have purchased. To use the License Wizard:

1. Select a license description.
2. Update the Purchased spin box.
3. Click **Apply**.
4. Repeat for other purchased licenses.

Results

The licensing information you provide is registered with the Tivoli Storage Manager server.

3.2.5 Device Configuration Wizard

The Device Configuration Wizard automatically detects storage devices attached to the Tivoli Storage Manager server. Use this wizard to select the devices you want to use with Tivoli Storage Manager and configure device sharing if required.
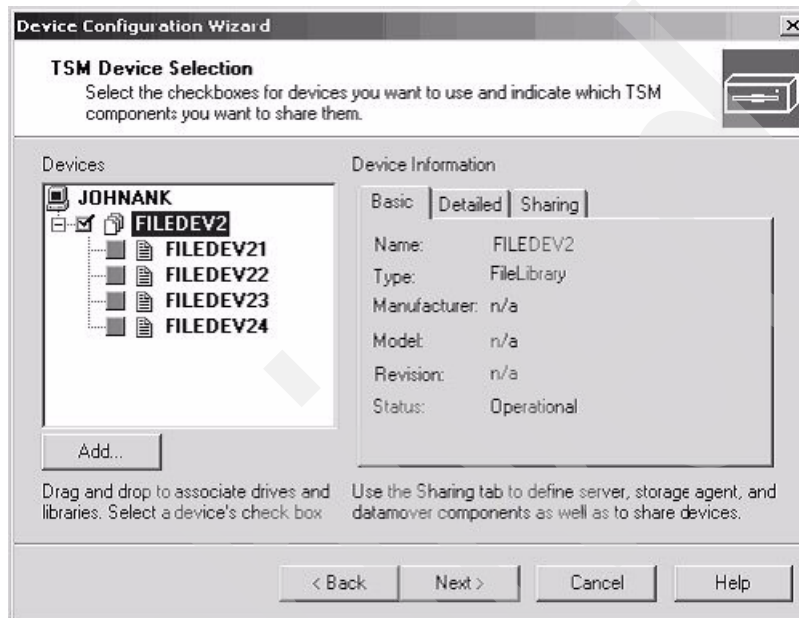
Figure 3-23   Device Configuration Wizard

The left wizard pane displays a tree view of devices connected to the Tivoli Storage Manager server machine. Tivoli Storage Manager device names are used to identify devices. Libraries and drives can only be detected if your hardware supports this function.

The right pane displays basic and detailed information about the device selected in the tree-view. If the device is a type that can be shared, the Sharing tab displays any Tivoli Storage Manager components that will share the device.

To define a device, select its check box. Any device with an open check box can be defined to the Tivoli Storage Manager server. A library check box that is partially filled indicates that some of the drives associated with that library have not been selected for use with Tivoli Storage Manager.

> **Note:** A solid green check box indicates that the device was previously defined to Tivoli Storage Manager. Previously defined devices cannot be manipulated or removed using the wizard. You can use the administrative Web interface or server command line to perform this task.

Configuration tasks

The Device Configuration Wizard consists of a Welcome page and input pages that help you perform the following tasks:

- ► Select the storage devices you want to use with Tivoli Storage Manager and define them to it.
- ► Manually associate drives with libraries, if required.
- ► Specify SCSI element number order for manually associated drives.
- ► Configure device sharing, if required.
- ► Manually add virtual or undetected devices.
- ► Manually associate drives.

Any drive listed as Unknown must be manually associated with a library. For example, drives attached to a Fibre Channel Switch or a SAN cannot be automatically associated. Tivoli Storage Manager can determine that the library contains a certain number of drives but cannot acquire their element numbers or addresses. The correct names for these drives will appear at the bottom of the tree as standalone drives. Drag and drop the unknown drive on the correct library. To use a library with Tivoli Storage Manager, any of its drives displayed as Unknown must be replaced with a valid drive name.

> **Note:** If you manually associate more than one drive with the same library, you must order the drives according to element number. If you do not arrange the drives correctly, Tivoli Storage Manager will not work as expected. To determine the element number for a drive, select the drive and click the **Detailed** tab in the right wizard pane. Use the element number lookup tool to determine the correct position of the drive. If your drive is not listed, refer to the manufacturer's documentation.

Setting up device sharing

To set up device sharing, click the **Sharing** tab and click **Components**. Follow the directions in the Device Sharing dialog is displayed.

Adding virtual or undetected devices

Click **New** to add File-type devices and drives or libraries accessed through an NDMP file server.

Results

The libraries and drives you define to Tivoli Storage Manager will be available to store data.

3.2.6 Client Node Configuration Wizard

With the Client Node Configuration Wizard, you can add and register the client nodes that will back up data to the server instance you are currently configuring. The wizard also enables you to specify how the backup data for these clients will be stored, by associating client nodes with storage pools.
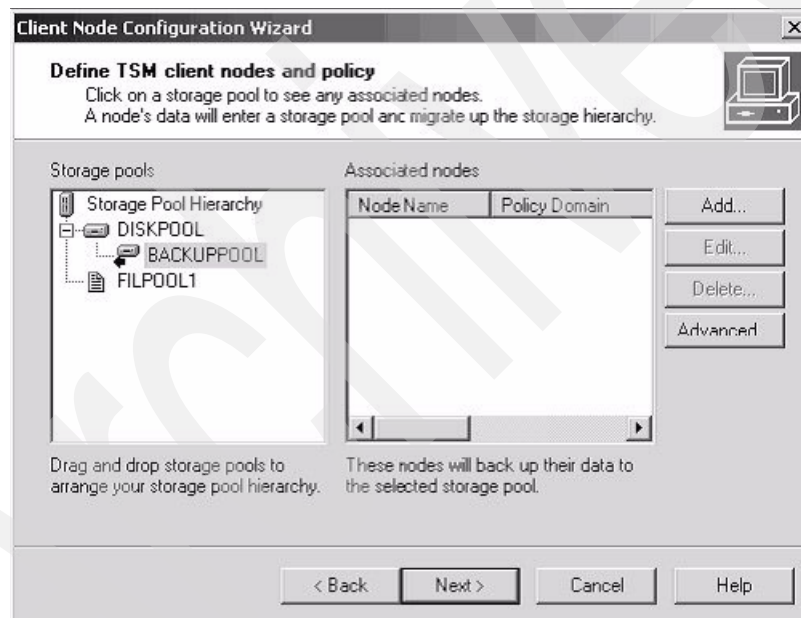

Figure 3-24   Client node configuration wizard

The left pane displays two default Tivoli Storage Manager storage pools (DISKPOOL and BACKUPPOOL). If you used the Device Configuration Wizard to define any storage devices to Tivoli Storage Manager, storage pools associated with those devices were automatically generated, and will also be displayed here.

The right pane displays client nodes associated with the storage pool selected in the left pane.

To register new client nodes, you must provide client node names and passwords. You can also change storage policy settings by adding or modifying policy domains. Tivoli Storage Manager storage policy determines how many copies of backed up files are maintained, and how long individual copies of files are retained in storage.

> **Note:** You should consider using this wizard to register any remote client nodes now, even if you have not yet installed Tivoli Storage Manager Client code on those machines. After you complete the initial server configuration, you can install the client code remotely and configure the client nodes to transfer data to this server.

3.2.7 Overview of storage pools

Tivoli Storage Manager uses a logical construct called a storage pool to represent storage resources. Different storage pools are used to route client data to different kinds of storage resources. Storage pools can be arranged in a hierarchy, with one pointing to another, to allow for migration of data from one type of storage to another.

Tivoli Storage Manager provides a default storage pool named DISKPOOL, which represents random-access storage space on the hard drive of the Tivoli Storage Manager server machine. During server initialization, Tivoli Storage Manager created one volume (representing a discrete amount of allocated space) in this storage pool. By default, this volume was configured to grow dynamically. You can add more volumes to expand this storage pool as required.

Tivoli Storage Manager also provides three other default storage pools, which are all set up to point to DISKPOOL. These three storage pools correspond to the three ways Tivoli Storage Manager manages client data: backup, archive, and space-management. The Client Node Configuration Wizard allows you to work with the backup storage pool, BACKUPPOOL.

By default, data for any client nodes you associate with BACKUPPOOL will be transferred immediately to DISKPOOL. You can store the data in DISKPOOL indefinitely, or just use DISKPOOL as a temporary cache and then migrate the data to any other storage devices represented in the storage pool hierarchy.

Configuration tasks

The Client Node Configuration Wizard consists of a Welcome page and several input pages that help you perform the following tasks:

► Register client nodes with the Tivoli Storage Manager server. You can add nodes individually, or detect and register multiple clients at once.

► Define client/disk associations for use with Tivoli Storage Manager Server-free Data Movement.

► Associate registered nodes with storage pools by adding the clients to a new or existing policy domain.

► Arrange the storage pool hierarchy to meet your storage needs.

Registering client nodes

To register client nodes individually, do the following:

1. Click **Add**. The Properties dialog appears, open to the Node information tab.
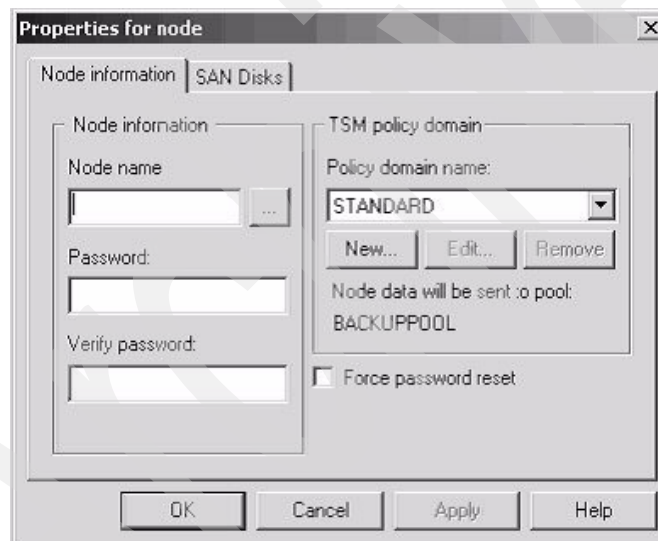
Figure 3-25   Node properties

2. Enter the node name and password information.

3. Consider your storage policy needs.

   By default, the new client node will be associated with the STANDARD storage policy domain. BACKUPPOOL is the default backup storage pool for this domain. You can associate the new client node with a different storage pool by clicking **New** to create a new policy domain, or **Edit** to modify the existing policy domain.

Managing multiple policy domains can significantly increase your administrative overhead, so you should create only the domains you require. For more information, refer to the chapter about implementing policies for client data in the Administrator's Guide.

► To detect and register multiple client nodes at once, return to the main wizard panel and click **Advanced**. Follow the instructions in the Properties dialog. You can add clients from a text file or choose from computers detected in your Windows domain. The Tivoli Storage Manager console directory contains a file named sample_import_nodes.txt, which defines the format required to import client nodes.

► To modify Tivoli Storage Manager client node information, select a client node name from the right wizard pane and click **Edit**. To delete a client node you just added, select the client node name and click **Delete**.

> **Note:** You cannot use the wizard to delete a client that was previously defined to the server. You can use the administrative Web interface or server command line to perform this task.

Defining client/disk associations

Tivoli Storage Manager can be configured for server-free data movement, which allows for full-volume backup and restore of client data stored on a dedicated SAN-attached disk. If you are planning to use this feature, you must define the client/disk association to the Tivoli Storage Manager server:

1. From the main wizard panel, click **Add**. The Properties dialog appears.

2. Click the **SAN Disks** tab. The Server Free Data Movement Disk Information page appears.
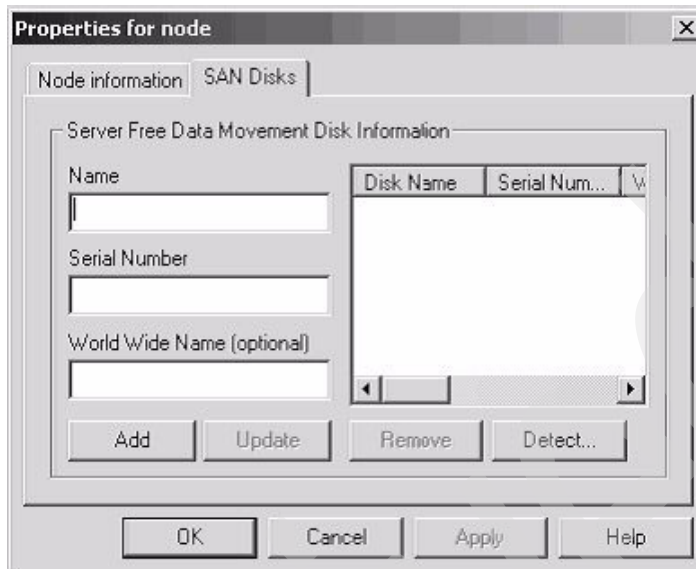
Figure 3-26   Configuring disk information

3. To manually add SAN disk information:

   a. Enter the name that uniquely identifies this SAN disk. Use the format harddiskX, where *X* is the disk number defined to the client machine. You can use the MMC Disk Management snap-in to obtain this disk number from the client machine. (See Tivoli Storage Manager online help.)

   b. Enter the serial number that identifies this disk on the SAN. The serial number can be obtained from the disk.

   c. Optionally, enter a world wide name for the disk.

   d. Click **Add**.

   The disk will be added to the right pane, and will be associated with this client node when the wizard completes.

   – To quickly identify and add SAN disk information, click the **Detect** button and follow the instructions in the Detect SAN Devices dialog.

   – To modify SAN disk information, select the disk name in the right pane, update any fields, and click **Update**.

   – To remove a SAN disk from the list, select the disk name in the right pane and click **Remove**.

> **Note:** You cannot use the wizard to remove a disk that was previously
> associated with this client. You can use the administrative Web interface or
> server command line to perform this task.

Arranging the storage pool hierarchy

By default, new client nodes will send backup data to BACKUPPOOL, which will
immediately migrate the data to DISKPOOL. You can point BACKUPPOOL at
any other displayed storage pool to route data there instead. A storage pool can
migrate data to one other storage pool. Multiple storage pools can be set up to
migrate data to the same storage pool.

To see which clients are associated with a storage pool, select a storage pool in
the left wizard pane. Any client nodes associated with that pool are displayed in
the right pane.

> **Note:** In a standalone server configuration, it is generally more efficient to
> back up data directly to tape. However, in a network configuration, consider
> arranging your storage pools so that client data is backed up to disk and later
> migrated to tape.

To back up client data directly to tape

1. Associate clients with BACKUPPOOL.
2. Drop BACKUPPOOL on a tape storage pool (for example, 8MMPOOL1).

To back up client data to disk, for migration to tape

1. Associate clients with BACKUPPOOL.
2. Drop BACKUPPOOL on DISKPOOL. (This is the default setting.)
3. Drop DISKPOOL on a tape storage pool.

Results

Client nodes you have registered can be configured to back up data to this Tivoli
Storage Manager server instance. The backup data will be managed according
to way you set up the client's associated storage pool hierarchy.

3.2.8 Media labeling wizard

Storage media must be labeled and checked in to Tivoli Storage Manager before
it can be used. Media labels are written at the start of each volume to uniquely
identify that volume to Tivoli Storage Manager.

The Media Labeling Wizard appears only if attached storage devices have been
defined to Tivoli Storage Manager. Slightly different versions of the wizard will

appear for automated and manual storage devices. This section describes the media labeling and check-in process for automated library devices.

Configuration tasks

The Media Labeling Wizard consists of a Welcome page and a series of input pages that help you perform these tasks:

► First input page: Select the devices that contain the media you want to label.
► Second input page: Select and label specific media.
► Third input page: Check in labeled media to Tivoli Storage Manager.

Selecting devices and drives

In the window shown in Figure 3-27, we can choose devices for labeling purposes.

The left pane displays devices and drives recognized by Tivoli Storage Manager. The right pane displays information about any device or drive selected in the left pane.

To select a device and any associated drives, check the box next to the device or drive name.

Figure 3-27   Device selection wizard

Selecting and labeling media

To select and label media:

1. Check the box next to the media you want to label (Figure 3-28).

2. Check **Overwrite existing label** if necessary, and select from the other available labeling options.

3. Click **Label Now**.
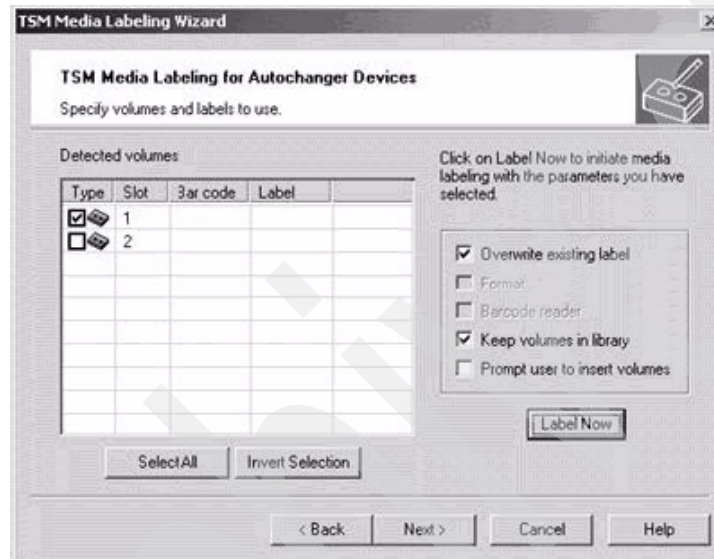
Figure 3-28   Media labeling wizard

4. The Tivoli Storage Manager Media Labeling dialog appears. Enter a label for the media. The Media Labeling Wizard supports labels up to six characters long.

5. Click **OK**. The Tivoli Storage Manager Media Labeling Monitor dialog appears. Status is displayed and updated throughout the labeling process.

   When the labeling process is complete, the OK button becomes active. The amount of time this takes can depend on the storage hardware and type of media you are using.

6. Click **OK**. The new label should appear in the left pane.

After you have finished labeling media, click **Next**. The Media Check-in dialog appears.

Checking in media

This dialog will appear only if you labeled media in the previous dialog.

1. Click **Check-in now** to check in labeled media to Tivoli Storage Manager.

2. Media volumes from all of the storage devices you selected in the first media labeling dialog are eligible for check-in.

3. All labeled media not previously checked in to this server will be checked in automatically at this time.

4. A dialog appears, describing the check-in process.

5. Check-in runs as a background process, and media will not be available for use until the process completes.

Depending on your storage hardware and the amount of media being checked in, this process can take some time. To monitor the check-in process, complete the initial configuration and take the following steps:

1. From the Tivoli Storage Manager Console, expand the tree for the Tivoli Storage Manager server you are configuring.

2. Expand **Reports** and click **Monitor**.

3. Click **Start** to monitor server processes in real time.

Results

When the check-in process has completed, media will be available for use by Tivoli Storage Manager. By default, media volumes will be checked in with scratch status.

Where to go from here

After the Initial Configuration completes, you are prompted to verify your configuration (Figure 3-29 on page 89). If you have installed a local backup-archive client, click Yes to start the client immediately. Click No if you have not installed the client code locally, or if you plan to verify your configuration by backing up remotely installed clients.

Note: Click the Tivoli Storage Manager Backup Client icon on your desktop to start the local backup-archive client at any time. You can use the Tivoli Storage Manager Console to perform a variety of administrative tasks, including issuing commands and monitoring server processes. You can also access the individual wizards you used during the initial configuration process from this interface. Additional wizards are also available.
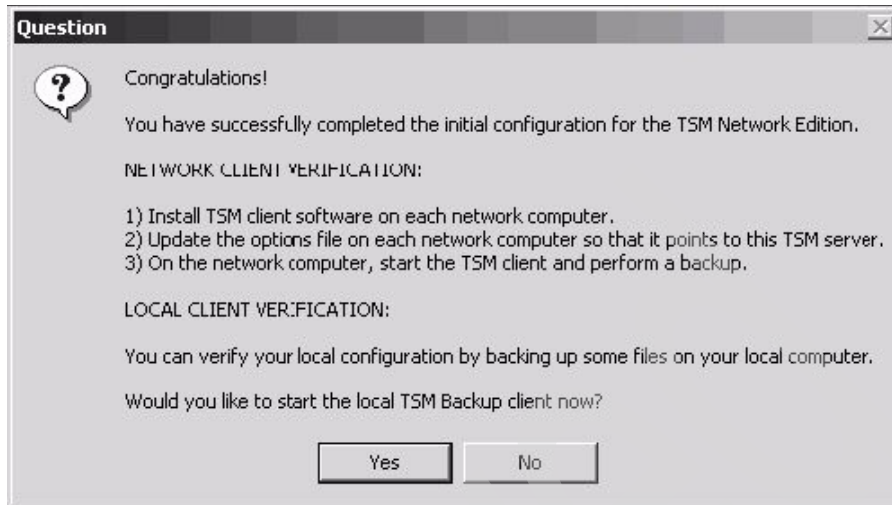
Figure 3-29   Initialization completes

Default configuration results

The Tivoli Storage Manager configuration wizards simplify the setup process by hiding some of the detail. For the ongoing management of your Tivoli Storage Manager system, it can be helpful to understand what has been created for you.

Data Management Policy Objects

Table 3-3 lists the default Tivoli Storage Manager data management policy objects.

Table 3-3   Default data management policy objects

TSM objects	Name	Details
Policy Set	STANDARD	This set is ACTIVE. It contains one management class.
Management Class	STANDARD	Contains a backup copy group and an archive copy group.
Copy Group (Backup)	STANDARD	Stores one active and one inactive version of existing files. The inactive version will be kept for 30 days. Stores one inactive version of deleted files for 60 days. Points to BACKUPOPOOL.
Copy Group (Archive)	STANDARD	Stores one active and one inactive version of existing files. The inactive version will be kept for 30 days. Stores one inactive version of deleted files for 60 days. Points to ARCHIVEPOOL.

3.3 Verifying the initial configuration

This section helps you verify the initial configuration by backing up client data to the Tivoli Storage Manager server. This section also includes these related tasks:

► Backing up a client
► Restoring client files or directories
► Archiving and retrieving files
► Retrieving archive copies

Backing up remote clients

Before you can back up a remote client, you must perform these tasks (in any order):

► Register the client node with the Tivoli Storage Manager server.

► Install and configure the Tivoli Storage Manager client on each remote machine.

Installing the Tivoli Storage Manager client

You can install the Tivoli Storage Manager client using any of these methods:

► Install directly from the CD-ROM.
► Create client images to install.
► Use a network-shared drive to distribute the Tivoli Storage Manager client code.

Configuring the Tivoli Storage Manager client

Configure the communications options in the client options file to connect with the server.

Note: Each Tivoli Storage Manager client instance requires a client options file (dsm.opt).

Backing up a client

This section describes a simple backup of client files.

Note: We recommend that you back up a small file or directory.

Do the following to back up a remote or local client:

1. Start the client, enter a node name and password, and click **Login**. The backup-archive client window opens.

2. Click **Backup** from the client window. The Backup window opens.

3. Expand the directory tree.

4. Select the folder icons to display the files in the directory.

5. Check the selection boxes next to the files or directories you want to back up.

6. From the pull-down list, choose the backup type:

   – Incremental (date only)

   – Incremental (complete)

   – Always backup: for a selective backup

   > **Note:** The first backup of a file is always a full backup, regardless of what you specify.

7. Click **Backup**. The Backup Report window displays the backup processing status.

   > **Note:** If you receive a message indicating that the server could not be contacted, see the Common Questions and Answers section of the IBM Tivoli Storage Manager Online Information.

Excluding files from the backup

You may not want to back up certain files. These files may be core files, local caches of network file systems, operating system or application files that could be easily recovered by installing the program again, or any other files that you could easily rebuild. You can create an include-exclude list in the client options file to exclude certain files from both incremental and selective backup processing. Tivoli Storage Manager backs up any file that is not explicitly excluded from backup. You can also include specific files that are in a directory that you have excluded. For more information, see the Backup-Archive Clients Installation and User's Guide for each relevant platform.

Restoring client files or directories

This section describes a simple restore of client files. For details and advanced procedures, see the appropriate Backup-Archive Clients Installation and User's Guide publication. To restore backup versions of files or directories:

1. Click **Restore** from the client window. The Restore window opens.

2. Expand the directory tree.

3. Expand the File Level.

4. Click on the selection boxes next to the files or directories you want to restore.

5. Click **Restore**. The Restore Destination window opens.

6. Select the destination in the Restore Destination window.

7. Click **Restore**. The Restore Report window displays the restore processing status.

Tivoli Storage Manager can keep multiple versions of files, and you can choose which version to restore. Tivoli Storage Manager marks the most recent version as active and all other versions as inactive. When you back up a file, Tivoli Storage Manager marks the new backup version active, and marks the previous active version as inactive. When the maximum number of inactive versions is reached, Tivoli Storage Manager deletes the oldest inactive version.

If you try to restore both an active and inactive version of a file at the same time, only the active version is restored.

► To restore an active backup version, click **Display active files only** from the View pull-down list.

► To restore an inactive backup version, click **Display active/inactive files** from the View pull-down list.

Archiving and retrieving files

This section describes a simple archive and retrieval of client files. For more information, see the appropriate Using the Backup-Archive Clients manual.

We recommend that you archive a small file or directory. You can select files to be archived by name or from a directory tree.

To archive files by name, do the following:

1. Click **Archive** in the client main window. The Archive window opens.

2. Expand the directory tree until you find the drive or directory that you want.

3. Highlight the drive or directory that you want.

4. Search for file names:

   a. Click the Find icon on the tool bar.

   b. Enter the search criteria in the Find Files window. You can use a mask to find files with similar names. Assign a unique description for each archive package.

   c. Click **Search**. The Matching Files window opens.

5. Click the selection boxes next to the files you want to archive.

6. In the Description box on the tool bar, enter a description, accept the default description, or select an existing description for your archive package.

7. Click **Archive** to archive the files. The Archive Status window displays the status progress of the archive.

Archiving files using a directory tree

You can archive specific files or entire directories from a directory tree. To archive your files from the directory tree, do the following:

1. Click **Archive** in the client main window. The Archive window opens.

2. Expand the directory tree until you find the directories or drive that you want.

3. Click the selection boxes next to the files or directories to archive.

4. In the Description box on the tool bar, enter a description, accept the default description, or select an existing description for your archive package.

5. Click **Archive**. The Archive Status window opens. The Archive Report window displays the status progress of the archive.

Retrieving archive copies

You retrieve files when you want to return archived copies of files or directories to your workstation. To retrieve archived copies, do the following:

1. Click **Retrieve** on the client main window. The Retrieve window opens.

2. You can find the files or directories in either of the following ways:

   – From the directory tree: Expand the directory tree until you find the object you want. The objects are grouped by archive package description.

   – By name:

      i.   Click the Find icon on the tool bar. The Find Files window opens.

      ii. Enter your search information in the Find Files window.

      iii. Click **Search**. The Matching Files window opens.

3. Click on the selection boxes next to the objects that you want to retrieve.

4. Click **Retrieve**. The Retrieve Destination window opens.

5. Enter the information in the Retrieve Destination window and click **Retrieve**. The Retrieve Report window displays the processing results.

3.3.1 Getting started with administrative tasks

This section provides an introduction to some basic Tivoli Storage Manager administrative tasks and describes the following administrative tasks:

► Managing the Tivoli Storage Manager server

   – Starting the TSM server
   – Stopping the TSM server
   – Backing up the TSM server database and database recovery log
   – Removing the TSM server

- Installing and configuring Tivoli Storage Manager clients
  - Installing and configuring clients
  - Creating or updating a client options file
- Managing Tivoli Storage Manager client schedules
  - Starting the Tivoli Storage Manager scheduler
  - Verifying a schedule
- Managing Tivoli Storage Manager communications
  - Setting client/server communications options
- Managing Tivoli Storage Manager administrators
  - Registering additional administrators
  - Changing administrator passwords

You can also use the Administration Center to manage servers and clients.

3.3.2 Managing the Tivoli Storage Manager server

This section describes the managing functions for the TSM server.

Starting the TSM server

You can start the TSM server in several ways. However, we recommend that you start it as a service. In this way, the server remains active when you log off the workstation. To start the server as a service, perform these steps from the Tivoli Storage Manager Console:

1. Expand the tree for the TSM server you are starting and expand **Reports**.

2. Click **Service Information**. The Service Information view appears in the right pane.

3. If the server status displays `Stopped`, right-click the service line and select **Start**.

Stopping the TSM server

You can stop the server without warning if required. To avoid losing administrative and client node connections, stop the server only after current sessions have been completed or canceled.

> **Attention:** For most tasks in this book, your server must be running. This procedure is explained here only if an unusual situation requires that you stop the server.

To stop the server, do one of the following:

1. Stop a server that is running as a Service:

   a. Expand the tree for the TSM server you are stopping, and expand **Reports**.

   b. Click **Service Information**. The Service Information view appears in the right pane.

   c. Right-click the server service line and select **Stop**.

   > **Note:** This shuts down the server immediately. The shutdown also cancels all Tivoli Storage Manager sessions.

2. Stop a server from the administrative Web interface:

   a. From the tree view in the browser, expand **Object View**.

   b. Expand **Server**.

   c. Click **Server Status**.

   d. From the pull-down menu, select **Halt Server** and click **Finish**.

   > **Note:** This procedure shuts down the server immediately. The shutdown also cancels all client sessions.

3. Stop a server from the administrative command line:

   a. Expand the tree for the Tivoli Storage Manager server you are stopping and expand **Reports**.

   b. Click **Command Line**. The Command Line view appears in the right pane.

   c. Click **Command Line Prompt** in the right pane. The Command Prompt dialog appears.

   d. Enter halt in the Command field, and click the **Submit** button.

   > **Note:** This shuts down the server immediately. The shutdown also cancels all client sessions.

Backing up the server database and database recovery log

If the Tivoli Storage Manager server database or the recovery log is unusable, the entire server is unavailable. If a database is lost and cannot be recovered, all of the data managed by that server is lost. If a storage pool volume is lost and cannot be recovered, the data on the volume is also lost.

With Tivoli Storage Manager, you can define administrative schedules so that the database and storage pools are backed up regularly. If you should lose your database or storage pool volumes, you can use offline utilities provided by Tivoli Storage Manager to restore your server and data.

Removing the TSM server

This section describes what you must do before you remove the current version of the TSM server, and describes how to return to a previous version of Tivoli Storage Manager (or ADSM).

After you remove the Tivoli Storage Manager device driver, restart your system.

To return to ADSM or an earlier version of Tivoli Storage Manager after you perform a migrate install, perform a full database backup from your original version and the server install code for your original version.

> **Note:** You cannot restore a backed-up database from a prior version onto a newer version of the TSM server.

If you return to ADSM or an earlier version of Tivoli Storage Manager, be aware of these results:

► References to client files that were backed up, archived, or migrated to the current TSM server will be lost.

► Some volumes might be overwritten or deleted during Tivoli Storage Manager server operation. If so, client files that were on those volumes and that were migrated, reclaimed, moved (MOVE DATA command), or deleted (DELETE VOLUME command) might not be accessible to the earlier version of ADSM or Tivoli Storage Manager.

► Definitions, updates, and deletions of Tivoli Storage Manager objects that were performed on the current Tivoli Storage Manager server will be lost.

Before you remove Tivoli Storage Manager, follow these steps:

1. Perform a full database backup.

   If you have a tape device class named tapeclass, enter this command to perform a full backup:

   ```
   backup db type=full devclass=tapeclass
   ```

2. Save a copy of the volume history and device configuration files that you defined on the VOLHISTORY and DEVCONFIG options in the server options file.

   To save the volume history in a file named volhist, and the device configuration in a file named devices, enter:

   ```
   backup volumehistory filenames=volhist backup devconfig
   filenames=devices
   ```

3. Store the output volumes in a safe location.

3.3.3 Return to a previous version of Tivoli Storage Manager

This section explains how to return to a previous version of the Tivoli Storage Manager.

Installing and configuring Tivoli Storage Manager clients

One way to install TSM clients is to run the setup routine manually on each network-attached client machine. Similarly, you can configure TSM clients by manually editing the client options file on each machine.

To simplify the installation and configuration of multiple TSM clients, consider copying the client setup files from the product CD and using the Network Client Options File Wizard to create a configuration package. The setup files and configuration package can then be placed on a file server that can be accessed by Windows clients using a network-shared drive.

Installing clients using shared resources

This section describes how to place the Tivoli Storage Manager client program on a file server and how to use the package created by the Network Client Options File Wizard. In the example shown in Figure 3-30 on page 98, Tivoli Storage Manager is installed on a server named EARTH, which shares its D drive with all of the Windows client machines.
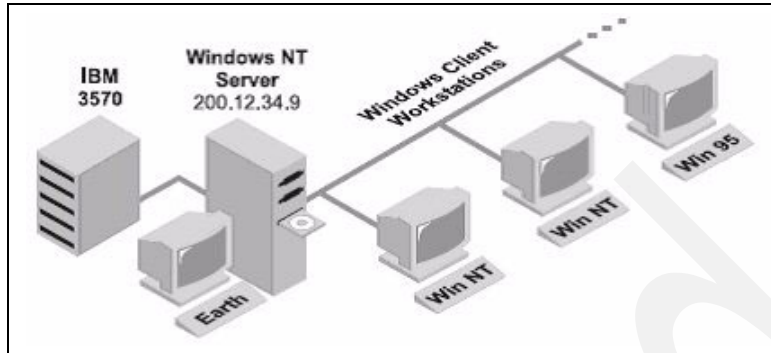
Figure 3-30   Installing client machines

Each client machine is configured so that when it boots up, it maps the EARTH D drive as its Z drive. For example, at start-up each client issues this command:

```
NET USE Z: \\EARTH\D$
```

The administrator used the Network Client Options File Wizard to create a client configuration package named earthtcp that was stored on EARTH in the d:\tsmshar directory. The administrator then registered each client node.

Installing and configuring clients

The following scenario describes how to install the remote client and configure it from a shared directory:

1. On EARTH, copy the contents of the Win32® client directory from the IBM Tivoli Storage Manager client CD to the d:\tsmshar directory. Ensure that you include any client subdirectories. You can use Windows Explorer or the **xcopy** command with the /s option to perform the copy.

2. Provide the users of the Windows clients with the following instructions for installing the client from the shared directory:

   a. Open a command prompt and change directories to the shared CD-ROM drive on EARTH.

   b. Start the client installation:

      ```
      setup
      ```

      Follow the instructions in the setup routine.

   c. Run the configuration package batch file to configure the client to communicate with the server (that is, create the client options file) by issuing:

      ```
      earthtcp.bat
      ```

Using Windows Explorer, you can run the batch file if the drive is shared and if you start the file from the shared directory. However, you cannot run the batch file if you go to the directory using Explorer's network neighborhood.

After they complete the procedure, the users can start their clients, contact the server, and perform a backup.

Creating or updating a client options file

Each client requires a client options file, which contains options that identify the server, communication method, backup and archive options, space management options, and scheduling options.

You can edit or create client options files in several ways, depending on the client platform and configuration of your system:

► Any client

   Edit the dsm.opt client options file with a text editor at a client workstation. This is the most direct method, but it may not be best if you have many clients.

► Windows clients

   Generate the dsm.opt client options file from the server with the Network Client Options File Wizard. This is easy and direct, and the wizard detects the network address of the Tivoli Storage Manager server. To run the wizard:

   – From the Tivoli Storage Manager Console, expand the tree for the TSM server on which you want to create the file and click **Wizards**. The Wizards list is displayed in the right pane.

   – Double-click **Client Options File** from the Wizards list to start the wizard.

   – Follow the instructions in the wizard.

► Networked Windows clients with a shared directory on a file server

   Use the Remote Client Configuration Wizard to create a package that enables remote users to create client options files. The administrator uses the wizard to generate a client configuration file and stores the file in a shared directory. Clients access the shared directory and run the configuration file to create the client options file. This method is suitable for sites with many clients.

3.3.4 Managing Tivoli Storage Manager client schedules

This section shows how to start Tivoli Storage Manager schedules that you have defined and how to verify that they are running correctly.

Starting the Tivoli Storage Manager schedule

The Tivoli Storage Manager Client Scheduler is the client component of the Tivoli Storage Manager scheduling model. The client scheduler runs as a Windows service and must be installed and running on the TSM client machine to execute any client schedules you define to the TSM server. The client scheduler can be installed using a wizard provided by the TSM client graphical interface. You can manually start the scheduler service on each client node, or update the managed services option in the client options file to automatically start the scheduler service as required. Refer to the Backup-Archive Client Installation and User's Guide for more information.

Verifying a schedule

You can verify that the automation is working as it should on the day after you define the schedule and associate it with clients. If the schedule runs successfully, the status indicates Completed.

> **Note:** The include-exclude list (file on UNIX clients) on each client also affects which files are backed up or archived.

3.3.5 Managing Tivoli Storage Manager client/server communications

This section describes the main communication settings among the Tivoli Storage Manager servers and its clients.

Setting client/server communications options

Use the Server Options utility on the Tivoli Storage Manager Console to view and specify server communications options. This utility is available from the Service Information view in the server tree. By default, the server uses the TCP/IP, Named Pipes, and HTTP communication methods. If you start the server console and see warning messages that a protocol could not be used by the server, either the protocol is not installed or the settings do not match the Windows protocol settings.

For a client to use a protocol that is enabled on the server, the client options file must contain corresponding values for communication options. From the Server Options utility, you can view the values for each protocol.

> **Attention:** This section describes setting server options before you start the server. When you start the server, the new options go into effect. If you modify any server options after starting the server, you must stop and restart the server to activate the updated options.

For more information about server options, see the Administrator's Reference or the Tivoli Storage Manager Console online help.

TCP/IP options

This is an example of a TCP/IP setting:

```
commmethod tcpip
tcpport 1500
tcpwindowsize 8
tcpnodelay no
```

Named Pipes options

The Named Pipes communication method is ideal when running the server and client on the same Windows machine because Named Pipes support is internal to the Windows base system. Named Pipes require no special configuration.

This is an example of a Named Pipes setting:

```
commmethod namedpipe
namedpipename \\.\pipe\adsmpipe
```

SNMP DPI subagent options

Tivoli Storage Manager implements a simple network management protocol (SNMP) subagent. You can configure the SNMP subagent to send traps to an SNMP manager, such as NetView®, and to provide support for a management information base (MIB).

The subagent communicates with the snmpd daemon, which in turn communicates with a management application. The snmpd daemon must support the DPI® protocol. Agents are available on AIX. The subagent process is separate from the Tivoli Storage Manager server process, but the subagent gets its information from a server options file. When the SNMP management application is enabled, it can get information and messages from servers.

Here is an example of an SNMP setting. You must specify the COMMMETHOD option:

```
commmethod snmp
snmpheartbeatinterval 5
snmpmessagecategory severity
```

3.3.6 Managing Tivoli Storage Manager administrators

This section describes how to manage Tivoli Storage Manager administrators.

Registering additional administrators

If you are adding administrators, you should register them and grant an authority level to each.

> **Note:** The name SERVER_CONSOLE is reserved for Tivoli Storage Manager console operations and cannot be used as the name of an administrator.

From the administrative Web interface, perform the following steps to register an administrative client and grant an authority level:

1. From the tree view, expand **Administrators**.
2. From the Operations pull-down menu, select **Register an Administrator**.
3. Enter the required information and click **Finish**.

Changing administrator passwords

From the administrative Web interface, perform the following steps to change the password of an administrator:

1. From the tree view, expand **Administrators**.
2. Select an administrator name.
3. From the Operations pull-down menu, select **Update an Administrator**.
4. Enter the password and click **Finish**.

3.4 Installing TSM to UNIX environments

Installing Tivoli Storage Manager V5.3 consists of the following steps:

- ► Installing the TSM server and related components on the server machine.
- ► Installing Tivoli Storage Manager client code on every machine that will transfer data to TSM server-managed storage.

This chapter provides instructions for installing the Tivoli Storage Manager server and related components on the UNIX environment (IBM AIX and Linux), including the following tasks:

- ► Installing Tivoli Storage Manager
- ► Verifying the installation
- ► Configuring Tivoli Storage Manager

3.4.1 Tivoli Storage Manager for AIX environment

AIX server requirements:

► RISC System/6000 or pSeries computer with at least 200 MB of free disk storage and 1 GB of memory.

► AIX 5.1 or later

Note: When you are in a library sharing or LAN-free environment, Version 5.3 and later of the Tivoli Storage Manager server and Storage Agent are not backward-compatible with Version 5.2 and earlier of the server and Storage Agent. To function properly, upgrade all servers and storage agents to Version 5.3 in a library sharing or LAN-free environment.

If you have an IBM 3570, 3590, or Ultrium tape library or drive, install the most current device driver before you install IBM Tivoli Storage Manager V5.3. You can locate the device drivers at:

`ftp://ftp.software.ibm.com/storage/devdrvr/`

3.4.2 Tivoli Storage Manager installation packages

Tivoli Storage Manager uses three types of AIX installation packaging. The type used depends on the content of the delivery. It is very important to understand the consequences of each type of install.

Note: Installation will be stopped and an error message displayed if an active server or storage agent process is detected. All active server and storage agent processes must be halted before installation can proceed

New install and migrate

For a new version or release of Tivoli Storage Manager, install packages are set to perform a new install if no prior version is installed or a migrate install if a prior version is installed. A new install or a migrate install always establishes a base level for each file set. In the case of a migrate install, the prior base level and all updates to that base level are removed from the system. You cannot remove file sets installed by a migrate install without uninstalling the product.

Update install

An update install package is used with a maintenance update (FixPack) or an Interim Fix, used to correct a small number of high impact problems. An update install allows the package to be rejected after installation and does not force a rebasing of a file set.

Use these settings:

ALL Available Software   `Install and Update` (SMIT option)
COMMIT software updates?   `no`
SAVE replaced files?   `yes`

> **Note:** If you COMMIT a file set, you have just rebased that file set and cannot remove it without uninstalling the product.

Migrating to IBM Tivoli Storage Manager Version 5.3

It is possible to install Tivoli Storage Manager V5.3 over a previous version of ADSM or Tivoli Storage Manager. This is called a *migrate install*. A DSMSERV UPGRADEDB operation is automatically performed during a migrate install.

> **Note:** In a scenario with several installations of the server with a separate log and database, the upgrade database that is performed during the install will have no effect. Enter the UPGRADEDB command for each database.

The ADSM default installation directories changed for Tivoli Storage Manager. If you have previously used Disaster Recovery Manager (DRM) to create a disaster recovery plan file, that file refers to path names that can no longer be valid. After you have installed Tivoli Storage Manager, you should back up your storage pools and database and create a new disaster recovery plan file. For the sequence and details of the procedure, see the Disaster Recovery Manager chapter in the Administrator's Guide.

If HACMP™ is being used and there is a need to migrate to Tivoli Storage Manager V5.3 (from any previous version), you must convert to the new startserver script. Device resets are no longer performed by the startserver script. They are now done by the server during initialization of the library.

If the RESETDRIVES parameter is set to YES for a library, then the reset will be performed on the library manager for the library and all drives defined to it. If a library is defined as SHARED, the RESETDRIVES parameter automatically defaults to YES for the library. Otherwise, you can run the UPDATE LIBRARY command with RESETDRIVES=YES.

To return to an earlier version of Tivoli Storage Manager after a migrate install, a full database backup of that original version is needed along with the install code for the server of that original version. It is not possible to restore a prior version's backed-up database onto the latest version of the server. For example, it is not possible to restore a Version 4.2 database onto Tivoli Storage Manager V5.3.

Installation directories

Here is an overview of the installation directories:

- ► Server directory (/usr/tivoli/tsm/server/bin), which contains:
  - – Storage pool volumes (backup.dsm, archive.dsm, spcmgmt.dsm)
  - – Database volume (db.dsm)
  - – Recovery log volume (log.dsm)
  - – Server code and licensing
- ► Related server directories
  - – The message repository, online help, and supported languages (/usr/lib/nls/msg/). The message repository is called dsmserv.cat and the command and message help is called dsmserv.hlp
  - – Device and StorageTek support (/usr/tivoli/tsm/devices/bin and /etc)
  - – Tivoli inventory (/usr/tivoli/tsm/tivinv)
  - – Event receiver (/etc/tivready/monitorslfs)
- ► Device directories
  - – /usr/tivoli/tsm/devices/bin
  - – /etc/drivers
  - – /etc/methodsv
- ► Language directory
  - – For language-dependent portions of the program: /usr/lib/nls/msg/[lang]/ file. U.S. English, German, French, Italian, Spanish, Brazilian Portuguese, Korean, Japanese, traditional Chinese, simplified Chinese, Chinese GBK, Chinese Big5, Russian, Czechoslovakian, Hungarian, and Polish are supported. United States English (ISO8559), the en_US Cultural convention and Language translation environment, is a required installation regardless of the language environment you are using.

Installation restrictions

This section lists restrictions that should be considered prior to installing Tivoli Storage Manager. Installation will be stopped and an error message displayed if an active server or storage agent process is detected. All active server or storage agent processes must be halted before installation can proceed.

Installation of the TSM server and Tivoli Storage Manager storage agent on the same machine is not supported. During server installation, rmitab autosrvr is run. This can remove customized autosrvr entries. The installation can remove all lines with the identifier autosrvr even if you have customized other options and commands under this identifier.

3.4.3 Installing Tivoli Storage Manager in an AIX environment

Use the following SMIT procedure to install the server and device support.

1. Log on as the root user.

2. Load the CD into the selected drive.

3. To install the server on AIX 5.1 or later, you must accept the license agreement. To view the license agreement, access SMIT and select **Yes** on the Preview new LICENSE agreements option on the SMIT installation menu. The license agreements are translated in many languages. The language environment that you set determines the version that is displayed.

4. From the desktop window, access SMIT and make selections according to the level of your AIX operating system. Enter:

   ```
   smit install_update &
   ```

5. Select **Install and Update Software** and **Install and Update from the LATEST Available Software**.

6. On the next window, select the device that you are using for the installation. You can enter the drive name in the window or click **List** to access the device list. If you click on List, select the CD drive that you are using for the installation (for example, /dev/cd0).

7. Click **OK**.

8. Locate the line `Software to Install`. The value of the environment variable LANG controls which translated messages, help, and device selection messages in SMIT are automatically installed. You can:

   – Install all components listed in the next step.

   – Selectively install components by clicking **List** for the latest available software packages, and continue to the next step.

9. Select the file sets you want to install for your configuration. Supported file sets are listed by configuration.

32-bit hardware, 32-bit AIX kernel
tivoli.tsm.server.com
tivoli.tsm.server.rte
tivoli.tsm.msg.en_US.server
tivoli.tsm.license.cert
tivoli.tsm.license.rte
tivoli.tsm.webcon
tivoli.tsm.msg.en-US.devices
tivoli.tsm.devices.aix5.rte

64-bit hardware, 64-bit AIX kernel
tivoli.tsm.server.com
tivoli.tsm.server.aix5.rte64
tivoli.tsm.msg.en_US.server
tivoli.tsm.license.cert
tivoli.tsm.license.rte
tivoli.tsm.webcon
tivoli.tsm.msg.en-US.devices
tivoli.tsm.devices.aix5.rte

64-bit hardware, 32-bit AIX kernel
tivoli.tsm.server.com
tivoli.tsm.server.rte
tivoli.tsm.msg.en_US.server
tivoli.tsm.license.cert
tivoli.tsm.license.rte
tivoli.tsm.webcon
tivoli.tsm.msg.en-US.devices
tivoli.tsm.devices.aix5.rte

10. Click **OK**.

11. Check the default settings for the options on this window. To continue, click **OK**.

    SMIT responds:

    ```
    ARE YOU SURE?...
    ```

12. To continue, click **OK**. This installation can take several minutes.

Note: Some file sets are operating system level–specific and will fail to install. This is normal behavior, and should not be interpreted as an error.

13. After the installation is complete, click **Done**, remove the CD, and exit from SMIT.

Note: The Database, Recovery Log, and default storage pools are created (or should be) by the installation process.

To start the server from the /usr/tivoli/tsm/server/bin directory, enter:

```
nohup ./dsmserv or run in the background with nohup ./dsmserv &
```

It is also required to install a backup-archive client and an administrative client.

When you install or upgrade the server to Tivoli Storage Manager V5.3, you must give your servers unique names. If all of your servers have the default name, SERVER1, you will only be able to add one of them to the Administration Center. Use the SET SERVERNAME command to specify the new server name. The maximum length of the name is 64 characters.

3.4.4 Installation verification

It is possible to verify server installation by issuing the following QUERY commands from the server console:

► QUERY STATUS
► QUERY STGPOOL (shows the stgpools automatically set up by the installation)
► QUERY DB (shows a basic database set up by the installation)
► QUERY LOG (shows a basic log set up by the installation)

After the server is installed, it runs in the background, so you must start the server in the foreground or use an administrative client to issue the commands.

Backing up client data from a backup-archive client can be done to verify the complete Tivoli Storage Manager installation. The client must have been installed from the UNIX client CD.

Note: Do not select files to back up that exceed your storage pool capacity. An 8 MB backup storage pool, an 8 MB archive storage pool, and an 8 MB space management pool were allocated at installation.

The server must be running before you can use the administrative and backup-archive clients. See "Stopping and Starting the Server" in the Administrator's Guide for the procedure for starting the server.

Configure the backup-archive client with these steps:

1. Copy the sample client system options file (dsm.sys.smp) and the sample client user options file (dsm.opt.smp). The sample files are in /usr/tivoli/tsm/client/ba/bin/.

► Edit the options files to include the following options:

- In dsm.opt:

```
servername server_name
```

- In dsm.sys:

```
servername server_name
commmethod tcpip
tcpport port_address
tcpserveraddress server_address
nodename client
```

Note: The server names specified in dsm.opt and dsm.sys must match.

2. Start the backup-archive client graphical user interface by entering `dsm`.

   The default ID and password for the backup-archive client are both `client`.

To back up several files, perform these steps:

1. Click **Backup**. The Backup window displays. You can select files from a directory tree, or you search a drive or directory to select files.

   - To select files from a directory tree, expand the tree and click on the files you want to back up.

   - To search for files:

     i. Click the **Find** icon on the tool bar.

     ii. The Find Files (Backup) window displays. Enter your search criteria.

     iii. Click **Search**.

     iv. The Matching Files (Backup) window displays. Click on the selection boxes next to the files you want to back up.

     v. Close the Matching Files (Backup) window by clicking the backup-archive icon on the menu bar and selecting **Close**.

2. Click **Always Backup** from the Type of Backup list.

3. Click **Backup**. The Backup Status window displays the backup processing status. A message appears when the backup has completed successfully.

Starting and stopping the server

To start the server from the /usr/tivoli/tsm/server/bin directory, enter
nohup ./dsmserv (or use **nohup ./dsmserv &** to run in the background).

You can stop the server without warning if an unexpected problem requires you to return control to the operating system. To avoid losing administrative and client

node connections, stop the server only after current sessions have completed or been canceled.

To stop the server, issue the **halt** command from the Tivoli Storage Manager command prompt.

Registering licenses

You should immediately register any Tivoli Storage Manager licensed functions that you purchase. Use the REGISTER LICENSE command to do this, as documented in the Administrators' Reference and the Administrators' Guide. Also, be sure to see the Tivoli Storage Manager readme file for the latest information regarding enrollment certificate files.

3.4.5 Linux server requirements

For Linux X86:

► Server requirements

   – An i686 symmetric multiprocessor (SMP) or uniprocessor (UP)

   – 256 MB of RAM

   – 72 MB hard disk space (includes full install, 9 MB recovery log, 17 MB database). Add 6 MB for each additional language support package.

► Operating system requirements

   – Red Hat Enterprise Linux 3

   – SUSE LINUX Enterprise Server 8/United Linux 1.0 - Service Pack 3 or higher

   – SUSE LINUX Enterprise Server 9

   – Version 2.2.5-213 or later of the GNU C libraries installed on the Tivoli Storage Manager machine.

   – Shared Memory Protocol (with Tivoli Storage Manager V5.3 Linux x86 Client)

   – A CD device available for installation or an Internet connection to obtain the Linux installation packages.

For Linux zSeries:

► Server requirements

   – A zSeries 900, 800, or T-Rex server with either native LPARs or VM guests. 64-bit LPARs and VM guests are supported. Both 31-bit and 64-bit LPARs and VM guests are supported by the storage agent to perform LAN-free operation.

- 256 MB of RAM
- 72 MB hard disk space (includes full install, 9 MB recovery log, 17 MB database). Add 6 MB for each additional language support package.

▶ Operating system requirements:

- Red Hat Enterprise Linux 3
- SUSE LINUX Enterprise Server 8/United Linux 1.0 - Service Pack 3 or higher
- SUSE LINUX Enterprise Server 9
- Version 2.2.5-213 or higher of the GNU C libraries installed on the Tivoli Storage Manager machine.
- A CD device available for installation or an Internet connection to obtain the Linux installation packages.

For Linux pSeries:

▶ Server requirements

One of the following IBM systems:

- RS/6000 44P Model 170, 44P Model 260, 44P Model 270
- pSeries 610, pSeries 620, pSeries 630, pSeries 640, pSeries 660, pSeries 670, pSeries 690
- 256 MB of RAM
- 128 MB hard disk space (includes full install, 9 MB recovery log, 17 MB database). Add 6 MB for each additional language support package.

▶ Operating system requirements

- Red Hat Enterprise Linux 3
- SUSE LINUX Enterprise Server 8/United Linux 1.0 - Service Pack 3 or higher
- SUSE LINUX Enterprise Server 9
- GNU C libraries requirements:
- For SUSE LINUX Enterprise Server 8, Version 2.2.5-108 or higher.
- For SUSE LINUX Enterprise Server 9 and Red Hat Linux 3, V2.3.3-98.

Tip: Up-to-date information about hardware requirements can be found at:

http://www.ibm.com/servers/eserver/iseries/linux

Linux iSeries

- ► Server requirements
  - – Any system with a POWER5 processor
  - – 256 MB of RAM
  - – 128 MB hard disk space (includes full install, 9 MB recovery log, 17 MB database). Add 6 MB for each additional language support package.
- ► Operating system requirements
  - – Red Hat Enterprise Linux 3
  - – SUSE LINUX Enterprise Server 8/United Linux 1.0 - Service Pack 3 or higher
  - – SUSE LINUX Enterprise Server 9
  - – Version 2.3.3-98 or higher of the GNU C libraries installed on the Tivoli Storage Manager machine
  - – A CD device available for installation or an Internet connection to obtain the Linux installation packages.

Installation directories

Here is an overview of the installation directories:

- ► Default server directory (/opt/tivoli/tsm/server/bin), which contains:
  - – Storage pool volumes (backup.dsm, archive.dsm, spcmgmt.dsm)
  - – Database volume (db.dsm)
  - – Recovery log volume (log.dsm)
  - – Server and licensing
- ► Related server directories:
  - – The message repository, online help, and supported languages (/opt/tivoli/tsm/server/bin/en_US)
  - – Device support (/opt/tivoli/tsm/devices/bin)
  - – Tivoli inventory (/opt/tivoli/tsm/tivinv)

3.4.6 Installing Tivoli Storage Manager in an Linux environment

To install the server on Linux, you must accept the license agreement. Perform the following steps:

1. Log on as the root user.

2. Navigate to the directory where the TIVsm-server package was uncompressed and unpacked:

   ```
   cd /mnt/cdrom/
   ```

3. Run the install_server script. The syntax is:

   ```
   ./install_server [prefix]
   ```

   The prefix is optional, and it denotes the file system where you would like Tivoli Storage Manager to be installed. If no prefix is given, the default is /opt.

4. From the displayed menu, select a number for the language that you prefer to display the license agreement. Press Enter.

5. The install_server script displays the license agreement in the specified language and asks you to accept it. To accept the license agreement, press 1 followed by the Enter key.

   Note: Installation of the Tivoli Storage Manager server and Tivoli Storage Manager Storage Agent on the same machine is not supported.

6. Use the following procedure to install the server and device support.

   a. Log on as the root user.

   b. Insert the Tivoli Storage Manager CD into a CD drive.

      Note: The following discussion assumes that the CD is mounted on directory /mnt/cdrom. See the README file on the CD for changes to the installation procedure.

   c. After you accept the license agreement, a menu appears with all available RPM packages for the corresponding platform. At this point, you can either quit the install_server script by pressing q followed by the Enter key, or select packages from the menu to be installed.

      • If you exit the menu, you can install any of the RPM packages that correspond to your platform. The default install location for Tivoli Storage Manager packages is /opt. To install to a different location, use the --prefix option in `rpm`.

      • If you chose to use the menu, choosing the Basic(b) installation will install the server. If you are installing from a CD, the Basic(b) selection will also install the license enabler.

- If you decide to install the packages manually, outside of the install_script server, here is an example of how to install the packages:

  ```
  rpm -ivh <packagename>
  ```

  In this syntax, `packagename` is one or more package names (separated by spaces) listed in Table 3-4 through Table 3-6.

Note: The Tivoli Storage Manager server will install by default in the path /opt/tivoli/tsm/server/bin. You have the option of installing under a different file system.

For example, to install the server under /usr/tivoli/tsm/server/bin, use:

```
rpm -ivh --prefix /usr TIVsm-server-5.3.0-0.i386.rpm
```

The Web administrator, license, and Web help packages must be installed under the same file system as the TSM server.

Table 3-4   Minimum required install packages for IA32

Package	Components
TIVsm-server-5.3.0-0.i386.rpm	Server package for IA32
TIVsm-license-5.3.0-0.i386.rpm	License enabler for IA32

Table 3-5   Minimum required install packages for ppc64 pSeries

Package	Components
TIVsm-server-5.3.0-0.ppc64.rpm	Server package for ppc64
TIVsm-license-5.3.0-0.ppc64.rpm	License enabler for ppc64
TIVsm-tsmscsi-5.3.0-0-ppc64.rpm	Tivoli Storage Manager SCSI passthrough drivers and utilities

Table 3-6   Minimum required install packages for 64-bit zSeries

Package	Components
TIVsm-server-5.3.0-0.s390x.rpm	Server package for s/390x
TIVsm-license-5.3.0-0.s390x.rpm	License enabler for s/390x
TIVsm-tsmscsi-5.3.0-0-s390x.rpm	Tivoli Storage Manager SCSI passthrough drivers and utilities

7. When you install or upgrade the server to Tivoli Storage Manager V5.3, you must give your servers unique names. If all of your servers have the default name, SERVER1, you will be able to add only one of them to the Administration Center. Use the SET SERVERNAME command to specify the new server name. The maximum length of the name is 64 characters.

   To name the server ITSO_SERVER, use this command:

   ```
   set servername ITSO_SERVER.
   ```

   See the Administrator's Reference for more details about this command.

8. When the installation is finished, remove the CD from the drive.

Note: Messages and help will install to /opt/tivoli/tsm/server/bin/<locale>, where <locale> is one of the locales specified. The message catalogs will always be called dsmserv.cat and the help files will be called dsm<locale>.hlp.

The following tables list Tivoli Storage Manager messages and command line help. Use these packages to customize your installation after the basic installation is complete. These packages are architecture-independent. They can be installed on pSeries, xSeries®, and zSeries.

Table 3-7   Tivoli Storage Manager messages and command line help

Package	Components
TIVsm-cmdlinehelp.de_DE-5.3.0.0.noarch.rpm	German messages and command line help
TIVsm-cmdlinehelp.es_ES-5.3.0.0.noarch.rpm	Spanish messages and command line help
TIVsm-cmdlinehelp.de_FR-5.3.0.0.noarch.rpm	French messages and command line help
TIVsm-cmdlinehelp.it_IT-5.3.0.0.noarch.rpm	Italian messages and command line help
TIVsm-cmdlinehelp.ja_JP-5.3.0.0.noarch.rpm	Japanese messages and command line help
TIVsm-cmdlinehelp.ko_KR-5.3.0.0.noarch.rpm	Korean messages and command line help
TIVsm-cmdlinehelp.pt_BR-5.3.0.0.noarch.rpm	Brazilian Portuguese messages and command line help
TIVsm-cmdlinehelp.zh_TW-5.3.0.0.noarch.rpm	Traditional Chinese messages and help (big5 codepage)

Package	Components
TIVsm-cmdlinehelp.zh_TW.euctw-5.3.0.0.noarch.rpm	Traditional Chinese messages and help (euctw codepage)
TIVsm-cmdlinehelp.zh_CN-5.3.0.0.noarch.rpm	Simplified Chinese messages and help (eucCN codepage)
TIVsm-cmdlinehelp.zh_CN.gb18030-5.3.0.0.noarch.rpm	Simplified Chinese messages and help (gb18030 codepage)
TIVsm-cmdlinehelp.de_DE.utf8-5.3.0-0	German messages and command line help uft8 package
TIVsm-cmdlinehelp.es_ES.utf8-5.3.0-0	Spanish messages and command line help uft8 package
TIVsm-cmdlinehelp.fr_FR.utf8-5.3.0-0	French messages and command line help uft8 package
TIVsm-cmdlinehelp.it_IT.utf8-5.3.0-0	Italian messages and command line help uft8 package
TIVsm-cmdlinehelp.ja_JP.utf8-5.3.0-0	Japanese messages and command line help uft8 package
TIVsm-cmdlinehelp.ko_KR.utf8-5.3.0-0	Korean messages and command line help uft8 package
TIVsm-cmdlinehelp.pt_BR.utf8-5.3.0-0	Brazilian Portuguese messages and command line help uft8 package
TIVsm-cmdlinehelp.zh_TW.utf8-5.3.0-0	Traditional Chinese messages and help uft8 package
TIVsm-cmdlinehelp.zh_CN.utf8-5.3.0-0	Simplified Chinese messages uft8 package
TIVsm-cmdlinehelp.en_US.utf8-5.3.0-0	United States English uft8 package

Compatibility with other versions of Tivoli Storage Manager

To ensure compatibility between the server and the storage agent, check the Tivoli Web site at:

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

This site has maintenance level requirements and the latest Fix Pack level for download. The Tivoli Storage Manager servers for the z/OS, AIX, HP-UX, Linux, Sun Solaris, and Windows operating systems support LAN-free data movement.

Starting with Tivoli Storage Manager Version 5.2, the server and storage agent are no longer backward-compatible with prior releases of the server and storage agent. If you have implemented library sharing, server-to-server, enterprise configuration, or LAN-free, it is important to note that all Tivoli Storage Manager servers and storage agents must be upgraded to a compatible and supported level of Version 5.2 or later code before invoking any Version 5.2 library sharing, server-to-server, or LAN-free communication.

When upgrading multiple servers participating in library sharing to Version 5.3, the servers acting as library manager must be upgraded first to maintain compatibility among the servers acting as library clients or storage agents. When upgrading multiple servers participating in server-to-server to Version 5.3, all servers must be upgraded at the same time.

Usually, Tivoli Storage Manager server supports storage agents and library clients at the same version, release, and modification level down to the modification level minus two. When the product release changes, Tivoli Storage Manager normally supports the last two maintenance releases of the previous release. For example, a Tivoli Storage Manager V5.3.0 server supports storage agents and library clients at the Version 5.3.0, Version 5.2.4, and Version 5.2.3 levels.

> **Note:** An exception to this rule is where a fix or a product enhancement requires concurrent code changes to server, storage agent, and library client.

Version 5.3 servers acting as a library manager are compatible with Version 5.2 and 5.1 servers acting as a library client. However, Version 5.3 servers acting as library clients remain incompatible with Version 5.2 and Version 5.1 servers acting as library managers. When multiple servers participating in library sharing are upgraded to Version 5.3, the servers acting as library managers must be upgraded first to maintain compatibility among the servers.

3.4.7 Installation verification

It is possible to verify server installation by issuing the following QUERY commands from the server console. After being installed, the server runs in the background, so you must start the server in the foreground or use an administrative client to issue the commands.

- ► QUERY STATUS
- ► QUERY STGPOOL (shows the stgpools automatically set up by the installation)
- ► QUERY DB (shows a basic database set up by the installation)
- ► QUERY LOG (shows a basic log set up by the installation)

Backing up client data from a backup-archive client can be done to verify the complete Tivoli Storage Manager installation. The client must have been installed from the UNIX client CD.

> **Note:** Do not select files to back up that exceed your storage pool capacity. An 8 MB backup storage pool, an 8 MB archive storage pool, and an 8 MB space management pool were allocated at installation.

The server must be running before you can use the administrative and backup-archive clients. See "Stopping and Starting the Server" in the Administrator's Guide for the procedure for starting the server.

To configure the backup-archive client, use the following steps:

1. Copy the sample client system options file (dsm.sys.smp) and the sample client user options file (dsm.opt.smp). The sample files are in /usr/tivoli/tsm/client/ba/bin/.

2. Edit the options files to include the options listed below:

   – In dsm.opt:

     ```
     servername server_name
     ```

   – In *dsm.sys*:

     ```
     servername server_name
     commmethod tcpip
     tcpport port_address
     tcpserveraddress server_address
     nodename client
     ```

> **Note:** The server names specified in dsm.opt and dsm.sys must match.

3. Start the backup-archive client graphical user interface by entering the `dsm` command.

   The default ID and password for the backup-archive client are both `client`.

To back up several files, perform the steps listed below.

1. Click **Backup**. The Backup window displays.

   You can select files from a directory tree, or search a drive or directory to select files:

   – To select files from a directory tree, expand the tree and click on the files you want to back up.

- – To search for files:
    - i. Click the Find icon on the tool bar.
    - ii. The Find Files (Backup) window opens. Enter your search criteria in the Find Files (Backup) window and click Search.
    - iii. The Matching Files (Backup) window displays. Click on the selection boxes next to the files you want to back up.
    - iv. Close the Matching Files (Backup) window by clicking backup-archive icon on the menu bar and selecting **Close**.
2. Click **Always Backup** from the Type of Backup list.
3. Click **Backup**. The Backup Status window displays the backup processing status. A message displays when the backup has completed successfully.

Starting and stopping the server

To start the server from the /usr/tivoli/tsm/server/bin directory, enter `nohup ./dsmserv` (or use `nohup ./dsmserv &` to run in the background).

You can stop the server without warning if an unexpected problem requires you to return control to the operating system. To avoid losing administrative and client node connections, stop the server only after current sessions have completed or been canceled.

To stop the server, issue the `halt` command from the Tivoli Storage Manager command prompt.

Registering licenses

You should immediately register any Tivoli Storage Manager licensed functions that you purchase. Use the REGISTER LICENSE command to do this, as documented in the Administrators Reference and the Administrators Guide. Also, be sure to see the Tivoli Storage Manager readme file for the latest information regarding enrollment certificate files.

3.5 Installing and configuring ISC

This section provides the step-by-step procedure for installing Integrated Solution Console (ISC) and Administration Center.

By the end of this section, you should be able to:

► Install Integrated Solution Console
► Install and configure Admin center

3.5.1 Overview of Integrated Solution Console (ISC) and Administration Center

The administrative Web interface is replaced in this release with the Administration Center. The Administration Center is a Web-based interface that can be used to centrally configure and manage Tivoli Storage Manager V5.3 servers. The Administration Center can only be used to administer Version 5.3 or later servers. The old administrative Web interface cannot be used with Version 5.3 or later servers.

The Administration Center is installed as an IBM Integrated Solutions Console (ISC) component. The Integrated Solutions Console enables you to install components provided by multiple IBM applications and access them from a single interface.

3.5.2 Installing Integrated Solution Console

1. Insert the CD named *Tivoli Storage Manager Administration Center* into the CD drive and double-click the setupISC.exe icon. This opens the window shown in Figure 3-31.
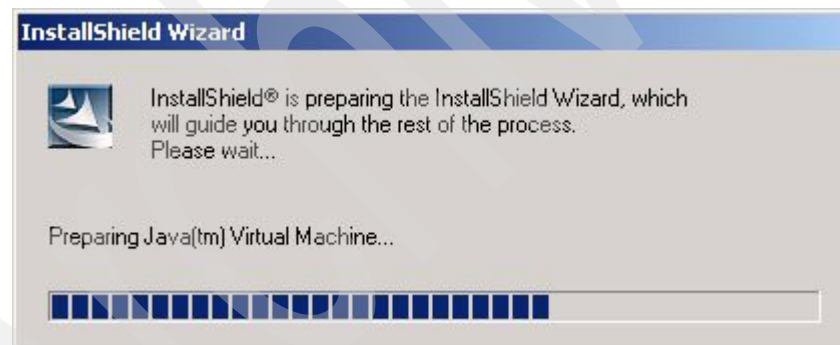
Figure 3-31   Java install

2. After the installation preparation wizard completes, you will see a window similar to Figure 3-32. Click **Next**.
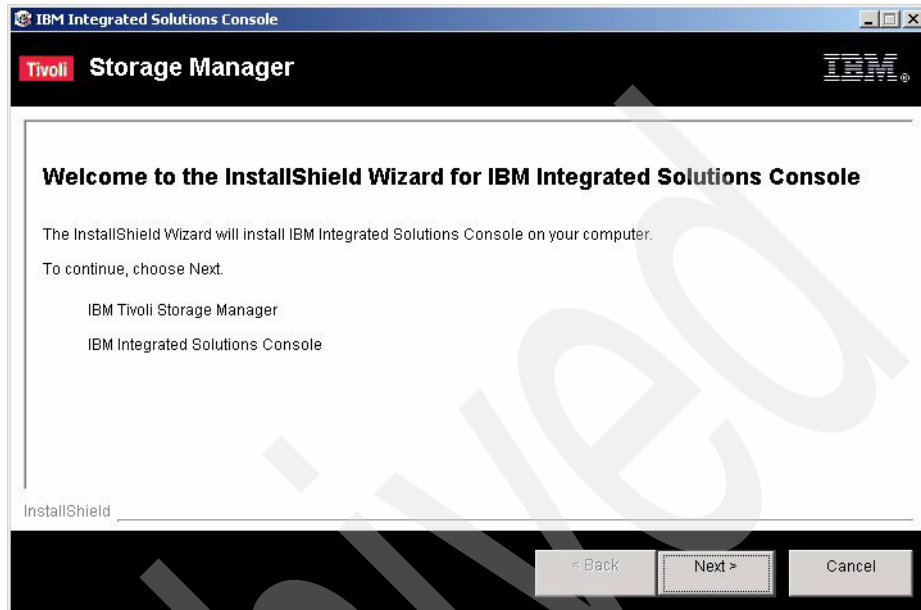
Figure 3-32   Welcome window

3. In the window shown in Figure 3-33, read the information and click **Next**.
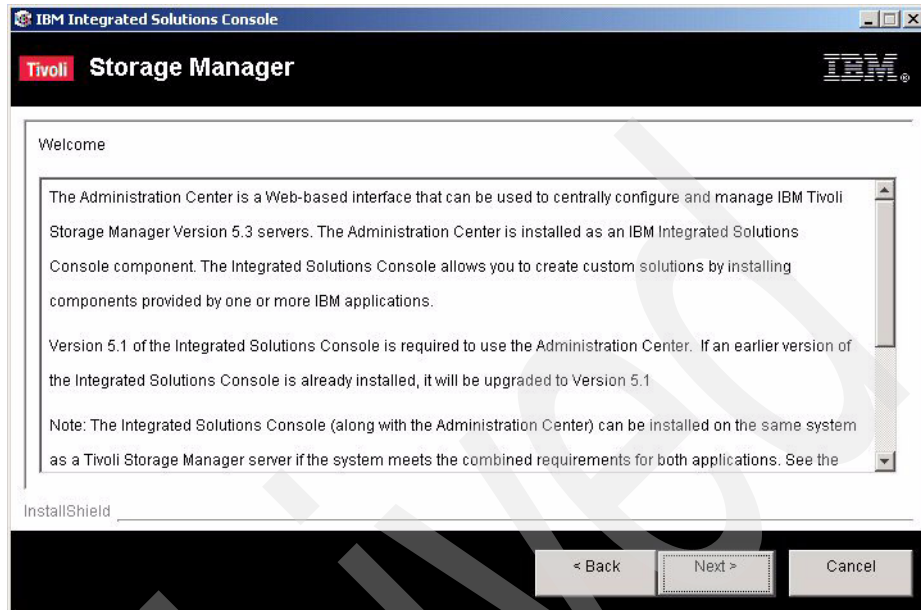
Figure 3-33   Second welcome window

4. On the License Agreement window, read the License carefully, accept the agreement, and click **Next**.
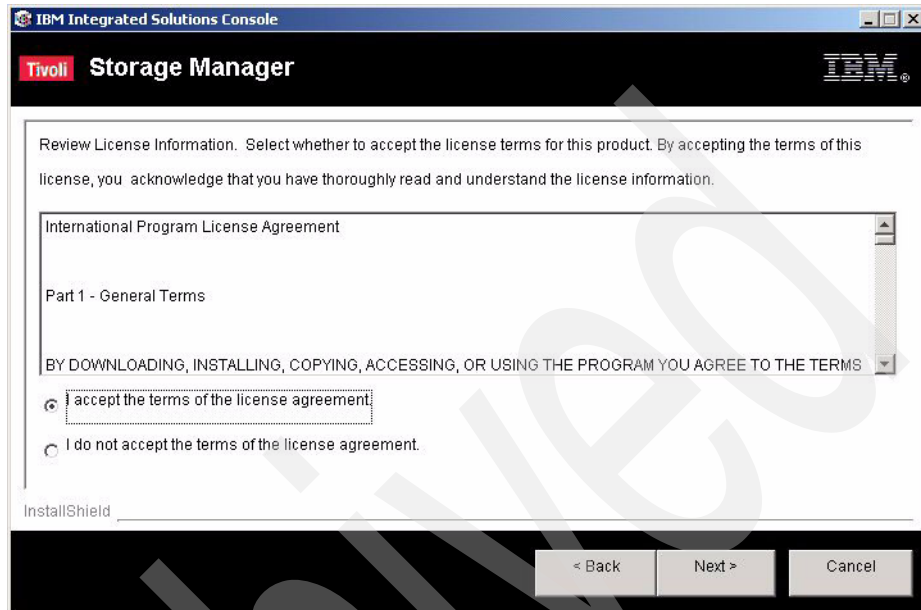
Figure 3-34   License Information window

5. Select the location of your installation file using **Browse**. Click **Next**.
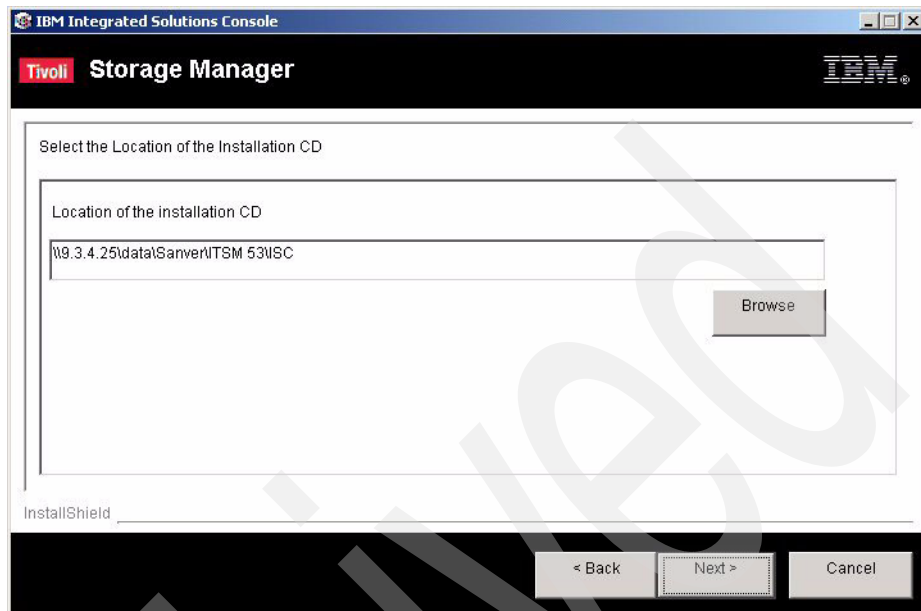
Figure 3-35   Installation files selection

6. Select the destination drive and folder, and click **Next**.
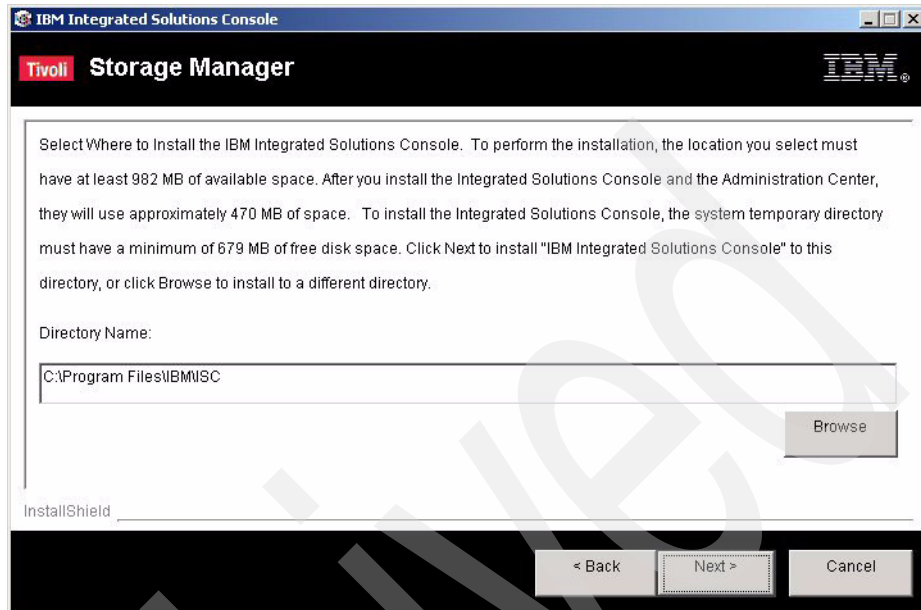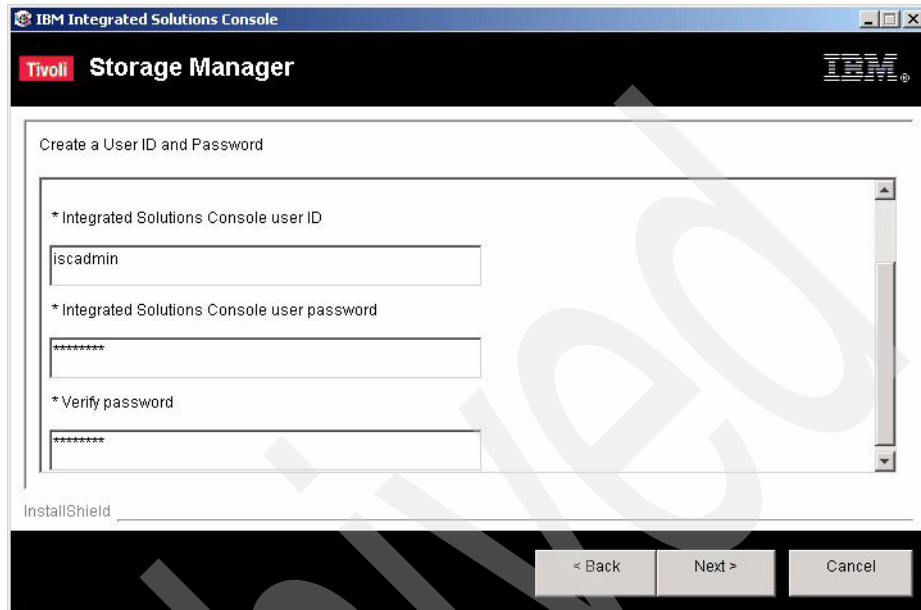
Figure 3-36   Destination selection

7. Enter the user name you want to create for ISC admin console, enter and
    confirm a password. Click **Next**.

Figure 3-37   ISC Admin User ID creation

8. Enter port numbers for the Web administration and Secure Web administration ports, and click **Next**.

Figure 3-38   Selecting the default port for ISC

9. A review window appears to confirm your selections. Click **Next**.
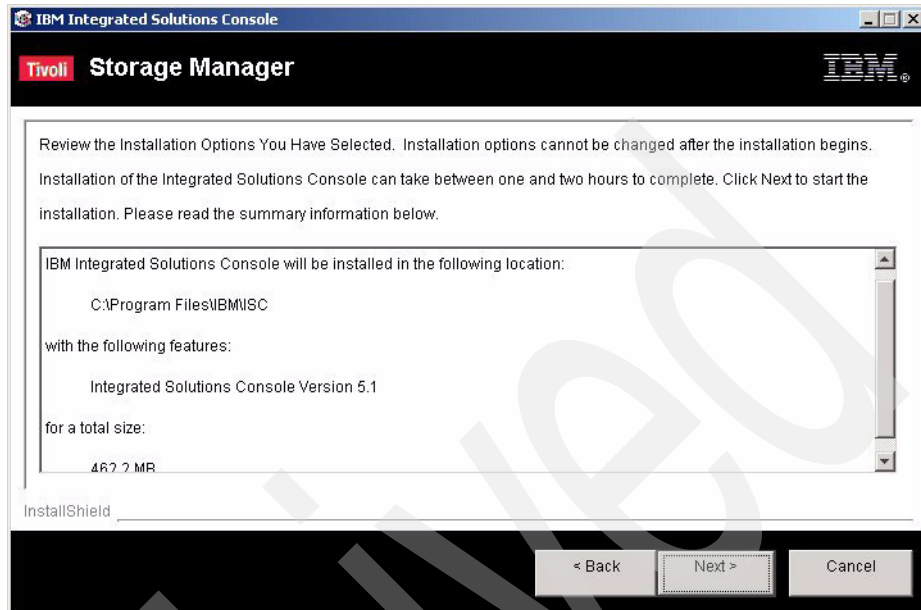
Figure 3-39   Confirming selections

10. The installation of Integrated Solution Console begins. This takes at least one to two hours to finish, depending on the memory and processing speed of the server.
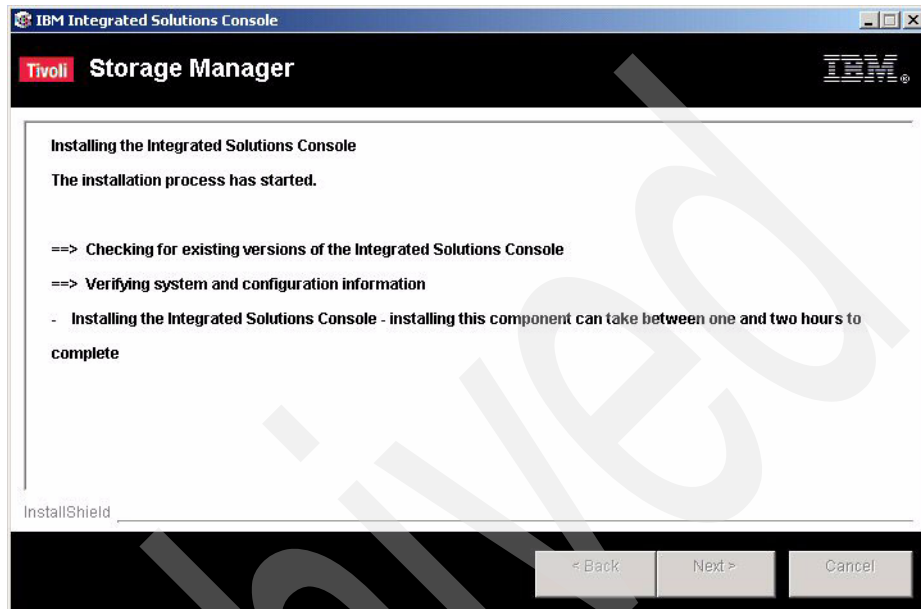
Figure 3-40   Installation progress

11.A completion window appears when installation is complete. Click **Next**.
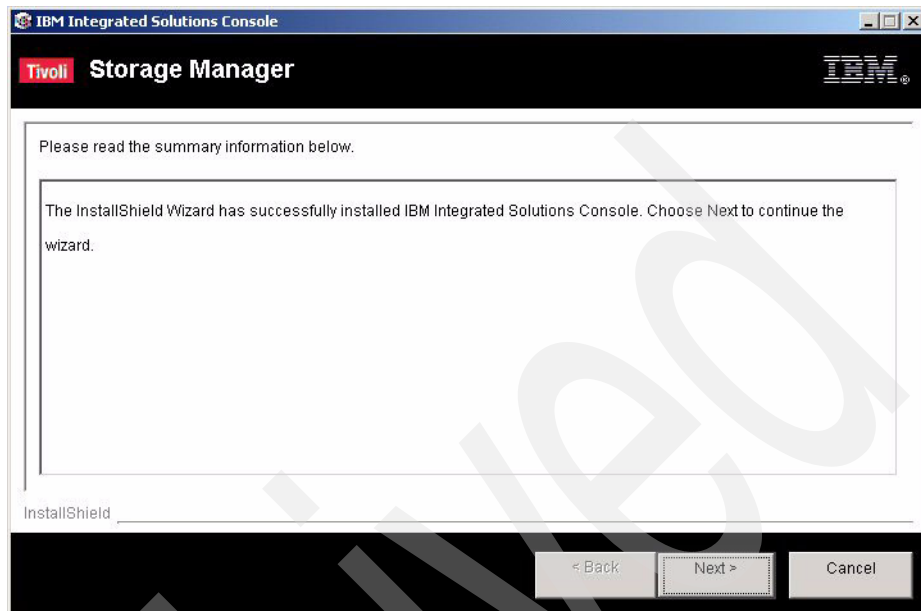
Figure 3-41   Installation completed message

12.Click **Finish**.
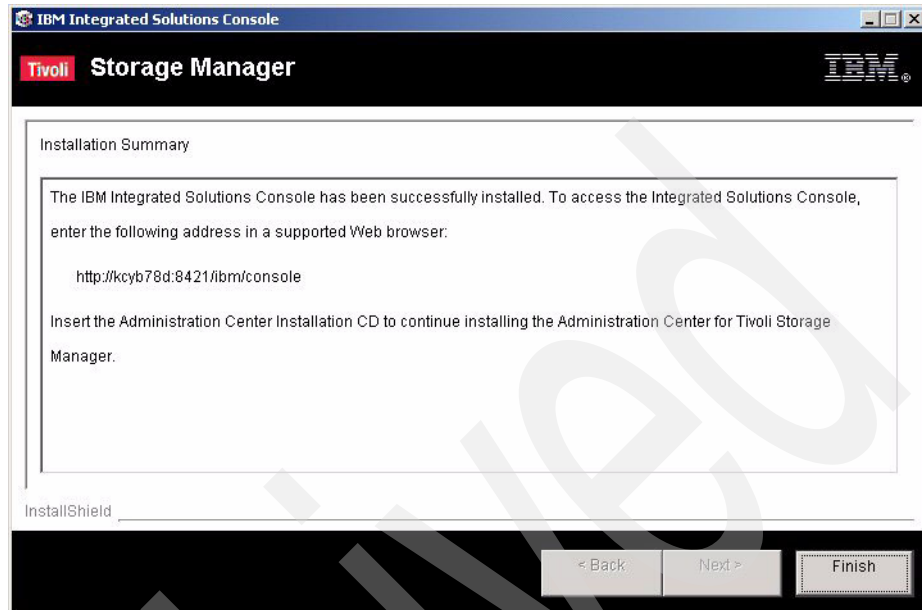
Figure 3-42   Installation Summary

> **Attention:** After installation completes, reboot the server before starting Administration Center installation. Otherwise the Administration Center installation will fail to install.

3.5.3 Installing Administration Center

This section provides the step-by-step method of installing Administration Center on the Windows platform. Before installing the Administration Center, make sure that you install ISC and restart the server.

Installation of Administration Center is similar to the ISC install. It also begins with the Java installation, as shown in Figure 3-43 on page 132.
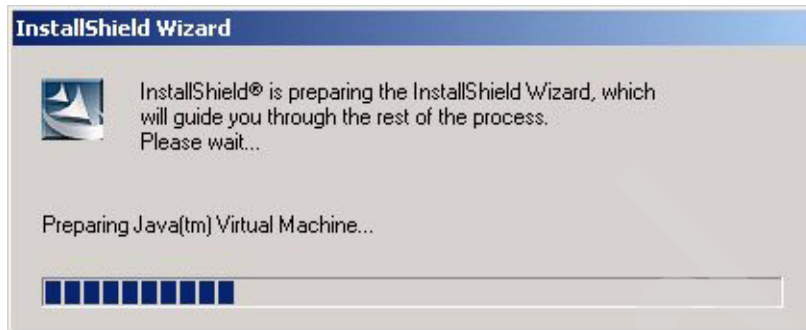
Figure 3-43   Java Install

1. The InstallShield Welcome window is displayed. Click **Next** to continue the installation.
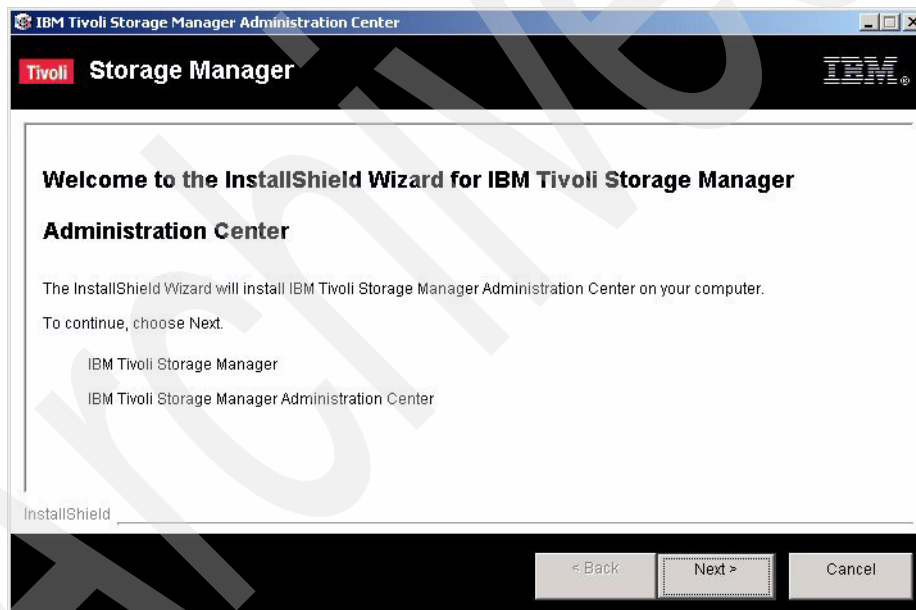
Figure 3-44   Welcome to InstallShield wizard for Administration Center

2. The detailed Administration Center welcome window appears. Click **Next**.
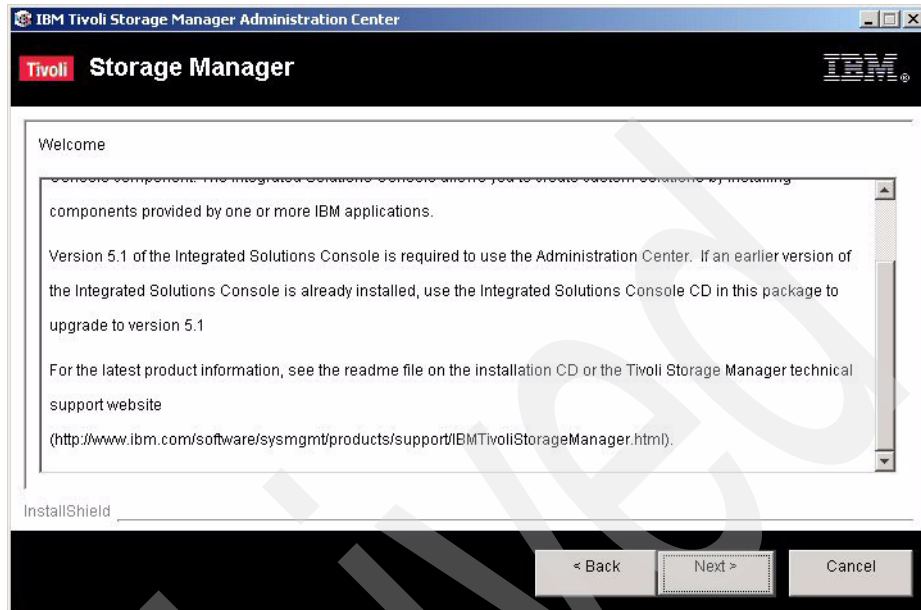
Figure 3-45 Second welcome screen with details

3. Accept the International License Agreement and click **Next** to continue.
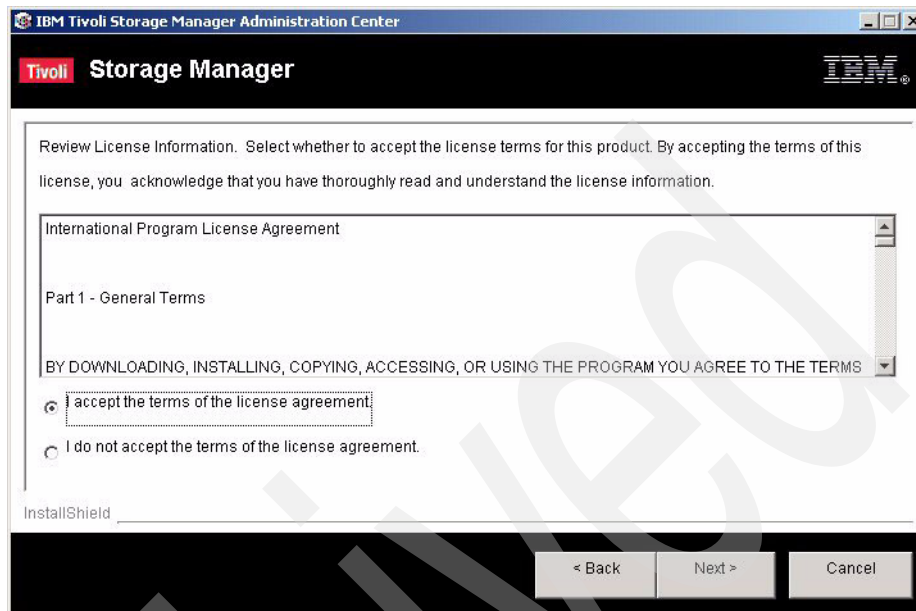
Figure 3-46   International Program License Agreement window

4. The next window lists the installation path and Web administration port you provided during the ISC installation process. If the information is correct, click **Next**.
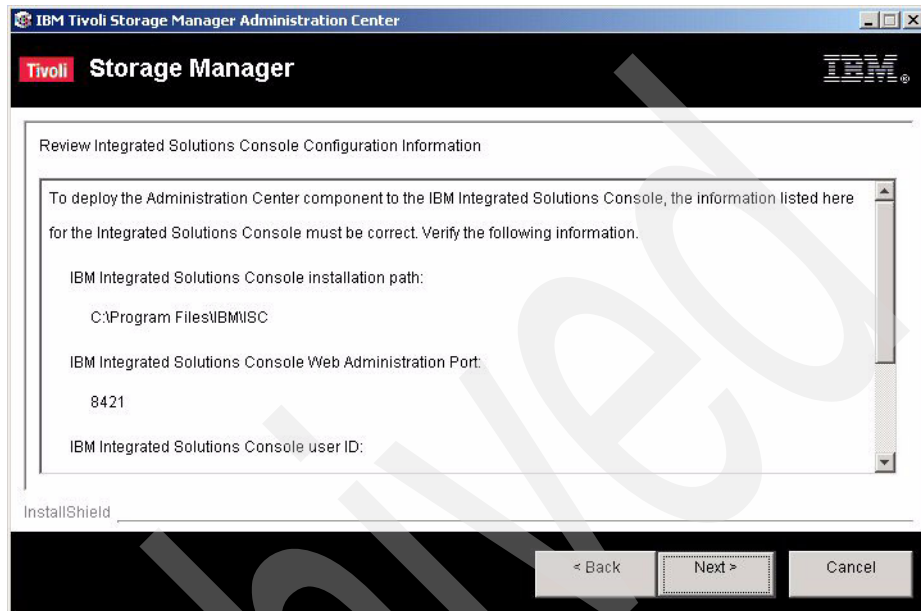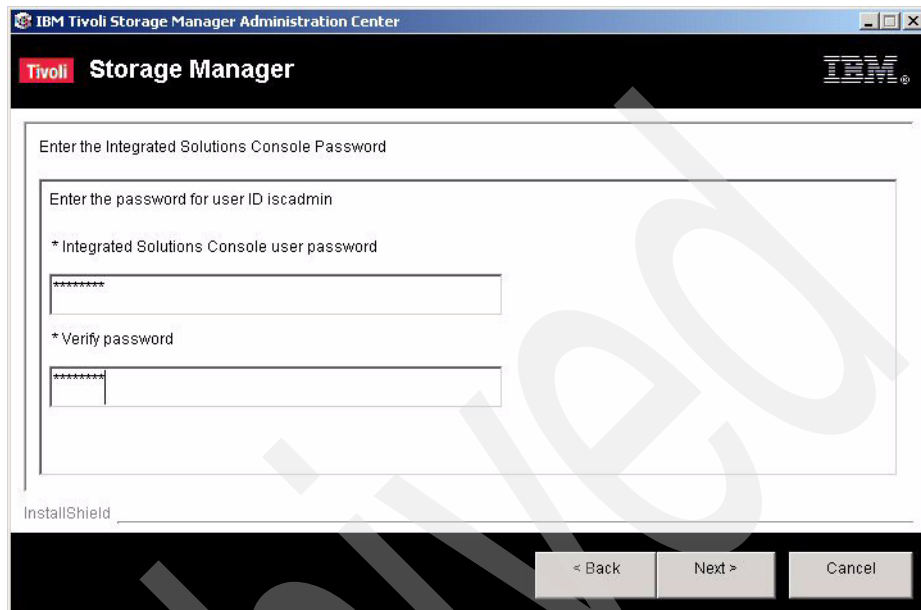
Figure 3-47   Review install path admin port and user ID

5. The ISC password is the password assigned during the ISC install. Enter and verify it, and click **Next**.

Figure 3-48   ISC Password

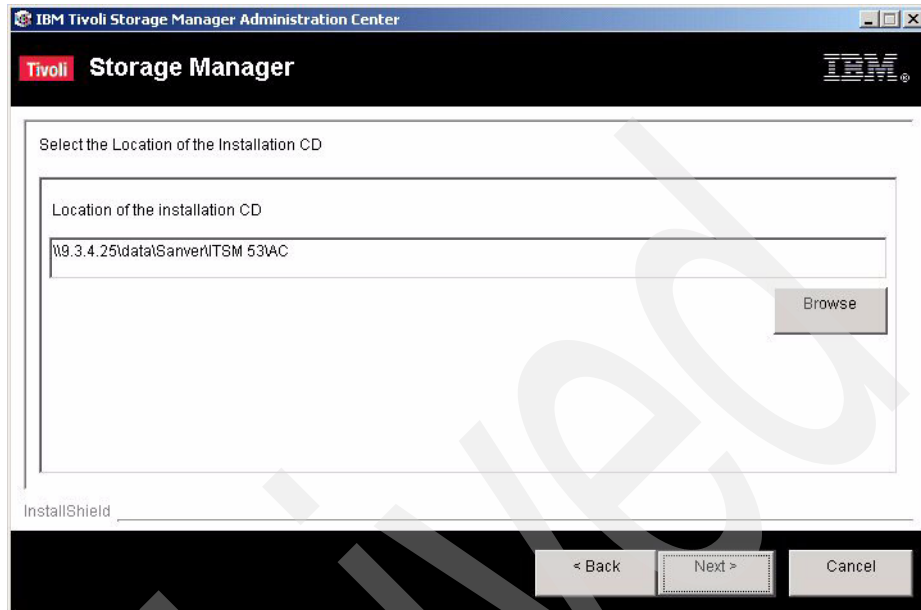6. Be sure the correct location of the installation CD is listed. Click **Next**.

Figure 3-49   Select location of the installation CD

7. Review your chosen installation options and click **Next**.

> **Important:** When the final review window has been displayed, clicking
> **Next** starts the installation, which *cannot* be stopped when it is underway.
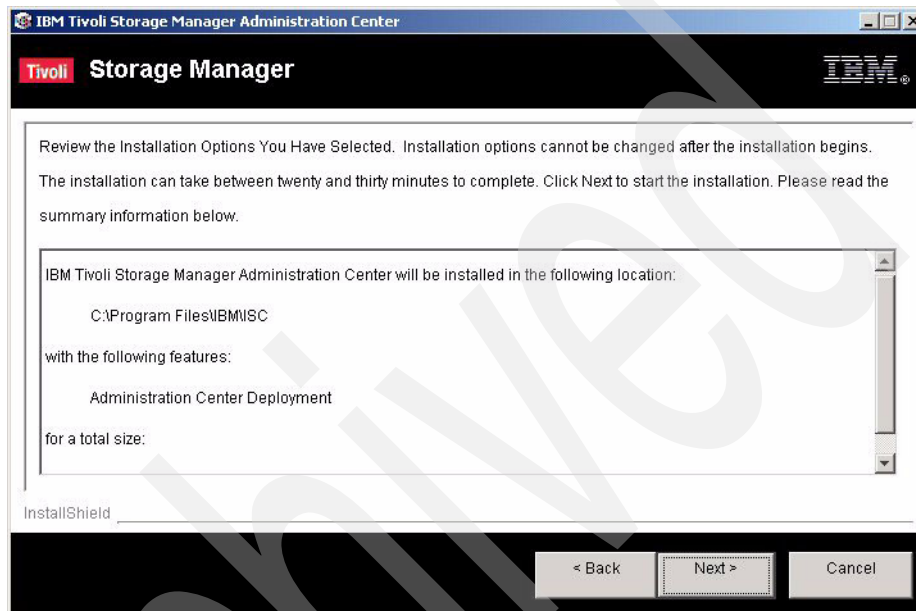

Figure 3-50   Final review of selected installation option

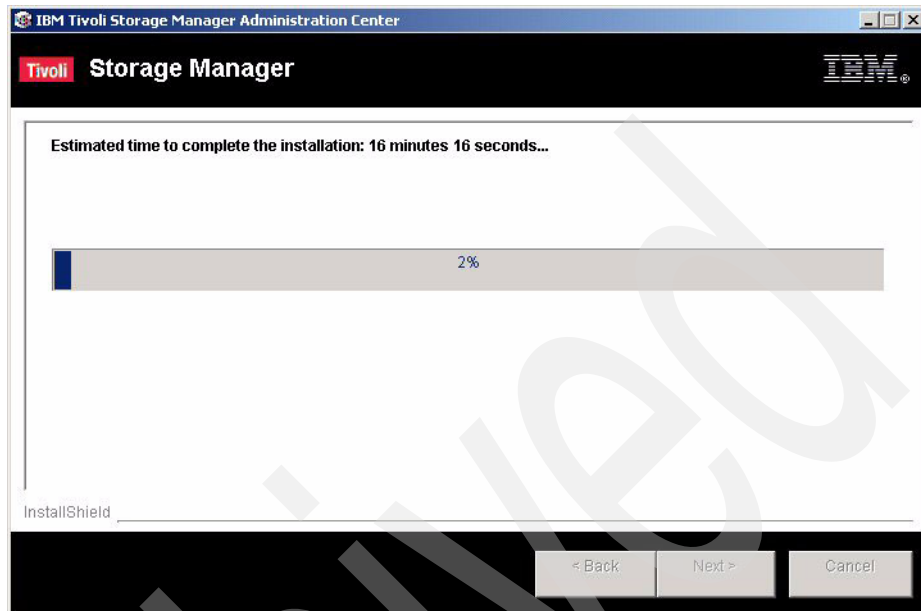8. Figure 3-51 shows the installation progress.

Figure 3-51   Installation progress window

9. When the installation has completed successfully (Figure 3-52), click **Next** to view the installation summary (Figure 3-53).
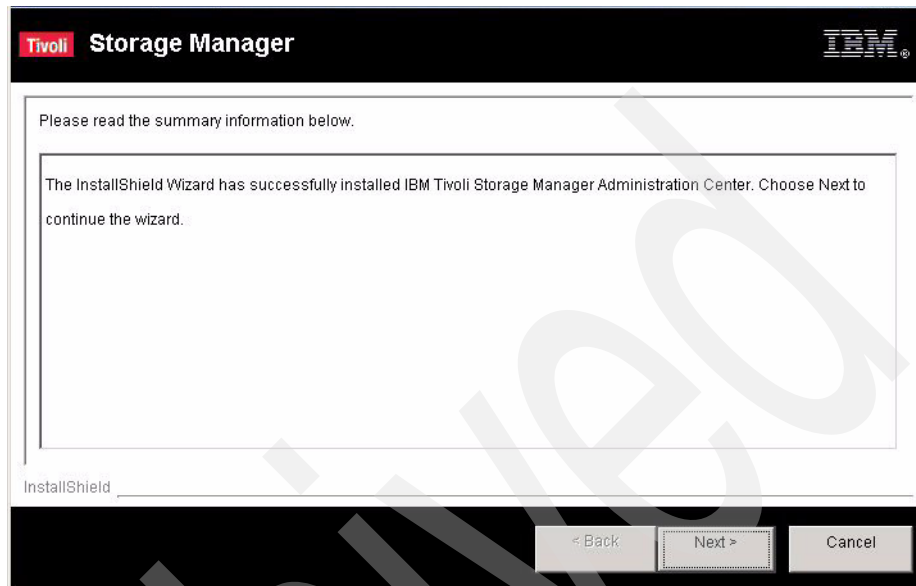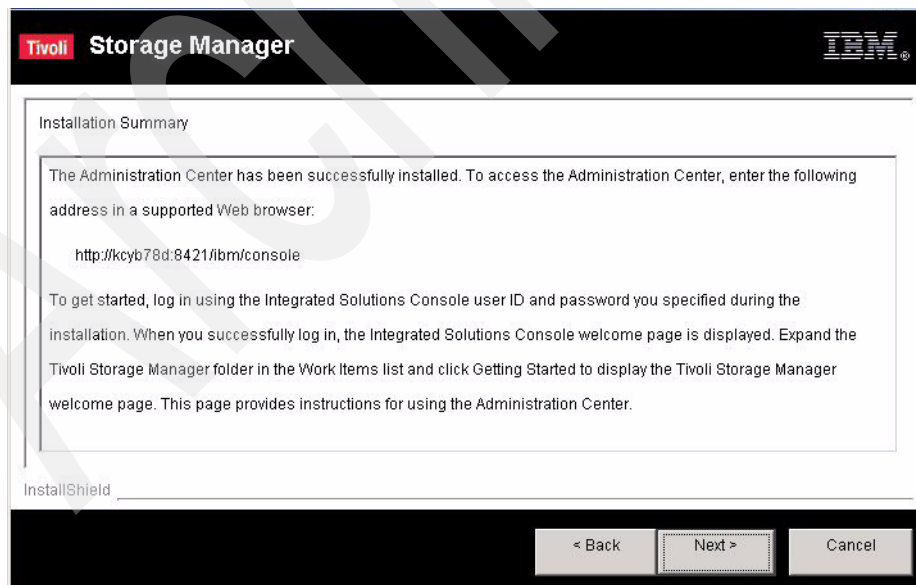

Figure 3-52   Installation successful

Figure 3-53   Installation summary

As with the ISC installation, the ISC is automatically launched, as shown in Figure 3-24, when you click **Next**.
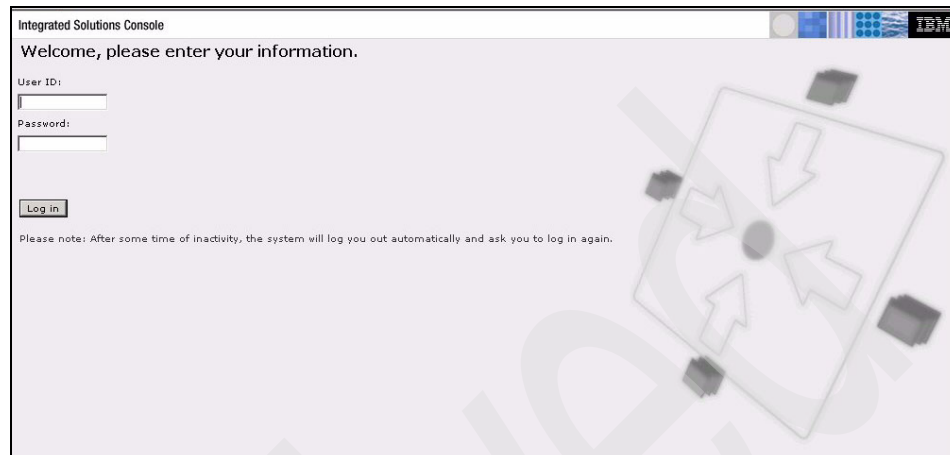

Figure 3-54   ISC logon automatically appears after the installation

This completes the Administration Center installation. To read more about Integrated Solution Console and Administration Center, refer to the *IBM Tivoli Storage Manager v5.3 Technical Guide*, SG24-6638.

3.5.4 Configuring the Administration Center

After ISC and Administration Center are installed, Tivoli Storage Manager servers should be added to the portal. Only Tivoli Storage Manager V5.3 and later releases can be added.

The following sections explain the configuration steps for the Administration Center.

Adding a server to Administration Center

Follow these steps to add a server:

1. Open a browser and navigate to `http://host:8421/ibm/console`.

2. Enter the Console user ID and password and click **Login**.

3. In the left menu tree, expand **Tivoli Storage Manager** → **Storage Devices**.

4. From the Servers window, select **Action** → **Add Server Connection** → **Go**.

5. Enter the necessary information (Figure 3-55):

   a. If this is the first installation, Admin name and password is `admin`.

   b. During installation, the admin name ADMIN_CENTER was created to monitor your Tivoli Storage Manager server. To use it, you have to unlock it by selecting the check box for **Unlock the ADMIN_CENTER Administrator**. Click **OK**.
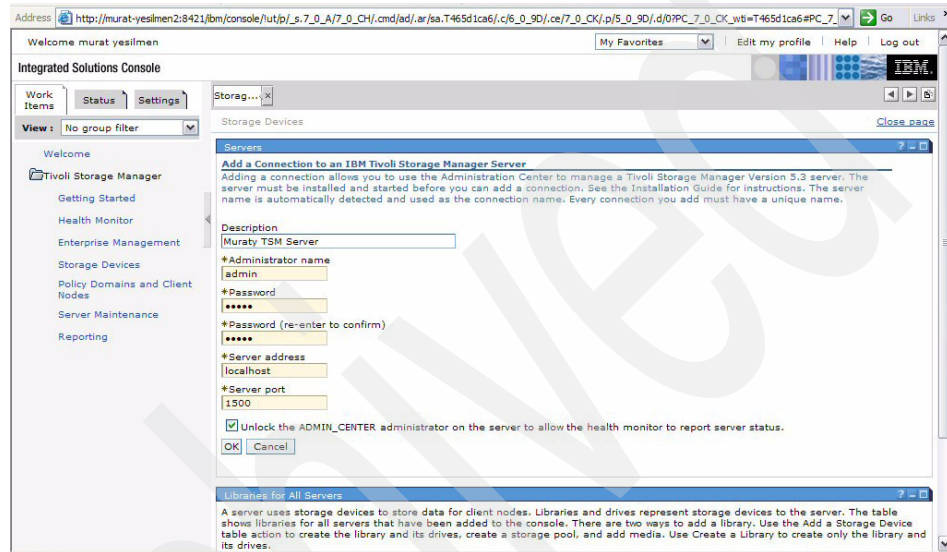

Figure 3-55   Adding IBM Tivoli Storage Manager server to Admin Center

6. The health monitor default password is `ADMIN_CENTER`. Change the password and, optionally, the refresh time for the health monitor (default is 10 minutes).

Your Tivoli Storage Manager server is now ready for the configuration.

Checking the health of Tivoli Storage Manager server

Follow these steps:

1. In the left menu tree, click **Health Monitor**.

2. The Health column to the right of the panel shows various messages:

   a. Normal (green): The server is running; the health monitor found no problems.

   b. Unknown (blue): The server could not be contacted. Reasons include:

      • The server is not currently running.

      • Network problems prevent communications with the server.

      • The administrator name that the health monitor uses, ADMIN_CENTER, is locked or does not exist on the server.

      • There were internal errors in the health monitor.

      Click the server name for more information about possible causes.

   c. Warning or Needs Attention (yellow): The health monitor detected conditions that might develop into significant problems (Figure 3-56). You should take preventive actions for the server's database, storage devices, or both. Click the server name for details.
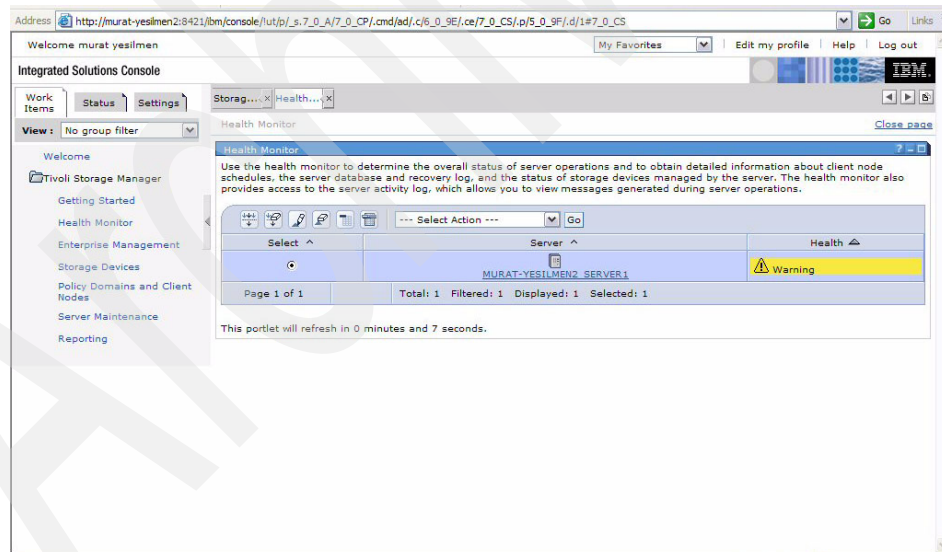

Figure 3-56   Health monitor panel

d. Critical or Error (red): The health monitor detected significant problems in the server's database, storage devices, or both. The problems prevent the server from operating normally, as shown in Figure 3-57.

The database or recovery log is out of space, or a library is not functioning. Click the server name for details.
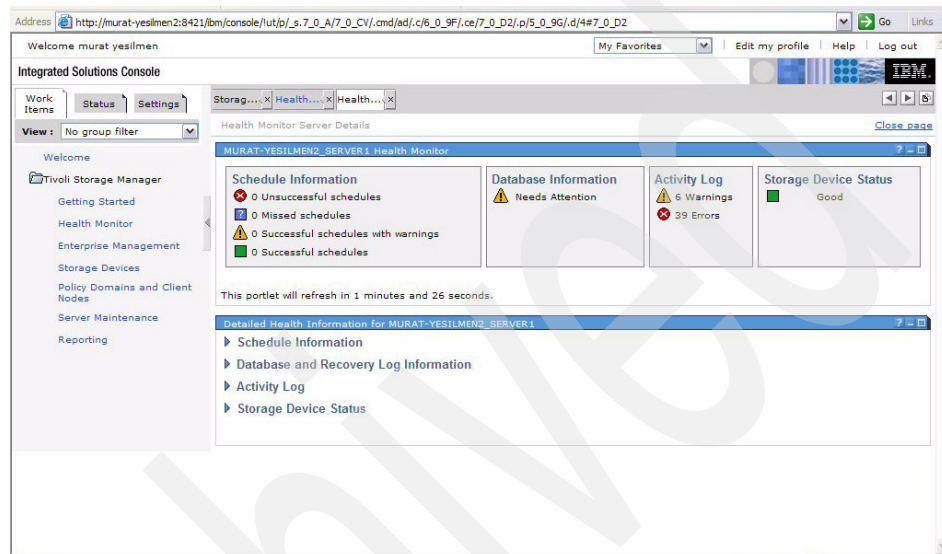
Figure 3-57   Detailed health information

3. This window shows the overall status of your Tivoli Storage Manager server. Identify the problem area and select the appropriate Detailed Report.

The Database Information section shows a "Needs Attention" flag. Choose the **Database and Recovery Log Information** report.

The Detailed Health report for the Database and Recovery log shows that the Cache Hit Ratio is less than its ideal value. Change the bufferpoolsize and wait for the next refresh.

When the Health Monitor refreshes its information, you will see that the status of Tivoli Storage Manager server is now good (Figure 3-58).
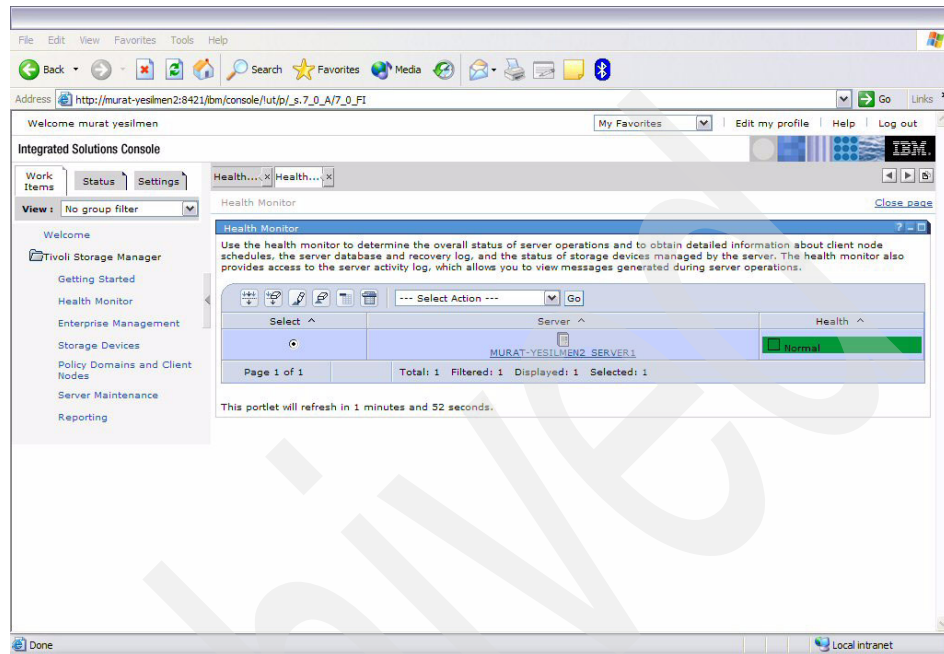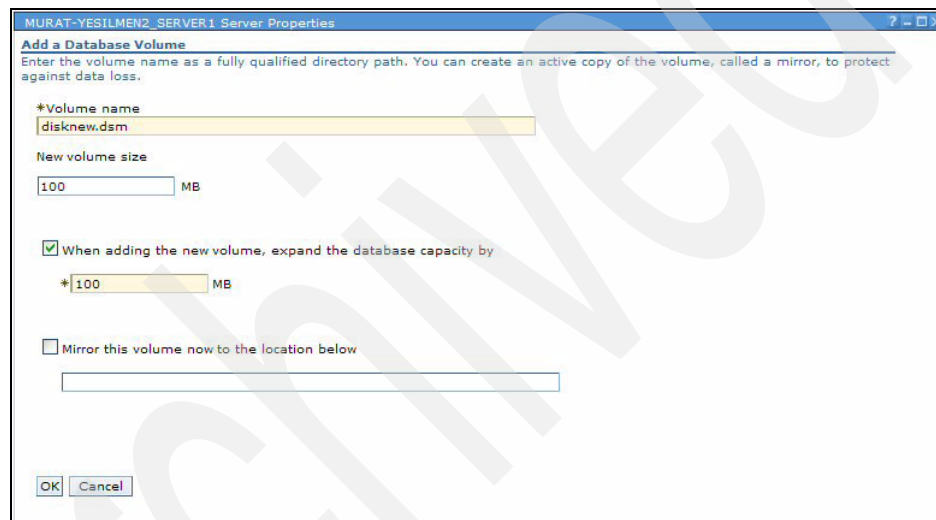

Figure 3-58   Health monitor shows the server health

Adding database/recovery volumes

These are the steps to follow:

1. Select **Storage Devices**.

2. Click the server name to get the Server Properties window.

3. Select **Database and Log**.

4. Select the **Add Volume** task from **Select Action** on top of the Database Section and click **Go**.

5. Fill in the Database Volume name and capacity (Figure 3-58 on page 145), and click **OK**.

Figure 3-59   Adding database volume

With this release, it is possible to extend the database while creating it.

> **Note:** To create the volume using other than the system default path, fill in the Volume Name field with the fully qualified directory path name.

3.5.5 Operational reporting

In this section will briefly discuss the reporting tool called Operational reporting.

Introduction

The Tivoli Storage Manager Operational Reporting feature automates some of the monitoring tasks you typically perform manually. By generating reports and monitors, Operational Reporting notifies you if a server requires attention.

Operational reports can be scheduled to run daily and are generated even if there are no problems. Operational monitors are special types of reports that can be scheduled to run hourly. The monitors send a notification only if there are issues. Operational Reporting does not maintain a separate database of information and is not a trending tool.

Operational Reporting is a free tool that can be used with any TSM server platform. It runs on Windows platforms, but can report on any TSM server.

This tool is part of the Tivoli Storage Manager for Windows server and is also available as a stand-alone package for a Windows server at no charge.

For information about installing the stand-alone package, see "Installing the IBM Tivoli Storage Manager Operational Reporting Stand-alone Package" in the *IBM Tivoli Storage Manager for Windows Administrators Guide*.

Functions

Operational Reporting is administered through the Microsoft Management Console on a Windows machine. All platforms of Tivoli Storage Manager servers, Version 5.1.8 or Version 5.2.2 and later, are supported. Operational Reporting runs as a service and supports multiple Tivoli Storage Manager servers running on a single machine.

An operational report consists of the following parts: a standard report, a customized summary, and optional extensions that you can create. You can select which sections to include in the report. The Operational Reporting installation package contains two default custom summary templates: one for a report and one for a monitor.

Default e-mail messages notify you if the server is running smoothly, or if there are issues such as failed or missed schedules. You can also link to a Web summary page to check operational reports about your server. An operational monitor will notify you either through e-mail or by sending an instant message to your Windows desktop. Operational Reporting can write data to a file that can be read by a Tivoli Enterprise™ Console log file adapter. The log file adapter reads the information and forwards it to the Tivoli Enterprise Console®.

For more information about Operational Reporting, refer to *IBM Tivoli Storage Manager V5.3 Technical Guide*, SG24-6638*.*

3.6 Summary

In summary, this chapter discussed the installation and configuration of the Tivoli Storage Manager and its components.

4

Deployment scenarios

This chapter provides basic deployment scenario information that describes different customer environments and possible recommendations for these environments.

This chapter covers the following scenarios and tasks:

- ► Server farm and small data center
- ► Medium-sized data center
- ► Large data center
- ► Application deployment
- ► Content management
- ► Workstation, desktop, and laptop deployment
- ► Sample case study

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4.1 Deployment scenarios

This section offers scenarios and deployment recommendations for various customer environments. We also discuss a customer case study.

4.1.1 Server farm and small data center

Typically, the management information systems assets of a medium-sized enterprise, consolidated in a single location. Examples include corporations below the Fortune 1000 level, medium to large hospitals and universities, and large public school districts. Could also include a distributed data center for a much larger enterprise.

Usage

Tivoli Storage Manager is used for backup and recovery of servers, applications, and associated data and storage.

Typical deployment

Usually first-time migration from separate ad hoc backups to central backup services. Occasionally competitive replacement.

Typical issues

► Customer expectation of "black box" solution requiring no administration
► Poor server box and tape library product selection by marketers
► No thought to DR planning
► No customer education

4.1.2 Medium-sized data center

Typically, the main data center for a large enterprise. Examples include Fortune 1000 corporations, very large hospitals and universities, and government agencies. Could also include a distributed data center for a much larger enterprise. Large iSeries or zSeries mainframes may be present. See Figure 4-1 on page 151.

Figure 4-1   Medium-sized data center

Usage

Tivoli Storage Manager is used for backup and recovery of servers, applications, and associated data and storage.

Typical deployment

Occasionally first-time migration from separate ad hoc backups to central backup services. Frequently competitive replacement.

Typical issues

- ► Poor server box and tape library product selection by marketers
- ► Disruption to existing DR process and rituals
- ► Inadequate customer education
- ► Conflicts between retention policies and service level agreements
- ► No effort at design of TSM infrastructure for performance and capacity
- ► No plans to manage or monitor Tivoli Storage Manager infrastructure

4.1.3 Large data center

Typically a major data center for a very large enterprise. These are usually found at the very largest corporations and government agencies. Multiple large iSeries or zSeries (or both) mainframes are almost certain to be present.
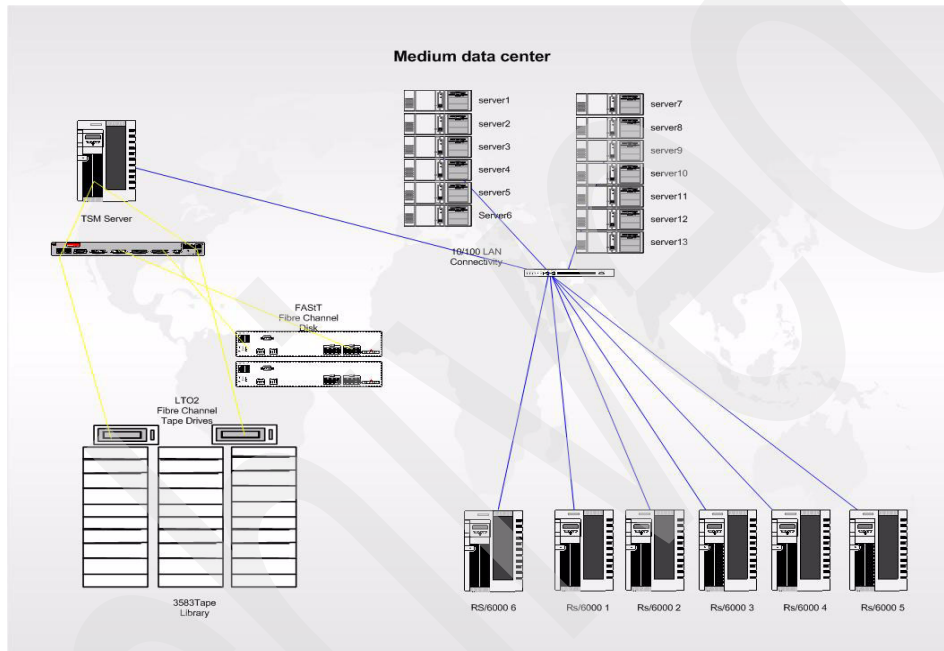
Usage

Tivoli Storage Manager is used for backup and recovery of servers, applications, and associated data and storage.

Typical deployment

Usually focused on some kind of storage migration. Occasionally competitive replacement.

Typical issues

► No effort at design of Tivoli Storage Manager infrastructure for performance and capacity

► No thought to integrating Tivoli Storage Manager infrastructure with monitoring and reporting tools and systems management processes

4.1.4 Application deployment

The deployment of a new and important application may typically include its own backup and recovery infrastructure. Even if a customer is already using Tivoli Storage Manager for existing applications and data, a special Tivoli Storage Manager infrastructure with different design characteristics may be implemented as part of such an important new application.

Usage

Tivoli Storage Manager is used for backup and recovery of servers, applications, and associated storage.

Typical deployment

Focuses on integration with application and middleware. Usually incorporates complex storage technologies. Frequently involves complex recovery testing.

Typical issues

► No effort at design of Tivoli Storage Manager infrastructure for performance and capacity

► No thought to integrating Tivoli Storage Manager infrastructure with monitoring and reporting tools and systems management processes.

4.1.5 Content management

Some content management applications include Tivoli Storage Manager "under the covers" as an object storage and retrieval subsystem. Deploying these content management solutions includes deployment of TSM. However, the design, configuration, and operation of the TSM subsystem can have important differences from how TSM is used for conventional backup and recovery.

Typical deployment

Focuses on integration with content management application and middleware. Usually incorporates complex storage technologies.

Typical issue

Lack of overlapping technical expertise in experts working with various subsystems of content management solution.

4.1.6 Workstation, desktop, and laptop deployment

The overwhelming number of Tivoli Storage Manager installations are used for backup and recovery of servers and server-associated data. However, organizations with medium to large end-user populations may deploy Tivoli Storage Manager for backup and recovery of data distributed on end users' workstations.

Typical deployment

Focuses on integration with software distribution tools and workstation deployment process.

Typical issues

► No available information about technical conflicts between Tivoli Storage Manager installation and software management

► No effort at design of Tivoli Storage Manager infrastructure for performance and capacity

► No thought to integrating Tivoli Storage Manager infrastructure with monitoring and reporting tools and systems management processes.

4.1.7 Typical characteristics of deployment scenarios

Every implementation has unique characteristics, but the characteristics listed in Table 4-1 are typically found in these scenarios.

Table 4-1   Deployment scenarios

	Server farm	Medium center	Large center	Application deployment	Content management	Workstations
Characteristics						
Server platform	Windows or Linux	Windows, Linux or UNIX	UNIX or zSeries	UNIX or Linux	UNIX or Linux	Windows, Linux, or UNIX
Storage connection	SCSI	iSCSI or SAN	SAN	iSCSI or SAN	SAN	Depends on size
Disk pool	RAID	FAStT	IBM ESS or EMC	IBM FAStT or ESS or EMC	IBM ESS or EMC	Depends on size
Media	DLT or LTO	LTO	LTO or 3590	LTO or 3590	LTO or 3590	Depends on size
LAN	Shared Ethernet	Shared 1 GBps Ethernet or Dedicated Ethernet	Shared 1 GBps Ethernet or Dedicated Ethernet	Shared 1 GBps Ethernet or Dedicated Ethernet	Shared 1 GBps Ethernet or Dedicated Ethernet	Shared Ethernet, special connections for travelling laptops
Client mix	Windows with some Linux	Windows and Linux with some UNIX	Windows Linux and UNIX	UNIX or Linux	UNIX or Linux	Windows, Linux, with some UNIX and Apple

4.2 Sample case study

In this section we describe a sample case study that includes plan and design discussions for the deployment of the solution.

4.2.1 Scenario

A Fortune 1000 distributor of medical products operates a single main data center at its combined offices and warehouse facility. This facility supports a significant population of desktop end users. Business operations are supported on a typical number of two-tier and three-tier applications running on a few dozen servers. The largest applications and databases are UNIX-based, with a large number of medium and smaller applications and databases hosted on Windows and Linux. Calendaring and e-mail services are provided by Outlook® and

Exchange servers. Desktop file, directory, and print services are provided by Netware servers. The UNIX servers, as well as the very largest Windows servers, are connected to a small SAN and share an EMC Symmetrix disk array. The smaller servers utilize internal disks, which are locally attached RAID arrays.

The firm has been using multiple backup solutions, each targeted for a specific OS, platform, or database. Backup operations are unsatisfactorily inefficient, with significant requirements for human tape handling, complications managing multiple streams of off-site tape rotations, and uneconomical procurement for multiple types of tape cartridges. Recovery operations have been even more unsatisfactory and alarming. Typical data recoveries have been slow and have required significant administrator time researching various recovery techniques for the different recovery software. The slow pace of typical recoveries, coupled with the results of some informal disaster recovery exercises, has generated alarming doubts about the MIS capability to recover in the event of a real disaster.

The firm has decided to migrate to an enterprise backup/recovery solution. After research and evaluations, the firm has chosen to deploy a new solution based on the Tivoli Storage Manager suite of software. The firm engages a Tivoli software technical sales specialist and some hardware technical sales specialists to determine the appropriate Tivoli Storage Manager components to order, and the best server, disk, and tape hardware to order to support the solution. The firm engages an experienced Tivoli Storage Manager backup/recovery and disaster recovery Solution Architect to help draw up the best detailed solution design.

4.2.2 Environment inventory

A complete high-level inventory of the MIS environment is created. Everything that the solution might be called on to recover (data, servers, disks, databases, applications) is inventoried. Software levels for operating systems, databases, and applications are noted. Sizes of file systems, disks, and databases are noted. Every resource that the solution might depend on (network segments, disk arrays, tape libraries, vaulting services) is inventoried. Appropriate diagrams are provided or created in order to study how data copies will flow during backups and recoveries.

Some design issues may begin to be noticed during the inventory phase. For this firm, fresh attention is drawn to one large database that has very short time windows for cold database backups.

4.2.3 Requirements definition

The firm's backup and recovery requirements are inventoried, defined, and reviewed. Existing Service Level Agreements for recovery and for application downtime are reviewed. The firm's data retention obligations (such as under the Sarbanes-Oxley regulations) are reviewed.

One key result of the requirements definition is an assignment of general data retention characteristics to the various general classes of data. For this firm, the data retention requirement for system data (software binaries, configuration files, and so forth) will be set to retain the most recent two copies, with older, inactive copies not kept beyond thirty days. The data retention requirements for user data (documents, spreadsheets, etc.) will be set to retain the most recent five copies, with older, inactive copies not kept beyond 90 days. All application database backups will be retained for 30 days. A determination is made that all data required for long-term retention will be regenerated out of the databases. In other words, the financial records for 1997 will be re-created, and financial data files with 1997 timestamps will not have to be located and retained for seven years.

For this firm, additional discussion ensued about some of the business' requirements for limited downtime and the impact this has on backups of databases and other systems maintenance. At this point, the conclusion reached is that the business requirement for short downtimes will be maintained as a documented requirement.

4.2.4 Disaster recovery plans

No matter how complex, an entire backup/recovery infrastructure is but one component of the larger disaster recovery solution. If disaster recovery requirements call for fast off-site recovery from site disasters, the backup and recovery solution must be designed and sized to support such fast recoveries. This firm, as is typical for medium-sized commercial businesses, has chosen to take a calculated risk involving disaster recovery. The firm's highest executives believe that an MIS outage of more than a few days would be catastrophic to the business, but decision making has focused on the high costs of a fast disaster recovery capability and the perceived low odds of a disaster occurring. MIS management has chosen to implement an economical disaster recovery plan that would be expected to take many days to fully re-establish MIS operations in the event of a site disaster. Recovery time objectives are set at 96 hours for the key UNIX-based business applications and databases, and 192 hours for the rest of the applications, databases, servers, and end-user data. These objectives are embraced because they are generally supported by the most popular disaster recovery strategy: tape-based recovery in a cold-site recovery.

4.2.5 Solution design

After the environment has been inventoried and described in sufficient detail, and all requirements have been agreed to and documented, the detailed design of the backup/recovery solution can be completed. The solution design focuses on data flows and the analysis of how copies of data on disks will be transferred through various networks to tape. The solution design focuses on operational schedules and the analysis of how various operations and various data transfers will complete in the allotted time slots.

This firm chooses a new IBM pSeries machine to serve as the dedicated Tivoli Storage Manager server. A large tape library with LTO tape drives is selected and is configured to be SAN attached. A dedicated disk array for the Tivoli Storage Manager database and recovery log is selected in order to make the TSM server independent of and isolated from the Symmetrix disk array, and to decrease I/O throughput requirements on the Symmetrix. An IBM DS4000 (FAStT) disk array is selected to be connected directly to the pSeries TSM server.

The solution design may require revisiting the Requirements Definition phase or the Disaster Recovery Plans phase. At this firm, detailed study of the requirement for fast cold backups of large databases indicated the requirement for data replication on the Symmetrix disk array. Analysis of the costs of additional storage and replication licenses were not favorable. The business requirement for very short application downtime was adjusted. An alternate technical solution matching the adjusted downtime requirement was developed, and SAN connections were provided from the largest database servers directly to tape drives in the tape library.

4.2.6 Procurement

After the detailed solution design has been completed, the actual hardware, software, services, and supplies can be ordered. It is typical for marketers to rush customers to the procurement phase before the Requirements Definition and Design phases have been performed. In such cases, about 10% to 15% of the total purchase typically ends up being exchanged later as trades are made between disk drives, tape drives, and adapter cards to resolve the difference between purchased and needed equipment in the designed technical solution.

For this firm, some miscommunications with a supply vendor result in tape cartridges being ordered without the barcode labels needed by the label-reading lasers inside advanced tape libraries. Cartridges have to be urgently exchanged, slightly slowing down deployment.

4.2.7 Project planning

Although most MIS managers would like the solution to be just "plug it in and forget it," implementing a backup/recovery infrastructure successfully requires a fair amount of coordination and collaboration. Implementing the detailed design successfully with minimal impact on regular MIS operations will require at least a small amount of project planning and project management.

This firm chooses the manager of one of the MIS functional departments to serve as Project Manager. The experienced Tivoli Storage Manager Solution Architect provides some example implementation project plans and some guidance about Tivoli Storage Manager project management issues. The firm chooses to engage some experienced outside technical specialists to quickly implement the new solution without requiring diversion of the firm's own MIS staff from their current responsibilities. The firm chooses an experienced Tivoli Storage Manager Technical Specialist to perform a turn-key implementation of the TSM server and its associated disk and tape subsystems, and to work with the firm's systems administrators on integrating backup operations with current production operations. The firm chooses one or two experienced server and storage Technical Specialists to take the lead in integrating the TSM server and TSM clients with the LAN, the SAN, and the various servers.

4.2.8 IBM Tivoli Storage Manager server and storage implementation

Configuring the TSM server and its associated disk and tape storage devices to match the detailed solution design, then testing it for successful configuration is a fairly laborious process. Most of the work does not relate to daily administration of Tivoli Storage Manager operations. By engaging an experienced outside Tivoli Storage Manager Technical Specialist to perform this work, the process is completed efficiently with minimal requirements on the firm's own staff.

4.2.9 IBM Tivoli Storage Manager client and application integration

After the TSM server and its supporting network and storage infrastructure have been implemented, the project can proceed to the more delicate work of integrating all data and applications into the new backup operations.

Fully accessing all data for complete backups requires the highest level of administrator-authority access to systems and databases, which leads to typical concerns about security and responsibility for impact on production operations. This firm chooses to have its own system administrators and database administrators lead the work, guided by the outside Tivoli Storage Manager Technical Specialist. Where traditional configurations are encountered, work proceeds directly and carefully. Where unique configurations are encountered,

extra testing is performed. Where large numbers of similar systems are encountered, a standard method may be tested and replicated.

4.2.10 Development of custom tools

When the backup and recovery system is roughly operational, it will be necessary to integrate its regular operation with existing processes and procedures, and with the systems management infrastructure. Some custom tools (usually reports, macros, scripts, and interfaces) must be created so that some daily operations will be automated to run at scheduled times, other operations can be initiated easily by operators and users, and typical hiccups and hang-ups will be reported automatically to the right administrators and escalated to the right managers.

In this project, the firm chooses to engage the experienced Tivoli Storage Manager Technical Specialist to develop some custom scripts to help automate daily tape operations and integrate Tivoli Storage Manager event management with the firm's problem management reporting and paging system. Additionally, the Technical Specialist will develop custom scripts and reports to help inform the firm's Tivoli Storage Manager Administrators of progress, status, and issues. The firm chooses to task some of its own staff with developing some custom scripts to integrate Tivoli Storage Manager with application and database daily activities.

4.2.11 Staff training

Long-term success of any backup and recovery solution requires that the support staff is capable of managing the solution effectively. Daily backup operations are sensitive to changes in the production environment. The support staff must be well trained in the details of Tivoli Storage Manager administration.

This firm selects key system administrators to serve as administrators of the Tivoli Storage Manager infrastructure. A small number of key administrators are sent to off-site formal hands-on training for the Tivoli Storage Manager software prior to the new solution being implemented. During the actual implementation, several key system administrators and database administrators participate closely in the technical configuration of the solution and receive hands-on training from the experienced Tivoli Storage Manager Technical Specialist.

4.2.12 Recovery testing

The most important part of the entire deployment is testing to validate that the new solution can successfully recover files, directories, disks, databases, and servers.

After successfully testing and documenting local practices for recovering data and systems, the firm confidently moves into production with the new backup and recovery infrastructure.

4.3 Tivoli Storage Manager server design factors

These key factors should be considered when deciding the type of Tivoli Storage Manager server solution to be deployed for any given scenario:

► Amount of data changed daily
► Total amount of data
► Network attachment of the clients
► Critical restore requirements
► Total number of other clients

Table 4-2 shows some combinations of data sizes and possible server solutions.

Table 4-2   Server sizes and solution

	Large total data	Large incremental data	Small total data	Small incremental data
Large total data		AIX server		Large NT server
Large incremental data	AIX server		Large NT server	
Small total data		Large NT server		NT server
Small incremental data	Large NT server		NT server	
AIX server: disk storage pools = 1 incremental, large memory >= 256 MB, large tape library   **Medium NT server:** Dual processor, disk storage pools = 1 incremental, large memory >= 256 MB, large tape library   **NT server:** Single processor, disk storage pools = 1 incremental, moderate memory >= 128 MB, medium tape library

In addition to these general configurations, the disk drives and tape drives on should be isolated on separate buses to eliminate bus contention during migration processing. You should always adhere to good system design.

As a general rule, use the following guidelines:

► Storage pool size: Equal to one day's incremental data.

► Tape robot size: Five to 10 times the total data should be able to reside in the robot without changing tapes.

- ► TSM database size: Tough to generalize, but as a first estimate use 1% of total data. You can easily add volume to the database later.
- ► Server size & capacity (again, hard to generalize, but use this):
  - – <5-10 GB of total data, Single Intel Processor system
  - – 10 – 50 GB, Dual Intel Processor system
  - – >50 GB, AIX system, possibly multi-processor
- ► Key initial design and growth factors:
  - – Are the existing storage pools large enough to accommodate the incremental data?
  - – Is there adequate tape support for all of the data?
  - – Can the existing network adapters in the server handle the traffic?
  - – Does different backup needs to have different retention periods?
  - – Should new Policy Domains be created?

5

Troubleshooting, hints & tips

In this chapter we discuss some troubleshooting methods, hints, and tips for customizing Tivoli Storage Manager and getting the most out of your IBM Tivoli Storage Manager server.

Attention: Expectations about fix levels that are mentioned in this chapter were correct when this book was written but are subject to change at the discretion of IBM.

This chapter includes the following topics:

► Most common errors
► Performance tuning

5.1 Most common errors

This section describes some of the error messages that you might see while installing or using Tivoli Storage Manager Version 5.3 and its components. This book covers issues and fixes briefly. For complete information, refer the readme document of the latest release.

5.1.1 Server installation errors

Listed below are some of common error messages seen while installing Tivoli Storage Manager server and its components.

► IBM TIVOLI STORAGE MANAGER REGISTER LICENSE COMMAND FAILS TO REGISTER ANY LICENSES, BUT DOES NOT ISSUE AN ERROR MESSAGE

– Error description

The Tivoli Storage Manager REGISTER LICENSE command can fail to successfully register any licenses without providing any error message regarding why it failed to do so. It simply displays blanks for current and new license information.

```
ANR2017I Administrator ADMIN issued command: REGISTER LICENSE
FILE=mgsyslan.lic NUMBER=1
ANR2852I Current license information:
ANR2853I New license information:
ANR2812W License Audit completed - ATTENTION:Server is NOT in
compliance with license terms.
```

There are several reasons why the server will fail to register licenses, however, with no external error message and lack of a clear reason for failure in a trace, it is difficult to determine why the failure occurred.

– APAR

IC43600

– Users affected

All Tivoli Storage Manager users

– Recommendation

Apply fixing level when available. This problem is currently projected to be fixed in V5.3.1. Note that this is subject to change at the discretion of IBM.

- IBM TIVOLI STORAGE MANAGER ADMINISTRATION CENTER INSTALLATION FAILS WITH SYSTEM RETURN CODE 4

  – Error description

    After the Integrated Solutions Console (ISC) is successfully installed, the Tivoli Storage Manager Administration Center installation fails with a system return code 4:

    ```
    ERROR: Removing Component from ISC failed.
    ```

    The failure occurs when the installer attempts to communicate with the ISC server immediately after this server is restarted. At this point the Tivoli Storage Manager Administration Center installer attempts to communicate with the ISC server and fails, causing the installation to fail.

  – APAR

    IC43853

  – Users affected

    Users installing Tivoli Storage Manager V5.3 Administration Center on Windows

  – Recommendation

    Apply fixing level when available. This problem is fixed in Tivoli Storage Manager Administration Center level 5.3.0.0-A. Note that this is subject to change at the discretion of IBM.

- IBM TIVOLI STORAGE MANAGER 5.3 UPGRADE FAILS WITH ANR9999D ADMINIT.C(3628): THREADID<0> FAILED TO CONVERT PASSWORD

  – Error description

    During Tivoli Storage Manager 5.3 upgrade, the decryption/encryption from DES to AES fails with this message.

  – A server CRYPTO trace reveals:

    ```
    14:45:04.961 [0][cryptog.c][1921]: Setting ICC context
    14:45:04.961 [0][cryptog.c][1544]: Check Stat exit  with rc 0
    14:45:04.961 [0][cryptog.c][279]: Not Setting FIPS status
    14:45:04.961 [0][cryptog.c][286]: Calling ICC attach.
    14:45:05.039 [0][cryptog.c][1544]: Check Stat exit  with rc 0
    14:45:05.039 [0][cryptog.c][1544]: Check Stat exit  with rc 0
    14:45:05.039 [0][cryptog.c][329]: Get install path returned C:\
    Program Files\Tivoli\TSM\Server\.
    14:45:05.039 [0][cryptog.c][1544]: Check Stat exit  with rc 0
    14:45:05.039 [0][cryptog.c][338]: Get version returned 1.3
    14:45:05.039 [0][cryptog.c][353]: Crypto init exit with rc 0
    14:45:18.671 [0][admutil.c][5156]: AdmDesToAesPassword:
    Failure on decrypt - password is not valid!.
    ```

The error is most likely due to an admin password that is not greater than the minimum password length (minpwlength).

– APAR

IC44367

– Users affected

Any Windows, UNIX, or Linux servers upgrading to V5.3 where a defined password is shorter than the current minimum password length

– Recommendation

Apply fixing level when available. This problem is expected to be fixed in levels 5.3.0.2 and 5.3.1. Note that this is subject to change at the discretion of IBM.

5.1.2 Operational errors

The following errors mostly appear during operation of Tivoli Storage Manager.

▶ IBM TIVOLI STORAGE MANAGER SERVER HANG WHEN ATTEMPTING TO VIEW NODE PROPERTIES VIA ISC

– Error description

Customers may experience a hang of the TSM server when attempting to view or update properties for their client nodes via the ISC. The problem occurs only if the customer has Tivoli Storage Manager administrators with "client owner" or "client access" authority for a large number of nodes (more than 50). When obtaining the properties for a given node, several queries are issued against the TSM server, including the `QUERY ADMIN F=D` command. This is the command that results in the TSM server hang. The activity log will show that the `QUERY ADMIN F=D` command was the last command issued from the ISC prior to the hang condition occurring.

– APAR

IC44901

– Users affected

Users of the Tivoli Storage Manager V5.3.0 Administration Center

– Recommendation

Apply fixing level when available. This problem is projected to be fixed in level 5.3.1. Note that this is subject to change at the discretion of IBM.

► The Administration Center displays the wrong list of nodes for a client schedule.

– Error description

A problem can be seen when looking at a client schedule in the Administration Center: If nodes are associated with the schedule, the Administration Center displays only the nodes that are associated. If there are no nodes associated with the schedule, all existing nodes are displayed. This gives the impression that all of those nodes are associated.

– APAR

IC44729

– Users affected

Users of the Tivoli Storage Manager Administration Center

– Recommendation

Apply fixing level when available. This problem is projected to be fixed in level 5.3.1. Note that this is subject to change at the discretion of IBM.

► IBM TIVOLI STORAGE MANAGER SERVER OFFSITE RECLAMATION FAILS

– Error description

During reclamation of off-site volumes, Tivoli Storage Manager may fail and issue messages ANR1173 for files it is unable to move. Tracing reveals that it is unable to locate a file to copy on disk or sequential media. Issuing a SHOW VERSIONS or SHOW ARCHIVES for the files not found shows that they reside on disk. Still, Tivoli Storage Manager may be unable at times to locate files on disk to copy during off-site reclamation. This is an example of an error message:

```
ANR1173E Space reclamation for offsite volume(s) cannot copy file in
storage pool DISKPOOL:
Node HSCTKINGDBRT101, Type Backup, File space \\hsctkingdbrt101\c$,
fsId 10, File name \ DRV.~.
```

If tracing is run on this error using **traceflags af bf ds -aflock -bflock**, you will see similar messages in the **tracefile:**

```
[afmove.c][5167]: HandleOffsiteFile: Transferring bitfile=0.99262940.
[dfmove.c][963]: DfTransferBitfile: transferring bitfile 0.99262940.
[bfutil.c][4375]: BfTransferBitfile: transferred 0 files, bytes 0.0,
rc=1.
[afmove.c][5229]: File not found in archive pool,bfId=0.99262940.
[output.c][5945]: ANR1173E Space reclamation for offsite volume(s)
cannot copy file in storage
pool DISKPOOL: Node HSCTKINGDBRT101, Type Backup, File space
\\hsctkingdbrt101\c$, fsId 10, File name \ DRV.~.
```

– Users affected

All users of Tivoli Storage Manager V5.1, V5.2, and V5.3 servers that perform off-site reclamation

– APAR

IC44453

– Recommendation

Apply fixing level when available. This problem is currently projected to be fixed in levels 5.1.10, 5.2.5, 5.3.1. Note that this is subject to change at the discretion of IBM.

► `ADMIN CENTER DOES NOT CORRECTLY DISPLAY THE CLIENT OPTION BACKDELETE`

– Error description

The Admin Center, which can be used to view or change client options, incorrectly displays information about the following option:

```
The client node can delete its own backup files.
```

The checkbox used to indicate that the client has the ability to delete its own backup files will not be checked even if the client node has the ability to do so. The Tivoli Storage Manager Admin Center should be changed to properly display the client node's ability to delete its own backup files.

– Users affected

Users of the Tivoli Storage Manager V5.3.0 Administration Center

– APAR

IC44755

– Recommendation

Apply fixing level when available. This problem is currently projected to be fixed in level 5.3.1. Note that this is subject to change at the discretion of IBM.

► `5.3 STORAGE AGENT SERVICE WILL NOT START`

– Error description

The Version 5.3 Tivoli Storage Manager Storage Agent on Windows will not start as a service, dstasvc.exe. The following error will be reported when starting on Windows 2003:

```
The IBM Tivoli Storage Manager StorageAgent1 service on Local
Computer started and then stopped. Some services stop automatically
if they have no work to do, for example, the Performance Logs and
Alert services.
```

On Windows 2000, the following events will be reported in the Application Event Log:

```
Event ID 2 - A IBM Tivoli Storage Manager Storage Agent has been
successfully started. Event ID 3 - A IBM Tivoli Storage Manager
Storage Agent has been successfully stopped.
```

If console logging is enabled for the StorageAgent, the following error will be seen in the console.log:

```
ANR1437E No device configuration files could be used.
```

The problem is due to a change in what paths are used by the Storage Agent. Prior to Version 5.3, the install path was pulled from the registry and was used as the base directory for any filename without a fully qualified path in the dsmsta.opt file. In V5.3, the current working directory is used instead. This enables the Storage Agent to be started successfully in the foreground, but fails when started as a service because the working directory in that case is %SystemRoot%, c:\winnt.

– Users affected

All users of Tivoli Storage Manager V5.3.0 server or Storage Agent.

– APAR

IC44780

– Recommendation

Apply fixing level when available. This problem is currently projected to be fixed in level 5.3.1. Note that this is subject to change at the discretion of IBM.

► HEALTH MONITOR FAILS TO LOAD AND PORTLET DISPLAYS A ERROR MESSAGE

– Error description

The health monitor server overview and server detail portlet may display a red message (`Portlet unavailable, Contact your portal administrator`) when the following commands fail to produce results in a 10-minute time frame. The response time of the commands below is based on three factors: the load on the server; the size of the activity log, and the size of the event table.

For example, when each of the following commands takes 3 minutes to run, you will see the message:

```
Command to collect schedule events counts:
select count(STATUS) as count from events where status='Completed'
and result=0 and scheduled_start='{24 hours in the past}'
select count(STATUS) as count from events where status='Completed'
and result > 0 and schedule_start='{24 hours in the past}'
```

```
select count(STATUS) as count from events where status='Failed' and
scheduled_start='{24 hours in the past}'
select count(STATUS) as count from events where status='Missed' and
scheduled_start='{24 hours in the past}'
Command to collect activity log counts:
select count(MSGNO) as count from actlog where severity='W'and
date_time > TIMESTAMP(CURRENT_TIMESTAMP - interval'24' hour) and
originator='SERVER'
select count(MSGNO) as count from actlog where (severity='E' or
severity='D' or severity='S') and date_time
>TIMESTAMP(CURRENT_TIMESTAMP - interval '24' hour) and
ORIGINATOR='SERVER'
```

– APAR

IC45084

– Users affected

Users of Tivoli Storage Manager Administration Center Version 5.3.0.0
and users of the health monitor.

– Recommendation

Apply fixing level when available. This problem is currently projected to be
fixed in level 5.3.1. Note that this is subject to change at the discretion of
IBM.

► CRASH IS SEEN AFTER AN INTERNAL SERVER ERROR

– Error description

After hitting an INTERNAL SERVER ERROR, the server can crash.This
occurs because of a memory overlay when the server attempts to show
the stack traceback for the INTERNAL ERROR. The crashes traceback
can look like the following output; the most important indicator is the
AdmActivityLogThread crashing:

```
pkShowCallChain
AbortServer
TrapHandler
*UNKNOWN*
*UNKNOWN*
*UNKNOWN*
*UNKNOWN*
outOpenStream
AdmActivityLogThread
StartTHread
*UNKNOWN*
```

A sample output of the internal error on the actlog can look similar to this:

```
ANR0408I Session 16 started for server HECATE (AIX-RS/6000) (Tcp/Ip)
for library sharing.
```

```
ANR1663E Open Server: Server HECATE not defined ANR1651E Server
information for HECATE is not available.
ANR0435W Session 16 for node HECATE (AIX-RS/6000) refused - internal
error detected.

ANR9999D ThreadId<55> issued message 435 from: <- 0x000000001015696A0
outMsgf <- 0x00000000100F40EAC OpenServer
<- 0x00000000100F3E1FC DoLibraryServer <- 0x00000000100F319B4
smExecuteSession <- 0x000000001000A993C SessionThread <-
0x00000000100089284 StartThread <- 0xFFFFFFFF7EC18814 *UNKNOWN*
ANR0409I Session 16 ended for server HECATE (AIX-RS/6000).
ANR7821S Thread 20 (tid 21) terminating on signal 11(Segmentation
violation).
```

Note that the traceback for the internal server error will be different from
the crash's traceback. The crash's trackback is the actual indicator of this
situation.

– APAR

IC44164

– Users affected

All V5.3.0 Tivoli Storage Manager server users.

– Recommendation

Apply fixing level when available. This problem is currently projected to be
fixed in level 5.3.0.1 and 5.3.1. Note that this is subject to change at the
discretion of IBM.

► DEFINING A SECOND IBM TIVOLI STORAGE MANAGER SERVER INSTANCE (MINIMAL
CONFIGURATION) ON WINDOWS WILL RENAME THE IBM TIVOLI STORAGE MANAGER
B/A CLIENT DSM.OPT TO DSM.OLD

– Error description

There is a problem when installing a second (or third, fourth, ...) Tivoli
Storage Manager server instance on a Windows system in "minimal
configuration" mode when there is already a Tivoli Storage Manager client
installed on this system. After the second TSM server instance has been
installed and initialized, a Congratulations!... pop-up window appears
and you will be asked whether you would like to start the local Tivoli
Storage Manager Backup/Archive client.

At this time—no matter whether you answer yes or no—in the background
the original dsm.opt has been renamed to dsm.old, and a new dsm.opt
has been created with the port number pointing to the new server
instance. If at this point another TSM server instance is installed, the
formerly original dsm.opt file would be lost, because as the now-actual
dsm.opt will be renamed to dsm.old, thus overwriting the original one.This

may not be noticed until the Tivoli Storage Manager client is started the next time as it would connect to the wrong Tivoli Storage Manager server instance.This happens only if the second Tivoli Storage Manager server instance is installed using minimal configuration mode.

– APAR

IC44048

– Users affected

All Tivoli Storage Manager Windows systems where a Tivoli Storage Manager Backup/Archive client is installed on the same system as a server and minimal configuration mode is used for the TSM server setup.

– Recommendation

Apply fixing level when available. This problem is currently projected to be fixed in levels 5.3.0.1 and 5.3.1. Note that this is subject to change at the discretion of IBM.

5.2 Performance tuning (DB and sizing issues)

Tivoli Storage Manager performance can be influenced by various tuning parameters. Tuning these functions for good performance requires diligence and expertise on the part of the implementer. IBM Tivoli Storage Manager can be quite complex because of the many operating systems, network configurations, and storage devices that Tivoli Storage Manager will support. It is the purpose of this tuning guide to provide tips and hints to ease the task of getting good performance for Tivoli Storage Manager operations.

Performance tuning for a single platform function is quite complex, but due to years of experience, it is generally well understood. However, Tivoli Storage Manager functions in the client/server realm, supports many operating systems, works across networks, and accepts different communication protocols. Consequently, many more factors can affect performance.

These factors can affect Tivoli Storage Manager performance significantly:

► Average client file size
► Percentage of files changed since last incremental backup
► Percentage of bytes changed since last incremental backup
► Client hardware (CPUs, RAM, disk drives, network adapters)
► Client operating system
► Client activity (non-Tivoli Storage Manager workload)
► Server hardware (CPUs, RAM, disk drives, network adapters)
► Server storage pool devices (disk, tape, optical)
► Server operating system

- ► Server activity (non-Tivoli Storage Manager workload)
- ► Network hardware and configuration
- ► Network utilization
- ► Network reliability
- ► Communication protocol
- ► Communication protocol tuning
- ► Final output repository type (disk, tape, optical)

5.2.1 Tivoli Storage Manager tuning options

This section talks about tuning the Tivoli Storage Manager server and client to obtain maximum performance.

Server tuning options

The following parameters are tunable on most Tivoli Storage Manager servers. Not all options are supported on all server platforms. Check the Administrators Reference for applicability to a particular platform. These parameters can all be changed in the server options file (dsmserv.opt), and some can be changed with the server SETOPT command. For any changes made in the server options file, the server must be restarted for the changes to take effect.

- ► BUFPoolsize
- ► EXPInterval
- ► LOGPoolsize
- ► MAXNUMMP (change in the client NODE definition)
- ► MAXSessions
- ► MOVEBatchsize / MOVESizethresh
- ► RESTOREINTERVAL
- ► SELFTUNEBUFPOOLsize
- ► SELFTUNETXNsize
- ► TAPEIOBUFS
- ► TCPNodelay
- ► TCPWindowsize
- ► TXNGroupmax
- ► USELARGEbuffer

Client tuning options

The following parameters are tunable on all Tivoli Storage Manager clients for all available releases:

```
COMPRESSION
COMPRESSALWAYS
COMMRESTRARTDURATION / COMMRESTARTINTERVAL
QUIET
LARGECOMmbuffers
```

```
MEMORYEFFICIENTBACKUP (previously SLOWINCREMENTAL)
Multi-Session Restore
RESOURCEUTILIZATION
TAPEPrompt
TCPBuffsize
TCPNodelay
TCPWindowsize
TXNBytelimin
```

Note: The Tivoli Storage Manager client option should be put in DSM.OPT or DSM.SYS file in a UNIX client.

For complete information about performance tuning, refer to the *IBM Tivoli Storage Manager Performance Tuning Guide*, SC32-9101.

Sample worksheets for planning and sizing

This appendix includes the worksheets that we introduced and recommended in 2.3, "Design and planning best practices" on page 28:

- ► Client requirements
- ► Storage policy requirements
- ► Database
- ► Recovery log
- ► Device configuration and volume history
- ► Total IBM Tivoli Storage Manager disk required
- ► Tape drive configuration
- ► Administrator IDs
- ► License requirements

Worksheets grouped in tables

Table A-1   Client requirements worksheet

Category	Client 1	Client 2	Client 3	Client 4
Client name				
Contact information				
Operating system				
Total storage available (GB)				
Total storage used (GB)				
GB changed per backup				
Number of files backed up				
Data compression				
Backup window times				
Backup number of hours				
Required recovery time				
IBM Tivoli Storage Manager recovery time				
GB copied per archive				
Number of files archived				
Number of archives kept				
Archive frequency				
Archive window times				
Archive number of hours				
Number of image backups				
Image backup frequency				
Number of backup sets				
Backup set frequency				
Policy domain				
Client option set				

Table A-2   Storage policy requirements worksheet

Category	Example 1	Example 2	Example 3
Group name			
Number of backup versions			
Backup file retention period			
Number of deleted versions			
Last deleted file version retention period			
Archive retention period			
Off-site copies			
On-site collocation			
Off-site collocation			
Image backup retention			
Backupset retention			

Table A-3   Database worksheet

Database volume	Filename (Primary)	Size (MB)	Filename (Copy)	Size (MB)

Table A-4   Recovery log worksheet

Log Volume	Filename (Primary)	Size (MB)	Filename (Copy)	Size (MB)
	Total		**Total**	

Table A-5   Device configuration and volume history worksheet

Category	Size (MB)
Total	

Table A-6   Total IBM Tivoli Storage Manager disk required worksheet

Category	Size (MB)
IBM Tivoli Storage Manager software (dependent on platform)	
IBM Tivoli Storage Manager database	
IBM Tivoli Storage Manager recovery log	
IBM Tivoli Storage Manager primary storage pools	
Device configuration table and volume history table	
Other (RAID, Operating system)	
Total	

Table A-7   Tape drive configuration worksheet

Category	Option
Library model	
Number of drives	
Drive model	
Number of on-site tape volumes	
Number of off-site tape volumes	

Category	Option
Number of database volumes	
Number of scratch tapes	
Number of backupset tape volumes	
Total tape volumes required	

Table 5-1   Administrator IDs worksheet

Functions	IBM Tivoli Storage Manager ID	Authority

Table A-8   License requirements worksheet

Category	Required
Server type	
Client connections	
Network connections	
Open systems environment clients	
Space management	

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 on ordering these publications, see "How to get IBM Redbooks" on page 182. Note that some of the documents referenced here may be available in softcopy only.

- ► *IBM Tivoli Storage Manager Version 5.3 Technical Guide,* SG24-6638
- ► *IBM TotalStorage Business Continuity Solutions Guide*, SG24-6547-02

Other publications

These publications are also relevant as further information sources:

- ► *IBM Tivoli Storage Manager for AIX Administrator's Guide Version 5.3*, GC32-0768
- ► *IBM Tivoli Storage Manager for AIX Installation Guide Version 5.3*, GC32-1597
- ► *IBM Tivoli Storage Manager for Windows Installation Guide Version 5.3*, GC32-1602
- ► *IBM Tivoli Storage Manager for Windows Administrator's Guide Version 5.3*, GC32-0782
- ► *IBM Tivoli Storage Manager for UNIX and Linux Backup-Archive Clients Installation and User's Guide Version 5.3*, GC32-0789
- ► *IBM Tivoli Storage Manager for Windows Backup-Archive Clients Installation and User's Guide Version 5.3*, GC32-0788
- ► *IBM Tivoli Storage Manager Performance Tuning Guide*, SC32-9101
- ► *Tivoli Field Guide - A Brief Introduction to IBM Tivoli Storage Manager Architecture: TSM Design and Planning Best Practices:*

    http://www.ibm.com/software/sysmgmt/products/support/Field_Guides_Technical.html

Online resources

These Web sites are also relevant as further information sources:

► IBM Tivoli Storage Manager:

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

► IBM Tivoli Storage Manager Extended Edition:

  http://www.ibm.com/software/tivoli/products/storage-mgr-extended/

► IBM Tivoli information center

  http://publib.boulder.ibm.com/infocenter/tivihelp/v1r1/index.jsp

► ADSM Forums

  http://my.adsm.org/

► IBM Tivoli Storage Manager FTP site

  ftp://service.boulder.ibm.com/storage/tivoli-storage-management/

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Redbooks

Deployment Guide for IBM Tivoli Storage Manager V5.3

Deployment Guide for IBM Tivoli Storage Manager V5.3

Planning for IBM Tivoli Storage Manager deployment

Installation and configuration

Troubleshooting, hints, and tips

Deploying a storage management solution for a small or medium-size business begins with a thorough analysis of the existing business and IT environment. The next step after fully understanding the organization is planning and sizing. This is the key stage, because deployment success depends on how well you plan and size.

This IBM Redbook takes a step-by-step approach to deploying a storage management solution based on IBM Tivoli Storage Manager. The first two chapters introduce overall planning and sizing issues. Then we focus on the detailed installation and configuration of Tivoli Storage Manager, and offer some deployment scenarios and troubleshooting of storage management implementation.

Readers should be familiar with the following topics:
- Storage management concepts
- Network topologies
- Distributed systems architectures and configuration

This book does not cover whole IBM Tivoli Storage Manager components or other discussions for the planning and sizing experience.

Redbooks