DFSMShsm ABARS and Mainstar Solutions

Use ABARS for backing up and recovering your critical applications

Expand the ABARS functionality by using Mainstar DR products

Simplify your DR tasks using Mainstar products

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Colleen Gordon

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International Technical Support Organization

DFSMShsm ABARS and Mainstar Solutions

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

Business readiness, in the event of a disaster, is gaining importance in information technology (IT) organizations. Senior management is taking the responsibility of protecting business assets seriously. Thus, today we see more business impact analyses (BIAs) and risk assessments being performed to identify a company's critical business functions. Although critical business functions may be similar among many companies within an industry, what is unique to each business is its data. And that is the focus of this IBM Redbook: protecting your data with ABARS.

This redbook is written for storage administrators, system programmers, or other IT professionals faced with the task of implementing ABARS for disaster recovery. Application owners, and disaster recovery or contingency planners, will also find the book useful for understanding what is involved in an ABARS implementation.

This redbook describes tasks and details to implement ABARS for a set of data (defined by you for your business) for the purpose of disaster recovery. It also explains how these tasks can be simplified and enhanced with Mainstar Software Corporation's products, ASAP and Backup & Recovery Manager, which IBM is remarketing through the TotalStorage Management Toolkit.

The team that wrote this redbook

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Chapter 1. Product overview

In this chapter, we describe the software function, ABARS, a function of DFSMShsm which is a component of DFSMS, as well as two Mainstar products: ASAP and Backup & Recovery Manager.

ABARS performs data backup and recovery processes on a predefined set of data called an aggregate. During backup processing, the data is packaged as a single entity in preparation for taking it off-site. This enables the recovery of individual applications in user-priority sequence.

The original design of ABARS was for use in disaster recovery. Since then, ABARS has also been used for transfer of workloads and remote distribution of data. Our focus for this publication will remain with the disaster recovery capabilities of ABARS.

ASAP assists in the identification of critical data within a defined application, making the planning and implementation of ABARS much easier. Backup & Recovery Manager enhances the ABARS backup and recovery functions, with menu-driven screens to manage both processes.

Throughout this publication, the features and functions discussed are those of z/OS DFSMShsm Version 1 Release 3, unless otherwise stated.
1.1 Aggregate Backup and Recovery Support

Aggregate Backup and Recovery Support (ABARS) facilitates a point-in-time backup of a collection of related data in a consistent manner. This group of related data is defined to ABARS as an aggregate. The backup copies are created in a device-independent format.

ABARS has three components:

- **Aggregate group definition**: The aggregate group lists the *selection data set* names, *instruction data set* name, and the management class for the aggregate. This component is implemented through the Interactive Storage Management Facility (ISMF) and requires the storage management subsystem (SMS) address space to be active.

- **Aggregate backup (ABACKUP)**: The ABACKUP command backs up a user-defined group (aggregate group) of data sets at that moment in time. This DFSMShsm function also requires the SMS address space to be active.

- **Aggregate recovery (ARECOVER)**: The ARECOVER command recovers data sets that were previously backed up by an aggregate backup. The SMS address space is not required, but it is highly recommended to simplify the recovery process. This address space is required to recover VSAM data sets in the ALLOCATE list and any extended format data sets.

1.1.1 Aggregate group definition

Defining an aggregate requires knowledge of the data being grouped together for backup and recovery and the backup requirements for that data. Identifying all data related to a selected business function or application for inclusion in an aggregate can be intimidating. The Mainstar product, ASAP, provides an alternative for identifying this data. Given a list of job names, ASAP analyzes System Management Facilities (SMF) records, job schedulers, and JCL libraries to produce a list of data set names referenced by those jobs. Refer to 1.2, “ASAP” on page 10 for a functional description of ASAP.

Data supported by ABARS can reside on primary disks, tape volumes, migration level 1 (ML1) disk volumes, or migration level 2 (ML2) tape volumes, and must be cataloged. During the aggregate backup process, ABARS collects catalog and DFSMShsm control data set (CDS) information, as well as allocation information for data sets that will not be copied (allocated only) nor moved to the recovery site.

To indicate how ABARS should process the data, a selection data set is created. Within the selection data set, data sets are specified as falling into one of three categories:
Chapter 1. Product overview

- **INCLUDE list**: Data sets to be included in the backup data file.
- **ALLOCATE list**: Data sets for which only catalog and space information is captured.
- **ACCOMPANY list**: Tape data sets that are cataloged only during recovery; a copy of these data sets is provided outside ABARS.

Data set names can be fully or partially qualified in the selection data set. EXCLUDE lists are used to further qualify data sets when naming masks are used.

Special procedures, hints, directions or any desired information for an application or aggregate can be documented in an instruction data set. The instruction data set is free format, and is optional. The following is a list of useful information that can be listed in the instruction data set:

- Description of the application
- Unique application execution instructions
- Resource Access Control Facility (RACF) environment
- SMS attributes
- Software and hardware requirements
- Contact phone number for software vendors

If an instruction data set is specified in the aggregate group definition, it will be backed up with the rest of the aggregate data.

The ABACKUP process can create up to 15 concurrent copies of the output data files. The number of copies is specified in the aggregate definition. Many installations create two copies: one to go offsite for disaster recovery and the other to remain onsite for local recovery. Installations can use Backup & Recovery Manager to restore an individual data set from the local copy. Other reasons for creating multiple copies include media failures, or to address other specific business risks.

Beyond specifying which data sets to capture for backup, ABARS allows unique prefixes for each aggregate's backup output files. Up to four output files are created for each aggregate. These output data sets are created with the following naming conventions:

- **Data file**: `outputdatasetprefix.D.CnnVnnnn` and `outputdatasetprefix.O.CnnVnnnn`
- **Control file**: `outputdatasetprefix.C.CnnVnnnn`
- **Instruction/activity log file**: `outputdatasetprefix.I.CnnVnnnn` for the instruction/activity log file
Providing a meaningful prefix helps associate the ABACKUP output files more easily with an aggregate.

A management class can be associated with each aggregate. Attributes specified in the management class control the maximum number of versions kept before roll off (deletion), as well as RETAIN ONLY and EXTRA versions. A copy serialization parameter controls whether ABARS should continue processing if an enqueue failure occurs or the ABACKUP fails. The ABACKUP copy technique parameter indicates the use of concurrent copy.

Information regarding application back up requirements is gathered from the application owner/analyst. It is used by the ABARS implementer or storage administrator to define the aggregate group, as shown below in Figure 1-1.

ABARS provides a powerful tool to back up and protect critical data. Security should always be a concern when handling business-sensitive data. The ABACKUP and ARECOVER commands can be protected by RACF through a RACF FACILITY class profile, or a similar function with your security product.
1.1.2 Aggregate backup

ABARS is a command-driven facility that can execute on more than one DFSMShsm processor in a multi-host environment. To improve performance of each aggregate backup or recovery, each ABARS task executes in a separate DFSMShsm secondary address space. Up to 64 ABARS tasks can be run concurrently for each DFSMShsm address space.

The ABACKUP process requires the SMS address space to be active regardless of whether you are backing up SMS-managed data sets or not. The aggregate definitions are stored in the source control data set (SCDS), therefore requiring that SCDS be active.

Before executing an aggregate backup, a test of this process can be run with the ABACKUP VERIFY command. No data backup will be performed, only data set verification. The ABACKUP VERIFY process lists all input tape volumes required, in addition to all migrated and non-migrated data sets, detecting validation errors. This list of validated data sets can be routed to a filter output data set for easy viewing.

Execution of aggregate backup creates the total logical data group you defined. Data that reside on primary or Level 0 disk volumes are logically dumped by DFSMSdss and written to the data file, also referred to as the \textit{D file}.

Migrated and tape data are copied by DFSMShsm to the aggregate backup output file, also referred to as the \textit{O file}. If an instruction file has been created for this aggregate, it will be copied to the instruction/activity data set file, including also the ABACKUP activity log. This output file is referred to as the \textit{I file}.

Finally, all the control information for the aggregate is written to the control file, also referred to as the \textit{C file}. Control information consists of space and catalog information for data to be allocated, a copy of the migration control data set (MCDS) records for each migrated data set, space information for recovering the aggregate, D, O, and I file names, and DFSMS class definitions.
The ABACKUP process, with data inputs and outputs, is illustrated in Figure 1-2.

For more information about ABACKUP, refer to Chapter 8, “Using ABACKUP” on page 111.
1.1.3 Aggregate recovery

Each aggregate is managed as a separate entity, so you can determine its recovery priority. Alternatively, aggregates can be recovered concurrently at multiple sites. If data sets are unique to a workload, critical applications can be recovered independently at a recovery site, and aggregate recoveries can continue while production work is started.

Aggregate recovery processes the aggregate data, recovering data sets from the INCLUDE list, allocating data sets from the ALLOCATE list, and cataloging data sets from the ACCOMPANY list. If the ARECOVER task fails, it can be restarted, continuing from the point of failure. A restart data set is created when the recovery does not complete successfully. It contains a list of all the names of data sets recovered successfully. When the aggregate recover command is reissued, the restart data set ensures that data sets already processed are not recovered a second time.

During aggregate recovery, data is directed into the existing environment by the ACS routines for SMS-managed data and by the DEFINE ARPOOL command parameters for non-SMS-managed data. Although SMS is not required to be active to execute ARECOVER, SMS is required to recover VSAM data sets specified in the ALLOCATE list, or to recover any extended format data sets. Migrated data in an aggregate can be returned to the same migration level as at the prime site, or directed specifically to ML1 or ML2 during aggregate recovery.

The ARECOVER process is illustrated in Figure 1-3.
Additional output from the ARECOVER process includes an activity log, a functional statistics record (FSR), and updates to the aggregate backup and recovery (ABR) record. The ARECOVER activity log contains messages written during the aggregate recovery process.

For more information about ARECOVER, refer to Chapter 10, “Using ARECOVER” on page 145.

1.1.4 Strengths of ABARS

ABARS has been enhanced with functions and features requested by our customers. Highlighted below are the strengths that have set this product apart, integrating technology advancements and associated products.

The strengths of ABARS are:
- **Application data integrity**: A shared data set enqueue is requested for each data set. When an enqueue failure is encountered, ABACKUP will fail, unless specifically coded in the management class to continue.

- **Applications backed up at synchronization point**: ABACKUP can be executed whenever the proper synchronization point is determined. It can be initiated through a job scheduler, or an automation product, added to an existing job stream, or initiated manually by a user. Up to 64 ABARS tasks can execute concurrently, providing additional flexibility.

- **Integrated Catalog Facility (ICF) catalog support**: User catalogs can be defined along with the associated aliases by the ARECOVER process. The catalog information is captured during ABACKUP if user catalogs are listed in the ALLOCATE list of the selection data set.

- **Data set conflict resolution options for recovery**: When recovering in an environment with existing data, a number of options are provided to handle the existence of data sets with the same name. Actions that can be taken include renaming the existing (target) data set, renaming the backup data set with a new given high-level qualifier, replacing the existing data set with the backup (source) data set, or skipping recovery of the conflicting data set.

- **Cost savings**: ABARS provides the ability to specify exactly what data is needed, capturing only what is needed to define, allocate, and recover your critical data. Backing up only what is required reduces CPU time, use of system resources, hardware, and storage. Migrated data is backed up and restored in its compressed format, thus saving tape and disk. In addition, further efficiencies are gained with the ABARSTAPES(STACK) option, which provides stacking of all aggregate backup output data on (potentially) a single tape cartridge. You may also avoid duplicate backups by not including in the backup those data sets residing on volumes that are being copied with a remote copy method like PPRC or XRC. Specifying the SKIP(PPRC) or SKIP(XRC) option indicates ABARS not to include those data sets in the backup.

- **Device independence**: Backup copies of the data are created by DFSMSdss logical dump and DFSMShsm for migration data. Both output formats allow recovery with any supported storage devices. This provides flexibility during recovery if there are restrictions on available hardware.

- **Process migrated data without recall**: Migrated data sets specified in the INCLUDE list are backed up directly from migration volumes. This eliminates the need to recall data to primary disk space and migrate the data back. Also, migrated data can be recovered back to its original level in the hierarchy, or all to ML1, or ML2.

- **Concurrent copy support**: Data sets with high data availability requirements can be backed up with minimal interruption using concurrent copy. This option is specified in the management class associated with the aggregate.
1. Generation Data Group (GDG) enhancements: Beyond the ability to reference generation data sets (GDSs) by relative generation number for backup, ABARS will capture the GDG base information to define the bases during aggregate recovery. GDG bases can be defined in your recovery environment without the backup of a GDS.

1.2 ASAP

ASAP, a software product developed by Mainstar Software Corporation, provides a set of tools for storage administrators and applications development personnel implementing or managing an installation’s recovery strategy. ASAP is a companion product to IBM’s DFSMSHsm ABARS.

1.2.1 ASAP data set identification

ASAP identifies all data sets belonging to an application. It determines the include, exclude, allocate, or accompany status of each data set. The output of ASAP analysis is written to the selection data set defined in the ASAP database. The selection data set is input to the ABARS ABACKUP execution.

1.2.2 ASAP data set analysis

As jobs execute, SMF creates a record whenever data sets (including those dynamically allocated) are created, updated, read, deleted, or otherwise accessed. ASAP real time selection process (RSP) captures these records for each job defined in ASAP’s database. ASAP analyzes the first occurrence of each data set and determines its criticality. In rerun recovery scenarios, ASAP considers input data sets as critical and writes them to the selection data set as includes. ASAP considers output data sets as noncritical, because they will be recreated during the rerun at the recovery site. ASAP writes them to the selection data set as data sets in the INCLUDE statement.

1.2.3 Monitoring changes

Using the RSP, monitoring of application changes is continuous and automatic. RSP uses a standard IEFU83 SMF exit to collect SMF data as it is created. ASAP uses the SMF records to reanalyze the criticality of data sets in the application. Because of the continuous, real-time nature of this process, application changes are immediately recognized, and the next ABACKUP execution automatically reflects the change.
1.2.4 ASAP filters and controls

ASAP analysis generally identifies many common critical data sets. SYS1, SYS2, PROCLIBs, JCL libraries, control card libraries, are just a few examples of these types of data sets. Data sets of this nature are not application centric and therefore should not be included. ASAP provides filtering capability to exclude these data sets globally for all applications. This is just one example of ASAP’s filtering capabilities. Other filters provide powerful filtering on the data set, volume, system ID and unit name level.

1.3 Backup & Recovery Manager

Backup & Recovery Manager enhances and simplifies the ABARS function of DFSMShsm. The focus of Backup & Recovery Manager is to provide easy aggregate recovery, online monitoring of the ABARS process, selective data set restore, online and batch reporting and additional functionality not provided by DFSMShsm ABARS. Backup & Recovery Manager can be executed in either dialog or batch modes. Backup & Recovery Manager is a companion product to DFSMShsm ABARS.

1.3.1 Easy aggregate recovery

Backup & Recovery Manager maintains ABARS ABACKUP and ARECOVER information in the Backup & Recovery Manager Inventory Data Set (IDS). When Backup & Recovery Manager is used to recover an aggregate, all of the information needed in submitting the ARECOVER command to DFSMShsm is available in Backup & Recovery Manager. You do not need to provide the control file name and tape volume serial numbers (volsers) with the ARECOVER command. ARECOVER commands can be submitted from Backup & Recovery Manager online ISPF menu panels or in a batch job.

1.3.2 Online monitoring

The ABARS Monitor function allows monitoring of backups and/or recoveries, as they are executing, and to associate the ABARS started task with the actual aggregate and job executing it. In addition, interactive dialog panels provide detailed information about aggregate ABACKUP and ARECOVER events. DFSMShsm ABARS activity log information is imported into the Backup & Recovery Manager IDS. Information about the aggregate’s failure or success is selected and viewed in the dialog panels. ABACKUP is resubmitted or ARECOVER restarted using Backup & Recovery Manager.
1.3.3 Selective data set restore

Backup & Recovery Manager provides the ability to recover any data set or group of data sets from an aggregate. Subsets of data sets, such as primary, migration level one (ML1), migration level two (ML2) or user tape may also be selected for recovery.

1.3.4 Aggregate balancing

The Aggregate LoadBalancer, a feature of Backup & Recovery Manager, breaks down large aggregates into several smaller aggregates or combines smaller aggregates into one larger one.

Breaking down large aggregates reduces the overall run time of ABACKUP and subsequent ARECOVER executions. Aggregate LoadBalancer takes full advantage of the 64 concurrent ABACKUP and ARECOVER tasks.

Reducing the size of the aggregate reduces processing time, freeing data sets for use by other applications or processes.

Combining multiple aggregates into a single aggregate avoids excessive tape mounts and provides a method to better utilize the tape media capacity. Consider the ABACKUP and ARECOVER execution times before using this feature.

Note: ABARS Aggregate LoadBalancer, is a free component of Backup & Recovery Manager.

1.3.5 Online and batch reporting

Backup & Recovery Manager inventory reports may be generated online interactively or in batch. Some of the reports available include history information, data sets overlapping more than one aggregate, data set lists, volume list, disk resource usage, and event summary information.

1.3.6 Additional functionality

Selection Data Set Language (SDSL) is a powerful language facility that far enhances the native ABARS selection criteria of INCLUDE, EXCLUDE, ALLOCATE and ACCOMPANY lists.
SDSL provides nearly 30 additional selection attributes. Using SDSL, you can use the file name, management class, storage group, DSORG, LRECL, RECFM, migration status, change date, and more to include or exclude data. Also supported are extended masking of data set names, and support for pre-defined filter groups. Pre-defined filter groups are provided as a convenience and maintenance enhancement so that common filtering done in many different aggregates can be defined once, and used where required.

Boolean support in SDSL permits complex conditional logic; operators include AND, OR, XOR, and NOT. This makes tailoring of a specific set of inclusion or exclusion conditions simple to define.

The use of SDSL is an optional technique that provides dynamic, real-time analysis of data sets for selection in an aggregate. Based on the specified parameters, the results update the selection data set with a list of specific data sets matching the coded criteria prior to backup processing. This standardizes frequent changes to your installation's data sets by automatically examining them each time an ABACKUP command is executed and including the matching file names in an aggregate's selection data set.

**Logical Aggregate Management** is a feature that helps manage or prioritize a group of aggregates by a single ABACKUP or a single ARECOVER command. Using Logical Aggregate Management, a logical name is assigned to, and manages, two or more physical aggregates. As an example, several aggregates can be grouped into one logical aggregate named CRITICAL1. At the recovery site, a single recover command is issued from Backup & Recovery Manager's ISPF panel for the logical aggregate CRITICAL1. All of the unique physical aggregates that are included in the logical aggregate, CRITICAL1, are submitted to DFSMShsm for recovery. Any group of aggregates can be logically grouped together within Backup & Recovery Manager, and can be monitored, tracked, executed, and managed from that single, overall point of view.

**Catalog BaseLine** supports a *recover to empty catalog* methodology at the disaster recovery site. Empty catalogs are simpler, cleaner, and less error prone than taking populated catalogs and spending precious time and resources only to clean out unwanted catalog entries.

Catalog BaseLine backs up and recovers the necessary ICF catalog structure including necessary ALIAS entries and all required information necessary to re-create and reconnect the enterprise's ICF user catalogs to one, or multiple master catalogs.

Catalog BaseLine extracts and builds the necessary GDG bases to re-create the enterprise's GDG base definitions at the recovery site.
These processes produces either IDCAMS control statement syntax, or an ABARS selection dataset, to port either ICF user catalog definitions, or GDG base definitions, or both. Catalog BaseLine assures your catalogs and generation data sets are ready to support the empty catalog methodology.

**Note:** Catalog BaseLine, is a companion product of Backup & Recovery Manager available from Mainstar Software Corporation. It must be installed to use this facility.

**Dynamic Backup/Reorganization** allows the Backup & Recovery Manager inventory data set to be backed up or reorganized without stopping Backup & Recovery Manager's active programs. Dynamic reorganization of the Backup & Recovery Manager IDS is accomplished by temporarily pausing access by Backup & Recovery Manager programs to the IDS. The programs in progress are paused until the backup or reorganization is finished.

**Full Data Set Rename** allows for renaming the entire data set name, not just the high level qualifier. Native ABARS allows only a limited set of data set rename capabilities. In fact, only the data sets' high level qualifier may be changed using ABARS parameters RECOVERNEWNAMELEVEL or RECOVERNEWNAMEALL. Backup & Recovery Manager offers a more robust rename capability to allow for renaming the entire data set name.

**Incremental ABARS** provides a facility for true, incremental support for ABARS. Incremental ABARS does not rely on the change bit indicator, a separate data base called the DAD, is used to track the base and all of it's associated incremental backups. Incremental backups reduce the amount of resources used to back up unchanged data sets and can provide a significant reduction in run time.

Unlike traditional incremental processes, Incremental ABARS provides a smart recovery. Upon recovery, the DAD database is analyzed to select the most current backup copy of every data set included in the base + incremental set. Only the most current backup copy is recovered, all other versions of the data set are skipped using the ABARS skip exit, ARCSKEXT. In addition, the GDG base record is captured for every GDG backed up. Upon recovery, Incremental ABARS compares the GDG with the base record. If the GDG would have normally rolled off the GDG base, it's not recovered. This prevents an older copy of a GDG data set from becoming the most current GDG in the base.
Incremental ABARS is most effective for applications that create a daily, weekly, monthly, quarterly and annual cycles. Output from each cycle is used as input to the next. Incremental ABARS helps to ensure that all of the data sets needed to process forward into the next cycle type (daily to weekly as an example) are recovered when they are included in an incremental aggregate. This eliminates the need to keep track of and restore individual data sets or groups of data sets that are needed for the next processing cycle.

**Note:** Incremental ABARS is a companion product of Backup & Recovery Manager available from Mainstar Software Corporation. It must be installed to use this facility.
Business recovery concepts

Business recovery contains the elements needed to recover critical business functions in the event of a disaster. A disaster is defined as an extended service interruption of the data processing services of an organization which cannot be corrected within an acceptable predetermined time frame, and which necessitates the use of an alternative site or alternative equipment for recovery.

Designing and implementing a suitable disaster recovery solution is not a simple task. Approaching it in phases or steps can make the task manageable. A solution must be designed and built to match your business requirements. It requires the development and testing of many new procedures. Staff from many departments must be involved and must work together when developing and implementing the solution.
2.1 A structured approach to disaster recovery

A structured approach for developing and implementing a disaster recovery solution is recommended. Figure 2-1 lists the main activities involved in developing a disaster recovery solution.

![Structured approach diagram]

The first activity — determining what the business requires — should include an environmental analysis, a business impact analysis (BIA), or a risk analysis. An environmental analysis reviews selected business functions, outlines application interdependence and timing considerations, reviews data management practices and evaluates recovery capabilities. A BIA identifies and prioritizes business processes, assesses the business impact of a potential outage, determines required recovery time frames, and recommends recovery objectives. A risk analysis identifies the likely causes of failure to your business and recommends mitigation actions. Senior level management and business owners should make the final decision on criticality and priority of business functions and their associated recovery requirements. The responsibility and liability rests with them.
The next three activities — determining the data processing requirements, designing the backup/recovery solution, and selecting products to match the design — should already have been performed, since ABARS has been selected as one of the products for your backup and recovery solution. Hopefully, you were involved in that decision-making and selection process.

The fifth activity — implementing the backup/recovery solution — is the focus of the rest of this book. Information from these prior activities is used in the ABARS implementation process. For example, requirements for a business function or application are used as input for selecting techniques used for aggregate definitions and aggregate backup.

The sixth activity — keeping the solution up-to-date — involves ongoing maintenance to ensure that your backup and recovery plans continue to protect your ever evolving business. Maintaining an up-to-date solution seems to be difficult; it slips too easily to the bottom of our priority list.

Automating this task with ASAP can help you keep your environment protected. ASAP will identify changes in your environment. The changes need to be reviewed to determine corrective actions. Periodic reviews with application owners, disaster recovery planners, and management complete this activity.

### 2.2 Relationships between backup and recovery

A backup method chosen solely on the basis of data backup requirements can yield perverse effects during recovery. Backup processes do have a relationship to the recovery process. To better understand this relationship, let’s review data characteristics and requirements that should be considered for backup and recovery.

In selecting a backup method, these characteristics of the data being backed up should be considered:

- **Volatility**: How rapidly is the data changing? If it is necessary to recover a current version of the data in a short time, data that is changing rapidly needs to be backed up more frequently than static data. If the data does not change very often or if current versions of the data are not necessary, less frequent backups may be acceptable.
- **Criticality**: How important is the data to the operation of the business? The impact to the business of losing or having to recreate the data must be considered. Criticality is an important factor in the complexity of the backup plan.

- **Recovery time**: How soon must the data be available after a failure? This characteristic may not be the same as criticality. Data critical to the business may be accessed only periodically. Recovery time should include all tasks and time to make the data available to its users.

- **Data currency**: How close to the point of disaster failure must the data be? Would data captured 24 hours prior to the failure satisfy your business needs, or must all data be within minutes of the failure? (This currency requirement is often seen in the financial industry because of regulatory requirements.)

Other factors are involved in the selection of a backup technique:

- Data loss
- Usage pattern of the data (for instance, data permanently in use)
- Relationships with other data
- Structures requiring particular backup methods or tools
- Availability requirements

The backup method chosen may provide benefits for backup resources but have opposing effects on recovery. For example, using online image copies (ICs) but allowing updates to the database while the IC is taken provides greater access time for the application. The application is not quiesced during this process. Recovery, on the other hand, will be elongated because all logs created during the IC process must be used in the recovery of that database.

Conversely, to shorten database recovery time, frequent ICs are made, requiring more system time and output devices for backup in the production environment. This enhances recovery by decreasing the time and number of updates (amount of log data), required to recover the database. Thus, frequent backups increase data currency and reduce recovery time, but require more resources during backup.
Backup time and resources, data currency, data availability, and recovery time are interrelated, tugging and pulling at one another, as shown in Figure 2-2. We cannot look at just one set of criteria, we must look at all of these in the decision process.

![Interaction of backup and recovery requirements](image)

In addition to understanding the type of backup taken and the data recovery requirements, you must also ensure all data is captured and synchronized if you are to recover the critical data successfully. Not only is the database itself important, but the logs, catalogs, inventory data (such as the RECON data set in IMS), and recovery software are also important in recovering the database and restoring it to a logically correct form. Identifying data for backup within an aggregate or collection of aggregates, demands an understanding of everything needed for that application to function properly after it is recovered. All needed components, whether preserved with ABARS or another backup product, must be present at recovery.
2.3 Solutions for reducing perceived burden of backup

The data factors paired with backup and recovery requirements present challenges to even the best IT organizations. Storage software and hardware technologies have stepped up to meet these challenges. Data growth is increasing at a progressive rate, coupled with increased data availability requirements and the need to reduce use of backup resources (storage capacity and time). Therefore, how do we do more with less?

The storage capacity of hardware continues to increase along with performance. Even with these enhancements, time is still required to create a backup of your data. The need for data availability has been the biggest driver for reducing backup windows.

When data availability meets the predetermined availability requirements, and at the same time a backup of that data is produced, the visibility of the backup window is reduced. Time is still required to perform the backup, but if the data remains accessible, the extent of the backup window seems less troubling. There are solutions that allow access to the data while a backup is made without sacrificing data integrity. Some examples are:

- IBM concurrent copy, a function of DFSMS and 3990-based storage controllers
- SnapShot, a feature of RAMAC Virtual Array (RVA)
- FlashCopy, a feature of the Enterprise Storage Server (ESS)
- Backup-While-Open (BWO)
- Remote copy solutions such as IBM Peer-to-Peer Remote Copy (PPRC) and Extended Remote Copy (XRC)

Can these play a part with ABARS, and if so, how? Concurrent copy is supported by aggregate backup. When indicated in the management class associated with an aggregate, concurrent copy is used during the backup of data sets that reside behind concurrent copy capable storage controls. Updates to the data must be stopped only while the concurrent copy session is initialized. This is typically measured in seconds. Once the initialization is complete, updates to the data can resume.
Figure 2-3 depicts a standard offline backup process at the top of the figure. Database is unavailable throughout the duration of the offline backup. Online backup using concurrent copy greatly reduces the time of the outage, as shown in the lower portion of the figure. The only time the database is unavailable is during the initialization process.

A total disaster recovery solution demands multiple techniques and backup methods, because all data is not equal. Different requirements and priorities dictate different solutions. The key to success is marrying these techniques and methods together to produce a recovered business information base that functions in the order in which data is needed.

Remote copy solutions address data protection and data availability at the highest level. Remote copy can maintain shadow copies of data in real time at a remote site. This disk mirroring is performed at the volume level, independent of data and application types. It guarantees replication of write updates at the remote site in the same sequence as they occurred at the primary site. Application performance protection, data currency options, and data independence are all offered as part of the IBM remote copy design.

This level of protection and performance is used for data requiring recovery within an hour or less. Yet not all data is required within that time frame. ABARS is an ideal choice for data with recovery requirements closer to 24 hours and beyond. (ABARS can of course be used for data recovery requirements under 24 hours.)
ABARS has the ability to recover data into an existing environment, as does remote copy. The operating system, subsystems, and infrastructure, as well as critical applications will already be recovered and in production, when aggregate recoveries are performed. In this situation, it is important to identify any data set conflicts:

- Does a copy of the data being recovered by ABARS already exist?
- If a copy exists, is it more current than the ABARS backup copy?
- Should the copy be replaced with the ABARS backup copy?

When using remote copy with ABARS recovery, you need to identify your exposures in this environment and develop the correct actions to ensure success. You have also the option to exclude from the ABARS backup all these data sets that are being copied with a remote copy solution. This will eliminate duplicates.

BWO requires a recovery manager such as CICS VSAM Recovery (CICSvr) and DFSMS BWO support. The BWO facility is achieved by DFSMSdfp recording a timestamp of BWO backups in the ICF catalog. The backup utility must preserve this timestamp and restore it in the ICF catalog at the recovery site. CICSVR uses the timestamp to ascertain where to begin forward recovery. Because ABARS does not invoke the interfaces required for performing a BWO copy, BWO technique is not supported by ABARS.

SnapShot, a feature of the RAMAC Virtual Array subsystem, and FlashCopy, a feature of ESS, are optional high-speed data duplication functions, which can be used to copy a volume, or data set in the case of SnapShot, within seconds. SnapShot operates entirely within the RAMAC Virtual Array, FlashCopy within the same ESS logical subsystem (LSS), eliminating the CPU time and channel utilization associated with traditional data copying techniques.

With Virtual Concurrent-Copy (a concurrent copy like feature of SnapShot) available in DFSMSdss, ABARS invokes directly SnapShot when data to be backed up resides on an RAMAC Virtual Array volume and has CONCURRENT REQUIRED or PREFERRED specified in the ABACKUP COPY TECHNIQUE attribute of the management class.
Sample environment

“Crazy Socks Corporation” is a fictitious company we created to provide a sample environment to illustrate a practical application of an ABARS implementation, incorporating enhancements within ASAP and Backup & Recovery Manager. Since it is impossible to provide examples of all implementation scenarios, we select only the most widely used techniques in the chapters to follow.
3.1 Crazy Socks Corporation

Crazy Socks Corporation is a catalog and mail order company with a customer service department that accepts orders 24 hours a day, 7 days a week. The order entry system supports customer service centers in the United States, Canada, Puerto Rico, and Japan. It typically processes 120,000 orders every 24 hours. The current Crazy Socks Information Systems (IS) environment is described in 3.2, “Crazy Socks Corporation configuration” on page 26.

Before management selected ABARS, ASAP, and Backup & Recovery Manager as the recovery solution tools, a BIA and environmental analysis identified the critical business functions and their relationships to the cost of the recovery solution. The maximum acceptable outage and recovery priorities were identified by Crazy Socks senior management and have been provided to the Information Systems Division. The information identified from the studies is presented in 3.3, “Data classification and recovery requirements” on page 28.

Our current recovery plan depends on a weekly quiesce of all applications to perform full-volume dumps of all disk volumes. This process has a significant impact on our ability to accept and process customer orders during the backup window. The impact is also felt on all other applications that support the order entry system. The current process, described in 3.2.2, “Current disaster backup procedures” on page 28, needs to be changed to meet the recovery requirements outlined in the BIA and environmental analysis.

Two recovery scenarios have been chosen to describe different sets of objectives sent down from senior management. They are presented in 3.4, “Recovery scenario A” on page 31, and 3.5, “Recovery scenario B” on page 32. We are using two scenarios to illustrate a number of ABARS techniques and solutions; you need only one recovery solution.

3.2 Crazy Socks Corporation configuration

The configuration described in this section is intended to provide you with necessary information regarding the environment of Crazy Socks Corporation. We did not attempt to provide all the details of a typical environment. The ABARS, ASAP, and Backup & Recovery Manager recovery solution provided in subsequent chapters has been developed with reference to this configuration.

The Crazy Socks environment is as follows:
Chapter 3. Sample environment

3.2.1 Crazy Socks business processes

The Crazy Socks information systems operate in a well structured environment. Naming conventions are used for data sets, jobs, and SMS constructs. Following are the naming conventions for our batch jobs. This information will be used as we develop our ABARS backup solution.

The Crazy Socks naming convention, AAAUC###, is used for batch jobs. Each component is described below:

<table>
<thead>
<tr>
<th>AAA</th>
<th>Three-position acronym of the related application</th>
</tr>
</thead>
<tbody>
<tr>
<td>U</td>
<td>Cycle indicator (W - Weekly, M - Monthly, D - Daily)</td>
</tr>
<tr>
<td>C</td>
<td>Country (U - Unites States, C - Canada, P - Puerto Rico, J - Japan)</td>
</tr>
<tr>
<td>###</td>
<td>Three-position numeric</td>
</tr>
</tbody>
</table>

Hardware:
- Two 9672 RX3 Parallel Enterprise Servers
- 1.35 terabytes of disk, comprising:
  - IBM Enterprise Storage Server (ESS) with 3390 model 3 devices defined
  - IBM RAMAC Virtual Array configured as 3390 Model 3s
- Tape systems:
  - IBM 3490E manual tape subsystems
  - IBM 3494 Tape Library Dataserver with both 3490E and 3590 tape subsystems
  - IBM 3494 Virtual Tape Server with 3490E virtual volumes

Software:
- z/OS 1.3, with the full set of DFSMS features:
  - DFSMSdfp
  - DFSMSdss
  - DFSMSshsm
  - DFSMSrmm
- ASAP V5.R01 (Service Pack D)
- Backup & Recovery Manager V3.R01
- Incremental ABARS V3.R01
- CatalogBaseLine V1.2.03

Database management subsystems:
- CICS
- IMS
- DB2

Catalogs:
- 1 ICF master catalog
- 17 ICF user catalogs
Approximately 60% of our data is SMS-managed. Both ML1 disk volumes and ML2 tape volumes are defined to DFSMSHsm.

We strictly enforce our data set naming conventions and have well organized user catalogs. However, we recognize that even in the best environments, a data set or job could slip through our procedures. As a result, we must ensure in our ABARS implementation activities that we check for these occurrences outside the normal process.

### 3.2.2 Current disaster backup procedures

Full-volume dumps are performed weekly within a 10 hour backup window, starting 10:00 pm Sunday night and ending at 8:00 am Monday morning. All disk volumes, excluding volumes containing the JES2 spool, page, space, temporary data sets, and sort work files, are dumped. Any failures encountered push this dump process beyond the 8:00 am stop time, and cause us to forfeit capturing volumes of data. Our applications are quiesced during the backup window to ensure data integrity and data synchronization across all volumes.

We have reduced the number of disk volumes processed because of the limited backup window. The amount of data we manage has grown at a steady rate and the current dump process cannot keep up with this growth.

**Vaulting cycle**

Each Monday at 10:00 am, our tape vault vendor picks up our newly created dump data. We keep four versions off site at our vendor’s storage facility.

At 8:00 am tape management housekeeping is run to produce the list of tape volumes to be sent off site. The tape volumes are prepared for pick up at 10:00 am.

### 3.3 Data classification and recovery requirements

Crazy Socks Corporation has systems support data and hundreds of applications that need to be recovered in the event of a disaster. The BIA and environmental analysis provided criticality levels to classify the data. The data classification levels, recovery time objective (RTO), and data descriptions are described below.

#### 3.3.1 Immediately critical data, to be recovered within 8 hours

Data of the highest level of criticality should be restored within 8 hours after gaining access to our recovery site.
This category forms the first layer of recovery. The software products and data provide the framework for our recovery environment. This data, which must be present before recovering any application data, includes the following:

- **Operating system**: Data required to restore and IPL the MVS system, which includes DFSMS, JES2, and VTAM. Our security product RACF will be restored within this group of data. The scheduling system and automation software are recovered as well.

- **Database management subsystems**: The database subsystem data supporting our applications, CICS, DB2, and IMS, fall within this group.

- **Disaster recovery software, tools, and utilities**: This group includes our Backup & Recovery Manager software, tools and utility data sets with our customized procedures needed for disaster recovery.

- **Infrastructure data**: Our infrastructure data includes the master and user catalogs, DFSMSHsm control data sets, Backup & Recovery Manager inventory database, RACF and DFSMSrmm databases.

### 3.3.2 Highly critical data, to be recovered in 24 hours

Applications with a business recovery requirement of 24 hours fall in this category. Recovery begins after DFSMSHsm and Backup & Recovery Manager are available.

The associated application acronym is listed for easy identification:

- **Order Entry (ORE)**: Our order entry application supports Customer Service departments in all four countries. The Customer Service Representative (CSR) inputs the order while the call is active. The average length of the call is 10 minutes. Mail orders are processed in a similar fashion by CSRs in all locations.

- **Accounts Receivable (ARS)**: The accounts receivable application processes input from the order entry application, extracting customer information and credit card numbers for processing.

- **Product Procurement (PPS)**: The product procurement application processes input from the order entry application, extracting orders to be filled and producing customer order lists for the Order Processing department.

- **Inventory (INV)**: The inventory application interfaces with the product procurement application and the order entry application, providing product availability to the CSR and product order invoices to suppliers.

- **Payroll (PAY)**: The payroll application supports 10,000 full and part-time employees and produces weekly payroll checks.
3.3.3 Moderately critical data, to be recovered in 48 hours

Applications with a business resumption requirement of 48 hours fall into the moderately critical level. Data recovery begins as soon as all more critical applications have been successfully recovered.

Two applications were identified in this category: Shipping and Receiving, and Accounts Payable. All other software products that are required by the remainder of the business (such as vacation or maintenance schedulers) were placed in this level also. These products are needed to run the applications, but are not required prior to recovering the application data:

- **Shipping and Receiving**: The shipping and receiving application processes input from the product procurement and inventory applications to ship orders to customers and receive product from suppliers.
- **Accounts Payable**: The accounts payable application processes input from the Product Procurement application to produce payment checks for administration cost and suppliers.
- **Software support**: Data sets needed for the recovery of software products used by the business but not essential to support the recovery of other data.

3.3.4 Less critical data, to be recovered in 4 days

Applications with a business recovery requirement of 4 days include historical marketing data and new product development. Data recovery begins as soon as data at higher levels of criticality is successfully recovered. Included are:

- **Historical or Archived Data (MKT)**: An example is the seasonal and trending reports used by the marketing department.
- **Business Development Data (CSC)**: As example is information regarding new products in development. Once products complete the development phase, they are input to the Crazy Socks Catalog application. The information is then used to provide product descriptions for the next catalog printing.

3.3.5 Least critical data, to be recovered in 7 days

TSO and test data have a business recovery requirement of about 7 days. TSO and test data support TSO users and applications development. Such data may not be recovered in a disaster recovery test scenario but is needed in the event of an actual disaster.
3.3.6 Changes required for production cycles or a vault run

Changes are needed with our current tape vault vendor, to increase the frequency of pickup and the storage capacity. Daily pickups are needed to meet our new recovery and data currency requirements. The time of pickup will be determined once our backup times are determined for the Immediately Critical and Highly Critical data.

A point in time will be established within the 24 hour period to synchronize the infrastructure data (the Backup & Recovery Manager inventory data set, user catalogs, tape management database, scheduling database, DFSMShsm control data sets, and security database), with the Highly Critical data. Applications and subsystems will be quiesced to ensure data integrity while backing up the infrastructure data. Backup techniques such as concurrent copy can be used to minimize application downtime.

3.4 Recovery scenario A

In our first scenario, the recovery objectives were developed, based on the studies performed, and requirements from our business function owners were received. Our ABARS recovery solution for Scenario A is described in 3.4.2, “Recovery solution” on page 32. Decisions on our backup techniques were made based on the recovery objectives.

3.4.1 Recovery objectives

An explanation of how each item meets a recovery objective is included in 3.4.2, “Recovery solution” on page 32. In subsequent chapters we will provide details on how each recovery objective is accomplished.

The Crazy Socks IS department was given a list of objectives to develop the recovery solution. The business and storage objectives are these:

- Reduce the backup window to 2 hours.
- Eliminate full-volume dumps of application data.
- Provide 95% availability for highly critical applications.
- Use 3590 tape cartridge capacity efficiently for ABARS backup data.
- Meet recovery objectives developed in the BIA and environmental analysis.
- Improve data protection and currency for the highly critical applications. Data cannot be older than 24 hours from point of failure. This affects frequency of backup and vault runs.
- All migration data (ML1 and ML2) will be recovered in a disaster.
3.4.2 Recovery solution

The following will be used in our ABARS implementation. Each item is directly related to a recovery objective. Our solution includes the following:

- Implementing ABARS aggregate backup for our application data will eliminate the need to perform full-volume dumps. As we implement ABARS, we will continue the full-volume dumps until all data from a particular volume is backed up with ABARS. A premature halt to a full-volume dump could leave us exposed in the transition period. Once we are fully implemented, the full backup window reduction will be achieved.

- We will use concurrent copy as the backup technique for application data requiring 95% availability. Concurrent copy allows updates to the data while a backup is taken, reducing application downtime for backup. This backup technique is specified in the management class associated with the aggregate.

- We will use SETSYS ABARSTAPES(STACK) to use tape cartridges efficiently. The aggregate backup output data sets are stacked on as few tape cartridges as possible, with one as the minimum.

- Aggregate backup for highly critical applications will be run daily. The vault run times will be adjusted and frequency increased.

- All catalogs will be recovered. The decision was made to take all migrated data to the recovery site. Catalog entries must be present to access migrated data. Therefore, all catalogs and their content must be present at recovery.

  SETSYS DUPLEX(MIGRATION(Y)) will be coded to automatically create a second copy of all ML2 volumes. The second copy, with data set name prefix.COPY.HMIGTAPE.DATASET, is sent offsite for disaster recovery. The ACS routine can be used to route the second ML2 copy to a remote tape library. This setting helps to meet our requirement of taking all migrated data to the recovery site.

  Any migrated data backed up by ABARS will be recovered to the same level of the storage hierarchy. This is a consideration for aggregate recovery.

3.5 Recovery scenario B

Scenario B has a slight variation in recovery objectives, which translates to a different set of items in our recovery solution.
3.5.1 Recovery objectives

The objectives senior management and the IS division have given us are the same as for Scenario A, except that migration volumes will not be backed up and migration data will not be taken to the recovery site. Any migration data needed for recovery must be backed up by ABARS, or some other means.

3.5.2 Recovery solution

The recovery solution for Scenario B is the same as for Scenario A, with the following differences:

- User catalogs will be defined during the recovery process. We will structure our catalogs such that only application data is contained in a particular set of user catalogs. Those catalogs will be specified in our aggregates, capturing the information to define them during aggregate backup. See 4.2.2, “Catalog Considerations” on page 32, for further discussion on handling catalogs.

- We will ensure efficient use of our 3590 tape cartridges by analyzing our aggregate group data and logically grouping smaller aggregates with ASAP Aggregate LoadBalancer processing. This is discussed in 7.5, “Aggregate Balancing” on page 91.

3.6 Our ABARS backup and recovery strategy

We employ the order entry application (ORE) to describe the techniques used in each of the recovery scenarios. Order entry has feeds into other applications, and the resulting interrelationships will be considered when building aggregates for the remaining highly critical applications. A discussion of interrelationships and overlapping data sets is included in 5.6, “Interfacing Systems” on page 53, and 7.4, “Identifying Overlapping Data Sets” on page 90.

Beyond ABARS implementation, there are process changes and coordination needed, including aggregate backup. Synchronization of infrastructure data, such as catalogs, must be coordinated with the new ABACKUP process. Operational changes may be needed, as well as communications with our offsite vault storage vendor.

ABARS, ASAP, and Backup & Recovery Manager offer many options to handle a range of situations. We cannot describe all possibilities in this book, but we want to give you enough tips and solutions to form a good foundation. You can then go on to successfully implement ABARS in your environment. If more specialized skills are needed for your project, IBM and Mainstar have consultants who can work with you from planning and solution design to full implementation.
ABARS implementation tasks and considerations

This chapter is divided into three sections:

- 4.1, “ABARS implementation tasks” on page 36 outlines activities to be addressed and performed, in addition to roles and responsibilities.

- 4.2, “Data considerations” on page 39 covers types of data in your environment, data supported by ABARS, and data related to aggregate backup.

- 4.3, “Setting up your ABARS environment” on page 46 discusses your tape management system, protection of tape resources and ABARS data, ABARS secondary address space authorization, and SETSYS and DEFINE ARPOOL commands.
4.1 ABARS implementation tasks

Thirteen major tasks are involved in implementing ABARS with the assistance of ASAP and Backup & Recovery Manager. Details for each task will vary, depending on your project needs, your business environment, and your personal preferences. We outline the tasks here as guidelines to use in building your own project plan.

These are the major ABARS implementation tasks:

1. Gather backup and recovery requirements for your disaster recovery solution, or develop them if none exist. To do so:
   – Define the scope of the ABARS project.
   – Identify applications for ABARS implementation.
   – Identify recovery priorities for applications and business functions.

2. Select a pilot application to begin implementation with the following criteria:
   – Set up a flexible schedule for ABACKUP and ARECOVER testing.
   – Make sure batch and online job streams are identifiable.
   – Decide on well defined cycles.

3. Educate project participants, including:
   – ABARS education
   – ASAP education
   – Backup & Recovery Manager education
   – Lab or hands-on activity for each

4. Collect data through interviews, questionnaires or both. Focus on:
   – Application data:
     • Naming conventions for data sets and jobs
     • JCL libraries and job names
     • Current backup and recovery procedures
     • Current restart procedures
     • Serialization requirements
     • Application dependencies
     • Application cycle
   – Production schedules
   – Application interrelationships

5. Define your applications to ASAP.

6. Validate application data with ASAP and review with application owners.
7. Define your aggregates with ISMF, including:
   - Selection data set
   - Instruction data set
   - Management class

8. Configure your ABARS environment:
   - Security of ABARS address space, data, and commands
   - Tape management
   - Installation exits
   - SMS ACS routines
   - SETSYS commands
   - Definition of ARPOOL

9. Import aggregates into Backup & Recovery Manager.

10. Test and verify ABACKUP:
    - Run ABACKUP with VERIFY.
    - Execute ABACKUP to test synchronization and serialization.
    - Perform tuning of run times, aggregate definition, and data selection.

11. Phase ABACKUP of aggregates into production:
    - Make scheduling changes and schedule process management steps.
    - Notify help desk staff of changeover phases and dates.
    - Make operational changes.

12. Test and verify ARECOVER:
    - Test within your primary facility.
    - Test during disaster recovery exercise at remote site.
    - Tune or redefine aggregate and backup if needed.

13. Establish ongoing maintenance of aggregates and procedures:
    - Incorporate procedures in disaster recovery plans.
    - Change management.
    - Schedule periodic reviews with application owners and disaster recovery planners.
    - Carry out periodic reviews with management.

### 4.1.1 Roles and responsibilities

We are often asked several questions:

- Who should work on this project?
- Should application owners be responsible for creating their backups?
- Who can give me the data I need to implement ABARS?
Although we would like to give you direct answers, these would depend on your business environment and structure, management style, and business requirements. Typically, storage administrators, system programmers, application owners, operations, staff, schedulers, first-line management or team leaders, and disaster recovery planners are involved in varying tasks and to varying degrees throughout the planning and implementation phases. However, there should be one leader: a Disaster Recovery Coordinator who is also the disaster recovery project manager. This person who has overall DR responsibility, needs strong people management and project management skills. He or she should be responsible for managing the education and getting the right people involved.

It would be futile to give you recommendations as to responsibilities that do not line up with your business structure. Therefore, you need to identify the framework you must work from. To provide the foundation for understanding roles and responsibilities for your implementation tasks, start with at least the following:

- Clearly state your ABARS implementation objectives.
- State the business requirements of the organization, such as application product requirements, recovery requirements, prioritization of business functions or applications, and service level agreements.
- Define existing organization or department responsibilities, including your own, in these areas:
  - Data center operations
  - Production control
  - Systems and storage administration
  - Database administrators
  - Applications
  - Business recovery and contingency planning
- Define change management and process management procedures.

This information can be used as your guidelines for gathering data, incorporating backup changes, and gaining commitments.

To help you accomplish your tasks with the least amount of resistance, we suggest a phased approach to build confidence and credibility. Choose a group of data with low vitality (does not change rapidly), low priority, or one controlled by those who are most open to adapting ABARS. Success of one implementation can fuel subsequent efforts. Concentrate your efforts to ensure success.

Gather all the people whose functions will be touched by this change. Explain the tasks involved and provide ABARS education. Fear of the unknown and lack of understanding of project goals stop more projects than anything else.
In addition, if processes need change, lay the foundation for change as one of your implementation tasks. Set up a help desk for questions and answers or assistance with errors.

Management understanding and commitment are important to your success, as is commitment from other key individuals throughout your organization.

4.2 Data considerations

Disaster recovery preparation must recognize the different data categories and data elements across platforms: MVS, distributed, and network. In addition, business and operational pressures today also prevent us from adopting any one disaster recovery solution. For details on devising a total disaster recovery solution for all data, and how that solution can be made strong in the face of various business and operational issues.

Critical data can be grouped into three general categories, as shown in Figure 4-1. The categories are system, infrastructure, and application. This includes both data and software; data priorities are also involved in the context of backup and recovery programs.

![Figure 4-1 Categories of critical data](image-url)
- **System data:** Is largely independent of the application data and, therefore, may have less dependence in terms of when it can be backed up. This includes the system platform and related files needed for the initial programming load (IPL) of an operational system. It consists largely of system software that is normally purchased from vendors, but requires tailoring. This data is typically subject to little change between new system releases. It is the most readily recreated type of data.

- **Infrastructure data:** Interacts with application data. The relationship is such that there is a volatile rate of change of infrastructure data to satisfy the operational requirements for the application data. This relationship, therefore, results in dependence between when each data category can be backed up and the moment, operationally, when each data category can be recovered.

  This category includes subsystem data supporting an application, such as database management subsystems, the catalogs, inventory data, and security data. All these kinds of data are subject to change based on the operational requirements of the user environment. Although these are often viewed as system data, the category is typically more volatile.

  The system and infrastructure data in our sample business environment, Crazy Socks Corporation, have been identified as the most immediately critical, requiring recovery within 8 hours. This data will continue to be backed up with full-volume dumps. All of this data is grouped into separate disk volume pools. Select data structures, such as the catalogs, RACF database, and DFSMSrmm database will have separate backup processes as close as possible to the vault pick up time.

- **Application data:** Consists of all data belonging to an application (databases, work files, programs, and so on) that must be present for the application to run. In a disaster, most of this data has to be recovered or re-created to enable application recovery. An important subset of the application data is what is known as business data. This is data that pertains to the business the IT organization supports. It is the reason for information processing, and it is also the most volatile, the most valuable, and the most challenging to recreate.

  Databases used by the major IBM subsystems are backed up by the associated product facility, IMAGE COPY for IMS, COPY for DB2, and VSAM Backup-While-Open for CICS. Other vendor products are designed specifically for database backup and recovery. There are specific functions provided in each of these backup and recovery utilities beyond creating a copy of the data for backup purposes. Database utilities provide database backups either online or offline, register or catalog the backup data sets for use in recovery, prepare and consolidate the log data for input to forward recovery, and automate the actual database recovery process. Because of these extra utility functions, ABARS is not needed to create database backups.
ABARS has been used to manage and logically group required DB2 data for recovering DB2 databases. This procedure is documented in *DB2 for MVS/ESA Version 4 Administration Guide*, SC26-3265. Most of the DB2 data, already backed up by other utilities, can be specified in the ACCOMPANY list, such as image copies of table spaces and archive logs. Data sets that need to be allocated at the recovery site to perform the database recovery, such as the boot strap data sets (BCDSs), logs, DB2 catalog, and DB2 directory, can be specified in the ALLOCATE list. Although ABARS is not used to back up the databases, it provides enhancements to an already established DB2 backup and recovery process.

### 4.2.1 Data supported by ABARS

In ABARS, there are three classifications of data for aggregate backup. The first is data that is copied or backed up. ABARS makes a backup copy of the data including all information required to recover it, such as catalog information and SMS attributes. This data is specified in the INCLUDE list.

The following data sets are supported by the INCLUDE list:

- VSAM data sets
- Partitioned data sets
- Extended format data sets (PDSEs, and VSAM)
- Physical sequential data sets
- Generation Data Group (GDG) data sets
- Direct access data sets
- SMS and non-SMS-managed data sets
- Level 0 and migrated data sets
- Empty data sets
- Disk and tape data sets

The second classification is data that is allocated. Only the information needed to allocate the data set is captured, not the contents. DB2 tablespaces that must be allocated before DB2 utilities execute the recovery process are good candidates for the ALLOCATE list. Many batch environments create generation data sets (GDSs). In some cases batch runs do not need the content of GDSs, but do need the GDG base to create subsequent generations. To satisfy this requirement, the ALLOCATE list can be used to capture the GDG base without backing up any of the GDSs.

The third classification is data that is already in a transportable form on tape, not requiring another backup, yet has the need to be logically grouped with the aggregate. These data sets are specified on the ACCOMPANY list. Catalog information is captured and stored with the aggregate backup data.
During aggregate recovery, only catalog entries are built for these data sets. The tape volumes containing these data sets will be identified as part of the set needed for recovery of this aggregate. These tape volumes must be transported along with the aggregate backup tapes to your recovery site.

For a complete list of data set types supported by ABARS backup INCLUDE and ALLOCATE functions, refer to *DFSMShsm Implementation and Customization Guide*.

### 4.2.2 Catalog considerations

Catalogs are the key to locating data. Without them (or with incorrect entries), locating data is very difficult or nearly impossible. Thus catalogs are a critical resource that must be recovered.

There are two methods of recovery for catalogs. One method is to back up the catalogs in their entirety. You can then restore them in the form that existed at the time of backup.

The second method is to define the catalogs at the recovery location and build all needed entries. Various recovery products create catalog entries as part of the recovery process including ABARS.

Consider the following when choosing your catalog recovery method:

- Will the recovery process for your data include creating a catalog entry? For example, a DFSMSdss full-volume logical restore of a disk volume can create catalog entries for data sets being recovered.
- Will data be transported to the recovery site on media, such as tape, that does not require a recovery process to be accessible? Tape media is easily transported and the data contained on those tape volumes could be accessed directly by an application or utility:
  - Database management system log data is archived to tape. During the database recover process, the log data is read directly from the tape volumes. Catalog entries would be required to locate and access the log data from tape, unless the tape volume serial numbers are coded in the recovery utilities. The database recovery utilities do not create catalog entries for this data during the recovery process.
  - Migrated data on ML2 tape requires a catalog entry to be present to reference that data. A catalog entry is required to locate the data set and invoke DFSMShsm to recall the data set.
A third example is data that is routed electronically to disk or tape with channel extenders to a remote site for disaster recovery. This data can be accessed directly as long as there is a catalog entry giving the location of the data.

If you have any of these data situations in your environment, you will need to provide catalog entries at the recovery site.

The method that has the fewest errors is backing up the catalog in its entirety. Trying to create needed catalog entries during recovery provides opportunity for errors. Were all needed entries created? Were all entries created correctly? Even building pre-generated DEFINEs leaves you with ongoing maintenance to ensure that what is built matches the current data set entries.

In a well-structured user catalog environment, it may be possible to identify which catalogs contain data needed for recovery. Then only those catalogs need to be backed up for disaster recovery.

On the other hand, if your recovery processes include creating catalog entries for all required data, then you can choose to define your catalogs at the recovery site. ABARS provides a function, ALLOCATE, that will do just that. List all required user catalogs in the ALLOCATE list. All information necessary to define the catalog, along with the associated aliases will be backed up in your aggregate. This is a nice clean way to start your recovery. A side benefit of this technique is eliminating the down time scheduled to back up these catalogs, thus shortening your backup window.

In our sample environment, recovery scenario A states that all catalogs will be backed up and recovered in their entirety. The catalogs are part of the infrastructure data and will be recovered before any ABARS recovery is performed. Therefore all catalog entries and aliases will be present at recovery.

It is crucial to synchronize the contents of your catalogs with all other backup data. Catalogs are usually one of the last items to be backed up. This allows you to ensure that catalog entries are created for all backup data.

Now that your catalogs exist in the recovery environment, what effect will this have on ABARS aggregate recovery? ABARS will create a catalog entry for data sets in all three categories, INCLUDE, ALLOCATE, and ACCOMPANY. When a catalog entry already exists, ABARS will fail to recover that data set unless the DATASETCONFLICT parameter is coded, or the ARCCREXT installation exit is active.

ABARS is designed to function in an environment with full catalogs as well as empty ones. A simpler recovery is achieved with empty catalogs, as ABARS builds the catalog entries and no other decisions need to be made.
Environments with full catalogs involve several options for resolving catalog entries. The first option is to replace the catalog entry with the correct information. This is specified on the DATASETCONFLICT parameter with the REPLACE option. ABARS will then perform a DELETE or DELETE NOSCRATCH to delete the catalog entry and rebuild it, reflecting the current status and location of your data.

When a data set is included in multiple aggregates, each aggregate will have different execution times and priorities, making it likely that the contents of the data set will be different in each aggregate at any one time. The highest priority aggregate in recovery will probably have the most current data. As lower priority aggregates are recovered with the REPLACE option, the existing data could be regressed to an earlier state.

It is important to recognize and understand the exposures of overlapping data sets. ASAP and Backup & Recovery Manager can help identify these data sets. See 7.4, “Identifying overlapping data sets” on page 109, and 9.1.6, “Search for Dataset” on page 134, for further details.

Another option is to rename either the existing (target) data set or the source data set (data set being recovered). DATASETCONFLICT subparameters indicate the action to resolve the conflict. This option applies only if the data set is found on the volume referenced in the catalog entry. If only a catalog entry exists, REPLACE is your only option.

Decisions are needed for data sets from the ALLOCATE and ACCOMPANY lists, as ABARS creates catalog entries for these also. GDGs have traditionally offered challenges in recovery. Many do not understand how GDG bases and GDSs are processed by ABARS. When a catalog entry does not exist for a GDS, but the GDG base is defined in the catalog, the REPLACE option must be specified to either recover or allocate the GDS. The GDG base reflects the current active set. When a GDS is recovered or allocated, the GDG base is altered to reflect that GDS in addition to a catalog entry for the GDS itself. For thorough details regarding GDG processing, refer to DFSMShsm Storage Administration Guide.

### 4.2.3 Naming conventions

ABARS, ASAP, and Backup & Recovery Manager all require definitions of application names, aggregate names, output data set names, selection data set names, and management class names. We recommend that you establish naming conventions in support of your recovery solution. This section describes the opportunities for naming conventions.
ASAP applications
A name is assigned to applications defined in the ASAP database. Most often, this is the same name as the aggregate name that is defined in ISMF and Backup & Recovery Manager. ASAP applications may have a one-to-many relationship with the defined aggregates. Establishing installation-wide naming conventions helps to facilitate this relationship.

Aggregates
Aggregates are defined in ISMF. Aggregate names can be formulated using application acronyms, cycle descriptors such as daily (D), weekly (W), or monthly (M), numbering schemes (001, 002 003), company codes, and a variety of other tokens meant to provide descriptive information about the application and the supporting aggregates.

Selection data set
Selection data set (SDS) names are defined in your aggregate group and ASAP. A total of five SDSs can be specified for each aggregate. ASAP supports two different SDS names: one is for testing support and the other for production support. The production SDS might be named so that update access is not allowed except by scheduling software and administrators. Support for two SDS names gives those who do not have update access to the production name an ability to complete ASAP application analysis and possibly test the ABACKUP execution.

ABARS output data set name prefix
The output data set name prefix is defined in your aggregate group and is appended to the beginning of the output data sets created by ABARS. It is often desirable to create a new high-level qualifier, such as ABARS, to easily identify and segregate ABARS output data sets from other data sets. We recommend using the aggregate name as one of the qualifiers in the output data set name prefix. This allows for correlation between output data sets and aggregates.

Management class
ABARS uses management classes to provide information on cycles, data set serialization, and other characteristics used by ABARS. We recommend that you define separate management classes for ABARS, although this is not a requirement. These management classes will contain specific attributes for ABARS aggregates and are used in the aggregate definition in ISMF. If you already have naming standards for SMS classes, you can incorporate ABARS management class names into the existing convention. If, however, a convention is not in use, we recommend that some thought be applied to naming these classes.
4.2.4 Vaulting cycle

A vaulting cycle is described as the synchronization of support data, such as user catalogs, the security database, the tape management database, the scheduling database, and related data sets. Tape-management housekeeping is run to produce pull lists for tape volumes to be sent offsite. The volumes are collected, packaged, and picked up by the offsite storage vendor for safe keeping.

Some environments require more frequent vaulting of data. Electronic vaulting can provide this protection. Data is transmitted to tape media located at a remote site. Once the data is created at the remote site, the data is protected. No manual intervention is required, transportation costs of time and storage are avoided, and there is less chance of error. This is also described as a vaulting cycle even though it may occur more than once a day.

4.3 Setting up your ABARS environment

There are a number of SETSYS parameters for ABARS to code in the DFSMShsm parameter library (PARMLIB) member ARCCMDxx to ensure that the settings are defined to DFSMShsm at startup.

4.3.1 SETSYS commands for ABARS

The SETSYS command allows you to externally define various aggregate backup and recovery options. Refer to DFSMShsm Implementation and Customization Guide, and DFSMShsm Storage Administration Reference for an explanation of the SETSYS commands and their values.

These are the SETSYS parameters pertaining to both ABACKUP and ARECOVER:

- **MAXABARSADDRESSSPACE(nn)** specifies the maximum number of concurrent ABARS secondary address spaces that DFSMShsm supports (up to 64).

  When determining this value, you should factor in such items as system load, resource contention, and aggregate backup and recovery activity. The overriding factor is the number of tape drives available. Aggregate backup uses at least one tape drive for each address space and two if backing up user tape data sets or data sets residing on ML2 tape. (The default for MAXABARSADDRESSSPACE is 1.)
**ABARSProCName** specifies the procedure name that is used to start an ABARS secondary address space. DFSMShsm appends `ABARSnnst` as an identifier. The value `nn` changes each time a new address space is started, ranging from 1 to 64. The value `st` is derived from the current clock time when the procedure is started.

**ABARSActLogMsgLvL(Full | Reduced)** indicates which DFSMShsm messages should be written to the ABACKUP and ARECOVER activity logs. When beginning implementation of ABARS, we recommend using `FULL` to receive all messages. Once you are familiar with the aggregate backup process and your aggregate data, change to `REDUCED`.

When `REDUCED` is specified, only the DFSMSdss messages ending in a ‘W’ (warning) or ‘E’ (error) are written; no informational messages are passed.

**ABARSActLogType(SYSOUT(Class) | DASD)** specifies whether the ABACKUP and ARECOVER activity logs will be written to SYSOUT or DASD. The ABACKUP activity logs must be directed to disk to be included in the aggregate backup output data set. Backup & Recovery Manager also requires that the activity logs be directed to disk to capture needed information for aggregate processing.

**ABARSDeleteActivity(Y | N)** indicates whether or not DFSMShsm will automatically delete the ABACKUP and ARECOVER activity logs corresponding to the ABACKUP version being rolled off. The deletion occurs during ABARS roll-off processing or EXPIREBV ABARSVERSIONS processing, and removes the need to manually manage the ABARS activity logs. By setting this parameter to `Y`, the deletion will correspond to the expiration of the aggregate backup data.

**ABARSBuffers(n)** indicates the number of ABARS I/O buffers, up to a maximum of nine buffers. DFSMShsm multiplies the number by two and uses one-half for input and the other half for output. We have seen a buffer number of five used most often.

**EXITOn(exitname)** lets you specify which installation exits (ARCBEEXT, ARCEDEXT, ARCM2EXT, ARCTVEXT, ARCCREXT, ARCSKEXT) are active during aggregate backup processing. (If you are using DFSMSrmm, ARCTVEXT does not need to be specified.)

Installation-wide exits are described in “Using the Aggregate Backup Installation-Wide Exits” and “Using the Aggregate Recovery Installation-Wide Exits” in *DFSMShsm Storage Administration Guide*. Installation-wide exits allow you to customize your environment according to your backup and recovery needs.
These are the SETSYS parameters pertaining to ABACKUP:

- **ABARSOPTIMIZE**(option) allows for adjustments in performance when invoking DFSMSdss to back up Level 0 disk data sets from the INCLUDE list. The values are one, two, or five tracks at a time or one cylinder at a time. This parameter can be overridden on the ABACKUP command with the OPTIMIZE(option) parameter. Usually one cylinder is recommended.

- **ABARSKIP**(PPRC | XRC) is used to specify which data sets ABACKUP should skip from processing. If a data set in an aggregate group is on a volume or volumes that are protected by peer-to-peer remote copy (PPRC), specifying ABARSKIP(PPRC) indicates ABARS not to back up this data set. If a data set is on a volume or volumes protected by extended remote copy (XRC), specifying ABARSKIP(XRC) indicates ABARS not to back up this data set. When you specify ABARSKIP(NOPPRC) or ABARSKIP(NOXRC), it means to include all the data sets protected by any of these remote copy methods in the backup. You may also indicate ABARSKIP(PPRC XRC) if you have implemented both in your installation and do not want to have duplicate protection.

- **ABARSTAPES**(STACK | NOSTACK) allows the placement of the ABACKUP output files from a single aggregate on a minimum number of tape cartridges (as few as one). The stacking function applies only to tape cartridges. Attempts to redirect ABACKUP output files to disk when the STACK option is in effect cause ABACKUP to fail.

  The default is STACK; therefore, NOSTACK must be specified if you want to direct the ABACKUP output files to disk, or if the output tapes need to be recovered on a processor running a DFSMS release earlier than V1R4. You can temporarily override the SETSYS ABARSTAPES value on the ABACKUP command.

- **ABARSUNITNAME**(unittype) indicates to DFSMShsm the tape unit type for allocation for the aggregate backup output data sets. The UNIT parameter of the ABACKUP command can be used to override this value. If the SETSYS ABARSUNITNAME is not specified, the default unit type is 3480.

These are the SETSYS parameters pertaining to ARECOVER:

- **ARECOVERUNITNAME**(unittype) specifies the default tape unit name for user tape data sets being recovered during aggregate recovery. If the TARGETUNIT parameter of the ARECOVER command is specified, its value takes precedence over the ARECOVERUNITNAME. If neither is specified, a default of 3400-6 is used. Make sure this is coded, or that the ACS routines through SMS assign a tape storage group.
Chapter 4. ABARS implementation tasks and considerations

- **ARECOVERML2UNIT(unittype)** is used to designate the type of tape unit for recovering migrated data sets to ML2 tape volumes. The default is 3480, if this is not specified. Make sure this is coded, or that the ACS routines assign a tape storage group through SMS.

- **ARECOVERPERCENTUTILIZED(nn)** allows you to specify to what percent DFSMSshm allows DFSMSdss to fill non-SMS disk recovery volumes during any ARECOVER command processing. The values can be an integer number between 1 and 100. The default is 080 (80%).

  You can temporarily override this value by using the PERCENTUTILIZED parameter of the ARECOVER command.

- **ARECOVERTGTGDS(option)** is a new parameter providing greater flexibility for managing SMS-managed GDSs that are being recovered to Level 0 disk.

  Further flexibility is given by using the TGTGDS(option) parameter on the ARECOVER command to specify choices for each aggregate.

- **ABARSVOLCOUNT(None | Any)** allows you to affect the method of invoking DFSMSdss for restoring Level 0 data sets that were dumped from primary volumes. If **None** is specified, the DFSMSdss VOLCOUNT parameter is not passed to DFSMSdss during the restore. If **Any** is specified, the VOLCOUNT(Any) parameter is passed to DFSMSdss during the restore.

  Specifying VOLCOUNT(Any) to DFSMSdss results in the allocation of the target data set on as many volumes as required, up to a maximum of 59 volumes.

The Crazy Socks Corporation storage administrator has decided on the SETSYS commands listed in Example 4-1, based on the backup and recovery requirements described in Chapter 3, “Sample environment” on page 25. Only the SETSYS commands for ABARS are displayed.

**Example 4-1  Crazy Socks ABARS SETSYS commands**

```
/***********************************************************************/
/* SAMPLE SETSYS COMMANDS THAT DEFINE THE ABARS ENVIRONMENT */
/* */
/***********************************************************************/
/* SETSYS MAXABARSADDRESSSPACE(20)    /* MAX # LIMITED BY TAPE DRIVES */
   /* AVAILABLE FOR ABARS, TODAY */
SETSYS ABARPROCNAME(DFHSMABR)
SETSYS ABARSACTLOGMSGFULL(ALL)       /* BACKUP & RECOVERY MANAGER REQUIRES - FULL */
SETSYS ABARSACTLOGDASD(8)           /* ASAP REQUIRES - DASD */
SETSYS ABARSDELETEACTIVITY(Y)       /* DELETE WITH AGGREGATE VERSION */
SETSYS ABARBUFFERS(5)
SETSYS ABARSOPTIMIZE(4)             /* READ ONE CYLINDER */
SETSYS ABARSOashire(PPRC XRC)       /* DO NOT BACK UP ALREADY PROTECTED DATA SETS
SETSYS ABARSTAPES(STACK)           /* STACK ABACKUP OUTPUT */
SETSYS ABARSUNITNAME(3590-1)        /* UTILIZE 3590 CART FOR ABACKUP */
```
4.3.2 DEFINE ARPOOL command

The DEFINE ARPOOL command allows you to determine the target disk Level 0 and ML1 volumes to be used for aggregate recovery. These target volumes are used for migrated and non-SMS-managed disk data sets, including data sets that were SMS-managed but, because the ACS routines do not manage them, they are non-SMS-managed at recovery. For this reason, and to support multivolume data sets, make sure that your ARPOOL is large enough for all Level 0 data. See “Issuing the DEFINE ARPOOL Command” in DFSMShsm Storage Administration Guide for an explanation of the DEFINE ARPOOL commands.

This command can be used to direct your aggregate data to a particular set of volumes. For example, if you wanted all Level 0 non-SMS-managed data for aggregate OREDU001 to go to volumes PRD300 through PRD302, you should code

```
DEFINE ARPOOL (OREDU001 L0VOLS(PRD300 PRD301 PRD302))
```

An ARPOOL can be defined for each aggregate, or for all aggregates. Issuing the DEFINE ARPOOL command with ‘*’ instead of an aggregate name defines a general ARPOOL. The general ARPOOL is used when a specific aggregate pool has not been defined for an aggregate. If an ARPOOL is not defined, ABARS uses all currently mounted ADDVOL primary and ML1 volumes as a temporary ARPOOL. There is a limit of 59 volumes per ARPOOL.

Even though ABARS supports a general pool of volumes for all aggregates, we recommend defining individual ARPOOLS for each aggregate. When the ARPOOL defaults to the current ADDVOLed volumes for all aggregates, all aggregate recoveries will choose the same volume as target volumes, causing contention for those volumes. To reduce volume contention and to improve performance, it is more beneficial to define a unique set of volumes to each aggregate being recovered, especially if more than one ABARS address space is active simultaneously.
Define these pools so that the order of the volumes is varied, especially those volumes defined with the ML1VOLS parameter. In addition, specify multiple Level 0 volumes if recovering multivolume data sets. For example, to define Level 0 volumes of PRD300, PRD301, and PRD302, and ML1 volumes of ML1007, ML1008, and ML1009, for three aggregates (OREDU001, OREDU002, and OREDU003), the DEFINE ARPOOL commands would be:

```
DEFINE ARPOOL (OREDU001 ML1VOLS(ML1007 ML1008 ML1009) -
                 LOVOLS(PRD300 PRD301 PRD302))

DEFINE ARPOOL (OREDU002 ML1VOLS(ML1008 ML1009 ML1007) -
                 LOVOLS(PRD301 PRD302 PRD300))

DEFINE ARPOOL (OREDU003 ML1VOLS(ML1009,ML1007,ML1008) -
                 LOVOLS(PRD302 PRD300 PRD301))
```

### 4.3.3 Security requirements

DFSMShsm and ABARS manage data on disk and tapes. The security of data on DFSMShsm-managed disk and tapes and the security of the DFSMShsm environment itself are important considerations. When you implement ABARS, you must determine how to protect your data and who will have authority to access that data.

These are the important questions to answer regarding access authority:

- Who is authorized to define, list, display, and alter the aggregate groups?
- Who is authorized to access the selection and instruction data sets for each aggregate group?
- Who is authorized to access the application data to be backed up?
- Who is actually authorized to execute the ABACKUP and ARECOVER functions using the DFSMShsm commands via TSO or the ISMF panels?
- Who is authorized to access the ABACKUP output files?
- Who is authorized to access the data recovered at the recovery site?
- Who is authorized to access the ABARS activity logs, RESTART data set, and conflict resolution data set?

RACF is the IBM security product for protecting resources and authorizing users. The objective of RACF is to protect system and user resources.

RACF protection is achieved by creating profiles. The profiles are assigned to users, groups of users, and resources. The profiles enable RACF to determine if the user or group has authority to access a given resource.
Authorizing ABARS started task

To apply RACF protection to ABARS processing, you must add the ABARS started procedure to the RACF definitions using the RACF STARTED class, and associate it with the ABARS defined userid. You may select a new userid for ABARS or use the same as DFSMSHsm. The RACF command to define a new userid is:

ADDUSER userid DFLTGRP(groupname)

Issue the following RACF commands to assign RACF identities to the ABARS started procedure. In this case we use the userid DFHSM, which is the one DFSMSHsm is using:

RDEFINE STARTED DFHSMABR.* STDATA(USER(DFHSM))
SETROPTS RACLIST(STARTED) REFRESH
SETROPTS GENERIC(STARTED) REFRESH

Note:

- The SETROPTS REFRESH command is used to refresh the in-storage profiles, and it is needed after you add profiles to STARTED class.
- Before RACF 2.1 no STARTED class was available for use, the only way to associate a started procedure with a RACF userid was by coding the RACF started procedures table, ICHRIN03.

Each aggregate backup and recover function is run as a started task. Modify the RACF STARTED class to include the name of the procedure used to start an ABARS secondary address space. Associate the name of each procedure with the RACF userid you have defined for ABARS.

Example 4-2 is a sample DFSMSHsm secondary address space startup procedure for starting ABARS processing (notice the procedure name DFHSMABR). The ABARS started procedure name can also be obtained from the SETSYS ABARSPROCNAMe command.

Example 4-2 Example of ABARS secondary address space startup procedure

```
//DFHSMABR PROC
//DFHSMABR EXEC PGM=ARCWCTL,REGION=OM
//SYSUDUMP DD SYSOUT=A
//MSYSIN DD DUMMY
//MSYSOUT DD SYSOUT=A
```

Refer to the DFSMSHsm Implementation and Customization Guide for further information. This publication also includes information about the RACF started procedure table, ICHRIN03, in case you are using a level of RACF before 2.1.
Protecting ABARS commands

Only DFSMSHsm-authorized users can issue ABACKUP or ARECOVER commands, unless RACF FACILITY CLASS is used to control access to these commands. This authority is granted by DFSMSHsm regardless of the access authority specified in resource profiles for related ISMF executable modules. As these authorized users can also issue other administrator commands unless protected (for example), HSEND FIXCDS, you should restrict the authorization of the ABACKUP and ARECOVER command. This includes DFSMSHsm commands entered through the operator console or through the SDSF LOG option.

In order to control the ability to perform functions associated with storage management, define FACILITY class profiles with names beginning with STGADMIN (storage administration). These FACILITY profiles are used to protect ABARS functions as well as many other SMS functions. If the RACF FACILITY class profile is not active, only DFSMSHsm-authorized users and console operators are authorized to issue the ABARS commands.

The following RACF commands define the profiles for comprehensive command authority:

```
RDEFINE FACILITY STGADMIN.ARC.ABACKUP
RDEFINE FACILITY STGADMIN.ARC.ARECOVER
```

The following RACF command authorizes a user to issue the ABACKUP command for all aggregate groups:

```
PERMIT STGADMIN.ARC.ABACKUP CLASS(FACILITY) ID(user_ID) ACCESS(READ)
```

More restricted aggregate backup authority can be defined with profiles `STGADMIN.ARC.ABACKUP. agname` for each aggregate. For example, the following command defines a facility class for the OREDU001 aggregate:

```
RDEFINE FACILITY STGADMIN.ARC.ABACKUP.OREDU001
```

Authority to issue the ABACKUP command for aggregate OREDU001 is given to user SMITHJR by the following command:

```
PERMIT STGADMIN.ARC.ABACKUP.OREDU001 CLASS(FACILITY) ID(SMITHJR) ACCESS(READ)
```

Users with this restricted authority must have a minimum of READ access to all RACF-protected data sets in the aggregate group. If they do not have this level of access to the data sets, the ABACKUP command fails.
As with the ABACKUP commands, ARECOVER commands can also be restricted with a profile for each aggregate, STGADMIN.ARC.ARECOVER. agname. The use of DCONFLICT(REPLACE), REPLACE as a conflict resolution data set action, or REPLACE specified by ARCCREXT can also be restricted through the use of RACF facility class profile STGADMIN.ARC.ARECOVER. agname.REPLACE:

RDEFINE FACILITY STGADMIN.ARC.ARECOVER.OREDU001.REPLACE

Authority to select aggregate group application from ISMF
Aggregate group application under ISMF is a storage administrator function. TSO user access to the ISMF Aggregate Group Application Selection panel (DGTSCAG1) can be restricted with one of the following alternatives:

- Concatenate alternate panel libraries to the TSO logon procedure
- Create a RACF profile for the appropriate load module

Access to ISMF aggregate group application, module DGTFAGCD in SYS1.DGTLLIB, can be protected with a resource profile belonging to the class PROGRAM. An access level of READ will allow a user to select the aggregate group application, whereas NONE will deny access.

Authority to select ABACKUP or ARECOVER from ISMF
Instead of using DFSMShsm commands, a user can also run ABACKUP or ARECOVER functions using the ISMF panel options. The following modules in SYS1.DGTLLIB are accessed when ISMF panels are used to run ABACKUP or ARECOVER:

- DGTFAGBK
- DGTFAGBU
- DGTFAGRC

If ISMF ABACKUP and ARECOVER modules are protected by RACF resource profiles with UACC of NONE, a TSO user will not be able to run ABACKUP or ARECOVER from ISMF panels. This is true even for a DFSMShsm authorized user.

Authority to select other aggregate group functions
Access to the LIST, DISPLAY, DEFINE, and ALTER functions for aggregate groups can be protected by resource profiles in the class PROGRAM when the following modules in SYS1.DGTLLIB are defined:

- DGTFAGLD
- DGTFAGDI
- DGTFAGDA
- DGTFAGAA
Any updates to these resource profiles and their access lists should be followed by a SETROPTS with the REFRESH parameter.

**Protecting the ABARS data sets**

As with any production data set, the ABARS-related data sets should be RACF-protected with similar authority.

Refer to *DFSMShsm Storage Administration Guide*, and *DFSMsd fp Storage Administration Reference* for further information.

### 4.3.4 Tape management considerations

In most cases, the output of ABACKUP is directed to tape media. Tape media is chosen because it is easily transported from one location to another. Along with this ease of movement comes the task of managing the tape contents, location, and security.

Many sites manage tapes with a tape management system (DFSMSrmm, for example) and DFSMShsm. A tape begins its life as a scratch tape, is used by DFSMShsm to store data, and is returned to the tape management system to be reused as a scratch tape. To implement this form of concurrent tape management, communications must be coordinated whenever you define the environment and data sets for the use of a tape management system.

**Defining the tape environment**

Example 4-3 shows the SETSYS commands that define a typical tape management system environment. Verify that these commands have been specified in your ARCCMDxx PARMLIB member. Each SETSYS parameter is described in further detail in *DFSMShsm Implementation and Customization Guide*.

---

**Example 4-3 Sample SETSYS commands for tape management**

```plaintext
/****************************************************/
/* SAMPLE SETSYS COMMANDS THAT DEFINE AN ENVIRONMENT FOR A */
/* TYPICAL TAPE MANAGEMENT SYSTEM. */
/****************************************************/
/
SETSYS SELECTVOLUME(SCRATCH)
SETSYS TAPEDELETION(SCRATCHTAPE)
SETSYS TAPESECURITY(RACF) /* OR SPECIFY (RACFINCLUDE) */
SETSYS EXITON(ARCTVEXT) /* NOT NEEDED IF YOU ARE USING RMM */
/*
```
Protecting ABARS tapes with RACF

Your aggregate backup output tapes can be protected by RACF by defining an aggregate backup tape volume set. Use the following command to define this set to RACF:

```
RDEFINE TAPEVOL HSMABR
```

Tape volumes added to the HSMABR RACF tape volume set are automatically removed by aggregate version roll-off processing during aggregate backup processing, during EXPIREBV processing, or if an aggregate backup failure occurs after the output tapes are opened. A tape volume can be deleted from the HSMABR tape volume set by entering the following RACF command:

```
RALTER TAPEVOL HSMABR DELVOL(volser)
```

DFSMSrmm interfaces

DFSMSrmm no longer uses the DFSMSshm tape volume exit ARCTVEXT to manage tapes that DFSMSshm uses. DFSMSrmm provides the programming interface EDGTVEXT that is used from DFSMSshm or any other APF-authorized program that needs to obtain the same services as the DFSMSshm ARCTVEXT exit. EDGTVEXT is basically the same code as the old DFSMSrmm-supplied ARCTVEXT but is now object-code only (OCO) and must use DFSMSrmm macros and check whether DFSMSrmm is in use.

DFSMShsm always invokes EDGTVEXT before it determines whether the call to ARCTVEXT is to be made. The ARCTVEXT exit can still be invoked for other tape management systems based on the SETSYS EXITON command.

To run DFSMShsm with DFSMSrmm, DFSMShsm must be defined to RACF. The DFSMShsm userid should be other than the default userid and should be defined in the STARTED class for RACF 2.1 or in the started procedures table ICHRIN03 for lower levels. Refer to DFSMShsm Implementation and Customization Guide for further information.

Authorizing ABARS for DFSMSrmm resources

To use DFSMSrmm with DFSMShsm ABARS, you must assign to ABARS userids the correct levels of authorization to STGADMIN.EDG.MASTER, STGADMIN.EDG.OWNER.user, and STGADMIN.EDG.RELEASE profiles.

If you have multiple ABARS userids, for example in a multisystem environment, and any ABARS userid can return tapes to scratch status, you must authorize each one. Define STGADMIN.EDG.OWNER.abarsid for each ABARS userid and give the other ABARS UPDATE access to it. This allows one ABARS to release the tapes initially obtained from scratch by the other ABARS procedure.
Retaining ABARS tape volumes

Some tape management products require the definition of DFSMShsm and ABARS as an external data manager. This allows DFSMShsm and ABARS to control the tape volumes created by their functions. Registering DFSMShsm and ABARS as external data managers may result in the tape management product dropping the chaining sequence of multivolume aggregates. To ensure that all tape volumes are available at the recovery site, define each output data set name, control file, data file, and instruction/activity file name as a separate vault pattern description even though these files are stacked on the same tape volume or set of tape volumes.

Use DFSMSrmm vital record specifications (VRSs) to retain the tape volumes until DFSMShsm expires them. Policies are defined using VRSs by specifying data set names or volume serial numbers. Information on how long to retain a data set and volume, and where to move volumes, can be specified. DFSMSrmm uses a retention period determined by the VRS to extend any expiration date or retention period previously set for the volume. Additionally, you can use VRS to identify volumes that should be moved out of the installation media library for safe keeping, or moved from an automated to a manual library.

The RMM ADDVRS subcommand is used to create the VRSs. Refer to DFSMSrmm Implementation and Customization Guide for details.

4.3.5 Expiring ABR records in the BCDS

Use the EXPIREBV ABARSVERSIONS command to expire ABR records created during aggregate backup or recovery processing.

ABARS normally automatically expires aggregate versions during normal ABARS roll-off processing when the number of versions specified in the management class is exceeded. Roll-off processing deletes the ABR record, uncatalogs the ABACKUP output files, removes the tape volumes for RACF if necessary, deletes the associated activity log if requested, and invokes either the EDGTVEXT or ARCTVEXT to inform the tape management system that ABARS is done with the tapes and they can be returned to scratch status.

EXPIREBV ABARSVERSIONS command only needs to be run when you wish to expire ABR records outside of normal ABARS roll-off processing.
EXPIREBV obtains the management class definition to determine which ABACKUP copies have expired. If the management class specified in the most current version of the ABR record for a specific aggregate group does not exist, expiration of the aggregate group being processed is skipped. The management class definition contains the following:

- RETAIN EXTRA VERSIONS — This attribute ensures that you save the most recent version, starting from the day the backups were created.
- RETAIN ONLY VERSION — This indicates how many days to keep the most recent backup version of a deleted data set, starting from the day DFSMShsm detects that it has been deleted.

If the ARCEDEXT installation exit specifies special management system expiration dates for the ABACKUP output files, the previous two values should be set to NOLIMIT. This prevents DFSMShsm from attempting to delete ABARS versions during ABACKUP and EXPIREBV processing by using management class criteria.

The preceding two values have total control over deletion of ABARS versions, unless the EXPIREBV command is issued with the RETAINVERSIONS keyword.

When ABARSVERSIONS has been specified, the BCDS is searched and each ABR record is checked to see if the ABARS version has expired. For expired ABARS versions, the control file, data files, and instruction file names are located in the catalog and a list of volume serial numbers that the files reside on is requested. When necessary, the volumes are deleted from the RACF HSMABR tape volume list. The files are uncataloged after the volume serial number list has been exhausted.

After the control file, data files, and the instruction or activity log file have been uncataloged and removed from the HSMABR tape volume set, the ABR record is deleted.

It is possible to code SMS ACS routines that will direct ABARS files to disk. If this is done, and the files are migrated to disk, an DFSMShsm DELETE command will be issued to remove them during expiration processing. If that delete fails, the file may remain cataloged with no ABR record pointing to it. If this happens, the data set should be deleted manually.
Application characteristics

When ABARS is implemented using a centralized department, such as the storage administration group, the ABARS administrator is responsible for collecting required information about each application for definition in ASAP. The ABARS administrator can be (and usually is) a storage administrator within the storage management group and must be knowledgeable about DFSMS, DFSMSHsm, DFSMSHsm ABARS, and DFSMSdss as well as other storage administration software tools. We use this method of administration at Crazy Socks Corporation.

Centralized administration requires the ABARS administrator to query the application's analyst about the details of each application. Information such as job names, recovery strategies, run schedules, interfacing systems, externally created data, database types, and synchronization points must be communicated to the ABARS administrator. The questionnaire is an effective tool for accomplishing this task.

The questionnaire, coupled with a short descriptive document about ABARS, ASAP, and Backup & Recovery Manager, educates the application analyst as to what information is required for ABARS and provides a tool for the ABARS administrator to collect the information needed about each application.

Chapter 3, “Sample environment” on page 25 describes the order entry application at Crazy Socks Corporation. We provided a questionnaire to the analyst responsible for the order entry application. The following sections show questions used on our questionnaire and answers provided by the analyst.
5.1 Current recovery strategies

The question in Example 5-1 asks the analyst about the recovery strategy for the order entry application. Determining whether an application is rerun or forward recovered at the recovery site is a decision that only the application analyst can make, based on the business requirements and recovery capabilities of the application.

Example 5-1  Business resumption questionnaire: current recovery strategies 1

**Question 1:**
Is the application recovery strategy to perform rerun or forward recover?

**Answer:**
The recovery strategy for the Order Entry system is to rerun the last successful run or rerun from the last available backup.

Rerun recoveries duplicate the last successful cycle at the recovery site and are generally easier to define, easier to test, and less costly to implement. Some application suites operate in such a way that a rerun strategy cannot be implemented without modification to the application. For all application suites, rerun recovery is generally easier to accomplish, and the recommended first step in a complete and reliable disaster recovery implementation.

Forward recoveries position the application to proceed into new work immediately upon recovery, reducing redundant processing during the recovery. Such recoveries are more challenging to test since they involve processing data not available, and therefore totals and balances are not anticipated. Forward recoveries generally require more effort and more processing resources to create and manage.

Each application analyst needs to make specific decisions about each application, balancing value, cost, and effort with the relative merits of each strategy. It is important to recognize that no single strategy is appropriate for all applications within an enterprise.

The recovery strategy for the order entry system is to perform a rerun. Therefore, all input data sets must be backed up before they are changed by the application. Output data sets need not be included because they will be recreated by the rerun.
Many applications have steps embedded within the batch jobs to back up data sets before they are changed. The question in Example 5-2 asks the analyst to review the application and determine if this type of activity is taking place. Understanding the reason for these backups or copies of data within the application cycle is imperative. If these backups or copies are taken to restart the application due to errors in processing, and are not intended for disaster recovery, they cannot be eliminated.

Example 5-2  Business resumption questionnaire: current recovery strategies 2

Question 2:
Are single data sets or groups of data sets backed up within the application before they are changed?

Answer:
IEBGENER is used to perform a backup of files before they are updated.

If the backups or copies are made for disaster recovery purposes, then ABARS aggregate backups can be taken prior to the execution of the application to ensure the data sets are backed up before they are changed by the application. Once the ABARS backup is in place, the redundant backup steps can be removed.

One of the many benefits of using ABARS is that you no longer need to depend on full-volume dumps to restore application data. Full-volume dumps for volumes that contain application-related data sets may be eliminated once these data sets are backed up using ABARS. The question in Example 5-3 asks the analyst if the application depends on full-volume dumps for recovery and if the full-volume dump represents a synchronization point in the application. Using ABARS may improve the recovery capability of the application and ensure data integrity by serializing the data sets prior to the backup.

Example 5-3  Business resumption questionnaire: current recovery strategies 3

Question 3:
Does the application depend on full volume dumps to recover application data?

If yes:
How often are the full volume dumps performed?
Is the application active or quiesced during the dump?

Answer:
We are aware that full volumes dumps of our production volumes are performed each Sunday night. The application is not quiesced during this dump process.
Full-volume dumps may be taken to provide for local recovery in case a single volume become unavailable. Full-volume restore in conjunction with DFSMSHsm application of incremental backup copies is a viable strategy in recovering lost volumes to a point in time. Before dispensing with these dumps, application owners should make sure that they are not needed for this purpose.

Our hardware, described in 3.2, “Crazy Socks Corporation configuration” on page 26, supports the concurrent copy feature. See 2.3, “Solutions for reducing perceived burden of backup” on page 22, for more information about concurrent copy. The order entry system is already using this feature to back up the VSAM databases prior to running the batch application. The question in Example 5-4 asks the analyst about the current use of concurrent copy.

Example 5-4  Business resumption questionnaire: current recovery strategies 4

**Question 4:**
Is concurrent copy currently used by this application?

If not, does the application have a need for concurrent copy?

**Answer:**
We use the concurrent copy feature to dump the CICS VSAM data sets that support our online system prior to running the nightly batch cycle. We perform this backup at 7:00 pm each night.

The question in Example 5-5 asks the analyst about the last disaster recovery test. The response may surprise you, but it is not unusual. In some cases, not enough time is scheduled at the disaster recovery site to allow the application analyst to test the restored applications. This situation may not change after the ABARS implementation, but ABARS may enable you to test the recovery process while you are still at the backup site. For example, during the ARECOVER process, the high-level qualifier can be renamed, allowing the data to be recovered on either the production system or a test system with shared disk. Applications can then rerun the application and compare the test data with the production run.

Example 5-5  Business resumption questionnaire: current recovery strategies 5

**Question 5:**
During your last disaster recovery test, how long did it take to recover your application and was the recovery successful?

**Answer:**
We have never tested a rerun of our application in a disaster recovery test.
5.2 Identifying job names and run schedules

Good naming conventions reduce the amount of effort required in identifying an application to ASAP. However, it is not uncommon for applications to include more than one naming convention from legacy systems. It is important for the analyst to include all possible job names for each application. It is additionally important to note that masking job names with an asterisk may include job names that are outside the scope of the application.

Example 5-6 shows the naming convention used for the application. The naming standard indicates different cycles to support different countries and daily, weekly, and monthly processing. These cycles could be defined as separate applications in ASAP because each cycle is unique.

Example 5-6  Business resumption questionnaire: identifying job names

Question 1:
What is the naming convention of the batch jobs that compose the application?

Answer:
The naming convention for the batch jobs is OREUC##.
ORE   Three-position system acronym for the order entry system
U     Cycle Indicator (W - Weekly, M - Monthly, D - Daily)
C     Country (U - United States, C - Canada, P - Puerto Rico, J - Japan)
### Incremental numerics

Question 2:
Will legacy or interfacing systems be considered as part of the application (and included in the ABARS backup)?

Note: Please provide job structure listings for each cycle that supports the application.

Answer:
There are no legacy or interfacing systems to be considered as part of the Order Entry application.

The applications analyst should provide the ABARS Administrator with job structures for each application cycle. Job scheduling packages, such as OPC/ESA, CA7, Zeke, JobTRAC, and Control-M, provide job structure listings by application cycle. These structures show the order in which the batch jobs are executed.
ASAP provides an interface into these scheduling packages to extract job structure information. However, the application analyst needs to review the structure information carefully to ensure that jobs from interfacing systems are excluded unless they are to be included in the ABARS backup. ASAP also supports manual entry of job names using the ISPF interface or by providing the name of a sequential data set that contains the job names.

5.3 Synchronization points

A synchronization point for an application is a point to which the application can be restored if a rerun of the application is required or a disaster has been declared. This point is sometimes established by the database administrator (DBA) supporting the application and involves image-copy processing of the databases. The image copy can subsequently be used to support a rerun of the application.

Example 5-7 asks the analyst about the established synchronization point in the application.

Example 5-7  Business resumption questionnaire: synchronization points

Question 1: What is the established synchronization point for each cycle within the application?

Answer: Copies of the online VSAM files are taken nightly at 7:00 PM. Online processing is resumed after the copies complete. The batch cycles then execute, processing the data from the copies.

5.4 Database types

Example 5-8 asks the analyst what type of databases support the application. The order entry system uses CICS VSAM databases. In database management systems where an image copy is used for database backup, the image-copy data set name can be included in the ABARS backup as an accompanying tape. This registers the image-copy output tapes with the application they support. When the aggregate is recovered, ABARS creates a catalog entry for each of the image-copy data set names included in the ACCOMPANY list. Make sure that the image-copy output data set names have been included in the tape management software vault pattern description, and are sent offsite at the same time as the ABARS backup output tapes.
Example 5-8  Business resumption questionnaire: database types

Question 1:
What database system(s) does the application use?

Note: If DB2 or IMS is used, please provide image copy output data set names.

Answer:
The order entry application uses CICS VSAM files for databases.

When you include database image-copies in an aggregate, understand what other data is required to recover that database. Ask whether the application owns that data and how and when that data is backed up for recovery. In 4.2, “Data considerations” on page 39, there is further reference to database-related data and recovery.

5.5 Application data sets

ASAP collects data set name information as the batch jobs execute using the real-time selection process (RSP). The questionnaire helps identify data sets that belong to the application. Example 5-9 asks the analyst to define the data set naming convention used by the application. The ABARS administrator uses this input to correctly identify the application data sets.

Example 5-9  Business resumption questionnaire: application data sets

Question 1:
What is the naming convention of the application data sets?

Answer:
All production data sets begin with the high-level qualifier of the letter P. The second-level node is the system acronym, ORE. The third-level node is the country indicator (U, J, P, or C). The fourth-level node indicates the data set type (VS=VSAM, SEQ=sequential, and so on). The remaining nodes are determined by the application analyst.

Example: P.ORE.J.VS.ORDER.IN895

Data sets that are common to many applications such as control card libraries, procedure libraries, and other support type data sets can be excluded from all applications, using ASAP’s Universal and Global filters. Interfacing data sets and others that are common within the application can be excluded using ASAP’s local filters.
5.6 Interfacing systems

Example 5-10 asks the analyst about shared data. Many applications share common data sets. These data sets may be updated by more than one application. It is important to identify the application that is responsible for performing the backup of the shared data. If shared data is included in the backup of several applications, an incorrect version could be recovered. ASAP provides reporting to help identify data sets that are included in more than one application.

**Example 5-10  Business resumption questionnaire: interfacing systems**

**Question 1:**
Does the application share data with other applications?

**Answer 1:**
Data from the order entry system is fed into ARS and PPS applications.

**Question 2:**
In the event of a recovery, which application is responsible for recovery of the shared data?

**Answer 2:**
The order entry system will recreate the shared files and the new output files will be fed into the ARS and PPS applications.

Identifying common data sets requires constant monitoring during the implementation process. The ABARS administrator can set up reporting jobs to run on a regular basis to assist in the monitoring process.

5.7 Externally created data sets

Externally created data is not identified by ASAP’s RSP process when it is created on another system or platform or when no SMF record is created. These externally created data sets can be added to ASAP’s local filters to include the data sets in the ABARS backup. Example 5-11 asks the analyst about data sets created externally so that they can be included in ASAP for the application.

**Example 5-11  Business resumption questionnaire: externally created data sets**

**Question 1:**
Does the application use any externally created data sets? For example, transmitted data, data created on another platform, and so on.

**Answer:**
The order entry system does not use any externally created data.
5.8 Dynamically built JCL

Example 5-12 asks the analyst about the use of dynamically built JCL. If the application uses dynamically built JCL and the job names have not been identified to ASAP as part of the application, the data sets used in these jobs will not be included in the ABARS backup. Once identified, the job names can be added to RSP’s job name table. If the job names are not consistent, data set names can be added to ASAP using local filters.

Example 5-12  Business resumption questionnaire: dynamically built JCL

Question 1:
Does the application dynamically build JCL using CLIST, REXX or other EXEC? Note: Please indicate whether the dynamically built JCL is submitted using the internal reader or another method.

Answer:
The order entry system does not dynamically build JCL.

Chapter 7, “Structuring applications using ASAP” on page 79, describes the process for defining the order entry application to ASAP. There, we show how the information provided by the questionnaire is used to create the ASAP application and, subsequently, the selection data set that will be input to the ABARS backup.
Aggregate definition

We are often asked if there are any guidelines for building an aggregate. How much data can be backed up from one aggregate? How many data sets are supported? What are my limits? Each environment has its own answer, based on the characteristics of your application, its data, interrelationships of applications and processes, hardware resources, and job scheduling.

The amount of data backed up from one aggregate depends mostly on how long your application can tolerate a quiesce for backup. ABARS provides a point-in-time backup synchronizing the aggregate data. To do this, all update access to the aggregate data must be quiesced. If so much data is specified in one aggregate, that it takes 3 hours to back up, the application may be unable to tolerate it. An amount of data that can be backed up in 30 minutes may be tolerable. Distributing the larger amount of data across multiple aggregates also allows multitasking to reduce the overall backup time. Running multiple aggregate backups concurrently requires an increase in tape resources.
6.1 Defining management classes

The ABARS aggregate group definition can contain a management class name used to obtain a management class definition. There are separate parameters for aggregate backup and only those attributes are used during the aggregate backup process. Separate management classes can be created for ABARS. If the management class specified in the aggregate group definition does not exist, ABACKUP will fail.

DFSMShsm saves the management class name for the aggregate in the ABR record. EXPIREBV uses the management class attributes to obtain the latest RETAIN values. When you create new management classes, you need to define the following aggregate backup parameters.

- **# Versions = nnnn | NOLIMIT**: The maximum number of aggregate group backup versions to be kept (a specific number of versions up to 9999, or NOLIMIT).
  
  Specifying a limit allows the creation of a new version to delete (roll-off) all existing versions that exceed the current limit. NOLIMIT specifies that no roll-off occurs.

- **Aggregate group backup RETAIN parameters for ABACKUP versions:**
  
  - **Retain Only Version = nnnn | NOLIMIT**: This field indicates how long the most recent backup version of an aggregate group is kept.
  
  - **Retain Extra Versions = nnnn | NOLIMIT**: This field indicates how long to keep backup versions of an aggregate group that precede the most recent version:
    
    **Unit = D | W | M | Y**: Specifies the time period unit of measure. This field cannot be blank if the Retain Only Version field, or the Retain Extra Versions field is specified, except when these fields are NOLIMIT.

    DFSMShsm generates a default expiration date of 99365 for the ABARS output files. (Installation-wide exit ARCEDEXT is called, if active, to allow you to specify expiration dates that have special meaning to tape management products, such as 99000).

    When rolling-off an ABARS version, DFSMShsm expires tape data sets without regard to the tape expiration date.

- **The serialization option:**
  
  - **Copy Serialization = C | F | blank**: Specify C (continue) for tolerate an enqueue failure, and F (fail) for do not tolerate an enqueue failure. Blank means a null entry.

  - **Abbackup Copy Technique** specifies whether concurrent copy should be used during aggregate backup processing.
Valid values are:

- **P** (concurrent copy preferred) — A concurrent copy session is requested for each data set. Aggregate backup continues if a concurrent copy session is not obtained for a particular data set.

- **R** (concurrent copy required) — A concurrent copy session is requested for each data set. The entire aggregate backup fails if a concurrent copy session is not obtained for a particular data set.

- **S** (Standard) — No concurrent copy session is requested.

Figure 6-1 shows the ISMF *Management Class Define* panel with the different attributes:

![Figure 6-1 Management Class Define panel - ABARS parameters](image)

We use the management class MCABARS for our OREDU001 aggregate. We have specified our number of versions and retention limits. We have chosen four versions to ensure a minimum of two versions in our remote tape vault at any time. This leaves the other two versions in rotation, one on the way to the remote vault and the other on the way back to return to the scratch pool. We want two versions available in case one is not readable. Because data integrity is a must, the aggregate backup fails if an enqueue cannot be obtained. The order entry application must maintain a high level of availability, so we want to use concurrent copy as our backup technique.
If a management class is not specified, ABACKUP processing continues using the default management class. If a default management class is not defined, ABACKUP uses the following DFSMShsm defaults:

- RETAIN ONLY VERSION = NOLIMIT
- RETAIN EXTRA VERSIONS = DAYS(14)
- NUMBER OF VERSIONS = 2
- COPY SERIALIZATION = STATIC
- ABACKUP COPY TECHNIQUE = STANDARD

The default management class name is never stored in the ABR record.

6.2 Defining aggregates

The aggregate group identifies the selection data sets, instruction data set, and additional control information required to perform aggregate backup. The aggregate group is an SMS construct that you must define through a set of ISMF panels before you can perform aggregate backup. You must activate the newly defined SMS configuration before issuing the ABACKUP command.

If you modify the aggregate group definition, the SMS configuration should be reactivated. This is not required if you are only changing the contents of the selection or instruction data sets.

Refer to DFSMSdfp Storage Administration Reference for details on how to define the aggregate group by using ISMF panels.

You must specify the following information in the aggregate group:

- **Aggregate group name** — The name can be up to 8 characters long.
- **Selection data sets** — Insert the names of one to five selection data sets you created for this aggregate backup.
- **Copies** — Insert the number of copies of the ABARS output files to be created. The maximum number of copies is 15, and the default is one copy.
- **Output data set prefix** — The prefix identifies the output data sets created by aggregate backup. These output data sets are created with the following naming conventions:
  - For the data file: `outputdatasetprefix.D.CnnVnnnn` and `outputdatasetprefix.O.CnnVnnnn`
  - For the control file: `outputdatasetprefix.C.CnnVnnnn`
  - For the instruction/activity log file: `outputdatasetprefix.I.CnnVnnnn`
Because they all share a common output data set prefix and version number, it is easier to identify all the output data sets from one aggregate backup.

For example, if you specify the output data set prefix as PAY1, the data, control, and instruction/activity log files would have the names PAY1.D.C01V0001, PAY1.O.C01V0001, PAY1.C.C01V0001, and PAY1.I.C01V0001, respectively.

**Note:** \( Cnn \) is the copy number and \( Vnnnn \) is the version number generated during the ABACKUP operation.

### 6.2.1 Aggregate group definition with ISMF

ISMF can be used to define, alter, list, display, back up or recover an aggregate group, or edit the selection or instruction data sets associated with an aggregate group by selecting **Option 9, Aggregate Group**, from the **ISMF Primary Option Menu** panel for Storage Administrators, displayed in Figure 6-2.

![Figure 6-2 ISMF Primary Option Menu](image_url)
The defining and altering of aggregates (as well as the ABACKUP and ARECOVER commands) can and should be RACF protected either by function or at the aggregate level. See 4.3.3, “Security requirements” on page 51.

Figure 6-3 illustrates the Aggregate Group Application Selection panel.

Specify the name of the SCDS you want to use to store your aggregate definition, in the field CDS Name. ISMF primes the CDS Name field and the Aggregate Group Name field with the name last used for an aggregate group. The default CDS name is the quoted word ‘ACTIVE’, which represents the currently active configuration. You cannot define or alter aggregate groups to the ‘ACTIVE’ configuration.

We are defining our order entry application aggregate as OREDU001. Specify your aggregate name and select Option 3, Define an Aggregate Group, then press Enter.

The first of the two pages of the Aggregate Group Define panel are shown in Figure 6-4. You can leave either page of this panel at any time without saving the aggregate group attributes or changes by issuing the CANCEL command.
Figure 6-4  Aggregate Group Define panel - Page 1

Page 1 of the Aggregate Group Define panel contains aggregate group define attributes. SCDS Name and Aggregate Group Name are output fields that contain the SCDS and aggregate group names you specified on the Aggregate Group Application Selection panel.

Description is an optional field of 120 characters where you can describe the aggregate group.

You can specify the following required attributes on the first page of the Aggregate Group Define panel:

- **Number of Copies** — Specifies the number of aggregate backup output files to be created in parallel. The valid values are 1 to 15.
  
  We have chosen a value of 2. Two tape drives are required for ABACKUP of the OREDU001 aggregate, because these copies are created concurrently.

- **Management Class Name** — Specifies the management class name from which the aggregate backup attributes are obtained. The valid values are 1 to 8 alphanumeric characters (first character not a digit) or a blank.
  
  The management class chosen for our aggregate is MCABARS.
- **Output Data Set Name Prefix** — Identifies the output data sets created by aggregate backup.

  We have chosen a naming convention for all aggregates. The first HLQ is ABARS. The second qualifier is the name of our aggregate, so we specify ABARS.OREDU001. A well thought out naming convention makes identification of your aggregates much easier.

- **Account** — Specifies an accounting code for our aggregate group.

  Installations can then use the information to charge application departments for ABARS services.

  ABARS records the CPU time for processing ABACKUP and ARECOVER requests. The accounting code gets written to the FSR control block (and associated SMF record where one exists) along with the CPU processing time for the aggregate. This information is also recorded in the ABR record and to the ABACKUP control file. It is written to the ABACKUP control file so the code can be used at the recovery site without requiring an aggregate definition at the recovery site.

  The accounting code is optional, and can be up to 32 characters in length. Valid characters are alphanumeric characters, blanks, commas, periods, parentheses, hyphens, slashes, ampersands, and apostrophes (single quotes).

**Attention:** Three aggregate group attributes have been removed in DFSMS. They are EXPIRATION DATE, DESTINATION, and TOLERATE ENQUEUE FAILURE. Aggregate groups defined in prior releases are accepted from DFSMS and the converse holds as well. The three deleted attributes remain in aggregate groups defined prior to DFSMS, but have no effect.

Once you have entered this information, press the PF8 key to advance to Page 2 for more options. Figure 6-5 shows Page 2 of the *Aggregate Group Define* panel, which allows you to specify the selection data set and the instruction data set names, and to allocate, browse, and edit these data sets.
Your selection data set will contain names of data sets to be processed during aggregate backup. You can identify one to five selection data sets.

A selection data set can be a partitioned data set (PDS) member, PDSE member, or a sequential data set. If you are using ASAP you must allocate the selection data set as a sequential data set.

If you create a selection data set outside of ISMF panels, you must allocate it as follows:

- Records must be in one of these two formats:
  - Fixed format, block size = 80, length = 80
  - Fixed block format, block size = any multiple of 80, length = 80
- Selection data sets must be cataloged

Our selection data set will be created as a sequential data set with the name of ABARS.OREDU001.SELECT.

The instruction data set is optional. If you decide to back up the instruction data set, you must create it before you issue the ABACKUP command. The instruction data set must be a sequential data set and it must be cataloged.
In our sample environment, we are creating an instruction data set. It follows our naming convention, with the name ABARS.OREDUD001.INSTRUCT.

6.2.2 Skipping data sets

If your installation has implemented a remote copy solution to protect the data on the disk volumes, you may have already a copy of some of your applications data sets. You could use these copies for a recovery in case it is needed and then you do not have to keep duplicate copies.

For doing that, you can use the ABACKUP command option SKIP(PPRC | XRC), specifying the remote copy technique you have implemented. Using this option you tell ABARS not to process the data sets included in the aggregate group that are on volumes being copied with PPRC or XRC. You may also want to know which data sets have been skipped due to the SKIP option by coding the option LIST(SKIPPED). The list of data sets not processed by the ABACKUP command goes to the ABARS activity log.

You may also choose to specify ABARS to skip the data sets being copied with remote copy solution by specifying the option SETSYS ABARSKIP(PPRC XRC) in PARMLIB. Then you do not need to code the SKIP option in the ABACKUP command.
Structuring applications using ASAP

As described in 1.2, “ASAP” on page 10, the primary function of ASAP is to automatically identify the files that must be restored in a disaster, populate the ABARS selection data set, and automatically maintain the list of critical data sets as the application changes.

At the primary site, ASAP assures that the correct and current files are selected for backup to be used, when required, for recovery. Design changes and implementation changes to applications are automatically accounted for, using the RSP feature, minimizing manual application disaster recovery update requirements that are easily overlooked by the analyst. At the recovery site, ASAP is used to recover the workload back to the primary site.

Using information from several different sources (such as RSP, scheduler interfaces, manually entered job name lists, JCL library scans, and SMF history data scans), ASAP constructs a list of data sets and determines whether the data sets are critical (input to the ABARS backup), or noncritical (excluded from the ABARS backup). The application analyst provides the final analysis. For example, the analyst may exclude data sets that ASAP identified as critical because they are backed up by another application.
7.1 Data collection methods

ASAP provides several options to identify critical data sets: job collection, dynamic JCL scan, batch SMF collection, and real-time selection process (RSP). Optimally, RSP JOBNAME MASKING and RSP should be used; if job name standards make job-name masking ineffective, the command JOB COLLECTION can be used to determine job relationships from the job scheduler inventory. Batch SMF scan is optional; it is used under the described conditions.

7.1.1 Job collection

Job collection is the process of using either an interface to supported scheduling packages (CA7, Control-M, Tivoli OPC, Zeke/MVS and JobTRAC), or providing a manual list of job names or a job name mask.

With some scheduling interfaces, an anchor job, the first job in a triggering sequence, or a schedule identification number is all that is needed to extract the data. Other systems require application names, event numbers, or both.

User-supplied job-name input requires that the ABARS administrator enter a job name or a job name mask. An ISPF data set is automatically created during the job collection process and is saved and used to provide the list of job names to RSP or to the batch SMF scan process.

The real-time selection process (RSP) dynamically collects and analyzes JCL data for applications defined to ASAP as they are executing in real-time mode, and continuously updates/saves the ASAP database, keeping it current with the collected application critical data set information. The IBM supplied IEFUJI default exit is used to collect the JCL records. This exit must be defined in your SMFPRMxx member of SYS1.PARMLIB. The exit is dynamically installed by RSP. See the ASAP Installation and Maintenance Guide for further information about the IEFUJI exit.

7.1.2 Batch SMF collection

Batch SMF collection is a process that reads SMF records collected on SMF tapes by your installation. The SMF records scanned are history records for events that have already occurred. You must be careful to scan data that includes the start and end of the application under ASAP’s analysis. You must also be careful not to collect data from more than one cycle of the application. Batch SMF scan is generally not used for final application setup and verification during the ABARS implementation but is helpful to provide initial analysis information about the size of an application and the data sets it uses. Also note that SMF scan function processes one application per pass of the SMF data.
7.1.3 Real-time selection process (RSP)

As described in 1.2, “ASAP” on page 10, RSP runs as a started task that uses a standard IEFU83 SMF exit facility to collect SMF data in real-time. It uses the collected data to reanalyze the criticality of data sets in the application. Because of the continuous real-time nature of this process, it is not necessary to provide job names in the order in which they execute. Application changes are immediately recognized and the next backup automatically reflects the change. RSP uses the standard IBM exit IEFUJI to collect JCL data.

When input data sets are present in the JCL but are not opened by the program, no SMF records are created. This means that using RSP SMF collection alone may not construct a list of all input data sets needed for recovery. If a single input data set, referenced in the JCL, does not exist at the recovery site, the entire job fails with a data set not found error. For this reason, it is necessary to use ASAP’s dynamic JCL scan to include data set records from the JCL as well as the records collected from SMF.

RSP also resolves a variety of typical but troublesome processing modes, such as data sets whose names change in some systematic but nonstandard method, and dynamically created data sets. RSP uses an added job or job step, the application end step, to signal the completion of a processing cycle. There can be one, or many, application end steps in an application job stream, depending on the complexity of job relationships. The application end step signals RSP that a full cycle has been completed, permitting a thorough and immediate reevaluation of the data set criticality matrix for the application, and the re-creation of the selected data set.

RSP is a key component of an effective ASAP deployment. In extremely simple and static environments, the initial setup of an ASAP application may remain current and valid for some time, and RSP may appear to be an unnecessary degree of sophistication. However, in environments in which change is a daily occurrence, RSP is critical in maintaining ASAP applications.

7.2 Defining applications to ASAP

In 3.3, “Data classification and recovery requirements” on page 28 we describe the applications run at Crazy Socks. The order entry system is described as one of the most critical applications. We will use the order entry system to show how applications are defined to ASAP.
7.2.1 ASAP application naming conventions

All Order Entry application jobs begin with the system acronym, ORE. There are three different cycles: daily, weekly, and monthly. The fourth position of the job name distinguishes the cycle, with D for Daily, W for Weekly, and M for Monthly. There are order entry jobs that support the U.S., Canada, Puerto Rico and Japan, distinguished by a character in the fifth place (U, C, P, or J). A total of 12 different ASAP applications support the order entry system: one daily, one weekly, and one monthly for each country.

The naming convention we selected supports applications such as the order entry system. Figure 7-1 shows the naming convention we selected. This is the same convention used to define aggregates to ISMF. The aggregate name and the ASAP application name are the same.

```
OREUC###
ORE  Three position system acronym for Order Entry application
U   Cycle Indicator (Daily, Weekly, Monthly)
C  Country Code (U=US, C=Canada, P=Puerto Rico, J=Japan)
### Incremental numeric field.
```

The Order Entry ASAP application names for the United States cycles are:

OREDU001 OREWU001 OREMU001

Figure 7-1 Naming conventions for the Order Entry application

The order entry ASAP application names for the United States daily, weekly, and monthly cycles are OREDU001, OREWU001 and OREMU001.

As we explained in 1.2, “ASAP” on page 10, aggregate balancing is used to break down large ABARS aggregates into smaller aggregates so they can be backed up concurrently, saving precious backup time. Aggregate balancing is also used to combine smaller aggregates into one larger aggregate, allowing better utilization of tape resources.

The incremental numeric positions in the naming convention support the use of aggregate balancing to split large aggregates into several smaller ones.
7.3 Steps for setting up ASAP applications using RSP

The following steps define the OREDU001 application to ASAP:

1. Create the ASAP application and customize the setup options.
2. Enter the application job names using the Job Collect panels.
3. Submit the RSPJRFSH job to update the RSP job table. RSP now begins collecting real-time SMF records for the order entry application.
4. Run the application batch cycle to create SMF records in executable order for ASAP.
5. Create the Application End (APPLEND) job, and install at the appropriate points and/or at the end of the application job stream.
6. Run Verification and view the list of data sets. Identify data sets to be filtered out on the universal, global and local levels.
7. Create or update universal, global and local level filtering.
8. Re-verify the application until the selected data set reflects the desired list of critical data sets.
9. Balance the aggregates using the aggregate balancing feature.

In the following sections we describe each of the steps in more detail.

7.3.1 Creating the application into ASAP

We access ASAP by typing in EX ‘ASAP.PARMLIB(ABRMGR)’ from the command line.
Figure 7-2 shows the ASAP (Manager) Auto Selection & Audit Process panel displayed.

Select Option 2, Select/Create Appl (Application) by typing the number 2 in the OPTION field and press Enter. The SELECT Current/NEW Application Name pop-up screen is displayed (Figure 7-3).
Enter the name of the application in the **Specify NEW Application Name** field and press Enter. We entered OREDU001 for the daily order entry system for the United States. If the panel contains an application name in the **Use Current/OLD Application Name** field, you will need to blank the field out by using the space bar to remove any characters in the field, prior to pressing Enter.

Since we are defining a new application to ASAP, the **APPL LOCATE ERROR** pop-up panel shown in Figure 7-4 is displayed. To continue adding the new application, press Enter.

![APPL LOCATE ERROR](image)

Figure 7-4  APPL Locate Error panel

The **Global Application Setup Options** panel is automatically displayed, divided into different sections. The sections are:

- APPLICATION General Setup
- JOB COLLECTION options
- JOB TYPE INCLUDES
- EXTENDED FILTERING Options
- Current VERIFICATION Options
- AUDITING Options
- APPLICATION DATASET Usage

Figure 7-5, Figure 7-6, and Figure 7-7 show the **Global Application Setup Options** panel with the default settings.
**SETUP OPTIONS FOR APPLICATION ==> OREDU001**

Command ==> SCROLL==> PAGE
Change Fields as Necessary; Use ENTER To Activate; Use PF3 To Return
More: +

--- APPLICATION General Setup ---
Appl DESC => APPLICATION CREATED BY: CG ON 05/13/2002 <=
Associate With ABARS Aggregate: OREDU001 <= ( ABARS Usage )
--- JOB COLLECTION Options ---
Collection Mode: MERGE <= ( REPLACE, MERGE )
Collection Structure: ALL <= ( ALL, ANCHOR )
--- JOB TYPE INCLUDES ---
Started tasks: Y <= ( Y/N )
Tso users: Y <= ( Y/N )
Batch jobs: Y <= ( Y/N )
--- Collection Options ---
Collect data via SMF or JCL: M <= ( M = Minimum)
( A = Future Release)
( N = No)
--- RSP Options ---
Next RSP cycle number: 0000000001
Number of RSP cycles to retain: 0001
Automatically delete old cycles: Y <= ( Y/N )
--- JCL Options ---
Next JCL cycle number: 0000000001
Number of JCL cycles to retain: 0001
Automatically delete old cycles: Y <= ( Y/N )
--- Batch SMF Scan Options ---
Next SMF cycle number: 0000000001
Number of SMF cycles to retain: 0001
Automatically delete old cycles: Y <= ( Y/N )
--- EXTENDED FILTERING Options ---
Change/Display FILTERING Entries: N <= ( Y/N )
Change/Display FILTERING Entries: N <= ( Y/N )
Apply FILTERING During JOB Coll: Y <= ( Y/N )
Apply FILTERING During SMF Scan: Y <= ( Y/N )
Apply FILTERING During VERification: Y <= ( Y/N )

Figure 7-5 Global Applications Setup Options panel before customization (1 of 3)
--- Current VERIFICATION Options ---

<table>
<thead>
<tr>
<th>Option</th>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Re-evaluate Dataset Entries</td>
<td>Y</td>
<td>Y/N</td>
</tr>
<tr>
<td>User Tape Datasets as ACCOMPANY</td>
<td>N</td>
<td>Y/N</td>
</tr>
<tr>
<td>Use SIZE For INC/ACCompy Tapes</td>
<td>N</td>
<td>Y/N</td>
</tr>
<tr>
<td>Max Tape INCLUDE Size: NONE</td>
<td>NONE</td>
<td>MB Size/NONE</td>
</tr>
<tr>
<td>Exclude dataset if not Cataloged</td>
<td>Y</td>
<td>Y/N</td>
</tr>
<tr>
<td>Category if 1st ref. DELETE</td>
<td>E</td>
<td>Include/Exclude</td>
</tr>
<tr>
<td>Category if 1st ref. RENAME OLD DSN</td>
<td>E</td>
<td>Include/Exclude</td>
</tr>
<tr>
<td>Use SMF data in selection dataset</td>
<td>Y</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Use JCL data in selection dataset</td>
<td>N</td>
<td>Yes/No</td>
</tr>
<tr>
<td>SELECTION Dsn Format: ABARS</td>
<td>ABARS</td>
<td>ABARS, DSS, XSS</td>
</tr>
<tr>
<td>( LIST, DMS, FDR )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RSP cycles to include in Sel. DS: 0001</td>
<td>N</td>
<td>Y/N</td>
</tr>
<tr>
<td>Evaluate all datasets as critical</td>
<td>N</td>
<td>Y/N</td>
</tr>
<tr>
<td>Detailed comments in Sel. Dataset</td>
<td>N</td>
<td>Y/N</td>
</tr>
</tbody>
</table>

----- VERIFICATION GDG Options -----

<table>
<thead>
<tr>
<th>Option</th>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Help for GDG options:</td>
<td>N</td>
<td>Y/N</td>
</tr>
<tr>
<td>GDS names in Selection Dataset</td>
<td>A</td>
<td>R = Relative, A = Absolute, B = Both</td>
</tr>
<tr>
<td>Evaluate GDG entries from JCL data</td>
<td>Y</td>
<td>Y/N</td>
</tr>
<tr>
<td>Evaluate GDG entries from SMF data</td>
<td>Y</td>
<td>Y/N</td>
</tr>
<tr>
<td>Expand Base only references</td>
<td>N</td>
<td>Y/N</td>
</tr>
<tr>
<td>Add entries for missing GDSes</td>
<td>F</td>
<td>N = No, M = Min for rerun, F = Forward recovery, A = All cataloged</td>
</tr>
<tr>
<td>Evaluate GDG entries from JCL data</td>
<td>Y</td>
<td>Y/N</td>
</tr>
<tr>
<td>Evaluate GDG entries from SMF data</td>
<td>Y</td>
<td>Y/N</td>
</tr>
<tr>
<td>Expand Base only references</td>
<td>N</td>
<td>Y/N</td>
</tr>
<tr>
<td>Add entries for missing GDSes</td>
<td>F</td>
<td>N = No, M = Min for rerun, F = Forward recovery, A = All cataloged</td>
</tr>
</tbody>
</table>

For forward recovery ONLY

<table>
<thead>
<tr>
<th>Option</th>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category for new GDS if new GDS</td>
<td>I</td>
<td>I = Include, E = Exclude</td>
</tr>
<tr>
<td>ABARS category for missing GDSes</td>
<td>I</td>
<td>I = Include, A = Allocate</td>
</tr>
<tr>
<td>ABARS category for new generations</td>
<td>I</td>
<td>I = Include, A = Allocate</td>
</tr>
</tbody>
</table>

Figure 7-6  Global Applications Setup Options panel before customization (2 of 3)
Figure 7-7  Global Applications Setup Options panel before customization (3 of 3)

The setup options need to be customized for each application. For a complete description of the Global Application SETUP options, refer to Mainstar: ASAP User Guide.

Figure 7-8 shows how we customized the first section of the Global Applications SETUP Options panel for the OREDU001 application. The following settings were made:

- **Appl DESC** — We changed the default description to: Order Entry Daily US - Highest Priority
- **Associate With ABARS Aggregate** — We entered the name of the ABARS aggregate, OREDU001, the same name as the ASAP application.
- **Collection Mode** — We changed the default from MERGE to REPLACE because we want ASAP to replace existing JOB database records with the new information each time we collect job information.
- **Started Tasks** — We changed the default from Yes to No so that data sets from started tasks that match the naming convention for this application are not included in ASAP’s analysis.
- **TSO Users** — We changed the default from Yes to No so that the TSO user-submitted jobs that match the naming convention for this application are not included in the ASAP’s analysis.
- **Batch Jobs** — We used the default, Y, to collect records from batch jobs.
- **Collect data via SMF or JCL** — We use the default, M, which means that ASAP records the first reference to each data set, or the first URD (update/rename/delete), in the data base.
The second section of the panel (Figure 7-9) contains RSP, JCL and Batch SMF Scan options. We did not make any changes to the default values of these options.

We can control how many cycles ASAP collects and retains in the ASAP database with the Number of RSP cycles to retain, number of JCL cycles to retain, number of SMF cycles to retain and the Automatically delete old cycles options. While retaining additional cycles is necessary in some cases, additional space is required in the database to house the extra records. Refer to Mainstar: ASAP User Guide for more information about retaining additional cycles of data in ASAP.

--- RSP Options ---
Next RSP cycle number: 0000000001
Number of RSP cycles to retain: 0001
Automatically delete old cycles: Y <= ( Y/N )

--- JCL Options ---
Next JCL cycle number: 0000000001
Number of JCL cycles to retain: 0001
Automatically delete old cycles: Y <= ( Y/N )

--- Batch SMF Scan Options ---
Next SMF cycle number: 0000000001
Number of SMF cycles to retain: 0001
Automatically delete old cycles: Y <= ( Y/N )
The third section of the panel (Figure 7-10) contains EXTENDED FILTERING and Current VERIFICATION options. We did not make any changes to the default values of these options.

If your application's behavior is to rename data sets the first time they are referenced, you can include the renamed data set if the renamed data set may resurface during the application, such as after a reorg or rebuilding of the data set. You may also want to include the renamed data set if your recovery methodology is forward and all data sets are considered critical.

--- EXTENDED FILTERING Options ---
Change/Display FILTERING Entries: N <= ( Y/N )
Apply FILTERING During JOB Coll: Y <= ( Y/N )
Apply FILTERING During SMF Scan: Y <= ( Y/N )
Apply FILTERING During VERification: Y <= ( Y/N )

--- Current VERIFICATION Options ---
Re-evaluate Dataset Entries: Y <= ( Y/N )
User Tape Datasets as ACCOMPANY: N <= ( Y/N )
Use SIZE For INC/ACCompy Tapes: N <= ( Y/N )
Max Tape INCLUDE Size: NONE <= ( MB Size/NONE )
Exclude dataset if not Cataloged: Y <= ( Y/N )
Category if 1st ref. DELETE: E <= ( Include/Exclude )
Category if 1st ref. RENAME OLD DSN: E <= ( Include/Exclude )
Category if 1st ref. RENAME NEW DSN: E <= ( Include/Exclude )
Use SMF data in selection dataset: Y <= ( Yes/No )
Use JCL data in selection dataset: Y <= ( Yes/No )

Figure 7-10  Global Application Setup Options panel (3 of 7)

The fourth section of the panel (Figure 7-11) asks what format the selection data set shall be written in. ASAP supports various formats including ABARS. We selected the ABARS format.

If you choose to retain multiple cycles of RSP data in the ASAP database, you can include that data in the selection data set written by ASAP. This supports batch cycles that may run for more than 24 hours or cycles that you are tracking for multiple days.

The selection, Evaluate all data sets as critical, indicates our recovery methodology. If (N) is specified, the recovery methodology is RERUN. Using the RERUN methodology means that only the input data sets are selected for inclusion by ASAP, and all output data sets are excluded. At the recovery site, the data are recovered and the last successful cycle is RERUN, causing all of the output data sets to be recreated. RERUN methodology requires that the backup occur before the input data sets are changed by the application. In some cases, this may require a backup at the beginning of the batch cycle.
We changed the default in this selection from N to Y to indicate FORWARD recovery. FORWARD recovery means that all input and all output data sets are selected by ASAP for inclusion. At the recovery site, the data are recovered and we are prepared to process FORWARD or the next processing cycle. FORWARD recovery requires that the data sets are backed up after the last update or at the end of the batch cycle.

You can cause ASAP to generate additional comments in the selection data set to aid in determining why a data set was classified in a given category. Since we selected FORWARD recovery, all data sets are written to the INCLUDE list and no data sets are excluded unless they match a universal, global, or local filter, or are uncataloged. For this reason, we chose not to use this option.

Figure 7-11  Global Application Setup Options panel (4 of 7)

Figure 7-12 shows the fifth section of the panel, VERIFICATION GDG Options. Verification options control generated data sets during APPLEND process or verification before they are written to the selection data set. To display the help panels, type a Y in the Help for GDG Options field and press Enter.

Generation data sets are added to the ASAP database from RSP JCL and SMF capture. Both the relative and absolute names are stored in the database. The GDS names in Selection Data Set option determines what you see in the selection data set that ASAP creates; either the relative name, the absolute name, or both. We are selecting the default of absolute name.

Expand Base only references GDG base names that are coded in the JCL. Since ABARS does not support a GDG base name in the INCLUDE list, it is necessary for ASAP to do a catalog lookup and include all of the generation data sets in the base. We changed this option from the default of no (N) to yes (Y).

The option, Add entries for missing GDGs, determines if GDS entries, not already present in the database at the time APPLEND is executed, should be added. Use of this option prevents gaps in the generation data set for generation data groups referenced by the application. As an example, if the batch job references the (0) and the (-2) and there is no other reference of the (-1), upon restore, the (-2) becomes the (-1) because the missing GDG (-1) was not included. We selected the default, F, to support our Forward recovery methodology.

![Selection Options Panel](image-url)
Figure 7-12 Global Application Setup Options panel (5 of 7)

Figure 7-13 shows the sixth section of the panel. These options are applicable in situations when RERUN recovery is used (the option, Evaluate all data sets as critical, is set to N) but it is desirable to include output generation data sets, normally used for FORWARD recovery. This situation is applicable for sites that either all of their data sets are generation data sets or all of their output data sets used in subsequent processing are generation data sets. If this scenario is applicable to you, you can cause output data sets to be included using these options. Refer to Mainstar: ASAP User Guide for a detailed explanation of each option.

Since we are already including all input and output data sets, no changes to this section are required.

For forward recovery ONLY

Category for new GDS if new GDS is only reference to GDG: I <= ( I = Include 
E = Exclude )
ABARS category for missing GDSes: I <= ( I = Include 
A = Allocate )
ABARS category for new generations: I <= ( E = Exclude 
I = Include 
A = Allocate )

Figure 7-13 Global Application Setup Options panel (6 of 7)
Figure 7-14 shows the last section of the panel. This section is where we define the selection data set name for Verify and RSP/Batch functions. The Verify selection data set name is a test data set name that we can update. The RSP/Batch selection data set name is used in production.

For new applications, a default selection data set name is automatically generated. If you have previously defined the ABARS aggregate in ISMF and the application you are adding matches that aggregate name, ASAP uses the name you supplied when you defined the aggregate. To change the name, simply type over the name with the name of your selection data set.

The AUDITING Options control the operation of ASAP Audit. ASAP Job Auditing is performed by executing the AUDITSCH command in the AMPPROC cataloged procedure. For more information about Job Auditing, refer to Mainstar: ASAP User Guide.

The ASAP AUDITING Options are applicable for jobs collected using one of the scheduling interfaces. Since we are not using a scheduling interface, we changed the default of yes (Y) to no (N) for this option.

APPLICATION DATASET Usage is used when batch SMF is executed. The names of the SMF data sets can be placed here to automatically display when the batch SMF panel is utilized. We did not modify this field.

--- SELECTION DATASETS ---
VERIFY => CG>AMPASAP.OREDUO01.SELECT
RSP/BATCH => ABARS.OREDUO01.SELECT
--- AUDITING Options ---
Automatic JOB Auditing: N <= ( Y/N )
JOB Auditing Frequency (Min): 005 <= ( No of Days )
Update Audit Changes To ASAP/DB: Y <= ( Y/N )
--- APPLICATION DATASET Usage ---
SMF Collection Libraries:
=> RMP.SMFMAN1.FLATFILE

Figure 7-14   Global Application Setup Options panel (7 of 7)
When customization is complete, press Enter to save the changes and then press PF3 to return to the ASAP (Manager) Application AutoBuild Options panel shown in Figure 7-15.

### 7.3.2 Job collection

We are using the ISPF interface to enter a job name mask for the order entry application.

When a job name mask is used, RSP tracks all jobs matching the mask and collects JCL and SMF records for all data sets. When APPEND is executed, all of the records collected by ASAP are analyzed, the filters are applied, and the selection data set list is created. This method of job collection is especially useful when the job names in the schedule vary on a cycle to cycle basis.

Using RSP ensures that the records are collected in the proper order, as they are created. There are coding rules for supplying job names using the ISPF interface. Review the rules in Mainstar: ASAP User Guide prior to job name entry.

### 7.3.3 Entering job names using ISPF interface

Select Option 1, Job Collect, by typing the number 1 in the option field on the ASAP (Manager) Application AutoBuild Options panel (shown in Figure 7-15) and press Enter. The ASAP Application JOB Collection Options panel, shown in Figure 7-16, appears.
Select Option A, FROM ISPF Edit Mode and press Enter.

ISPF creates a sequential data set, shown in Figure 7-17, in edit mode for you to enter the job names. We entered the job name mask, OREDU*, to pick up all job names in our order entry daily U.S. application. Because we established good job-naming conventions, we can be sure that we do not include job names outside of our application. Using a job name mask minimizes our effort, both in defining the job names and in supporting the ongoing maintenance of the application.

After entering the job name mask, OREDU*, we pressed Enter and then PF3. A message appears that the job information is saved. We are returned to the ASAP (Manager) Application AutoBuild Options panel shown in Figure 7-18. The Event STATUS field next to JOB COLLECT, option 1, is automatically updated with the date and time of the update.
7.3.4 JES3 considerations

JES3 performs allocation of data sets up front for the entire job stream. Data sets from conditional steps that are not executed are only recognized by ASAP when Dynamic JCL Scan is used, because no SMF records are created. If dynamic JCL scan is not used, these data sets cannot be recognized as requiring backup or recovery. At the recovery site, the job stream execution fails, because JES3 attempts to preallocate the nonexistent data sets in the conditional job steps. In order to resolve this situation, make sure you are collecting records using the Dynamic JCL Scan feature of ASAP.

7.3.5 Collecting records using RSP

The product installer is responsible for establishing the RSP task in your environment. Once established and executing on all images, RSP uses an internal job table containing the names of all jobs and applications defined in the ASAP database.

The job table is updated by a batch job called RSPJRFSH. This job is a member of the ASAP product installation libraries and can be copied to any JCL library for submittal by the ABARS administrator or job scheduling software. Jobs are not tracked by RSP until RSPJRFSH has been executed.
### 7.3.6 Application end

The Application End procedure (APPLEND) is a job or a job step that is executed to signal the end of an application cycle. The JCL for this job is provided in the ASAP installation libraries; see the *ASAP Installation and Maintenance Guide* for more information. When copied to a procedure library, the JCL executed needs to include a parameter for the application name. The order entry system uses the following parameter:

```plaintext
//jobcard........
//STEP1 EXEC APPLEND,PARM=OREDU001
```

During the initial setup of the application, the ABARS administrator may execute the APPLEND step outside of the control of the order entry application. Once put into production, this job becomes part of the daily, weekly, and monthly order entry application and is named according to the naming conventions for the order entry system.

It is important to implement the APPLEND step execution concurrently with refreshing ASAP's job table (running RSPJRFSH). This is because records are held in the RSP queues until they are purged by the APPLEND procedure. If you continue to collect records for some time without purging any, the database may become larger to accommodate the records. APPLEND has execute parameters that permit implementation and SMF record capture without updating the ASAP database, as well as options that permit database update but no autoanalysis: see the options (UPDATE, NOSELREBUILD), (UPDATE, SELREBUILD), and NOUPDATE options.

### 7.3.7 Verification

Now that RSP has collected data for us to view in ASAP, we can use the Verification panels to take a look at data sets and the analysis ASAP has performed. ASAP classifies data sets and builds INCLUDE, EXCLUDE, ALLOCATE, and ACCOMPANY control cards in the selection data set for the application.

When RERUN methodology is used, ASAP classifies all data sets used for input in the batch cycle as part of the INCLUDE list. All output data sets created in the cycle are classified as part of the EXCLUDE list because they will be recreated at the disaster recovery site during the recovery rerun. All user tape data sets are classified as part of the ACCOMPANY list because we said we wanted to ACCOMPANY tape files in the setup parameters of the daily order entry application. Permanently allocated non-GDS data sets, used as output, are classified as part of the ALLOCATE list.
When running FORWARD recovery, all data sets are placed in the INCLUDE control card of the ABARS selection data set. You may override ASAP and place specific data sets on the ALLOCATE or EXCLUDE list using local filters.

The applications analyst, the ABARS administrator, or both, reviews the list of data sets during the verification process and identifies any data sets that may need to be removed, added or moved to the INCLUDE, ALLOCATE, or ACCOMPANY list. For example, the analyst may want to exclude an included data set or move a data set to the ALLOCATE list.

Universal, Global and Local filters are used to permanently change ASAP’s classification of the data sets. These filters are discussed in more detail in 7.3.9, “Filters and controls” on page 102.

### 7.3.8 Initiating verification

Verification is the manual triggering of the autoanalysis function of ASAP, and is used during the setup of an application in order to evaluate the quality of the data captured, and the effect of (or need for) any application filters. Verification is replaced by APPLEND processing during normal, day-to-day operation.

The Verification options also permit you to specify a selection data set name that is different from the one defined in the ABARS Aggregate Group Definition. This allows you to test using a non-production data set name, for which you have update authority, and then convert to a production mode, where the defined selection data set will be used, and for which you may not have update access.

Verification is selected from the ASAP (Manager) Application AutoBuild Options panel (Figure 7-19).

---

<ASAP (Manager) Application AutoBuild Options panel>

---

**Option ==>
SPECIFY Aggregate (Application) Name ==> OREDU001**

--- PRIMARY COLLECTION SEQUENCE (PCS) ----

**0 - SETUP : Setup Application Options.**

**1 - JOB COLLECT : Collect Application JOB Structure.**

--- APPLICATION POST-PROCESSING OPTIONS ----

**4 - VERIFICATION : Determine Final SEL Dataset Entries.**

**5 - AUDITING : Monitoring of Application Changes.**

**6 - STATUS : Display Current Application's Status.**

**7 - NOTEBOOK : Maintain Application NOTES.**

{ APPLICATION CREATED BY: CG ON 05/13/2002 }

---

**Figure 7-19  ASAP (Manager) Application AutoBuild Options panel**
Select **Option 4, VERIFICATION**, and press Enter. The *SELECTION DATASET BUILD* panel, shown in Figure 7-20, appears.

**SELECTION DATASET BUILD**

**CMD:**

CHOOSE PROCESSING OPTION

* F FOREGROUND
* B BATCH

**Figure 7-20  Selection Data Set Build panel**

Select **Option F, FOREGROUND** by typing the letter F in the CMD field and press Enter. The *SELECTION DATASET BUILD FOREGROUND OPTIONS* panel, shown in Figure 7-21, appears.

**SELECTION DATASET BUILD FOREGROUND OPTIONS**

**CMD:**

APPLICATION ==> OREDU001

SYSID ==> DVLP

RE-EVALUATE: ENABLED
FILTERING: ENABLED
USER TAPES: AS INCLUDES
USE MAX-INC SIZE: DISABLED
MAX-INC SIZE: NONE
FINAL CATALOG CHECK: ENABLED
BASE GDG(S): NOT INCLUDED
SELECT DSN FORMAT: ABARS
SMF DATA FROM RSP OR BATCH SMF SCAN? => R (R=RSP,S=SMF SCAN)
CHANGE APPLICATION SETUP OPTIONS? => N (Y/N)
MAKE ONE-TIME CHANGES TO DATASET CATEGORIES? => N (Y/N)
SELECTION DATASET NAME FOR THIS BUILD
=> CG.AMPASAP.OREDU001.SELECT
VERIFY SELECTION DATASET NAME IN DATABASE
=> OG.AMPASAP.OREDU001.SELECT

**Figure 7-21  Selection Data Set Build Foreground Options panel**

Overtype the **N** default value with a **Y** in the field **MAKE ONE-TIME CHANGES TO DATASET CATEGORIES?** field and press Enter. Figure 7-22 shows the *SELECTION DATA SET CATEGORY SUMMARY* panel.
View the data sets in each category, type the word **ALL** in the CMD (command) field and press Enter. Figure 7-23 shows the **DATASET ENTRIES VIEW/CHANGE** panel.

Once the panel is displayed, use the standard ISPF scroll keys, PF8 (down) and PF7 (up) to scroll through the data set names.
You are highly likely to find data sets that you do not wish to include in your ABARS backup. We found data sets that begin with SYS1, SYS2 and other high-level qualifiers used by the systems programmers for system-related data sets. We also found data sets that are common to most or all applications, such as the name of our production JCL library, control card library, and DB2 DCLGEN libraries. We use universal, global and local filters, discussed in 7.3.9, "Filters and controls" on page 102, to permanently exclude these data sets from your application's ABACKUP.

Press PF3 on the DATASET ENTRIES VIEW/CHANGE panel to return to the SELECTION DATASET CATEGORY SUMMARY panel. Press PF3 again to return to the SELECTION DATASET BUILD FOREGROUND OPTIONS panel. Press Enter in this panel to initiate the verification of the application. When this process completes, ASAP automatically displays the selection data set, as shown in Figure 7-24.

```
BROWSE   DS01.DS1AB.SDS   Line 00000000 Col 001 080
Command ==>                                           Scroll ==> PAGE
*****************************************************************
/*    LAST UPDATE: CG     05/14/2002 10:35:16        */
/*    SELECTION DATASET UPDATE VIA ASAP(C) FACILITY: */
/*    COPYRIGHT 1997-1999 MAINSTAR SOFTWARE CORPORATION */
/*    APPL NAME: OREDU001 */
/*    DESC: APPLICATION CREATED BY: DS01 ON 04/18/2002 */
/*    DSN FORMAT: ABARS */
/*    SYSID: **** */
/*    EXEC MODE: DIALOG (OPTION-4) */
/*    RE-EVALUATE DATASET ENTRIES: YES */
/*    DATASETS EVALUATED FROM: SMF AND JCL */
/*    TAPE DATASET AS ACCOMPANY: YES */
/*    USE SIZE FOR INC/ACC TAPES: NO */
/*    CTLG CHK: ENABLED */
/*    PROCESS FILTERS: YES */
/*    NAME TYPE FOR GDSES: REL AND ABS */
/*    GDSES EVALUATED FROM: SMF AND JCL */
INCLUD
P.ORE.J.VS.ORDER.D1 /* DASD(PROD002) 2002.108 */
P.ORE.J.ORDER.INV1 /* DASD(PROD002) 2002.108 */
P.ORE.J.S.INVENTORY /* DASD(PROD001) 2002.108 */
P.ORE.INV.MASTER(0) /* DASD (PROD001) 2002.108 */
)
```

Figure 7-24 Selection data set for the order entry application
This completes the initial verification of the OREDU001 application. We have already identified data sets that we need to filter out using the ASAP filters and controls. After we add the filters, final verification is run to update the selection data set with the desired critical data sets. The next section describes how to use the ASAP filters and controls.

7.3.9 Filters and controls

There are three different types of filters: job name, data set retention, and data set evaluation. Within each type of filter, three levels of filtering are available: universal, global and local.

Refer to Mainstar: ASAP User Guide, “Using Filters and Controls”, for syntax requirements and detailed information about ASAP’s filters and controls. Remember that all filters are evaluated on the basis of “first-hit-and-out” logic, whether the hit is positive (include) or negative (exclude). This makes it simple to determine the effect of a given set of filters. The filters are:

- **Job name filters**: Job name filters are applicable only to those jobs collected using the scheduling interfaces. They do not apply if job names are entered manually. You may INCLUDE or EXCLUDE job names.

- **Data set retention filters**: Retention filters affect which records are added to the ASAP database from Dynamic JCL scan, RSP or Batch SMF scan. You can DISCARD or KEEP records based on data set name, volume name, system identification, and unit name.

- **Data set evaluation filters**: Evaluation filters affect whether records collected by Dynamic JCL scan, RSP or Batch SMF scan are to be evaluated or excluded. You can evaluate or exclude records based on data set name, volume name, system identification, or unit name.

- **Universal level filters**: Universal level retention and evaluation filters are processed first for absolute control over every application. These filters are automatically applied.

- **Global Level filters**: Global level filters are applied across all applications when they are invoked in the local filtering of the application.

- **Local Level filters**: Local level filters are applicable to a specific application.

7.3.10 Creating universal and global filters

In the ASAP (Manager) Auto Selection & Audit Process Main Menu (Figure 7-2 on page 84), select Option 9, FILTERS/CONTROLS and press Enter. The Global Filtering/Controls Selection panel appears, as shown in Figure 7-25.
Type the letter E in the Universal Retention Filters field and press Enter. ISPF displays a sequential data set in which to add the filtering criteria.

**Note:** Typing an E in any of the fields on the Global Filtering/Controls Selection panel results in ISPF displaying a sequential data set in which you code your filtering criteria. Typing the letter B in these fields allows you to browse the information that has already been entered.

ASAP provides helpful information as NOTE data in the ISPF edit entry panel. To use the data provided in the NOTE format, type the ISPF command, MD in the NOTE label field (over typing the word NOTE) and press Enter. The MD command is described as “make data”. The data is now an actual record that is saved and used by ASAP’s filtering process. Do not forget to customize the entry with data set names that are applicable to your environment.

The universal filter in Figure 7-26 discards all SYS1 data set records. This means that ASAP does not collect the record in the ASAP database. We prefer to use the universal filter for SYS1 data sets because these data sets are backed up and restored as part of the operating system.
After coding the entry, press Enter, then press PF3 to return to the Global Filtering/Controls Selection panel.

We use universal evaluation filters to exclude all production JCL libraries, control card libraries, DB2 DCLGENs, DB2 table space, and IMS databases. The evaluation filter is used because we want these records included in ASAP's database. Figure 7-27 shows the universal evaluation filters entered.

A volume parameter is used for both DB2 volumes and IMS volumes because all DB2 tablespaces and IMS databases reside on volumes that begin with DB2 or IMS.
Global retention and evaluation filters are entered in a similar fashion; however, there is a separate edit operation for each type: DSN, volume, unit, and SYSID. Unlike universal filters, global filters must be explicitly included in the local filter for each application.

We entered global filters in each of the categories. Example 7-1 shows the DSN, volume, unit, and SYSID global filters we entered.

**Example 7-1  Global Filters at Crazy Socks Corporation**

EXCL_DSN(P.S.CALL.FORECAST)
EXCL_DSN(P.S.STRANGE.CALLERS)
EXCL_DSN(P.S.EXCHANGE.INFO)
EXCL_VOL(XRC*)
EXCL_UNIT(TEST)
EXCL_SYSID(SYSO)
7.3.11 Local filters

Local filters are similar in nature to universal and global filters, but they apply to specific applications and are entered as part of the setup options for each application. Any global filter that a particular application wants to include must be included at the local level.

To create a local filter, select Option 0, SETUP on the ASAP (Manager) Application AutoBuild Options panel (Figure 7-15 on page 94) and press Enter. The SETUP OPTIONS FOR APPLICATION panel appears (Figure 7-28).

![Setup Options for Application](Figure 7-28 Setup Options for Application)
Scroll down (using PF8) to the Change/Display FILTERING Entries field, overtype the N value with the letter Y and press Enter. The APPLICATION FILTER EDIT/BROWSE panel shown in Figure 7-29 appears.

![APPLICATION FILTER EDIT/BROWSE](image)

Figure 7-29 Application Filter Edit/Browse panel

Type the letter E in the field to the right of Application Evaluation filter(s) and press Enter. ISPF will display a sequential data set in which to type the filter entries.

We use local filters to include data sets that are external to the application but are required for recovery at the disaster recovery site. We also want to include the global filters previously defined.

The entries we coded are shown in Figure 7-30. You may notice that we coded the global filters after our local filters. This is because we want our local filtering to take precedence over global filtering.
When completed, press PF3 to save the entries and return to the APPLICATION FILTER EDIT/BROWSE panel. Continue pressing the PF3 key until you return to the ASAP (Manager) Application AutoBuild Options panel.
7.3.12 Final verification

We viewed our initial list of data set names and identified several data sets that required filtering controls. We established these controls using universal, global and local filtering. Now we need to reverify our application and review the final list of data sets to be included in the ABARS backup. When we complete the final verification, we are ready to start using ABARS to perform ABACKUP on our application data sets.

7.4 Identifying overlapping data sets

Because many applications share common data sets, it is possible that the same data set can be considered critical to more than one application. By identifying these overlaps, the application analyst can determine which application is best suited to back it up. ASAP’s Overlap program produces a report of all data sets in more than one application. The Overlap program is provided in the ASAP installation libraries. Refer to Mainstar: ASAP User Guide for more information about ASAP’s overlapping data sets report.

7.5 Aggregate balancing

Backup & Recovery Manager’s Aggregate LoadBalancer feature divides large aggregates into several smaller aggregates or combines smaller aggregates into one aggregate.

Breaking down large aggregates reduces the overall run time of ABACKUP and subsequent ARECOVER executions. Aggregate LoadBalancer takes full advantage of the 64 concurrent ABACKUP and ARECOVER tasks. Reducing the size of the aggregate means less processing time, and frees data sets for use by other applications or processes.

Combining multiple aggregates into a single aggregate avoids excessive tape mounts and provides a method to better utilize tape media capacity. Consider the ABACKUP and ARECOVER execution times before using this feature.

The Aggregate Balancing feature also provides a user exit, allowing you to tailor how an aggregate is broken down. For example, you might have a very large aggregate that you want to divide into five separate aggregates. The aggregate contains CICS data sets that you would like to direct to one of the five aggregates. The user program identifies the CICS data sets, directs them to the appropriate aggregate, and directs the remaining data sets into the other four aggregates.
Aggregate balancing is performed as a batch job after the APPLEND job has been executed, creating the selection data set and before the ABARS backup. Control cards are used to identify the name of the input selection data set and the names of the output selection data sets. If we wanted to divide our daily 6 GB order entry aggregate into three 2 GB aggregates, the control cards would be coded as shown in Example 7-2.

**Example 7-2  Aggregate Balancing Control Statements**

```
DISTRIBUTE(BY_TOTAL_KB(2000000) -INPUT(
  SELDSN(P.ORE.S.OREDU001.SELECT) -OUTPUT(
  SELDSN(P.ORE.S.OREDU002.SELECT) -(
  P.ORE.S.OREDU003.SELECT) -(
  P.ORE.S.OREDU004.SELECT))
```

We defined three new aggregates to ISMF: OREDU002, OREDU003, and OREDU004. We used the selection data set names shown in the control cards to split the OREDU001 aggregate into three smaller aggregates. We now require three aggregate backup tasks to perform the backup on aggregates OREDU002, OREDU003 and OREDU004. aggregate backup is not executed for aggregate OREDU001 because those data sets are now part of the three smaller aggregates.
Using ABACKUP

ABACKUP is the ABARS command that you use for making backup copies of the data sets that have been defined in the aggregate group.

You may use Backup & Recovery Manager to invoke the ABACKUP command and provide additional value.

In this chapter we review the standard ABACKUP command and how it is used with Backup & Recovery Manager.
8.1 ABARS ABACKUP command

The ABARS ABACKUP command is used to perform aggregate backups. You can use it in two ways, specifying any of the following, and mutually exclusive, keywords:

- **VERIFY**: This performs a test run of the aggregate backup without backing up the data sets. An example command could be as follows:

  ```
  ABACKUP aggnname VERIFY
  ```

- **EXECUTE**: This performs the real aggregate backup. It first performs a verification as with the VERIFY option, but after that, it backs up the data sets. An example command could be:

  ```
  ABACKUP aggnname EXECUTE
  ```

To be able to execute the ABACKUP command, you have to define all the necessary components of the aggregate backup. For more information about setting up the environment, refer to Chapter 6, “Aggregate definition” on page 69.

8.1.1 ABARS ABACKUP parameters

The ABACKUP command has a number of optional parameters to help define the scope of the backup.

There is just one *required* parameter, which is **EXECUTE | VERIFY**.

The optional parameters are:

- **FILTEROUTPUTDATASET**(dsname): This identifies the data set name in which the name of the data set names that pass the filtering specified by INCLUDE/EXCLUDE, ALLOCATE/ALLOCATEXCLUDE, and ACCOMPANY/ACCOMPANYEXCLUDE will be written.

- **LIST(SKIPPED)**: This indicates ABARS to write in the activity log all the data sets not backed up due to the specification of SKIP(PPRC) or SKIP(XRC).

- **MOVE**: This specifies whether to delete, uncatalog, or do both, on all the data sets selected after a successful aggregate backup.

- **OPTIMIZE**(option): This is used to override the value of the SETSYS ABARSOPTIMIZE command. This parameter is passed to DFSMSdss when backing up the level 0 data sets. The values are the same as those specified in DFSMSdss.

- **PROCESSONLY**(LEVEL0 | MIGRATIONLEVEL1 | MIGRATIONLEVEL2 | USERTAPE): This parameter is used to specify which categories of data DFSMSShsm should process. If it is not specified, all categories are processed.
Chapter 8. Using ABACKUP

8.2 BRM ABACKUP command

The Backup & Recovery Manager ABACKUP command invokes the ABARS ABACKUP command, but also improves the processing.

8.2.1 Executing BRM ABACKUP

This section documents the execution of the ABACKUP command with Backup & Recovery Manager, assuming that we also used ASAP for selecting the application critical data sets, as explained in Chapter 7, “Structuring applications using ASAP” on page 79.

Once critical data sets are identified and written to the selection data set, using RSP, the APPLEND program signals the end of the application. That signal triggers ASAP to analyze the data sets, apply universal, global, and local filtering, and write the INCLUDE, ALLOCATE, ACCOMPANY, and EXCLUDE statements to the selection data set.

When we completed the data set analysis for the order entry system, we modified the APPLEND job that was already added to our scheduling package, from a setting of UPDATE, NONSELREBUILD to that of UPDATE, SELREBUILD. This setting performs autoanalysis on captured data sets at each APPLEND execution, and places the results in a freshly re-created selection data set in preparation for ABACKUP. We also added the ABARS aggregate balancer job to our scheduling package to be executed after the APPLEND job, to divide the aggregate into smaller aggregates for backup and recovery performance.
We are now ready to add the ABACKUP job to our application. We initially set up our ABACKUP job to run in verify mode. BRMBPROC is the procedure that Backup & Recovery Manager uses to submit ABACKUP and ARECOVER commands, and Backup & Recovery Manager batch reports. The product installer adds BRMBPROC to a procedure library so we can execute it in a batch job. Example 8-1 shows the BRMBPROC batch execution JCL.

Example 8-1  Backup & Recovery Manager BRMBPROC execution JCL

```
//BRM EXEC BRMBPROC,
//   LOAD1='BRMX.QA.LOAD',
//   PARMLIB='BRMX.QA.PARMLIB',
//   DAD='DAD.DADHHATT.DAD',
//   IDS='BRMX.INVDB'
//BRMBATCH.SYSIN DD *

place submit commands here......
```

The command to run ABACKUP in verify mode is entered as follows:

```
ABACKUP  AG(OREDU001) +
   VER +
   TERMMGS(YES) +
   UNIT(CART)
```

This command is unique to Backup & Recovery Manager. This Backup & Recovery Manager command invokes the ABARS ABACKUP command. OREDU001 is the name of our daily order entry application for the United States. The VER(ify) keyword is used to test the ABACKUP process. No data backup is performed, only data set verification. The ABACKUP VERIFY command process lists all input tape volumes required, in addition to all migrated and non-migrated data sets.

After successful execution of the ABACKUP VERIFY command, we are ready to change the VER(ify) parameter to EXECUTE to perform data backup. The command is changed to:

```
ABACKUP  AG(OREDU001) +
   EXEC +
   TERMMGS(YES) +
   UNIT(CART)
```

### 8.3 Initiating ABACKUP using ISPF dialog

ABACKUP is initiated by selecting Option 2, Backup/Recovery Management on the Backup & Recovery Manager - Main Menu panel (Figure 8-1).
The *BRM Backup/Recovery Management* panel shown in Figure 8-2 allows you to perform backups and recoveries, and view detailed information about past backup and recovery events.

To initiate the backup command, type the letter **B** next to the aggregate name and press Enter. The *BRM Submit Backup* panel (Figure 8-3) is displayed.
We selected the following options:

- In the **Backup Process** field we changed from V, Verify to **E**, Execute.
- In the **Incremental or Base** field we used the default, **B**, which means that we are not using the Incremental ABARS feature for this aggregate.
- Our **Output UNIT** is the esoteric name **CART**.
- In the **Receive ABARS Messages** field we used the default value of **Y**, so that all ABARS messages are sent back to the submitter.
- **Invoke SDSL Processing** is set to **N**, which is the default, because we are not using the SDSL language to create the include list for this aggregate.
- **STACK** is set to **Y** because we want to stack the ABARS output onto a single output cartridge or series of cartridges.
- To improve the performance of the backup, we select the value **4** in the **Optimize** parameter, making DFSMSdss to move 1 cylinder of data at a time when copying the data.
- We are performing ABACKUP without the **MOVE** option, so we selected the default value of **N**.
- The option **FILTEROUTPUTDATASET** is left blank because we are not creating an optional filter output data set.
The **PROCESSONLY** field is set to **Y** for all the subfields because we are including data sets from all levels of the storage hierarchy in this backup. This is the default.

After customizing the panel, we are ready to select the **Build/Submit JCL** option to execute our ABACKUP command for OREDU001. We type the letter **S** in the **Build/Submit JCL** option field and press Enter.

This action results in the following command submitted to ABARS from Backup & Recovery Manager:

```
ABACKUP AG(BB1) +
EXECUTE +
TERMMSG(YES) +
NOSTACK +
UNIT(CART)
```

### 8.4 Resolving common ABARS ABACKUP errors

When ABARS cannot successfully process all data sets in an aggregate, it issues one or more error messages and ends with a nonzero return code (RC). This RC is the suffix for a DFSMShsm message **ARC6sssx**, where **sss** is that three-digit RC and **x** is either **I**, or more likely **W** (Warning) or **E** (fatal Error). Those ARC messages can be found in *MVS System Messages, Volume 2*.

Subsidiary and related messages from DFSMSdss, which is being invoked to make the backup copy, can be found in that same manual. Those messages begin with **ADR**.

The most common return codes (RCs) from ABARS we have experienced are:

- **RC = 034 - Data set in use**

  The most common reason for this error is that either the backup job or the competing production job is running outside its normal execution times. Usually the analyst or scheduler should try to rerun the backup a few minutes later, since the in-use condition is often short lived.

  If this error is repetitive, the analyst should first consider whether the timing of the two (or more) competing jobs can be resolved, perhaps by a change in the schedule package’s dependencies or timing. If that is not possible, consider splitting the aggregate into two or more parts that run at different times. If neither of those changes is possible, then the aggregate definition in the SMS Management Class definition can be changed to allow a fuzzy copy to be created (Copy Serialization Continue). All data sets in the aggregate will be backed up regardless of whether or not they are currently being used or even updated.
- **RC = 073 - ENQ failure**
  This also is a timing-related issue, although the culprit in this case is not another job, but rather some other DFSMShsm function, usually migration or backup. Usually restarting the backup a few minutes after the failure solves the problem.

- **RC = 125 - User not authorized to data set**
  The Batch ID that is associated with the backup job does not have RACF authority to process the data set. For non-VSAM data sets, that means RACF Read access. For VSAM data sets, that means Alter Authority.

  The most common resolution is to Permit the Batch ID to the data set profile that covers the data set in question. If the application analyst determines that the data set should not be backed up as part of the current aggregate, and the selection data set is created by ASAP, the data set can be excluded from backup using ASAP’s local filtering option.

- **RC = 167 - Data set not found**
  A data set whose name is fully qualified in the selection data set cannot be found. ABARS requires that all data sets be cataloged. The initial step of the ABARS backup is to check the catalog to verify that each data set is cataloged.

  This error should not occur for aggregates produced by ASAP, since the step that rebuilds the selection data set also does a catalog check and flags all uncataloged data sets so ABARS does not attempt to back them up.

  If a RC=167 occurs for an ASAP aggregate, it means that the data set has been uncataloged (or, in the case of a GDS, rolled off the GDG base), between the time the selection data set was rebuilt and the time the backup became active.

- **RC = 176 - Syntax error in selection data set**
  This message also includes a line number and a reason code. If the line number is 1 and the reason code is 09, the most likely reason for the error is that there was no job activity for the jobs being tracked for this aggregate since the last time the backup job executed. The reason could be that the backup job was run out of sequence, or that after a backup failure the job was restarted at the beginning rather than at the backup step.

  If the line number is not 1 with a reason code of 09, check the message manual for the meaning of the reason code.
RC = 259 - The operator replied NO to a request to retry the allocation for a specific tape volume which is in use by some other DFSMShsm function.

This message indicates that ABARS waited at least one multiple of 30 minutes for the other DFSMShsm function to release a DFSMShsm ML2 tape containing a data set that needs to be backed up by this aggregate. Because this condition could exist for several hours, simply restarting a backup may not resolve it.
Managing aggregates with Backup & Recovery Manager

Now that ABARS is being used to perform application backups, the role of the ABARS administrator has expanded to include management of the aggregates. Backup & Recovery Manager simplifies this task by providing aggregate inquiry, reporting, and submittal of ABARS commands, both online and in batch.
9.1 Interactive Backup & Recovery Manager

Backup & Recovery Manager interactive panels provide the ability to interrogate the status of aggregates, execute ABACKUP and ARECOVER commands, provide a history of ABARS events, generate various reports, and allow real-time event monitoring.

9.1.1 Online aggregate inquiry

Figure 9-1 shows the Backup & Recovery Manager - Main Menu panel. From the main menu, you can:

- Obtain all required information about aggregates
- Monitor event backup or recoveries by name, date, and type
- Add, change, or delete logical aggregates and manage aggregates as a group
- Add change or delete group filters
- Search for specific data sets or data set name masks across all backup events
- Identify data set overlaps
- Create reports
- View events based on their backup/recovery date.

![Backup & Recovery Manager - Main Menu](image)

Figure 9-1 Backup & Recovery Manager - Main Menu
Sub-menus are available from all primary panels of Backup & Recovery Manager, with one exception; the Utilities sub-menu is only available from the main menu. Sub-menus are located along the top of each panel, as shown in Figure 9-1. To select a sub-menu, simply position the cursor over the desired sub-menu and press Enter. A numbered list of selectable sub-menu options are displayed.

### 9.1.2 Aggregate Management with SMS Interface

Using Backup & Recovery Manager, you can manage your aggregates in the same way you do this with SMS. **Option 1, Aggregate Management with SMS Interface** of the *Backup & Recovery Manager - Main Menu* panel, provides for viewing aggregate detail as seen from SMS, and using line commands to add, change, or delete the aggregate from the Backup & Recovery Manager inventory data set. Other line commands are available that interface with other options of Backup & Recovery Manager.

To select Aggregate Management with SMS Interface, type the number 1 in the **Command** field and press Enter. The *Aggregate Management w/SMS Interface Setup* panel is displayed (Figure 9-2).

In this panel you can enter an aggregate name, a mask, or an asterisk to view all aggregates. If you select to **Store values to be used as default for this USERID**, by typing a forward slash (/) in the field, the values are saved until you change them. If you select the option, **Don't show this panel again**, by typing a forward slash (/) in the field, this panel does not display on subsequent visits. If you leave these fields blank, the values are not saved, and the setup panel redispays each time you select option 1.

---

*Figure 9-2  Aggregate Management w/SMS Interface Setup panel*
After selecting your customization options on the *Aggregate Management w/SMS Interface Setup* panel, the *BRM - Aggregate Management w/SMS Interface* panel is displayed as shown in Figure 9-3.

The *Aggregate Management w/SMS Interface* panel displays a combination of data input to Backup & Recovery Manager, and data obtained from DFSMS that is captured from ISMF.

Use this to add aggregates, defined in ISMF, to Backup & Recovery Manager by aggregate name or an aggregate name mask using the ADD command. You may also type the **A** (ADD) line command next to the aggregate name and press Enter.

Before an aggregate can be tracked and managed by Backup & Recovery Manager, it must be added to the IDS. Aggregates that are not managed by Backup & Recovery Manager can only be inquired on. Once the aggregate has been added, a backup can be performed through Backup & Recovery Manager by typing the **B** (BACKUP) line command next to the aggregate name in the panel shown in Figure 9-3.
After selecting any of the options in the *Aggregate Management w/SMS Interface* panel, the *BRM Aggregate Controls* panel is displayed as shown in Figure 9-4.

![BRM Aggregate Controls panel](image)

There are a variety of fields and options in this panel:

- **Backup Gens/Groups to Retain**
  
  In this field, specify the number of backup generations to retain in the IDS. If you are using Incremental ABARS, the aggregate must be defined in ISMF with retain versions 9999 or NOLIMIT for Backup & Recovery Manager to properly manage the aggregate using Incremental ABARS.

- **Recovery Gens to Retain**
  
  In this field, specify the number of recovery generations to retain in the IDS.

- **Identify as Incremental**
  
  A Y in this field identifies this aggregate as an Incremental ABARS aggregate.

- **USE SDSL Processing**
  
  A Y in this field identifies the aggregate as having SDSL parameters.
The various options provide a means to correct errors in the selection data set automatically. Each option is enabled with a Y or disabled with an N. You can also set a return code of 0, 4, or 8 as an indication that Backup & Recovery Manager has made a correction to the selection data set. You can cause the job to end normally with a 0 or 4 condition code or abort with a condition code of 8.

To save the entries and changes made to the **BRM Aggregate Controls** panel, press PF3 or type the word **SAVE** on the command line and press Enter. You are returned to the **BRM Aggregate Management w/SMS Interface** panel shown in Figure 9-3 on page 124.

The various line commands on the **BRM Aggregate Management w/SMS Interface** panel, allow submitting backup for selected aggregates, deleting aggregates, displaying information from the IDS, browsing or editing the selection data set, browsing, editing or converting SDSL parameters, or invoking the **Backup/Recovery Management** panel, Option 2, from this panel. For more information on the Line Commands and Primary Commands on this panel, refer to **Mainstar: Backup & Recovery Manager User Guide**.

### 9.1.3 Backup/Recovery Management

When you select **Option 2, Backup/Recovery Management**, on the **Backup & Recovery Manager - Main Menu** panel, you are displayed the **Backup/Recovery Management Search Setup** panel shown in Figure 9-5. This panel is used to specify the criteria to use when searching for selected backup and recovery events or displaying all events in the IDS.
To use this panel, type the name of the aggregate, or an aggregate mask, on the Name or Mask field. Specifying an asterisk (*) on this field displays all aggregates in the inventory.

Auto Expand List is a field that, when Y is specified, shows all of the events that match the aggregate name. When N is specified, only the most current event is shown. The list can be expanded to show all events in the BRM - Backup/Recovery Management panel shown in Figure 9-6.

The Program field provides for displaying only ABACKUP events or ARECOVER events. This field is helpful at the recovery site to limit the view to only ARECOVER events to help manage the amount of data reported.

The Event Type field allows for selecting Base/Incremental events or verify events.

You can search for events based on the date in a variety of date formats in the Event Date field.

You can also search for events based on the return code value, in a variety of ways, using the RC (ABARS/BRM) field.
In the **Sort list by** field, you can select how the list of events are displayed on the panel, by name, date, errors, or space information.

Once you customize the *Backup /Recovery Management Search Setup* panel, you can choose to:

- Include BRM Managed aggregates without Backup/Recovery data
- Store values to be used as default for this USERID, and/or
- Don’t show this panel again

You can do this by typing a forward slash (/) in each field selected. Press Enter to continue. The *BRM Backup/Recovery Management* panel shown in Figure 9-6 is displayed.

The Backup/Recovery Management panel is the panel used to inquire about recent ABACKUP or ARECOVER events, display the list of data sets backed up or recovered, view the detail of the events, display the amount of space required to recover the aggregate, view the activity log, view any errors that may exist, submit a backup or recover command for an aggregate, as well as many other activities.

---

**Figure 9-6  Backup/Recovery Management panel**
This panel also provides for restoring data sets from the ABARS data file using DFSMSdss rather than ABARS. This feature may be desirable in certain situations where you prefer to use DFSMSdss rather than ABARS to perform the restore. You should note that DFSMSdss does not support data that was backed up from tape or from DFSMShsm migration, only data sets backed up from primary disk can be restored using this option. Backup & Recovery Manager stores all of the information about ABARS activities in the IDS. The information is centrally located and viewable from the BRM Backup/Recovery Management panel.

9.1.4 Logical Aggregate Management

Logical Aggregate Management is a feature that provides a way to manage or prioritize a group of aggregates using a single ABACKUP or ARECOVER command.

A logical aggregate is a logical name that is associated with, and manages, several physical aggregates which may need to be grouped together for tracking and prioritization. As an example, if you have several aggregates that must be recovered first, before any other data can be recovered, you can group them into a logical aggregate and when the ARECOVER command is submitted, all of the unique physical aggregates in the group are automatically submitted for recovery.

Another example is an aggregate that was balanced into several smaller aggregates using the Aggregate LoadBalancer feature. All of the aggregates can be grouped into one logical group and a single ARECOVER command causes all of the aggregates to be submitted for recovery concurrently.

Any group of aggregates can be logically grouped together within Backup & Recovery Manager, and can be monitored, tracked, executed, and managed from that single, overall point of view.

When you select Option 3, Logical Aggregate Management, on the Backup & Recovery Manager Main Menu panel, the Logical Aggregate Management Setup panel, shown in Figure 9-7 is displayed. This panel is used to enter the desired search criteria and save the values in your profile. You can select to view a specific Logical Aggregate by aggregate name, a name mask, or you may enter an asterisk (*) to view all logical aggregates.
As with some other panels, by typing the forward slash (/) in the appropriate field, you can select to:

- Store values to be used as default for this USERID, and/or
- Don't show this panel again

To add new logical aggregate, type a Y on the Add NEW Logical Aggregate field and press Enter. The Create Logical Aggregate panel, shown in Figure 9-8, is displayed.

Type in a name, up to 30 characters, and press Enter. The BRM Add Aggregate to Logical Aggregate panel, shown in Figure 9-9 is displayed.
This panel provides a list of all aggregates in the IDS to select and add to your newly created logical aggregate. To add an aggregate, type the S (select) command in the command field next to all of the aggregates you wish to add and press Enter. The newly created logical aggregate is saved to the Backup & Recovery Manager IDS. You can add or delete aggregate from your logical aggregate during subsequent visits to this panel.

Figure 9-9   BRM Add Aggregate to Logical Aggregate panel

When you finish entering data on the Logical Aggregate Management Setup panel (Figure 9-7), press Enter to continue. The BRM Logical Aggregate Management panel, shown in Figure 9-10, is displayed.
Use the R (ARECOVER) line command in this panel to recover and monitor logical aggregates at the recovery site. Return codes from ABARS or Backup & Recovery Manager for both ABACKUP and ARECOVER events can also be viewed in this panel. The panel displays the events date and time information for each logical aggregate.

### 9.1.5 Group Filter Management

The Group Filter Management feature provides for creating, changing and deleting group filters within Backup & Recovery Manager to be used in relationship with SDSL processing. To understand this feature, we must first take a look at SDSL.

SDSL is an acronym for Selection Data Set Language, a special language developed for use with Backup & Recovery Manager. It is a powerful language facility that enhances the native ABARS selection criteria of INCLUDE, EXCLUDE, ALLOCATE and ACCOMPANY lists.

SDSL provides nearly 30 additional selection attributes such as management class, storage group, DSORG, LRECL, RECFM, migration status, change date and more, to include or exclude data. The Filter Groups are provided as a convenience and maintenance feature so that filtering, common to more than one aggregate, can be defined once and used where required.
A good example may be SYS1, SYS2 and SYS3 data sets, used in your environment for your MVS system and third party software, or data sets that are currently migrated. You can exclude these data sets from all of your Backup & Recovery Manager aggregates that use SDSL language to create the list of data sets to backup, just as we used Universal, Global and Local Filters in ASAP.

When you select Option 4 on the Backup & Recovery Manager Main Menu panel, the BRM Group Filter Management panel is displayed (Figure 9-11). In this panel you may use the ADD command to add a new filter or the E (Edit) command to edit an existing filter.

![Figure 9-11 BRM Group Filter Management panel](image)

We placed an E next to the Group Filter OREDAILY and pressed enter. The Add Filter ISPF Edit panel, shown in Figure 9-12, is displayed.

![Figure 9-12 BRM ADD Filter ISPF Edit panel](image)
The syntax requirements for SDSL are covered in the SDSL - Selection Data Set Language chapter of Mainstar: Backup & Recovery Manager User Guide. In our group filter example, we are excluding data sets that match the mask, SYS1.**. Later, when we code SDSL language for some of our aggregates, we can include the group filter using the FILTERS instruction syntax, as follows.

FILTERS(GROUP(OREDAILY))

9.1.6 Search for Dataset

The Search for Dataset feature allows for searching all backup events in the IDS for a specific data set name or data set name mask. The backups displayed can be either ABARS ABACKUP events or DFSMShsm incremental or command backups.

This feature of the product can be distributed to the application and client environments so they can search for and recover (and rename) data sets backed up with ABARS or DFSMShsm. No knowledge of the ABARS ARECOVER command or DFSMShsm HRECOVER command is necessary. Backup & Recovery Manager takes care of constructing the command syntax and submitting the command to the operating system for execution.

To begin a search request, select Option 5, Search for Dataset on the Backup & Recovery Manager Main Menu and press Enter. The Search for Dataset Setup panel is displayed as shown in Figure 9-13. This panel provides for customization of the search criteria. You may enter a data set name or a data set name mask in the field provided. The same Auto Expand List and Sort By fields are provided as we have seen in the other setup panels.

```
Command ==> _______________________________________________________
Specify the criteria to use when searching for selected Dataset(s).

DSN or Mask ===> ________________________________________________
Auto Expand List ===> N          Y or N
Sort by ===> N          N Dataset Name or D Date
Display
Overlaps Only ===> N          Y or N
HSM Incrementals ===> N          Y or N
Enter "/" to select option
_ Store values to be used as default for this USERID
_ Don't show this panel again
Press ENTER to Continue or Press END(PF3) to Return
```

Figure 9-13 Search for Dataset Setup panel
Overlap information, information about data sets that are backed up in more than one aggregate, is available from this panel as well. You can display data sets that only have overlaps by overtyping the N default value with a Y value in the **Overlaps Only** field.

You can select to view DFSMShsm incremental and command backup information along with any ABARS backup information or to exclude this information. To display backups from DFSMShsm, overtype the default value of N with a Y in the **HSM Incrementals** field.

As we have provided before, you can select to store the customization values you have entered on this panel and/or to not show this panel on subsequent visits, with a forward slash (/) in the field next to these options.

Once your customization is complete, press Enter to display the **BRM Search for Dataset** panel as shown in Figure 9-14. This panel provides the information requested from the IDS and provides line commands to view the data set detail, view data set overlaps, submit an ARECOVER request for selected data sets and view backup event detail information.

---

**Figure 9-14  BRM Search for Dataset panel**

---

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If a data set backup is in DFSMShsm and a R (RECOVER) command is entered in the command line next to the data set name, the **BRM - HRECOVER Options** panel, shown in Figure 9-15 is displayed. The submitter may select to rename the data set by typing the new name in the field provided on this panel.

If you are a DFSMShsm authorized user, you may select from the additional options provided under the section **For Systems Administrator only**.

![BRM HRECOVER Options panel](image)

### 9.1.7 Reports

Selecting **Option 6** on the **Backup & Recovery Manager Main Menu** panel, the **BRM Reports Menu** panel is displayed as shown in Figure 9-16. Using this option, you can submit batch report requests, or create and view reports online.

![BRM Reports Menu panel](image)
The selections on this panel provide for reporting from a variety of perspectives, data set, event, generation, date, level or backup type. Also provided is a tape pull list for particular aggregates, aggregate generations or by date. Each subsequent reporting panel provides for reporting by logical aggregate as well as unique aggregate names, name masks or all aggregates in the IDS.

A very popular report is the Disaster Recovery Space Summary Report. This report provides space requirements for primary disk, ML1, ML2 and user tape VOLSER requirements for recovery planning at the recovery site. This information is provided by aggregate name, logical aggregate name, generation (0), (-1), (-2), aggregates (0) represents all current generations of every aggregate, (-1) represents the next to the most current generation, and so on), or all events in the IDS. A sample report is shown in Example 9-1.

Example 9-1 Sample Disaster Recovery Space Summary Report

<table>
<thead>
<tr>
<th>DSN Type</th>
<th># DSNS Alloc Space</th>
<th>Used Space</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>3348</td>
<td>2.70 Gb</td>
</tr>
<tr>
<td>ML1</td>
<td>1498</td>
<td>684.59 Mb</td>
</tr>
<tr>
<td>ML2</td>
<td>1</td>
<td>972.00 b</td>
</tr>
<tr>
<td>User Tape</td>
<td>277</td>
<td>3.37 Gb</td>
</tr>
</tbody>
</table>

9.1.8 ABARS Monitor

The ABARS Monitor feature provides for monitoring backup and/or recoveries as they are executing and to associate the ABARS started task with the actual aggregate and job executing it. This feature is most advantageous at the recovery site when several ARECOVER events are executing concurrently.

When Option 7, ABARS Monitor, is selected from the Backup & Recovery Manager Main Menu, the ABARS Monitor Search Setup panel is displayed as shown in Figure 9-17. Using this panel, you can customize the display by entering the aggregate name or name mask or an asterisk (*) in the Aggregate Name or Mask field. You can limit the display to just ABACKUP or ARECOVER events using the Function Name or Mask field or you can limit the display by filling in Jobname or Mask and Stepname or Mask fields. Use the forward slash (/) to store the values to be used as the default for subsequent visits to this panel and/or select to not display the setup panel on future visits.
After customizing the ABARS Monitor Search Setup panel and pressing Enter, the BRM ABARS Monitor panel is displayed as shown in Figure 9-18. If you are not currently executing any ABACKUP or ARECOVER events, the following message is displayed on the panel:

NO EVENTS FOUND FOR SPECIFIED NAME AND CRITERIA

The Status fields show the DFSMShsm status of ABACKUP and ARECOVER. The functions can be either HELD or NOT HELD as shown in this display.
As you can see from the field titles on this panel, you can easily identify aggregates using the aggregate name field and associate them with the job name in the Jobname field. The Execution Mode is displayed along with the Stepname, elapsed time, version information and any data set conflict information that may be available.

9.1.9 History

The History feature provides inquiry capabilities for past events sorted by date, newest to oldest. You can view events based on their backup or recovery date. Additional line commands on this panel provide an option to view event detail.

When Option 9, History, is selected on the Backup & Recovery Manager Main Menu, the BRM - History Search Setup panel is displayed as shown in Figure 9-19. This panel provides for customization of the display by entering an aggregate name or name mask or an asterisk (*) to display all events. Use the forward slash (/) to store the values to be used as the default for subsequent visits to this panel and/or select to not display the setup panel on future visits.

![BRM - History Search Setup](image)

Once you have customized the History Search Setup panel and pressed Enter, the BRM History panel is displayed as shown in Figure 9-20. Using this panel, you can display a list of data set names backed up or recovered, view backup and recovery detail information, view the log file produced by ABACKUP or ARECOVER, and view any errors that may exist from these events.
Incremental ABARS is a selectable unit of Backup & Recovery Manager. An incremental backup includes taking a full or base backup of an aggregate followed by one or more backups of data in the selection data set that have changed or are new since the last base backup.

Incremental backups are useful when many of the data sets included in the application selection data set do not change from day-to-day. This might include a list of large VSAM data sets that are only updated once a week or once a month but are used in daily batch processing.

Incremental backups are also very useful when the application creates daily output files that are subsequently read into a weekly application, weekly to monthly, and so on. Applications that have this behavior are common. Using the Incremental ABARS feature, each day of the daily application is a part of the base and is subsequently recovered as a whole at the recovery site.

As an example, let’s look at Table 9-1. Each day of the week, an output data set is created in job @PDAP001, the Daily Accounts Payable batch job. On Friday, all of these files are read in as input to job @PWAP001, the Weekly Accounts Payable batch job. Depending on which day of the week the disaster strikes, we may have one, two, or four output data sets that are needed to process the Weekly Accounts Payable batch job.
Let’s say that the disaster occurred on a Thursday. Using traditional ABARS backups, we would need to backup the daily aggregate each day, keep five cycles of the daily aggregate offsite, and at the recovery site, recover four daily aggregates, separately, in order to have each output data set available to execute the weekly job @PWAP001. In addition, we need to keep five weeks of the Weekly Accounts Payable aggregates in order to have all of the input files we need for the monthly job, @PMAP001. If we are running quarterly and annual jobs, the output from the monthly job @PMAP001 is input to the quarterly job and so on.

Now, let’s look at the same example, but this time we are using Incremental ABARS. On Monday, we run a base backup of the Accounts Payable aggregate. On Tuesday, Wednesday, and Thursday we run an incremental backup.

Our disaster occurs on a Thursday. At the recovery site, since we used incremental backup, we simply recover the Daily Accounts Payable aggregate. Incremental ABARS takes care of recovering the data from base to the most current incremental backup. In addition, if the same data set is backed up (because it has been changed) in one or more of the backups, only the most current copy of the data set is restored. If a GDG would normally rolled-off of the base and expired, Incremental ABARS skips the recovery of the expired GDG automatically. When the recovery is complete, we have all of our daily output files for input to our weekly job, @PWAP001 with just one ARECOVER submission.

For more information on the advantages of using Incremental ABARS and how to implement this feature, refer to Mainstar: Backup & Recovery Manager User Guide.

<table>
<thead>
<tr>
<th>Day of week</th>
<th>Jobname</th>
<th>Base or Incremental</th>
<th>(+1) Output Dataset</th>
<th>Used as input in Job</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>@PDAP001</td>
<td>Base</td>
<td>AP:DAILY.G0001V00</td>
<td>@PWAP001</td>
</tr>
<tr>
<td>Tuesday</td>
<td>@PDAP001</td>
<td>Incremental</td>
<td>AP:DAILY.G0002V00</td>
<td>@PWAP001</td>
</tr>
<tr>
<td>Wednesday</td>
<td>@PDAP001</td>
<td>Incremental</td>
<td>AP:DAILY.G0003V00</td>
<td>@PWAP001</td>
</tr>
<tr>
<td>Thursday</td>
<td>@PDAP001</td>
<td>Incremental</td>
<td>AP:DAILY.G0004v00</td>
<td>@PWAP001</td>
</tr>
<tr>
<td>Friday</td>
<td>@PDAP001</td>
<td>Incremental</td>
<td>AP:DAILY.G0005v00</td>
<td>@PWAP001</td>
</tr>
<tr>
<td>Friday</td>
<td>@PWAP001</td>
<td>Base</td>
<td>AP:WEEKLY.G0001V00</td>
<td>@PMAP001</td>
</tr>
</tbody>
</table>
9.1.11 Prevent BackLevel

Prevent BackLevel is a feature you may use at the recovery site. It is intended to prevent data sets from inadvertently being back-leveled due to the recovery of an older data set and using the REPLACE keyword. This feature is only for application to a site using FORWARD as the recovery methodology, because only the most current backup copy of each data set is recovered. Using Prevent BackLevel during ARECOVER processing causes Backup & Recovery Manager to compare all data sets being recovered with the Prevent BackLevel list. If the data set is the most current backup copy, it is recovered. If it is not the most current backup copy, it is not recovered. Using this option assumes that all current aggregates are eventually recovered at the disaster site and that no applications are executed until all of the aggregate recoveries are complete.

To use this feature at the recovery site, a file containing a list of all data sets that were backed up in all aggregates is created by running any of the batch reports, “Overlaps by DSN” or “Overlaps by Event”. Procedures to create the file are document in the Backup & Recovery Manager Installation and Maintenance Guide. Set the PREVENT_BACKLEVEL parameter in the BRMINI member to Y in the product's PARMLIB library and add a chosen back-level data set name.

All ARECOVER events, initiated from the Backup & Recovery Manager panels are automatically updated with the Prevent BackLevel parameter and the feature is invoked.

9.1.12 Dynamic Data Set Backup/Reorg

Dynamic Data Set Backup/Reorg is an utility that allows the Backup & Recovery Manager IDS to be backed up or reorganized without stopping the product, or product programs. The BACKUP utility is provided to get a clean backup copy of the IDS while Backup & Recovery Manager programs are executing by pausing them. Without this feature, a backup of the IDS can result in a program failing because the backup has an enqueue on the IDS, therefore preventing the executing program from opening and updating the IDS.

Dynamic Reorganization of the IDS is accomplished by the REORG utility by temporarily pausing access by Backup & Recovery Manager programs to the IDS. The programs in progress during the reorganization pause until the reorganization is complete.

More information about Dynamic Data Set Backup/Reorg is provided in Mainstar: Backup & Recovery Manager User Guide.
9.1.13 Full rename

Native ABARS ARECOVER allows only a limited set of data set rename capabilities. In fact, only data set high level qualifiers may be changed using ABARS parameters RECOVERNEWNAMELEVEL or RECOVERNEWNAMEALL. Backup & Recovery Manager offers a more robust rename capability, data sets can be renamed in almost any way desired. With the exception of ICF catalogs, and tape data sets, Backup & Recovery Manager can rename any type of data set.

Backup & Recovery Manager allows any number of data sets to be renamed, and qualifiers other than the first may be changed. Full selection criteria allows changing any qualifier to any individual data set or group of data sets, or replacement of the entire data set name.

After the ABARS ARECOVER event is complete, and the original data sets are restored, Backup & Recovery Manager produces a file containing a series of IDCAMS ALTER control statements. Keyword values in the BRMINI member of the product PARMLIB can be set to specify whether IDCAMS is invoked automatically by Backup & Recovery Manager, or if a subsequent IDCAMS ALTER job step is submitted by the user to complete the rename operation.

In situations where it is not possible to wait until the ARECOVER event has completed before renaming the data sets, the parameter, ABARS RECOVERNEWNAMEALL or RECOVERNEWNAMELEVEL, can be used to rename the data sets to a temporary or intermediate high level qualifier and follow with the full rename capabilities of Backup & Recovery Manager.
Using ARECOVER

ARECOVER is the command that you use for recovering aggregate backups previously backed up with an ABACKUP command. This is an ABARS command.

You may use Backup & Recovery Manager to invoke the ARECOVER command and provide additional value.

In this chapter we review the standard ARECOVER command and how it is used with Backup & Recovery Manager.
10.1 ABARS ARECOVER command

The ABARS ARECOVER command is used to perform recovery of aggregates. The ARECOVER command is very similar to ABACKUP command. You can use it in three ways, specifying any of the following mandatory, and mutually exclusive, keywords:

- **VERIFY**: This performs a test run of the aggregate recovery without recovering any data sets. An example command could be as follows:
  ```
  ARECOVER aggname VERIFY
  ```

- **EXECUTE**: This performs the real aggregate recovery. It first performs a verification as with the VERIFY option but after that it backs up the data sets. An example command could be:
  ```
  ARECOVER AGGREGATE(aggname) EXECUTE
  ```

- **PREPARE**: This creates an ABR record with no verification or data movement if the record does not exist in the recovery site. An example command is:
  ```
  ARECOVER AGGREGATE(aggname) PREPARE
  ```

When VERIFY or PREPARE are specified, then messages are issued indicating the amount of storage required to perform a successful aggregate recovery.

For more information about setting up the environment, refer to Chapter 6, “Aggregate definition” on page 69.

10.1.1 ABARS ARECOVER parameters

The ARECOVER command has a number of parameters to help define the scope of the recovery.

There are some required parameters, apart from the EXECUTE | VERIFY | PREPARE. They are:

- **AGGREGATE(aggname)**: This identifies the name of the aggregate group to be recovered. By default, the most current version of the aggregate is selected.

  An ABR record for the aggregate must exist in the recovery site when AGGREGATE parameter is specified. If it is not, then a message is issued indicating that there is not ABR record. In this case you need to submit the ARECOVER command with the PREPARE keyword to create the ABR record and to catalog the proper files.

- **DATASETNAME(dsname)**: This specifies the name of the control file with the information of the aggregate groups that were previously processed by an ABACKUP command.
Chapter 10. Using ARECOVER

- **VOLUMES(vol1,.....voln) | XMIT:** This is used to locate the control data set specified in the DATASETNAME parameter.

  VOLUMES(vol1,.....voln) identifies 1 to 15 volumes where the control data set to be recovered resides.

  The XMIT keyword tells ABARS that the control file name is already available on disk. This keyword requires that all ABACKUP output files are already cataloged at the recovery site and is implemented for installations that electronically transmitted files to the recovery site using a product such as NetView File Transfer Program (FTP).

  In most cases where the files get transmitted, the transmission program precatalogs the files to the volumes that received them. The XMIT keyword may be used when an installation writes the ABARS control file to disk using DFSMS ACS routines, then backs up the C files using DFSMSdss or other method. The control files are then restored and cataloged at the disaster site prior to ABARS ARECOVER processing. The XMIT keyword is then used to indicate that the files are already restored and cataloged.

There are also some optional parameters:

- **ACTIVITY:** This indicates to recover the activity data set included in the aggregate group. You should specify this parameter the first time you execute the ARECOVER command.

- **DATASETCONFLICT(RENAMESOURCE(qualifier) | RENAMETARGET(qualifier) | BYPASS | REPLACE):** This provides a directive in handling all ARECOVER failures due to duplicate data set names.

  The REPLACE option is used when you wish to replace all existing cataloged data sets (or catalog entries) during the ARECOVER process. This option is commonly used when you have restored full user catalogs at the recovery site.

  The BYPASS option tells ABARS not to recover any data set that is already cataloged.

  The RENAMETARGET(qualifier) option allows you to rename the existing cataloged entry with a new high-level qualifier whenever a duplicate data set name, or conflict, situation occurs.

  The RENAMESOURCE(qualifier) option is similar to RENAMETARGET. This option allows you to rename the data set to be restored because a duplicate data set name, or conflict, exists.
DATE(yyyy/mm/dd) | VERSION(nnnn): This specifies the date or the version of the aggregate group to be recovered. It is only valid when AGGREGATE parameter is specified.

DATE(yyyy/mm/dd) indicates the date of the aggregate group version you want recovered.

VERSION(nnnn) indicates the specific version of the aggregate group to be recovered.

INSTRUCTION: This is used to specify that the instruction data set, if exists, must be recovered for the specified aggregate group.

MENTITY(modeldsn): This is used to specify the predefined model entity. It is used to define discrete profiles to RACF for data sets to be recovered.

MIGRATEDDATA(ML1 | ML2 | SOURCELEVEL): This provides options in recovering migrated data sets, either to migration level 1 (the default), migration level 2, or options based on their source level. This keyword is helpful if you are recovering at a site that does not have available tape resources to support your recovery. Specifying MIGRATEDDATA(ML1) directs all data backed up from ML2 to restore to ML1.

NOBACKUPMIGRATED: This parameter prevents DFSMSShsm Automatic Backup from taking a backup copy of data restored to ML1 by ABARS when Automatic Backup is executed at the recovery site.

PERCENTUTILIZED(nnn): This tells ABARS to recover data sets to a disk pool until the pool reaches a specified percentage full. The default is 80%. You may wish to override the default by supplying this keyword on the ARECOVER command. This applies only when DFSMSdss is invoked to restore data sets on a non-SMS-managed disk.

RECOVERNEWNAMEALL(level) | RECOVERNEWNAMELEVEL(olevel1,nlevel1, ...): This allows the recovered data sets to be recovered and the high-level qualifier to be renamed. This keyword is especially helpful when testing the ARECOVER process at the backup site.

RECOVERNEWNAMEALL(level) renames all the recovered data sets with the new high level qualifier level.

RECOVERNEWNAMELEVEL(olevel1,nlevel1, ... ) renames all the recovered data sets with high level qualifier olevel1 to the new high level qualifier nlevel1.

STACK | NOSTACK: You can use this in the ARECOVER command to specify to the ARECOVER DATASETNAME processing whether or not the ABACKUP output was stacked. When the ABACKUP output files are stacked, the ARECOVER processing will allocate file sequence number four.
Chapter 10. Using ARECOVER

- **TARGETUNIT(UNITTYPE)**: This parameter provides a way to override the unit name value in the SETSYS ARECOVERUNITNAME parameter in DFSMSHsm. This may be useful if you are recovering on a system that does not have your esoteric unit names available. (This applies only when restoring user tape data sets.)

- **TGTGDS(OPTION)**: This parameter provides a way to override the specification of the SETSYS ARECOVERTGTGDS command. The TGTGDS parameter is passed to DFSMSdss and provides greater flexibility managing SMS-managed generation data sets that are being restored to level 0 disk.

- **UNIT(UNITTYPE)**: This specifies the tape unit type to be allocated for the recovering of data sets. The VOLUMES parameter is required when you use UNIT.

- **VOLCOUNT(ANY)**: This parameter allows to override the SETSYS ABARSVOLCOUNT command and allows DFSMSdss to allocate as many volumes in the storage group as required to a maximum of 59 for all L0 data sets.

For more detailed information about the ARECOVER parameters, refer to DFSMSHsm Storage Administration Reference, SC35-0422.

10.2 BRM ARECOVER command

Backup & Recovery Manager has additional parameters you can use on the ARECOVER command:

- **GDGREPLACE**
- **FULLRENAMEMASKS**
- **PREVENT_BACKLEVEL**

GDGREPLACE is an optional Backup & Recovery Manager parameter that automatically updates the GDG base catalog entries without replacing existing data sets and without using the DATASETCONFLICT(REPLACE) keyword on the ARECOVER command. It is used in sites that are recovering to empty (unpopulated) catalogs or in sites where a utility is executed to delete catalog entries for data sets that are recovered by ABARS.

FULLRENAMEMASKS is an optional Backup & Recovery Manager parameter that supports the FullRename function. It contains the “old mask” and “new mask” parameters used to rename the data sets.

PREVENT_BACKLEVEL is an optional Backup & Recovery Manager parameters that is used to prevent a data set from being back-leveled during recovery when the DATASETCONFLICT(REPLACE) parameter is used.
10.2.1 ARECOVER SUBMIT command

In 4.2.2, “Catalog considerations” on page 42, we discuss different methods of catalog recovery. Your recovery strategy needs to be considered when coding the ARECOVER command. Most often, customers either back up and restore their user catalogs with all the entries (full), or they use ABARS to allocate their catalogs empty. It also discusses why you would select one method or the other and the various advantages and disadvantages.

ARECOVER command with full catalogs
At the recovery site, user catalogs are recovered with all of the catalog entries. ABARS ARECOVER attempts to recatalog each data set as it is recovered. We need to code the DATASETCONFLICT parameter with the REPLACE option allowing ABARS to replace the catalog entries as data is recovered.

The Backup & Recovery Manager SUBMIT command for this example is:

```
ARECOVER AG(OREDU001) EXEC +
     DATASETCONFLICT(REPLACE)
```

We also brought backups of our control files, which we directed to disk using DFSMS ACS routines and backed up using DFSMSdss. We restored them at the recovery site prior to our ARECOVER processing. We need to code the XMIT parameter to tell ABARS that any output files (C, I, D, or O files) are already cataloged and on disk. The SUBMIT command used in this example is:

```
ARECOVER AG(OREDU001) EXEC +
     XMIT +
     DATASETCONFLICT(REPLACE)
```

ARECOVER command with empty catalogs
At the backup site, we coded our user catalog data set names and GDG base names in the ALLOCATE statement of an ABARS aggregate and ran ABACKUP. We executed ARECOVER for this aggregate here at the recovery site. We now are ready to recover applications using ABARS, which catalogs the data sets as they are recovered. The SUBMIT command used in this example is:

```
ARECOVER AG(OREDU001) EXEC +
     GDGREPLACE(Y)
```

10.3 Executing BRM ARECOVER command

As with ABACKUP, described in Chapter 8, “Using ABACKUP” on page 111, ARECOVER is executed either as a batch job or using the Backup & Recovery Manager dialog panels.
ARECOVER in batch uses the same BRMBPROC procedure as ABACKUP. Example 10-1 shows the BRMBPROC execution JCL for ABACKUP.

Example 10-1  Backup & Recovery Manager BRMBPROC Execution JCL

```
//BRM EXEC BRMBPROC,
//   LOAD1='BRMX.QA.LOAD',
//   PARMLIB='BRMX.QA.PARMLIB',
//   DAD='DAD.DADHHATT.DAD',
//   IDS='BRMX.INVDB'
//BRMBATCH.SYSIN DD *
```

place submit commands here......

10.3.1 Initiating ARECOVER using BRM dialog

Using Backup & Recovery Manager to construct the ABARS ARECOVER commands is another way to simplify the recovery process. Backup & Recovery Manager provides a panel in which you may choose the keywords and options you wish to use. ARECOVER is initiated by selecting **Option 2**, Backup/Recovery Management or **Option 3**, Logical Aggregate Management on the Backup & Recovery Manager - Main Menu panel shown in Figure 10-1. If you are using logical aggregates, Option 3 provides for recovery by logical name.

```
Menu  Diagnostics  Preferences  Utilities
V3R101  Backup & Recovery Manager - Main Menu
Command => __________________________________________________________

Enter an option from the list below:
1  Aggregate Management with SMS Interface
2  Backup/Recovery Management
3  Logical Aggregate Management
4  Group Filter Management
Miscellaneous Functions
5  Search for Dataset
6  Reports
7  ABARS Monitor
8  History
X  Exit

Copyright (C) 2002 Mainstar Software Corporation
All Rights Reserved
```

Figure 10-1  Backup & Recovery Manager Main Menu
When **Option 2**, Backup/Recovery Management is selected, the **BRM Backup/Recovery Management** panel is displayed (Figure 10-2).

![Figure 10-2 BRM Backup/Recovery Management panel](image)

To initiate an ARECOVER command, type the `R`, RECOVER line command next to the aggregate name and press enter. The **BRM - Submit Recovery** panel is displayed as shown in Figure 10-3.
Chapter 10. Using ARECOVER

Figure 10-3  BRM Submit Recovery panel

The BRM Submit Recovery panel is used to submit ARECOVER commands from Backup & Recovery Manager. This panel provides for selecting all of the available ABARS options on the ARECOVER command and all of the Backup & Recovery Manager options such as GDGREPLACE and PREVENT_BACKLEVEL.

After entering the appropriate information and selecting the desired options, type the S, SELECT line command in either the Build/Submit JCL field or the Build/View JCL. If you select Build/Submit JCL, the JCL required to submit the ARECOVER is created and the job is submitted to execute. If you select Build/View JCL, the JCL is created and an ISPF VIEW panel is displayed.

When several ARECOVER events are executing at the same time, use the ABARS Monitor, Option 7 on the Backup & Recovery Manager Main Menu, to monitor the events.
The **BRM Logical Aggregate Management** panel, shown in Figure 10-4, is used to submit ARECOVER events for aggregates that are part of a logical group. To initiate an ARECOVER event, type the `R`, RECOVER line command next to the **Logical Aggregate** name and press enter. The **BRM - Submit Recovery** panel, shown in Figure 10-3 is displayed. After entering the appropriate information and selecting the desired options, select to submit or view the created JCL, as explained before.

**Figure 10-4  BRM Logical Aggregate Management panel**

After submitting the ARECOVER command for recovering the logical aggregate, use the ABARS Monitor, **Option 7** on the **Backup & Recovery Manager Main Menu**, to monitor the events.

### 10.3.2 Restarting ARECOVER

If the REPLACE option is not coded on the ARECOVER command, and a conflict is encountered, ABARS creates a conflict resolution data set and a restart data set. The restart data set has a list of all data sets successfully recovered so that they are not recovered again when the ARECOVER event is restarted. The conflict resolution data set lists the data sets in conflict and automatically sets the DATASETCONFLICT(BYPASS) option for each data set.

You can view the conflict resolution data set from Backup & Recovery Manager by typing in the **VC**, View Conflict line command next to the aggregate name in the **BRM Backup/Recovery Management** panel shown in Figure 10-2 on page 152. An EDIT panel of the conflict resolution data set is displayed (Figure 10-5) for editing.
You will need to resolve the conflicts using one of the ABARS Conflict Resolution optional parameters in order to recover the data. To resolve the conflict, change the BYPASS keyword to the desired Conflict Resolution optional parameter in the panel and save your changes by pressing Enter followed by PF3. For example, you can replace the cataloged data set with the data set to be recovered. Changing the BYPASS option to REPLACE resolves the conflict.

Once all of the conflicts have been resolved, you can resubmit the ARECOVER event, either by rerunning the batch job, or by reissuing the command from the Backup & Recovery Manager panel. ABARS automatically restarts the ARECOVER event as a result of the conflict resolution data set and the restart data set being present. Once the ARECOVER event is successful, ABARS deletes both the conflict resolution data set and the restart data set.

If, for any reason, the entire ARECOVER event is to be rerun, you need to delete the conflict resolution data set and the restart data set before submitting the ARECOVER command for the aggregate.

---

**Figure 10-5  Conflict Resolution Data Set Edit panel**

You will need to resolve the conflicts using one of the ABARS Conflict Resolution optional parameters in order to recover the data. To resolve the conflict, change the BYPASS keyword to the desired Conflict Resolution optional parameter in the panel and save your changes by pressing Enter followed by PF3. For example, you can replace the cataloged data set with the data set to be recovered. Changing the BYPASS option to REPLACE resolves the conflict.

Once all of the conflicts have been resolved, you can resubmit the ARECOVER event, either by rerunning the batch job, or by reissuing the command from the Backup & Recovery Manager panel. ABARS automatically restarts the ARECOVER event as a result of the conflict resolution data set and the restart data set being present. Once the ARECOVER event is successful, ABARS deletes both the conflict resolution data set and the restart data set.

If, for any reason, the entire ARECOVER event is to be rerun, you need to delete the conflict resolution data set and the restart data set before submitting the ARECOVER command for the aggregate.
**10.3.3 Recovering selected data sets using BRM**

To recover single data sets or a group of data set matching a mask name, use the **Option 5**, Search for Data Set, on the *Backup & Recovery Manager Main Menu*. The *Search for Dataset Setup* panel is displayed, as shown in Figure 10-6.

![Search for Dataset Setup panel](image)

**Figure 10-6  Search for Dataset Setup panel**

Type the data set name or data set name mask in the **DSN or Mask** field, select the additional options, if desired, and press Enter. The *Search for Dataset* panel, shown in Figure 10-7 is displayed.
Chapter 10. Using ARECOVER

Figure 10-7  Search for Dataset panel

The BRM Search for Dataset panel lists all of the data sets that match your search criteria. You can select all of the data sets for ARECOVER by typing in the primary command R, RECOVER, followed by a data set name mask that includes all of the data sets in the list. In the sample before, we selected the mask OGG** for recovering all the data sets starting with OGG within the same ARECOVER command.

To select specific data sets, type the R, line command next to the selected data set names and press Enter. The BRM Submit Recovery panel, shown in Figure 10-3 on page 153 is displayed. On this panel you enter the options that match your needs and then submit the ARECOVER JCL created. In some cases, multiple aggregate recoveries may be submitted because the selected data sets were backed up in different aggregate backups.

You can select Option 7, ABARS Monitor, on the Backup & Recovery Manager Main Menu to monitor the events.
Migration can mean moving from an older version of a program to a newer version, or from one method to another. When your installation progresses to z/OS DFSMShsm V1R3, there are a number of differences in ABARS between this level and prior levels of DFSMShsm. If you have implemented ABARS for a prior DFSMShsm level, you will have aggregate backups created on an earlier level being recovered on the new level.

In this chapter, we describe the differences between z/OS DFSMShsm V1R3 ABARS and earlier versions. For migration from another backup method to ABARS, there are various considerations. We describe this transition and offer some helpful hints.
11.1 Migration and coexistence

Higher level releases are not always installed using a sharp cut-over, dropping the older release and running the new version in one step. Many times two releases are run together (coexistence). A clean cut-over demands taking account of differences between the older release and the new one, as well as new features and default changes.

Depending on which level you are migrating from, you will have to take different actions. For detailed information about migration from one version of the product to a newer one, refer to the publication *DFSMS Migration*, GC26-7398.

11.2 Removing existing backup procedures

Adopting new backup procedures will take planning and an increase in resources during the transition period. We can seldom stop existing procedures abruptly, in an on/off fashion. Redundant processes need to continue running until all data has been converted. This redundancy should be expected and planned for. The only exception is if your environment is well structured and segmented, where each logical grouping of data is separate from other logical groupings, and backup procedures are independent as well.

In an environment where full-volume dumps are the current backup method, application data is likely to be scattered across many volumes with logically unrelated data residing on the same physical volume. This placement of data is often done for performance reasons. Data with different access times may be placed together on the same disk volume because one type does not interfere with the other. If the current backup procedure is full-volume dumps, those dumps cannot be discontinued until all critical data is under the control of ABARS. Therefore, as you are implementing ABARS, the full-volume dumps will continue.

Another issue is how to use the two methods in recovery. When using full-volume dumps in combination with ABARS, all volume-restore operations need to be completed before starting aggregate recoveries. This can lengthen your recovery time.
One technique used to allow aggregate recoveries to begin earlier in the recovery process, before the volume-restore operations have completed, is to define a new storage pool for your aggregate data. Alter your ACS routines to direct the aggregate data to this new storage group. The ACSENVIR value of RECOVER is passed to the ACS routines for Level 0 data and can be used to direct allocation of these data sets. Although your full-volume dumps contain all application data, including data now backed up with ABARS, the two methods remain separate. Disk volumes restored from full-volume dumps do not overlie aggregate data, which is in a separate storage group. Some form of the application data will be on the disk volumes restored, but the catalog entries will point to the data recovered by ABARS.

This technique provides several benefits. The full-volume restores do not destroy the data recovered by ABARS, because the aggregate data is directed to a new storage group. The technique also allows the application analysts access to their data for testing, independent of the full volume restores, and hopefully sooner. This recovery alternative is useful only while you are in transition. It is not desirable to recover two forms of data, having uncataloged data on your disk volumes. As your ABARS implementation progresses, full-volume dumps can be eliminated on selected volumes.

Consider also why you are performing the current backup processes. Are they being used for in-house or media failures as well as disaster recovery? One of the single most important principles in constructing a total backup and recovery solution is to devise a solution that creates no dependence between in-house and disaster backups. This ensures that disaster recovery is never compromised by an in-house recovery requirement. Sometimes this ideal is compromised by the cost of maintaining two sets of backups.

As you implement ABARS in your environment, the process may open a door to reviewing your in-house backup and recovery strategy. Are full-volume dumps really needed for disk media failures with the reliability of RAID (redundant array of independent disks) devices? Are there other ways to ensure in-house recovery that are not as costly?

ABARS offers flexibility in both backup and recovery. It can work within existing structures, and can be blended with other backup and recovery methods: Proper planning, and the help of ASAP, Backup & Recovery Manager, and Incremental ABARS can lead to a very successful implementation.
Sample questionnaire

This appendix lists sample questionnaires used in Chapter 5, “Application characteristics” on page 59. These questionnaires are used to identify application characteristics.
A.1 Questionnaire for current recovery strategies

Is the application recovery strategy to perform rerun or forward recover?

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Are single data sets or groups of data sets backed up within the application before they are changed?

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Does the application depend on full volume dumps to recover application data?
If yes: How often are the full volume dumps performed?

Is the application active or quiesced during the dump?

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Is concurrent copy currently used by this application?
If not, does the application have a need for concurrent copy?

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______________________________________________________________
During your last disaster recovery test, how long did it take to recover your application and was the recovery successful?

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A.2 Questionnaire to identify names and run schedule

What is the naming convention of the batch jobs that compose the application?

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Will legacy or interfacing systems be considered as part of the application (and included in the ABARS backup)?

Note: Please provide job structure listings for each cycle that supports the application.

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A.3 Questionnaire for synchronization points

What is the established synchronization point for each cycle within the application?

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______________________________________________________________
A.4 Questionnaire for database types

What database system(s) does the application use?

Note: If DB2 or IMS is used, please provide image copy output data set names.

A.5 Questionnaire for application data sets

What is the naming convention of the application data sets?

A.6 Questionnaire for interfacing systems

Does the application share data with other applications?
In the event of a recovery, which application is responsible for recovery of the shared data?

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A.7 Questionnaire for externally created data sets

Does the application use any externally created data sets? For example, transmitted data, data created on another platform, and so on.

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A.8 Questionnaire for dynamically built JCL

Does the application dynamically build JCL using CLIST, REXX or other EXEC?

Note: Please indicate whether if the dynamically built JCL is submitted using the internal reader or other method.

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## Abbreviations and acronyms

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ABARS</td>
<td>Aggregate Backup and Recovery Support</td>
</tr>
<tr>
<td>ABR</td>
<td>aggregate backup and recovery</td>
</tr>
<tr>
<td>ACS</td>
<td>automatic class selection</td>
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<tr>
<td>APF</td>
<td>authorized program facility</td>
</tr>
<tr>
<td>ASA</td>
<td>automatic selection and audit</td>
</tr>
<tr>
<td>ASAP</td>
<td>Automatic Selection and Audit Process</td>
</tr>
<tr>
<td>ATL</td>
<td>automated tape library</td>
</tr>
<tr>
<td>BCDS</td>
<td>backup control data set</td>
</tr>
<tr>
<td>BIA</td>
<td>business impact analysis</td>
</tr>
<tr>
<td>BRM</td>
<td>Backup and Recovery Manager</td>
</tr>
<tr>
<td>BWO</td>
<td>backup while open</td>
</tr>
<tr>
<td>CDS</td>
<td>control data set</td>
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<tr>
<td>CICS</td>
<td>Customer Information Control System</td>
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<tr>
<td>CICSVR</td>
<td>CICS VSAM recovery</td>
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<tr>
<td>CPU</td>
<td>central processing unit</td>
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<tr>
<td>CSR</td>
<td>Customer Service Representative</td>
</tr>
<tr>
<td>DBA</td>
<td>Database Administrator</td>
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<tr>
<td>DBMS</td>
<td>database management system</td>
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<tr>
<td>DP</td>
<td>data processing</td>
</tr>
<tr>
<td>DR</td>
<td>disaster recovery</td>
</tr>
<tr>
<td>DSCB</td>
<td>data set control block</td>
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<tr>
<td>DSN</td>
<td>data set name</td>
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<tr>
<td>EOV</td>
<td>end of volume</td>
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<tr>
<td>FSR</td>
<td>function statistics record</td>
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<tr>
<td>FTP</td>
<td>file transfer protocol</td>
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<tr>
<td>GDG</td>
<td>generation data group</td>
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<tr>
<td>GDS</td>
<td>generation data set</td>
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<tr>
<td>HSM</td>
<td>hierarchical storage manager</td>
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<tr>
<td>IBM</td>
<td>International Business Machines Corporation</td>
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<tr>
<td>IC</td>
<td>image copy</td>
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<td>ICF</td>
<td>integrated catalog facility</td>
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<tr>
<td>ID</td>
<td>identification</td>
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<td>IDCAMS</td>
<td>access method services</td>
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<tr>
<td>IDS</td>
<td>inventory data set</td>
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<tr>
<td>IMS</td>
<td>Information Management System</td>
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<tr>
<td>IS</td>
<td>information systems</td>
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<tr>
<td>ISMF</td>
<td>Interactive System Management Facility</td>
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<td>ISPF</td>
<td>Interactive System Productivity Facility</td>
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<tr>
<td>IT</td>
<td>information technology</td>
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<td>ITSO</td>
<td>International Technical Support Organization</td>
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<td>JCL</td>
<td>job control language</td>
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<tr>
<td>MCDS</td>
<td>migration control data set</td>
</tr>
<tr>
<td>ML1</td>
<td>migration level 1</td>
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<tr>
<td>ML2</td>
<td>migration level 2</td>
</tr>
<tr>
<td>MVS</td>
<td>Multiple Virtual Storage</td>
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<tr>
<td>OAM</td>
<td>object access method</td>
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<tr>
<td>OCO</td>
<td>object code only</td>
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<tr>
<td>PDS</td>
<td>partitioned data set</td>
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<tr>
<td>PDSE</td>
<td>partitioned data set extended</td>
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<tr>
<td>RACF</td>
<td>Resource Access Control Facility</td>
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<tr>
<td>RAID</td>
<td>redundant array of independent devices</td>
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<tr>
<td>RC</td>
<td>return code</td>
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<tr>
<td>RMF</td>
<td>resource measurement facility</td>
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<td>RSP</td>
<td>real-time selection process</td>
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<tr>
<td>Abbreviation</td>
<td>Description</td>
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<tr>
<td>RTO</td>
<td>recovery time objective</td>
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<tr>
<td>SAM</td>
<td>sequential access method</td>
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<tr>
<td>SCDS</td>
<td>source control data set</td>
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<tr>
<td>SDS</td>
<td>selection data set</td>
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<tr>
<td>SDSF</td>
<td>Spool Display Screen Facility</td>
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<tr>
<td>SDSL</td>
<td>selection data set language</td>
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<tr>
<td>SFM</td>
<td>sysplex failure management</td>
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<tr>
<td>SHCDS</td>
<td>sharing control data sets</td>
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<tr>
<td>SMB</td>
<td>system managed buffering</td>
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<tr>
<td>SMF</td>
<td>System Management Facility</td>
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<tr>
<td>SMS</td>
<td>storage management subsystem</td>
</tr>
<tr>
<td>SNA</td>
<td>Systems Network Architecture</td>
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<tr>
<td>TSO</td>
<td>Time Sharing Option</td>
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<tr>
<td>VSAM</td>
<td>Virtual Storage Access Method</td>
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<td>VTAM</td>
<td>Virtual Telecommunication Access Method</td>
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<tr>
<td>WWFSR</td>
<td>See FSR</td>
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<tr>
<td>XDF</td>
<td>extended destination facility</td>
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<tr>
<td>XSS</td>
<td>expanded selection support</td>
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</tbody>
</table>
Glossary

Your glossary term, acronym or abbreviation. Term definition.

A

ABARS. Aggregate Backup and Recovery Support.

ABR. Aggregate backup and recovery record.

access method services (AMS). A multifunction service program that manages VSAM and non-VSAM data set, as well as integrated catalog facility (ICF). Access method services provides the following functions:

- Defines and allocates space for data sets and catalogs.
- Converts indexed-sequential data sets to key-sequenced data sets.
- Modifies data set attributes in the catalog.
- Reorganizes data sets
- Creates backup copies of data sets
- Assists in making inaccessible data sets accessible
- List the records of data sets and catalogs
- Defines and builds alternate indexes
- Converts CVOLs to ICF catalogs

accompany data set. In aggregate backup and recovery processing, a data set that is physically transported from the backup site to the recovery site instead of being copied to the aggregate data tape. It is cataloged during recovery.

accompany list. An optional list in the selection data set that identifies the accompany data sets.

ACS. Automatic Class Selection.

active control data set (ACDS). A VSAM linear data set that contains an SCDS that has been activated to control the storage management policy for the installation. When activating a SCDS, you determine which ACDS will hold the active configuration (if you have defined more than one ACDS). The ACS is shared by each system that is using the same SMS configuration to manage storage.

active data. Data that is frequently accessed by users and that resides on level 0 volumes.

activity log. In DFSMShsm, a SYSOUT or data set on disk used to record activity and errors that occurred during DFSMShsm processing.

aggregate backup. The process of copying the data sets and control information of a user-defined group of data sets so that they may be recovered later as an entity by an aggregate recovery process.

aggregate data sets. In aggregate backup and recovery processing, data sets that have been defined in an aggregate group as being related.

aggregate group (AG). A SMS construct that defines control information and identifies the data sets to be backed up by a specific aggregate backup.

aggregate recovery. The process of recovering a user-defined group of data sets that were backed up by aggregate backup.

APF. Authorized Program Facility.

ASAP. Automatic Selection and Audit Process.

audit. A DFSMShsm process that detects discrepancies between data set information in the VTOCs, the computing system catalog, the MCDS, BCDS, and OCDS.
authorized user. In DFSMShsm, the person or persons who are authorized through the DFSMShsm AUTH command to issue DFSMShsm system programmer, storage administrator, and operator commands.

automated tape library (ATL). A device consisting of robotic components, cartridge storage frames, tape subsystems, and controlling hardware and software, together with the set of volumes which reside in the library and may be mounted on the library tape devices.

automatic backup. In DFSMShsm, the process of automatically copying eligible data sets from DFSMShsm-managed volumes or migration volumes to backup volumes during a specified backup cycle.

automatic class selection (ACS) routine. A procedural set of ACS language statements. Based on a set of input variables, the ACS language statements generate the name of a predefined SMS class, or a list of names of predefined storage groups.

automatic class selection (ACS). A mechanism for assigning SMS classes and storage groups.

availability management. In DFSMShsm, the process of ensuring that a current version (backup copy) of the installation’s data sets resides on tape or disk.

B

backup control data set (BCDS). A VSAM key-sequenced data set that contains information about backup versions of data sets, backup volumes, dump volumes, and volumes under control of the backup and dump functions of DFSMShsm.

backup copy. In DFSMShsm, a copy of a data set that is kept for reference in case the original data set is destroyed.

backup cycle. In DFSMShsm, a period of days for within a pattern is used to specify the days in the cycle on which automatic backup is scheduled to take place.

backup frequency. In DFSMShsm, the number of days that must elapse since the last backup version of a data set was made until a changed data set is again eligible for backup.

backup version. Synonym of backup copy.

backup volume. A volume managed by DFSMShsm to which backup versions of data sets are written.

backup. In DFSMShsm, the process of copying a data set residing on a level 0 volume, a level 1 volume, or a volume not managed by DFSMShsm to a backup volume.

base configuration. The part of SMS configuration that contains general storage management attributes, such as the default management class, default unit, and default device geometry. It also identifies the systems or system groups that an SMS configuration manages.

base sysplex. A base (or basic) sysplex is the set of one or more MVS systems that is given a cross-system coupling facility (XCF) name and in which the authorized programs can then use XCF coupling services. A base system does not include a coupling facility.

basic catalog structure (BCS). The name of the catalog structure in the integrated catalog facility environment.

BIA. Business Impact Analysis.

BWO. Backup while open.

C

CDS. Control data set.

CICS. Customer Information Control System.
CICSVR. CICS VSAM Recovery.

communications data set (COMMDS). The primary means of communications among systems governed by a single SMS configuration. The COMMDS is a VSAM linear data set that contains the name of the ACDS and current utilization statistics for each system-managed volume, which helps balance space among systems running SMS.

compaction. In DFSMShsm, a method of compressing and encoding data that is migrated or backed up.

compress. To reduce the amount of storage required for a given data set by having the system replace identical words or phrases with shorter token associated with the word or phrase.

compressed format. A particular type of extended-format data set specified with the COMPACTION parameter of data class. VSAM can compress individual records in a compressed-format data set. SAM compresses individual blocks in a compressed-format data set.

concurrent copy. A function to increase the accessibility of data by enabling you to make a consistent backup or copy of data concurrent with the usual application program processing.

construct. One of the following: data class, storage class, management class, storage group, aggregate group, base configuration.

control data set (CDS). In DFSMShsm, one of three data sets (BCDS, MCDS, and OCDS) that contains records used in DFSMShsm processing.

coupling facility (CF). The hardware that provides high-speed caching, list processing and locking functions in a Parallel Sysplex.

CPU. Central processing unit.

data class. A collection of allocation and space attributes, defined by the storage administrator, that are used to create a data set.

Data Facility Sort (DFSORT). An IBM licensed program that is a high-speed data processing utility. DFSORT provides an efficient and flexible way to handle sorting, merging, and copy operations, as well as providing versatile data manipulation at the record, field, and bit level.

Data Facility Storage Management Subsystem (DFSMS). An operating environment that helps automate and centralize the management of storage. To manage storage, SMS provides the storage administrator with control over data class, storage class, management class, storage group, and automatic class selection routine definitions.

DBA. Database Administrator.

DBMS. Database Management System.

device category. A storage device classification used by SMS. The device categories are as follows: SMS-managed disk, SMS-managed tape, non-SMS-managed disk, non-SMS-managed tape.

DFSMSdfp. A DFSMS functional component or base element of z/OS, that provides functions for storage management, data management, program management, device management, and distributed data management.

DFSMSdss. A DFSMS functional component or base element of z/OS, used to copy, move, dump, and restore data sets or volumes.

DFSMShsm. A DFSMS functional component or base element of z/OS, used for backing up and recovering data, and managing space on volumes in the storage hierarchy.

DFSMSrmm. A DFSMS component or base element of z/OS, that manages removable media.
disaster recovery. A procedure for copying and storing an installation's essential business data in a secure location, and for recovering that data in the event of a catastrophic problem.

DP. Data processing.

DR. Disaster recovery.

DSCB. Data set control block.

DSN. Data set name.

dummy storage group. A type of storage group that contains the serial numbers of volumes no longer connected to a system. Dummy storage groups allow existing JCLs to function without having to be changed.

E

EOV. End of volume.

esoteric unit name. A name used to define a group of devices having similar hardware characteristics, such as TAPE or SYSDA.

expiration. The process by which data sets or objects are identified for deletion because their expiration date or retention period has passed. On disk, data sets and objects are deleted. On tape, when all data sets have reached their expiration date, the tape volume is available for reuse.

extended addressability (EA). The ability to create and access a VSAM data set that is greater than 4GB in size. Extended addressability data sets must be allocated with DSNTYPE=EXT and EXTENDED ADDRESSABILITY=Y.

extended format. The format of a data set that has a data set name type of EXTENDED. The data set is structured logically the same as a data set that is not in extended format but the physical format is different.

extent reduction. In DFSMShsm, the releasing of unused space, reducing the number of extents, and compressing partitioned data sets.

F

filtering. The process of selecting data sets based on specified criteria. These criteria consist of fully or partially-qualified data set names or of certain data set characteristics.

FSR. Function statistics record.

FTP. File transfer protocol.

functional statistics record (FSR). A record that is created each time a DFSMShsm function is processed. It contains a log of system activity and is written to the SMF data set.

G

GDG. Generation data group.

GDS. Generation data set.

generation data group (GDG). A collection of data sets with the same base name, such as PAYROLL, that are kept in chronological order. Each data set is called generation data set (GDS).

generic unit name. A name assigned to a class of devices with the same geometry (such as 3390).

global resource serialization (GRS). A component of z/OS used for serializing the use of system resources and for converting hardware reserves on disk volumes to data set enqueues.

global scratch pool. A group of empty tapes that do not have unique serial numbers and are not known individually to DFSMShsm. The tapes are not associated with a specific device.

H

hierarchical file system (HFS) data set. A data set that contains a POSIX-compliant file system, which is a collection of files and directories organized in a hierarchical structure, that can be accessed using z/OS UNIX System Services.
HSM complex (HSMplex). One or more z/OS images running DFSMShsm that share a common set of control data sets (MCDS, BCDS, OCDS, and journal).

HSM. Hierarchical storage manager.

IBM. International Business Machines.

IC. Image copy.

ICF. Integrated catalog facility.

ID. Identification.

IDS. Inventory data set.

IMS. Information Management System.

inactive data. Copies of active or low-activity data that reside on DFSMShsm-owned dump and incremental backup volumes.

IS. Information systems.

ISMF. Interactive System Management Facility.

ISPF. Interactive System Productivity Facility.

IT. Information technology.

ITSO. International Technical Support Organization.

JCL. Job control language.

journal data set. In DFSMShsm, a sequential data set used by DFSMShsm for recovery of the MCDS, BCDS, and OCDS. The journal contains a duplicate of each record in the control data sets that has changed since the MCDS, BCDS, and OCDS were last backed up.

L

level 0 volume. A volume that contains data sets directly accessible by the user. The volume may be either DFSMShsm-managed or non-DFSMShsm-managed.

level 1 volume. A volume owned by DFSMShsm containing data sets migrated from a level 0 volume.

level 2 volume. A volume under control of DFSMShsm containing data sets that migrated from a level 0 volume, from a level 1 volume, or from a volume not managed by DFSMShsm.

M

management class. A named collection of management attributes describing the retention, backup, and class transition characteristics for a group of objects in a object storage hierarchy.

MCDS. Migration control data set.

MEDIA2. Enhanced Capacity Cartridge System Tape (ECCST).

MEDIA3. High Performance Cartridge Tape (HPCT).

MEDIA4. Extended High Performance Cartridge Tape (EHPCT).

migration control data set (MCDS). In DFSMShsm, a VSAM key-sequenced data set that contains records, control records, user records, records for data sets that have migrated, and records for volumes under migration control of DFSMShsm.

migration level 1 (ML1). DFSMShsm-owned disk volumes that contain data set migrated from primary storage volumes. The data can be compressed.

migration level 2 (ML2). DFSMShsm-owned tape or disk volumes that contain data sets migrated from primary storage volumes or from migration level 1 volumes. The data can be compressed.
Migration. The process of moving unused data to lower cost storage in order to make space for high-availability data. If you wish to use the data set, it must be recalled.

MVS. Multiple Virtual Storage.

NaviQuest. A component of DFSMSdfp for implementing, verifying, and maintaining your SMS environment in batch mode. It provides batch testing and reporting capabilities that can be used to automatically create test cases in bulk, run many other storage management tasks in batch mode, and use supplied ACS code fragments as models when creating your own ACS routines.

O

OAM. Object Access Method.

Object access method (OAM). An access method that provides storage, retrieval, and storage hierarchy management for objects and provides storage and retrieval management for tape volumes contained in system-managed libraries.

OCO. Object code only.

Offline control data set (OCDS). In DFSMShsm, a VSAM key-sequenced data set that contains information about tape backup volumes and tape migration level 2 volumes.

P

Parallel sysplex. A sysplex with one or more coupling facilities, and defined by the COUPLEExx members of SYS1.PARMLIB as being a parallel sysplex.

Partitioned data set (PDS). A data set on direct access storage that is divided into partitions, called members, each of which can contain a program, part of a program, or data.

Partitioned data set extended (PDSE). A system-managed data set that contains an indexed directory and members that are similar to the directory and members of partitioned data sets. A PDSE can be used instead of a PDS.

PDS. Partitioned data set.

PDSE. Partitioned data set extended.

Pool storage group. A type of storage group that contains system-managed disk volumes. Pool storage groups allow groups of volumes to be managed as a single entity.

Primary space allocation. Amount of space requested by a user for a data set when it is created.

Primary storage. A disk volume available to users for data allocation. The volumes in primary storage are called primary volumes.

R

RACF. Resource Access Control Facility.

RAID. Redundant Array of Independent Devices.

RC. Return code.

Recall. The process of moving a migrated data set from a level 1 or level 2 volume to a DFSMShsm-managed volume or to a volume not managed by DFSMShsm.

Record level sharing (RLS). An extension to VSAM that provides direct shared access to a VSAM data set from multiple systems using cross-system locking.

Recovery. The process of rebuilding data after it has been damaged or destroyed, often by using a backup copy of the data or by reapplying transactions recorded in a log.
Resource Access Control Facility (RACF). An IBM licensed program that provides access control by identifying users to the system; verifying users of the system; authorizing access to protected resources; logging defected, unauthorized attempts to enter the system; and logging defected accesses to protected resources. RACF is included in z/OS Security Server and is also available as a separate program for the MVS and VM environments.

Resource Measurement Facility (RMF). An IBM licensed program or optional element of z/OS, that measures selected areas of system activity and presents the data collected in the format of printed records, system management facilities (SMF) records, or display reports. Use RMF to evaluate system performance and identify reasons for performance problems.

restore. In DFSMShsm, the process of invoking DFSMSdss to perform the program’s recover function. In general, it is to return to an original value or image, for example, to restore data in main storage from auxiliary storage.

RMF. Resource Measurement Facility.

RSP. Real-time selection process.

RTO. Recovery time objective.

S

SAM. Sequential access method.

SCDS. Source control data set.

SDS. Selection data set.

SDSF. Spool Display Screen Facility.

secondary space allocation. Amount of additional space requested by the user for a data set when primary space is full.

service-level agreement. (1) An agreement between the storage administration group and a user group defining what service-levels the former will provide to ensure that users receive the space, availability, performance, and security they need. (2) An agreement between the storage administration group and operations defining what service-level operations will provide to ensure that storage management jobs required by the storage administration group are completed.

SFM. Sysplex failure management.

SHCDS. Sharing control data sets.

shelf location. A single space on a shelf for storage of removable media.

shelf. A place for storing removable media, such as tape and optical volumes, when they are not being written or read.

SMB. System managed buffering.

SMF. System Management Facility.

SMS complex. A collection of systems or system groups that share a common configuration. All systems in an SMS complex share a common active control data set (ACDS) and a communications data set (COMMDS). The systems or system groups that share the configuration are defined to SMS in the SMS base configuration.

SMS configuration. A configuration base, SMS class, group, library, and drive definitions, and ACS routines that SMS uses to manage storage.

SMS control data set. A VSAM linear data set containing configurational, operational, or communications information that guides the execution of SMS.

SMS. Storage Management Subsystem.

SNA. Systems Network Architecture.
source control data set (SCDS). A VSAM linear data set containing an SMS configuration. The SMS configuration in a SCDS can be changed and validated using ISMF.

specific scratch pool. A group of empty tapes with unique serial numbers that are known to DFSMSHshm as a result of being defined to DFSMSHshm with the ADDVOL command.

storage administrator. A person in the data processing center who is responsible for defining, implementing, and maintaining storage management policies.

storage class. A collection of storage attributes that identify performance goals and availability requirements, defined by the storage administrator, used to select a device that can meet those goals and requirements.

storage control. The component in a storage subsystem that handles interaction between processor channel and storage devices, runs channel commands, and controls storage devices.

storage group. A collection of storage volumes and attributes, defined by the storage administrator. The collections can be a group of disk volumes, or a group of disk, optical, or tape volumes treated as a single object storage hierarchy.

storage hierarchy. An arrangement of storage devices with different speeds and capacities. The levels of the storage hierarchy include main storage (memory, disk cache), primary storage (disk containing uncompressed data), migration level 1 (disk containing data in a space-saving format), and migration level 2 (tape cartridges containing data in a space-saving format).

Storage Management Subsystem (SMS). A DFSMS facility used to automate and centralize the management of storage. Using SMS, a storage administrator describes data allocation characteristics, performance and availability goals, backup and retention requirements, and storage requirements to the system through data class, storage class, management class, storage group, and ACS routine definitions.

storage management. The activities of data set allocation, placement, monitoring, migration, backup, recall, recovery, and deletion. These can be done either manually or by using automated processes. SMS automates these processes for you, while optimizing storage resources.

sysplex. A set of MVS or z/OS systems communicating and cooperating with each other through certain multi-system hardware components and software services to process customer workloads.

system-managed data set. A data set that has been assigned a storage class.

system-managed storage. An approach to storage management in which the system determines data placement and an automatic data manager handles data backup, movement, space, and security.

system-managed tape library. A collection of tape volumes and tape devices, defined in the tape configuration data base (TCDB). A system-managed tape library can be automated or manual.

system-managed volume. A disk, optical or tape volume that belongs to a storage group.

tape configuration data base (TCDB). One or more volume catalogs used to maintain records of system-managed tape libraries and tape volumes.
tape library. A set of equipment and facilities that support an installation's tape environment. This can include tape storage racks, a set of tape drives, and a set of related tape volumes mounted on these devices.

tape storage group. A type of storage group that contains system-managed private tape volumes. The tape storage group definition specifies the system-managed libraries that can contain tape volumes.

TSO. Time Sharing Option.

TTOC. Tape table of contents.

V

virtual storage access method (VSAM). An access method for direct or sequential processing of fixed and variable-length records on direct access devices. The records in a VSAM data set or file can be organized in logical sequence by a key field (key sequence), in the physical sequence in which they are written on the data set or file (entry-sequence), or by relative-record number.

volume pool. In DFSMShsm, a set of related primary volumes. When a data set is recalled, if the original volume that is was on is in a defined volume pool, the data set can be recalled to one of the volumes in the pool.

volume. The storage space on disk, tape, or optical devices, which is identified by a volume label.

VSAM. Virtual Storage Access Method.

VTAM. Virtual Telecommunication Access Method.

W

WWFSR. See FSR.

X

XDF. Extended destination facility.

XSS. Expanded selection support.
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.

- DFSMSHsm Primer, SG24-5272

Other resources

These publications are also relevant as further information sources:

- Mainstar: ASAP User Guide
- Mainstar: Backup & Recovery Manager User Guide
- DFSMSHsm Implementation and Customization Guide, SC35-0418
- DFSMSHsm Storage Administration Guide, SC35-0421
- DFSMSHsm Storage Administration Reference, SC35-0422
- DFSMS: Implementing System-Managed Storage, SC26-7407
- DFSMS: Using the Interactive Storage Management Facility, SC26-7411
- DFSMS Migration, GC26-7398

Referenced Web sites

These Web sites are also relevant as further information sources:

- Mainstar Software Corporation
  http://www.mainstar.com/
- IBM TotalStorage Management Toolkit
- Mainstar Disaster Recovery Utilities
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Business readiness, in the event of a disaster, is gaining importance in information technology (IT) organizations. Senior management is taking the responsibility of protecting business assets seriously. Thus, today we see more business impact analyses (BIAs) and risk assessments being performed to identify a company’s critical business functions. Although critical business functions may be similar among many companies within an industry, what is unique to each business is its data. And that is the focus of this IBM Redbook: protecting your data with ABARS.

This redbook is written for storage administrators, system programmers, or other IT professionals faced with the task of implementing ABARS for disaster recovery. Application owners, and disaster recovery or contingency planners, will also find the book useful for understanding what is involved in an ABARS implementation.

This redbook describes tasks and details to implement ABARS for a set of data (defined by you for your business) for the purpose of disaster recovery. It also explains how these tasks can be simplified and enhanced with Mainstar Software Corporation’s products, ASAP and Backup & Recovery Manager, which IBM is remarketing through the TotalStorage Management Toolkit.