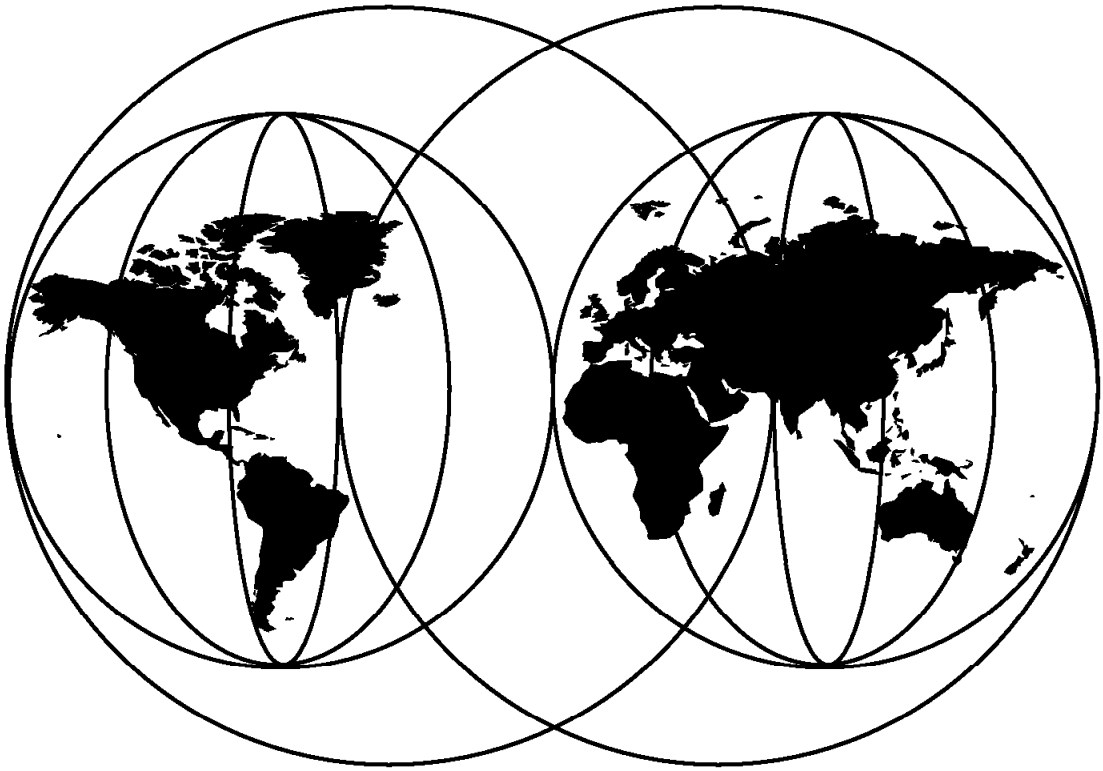
DFSMShsm ABARS and Mainstar Solutions

Toru Yamazaki, Debra Hammert, Colleen Gordon, Kelly Smith



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DFSMShsm ABARS and Mainstar Solutions

April 1998

Take Note!

Before using this information and the product it supports, be sure to read the general information in Appendix C, “Special Notices” on page 129.

First Edition (April 1998)

This edition applies to Version 1, Release 4 of DFSMS/MVS, 5695-DF1, Version 2, Release 4 of ASAP, and Version 2, Release 4 of ABARS Manager for use with the OS/390 Operating System.

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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 redbook: protecting **your data** with aggregate backup and recovery support (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 Automated Selection and Audit Process (ASAP) and ABARS Manager, which IBM is remarketing.

The Team That Wrote This Redbook

This redbook was produced by a team of specialists from around the world working at the International Technical Support Organization San Jose Center.

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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/MVS, and two Mainstar products: ASAP and ABARS 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. ABARS 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 DFSMShsm Version 1 Release 4, unless otherwise stated.

1.1 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 for 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 recover (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 such as the partitioned data set extended (PDSE).

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 Automated Selection and Audit Process (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 sections below for a functional description of ASAP.

Data supported by ABARS can reside on primary direct access storage device (DASD), tape volumes, migration level 1 (ML1) DASD, 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 is specified into one of three categories;

- **INCLUDE** (data to be included in the backup data file)
- **ALLOCATE** (catalog and space information captured only)
- **ACCOMPANY** (tape data sets that are cataloged only during recovery; a copy of the data 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 ABARS 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:

- *outputdatasetprefix*.D.C*nn*V*nnnn* and *outputdatasetprefix*.O.C*nn*V*nnnn* for the data file
- *outputdatasetprefix*.C.C*nn*V*nnnn* for the control file
- *outputdatasetprefix*.I.C*nn*V*nnnn* 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. An ABACKUP copy technique 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.

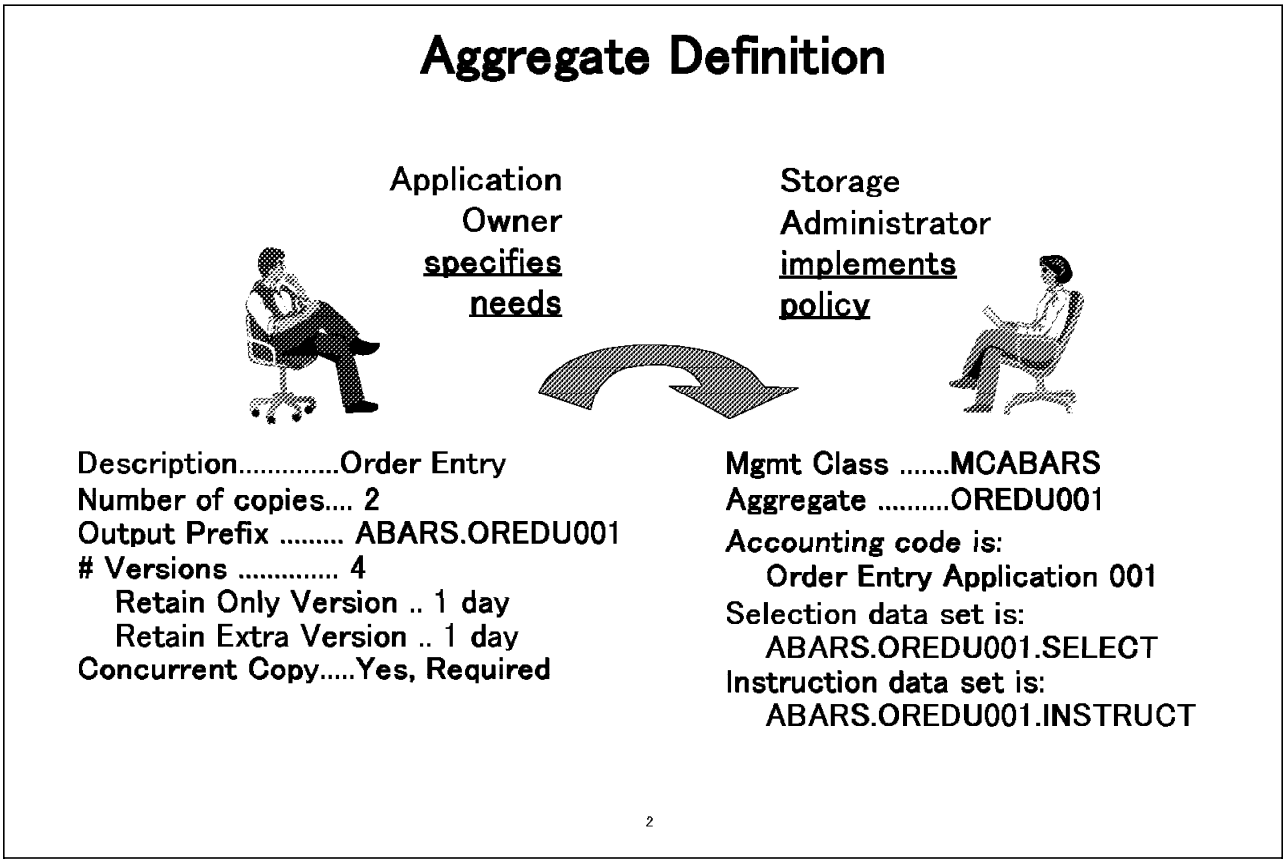

Figure 1. Aggregate Group Definition

ABARS provides a powerful tool to backup 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 an 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 multihost 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.

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 command ABACKUP VERIFY. 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 nonmigrated 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 DASD volumes are logically dumped by DFSMSdss and written to the data file, also referred to as the *D file*. Migrated and tape data are copied by DFSMShsm to the aggregate backup output file, also referred to as the *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 *I file*. Finally, all the control information for the aggregate is written to the control file, also referred to as the *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/MVS class definitions.

The ABACKUP process, with data inputs and outputs is illustrated in Figure 2 on page 5.

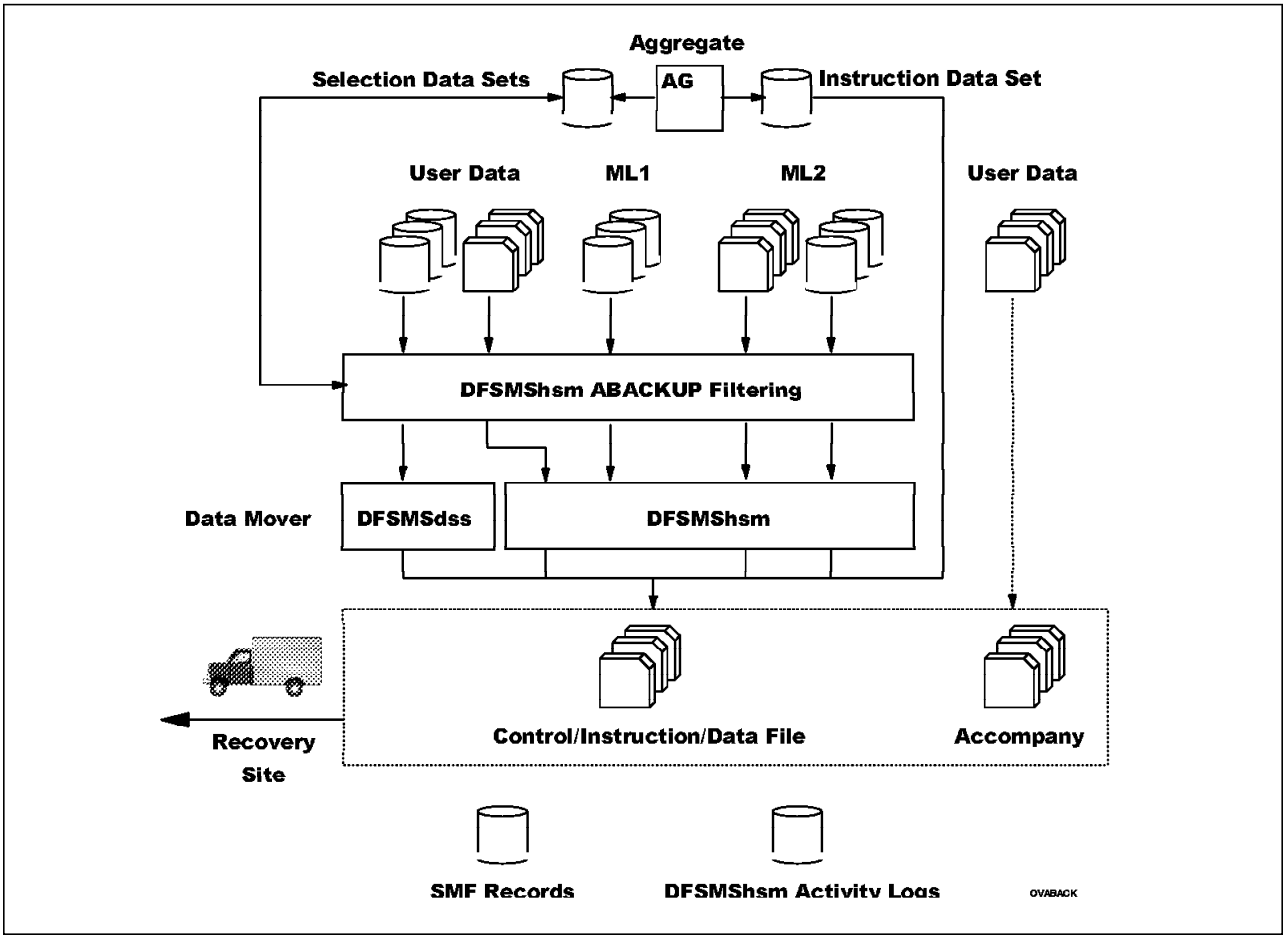

Figure 2. Aggregate Backup Process

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 such as PDSEs. 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 3.

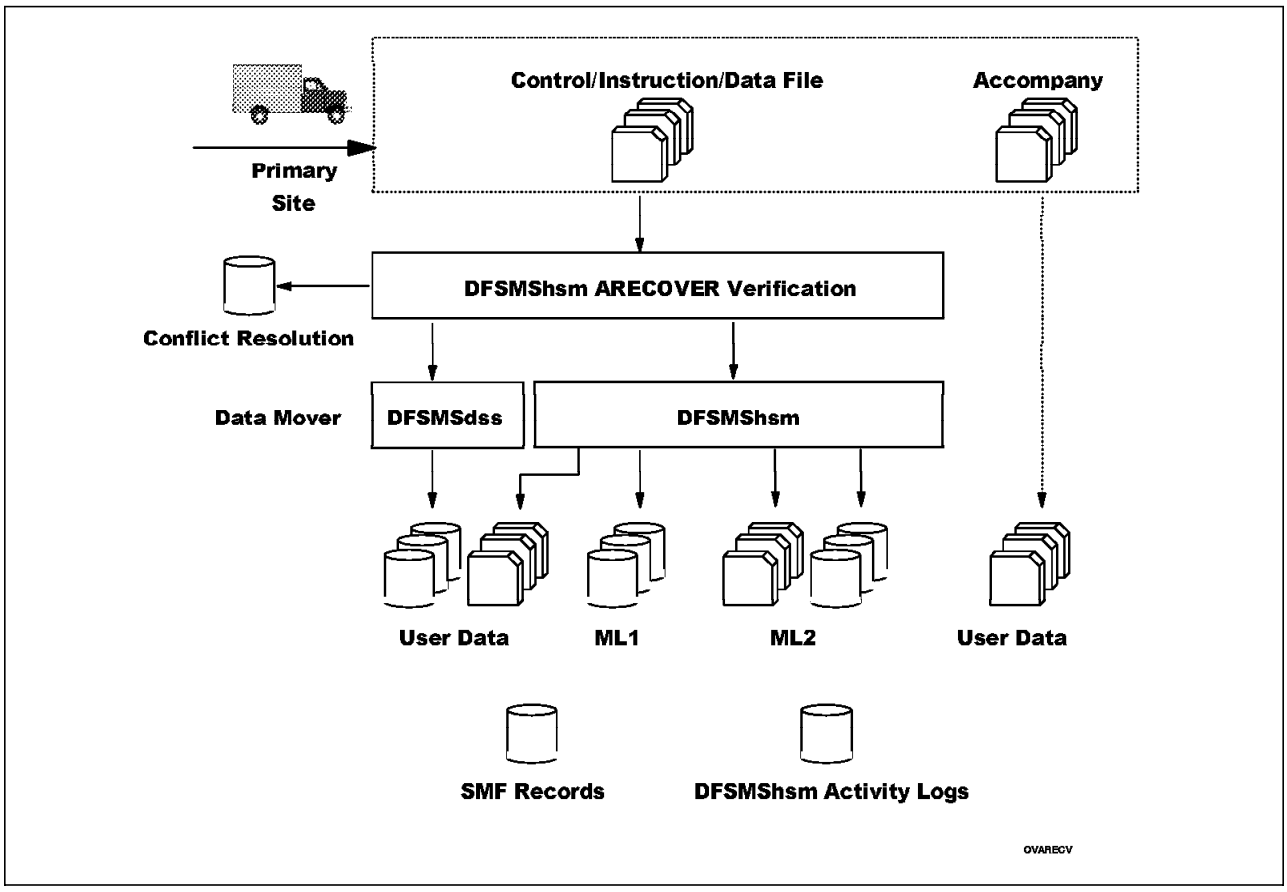

Figure 3. Aggregate Recovery Process

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.

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. Now in DFSMShsm V1R4 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 DASD. 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.
- ***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 DASD 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.
- ***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.

1.1.5 ABARS Enhancements in DFSMShsm V1R4

The following ABARS enhancements are included in DFSMShsm V1R4. See Appendix B, “ABARS Enhancements in DFSMS/MVS V1R4” on page 121 for more detail:

- ABARS output files can be stacked on a minimum number of tape volumes.
- Number of concurrent active ABARS tasks has been increased from 15 to a maximum of 64.
- Invocation of ARCBEEXT has been extended to data sets that are being processed by DFSMSdss during aggregate backup. Installations can bypass data sets that fail serialization.
- GDG base names can be specified in the ALLOCATE list. A GDG base can be defined during aggregate recovery without having to back up an associated GDS.

- The ABARS activity log is automatically deleted when aggregate roll-off occurs, during either automatic roll-off or EXPIREBV processing, when SETSYS ABARSDELETEACTIVITY(Y) is specified.
- CPU times for processing ABACKUP, ARECOVER, and the 32-character-long accounting code are maintained in the ABACKUP/ARECOVER Functional Statistics record (WWFSR) and the ABR record. This enables installations to charge application owners for ABARS services.
- The TGTGDS and OPTIMIZE keywords used when invoking DFSMSdss are externalized. These can be specified on the SETSYS, ABACKUP (OPTIMIZE only), and ARECOVER (TGTGDS only) commands.

1.2 Automatic Selection and Audit Process

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′s 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′s 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′s 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′s 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 Aggregate Balancing

Aggregate balancing feature 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 balancing takes full advantage of the 64 concurrent ABACKUP and ARECOVER tasks now available in DFSMS 1.4.

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, a companion product of ASAP available from Mainstar Software Corporation, must be installed to use this function.

1.2.5 ASAP′s 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 ABARS Manager

ABARS Manager enhances and simplifies the ABARS function of DFSMShsm. The focus of ABARS 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. ABARS Manager can be executed in either dialog or batch modes. ABARS Manager is a companion product to DFSMShsm ABARS.

1.3.1 Easy Aggregate Recovery

ABARS Manager maintains ABARS ABACKUP and ARECOVER information in the ABARS Manager Inventory Data Set (IDS). When ABARS Manager is used to recover an aggregate, all of the information needed in submitting the ARECOVER command to DFSMShsm is available in ABARS 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 ABARS Manager′s online ISPF menu panels or in a batch job.

1.3.2 Online Monitoring

Interactive dialog panels provide detailed information about aggregate ABACKUP and ARECOVER events. DFSMShsm ABARS activity log information is imported into the ABARS 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 ABARS Manager.

1.3.3 Selective Data Set Restore

ABARS 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 Online and Batch Reporting

ABARS 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, DASD resource usage, and event summary information.

1.3.5 Additional Functionality

Expanded Selection Support (XSS) is a facility of ABARS Manager that allows dynamic, preselection processing of data sets for an aggregate. XSS provides an alternative method of selecting data sets for inclusion into the ABARS ABACKUP. For example, XSS allows the user to select all data sets on a particular DASD volume by volser or set of volsers for inclusion in the ABACKUP. XSS reads the catalog for all data sets on the volser or set of volsers and automatically creates the selection data set in the proper format for ABARS. XSS uses select keywords, comparatives, and arguments providing the user with hundreds of alternatives for data set selection.

Extended Destination Facility (XDF) is a facility you can use to assign another name to an aggregate for the purpose of assigning priorities, grouping aggregates logically, and meeting other criteria designated by your organization. ABARS Manager supports sorting by the destination field so aggregates can be viewed according to these logical groups.

The Online Critical Backup Facility ensures the availability of critical files for the backup system by taking periodic separate backups of such files, and transferring the backup tapes to a safe location. This may be repeated several times a day. The tapes can then be transported to a second site by courier, or optionally, the facility can electronically vault the critical files after completion of the backups.

The Deferred Request Queue Facility provides a mechanism for you to save or requeue any ABACKUP or ARECOVER batch request for either unauthorized users or non-ABARS-Manager primary users and reschedule the events at a later time.

The ABARS Manager Activity Monitor provides status monitoring of aggregate backup and recovery activity. The ABARS Manager Activity Monitor ISPF panels display the default values currently in use by ABARS and DFSMShsm, as well as information about the aggregate backup and recovery tasks that are currently executing.

The GDG Base Facility executes program GDGBAS26 to scan the catalogs for GDG base definitions in order to create IDCAMS control statements for subsequent recreation of GDG bases. The intent is to provide a mechanism for recreating GDG base entries on a test or disaster recovery system.

Note: GDG Baseline, a companion product of ABARS Manager available from Mainstar Software Corporation, must be installed to use GDG Base Facility.

Chapter 2. 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. Book 1 of the Disaster Recovery Library, *Fire In The Computer Room— What Now?* (SG24-4211) describes in detail the six major steps of this structured approach. Figure 4 on page 12 lists the main activities involved in developing a disaster recovery solution.

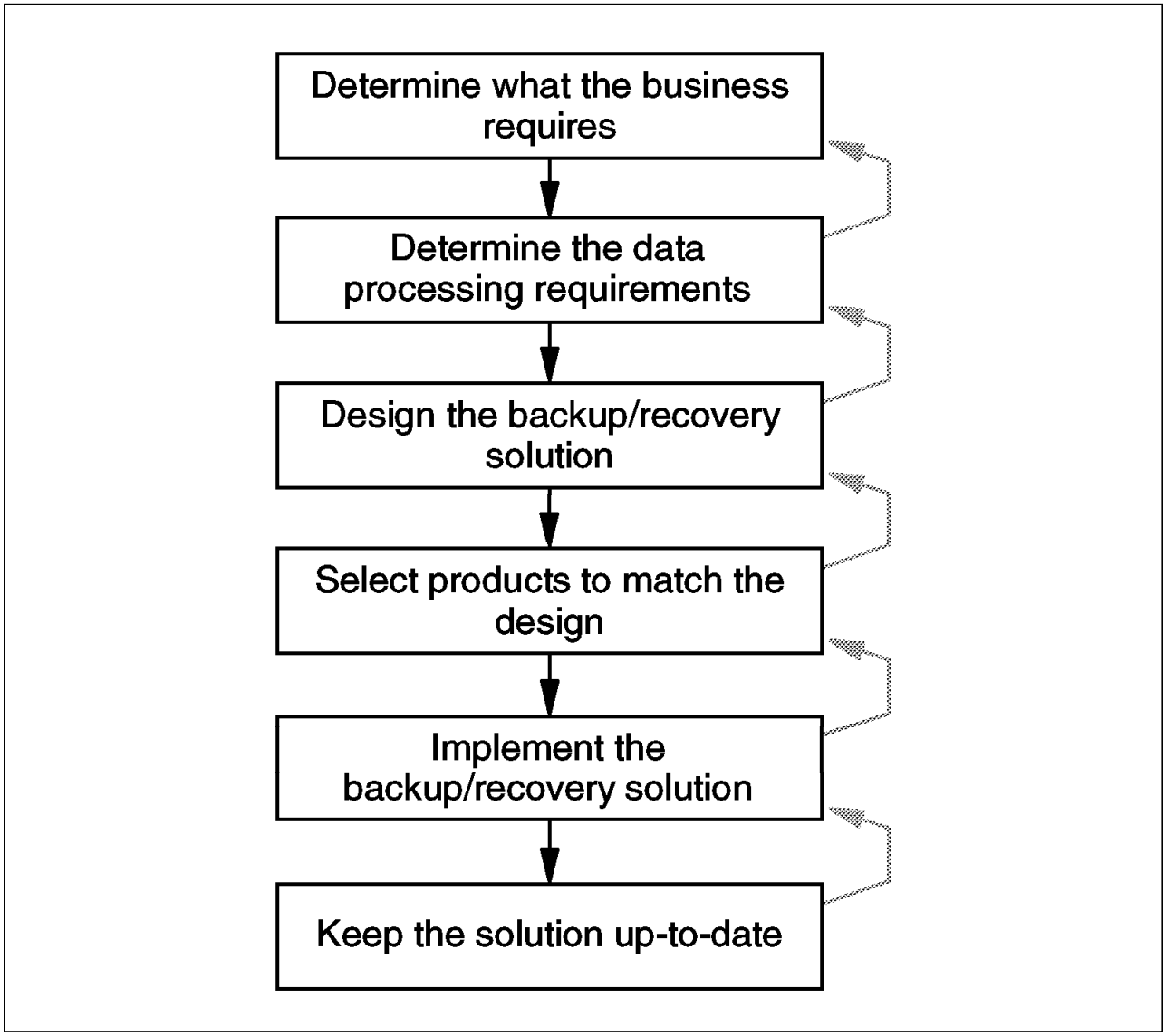

Figure 4. A Structured Approach for Disaster Recovery Planning

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 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, implement 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 methoed, data 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

Matching backup methods with data requirements is documented in detail in the publication *Disaster Recovery Library: Data Recovery* (GG24-3994).

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 5. We cannot look at just one set of criteria, we must look at all of these in the decision process.

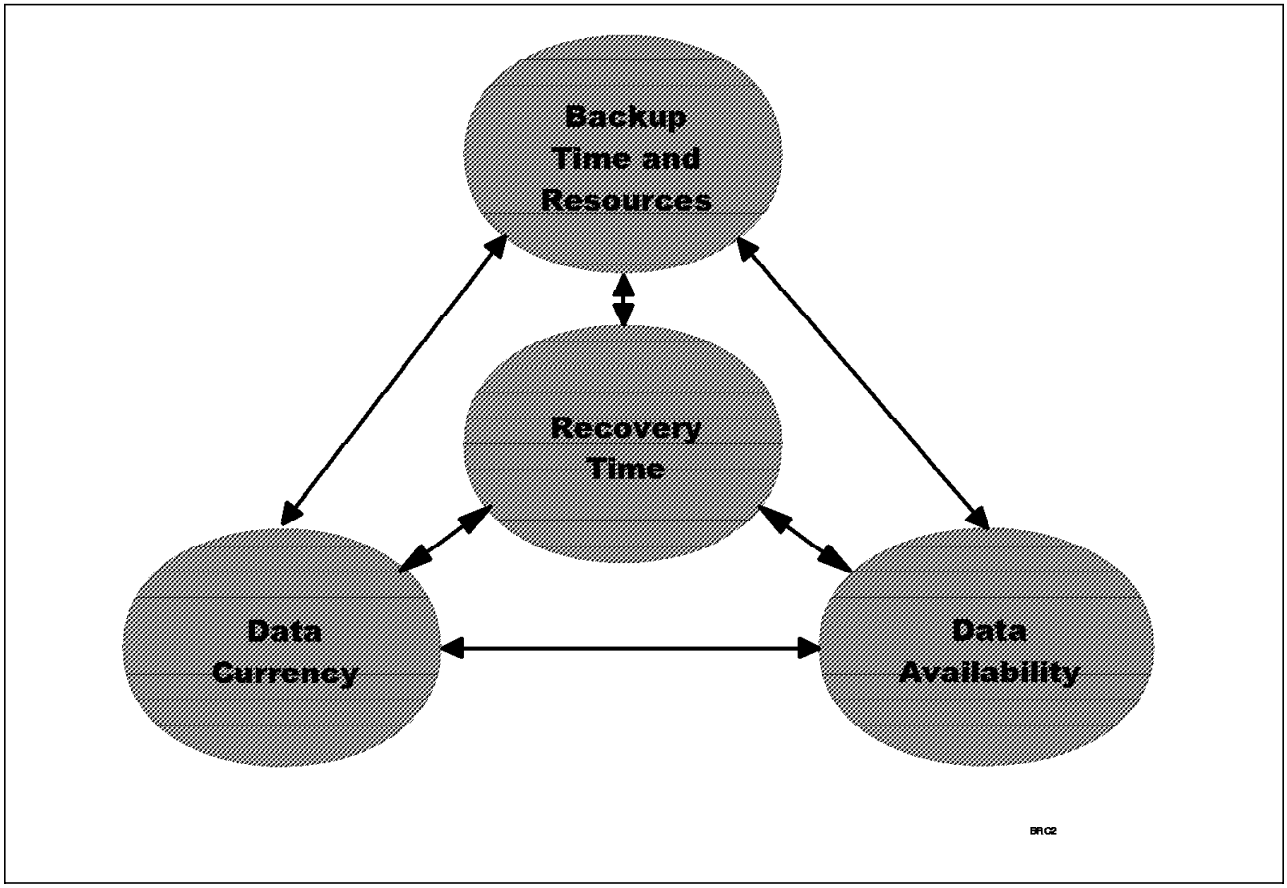

Figure 5. Interaction of Backup and Recovery Requirements

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 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 Technology Solutions for Reducing the 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. IBM′s Concurrent Copy, a function of DFSMS/MVS and the 3990 Storage Controllers; SnapShot, a feature of RAMAC Virtual Array; Backup-While-Open (BWO); and Remote Copy are some examples.

Can these play a part with ABARS, and if so, how? Concurrent Copy is now 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 3990 control units with the Concurrent Copy feature. 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 6 on page 16 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.

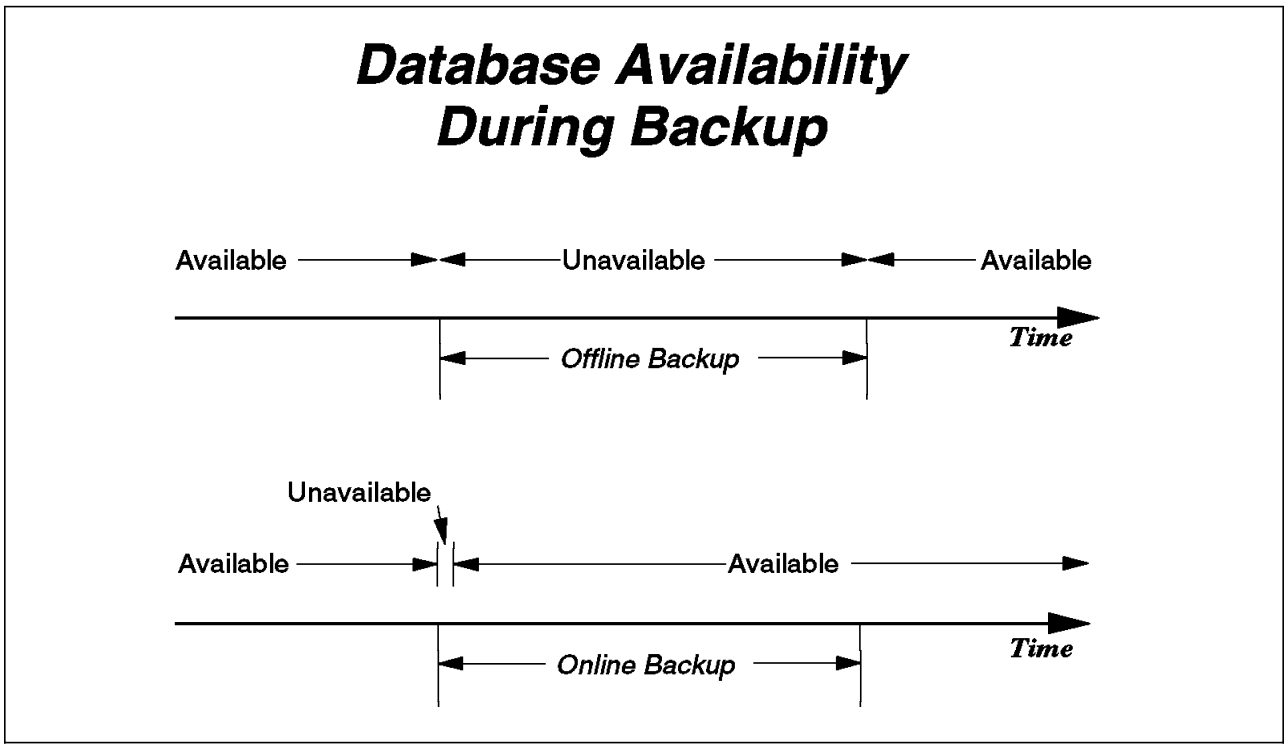

Figure 6. Database Availability During Backup

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.

IBM′s Remote Copy method addresses 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 DASD 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.

BWO requires a recovery manager such as CICS/VR and DFSMS/MVS 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. CICS/VR 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.

The RAMAC Virtual Array feature, SnapShot, is an optional high-speed data duplication function, which can be used to copy a volume or data set within seconds. SnapShot operates entirely within the RAMAC Virtual Array, eliminating the CPU time and channel utilization associated with traditional data copying techniques.

With Concurrent-Copy-compatible SnapShot available in DFSMSdss (see APAR OW29883 for detail), ABARS is now able to directly invoke SnapShot when data to be backed up resides on an RAMAC Virtual Array volume and has CONCURRENT REQUIRED or PREFERRED attribute to ABACKUP COPY TECHNIQUE in the management class.

Chapter 3. 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 ABARS 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.

Crazy Socks 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 Section 3.1, “Crazy Socks Corporation Configuration.”

Before management selected ABARS, ASAP, and ABARS Manager as 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 Section 3.2, “Data Classification and Recovery Requirements” on page 21.

Our current recovery plan depends on a weekly quiesce of all applications to perform full-volume dumps of all DASD 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 Section 3.1.2, “Current Disaster Backup Procedures” on page 20, 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 Sections 3.3, “Recovery Scenario A” on page 23, and 3.4, “Recovery Scenario B” on page 24. We are using two scenarios to illustrate a number of ABARS techniques and solutions; you need only one recovery solution.

3.1 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 ABARS Manager recovery solution provided in subsequent chapters has been developed with reference to this configuration.

The Crazy Socks OS/390 environment is as follows:

- Hardware
  - Two 9672 RX3 Parallel Enterprise Servers
  - 1.35 terabytes of DASD, comprising:
    - IBM RAMAC Virtual Array configured as 3390 Model 3s
    - 3990 Model 6s, 3390 Model 3s (Concurrent Copy capable)
    - 3390 Model 9s

  - Tape Systems
    - IBM 3480 and 3490E manual tape subsystems
    - IBM 3494 Tape Library Dataserver with both 3490E and 3590 tape subsystems

- Software
  - OS/390 R3, including the DFSMS/MVS Version 1 Release 4 family of products,
    - DFSMSdfp,
    - DFSMSdss,
    - DFSMShsm,
    - DFSMSrmm
  - ASAP V2 R4 (Service Pack 2411D)
  - ABARS Manager V2 R4 (Service Pack 2411D)
- Database management subsystems
  - CICS
  - IMS
  - DB2
- Catalogs
  - 1 ICF master catalog
  - 17 ICF user catalogs

3.1.1 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.

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

```
AAAUC###
AAA      Three-position acronym of the related application
   U     Cycle Indicator (W - Weekly, M - Monthly, D - Daily)
    C    Country (U - United States, C - Canada, P - Puerto Rico,
         J - Japan)
     ### Three-position numeric
```

Approximately 60% of our data is SMS-managed. Both ML1 DASD volumes and ML2 tape volumes are defined in 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.

3.1.2 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 DASD 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 DASD 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.

3.1.2.1 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.

3.2 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.

3.2.1 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 OS/390, which includes DFSMS/MVS, 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 ABARS 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, ABARS Manager inventory database, RACF and DFSMSrmm databases.

3.2.2 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 ABARS 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.

3.2.3 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.

3.2.4 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.

3.2.5 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.

3.2.6 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 ABARS 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 IBM′s Concurrent Copy can be used to minimize application downtime.

3.3 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 Section 3.3.2, “Recovery Solution” on page 24. Decisions on our backup techniques were made based on the recovery objectives.

3.3.1 Scenario A Recovery Objectives

An explanation of how each item meets a recovery objective is included in 3.3.2, “Recovery Solution” on page 24. 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.

3.3.2 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 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 is not an ABARS feature. We mention this new enhancement from DFSMShsm V1R4 because it 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.

3.4 Recovery Scenario B

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

3.4.1 Recovery Scenario B 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.

3.4.2 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.

  Note: ABARS Aggregate LoadBalancer, a companion product of ASAP available from Mainstar Software Corporation, must be installed to use this function.

3.5 Our ABARS Backup and Recovery Strategy

We will 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 ABARS 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.

Chapter 4. ABARS Implementation Tasks and Considerations

This chapter has three sections:

- *ABARS Implementation Tasks* outlines activities to be addressed and performed, in addition to roles and responsibilities.
- *Data Considerations* covers types of data in your environment, data supported by ABARS, and data related to aggregate backup.
- *Setting Up Your ABARS Environment* 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 ABARS 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
   - ABARS Manager education.
   - Include 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 ABARS Manager.
10. Test and verify ABACKUP:
    - 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, the answers 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 (doesn't change rapidly), low priority, or controlled by those who are most open to adapting ABARS. The 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: OS/390, 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, see *Disaster Recovery Library: Data Recovery* (GG24-3994). This publication also discusses the backup and recovery tools available, and the general advantages and disadvantages of each.

Critical data can be grouped into three general categories, as shown in Figure 7 on page 30. 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.

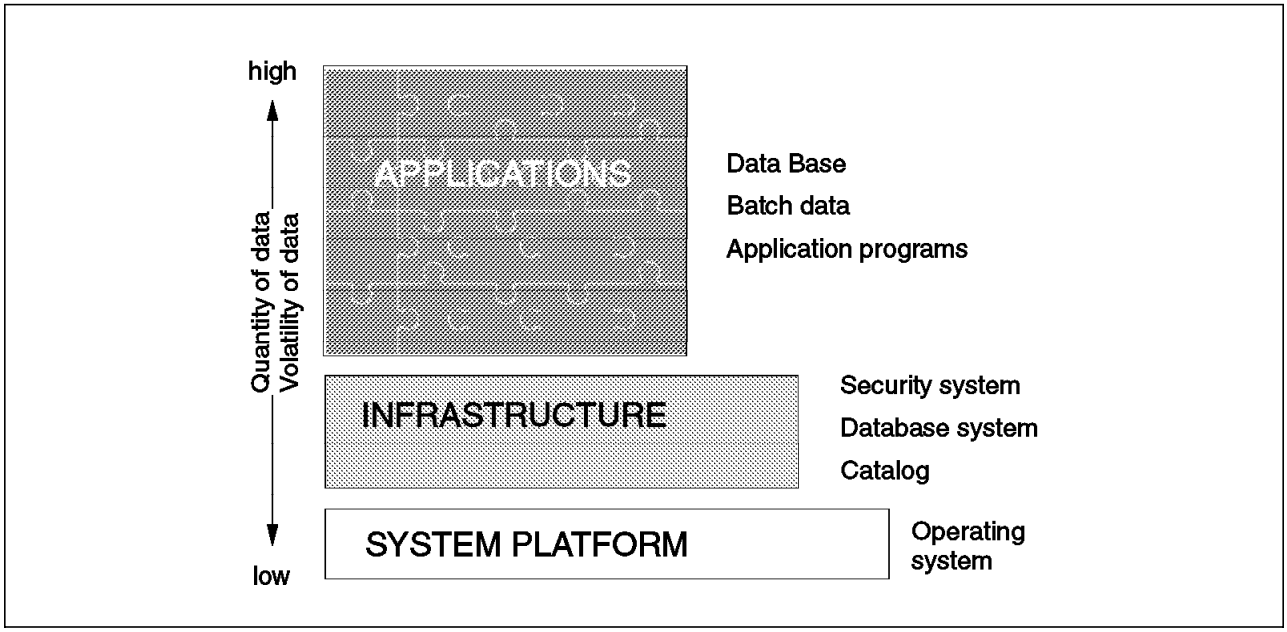

Figure 7. Categories of Critical Data

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 DASD 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 Chapter 5, ″Database Management Systems″ in the *Disaster Recovery Library: S/390 Technology Guide* (SG24-4210-01), and in the *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 statement, 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 BCDS, logs, DB2 catalog, and DB2 directory, can be specified in the ALLOCATE statement. 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 statement.

The following data sets are supported by the INCLUDE statement:

- VSAM data sets
- Partitioned data sets
- PDSE data sets
- 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
- DASD 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 function. 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 function 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 statement. 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 see *DFSMS/MVS V1R4 DFSMShsm Implementation and Customization Guide* (SH21-1078).

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 DASD 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 DASD 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 pregenerated 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 REPLACE. 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 parameter, the existing data could be regressed to an erlier state.

It is important to recognize and understand the exposures of overlapping data sets. ASAP and ABARS Manager can help identify these data sets. See 7.4, “Identifying Overlapping Data Sets” on page 90, and 9.1.6, “DATA SET” on page 102, 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 *DFSMS/MVS V1R4 DFSMShsm Storage Administration Guide* (SH21-1076).

4.2.3 Naming Conventions

ABARS, ASAP, and ABARS 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.

4.2.3.1 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 ABARS Manager. ASAP applications may have a one-to-many relationship with the defined aggregates. Establishing installation-wide naming conventions helps to facilitate this relationship.

4.2.3.2 Aggregates

Aggregates are defined in ISMF and imported into ABARS Manager. 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.

4.2.3.3 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.

4.2.3.4 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.

4.2.3.5 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 including new parameters and values in DFSMShsm V1R4. It is best to code these SETSYS commands in the DFSMShsm parameter library member (ARCCMDxx) to ensure that the settings are defined to DFSMShsm at startup. Refer to the *DFSMS/MVS V1R4 DFSMShsm Implementation and Customization Guide* (SH21-1078) and the *DFSMS/MVS V1R4 DFSMShsm Storage Administration Reference* (SH21-1075) for SETSYS parameter details.

4.3.1 SETSYS Commands for ABARS

The SETSYS command allows you to externally define various aggregate backup and recovery options. See ″Defining SETSYS Parameters for Aggregate Backup″ and ″Defining SETSYS Parameters for Aggregate Recovery″ in the *DFSMS/MVS V1R4 DFSMShsm Storage Administration Reference* (SH21-1075) 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(name)** 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 DASD to be included in the aggregate backup output data set. ABARS Manager also requires that the activity logs be directed to DASD 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. Prior to this new parameter in DFSMShsm V1R4, SMS was used to manage and delete the ABARS activity logs. Now, 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) are active during aggregate backup processing and (ARCCREXT, ARCSKEXT, ARCTVEXT) are active during aggregate recovery 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 the *DFSMS/MVS Version 1 Release 4 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 DASD 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.
- **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 DASD 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 DASD, or if the output tapes need to be recovered on a processor running a DFSMS/MVS 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.
- **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(nnn)** allows you to specify to what percent DFSMShsm allows DFSMSdss to fill non-SMS DASD 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 DASD.

  Further flexibility is given by using the TGTGDS(option) keyword 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 Figure 8, based on the backup and recovery requirements described in Chapter 3. Only the SETSYS commands for ABARS are displayed in Figure 8.

```
/*********************************************************************/
/*  SAMPLE SETSYS COMMANDS THAT DEFINE THE ABARS ENVIRONMENT         */
/*                                                                   */
/*********************************************************************/
/*
SETSYS MAXABARSADDRESSSPACE(20)     /*  MAX # LIMITED BY TAPE DRIVES    */
                                    /*    AVAILABLE FOR ABARS, TODAY    */
SETSYS ABARSPROCNAME(DFHSMABR)
SETSYS ABARSACTLOGMSGLVL(FULL)      /*  ABARS MANAGER REQUIRES - FULL   */
SETSYS ABARSACTLOGTYPE(DASD)        /*  ASAP REQUIRES - DASD            */
SETSYS ABARSDELETEACTIVITY(Y)       /*  DELETE WITH AGGREGATE VERSION   */
SETSYS ABARSBUFFERS(5)
SETSYS ABARSOPTIMIZE(4)             /*  READ ONE CYLINDER               */
SETSYS ABARSTAPES(STACK)            /*  STACK ABACKUP OUTPUT            */
SETSYS ABARSUNITNAME(3590-1)        /*  UTILIZE 3590 CART FOR ABACKUP   */
SETSYS ARECOVERUNITNAME(3490)       /*  UTILIZE 3490 FOR USER TAPE      */
                                    /*    DATA SETS AT ARECOVER TIME    */
SETSYS ARECOVERML2UNIT(3590-1)      /*  UTILIZE 3590 FOR ML2 DATA       */
                                    /*    WITH ARECOVER                 */
SETSYS ARECOVERPERCENTUTILIZED(85) /*  FILL NON-SMS DASD 85%           */
SETSYS ARECOVERTGTGDS(SOURCE)       /*  ARECOVER GDS TO STATUS AT       */
                                    /*    ABACKUP TIME                  */
SETSYS ABARSVOLCOUNT(ANY)           /*  PASSED TO DFSMSDSS AT ARECOVER  */
/*
```

Figure 8. Crazy Socks ABARS SETSYS Commands

4.3.2 DEFINE ARPOOL Command

The DEFINE ARPOOL command allows you to determine the target DASD Level 0 and ML1 volumes to be used for aggregate recovery. These target volumes are used for migrated and non-SMS-managed DASD 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 the *DFSMS/MVS V1R4 DFSMShsm Storage Administration Guide* (SH21-1076) 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, 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 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) -
                        L0VOLS(PRD300 PRD301 PRD302))

DEFINE ARPOOL (OREDU002 ML1VOLS(ML1008 ML1009 ML1007) -
                        L0VOLS(PRD301 PRD302 PRD300))

DEFINE ARPOOL (OREDU003 ML1VOLS(ML1009,ML1007,ML1008) -
                        L0VOLS(PRD302 PRD300 PRD301))
```

4.3.3 Security Requirements

The DFSMShsm and ABARS manage data on DASD and tapes. The security of data on DFSMShsm-managed DASD 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 IBM's mainframe 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.

4.3.3.1 Authorizing ABARS Started Task

To apply RACF protection to ABARS processing, you must add the ABARS started procedure to the RACF started-procedures table. First create a RACF user ID for the ABARS startup procedure. Specify the user ID to RACF with the following command:

```
ADDUSER userid DFLTGRP(groupname)
```

Each aggregate backup and recover function is run as a started task. Modify the RACF started-procedures table (ICHRIN03) to include the name of the procedure used to start an ABARS secondary address space. Associate the name of each procedure with the RACF user ID you have defined for ABARS.

Figure 9 is a sample DFSMShsm secondary address space startup procedure for starting ABARS processing (notice the procedure name DFHSMABR). The ABARS ID can also be obtained from the SETSYS ABARSPROCNAME command.

```
//DFHSMABR PROC
//DFHSMABR EXEC PGM=ARCWCTL,REGION=0M
//SYSUDUMP DD SYSOUT=A
//MSYSIN   DD DUMMY
//MSYSOUT  DD SYSOUT=A
```

Figure 9. Example of ABARS Secondary Address Space Startup Procedure

The ABARS entry in Figure 10 reflects DFHSMABR as the ABARS procedure name and its associated user ID, DFHSM.

```
 ___________ ___________ ___________ ____________ ____________
| DFHSMABR  | DFHSM     |           |    X¢00¢   |  X¢0000000¢ |
|___________|___________|___________|____________|____________|
```

Figure 10. Example of RACF-Started-Procedure Table Entry for ABARS

See the *DFSMS/MVS V1R4 DFSMShsm Implementation and Customization Guide* (SH21-1078) for further information.

4.3.3.2 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.

Define the following profiles for comprehensive command authority with the following RACF commands:

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

The following 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. We issue the following command to define a facility class for the OREDU001 aggregate:

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

Authority to issue an 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 DSCONFLICT(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
```

4.3.3.3 Authority to Select ISMF Aggregate Group Application

Aggregate group application under ISMF is a storage administrator function. TSO user access to ISMF aggregate group application 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.

4.3.3.4 Authority to Select ABACKUP or ARECOVER Functions Through 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 if 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.

4.3.3.5 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 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.

4.3.3.6 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 *DFSMS/MVS V1R4 DFSMShsm Storage Administration Guide* (SH21-1076) and *DFSMS/MVS V1R4 DFSMSdfp Storage Administration Reference* (SH21-1075) 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.

4.3.4.1 Defining the Tape Environment

Figure 11 shows the SETSYS commands that define a typical tape management system environment. Validate that these commands have been specified in your ARCCMDxx PARMLIB member. Each SETSYS parameter is described in further detail in *DFSMS/MVS V1R4 DFSMShsm Implementation and Customization Guide* (SH21-1078).

```
/*********************************************************************/
/*  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 */
/*
```

Figure 11. Sample SETSYS Commands for Tape Management

4.3.4.2 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)
```

4.3.4.3 DFSMSrmm Interfaces

DFSMSrmm no longer uses the DFSMShsm tape volume exit ARCTVEXT to manage tapes that DFSMShsm uses. DFSMSrmm provides the programming interface EDGTVEXT that is used from DFSMShsm or any other APF-authorized program that needs to obtain the same services as the DFSMShsm 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 based on the SETSYS EXITON command. The EDGTVEXT general-use programming interface frees ARCTVEXT from DFSMSrmm usage, so you can use ARCTVEXT for other tape management systems.

To run DFSMShsm with DFSMSrmm, DFSMShsm must be defined to RACF. The DFSMShsm user ID should be other than the default user ID and should be defined in the started procedures table ICHRIN03 or with the RACF 2.1 STARTED class. See *DFSMS/MVS V1R4 DFSMShsm Implementation and Customization Guide* (SH21-1078) for further information.

Authorizing ABARS for DFSMSrmm Resources: To use DFSMSrmm with DFSMShsm ABARS, you must assign ABARS IDs the correct levels of authorization to STGADMIN.EDG.MASTER, STGADMIN.EDG.OWNER.user, and STGADMIN.EDG.RELEASE.

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

4.3.4.4 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 specification to retain tape volumes until DFSMShsm expires them. Policies are defined using vital record specifications 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 vital record specification to extend any expiration date or retention period previously set for the volume. Additionally, you can use vital record specification 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 vital record specifications. See the *DFSMS/MVS V1R4 DFSMSrmm Implementation and Customization Guide* (SC26-4932) 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 only needs to be run when you wish to expire 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 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 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 DASD. If this is done, and the files are migrated to DASD, an DFSMShsm DELETE 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.

Chapter 5. 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.

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 ABARS 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 19 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 the questions used on our questionnaire and the answers provided by the analyst.

5.1 Current Recovery Strategies

The question in Figure 12 on page 48 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.

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.

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.

Figure 12. Business Resumption Questionnaire: Current Recovery Strategies 1

Many applications have steps embedded within the batch jobs to back up data sets before they are changed. The question in Figure 13 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.

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.

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.

Figure 13. Business Resumption Questionnaire: Current Recovery Strategies 2

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 Figure 14 on page 49 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.

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.

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.

Figure 14. Business Resumption Questionnaire: Current Recovery Strategies 3

Our hardware, described in 3.1, “Crazy Socks Corporation Configuration” on page 19, supports the concurrent copy feature. See 2.3, “Technology Solutions for Reducing the Perceived Burden of Backup” on page 15, 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 Figure 15 asks the analyst about the current use of concurrent copy.

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.

Figure 15. Business Resumption Questionnaire: Current Recovery Strategies 4

The question in Figure 16 on page 50 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 DASD. Applications can then rerun the application and compare the test data with the production run.

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.

Figure 16. Business Resumption Questionnaire: Current Recovery Strategies 5

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.

Figure 17 on page 51 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.

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.

Question 1.

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

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 to Question 1.
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

Answer to Question 2.
There are no legacy or interfacing systems to be considered as part of the Order Entry application.

Figure 17. Business Resumption Questionnaire: Identifying 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.

Figure 18 asks the analyst about the established synchronization point in the application.

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.

Figure 18. Business Resumption Questionnaire: Synchronization Points

5.4 Database Types

Figure 19 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.

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 Section 4.2, “Data Considerations” on page 29, there is further reference to database-related data and recovery.

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.

Figure 19. Business Resumption Questionnaire: Data Base Types

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. Figure 20 on page 53 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.

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.

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 soon)

The remaining nodes are determined by the application analyst.

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

Figure 20. Business Resumption Questionnaire: Application Data Sets

5.6 Interfacing Systems

Figure 21 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. 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.

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.

Figure 21. Business Resumption Questionnaire: Interfacing Systems

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. Figure 22 asks the analyst about data sets created externally so that they can be included in ASAP for the application.

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.

Figure 22. Business Resumption Questionnaire: Externally Created Data Sets

5.8 Dynamically Built JCL

Figure 23 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.

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.

Figure 23. Business Resumption Questionnaire: Dynamically Built JCL

Chapter 7, “Structuring Applications Using ASAP” on page 69, 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.

Chapter 6. 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. Existing management classes can be used. 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. Whether you create new management classes or use existing ones, you need to define the following aggregate backup parameters. These attributes are displayed in Figure 24 on page 56:

- The maximum number of aggregate group backup versions to be kept (a specific number of versions up to 9999, or NOLIMIT).

  # Versions = nnnn | 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 : The Unit field 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.

- Abackup 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.

```
  Panel  Utilities  Scroll  Help
------------------------------------------------------------------------------
                          MANAGEMENT CLASS DEFINE              Page 5 of 5
Command ===>

SCDS Name . . . . . . : SYS1.SCDSRLS
Management Class Name : MCABARS

To DEFINE Management Class, Specify:
  AGGREGATE Backup Attributes:
    # Versions . . . . . . . . . 4       (1 to 9999, NOLIMIT or blank)
    Retain Only Version  . . . 1       (1 to 9999, NOLIMIT or blank)
      Unit . . . . . . . . . . D       (D=days, W=weeks, M=months, Y=years or
                                       blank)
    Retain Extra Versions  . . 1       (1 to 9999, NOLIMIT or blank)
      Unit . . . . . . . . . . D       (D=days, W=weeks, M=months, Y=years or
                                       blank)
    Copy Serialization . . . . F       (C=continue, F=fail or blank)
    Abackup Copy Technique . . R       (P=Conc Preferred, R=Conc Required or
                                       S=Standard)


 F1=Help    F2=Split   F3=End     F4=Return  F7=Up      F8=Down    F9=Swap
F10=Left   F11=Right  F12=Cursor
```

Figure 24. Management Class Define ISMF Panel, Page 5

We use this management class 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

6.2.1 Overview

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 the *DFSMS/MVS V1R4 DFSMSdfp Storage Administration Reference* (SH21-1075-03) 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:
  - *outputdatasetprefix*.D.C*nn*V*nnnn* and *outputdatasetprefix*.O.C*nn*V*nnnn* for the data file
  - *outputdatasetprefix*.C.C*nn*V*nnnn* for the control file
  - *outputdatasetprefix*.I.C*nn*V*nnnn* for the instruction/activity log file

  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: C*nn* is the copy number and V*nnnn* is the version number generated during the ABACKUP operation.

6.2.2 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 ***Primary Option Menu*** for Storage Administrators, displayed in Figure 25. 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 39.

```
  Panel  Help
------------------------------------------------------------------------------
                  ISMF PRIMARY OPTION MENU - DFSMS/MVS 1.4
Enter Selection or Command ===>  9

Select one of the following options and press Enter:

0  ISMF Profile              - Specify ISMF User Profile
1  Data Set                  - Perform Functions Against Data Sets
2  Volume                    - Perform Functions Against Volumes
3  Management Class          - Specify Data Set Backup and Migration Criteria
4  Data Class                - Specify Data Set Allocation Parameters
5  Storage Class             - Specify Data Set Performance and Availability
6  Storage Group             - Specify Volume Names and Free Space Thresholds
7  Automatic Class Selection - Specify ACS Routines and Test Criteria
8  Control Data Set          - Specify System Names and Default Criteria
9  Aggregate Group           - Specify Data Set Recovery Parameters
10 Library Management        - Specify Library and Drive Configurations
11 Enhanced ACS Management   - Perform Enhanced Test/Configuration Management
C  Data Collection           - Process Data Collection Function
L  List                      - Perform Functions Against Saved ISMF Lists
R  Removable Media Manager   - Perform Functions Against Removable Media
 F1=Help    F2=Split   F3=End     F4=Return  F7=Up      F8=Down    F9=Swap
F10=Left   F11=Right  F12=Cursor
```

Figure 25. ISMF Primary Option Menu

Figure 26 on page 59 illustrates the Aggregate Group Application Selection panel. This screen is displayed after selecting Option 9 on the ***ISMF Primary Options Menu***.

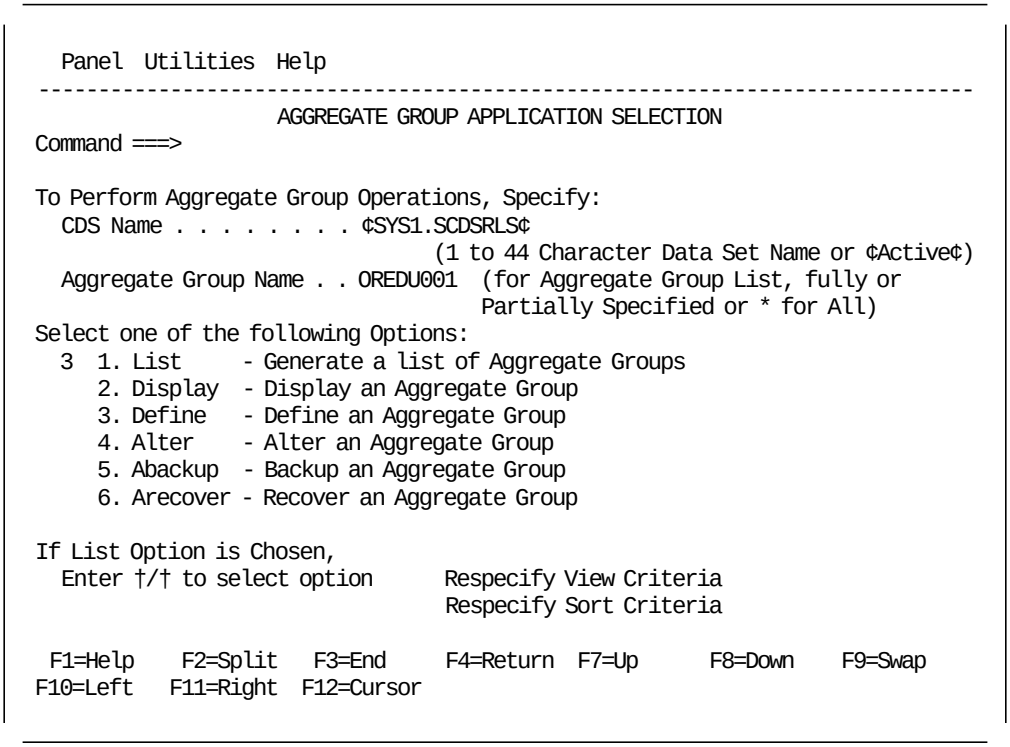

Figure 26. Aggregate Group Application Selection Panel

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 27 on page 60 below. You can leave either page of the ***Aggregate Group Define*** panel at any time without saving the aggregate group attributes or changes by issuing the CANCEL command.

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

```
  Panel  Utilities  Scroll  Help
------------------------------------------------------------------------------
                          AGGREGATE GROUP DEFINE              Page 1 of 2
Command ===>

SCDS Name  . . . . . : SYS1.SCDSRLS
Aggregate Group Name : OREDU001

To DEFINE Aggregate Group, Specify:
 Description ==>  This is the Order Entry Application.
             ==>

 Backup Attributes
   Number of Copies  . . . . . . . 2              (1 to 15)
   Management Class Name . . . . . MCABARS        (1 to 8 characters, to be
                                                  defined in current SCDS)

 Output Data Set Name Prefix . . . ABARS.OREDU001
                                                  (1 to 33 Characters)
 Account . . . . . . . . . . . . . OREDU999
                                                  (1 to 32 Characters)

 F1=Help    F2=Split   F3=End     F4=Return  F7=Up      F8=Down    F9=Swap
F10=Left   F11=Right  F12=Cursor
```

Figure 27. 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).

Once you have entered this information, press the PF8 key to advance to page 2 for more options. Figure 28 displays 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.

```
   Panel  Utilities  Scroll  Help
------------------------------------------------------------------------------
                          AGGREGATE GROUP DEFINE              Page 2 of 2
Command ===>

SCDS Name  . . . . . : SYS1.SCDSRLS
Aggregate Group Name : OREDU001
To Edit a Data Set, Specify Number  . .     (1, 2, 3, 4, 5, or 6)
  Selection Data Sets:           (1 to 44 characters)
   1 ===> ¢ABARS.OREDU001.SELECT¢
     Member Name ===>             (1 to 8 characters)
   2 ===>
     Member Name ===>             (1 to 8 characters)
   3 ===>
     Member Name ===>             (1 to 8 characters)
   4 ===>
     Member Name ===>             (1 to 8 characters)
   5 ===>
     Member Name ===>             (1 to 8 characters)

  Instruction Data Set:          (1 to 44 characters)
   6 ===> ABARS.OREDU001.INSTRUCT
 F1=Help    F2=Split   F3=End     F4=Return  F7=Up      F8=Down    F9=Swap
F10=Left   F11=Right  F12=Cursor
```

Figure 28. Aggregate Group Define Panel, Page 2

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. PDSE data sets are also supported for the selection data set (see APAR OW29117 for more detail). 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.OREDU001.INSTRUCT.

6.3 Importing Aggregates into ABARS Manager

The import and export services feature in ABARS Manager is used to import information about aggregates defined to ISMF into the ABARS Manager inventory data set (IDS) for tracking and control.

During ABARS implementation, the import process is done each time a new aggregate or group of aggregates is defined to ISMF.

ABARS Manager will automatically track and capture activity information for an aggregate under its control but uses the imported ISMF information to track more than one copy of the aggregates output files. It also provides the capability of editing either the aggregates selection or instruction data sets (or both) directly from the ***Aggregate List Selection*** screen in ABARS Manager without requiring a separate SPF edit session.

Backups performed before implementing ABARS Manager, and backups performed outside of ABARS Manager′s control may also be imported into ABARS Manager′s IDS for tracking.

ISMF import through ABARS Manager can be initiated any time. ABARS Manager selects only those aggregates that have changed or been added as new since the last import event.

We defined the DFSMS management class, MCABARS, and aggregate, OREDU001, for the order entry system to ISMF in 6.1, “Defining Management Classes” on page 55, and 6.2, “Defining Aggregates” on page 57. We then activated the new DFSMS configuration using ISMF. We will now import these entities into ABARS Manager.

6.3.1 Capturing ISMF Data in ISPTLIB

The steps are these:

Step 1: Select Option 9, ***Aggregate Group***, from the ***ISMF Primary Option Menu*** and press Enter as shown in Figure 29.

```
                          ISMF PRIMARY OPTION MENU
ENTER SELECTION OR COMMAND ===> 9

SELECT ONE OF THE FOLLOWING OPTIONS AND PRESS ENTER:

0  ISMF PROFILE              - Specify ISMF User Profile
1  DATA SET                  - Perform Functions Against Data Sets
2  VOLUME                    - Perform Functions Against Volumes
3  MANAGEMENT CLASS          - Specify Data Set Backup and Migration Criteria
4  DATA CLASS                - Specify Data Set Allocation Parameters
5  STORAGE CLASS             - Specify Data Set Performance and Availability
6  STORAGE GROUP             - Specify Volume Names and Free Space Thresholds
7  AUTOMATIC CLASS SELECTION - Specify ACS Routines and Test Criteria
8  CONTROL DATA SET          - Specify System Names and Default Criteria
9  AGGREGATE GROUP           - Specify Data Set Recovery Parameters
10 LIBRARY MANAGEMENT        - Specify Library and Drive Configurations
C  DATA COLLECTION           - Process Data Collection Function
L  LIST                      - Perform Functions Against Saved ISMF Lists
R  REMOVABLE MEDIA MANAGER   - Perform Functions Against Removable Media
X  EXIT                      - Terminate ISMF


USE HELP COMMAND FOR HELP; USE END COMMAND OR X TO EXIT.
```

Figure 29. ISMF Primary Option Menu Panel

Step 2: On the ***Aggregate Group Application Selection panel*** (Figure 30 on page 64), use the active DFSMS CDS configuration by typing the word 'ACTIVE' in the CDS name entry field. Select Option 1, **List**, and press Enter. A list of all aggregates defined to ISMF is displayed.

```
                    AGGREGATE GROUP APPLICATION SELECTION
COMMAND ===>

TO PERFORM AGGREGATE GROUP OPERATIONS, SPECIFY:

  CDS NAME              ===> ¢ACTIVE¢
                                 (1 to 44 character data set name or ¢ACTIVE¢)
  AGGREGATE GROUP NAME ===> *               (for Aggregate Group List, fully or
                                             partially specified or * for all)
SELECT ONE OF THE FOLLOWING OPTIONS ===> 1

  1  LIST     - Generate a list of Aggregate Groups
  2  DISPLAY  - Display an Aggregate Group
  3  DEFINE   - Define an Aggregate Group
  4  ALTER    - Alter an Aggregate Group
  5  ABACKUP  - Backup an Aggregate Group
  6  ARECOVER - Recover an Aggregate Group

IF OPTION 1 CHOSEN ABOVE,
  RESPECIFY VIEW CRITERIA           ===> N   (Y OR N)
  RESPECIFY SORT CRITERIA           ===> N   (Y OR N)

USE ENTER TO PERFORM SELECTION;
USE HELP COMMAND FOR HELP; USE END COMMAND TO EXIT.
```

Figure 30. Aggregate Group Application Selection Panel

Step 3: Type SAVE AMPALIST REPLACE on the command line of the ***Aggregate Group List*** panel (Figure 31) and press Enter. This command requests ISPF to save the contents of all (or selected) aggregates if using a mask as member AMPALIST in your first private ISPTLIB. Each time this command is issued, it writes over previous entries.

```
                              AGGREGATE GROUP LIST
COMMAND ===> save ampalist replace                          SCROLL ===> HALF
                                                         Entries 1-4 of 4
                                                         Data Columns 3-3 of 19
CDS NAME:  ACTIVE

ENTER LINE OPERATORS BELOW:

    LINE       AGGROUP
    OPERATOR   NAME         OUTPUT DATA SET NAME PREFIX
   ---(1)----  --(2)---  ---------------(3)---------------
               ABARS001  ABARS.WORK1.TODISK
               ABARS002  ABARS.WORK2.TODISK
               ABARS003  ABARS.WORK3.TODISK
               ABARS004  ABARS.WORK4
   ----------  --------  ------  BOTTOM  OF  DATA  ------  --------  ----------









USE HELP COMMAND FOR HELP; USE END COMMAND TO EXIT.
```

Figure 31. Aggregate Group List Panel

Step 4: Exit ISMF.

6.3.2 Invoking ABARS Manager

ABARS Manager can be executed as a CLIST in TSO Option 6, or as an option on a customized ISPF panel. Your site's product installer is responsible for providing instructions on how to invoke ABARS Manager at your site. For demonstration in this publication, we invoke ABARS Manager using a CLIST named %AMPSTART. Refer to the *ABARS Manager/ASAP Installation & Maintenance Guide* for more information about invoking ABARS Manager.

6.3.3 ABARS Manager Import Function

The steps are these:

Step 1: Invoke ABARS Manager.

Step 2: From the ABARS Manager Main Menu (Figure 32), select Option 3, ***Import/Export*** and press Enter.

```
<V2R411D> ---  A B A R S   (Manager)  SELECTION  Menu  --------      19:03

   SELECT AN OPTION ==>  3

   Select One of the Following:

     1  FILE INQUIRY      -  Display Aggregate(s), Generations, Data Sets
                             and Destinations from Inventory File
     2  ACTIVITY LOGS     -  Examine ABARs Activity Logs
     3  IMPORT / EXPORT   -  Perform Data Transfer Functions against File(s)
     4  ABACKUP SELECT    -  Selective ABACKup By Aggregate
     5  ARECOVER SELECT   -  Selective ARECOVER By Data Set / Aggregate
     6  HISTORY LOG       -  Display Events From History Log File
     7  DIAG / MAINT      -  Perform Diagnostic & Maintenance Functions
     8  SAMPLE AGGREGATES -  Create, Delete Sample Aggregate Information
     9  RESERVED          -  Reserved for Future Usage.
     A  AUTOBUILD (ASAP)  -  Use Automatic Selection & Audit Process (ASAP)
     X  EXIT              -  Terminate ABARs Manager

     Copyright (C) 1992-1996: Software Information Services,Inc. <V2R411D>
```

Figure 32. ABARS Manager Selection Menu Panel

Step 3: From the ***Import/Export Select*** menu (Figure 33 on page 66), select Option 4, ***ISMF Information***, and press Enter.

```
<V2R411D> ---  A B A R S   (Manager)  IMPORT / EXPORT Select --- SELECT OPTION

    SELECT ==>  4


    IMPORTING Functions:

        1-  ACTIVITY LOGS      = Update Inventory File with Previous Activity
                                 Log Information.
        2-  INVENTORY FILE     = Update Inventory File from Previously EXPORTED
                                 Inventory File Copy (Repro).
        3-  CHECKPOINT FILE    = Perform Checkpoint Recovery from current ABARs
                                 Manager CHECKPOINT File.
        4-  ISMF INFORMATION   = Update Inventory Aggregate Entries from ISMF
                                 Aggregate Information.

    EXPORTING Functions:

        5-  INVENTORY FILE     = Copy/Repro Current ABARs Manager Inventory
                                 File to Exported File.
        6-  GENERATE REPORTS   = Produce Offline/Batch Inventory File Reports.
```

Figure 33. ABARS Manager Import/Export Select Panel

You immediately see a pop-up panel informing you that ABARS Manager is currently scanning for the AMPALIST member in your libraries. ABARS Manager will locate the AMPALIST member, decode the aggregate information, and determine which aggregates have changed or were added as new since the last ISMF import event.

Step 4: The ***ISMF Aggregate Import Verification*** screen displays the aggregates to be added or updated. All aggregates displayed when saving AMPALIST are imported into ABARS Manager. The total number of aggregates to be updated and the specific aggregate names are displayed in a message box called ***Partial Aggregate List***. The ***Partial Aggregate List*** box lists the first 24 aggregate names of the total to be updated. Once completed, the ***Aggregate Import Status*** box displays all of the aggregate names imported.

Press Enter to initiate the aggregate import. The processing time for each aggregate operation depends on available system resources. As the aggregate information is imported, a pop-up screen is displayed (Figure 34 on page 67), showing the progress of each aggregate and final status as either Updated or Added.

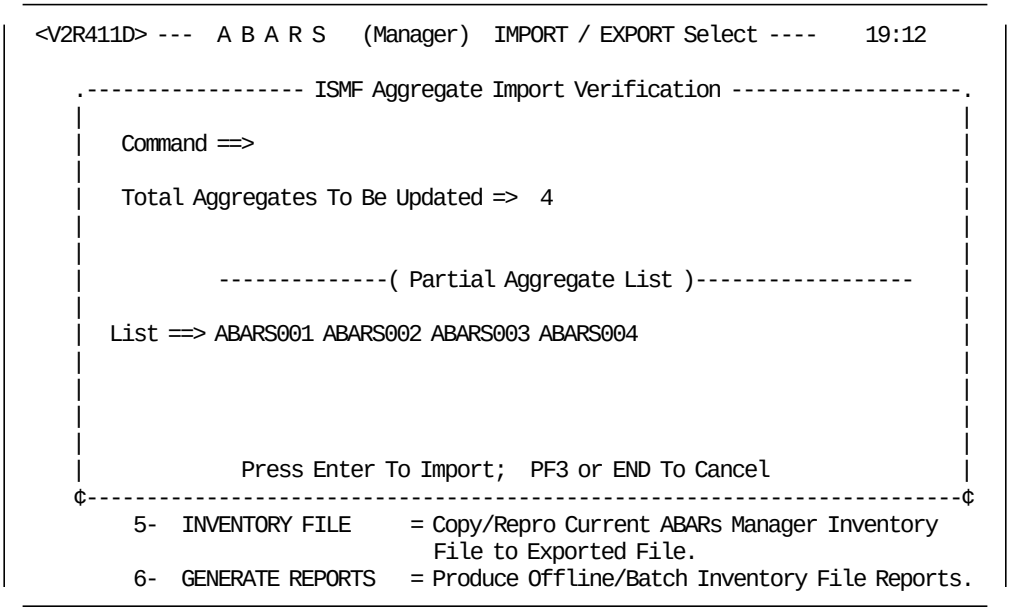

Figure 34. ISMF Aggregate Import Verification Pop-Up Screen

As ABARS Manager imports the aggregates from AMPALIST, the aggregates are displayed on the panel (Figure 35).

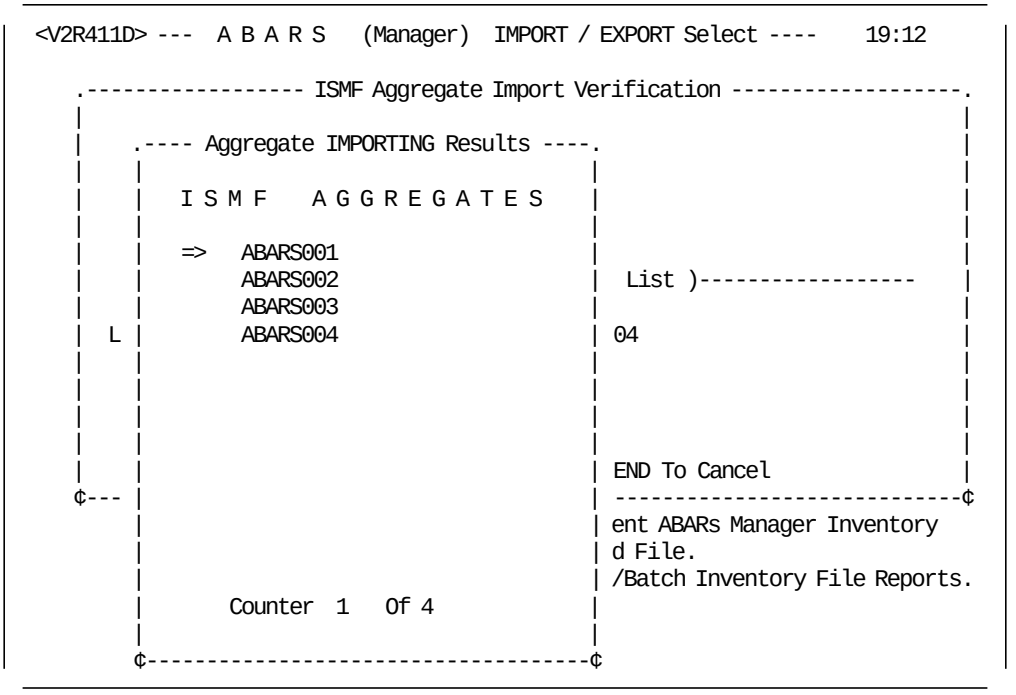

Figure 35. Aggregate Importing Results Pop-up Screen

When all aggregates have been processed, a scrollable table is displayed showing each aggregate and the information imported into the IDS (Figure 36 on page 68). When you have completed viewing the results of the import activity, return to the ***Import/Export menu*** by pressing the PF3 key.

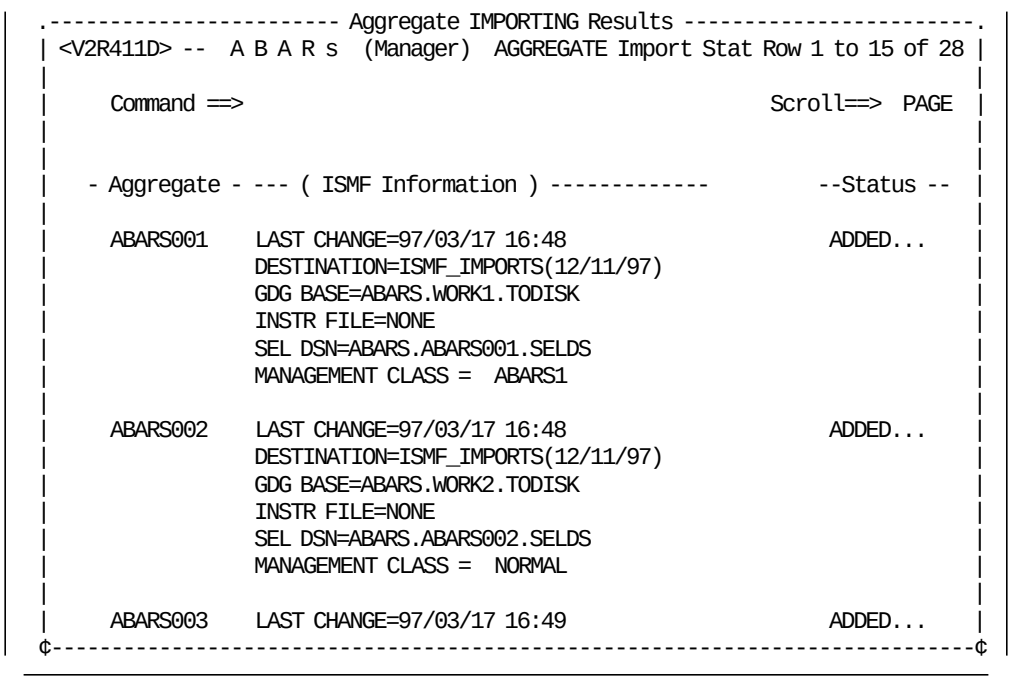

Figure 36. Aggregate Importing Results Panel

Step 5: Back out to the main ***ABARS Manager Menu*** and select Option 1, ***File Inquiry***. Select Option 2, ***Aggregate*** and press Enter. At the top of the screen, type an A to select by aggregate, then place an * at the aggregate name and press Enter. The aggregates already imported are now displayed (Figure 37).

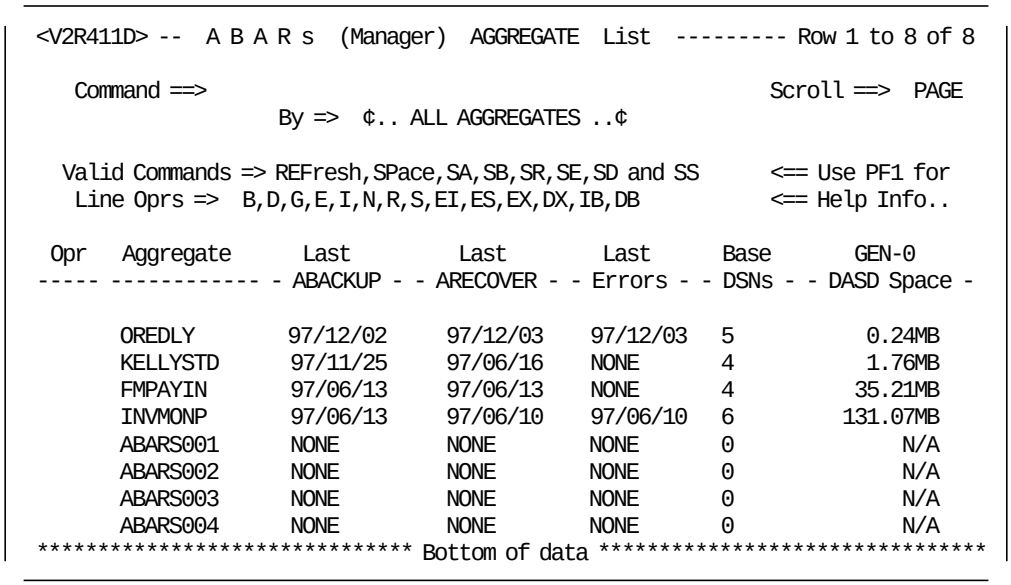

Figure 37. ABARS Manager Aggregate List Panel

The next step is to define the order entry application to ASAP. Chapter 7, “Structuring Applications Using ASAP” on page 69 describes the steps required to define the application.

Chapter 7. Structuring Applications Using ASAP

As described in 1.2, “Automatic Selection and Audit Process” on page 8, 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, 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. JCL scan and SMF scan are optional; they are 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, OPC/ESA, Zeke/MVS and JobTRAC), or providing a manual list of jobs in the order in which they execute.

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 the jobs in the order in which they run. This is necessary because the ASAP analysis is based on the first occurrence of each data set. 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 ASAP.

7.1.2 JCL Scan

JCL scan is a process that runs MVS TYPRUN=SCAN for each job listed in the job list. The production JCL library name is defined for each application and ASAP automatically constructs a batch job to perform the scan. The integrity of the ASAP analysis depends on the correct run sequence of the jobs collected, whether using a scheduling interface or manual entry.

7.1.3 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.

7.1.4 Real-Time Selection Process

As described in 1.2, “Automatic Selection and Audit Process” on page 8, RSP is 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 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

Section 3.2, “Data Classification and Recovery Requirements” on page 21 describes 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 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 38 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 38. 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, “Automatic Selection and Audit Process” on page 8, 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.

7.2.2 Steps for Setting up ASAP Applications Using RSP

The following steps define the OREDU001 application to ASAP:

Step 1: Create the ASAP application and customize the setup options.

Step 2: Enter the application job names using the Job Collect panels.

Step 3: Submit the RSPJRFSH job to update the RSP job table. RSP now begins collecting real-time SMF records for the order entry application.

Step 4: Run the application batch cycle to create SMF records in executable order for ASAP.

Note: If running JCL Scan is necessary, run JCL scan prior to executing the batch cycle and collecting the SMF data.

Step 5: Create the APPLEND job, and install at the appropriate points at the end of the application job stream.

Step 6: Run Verification and view the list of data sets. Identify data sets to be filtered out on the universal, global and local levels.

Step 7: Create or update universal, global and local level filtering.

Step 8: Reverify the application until the selected data set reflects the desired list of critical data sets.

Step 9: Balance the aggregates using the aggregate balancing feature.

Step 10: Perform ABACKUP using ABARS Manager.

7.3 Defining the Application to ASAP

We access ASAP through ABARS Manager as we did before in Chapter 6, “Aggregate Definition” on page 55.

ASAP is Option A, ***Autobuild*** (ASAP), on the ABARS Manager ***Primary Option Menu***. Select this option by typing the letter A in the ***SELECT AN OPTION*** field and press Enter.

Figure 39 shows the ASAP (Manager) panel displayed after selecting Option A on the ABARS Manager ***Primary Option Menu***.

```
<V2R411D> ---  A S A P   (Manager)  Auto Selection & Audit Process --  -

      OPTION ==>

                        W E L C O M E  To:

     AUTOMATIC SELECTION & AUDIT PROCESS - ASAP(c): Main Menu Services

     1 - LIST APPLICATIONS     : Display Current ASAP/Application List.
     2 - SELECT/CREATE APPL    : Application Management: Create New or Select
                                 Existing Applications.
     4 - AUDITING PROCESS      : Application Auditing of Dataset Entries.
     6 - EVENT LOG             : Display Event Log Information.
     7 - NOTEBOOK              : Create Application Notebook Entries.
     8 - FILES                 : Display Application Information Files.
     9 - FILTERS/CONTROLS      : Display/Edit Global configuration data.
     X - EXIT                  : Exit From ASAP Manager.

                 Your Last Active Application: OREDLY

    (c) Copyright-1996 Software Information Services,Inc ( V2R411D ) 02 NOV 1997
```

Figure 39. ASAP (Manager) Application AutoBuild Panel

Select Option 2, ***Select/Create Appl*** (Application) by typing the number 2 in the ***Option*** field on the ***ASAP (Manager) Auto Selection & Audit Process*** panel and

press Enter. Figure 40 on page 73 shows the ***SELECT Current/NEW Application Name*** pop-up screen displayed.

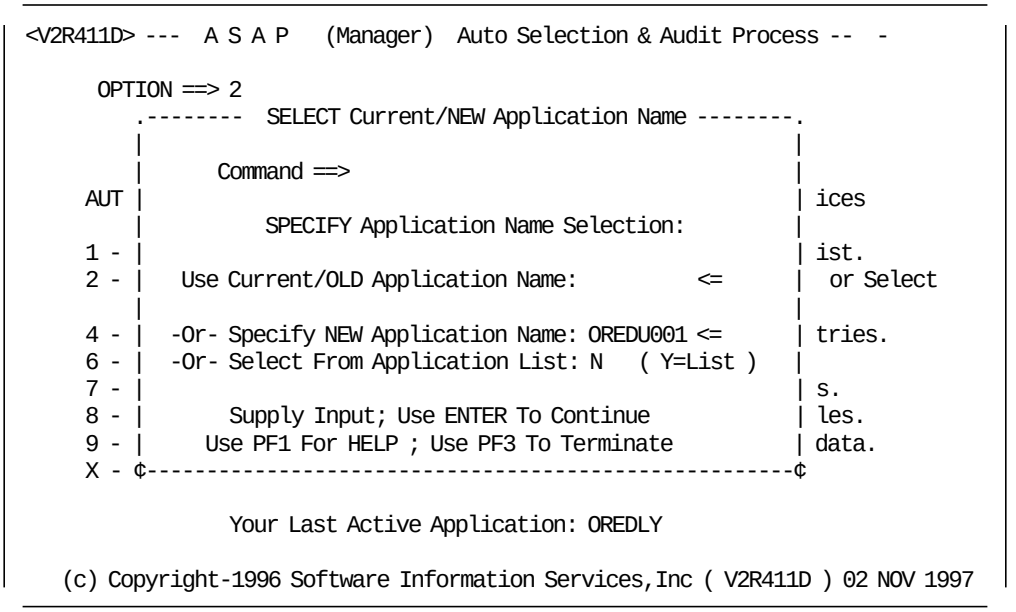

Figure 40. Select Current/New Application Name Panel

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 ***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 and application data set usage. Figure 41 on page 74 shows the ***Global Application Setup Options*** panel with default settings.

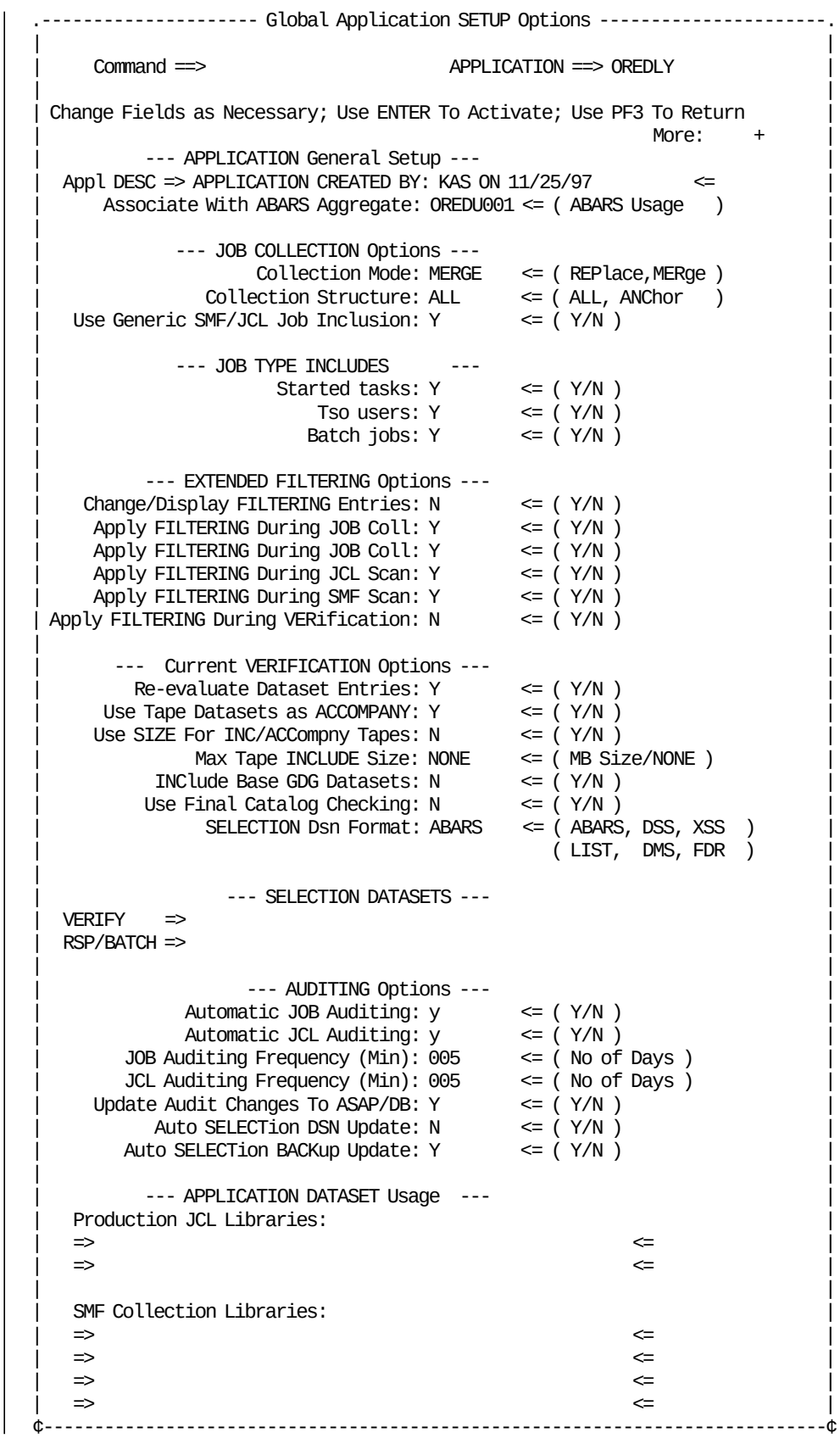

Figure 41. Global Applications Setup Options Panel before Customization

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

Figure 42 shows how we customized the first section of the ***Global Applications SETUP Options*** panel for the OREDU001 application. The following changes 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 the contents of the selection data set each time the application end step is run.
- 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.

```
 .---------------------- Global Application SETUP Options ----------------------.
 |                                                                               |
 |     Command ==>                          APPLICATION ==> OREDLY               |
 |                                                                               |
 | Change Fields as Necessary; Use ENTER To Activate; Use PF3 To Return          |
 |                                                                 More:     +   |
 |          --- APPLICATION General Setup ---                                    |
 |  Appl DESC => Order Entry Daily US - Highest Priority          <=             |
 |      Associate With ABARS Aggregate: OREDU001 <= ( ABARS Usage   )            |
 |                                                                               |
 |             --- JOB COLLECTION Options ---                                    |
 |                    Collection Mode: REPLACE  <= ( REPlace,MERge )             |
 |                Collection Structure: ALL     <= ( ALL, ANChor   )             |
 |   Use Generic SMF/JCL Job Inclusion: Y       <= ( Y/N )                       |
 |                                                                               |
 |             --- JOB TYPE INCLUDES      ---                                    |
 |                       Started tasks: N       <= ( Y/N )                       |
 |                           Tso users: N       <= ( Y/N )                       |
 |                          Batch jobs: Y       <= ( Y/N )                       |
 |                                                                               |
¢-------------------------------------------------------------------------------¢
```

Figure 42. Global Application Setup Options after Customization (1 of 3). General Setup, Job Collection and Job Type Includes

The second section of the panel (Figure 43 on page 76) contains extended filter options and current verification options. We made changes to the following options:

- Apply Filtering During Verification— We changed the default from No to Yes because we want ASAP to use any filtering we enter for this application during verification.
- Use Final Catalog Checking— We changed the default from No to Yes because we want ASAP to check the catalog status of all data sets in the selection data set.

```
|          --- EXTENDED FILTERING Options ---                              |
|    Change/Display FILTERING Entries: N       <= ( Y/N )                  |
|     Apply FILTERING During JOB Coll: Y       <= ( Y/N )                  |
|     Apply FILTERING During JOB Coll: Y       <= ( Y/N )                  |
|     Apply FILTERING During JCL Scan: 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 )                  |
|      Use Tape Datasets as ACCOMPANY: Y       <= ( Y/N )                  |
|     Use SIZE For INC/ACCompny Tapes: N       <= ( Y/N )                  |
|              Max Tape INCLUDE Size: NONE     <= ( MB Size/NONE )         |
|           INClude Base GDG Datasets: N       <= ( Y/N )                  |
|          Use Final Catalog Checking: Y       <= ( Y/N )                  |
|                SELECTION Dsn Format: ABARS   <= ( ABARS, DSS, XSS  )     |
|                                                 ( LIST,  DMS, FDR  )     |
```

Figure 43. Global Application Setup Options after Customization (2 of 3). Extended Filtering Options and Current Verification Options

- VERIFY— We entered the name of the test selection data set, T.ORE.S.OREDU001.SELECT so that both the ABARS administrator and the application analyst supporting the order entry system can update the data set. This data set is preallocated as a sequential, 80 byte data set prior to ASAP application definition but is not defined in the aggregate definition in ISMF.
- RSP/Batch— We entered the name of the production selection data set, P.ORE.U.S.OREDU001.SELECT. This selection data set can only be updated by our scheduling software. This data set is preallocated as a sequential, 80 byte data set prior to ASAP definition and is defined in the aggregate definition in ISMF.
- Production JCL Libraries— We entered the name of the JCL library that contains the Order Entry JCL members.

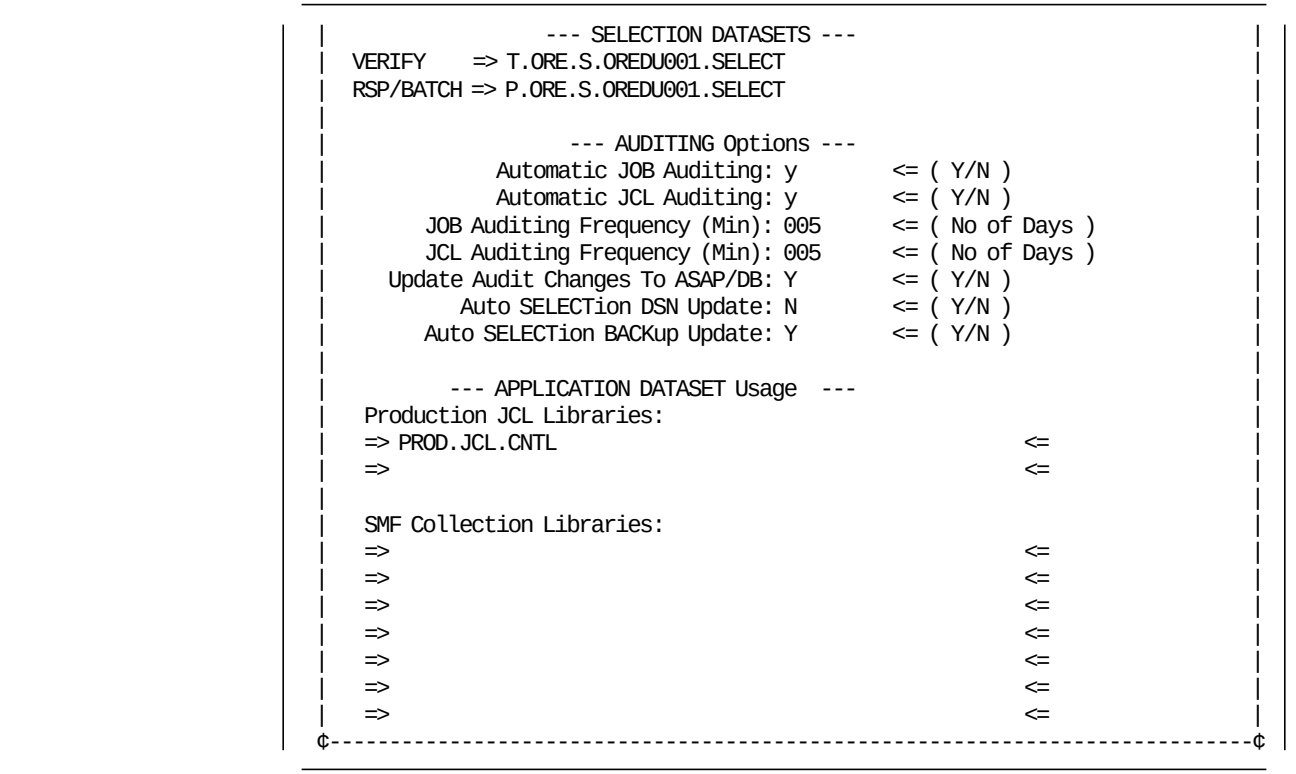

Figure 44. Global Application Setup Options after Customization (3 of 3). Selection Data Sets, Auditing Options, and Application Data Set Usage

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 45.

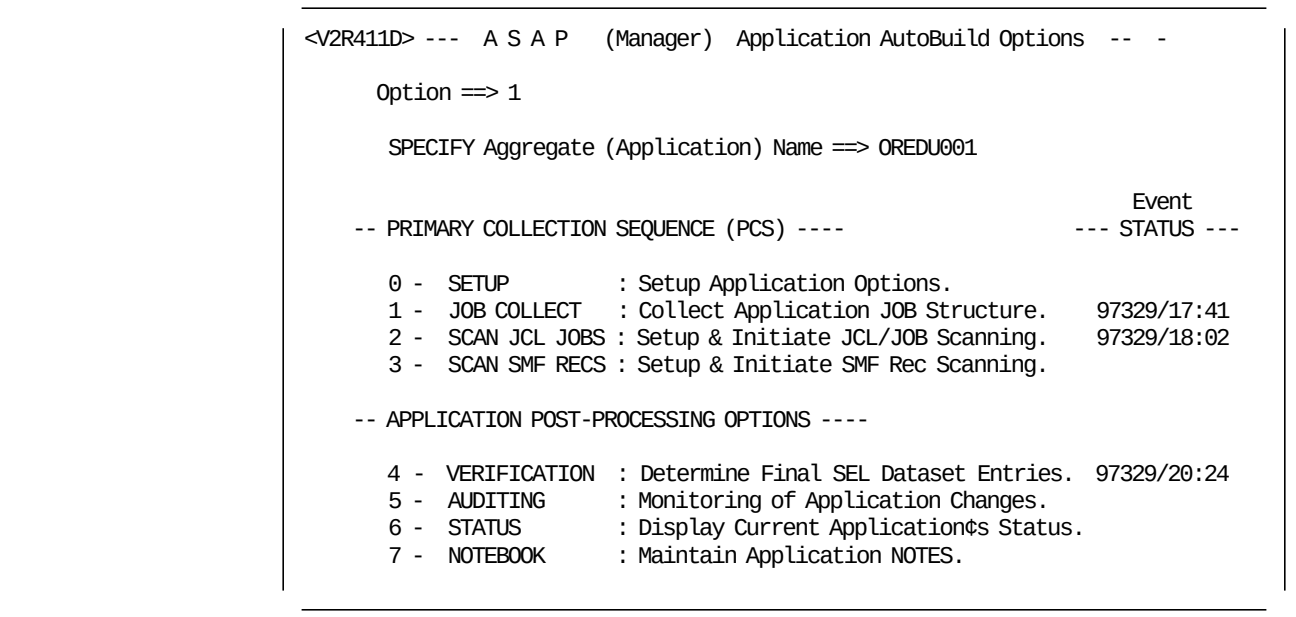

Figure 45. ASAP (Manager) Application AutoBuild Options Panel

7.3.1 Job Collection

We are using RSP and the ISPF interface to supply a list of job names for the order entry application. We are not concerned about supplying the job names in the order in which they execute, because RSP collects SMF records as they are created when the batch cycle is executing.

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

7.3.2 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 and press Enter. The ***ASAP Application JOB Collection Options*** panel, shown in Figure 46, appears.

Select ***From ISPF Edit Mode*** by typing the letter S in the field next to this option, then press Enter.

```
<V2R411D> ---  A S A P   (Manager)  Application AutoBuild Options  --  -

      Option ==>  1
       .------------- ASAP Application JOB Collection Options -------------.
       |                                                                    |
       |    Command ==>              APPLICATION Name => OREDU005           |
       |                                                                    |
    -- |            Select Application JOB Collection Method:              | -
       |                                                                    |
       |        _ FROM CA7 Anchor Job Chain.                                |
       |        _ FROM CONTROL-M Table Members                              |
       |        _ FROM JCS/Matrix Module Files                              |
       |        _ FROM JobTRAC Anchor Job Chain.                            |
       |        _ FROM OPC Anchor Job Chain.                                |
    -- |        _ FROM ZEKE MVS Anchor Job Chain.                           |
       |                 -- or --                                           |
       |        s FROM ISPF Edit Mode.                                      |
       |        _ FROM JOB Pre-Staged Data Set (Batch Mode).                |
       |        _ FROM User Supplied Data Set  (Specify Name Below).        |
       |                                                                    |
       |      Data Set:=> ____________________________________________ <=   |
       |                                                                    |
       ¢--------------------------------------------------------------------¢
```

Figure 46. ASAP Application JOB Collection Options Panel

ISPF will create a sequential data set, shown in Figure 47 on page 79, 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.

```
EDIT       AMP.AMPASAP.OREDU001.ENTRIES(JOBINPUT) - 01.     Columns 00001 00072
 Command ===>                                                  Scroll ===> PAGE
 ****** ***************************** Top of Data ******************************
 000001 *
 000002 *     SUPPLY INPUT JOB NAMES AS THE FIRST ITEM IN EACH LINE.  YOU MAY
 000003 *   INCLUDE ANY OPTIONAL DESCRIPTIVE TEXT INFORMATION FOLLOWING THE
 000004 *   JOB NAME VALUE SEPARATED BY ONE OR MORE BLANKS.  YOU MAY ADD ANY
 000005 *   ADDITIONAL LINES AS NECESSARY.
 000006 *   WHEN COMPLETED, YOU MAY USE PF3 TO SAVE YOUR ADDITIONS OR CHANGES.
 000007 *
 000008 *
 000009 OREDU*
 ****** ************************** Bottom of Data ******************************
```

Figure 47. Job Entry ISPF Edit Panel

After entering the job names, we pressed enter and then PF3. The ***Job STRUCTURE Save Options*** panel, shown in Figure 48 appears. Select the ***REPLACE Existing With New Job Structure*** option by typing an S in the entry field next to this option and pressing Enter. ASAP saves the entries and returns to the the ***ASAP (Manager) Auto Selection & Audit Process*** panel.

```
<V2R411D> ---  A S A P   (Manager)  Application AutoBuild Options  --  -

      Option ==>  1

       SPEC .-------------  Job STRUCTURE Save Options -------------.
            |                                                       |
            |  Command: ==>                                         | vent
    -- PRIM |                                                       | ATUS ---
            |        APPLICATION:   OREDU001                        |
      0 -   |                                                       |
      1 -   |      How Do You Want The JOB Entries SAVED:           | 9/17:41
      2 -   |                                                       | 9/18:02
      3 -   |   _ MERGE New With Existing Job Structure. (Default)  |
            |   s REPLACE Existing With New Job Structure.          |
    -- APPL |   _ RETURN Without Saving Job Structures.             |
            |                                                       |
      4 -   |   Use S For Selection, and ENTER; PF3 = Use MERGE.    | 9/20:24
      5 -   ¢-------------------------------------------------------¢
      6 -  STATUS        : Display Current Application¢s Status.
      7 -  NOTEBOOK      : Maintain Application NOTES.
```

Figure 48. ASAP Job Structure Save Options Panel

7.3.3 JCL Scan

JCL scan is run whenever you want to collect data in advance for an application, as when data sets exist in the application's JCL but are never actually referenced by the application, or when concatenated data sets exist in the application's JCL but are not referenced by the application.

Data sets that are in JCL but are never referenced must be included in the ABARS backup to avoid a JCL error at the recovery site. RSP cannot collect SMF records on data sets that are not referenced by the application because no SMF record is created.

To collect accurate information using JCL scan, job names must be in the order in which they execute. JCL Scan jobname masking is not helpful unless the jobs execute in the same order as they are found in the JCL library.

If you discover never-referenced data sets in your application′s JCL, you may use ASAP′s local filtering to automatically include the names of the data sets each time a selection data set is created for the application.

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 not recognized by ASAP, because no SMF records are created. Consequently, these data sets cannot be recognized as requiring backup or recovery. At the recovery site, the job stream will fail, because JES3 attempts to preallocate the nonexistent data sets in the conditional job steps. In order to resolve this situation, these data sets must be included using ASAP′s local filters or JCL scan must be run to include these data sets.

If many data sets fall into this scenario, consider changing conditionally executed job steps to conditionally executed jobs, eliminating backing up data sets that are not referenced along with the need for adding the data sets to local filters or running JCL scan.

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 ABARS Manager/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 ABARS Manager/ASAP installation libraries; see the *ABARS Manager/ASAP Installation and Maintenance Guide*

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:

```
//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 queues will fill up and data could eventually be lost. 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.

ASAP classifies all data sets used for input in the batch cycle as INCLUDEs. All output data sets created in the cycle are classified as EXCLUDEs because they will be recreated at the disaster recovery site during the recovery rerun. All user tape data sets are classified as ACCOMPANY 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 ALLOCATE.

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 or added to the INCLUDE, ALLOCATE, or ACCOMPANY list. For example, the analyst may want to include an excluded data set or exclude a shared data set that should be backed up by another application.

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 85.

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 nonproduction 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 the ***ASAP (Manager) Application AutoBuild Options*** panel.

Select Option 4, ***Verification***, and press Enter. The ***Selection Dataset Build*** panel, shown in Figure 49 on page 82, appears.

Select Option F, ***Foreground*** by typing the letter F in the ***CMD*** field and press Enter.

```
The SELECTION DATASET BUILD panel displays.
                  SELECTION DATASET BUILD
     CMD:


                  CHOOSE PROCESSING OPTION

                       F  FOREGROUND
                       B  BATCH
```

Figure 49. Selection Data Set Build Panel

Figure 50 shows the ***Selection Data Set Build Foreground Options*** panel.

Overtype the N default value with a Y in the ***Change Selection Data set Before Build*** field and press Enter.

```
SELECTION DATASET BUILD FOREGROUND OPTIONS
 CMD:                                                APPLICATION ==> OREDU001
                                                           SYSID ==> P390
                        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

       CHANGE SELECTION DATASET OPTIONS?  =>  N (Y/N)

   CHANGE SELECTION DATASET BEFORE BUILD?  =>  y (Y/N)

                 SELECTION DATASET NAME FOR THIS BUILD
              => T.ORE.S.OREDU001.SELECT

              VERIFY SELECTION DATASET NAME IN DATABASE
              => P.ORE.S.OREDU001.SELECT
```

Figure 50. Selection Data Set Build Foreground Options Panel

Figure 51 on page 83 shows the ***Selection Data set Category Summary*** panel.

View the data sets in the each category, type the word `all` in the ***CMD*** (command) field and press Enter.

```
SELECTION DATASET CATEGORY SUMMARY
  CMD:  all                                          APPLICATION ==> OREDU001


   ENTER CONTINUE SELECTION DATASET BUILD;  END(PF3) TO RETURN
    COMMANDS => ALL (SELECT ALL)
   LINE OPRS => I (INCLUDE), E (EXCLUDE), AL (ALLOCATE) OR S (SELECT)

              APPLICATION           TOTAL         TOTAL K
   - OPR - - DATASET CATEGORIES - - DATASETS - - DATASET SPACE -

            TOTAL                      7              896
           --------------------    --------     ------------
      S    INCLUDES                   633              168
      __   ACCOMPANY                  120              300
      __   ALLOCATES                    51              256

      __   EXCLUDES                  2232              112
      __   FILTERED                    91              560
      __   UNCATLOGED                  0
```

Figure 51. Selection Data Set Category Summary Panel

Figure 52 Shows the ***Data Set 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 system's 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 85, to permanently exclude these data sets from our application's ABACKUP.

```
DATASET ENTRIES VIEW/CHANGE                  ROW 1 TO 7 OF 7
 CMD:                                                    SCROLL: CSR
                                                              MORE >
    COMMANDS => SORT OR FILTER
   LINE OPRS => I (INCLUDE), E (EXCLUDE), AL (ALLOCATE) OR AC (ACCOMPANY)
                                                            DATASET
 CM DATASET NAME                                STATUS   REASON     SIZE
 __ ____________________________________________ _______ __________ _______
    EP.LOAD                                     EXCLUDE  FILTER        560
    P.ORE.VS.ORDER.D1                           INCLUDE  EVALUATION     56
    P.ORE.S.ORDER.D2                            EXCLUDE  EVALUATION     56
    P.ORE.VS.ORDER.INV1                         EXCLUDE  EVALUATION     56
    P.ORE.S.ORDER.IN895                         INCLUDE  EVALUATION     56
    P.ORE.S.SYSUT1                              INCLUDE  EVALUATION     56
    P.ORE.S.SYSUT2                              ALLOCATE EVALUATION     56
    SYS1.PROCLIB                                INCLUDE  EVALUATION     56
    SYS1.ISPPLIB                                INCLUDE  EVALUATION     56
    SYS2.TECH.PROCLIB                           INCLUDE  EVALUATION     56
    SYS3.AMP.JCLLIB                             INCLUDE  EVALUATION     56
    P.ORE.J.SYSUT1                              INCLUDE  EVALUATION     56
```

Figure 52. Data Set Entries View/Change Panel

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 for this panel to initiate the verification of the application. Press Enter when the three asterisks appear in the bottom left-hand side of the panel. ASAP presents a pop-up panel, ***Evaluating Application Data sets***. Three asterisks appear in the lower left-hand corner of the panel when this process is complete. Press Enter to begin the next process, Building Selection Data Set. When this process completes, ASAP automatically displays the selection data set, as shown in Figure 53.

```
BROWSE    P.ORE.S.OREDU001.SELECT                      Line 00000000 Col 001 080
 Command ===>                                                 Scroll ===> PAGE
******************************** Top of Data ********************************
/*                                                                          */
/*             LAST UPDATE: KAS      12/11/1997 19:53:46                   */
/*           SELECTION DATASET UPDATE VIA ASAP(C) FACILITY:                 */
/*          COPYRIGHT 1994 SOFTWARE INFORMATION SERVICES, INC               */
/*                                                                          */
/*  APPL NAME: OREDU001                                                     */
/*       DESC: ORDER ENTRY DAILY US û HIGHEST PRIORITY                      */
/*                                                                          */
/*      SYSID: ****                                                         */
/*  EXEC MODE: DIALOG (OPTION-4)                                            */
/*   CTLG CHK: ENABLED                                                      */
/*  BASE GDGS: NOT INCLUDED                                                 */
/* DSN FORMAT: ABARS                                                        */
/*                                                                          */
          INCLUDE(
P.ORE.J.VS.ORDER.D1                          /*DASD(PRD002) 1997.329*/ +
P.ORE.J.S.ORDER.IN895                       /*DASD(PRD001) 1997.329*/ +
P.ORE.J.S.INVENTORY                        /*DASD(PRD001) 1997.329*/ +
ALLOCATE(
P.ORE.J.SYSUT2                           /*DASD(TSO001) 1997.329*/ +
                )
/*                                                                          */
/*           FILTERED DATASET ENTRIES EXCLUDED:                             */
/*                                                                          */
/*                                                                          */
/*    GLOBAL DSN    EP.LOAD                                                 */
/*           DSN=EP.LOAD                                          DASD */
/*                                                                          */
/*           OTHER DATASET ENTRIES EXCLUDED:                                */
/*                                                                          */
/* DSN=P.ORE.J.ORDER.D2                              DASD */
/* DSN=P.ORE.J.ORDER.INV1                            DASD */
```

Figure 53. 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. Section 7.3.9, “Filters and Controls” on page 85 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.

See the *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 JCL scan, RSP or 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 JCL scan, RSP or 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: Universal level retention and evaluation filters are processed first for absolute control over every application. These filters are automatically applied.
- Global Level: Global level filters are applied across all applications when they are invoked in the local filtering of the application.
- Local Level: Local level filters are applicable to a specific application.

7.3.10 Creating Universal and Global Filters

Access ABARS Manager/ASAP, select option A, ***Autobuild***, on the ***ABARS (Manager) Selection Menu*** and press Enter. The ***ASAP Auto Selection & Audit Process*** panel appears.

Select Option 9, ***Filters/Controls*** by typing the number 9 in the ***Option*** field of the panel and press Enter. The ***Global Filtering/Controls Selection*** panel appears, shown in Figure 54 on page 86.

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.

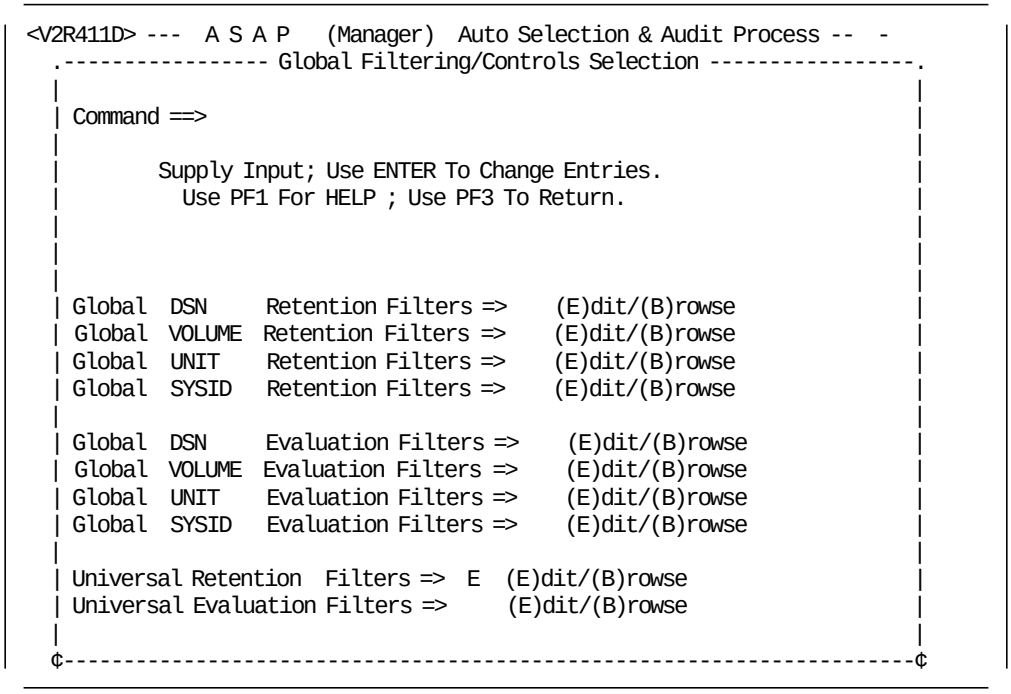

Figure 54. Global Filtering/Controls Selection Panel

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 (overtyping 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. Don't forget to customize the entry with data set names that are applicable to your environment.

The universal filter in Figure 55 on page 87 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.

```
File  Edit  Confirm  Menu  Utilities  Compilers  Test  Help
------------------------------------------------------------  ---------
EDIT       SYS97349.T210945.RA000.CG.R0105776           Columns 00001
00080
Command ===>                                                 Scroll ===>PAGE

****** ***************************** Top of Data ******************************
=NOTE=   EDIT UNIVERSAL RETENTION FILTERS
=NOTE=
=NOTE=  UNIVERSAL RETENTION FILTERS ARE OF THE FORM:
=NOTE=  VERB_TYPE(VALUE)
=NOTE=  WHERE VERB IS:  KEEP OR DISCARD
=NOTE=  WHERE TYPE IS:  SYSID, DSN, VOL OR UNIT
=NOTE=  AND  VALUE IS:  THE ITEM NAME OR A MASK
=NOTE=  GLOBAL FILTER REFERENCES ARE NOT ALLOWED IN UNIVERSALS
=NOTE=
=NOTE=  EXAMPLES:
=NOTE=       KEEP_DSN(ABC.XYZ)
=NOTE=       DISCARD_DSN(SYS1.COB*)
=NOTE=       KEEP_VOL(TSO003)
000001DISCARD_DSN(SYS1.**)
****** **************************** Bottom of Data ****************************
```

Figure 55. Universal Filters Panel

We use universal evaluation filters to exclude all production JCL libraries, control card libraries, DB2 DCLGEN's, DB2 table space, and IMS databases. The evaluation filter is used because we want these records included in ASAP's database. Figure 56 on page 88 shows the universal evaluation filters entered.

A volume parameter is used for both DB2 volumes and IMS volumes because all DB2 table spaces and IMS databases reside on volumes that begin with DB2 or IMS.

```
File  Edit  Confirm  Menu  Utilities  Compilers  Test  Help
------------------------------------------------------------  ---------
EDIT       SYS97349.T210945.RA000.CG.R0105776           Columns 00001
00080
Command ===>                                                Scroll ===>
PAGE
****** ********************************* Top of Data   *********************
 =NOTE=   EDIT UNIVERSAL EVALUATION FILTERS
 =NOTE=
 =NOTE=  UNIVERSAL EVALUATION FILTERS ARE OF THE FORM:
 =NOTE=  VERB_TYPE(VALUE)
 =NOTE=  WHERE VERB IS:  EVAL OR EXCL
 =NOTE=  WHERE TYPE IS:  SYSID, DSN, VOL OR UNIT
 =NOTE=  AND  VALUE IS:  THE ITEM NAME OR A MASK
 =NOTE=  GLOBAL FILTER REFERENCES ARE NOT ALLOWED IN UNIVERSALS
 =NOTE=
 =NOTE=  EXAMPLES:
 =NOTE=       EVAL_DSN(ABC.XYZ)
 =NOTE=       EXCL_DSN(SYS1.COB*)
 =NOTE=       EVAL_VOL(TSO003)
000001EXCL_VOL(DB2*)
000002EXCL_VOL(IMS*)
000003EXCL_DSN(PROD.JCL.LIB)
000004EXCL_DSN(PROD.CNTL.LIB)
000005EXCL_DSN(PROD.DB2.DCLGEN)
****** ******************************** Bottom of Data ***********************
```

Figure 56. Universal Evaluation Filters Panel

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. Figure 57 shows the data set, volume, unit, and SYSID global filters we entered

```
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)
```

Figure 57. Global Filters at Crazy Socks Corporation

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 the ***SETUP*** option (0) on the ***ASAP (Manager) Application AutoBuild Options*** panel and press Enter. The ***Global Application SETUP Options*** panel appears.

Overtype the N value with the letter Y in the ***Change/Display FILTERING Entries*** field and press Enter. The ***Application Filter Edit/Browse*** panel shown in Figure 58 on page 89 appears.

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.

```
 .------------------- APPLICATION FILTER EDIT/BROWSE --------------------.
 |                                                                        |
 | Command ==>                                                            |
 | Application: DSA                                                       |
 |                                                                        |
 |        Supply Input; Use ENTER To Change Entries.                      |
 |          Use PF1 For HELP ; Use PF3 To Return.                         |
 |                                                                        |
 | Modify  JOB  Filters/Controls =>     ( Y/N )                           |
 |                                                                        |
 | Application EVALUATION  filters(s) =>    (E)dit/(B)rowse/(O)verview    |
 |                                                                        |
 | Application RETENTION   filters(s) =>    (E)dit/(B)rowse/(O)verview    |
 |                                                                        |
 |                                                                        |
 | Current Filter status:                                                 |
 | Global DSN   Retentions?=> N     Global DSN    Evaluations?=> N        |
 | Global VOL   Retentions?=> N     Global VOL    Evaluations?=> N        |
 | Global UNIT  Retentions?=> N     Global UNIT   Evaluations?=> N        |
 | Global SYSID Retentions?=> N     Global SYSID  Evaluations?=> N        |
 |                                                                        |
 |                                                                        |
 ¢------------------------------------------------------------------------¢
```

Figure 58. Application Filter Edit/Browse Panel.

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 59 on page 90. 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 to press the PF3 key until you return to the ***ASAP (Manager) Application AutoBuild Options*** panel.

```
File  Edit  Confirm  Menu  Utilities  Compilers  Test  Help
------------------------------------------------------------------------------
-
EDIT       SYS97349.T213026.RA000.CG.R0105781             Columns 0000100072

Command ===>                                                  Scroll ===>PAGE

****** ***************************** Top of Data ******************************
=NOTE= ENTER KEYWORDS AND VALUES, FIRST MATCH TAKES PRECEDENCE
=NOTE=  EVAL_DSN|VOL|SYSID|UNIT(DISCRETE NAME OR MASK)
=NOTE=         FORCES EVALUATION IF OTHERWISE WOULD HAVE BEEN EXCLUDED
=NOTE=  EXCL_DSN|VOL|SYSID|UNIT(DISCRETE NAME OR MASK)
=NOTE=         FORCES EXCLUSION OF DATASET FROM ANY SDS CATEGORY
=NOTE=  INCL_DSN(DISCRETE NAME OR MASK)
=NOTE=         FORCES CATEGORY TO ABARS INCLUDE
=NOTE=  ALLOC_DSN(DISCRETE NAME OR MASK)
=NOTE=         FORCES CATEGORY TO ABARS ALLOCATE
=NOTE=  ACCOMP_DSN(DISCRETE NAME OR MASK)
=NOTE=         FORCES CATEGORY TO ABARS ACCOMPANY
=NOTE=  GLOBAL_SYSID
=NOTE=  GLOBAL_DSN
=NOTE=  GLOBAL_VOL
=NOTE=  GLOBAL_UNIT
=NOTE=         GLOBAL KEYWORDS SPECIFY GLOBALS WILL BE PROCESSED AND
=NOTE=         ORDER OF PRECEDENCE RELATIVE TO OTHER KEYWORDS
=NOTE= FOLLOWING KEYWORDS ALWAYS PROCESSED FIRST
=NOTE=  INCL_EXTDSN(DISCRETE NAME OR MASK)
000001INCL_EXT(P.S.ORDER.ENTRY.JCL)
000002INCL_EXT(P.S.ORDER.ENTRY.CNTL)
000003INCL_EXT(P.S.ORDER.ENTRY.PROGRAMS)
000004INCL_EXT(P.S.ORDER.ENTRY.PROCS)
000005GLOBAL_DSN
000006GLOBAL_VOL
000007GLOBAL_SYSID
000008GLOBAL_UNIT
```

Figure 59. ISPF Edit Entry of Local Filters

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 ABARS Manager/ASAP installation libraries. See the *ASAP User Guide* for more information about ASAP′s overlapping data sets report.

7.5 Aggregate Balancing

ASAP's Aggregate Balancing 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 balancing takes full advantage of the 64 concurrent ABACKUP and ARECOVER tasks now available in DFSMS 1.4. 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, shown in Figure 60 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 Figure 60.

```
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))
```

Figure 60. Aggregate Balancing Control Statements

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.

Note: Aggregate LoadBalancer, a companion product of ASAP available from Mainstar Software Corporation must be installed to use this function.

Chapter 8. Executing ABACKUP

Once critical data sets are identified and written to the selection data set, using JCL Scan and 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 will then perform autoanalysis on captured data sets at each APPLEND execution, and place 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. AMPPROC is the procedure the ABARS Manager uses to submit ABACKUP and ARECOVER commands, and ABARS Manager batch reports. The product installer adds AMPPROC to a procedure library so we can execute it in a batch job. Figure 61 shows the AMPPROC batch execution JCL.

```
//STEP1      EXEC  AMPPROC
//ABARS.SYSIN  DD *
//SYSPRINT DD SYSOUT=*
      place submit commands here......
```

Figure 61. ABARS Manager AMPPROC Execution JCL

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

```
SUBMIT ABACKUP OREDU001 VERIFY
```

The SUBMIT command is unique to ABARS Manager. ABACKUP is the ABARS command we are invoking. OREDU001 is the name of our daily order entry application for the United States. The VERIFY 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 nonmigrated data sets.

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

```
SUBMIT ABACKUP OREDU001 EXECUTE
```

8.1 Initiating ABACKUP Using ABARS Manager Online Dialog

ABACKUP is initiated by selecting Option 4, ***ABACKUP SELECT*** on the ***ABARS (Manager) Selection*** menu. Figure 62 shows the ***ABARS (Manager) ABACKUP Command Submission*** panel. Up to eight aggregate names can be provided in one ABACKUP submission. To initiate an ABACKUP for the daily order entry U.S. application, type the aggregate name OREDU001 in the Aggregates field. The ***Option*** field allows you to choose the type of ABARS execution: verify, execute, or both verify and execute. In our example, we typed E for execute in the option field. The ***B,I,D*** field on the panel allows you to choose a base, incremental, or differential backup. We selected a base backup, which means that all data sets will be backed up even if they have not changed. Base is the default. We entered 3490 in the unit field to tell ABARS to write the ABACKUP output to 3490 tape cartridges. A user ID of CG is entered so that ABARS will pass messages about ABACKUP processing back to the user ID that initiated it.

```
<V2R411D>  -- A B A R s  (Manager)  ABACKUP Command Submission --   21:52:15
                                                          SELECT OPTION
  Command ==>

--- ABACKUP Selections (Common) -------

                                                                 More:     +
   Aggregate(s) ==> OREDU001   ==>           ==>           ==>
                ==>            ==>           ==>           ==>

         Option ==>  E          ( V =Verify Only; E =Execute; VE =Ver & Exec)
                                ( VX =Verify XSS Dataset Selections Only..  )
          B,I,D ==>  B          (Base,Incremental,Differential)
           Unit ==>  3490       (Unitname for Abackup Output)
            Msg ==>  CG         (Userid for Messages)

--- DFSMShsm 1.x Extended Options ---

    ABACKUP Only ( L0       ) ==> NO  ( YES or NO ) For ¢PROCESSONLY¢ Keyword
                 ( ML1      ) ==> NO       ..
                 ( ML2      ) ==> NO       ..
                 ( USERTAPE ) ==> NO       ..

    DELETE DSNs After ABACKUP ==> NO  ( YES or NO ) For ¢MOVE¢ Keyword
```

Figure 62. ABARS (Manager) ABACKUP Command Submission Panel. Note that the option B,I,D will not appear unless a companion product of ABARS Manager, Incremental ABARS, is installed.

The panel shown in Figure 62 also includes extended ABACKUP only options on this panel: ABACKUP Only L0, ML1, ML2, and USERTAPE. These options create the ABARS PROCESSONLY keyword on the ABACKUP command. If, for example, we wanted to include only primary data sets in the ABACKUP, we would change the default value of NO in the ***ABACKUP Only*** (L0) field to a YES. This action results in the following command submitted to ABARS from ABARS Manager:

```
SUBMIT ABACKUP OREDU001 EXECUTE PROCESSONLY(L0)
```

To include both primary and migration level 1, the following command is submitted to ABARS from ABARS Manager.

```
SUBMIT ABACKUP OREDU001 EXECUTE PROCESSONLY(L0 ML1)
```

The ***DELETE DSNs After ABACKUP*** field supports the ABARS MOVE command. MOVE deletes data sets after they are successfully backed up. This option is commonly used to move workloads from one system or site to another. Pressing Enter on this panel schedules the ABACKUP job for execution.

8.2 Resolving Common ABARS ABACKUP Errors

If ABARS cannot successfully process all data sets in an aggregate, it issues one or more error messages and ends with a nonzero return code. That return code is the suffix for an DFSMShsm message ARC6sssx, where sss is that three-digit RC and x is either I, or more likely W (warming) or E (fatal Error). Those ARC messages can be found in the *IBM System Messages Volume 1* (GC28-1784)

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 an DFSMShsm ML2 tape containing a data set that needs to be backed up by this aggregate. This condition could exist for several hours, so restarting a backup may not resolve it.

Chapter 9. Managing Aggregates with ABARS Manager

Now that ABARS is being used to perform application backups, the role of the ABARS Administrator expands to include management of the aggregates. ABARS Manager simplifies this task by providing aggregate inquiry, reporting and submittal of ABARS commands, both online and in batch.

9.1 Interactive ABARS Manager

ABARS Manager's interactive screens provide the ability to interrogate the status of aggregates, execute ABACKUP and ARECOVER commands, provide a history of ABARS events, give auditing information, and allow real-time event monitoring.

9.1.1 Online Aggregate Inquiry

Figure 63 shows the ***ABARS (Manager) Selection Menu*** for a primary user. Primary users are defined in the AMPINI parameter library member during product installation and configuration. See the *ABARS Manager/ASAP Installation and Maintenance Guide* for more information about primary users and AMPINI.

Primary users are generally ABARS administrators, storage administrators, and others whose responsibilities include maintaining ABARS and ABARS Manager and monitoring and reporting on ABARS aggregates.

```
<V2R411D> ---  A B A R S   (Manager)  SELECTION  Menu  --------
19:53
SELECT AN OPTION ==>
Select One of the Following:
     1  FILE INQUIRY      -  Display Aggregate(s), Generations, DataSets
                             and Destinations from Inventory File
     2  ACTIVITY LOGS     -  Examine ABARs Activity Logs
     3  IMPORT / EXPORT   -  Perform Data Transfer Functions against File(s)
     4  ABACKUP SELECT    -  Selective ABACKup By Aggregate
     5  ARECOVER SELECT   -  Selective ARECOVER By Data Set / Aggregate
     6  HISTORY LOG       -  Display Events From History Log File
     7  DIAG / MAINT      -  Perform Diagnostic & Maintenance Functions
     8  SAMPLE AGGREGATES -  Create, Delete Sample Aggregate Information
     9  RESERVED          -  Reserved for Future Usage.
     A  AUTOBUILD (ASAP)  -  Use Automatic Selection & Audit Process (ASAP)
     X  EXIT              -  Terminate ABARs Manager
Copyright (c) 1992-1996: Software Information Services,Inc.
```

Figure 63. ABARS Manager Primary-User Option Menu

Figure 64 on page 98 shows the ***ABARS (Manager) Selection Menu*** for secondary users (those not designated as primary users). The options provided on this panel are a subset of those provided on the primary-user option menu.

```
<V2R411D> ---  A B A R S   (Manager)  SELECTION  Menu  --------
19:53
SELECT AN OPTION ==>
Select One of the Following:
     1  FILE INQUIRY      -  Display Aggregate(s), Generations, DataSets
                             and Destinations from Inventory File
     2  ACTIVITY LOGS     -  Examine ABARs Activity Logs
     4  ABACKUP SELECT    -  Selective ABACKup By Aggregate
     5  ARECOVER SELECT   -  Selective ARECOVER By Data Set / Aggregate
     6  HISTORY LOG       -  Display Events From History Log File
     A  AUTOBUILD (ASAP)  -  Use Automatic Selection & Audit Process (ASAP)
     X  EXIT              -  Terminate ABARs Manager
Copyright (c) 1992-1996: Software Information Services,Inc.
```

Figure 64. ABARS Manager Secondary-User Option Menu

9.1.2 Inquiry (Option 1)

Option 1, File Inquiry is available on both the primary-user and secondary-user option menus. You can display aggregates, aggregate generations, data sets, and destination information from the ABARS Manager inventory database. To select Option 1, ***File Inquiry***, from either menu, type the number 1 in the ***Select an Option*** field and press Enter. The ***ABARS (Manager) Inventory List*** panel is displayed.

Figure 65 shows the ***ABARS (Manager) Inventory List*** panel and the available options: destination, aggregate, and data set.

```
<V2R411D> ---  A B A R S   (Manager)  INVENTORY  List         SELECT OPTION
SELECT ==>

Select For Inventory Search:
1-  DESTINATION   :  Search From DESTINATION Group Names To:
                        - Aggregate Name List
                        - Data Set Name List
                        - Volume Usage By Date

2-  AGGREGATE     :  Search From AGGREGATE Names To:
                        - Generation Summaries & Detail
                        - Data Set Name List (by Generation)
                        - Event Errors & Instruction File Data

3-  DATA SET      :  Search From DATA SET Names To:
                        - Detail Data Set List By Aggregate
                        - Generation Levels By Data Set
```

Figure 65. ABARS (Manager) Inventory List Select Option Panel

9.1.3 DESTINATION

Option 1 on the ABARS (Manager) Inventory List is ***DESTINATION***. In IBM's original design of ABARS, a field was set aside within the SMS definition for an aggregate called *destination*. Its intent was to tag output tapes created from ABARS events with text describing where the tapes were to be stored— the name of the tape vault, for example. DFSMS/MVS V1R1 discontinued the use of the destination field. ABARS Manager continues to support the destination field, although the most common use of this field has changed from a tag for the output tapes to tagging an aggregate or groups of aggregates with meaningful text. For example, all aggregates that must be recovered first may be tagged with the text "Highest Priority". ABARS Manager tracks the destination field and allows it to be used as a filter for online reports and selection screens.

Figure 66 shows the ***ABARS (Manager) Destination Selection*** panel, which is displayed when Option 1 is selected on the ***ABARS (Manager) Inventory List*** panel. The selection panel allows for information by destination tag to be displayed, including aggregates and tape volumes. Destination groups may be selected by name or by use of an asterisk (*) for all groups.

```
<V2R411D>  --- A B A R s (Manager)  DESTINATION  Selection ------   21:07

     Command  ===>                                    Date:  97/12/11

   -- SELECTION Filter -----------

      DESTINATION Group Name ==> *                          ( * =All Names)

   -- DISPLAY Options ----------- (Use PF1 For HELP)--

      Show Only ACTIVE Groups ==> NO
     Sort By Destination Name ==> YES
     Sort By Total Aggregates ==>
         Sort By ABACKUP Date ==>

   * Line Commands Available After the LIST is Displayed:

     A - Display Detail Aggregate List       Ng - Display Dataset LIST by Gen.
     V - Selections for VOLUME Display       B  - ABACKUP Aggregate Select.
     R - ARECOVER Aggregate Select.
```

Figure 66. ABARS (Manager) Destination Selection Panel

9.1.4 AGGREGATE

Option 2 on the ***ABARS (Manager) Inventory List*** panel is ***Aggregate***. This option provides inquiry capabilities at the aggregate name level. Aggregate names may be fully specified or partially specified using an asterisk (*)

Figure 67 on page 100 is displayed when Option 2 is selected from the Inventory List panel. Selection options are presented in the first section of the panel. The middle portion of the panel provides for selection filters to be entered, such as aggregate names, destination information, dates, or data set names. Filters may be specified with fully qualified names or partial names using an asterisk as a masking character. Typing an asterisk in any of these fields presents information on all aggregates in the inventory database. The bottom portion of

the panel displays the line commands that become available when the inquiry information is displayed.

```
<V2R411D>  -- A B A R s  (Manager)  AGGREGATE  Selection  ------ SELECT OPTION

    SELECT Option ===>  A                            Current Date:  12/11/97

    Blank  - Display Aggregate Statistics        E  - Select by Recent Errors
    A  - Select by Aggregate Name                D  - Select by Date of Event
    U  - Select by Last 6 Aggregates Updated     T  - Select by Destination
    N  - Select by Data Set Name (Filter)

  -- Selection Filters --- ( Choose Only One ) ------

     Aggregate Name ==>  *                              ( If  A  Selected )
     Destination    ==>                                 ( If  T  Selected )
     Date:  MM/DD   ==>                                 ( If  D  Selected )
     Data Set Name  ==>                                 ( If  N  Selected )

   * The Following Line Commands will be Available When the List is Displayed
     S   - Show Aggregate History Info          D - Delete Aggregate Entry
     G   - Modify Aggregate MAXHIST Gens
     B   - Submit ABACKup Command               N - Display Data Set List (Gen-0)
     R   - Submit ARECOVER Command              I - Display User Instruction File
    ES   - Edit SELECTION Dataset              EI - Edit User Instruction File
```

Figure 67. ABARS (Manager) Aggregate Selection Panel

9.1.5 Listing All Aggregates

The simplest method of listing aggregates on the ***ABARS (Manager) Aggregate Selection*** panel is to type the letter A in the ***Select Option*** panel, type an asterisk in the ***Aggregate Name*** field, then press Enter. This action displays the panel in Figure 68 on page 101

The ***ABARS (Manager) AGGREGATE List*** panel shows all aggregates in the inventory, the most current ABACKUP date, the most current ARECOVER date, whether the aggregate′s most recent activity had errors, the number of data sets, and the total amount of DASD space required to restore the aggregate.

Several commands are available on this panel:

- Refresh allows the aggregate screen list to be redisplayed with any new inventory information such as a recently completed ABACKUP or ARECOVER event.
- SA sorts the aggregate list by aggregate name.
- SB sorts the aggregate list by the most current ABACKUP event.
- SR sorts the aggregate list by the most current ARECOVER event.
- SE sorts the aggregate list by the most recent events that received error messages..
- SD sorts the aggregate list by the total number of data sets.
- SS sorts the aggregate list by the total data set space amount, highest to lowest.

Line operators provide additional selection displays. Placing a line operator command next to an aggregate provides selection capabilities by aggregate. A short description of each line operator follows:

- B initiates an ABACKUP for the aggregate.
- D deletes an aggregate from the inventory data set.
- G allows definition of the number of generations ABARS Manager will track for the aggregate.
- E displays error information for the aggregate.
- I displays the instruction file for the selected aggregate.
- N displays a data set list for the aggregate selected.
- R initiates an ARECOVER for the aggregate.
- S generates a history summary of the aggregate selected.
- EI allows edit for the instruction file associated with an aggregate.
- ES allows edit for the selection data set.
- EX allows editing for the XSS data set.
- DX deletes the XSS data set.
- IB initiates an incremental backup.
- DB initiates an differential backup.

```
<V2R411D> --  A B A R s  (Manager)  AGGREGATE  List  ------- Row 1 to 32

Command ==>                                                 Scroll ==>PAGE
                    By =>  ¢.. ALL AGGREGATES ..¢

Valid Commands => REFresh,SPace,SA,SB,SR,SE,SD and SS         <== Use PF1
for Line Oprs =>  B,D,G,E,I,N,R,S,EI,ES,EX,DX,IB,DB           <== HelpInfo..

Opr   Aggregate      Last         Last         Last      Base   Gen-0
----- ----------- - ABACKUP - - ARECOVER - - Errors - - DSNs -DASDSpace -

      OREDU001      97/12/09     NONE         NONE      15      39.03MB
      OREWJ001      97/12/04     NONE         NONE      2        6.50MB
      OREMU001      97/12/02     97/12/02     NONE      68      42.97MB
      PPSDU001      97/12/02     97/12/03     97/12/03  600   5000.00MB
      PPSWU001      97/11/16     97/11/11     NONE      6110 3631.56MB
      PPSDU002      97/11/08     97/10/13     NONE      744   2333.97MB
      PPSDU003      97/11/06     97/09/30     NONE      1131 2345.34MB
      PPSMU001      97/11/06     97/11/06     NONE      435    331.21MB
      SARDJ001      97/11/06     97/11/03     97/11/03  6131   456.07MB
      SARDJ002      97/11/06     NONE         NONE      7254   934.49MB
      SARDJ003      97/11/06     97/11/06     NONE      327     58.62MB
      SARWJ001      97/11/01     97/11/06     NONE      1181    33.41MB
```

Figure 68. ABARS (Manager) Aggregate List Panel

Type the SPACE command on the command line and press Enter. This displays the ***ABARS (Manager) Aggregate Space Usage*** panel shown in Figure 69 on page 102. This panel provides space information for each aggregate by total amount, amount of space for data sets backed up on primary, the amount of space for ML1 data, the amount of space for ML2 data, and the number of user tape volumes.

```
<V2R411D> --  A B A R s  (Manager)  AGGREGATE  Space  Usage ------ Row 1 of 83

   Command ==>                                                        PAGE

   Valid Commands (Sorting) =  SA, ST, SP, S1, S2 or SV

                                                                    Usr Tape
- Aggregate - - (Total) - - (Prime) - -- ( ML1 ) -- -- ( ML2 ) -- - ( Vols ) -

  ARSDU002        39.03MB     39.03MB       0.00MB        0.00MB        0
  ARSDU003         6.50MB      6.50MB       0.00MB        0.00MB        0
  ACPDJ001        42.97MB     40.52MB       1.08MB        1.36MB        0
  ACPDJ002         0.00MB      0.00MB       0.00MB        0.00MB        0
  CSCDU001        31.56MB     30.74MB       0.81MB        0.00MB        0
  CSCDU002        44.97MB     44.97MB       0.00MB        0.00MB        0
  CSCDW001        31.34MB     31.34MB       0.00MB        0.00MB        0
  CSCDM001        35.21MB      7.68MB       0.00MB       27.53MB        0
  PAYDC001       131.07MB     89.71MB      36.14MB        5.22MB        3
```

Figure 69. ABARS (Manager) Aggregate Space Usage Panel

9.1.6 DATA SET

Option 3 on the Inventory List panel is ***Data Set***. Selecting Option 3 displays the panel shown in Figure 70. You can search for aggregates that contain the data set by providing fully qualified data set names or by providing partially qualified names masked with an asterisk (*). The selection can be tailored further by indicating the aggregate generation number to be searched and listed.

```
<V2R411D>  --- A B A R s (Manager)  DATA SET  Selection  --------   21:23

     Command  ===>                                        Date:  12/11/97


  -- SELECTION Filters -----------

    Data Set Name  ==> P.ORE.J.**
       Generation  ==>  0     <== (0 = Default: or -1, -2..etc)
                                  (Use * To Search ALL Generations)

  -- OPTIONAL Search -------------

    Show Dataset-to-Aggregate Overlap Only  ==>  YES    <== (YES -or NO)


  * The Following Line Commands will be Available When the List is Displayed

    G  - Display Aggregate Gen Summary       S  - Display Data Set GEN Detail
    R  - Submit Data Set ARECOVer Request    Z  - Display Data Set SPACE Usage
```

Figure 70. ABARS (Manager) DATA SET Selection panel.

The ***Show Dataset-to-Aggregate Overlap Only*** field allows you to include overlap information in the selection filters. An overlap data set is one that is backed up in more than one aggregate. To include overlap information in the selection, type the word YES in the ***Show Dataset-to-Overlap Only*** field, then press Enter. Figure 71 on page 103 shows the result of the selection criteria and overlap information requested on the ***ABARS (Manager) Data Set Selection*** panel. Each

data set is reported with date, time and the names of the aggregates. Monitoring information about overlapping data sets is important for the ABARS administrator. Data sets that can be backed up by more than one aggregate can cause a data set to be back-leveled during a recovery. We recommend that the ABARS administrator run reports on overlapping data sets, preferably in batch, on a regular basis.

```
<V2R411D> --  A B A R s  (Manager)  DATA SET  Overlaps  ------ Row 1 to 6 of 6

    Command ==>                                            Scroll==>  PAGE

                  By =>  ¢ .. OVERLAPPED DATA SETS .. ¢


                                                        ABACKup
   -- Overlapped Data Sets (Gen 0   ) -----     --- Date & Time - - Aggregate -

     P.ORE.J.ORDER.D1                              97/12/11 20:43:11  OREDLY
     P.ORE.J.ORDER.D1                              97/11/25 21:00:18  KELLYSTD

     P.ORE.J.SYSUT1                                97/12/11 20:43:11  OREDLY
     P.ORE.J.SYSUT1                                97/11/25 21:00:18  KELLYSTD

****************************** Bottom of data ********************************
```

Figure 71. ABARS (Manager) DATA SET Overlaps Panel

9.1.7 Controlling History Information For Aggregates

We want ABARS Manager to maintain history information for five aggregate versions for our order entry system. To perform this task, type the letter G next to the OREDU001 aggregate listed on the ***ABARS (Manager) Aggregate List*** panel and press Enter. Figure 72 on page 104 shows the ***ABARS (Manager) History Controls*** panel. We typed the number 5 in the ***Current Display Histories*** field and pressed Enter on this panel to save our changes. No other fields on this panel need to be modified and are set with defaults. Back out of the panel using PF3 to return to the ***ABARS (Manager) Aggregate List*** panel.

```
<V2R411D>  -- A B A R s  (Manager)  History Controls      -------   21:31

   SELECT Option ===>                                  Current Date:  97/12/11


    Aggregate Name      ==> OREDU001
    Database History format    ==> 200
    Maximum DISPLAY HISTORIES  ==> 200
    Current DISPLAY HISTORIES  ==> 5
    New     DISPLAY HISTORIES  ==>
    Current RETAIN CYCLES      ==> 9999
    New     RETAIN CYCLES      ==>
```

Figure 72. ABARS (Manager) History Controls Panel

9.1.8 Displaying Aggregate Errors

The ABARS Administrator is also interested in displaying and correcting ABACKUP or ARECOVER errors. When the ABACKUP or ARECOVER command is submitted, ABARS creates an activity log for each aggregate. Figure 73 shows an example of errors reported by ABARS. All of the information about the activity performed is written to the activity log. When an aggregate is submitted using the ABARS Manager online panels or using the ABARS Manager batch submittal procedure, ABARS Manager automatically imports the aggregate activity log information into the inventory data set. All the information in the activity log, including errors, is now available in the ABARS Manager.

Error information can be quickly obtained by typing the line operator command, E, next to the aggregate name in the ***ABARS (Manager) Aggregate List*** panel and pressing Enter. Figure 73 shows error information viewed in the ***ABARS (Manager) Error Analysis List*** panel. The error information is exactly the same information that ABARS writes to the activity log.

```
<V2R411D> ----  A B A R s  (Manager)  ERROR  Analysis  List  ----  Row 1 of 13

   Command ===>                                            Scroll ==>  PAGE

   Aggregate =  OREDU001         Date and Time =  12/03/97 09:21:14


+---- ERRORS ------------ ( AGGREGATE => OREDLY ) --------------------------+
|  (ARC MESSAGES ARE DESCRIBED IN THE IBM MANUAL, DFHSM MESSAGES)           |
|                                                                           |
| ARC6164E DYNAMIC ALLOCATION FAILED FOR PROD.TODISK.OREDLY.D.C01V0004      |
|          DURING AGGREGATE RECOVERY FOR CONTROL FILE DATA  SET             |
|          PROD.TODISK.OREDLY.C.C01V0004 - SVC 99 REASON CODE IS            |
|          X¢0000035C¢, INFORMATION CODE IS X¢00000010¢                     |
|                                                                           |
| ARC6112E ALLOCATION ERROR OCCURRED IN READING THE DATA FILE DATA SET      |
|          PROD.TODISK.OREDLY.D.C01V0004 - AGGREGATE RECOVERY  FAILED       |
|                                                                           |
+---------------------------------------------------------------------------+
****************************** Bottom of data ********************************
```

Figure 73. ABARS (Manager) Error Analysis List Panel

9.1.9 Displaying the List of Data Set Names for an Aggregate

Another common inquiry is determining what data sets are included in an aggregate. The line operator command, N, typed next to the aggregate name and entered, displays the panel shown in Figure 74. The list of data sets is provided along with an indication of where they were backed up. Data backed up from ML1 is indicated by <1>. Data backed up from ML2 is indicated by <2>. Data that is user tape is indicated by <3>. Data that is in the allocate list is indicated by <AL>. Data that is on the accompany list is indicated by <AC>. No notation next to the data set name indicates that the data was backed up from primary DASD. From this panel, a single data set or a group of data sets can be selected for the restore operation by typing the letter S next to the data set or data sets and pressing Enter.

```
<V2R411D> ----  A B A R s  (Manager)  DATA SET  List  ------------  Row 1 of 5

   Command ===>                                          Scroll ==>  PAGE

                  ** GENERATION => 0 <= DISPLAY **

   Aggregate =  OREDLY     Destination =  DEFAULT_ABACKUP_DEST

    S  - Select DS for Current ARECOVER Req (OR) To Initiate ARECOVER Event

                                                          GEN-0
-  Opr  ----- DATA SET List ----------------------  -- Space Amts --

        P.ORE.J.VS.ORDER.D1                                0.44MB
        P.ORE.J.S.ORDER.INV1                               2.44MB
        P.ORE.J.S.ORDER.IN895<2>                           0.04MB
        P.ORE.J.VS.D87429.INV<AL>                             N/A
        P.ORE.J.SYSUT2<1>                                 27.43MB
****************************** Bottom of data ********************************
```

Figure 74. ABARS (Manager) Data Set List Panel

9.1.10 Displaying Aggregate Generations

Information about all generations for an aggregate is displayed by typing the letter S next to the aggregate name on the ***ABARS (Manager)Aggregate List*** panel and pressing Enter. Figure 75 on page 106 shows the ***ABARS (Manager) Aggregate History panel***. The generations are listed in order of most current to oldest; the list includes summary information about event time, system identification, number of data sets, and the amount of space.

```
<V2R411D> ----  A B A R s   (Manager)  AGGREGATE  History  ------- Row 1 of 12

    Command ===>                                              Scroll ==>  PAGE

    Aggregate =  OREDU001    Destination =  TAPE_VAULT_LOC7777

    S  - Show Expanded Detail              N  - Display ABACKEDup Data Sets
    R  - Submit ARECOVER Command           VR - Recover SPECIFIC version

- Stat - Opr - Last Event -- Gen Type  --- Summary Information --------

 ABAK =>        11/06/97      0    U    TIME=22:04:34 SYS=3 DS=4 SP=  35.21MB
                11/01/97     -1    U    TIME=17:13:34 SYS=3 DS=4 SP=  35.21MB
                10/27/97     -2    U    TIME=07:10:34 SYS=3 DS=4 SP=  35.21MB
                08/22/97     -3    U    TIME=22:04:34 SYS=3 DS=4 SP=  35.21MB
                08/17/97     -4    U    TIME=17:13:34 SYS=3 DS=4 SP=  35.21MB
                08/12/97     -5    U    TIME=07:10:34 SYS=3 DS=4 SP=  35.21MB

 AREC =>        11/06/97               TIME = 16:23:34; RECVD DS=4 RETCD=0

 VERF =>        NONE

 ERRS =>        NONE
 ******************************** Bottom of data ********************************
```

Figure 75. ABARS (Manager) Aggregate History Panel

More detail is obtained by typing the letter S in the field next to the specific aggregate generation you would like more detail about. After you press Enter, the panel in Figure 76 is displayed. The ***ABARS (Manager) Generation Detail*** panel provides detailed information about that aggregate generation.

```
<V2R411D> ----  A B A R s  (Manager) GENERATION  Detail ------ Row 1 to5 of 5
Command ===>                                                 Scroll ==>PAGE
   Aggregate =  ORDU001                  Generation => 0    <
   Type => BASE                          Destination => DEFAULT_ABACKUP_DEST

----  Generation Information  ----------------------------------------
     Date = 11/06/97 Time = 14:29:00 Host = H1   Last Job = DS012KUC
     Level:    Primary          ML1          ML2        Tape
Total
  Datasets: (        11 ) (        0 ) (        0 ) (       0 )(          11 )
     Space: (   31.34MB ) (   0.00MB ) (   0.00MB ) (   N/A   ) (31.34MB )
Elsp Time = 5:9 (MM.SS)       InCmpRecv = NO
----------  ABARS DataSets  ----------  ---  Volumes

DS01.DS5.TODISK.C.C01V0009  SMS002
(**NO INSTRUCTION FILE CREATED**)  N/A
        DS01.DS5.TODISK.D.C01V0009
(**NO OUTPUT-FILE CREATED**)  N/A
******************************** Bottom of data*********************************
```

Figure 76. ABARS (Manager) Generation Detail Panel

9.2 ABARS Manager Batch Reporting

All of the inquiry information available in ABARS Manager's online panels can also be generated using ABARS Manager's batch procedure, AMPPROC. ABACKUP and ARECOVER commands executed in batch mode also employ the AMPPROC procedure. For detailed information about ABARS Manager in batch mode, see the *ABARS Manager User Guide*.

ABARS Manager provides much more functionality than we are able to present in this Redbook. Some of this functionality is summarized in 1.3, "ABARS Manager" on page 9. Refer to the *ABARS Manager User Guide* for complete information about all of the functions and features available.

Chapter 10. ARECOVER Using ABARS Manager

As with ABACKUP, described in Chapter 8, “Executing ABACKUP” on page 93, ARECOVER is executed either as a batch job or using the ABARS Manager dialog panels.

ARECOVER in batch uses the same AMPPROC procedure as ABACKUP. Figure 77 shows the AMPPROC execution JCL for ABACKUP.

```
//STEP1      EXEC  AMPPROC
//ABARS.SYSIN  DD *
//SYSPRINT DD SYSOUT=*
      place submit commands here......
```

Figure 77. ABARS Manager AMPPROC Execution JCL

10.1 ARECOVER Commands

The ARECOVER command is similar to the ABACKUP command. Several keywords are available to control the ARECOVER process. See the *DFSMS/MVS V1R4 DFSMShsm Storage Administration Reference* (SH21-1075-03) for all of the available ARECOVER commands and their usage. There are a few keywords we commonly use, which we briefly discuss:

- GENERATION
- PERCENTUTILIZED
- TARGETUNIT
- XMIT
- COPYSET
- MIGRATEDDATA
- RECOVERNEWNAMEALL
- DATASETCONFLICT

The GENERATION(0) keyword is used to supply a generation other than the most current, the (0) generation. Prior generations are requested by coding GENERATION(-1), GENERATION(- 2), GENERATION(-3), and so on, on the ARECOVER command.

PERCENTUTILIZED(80) tells ABARS to recover data sets to a DASD 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 DASD.

The TARGETUNIT(unit) keyword 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.)

The XMIT keyword tells ABARS that the control file name is already available on DASD. 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 may be used when an installation writes the ABARS control file to DASD 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.

COPYSET(1|2) allows you to indicate which backup set of output volumes to use for ARECOVER processing. ABARS Manager supports up to two copy sets per aggregate. The default value is COPYSET(1).

The MIGRATEDDATA(ML1|ML2|SOURCE) keyword 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.

RECOVERNEWNAMEALL(qualifier) 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.

The DATASETCONFLICT(Replace|Bypass|renamesource|renametarget) keyword, included on the ARECOVER execution command, 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. 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.

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.

10.1.1 ARECOVER SUBMIT Commands

4.2.2, “Catalog Considerations” on page 32, discusses 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. 4.2.2, “Catalog Considerations” on page 32 discusses why you would select one method or the other and the various advantages and disadvantages.

10.1.2 ARECOVER Command with Full Catalogs (Recovery Scenario A)

At the recovery site, user catalogs are recovered with all of the catalog entries. ABARS ARECOVER will attempt 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 ABARS Manager SUBMIT command for this example is:

```
SUBMIT ARECOVER OREDU001 EXECUTE DATASETCONFLICT(REPLACE)
```

We also brought backups of our control files, which we directed to DASD 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 DASD. The SUBMIT command used in this example is:

```
SUBMIT ARECOVER OREDU001 EXECUTE XMIT DATASETCONFLICT(REPLACE)
```

10.1.3 ARECOVER Command with Empty Catalogs (Recovery Scenario B)

At the backup site, we coded our user catalog data set 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 will catalog the data sets as they are recovered. The SUBMIT command used in this example is:

```
SUBMIT ARECOVER OREDU001 EXECUTE.
```

10.2 Initiating ARECOVER Using ABARS Manager Online Dialog

Using ABARS Manager to construct the ABARS ARECOVER commands is another way to simplify the recovery process. ABARS Manager provides a panel in which you may choose the keywords and options you wish to use. ARECOVER is initiated by selecting Option 5, ***ARECOVER SELECT*** on the ***ABARS (Manager) Selection Menu***. Figure 78 on page 112 shows the ***ABARS (Manager) Arecover Command Submission*** panel.

Up to eight aggregate names may be provided in one ARECOVER submission. To initiate an ARECOVER for the order entry daily U.S. application, type the aggregate name `OREDU001` in the ***Aggregate*** field.

The ***Gen/File*** field allows you to choose which aggregate generation will be used. The default is zero, most recent.

The ***VOption*** field allows you to choose the type of ABARS execution: verify, execute, or verify and execute. In the example provided in Figure 78 on page 112, we typed `E` for execute in the option field.

REPOption allows us to select which Conflict Resolution option we would like to use for the ARECOVER. We typed `REPLACE` on the panel.

3480 is the default value of the ***Unit*** field. We used the default value of 3480.

The ***All Data*** field allows you to select all data for the ARECOVER event, or type `N` and have ABARS Manager display a panel with all of the data sets backed up in the aggregate. You can then select a data set or a group of data sets to be recovered.

The panel also includes optional parameters for ARECOVER: Msg, Xmit, Pctu, Tunit, and Mentity. We do not need to provide a value for these parameters unless we are overriding the default values.

Pressing Enter for this panel schedules the ARECOVER job for execution.

```
<V2R411D>  -- A B A R s  (Manager)  ARECOVER COMMAND Submission -   21:06:29
 SELECT OPTION
   Command ==>

 --- ARECOVER  Selections (Common) ----

                                                                  More:     +
    Aggregate(s) ==>  oredly    ==>           ==>           ==>
                 ==>            ==>           ==>           ==>

      Gen / File ==>  0          (Recover from generation 0; -1; etc.)
         VOption ==>  e          ( V = Verify; E = Execute; VE = Ver & Exec)
            Unit ==>  3480       (Input Unit for recovery)
          All Data ==>  Y        ( Y = All Data Set in Aggregate -OR- )
                                 ( N = Next Panel For DSN Levels..    )
 Extended Options ==>  Y         ( Y = Use Extended DFSMShsm Options. )

 --- OPTIONAL Parameters ------

             Msg ==>  KAS        ( Userid for Messages        )
            Xmit ==>             ( Y = Files were Transmitted )
            Pctu ==>             ( Percent Utilized on PRIMary)
           Tunit ==>             ( TARGETUNIT - User Tape Data)
. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
```

Figure 78. ABARS (Manager) ARECOVER Command Submission

10.3 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 contains the DATASETCONFLICT(BYPASS) keyword and option for each data set. You need to resolve the conflicts in order to recover the data. 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 ABARS Manager panel. ABARS automatically restarts the ARECOVER event as a result of the conflict resolution data set and the restart data set. 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.

Chapter 11. Migration Considerations

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 DFSMShsm V1R4, 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 V1R4 level. This chapter describes the differences between DFSMShsm V1R4 ABARS and earlier versions.

For migration from one backup method to ABARS, there are other considerations. This transition and helpful hints are discussed below.

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.

The following differences are introduced with DFSMShsm V1R4:

- Stacking ABACKUP output on a minimum number of tape volumes is a new feature.
- ARCTVEXT is no longer required with DFSMSrmm V1R4.
- GDG bases are now defined with the ALLOCATE statement.
- ABARS tasks increase to 64.

Although there are a number of other ABARS enhancements in DFSMShsm V1R4, these four are the ones that need emphasis. Appendix B, “ABARS Enhancements in DFSMS/MVS V1R4” on page 121 describes all ABARS enhancements in DFSMShsm V1R4.

The ABACKUP output files changed from GDS starting with DFSMShsm V1 R1. See the *DFSMS/MVS V1R4 DFSMShsm Storage Administration Guide* (SH21-1076-03) for information regarding compatibility.

11.1.1 Stacking ABACKUP Output

In previous releases of DFSMShsm, a minimum of three tape volumes were used for ABACKUP output, if an instruction data set was specified in the aggregate and DASD logging was specified for the ABACKUP activity log. The instruction data set and activity log were written to the I file on a tape volume, the D and O files were written to another tape volume, and the C file was written to still another tape volume, producing the minimum three tape volumes. APAR OW06008 allowed patching of the ABRCB control block to eliminate backing up the instruction and activity log, reducing the minimum number to two tape volumes.

Now in DFSMShsm V1R4, all ABACKUP output files are written to a minimum number of tape volumes (potentially a single tape volume). A new SETSYS parameter ABARSTAPES(STACK | NOSTACK) has been added. The default, if this SETSYS parameter is not specified, is STACK. If you do not want the

stacking to occur code the new ABARSTAPES parameter with NOSTACK, or specify NOSTACK on the ABACKUP command.

A prior release of DFSMShsm ABARS cannot recover an aggregate created with the STACK option. If there is a chance that you need to use an earlier release to recover your aggregates, create them with the NOSTACK option.

When recovering an unstacked aggregate with DFSMShsm V1R4 and using the ARECOVER command with the STACK option, ARECOVER automatically retries open with the NOSTACK option. The installation initially sees an OPEN error, but ABARS will retry and should complete successfully.

11.1.2 Use of ARCTVEXT with DFSMSrmm V1R4

DFSMShsm V1R4 can now communicate with DFSMSrmm V1R4 directly without exits. It no longer requires the exit ARCTVEXT to send requests to DFSMSrmm tape management. The ARCTVEXT exit is now free and other tape management products can use it.

A new general-use programming interface, EDGTVEXT, is provided, which is called from DFSMShsm with the same parameter list as ARCTVEXT. DFSMShsm always invokes EDGTVEXT before it determines whether the call to ARCTVEXT is to be made. The ARCTVEXT exit is still invoked based on the SETSYS EXITON command. ARCTVEXT can still be used with other tape management systems.

11.1.3 Defining GDG Bases

In previous releases, you had to back up a GDS to have a GDG base defined. A GDG base name was not permitted in the selection data set. Many customers wanted a method to define a GDG base without having to back up a GDS. As a result, ABARS has been enhanced so that you can specify a GDG base name in the ALLOCATE statement and have ABARS predefine the GDG base during ARECOVER processing.

The GDG base is defined only if it does not already exist. The DATASETCONFLICT parameter of the ARECOVER command does ***not*** apply to these GDG base names. RECOVERNEWNAMELEVEL and RECOVERNEWNAMEALL ***do*** apply to the GDG base names. The ARCCREXT exit does ***not*** get control when conflicts arise with GDG base names in the ALLOCATE statement.

During ARECOVER processing, all GDG base names are defined before any GDSs specified in the aggregate are restored.

11.1.4 Increase to 64 ABARS Tasks

Some customers were pushing the limits of the previous maximum number of tasks. This was particularly important during recovery, trying to recover as much data as quickly as possible. To increase the limit from 15 tasks, some would bring up an additional MVS image with DFSMShsm, giving them the ability to run 30 ABARS tasks.

Now, 64 ABARS tasks can be run concurrently. Modify the SETSYS MAXABARSADDRESSSPACE parameter to the desired number of tasks. You may have different values at your home site than in a recovery environment. When creating your aggregate backups, tape resources may be limited and the aggregate backup tasks may be spread over time. In recovery, you may want

the ability to run more ARECOVER commands concurrently to recover as much data as possible as quickly as possible.

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 DASD 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. DASD 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 DASD 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 DASD 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 DASD 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 and ABARS Manager can lead to a very successful implementation.

Appendix A. Sample Questionnaire

This appendix lists sample questionnaires used in Chapter 5, “Application Characteristics” on page 47. 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?

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

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?

Is concurrent copy currently used by this application?

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

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

A.2 Questionnaire for Identifying Names and Run Schedule

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

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.

A.3 Questionnaire for Synchronization Points

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

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?

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.

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.

Appendix B. ABARS Enhancements in DFSMS/MVS V1R4

The following ABARS enhancements are included in DFSMShsm V1R4:

- ABARS output files can now be stacked to minimize the number of tape volumes
- The number of concurrent active ABARS requests has been increased to 64.
- Invocation of ARCBEEXT has been extended to data sets that are being dumped by DFSMSdss processing so that installations can bypass data sets that fail.
- GDG base names can be specified in the ALLOCATE list. Thus you can back up and restore GDG base definitions without having to back up an associated generation data set (GDS).
- ABARS activity log on DASD or tape is automatically deleted when aggregate roll-off (deletion) occurs, during either automatic roll-off or EXPIREBV processing.
- CPU time for processing ABACKUP or ARECOVER is maintained in the ABACKUP/ARECOVER Function Statistics record (WWFSR) and aggregate backup and recovery (ABR) record. A new 32-character accounting information attribute in the aggregate group definition is saved in the WWFSR and the ABR record.
- The TGTGDS and OPTIMIZE keywords used when invoking DFSMSdss to dump and restore data sets are externalized.

B.1 Output File Stacking

Today ABARS ABACKUP typically needs at least three tape cartridges for output: one for the control file ABARS ARECOVER needs for the recovery process, one to contain the activity log and instruction data set, and one or more for the data itself (see Figure 79 on page 122).

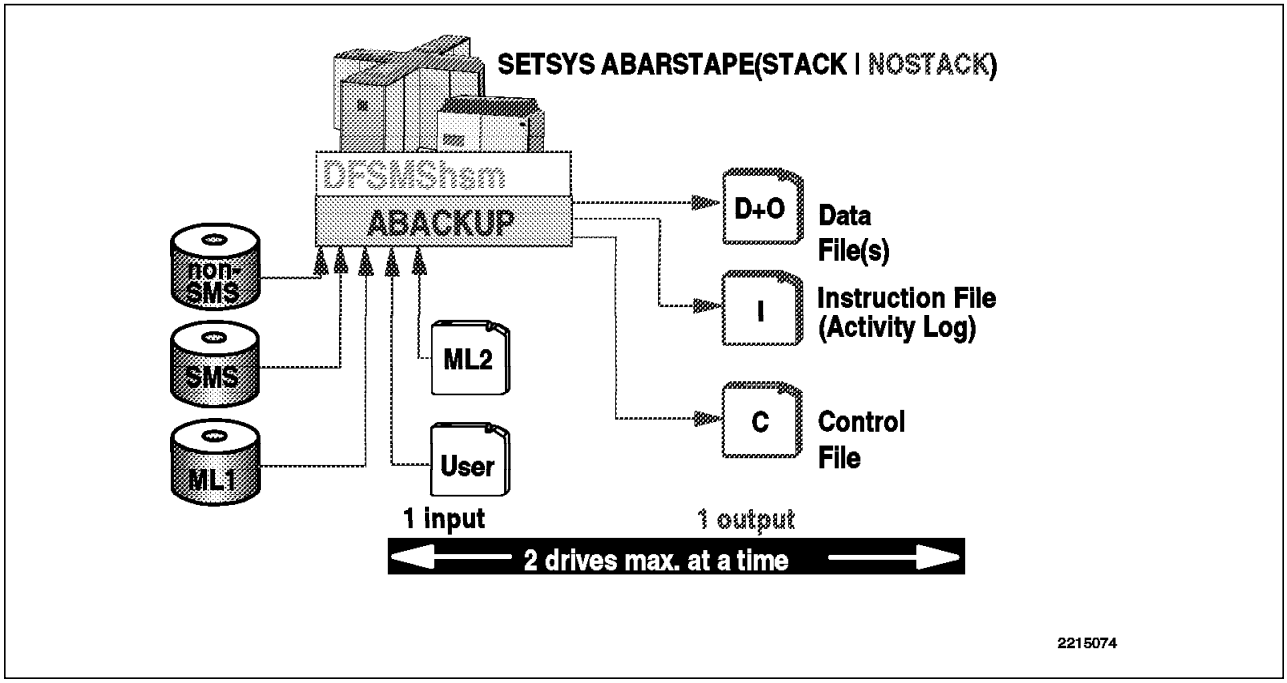

Figure 79. ABARS Output Tapes. ABARS prior to DFSMS/MVS V1R3 requires at least three tapes for output.

ABARS provides a new function that allows the ABACKUP output files to be stacked on a minimum number of tape cartridges. The minimum number of tape cartridges could be one if the aggregate is small (see Figure 80).

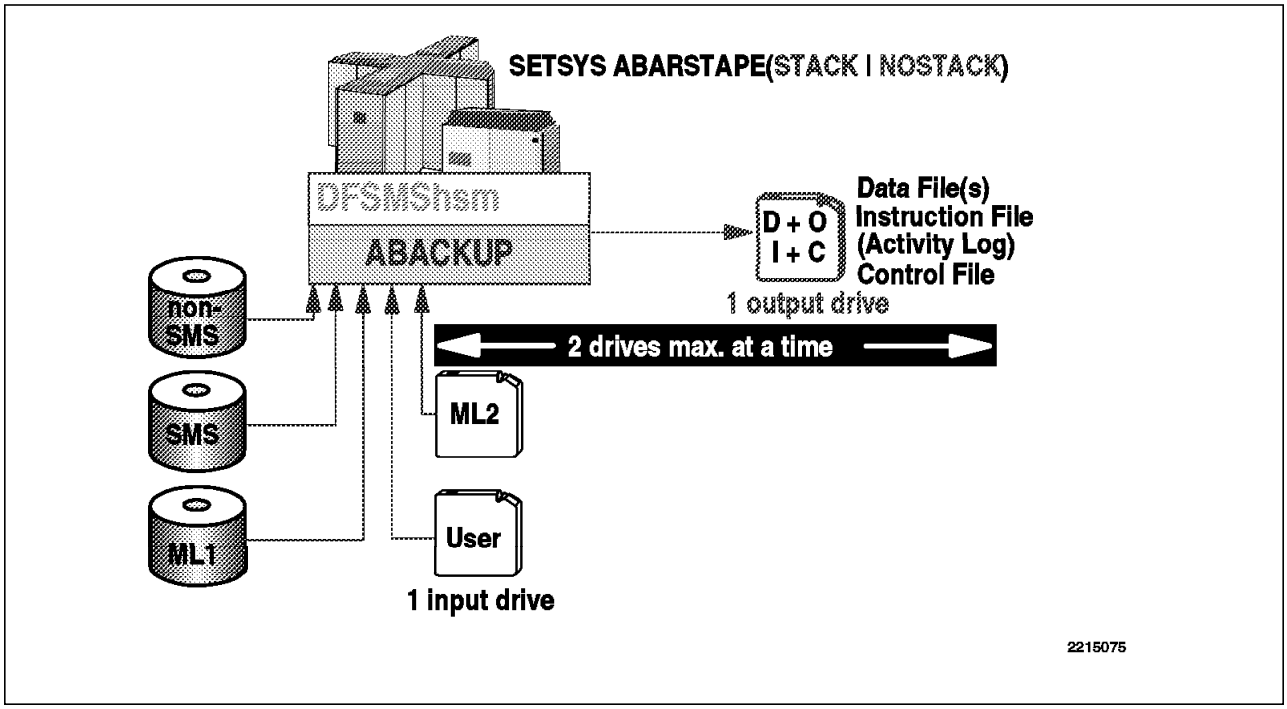

Figure 80. ABARS Output Tape File Stacking

B.1.1 Invocation of Output File Stacking

The SETSYS command has been updated with a new parameter, ABARSTAPES(STACK|NOSTACK), with STACK as the default.

The STACK parameter indicates to ABACKUP to stack the ABACKUP output files onto a minimum number of tape volumes, NOSTACK indicates to ABACKUP not to stack the ABARS tape. Specifying NOSTACK causes ABACKUP to operate as it does in earlier releases of DFSMShsm.

B.1.2 QUERY SETSYS and QUERY ABARS

The QUERY SETSYS and QUERY ABARS commands have been enhanced to display the status of the ABARSTAPES parameter in message ARC6036I.

B.1.3 ABACKUP and ARECOVER DATASETNAME

The ABACKUP command has been enhanced with the new STACK|NOSTACK parameters to allow installations to override the SETSYS ABARSTAPES.

The ARECOVER command with the DATASETNAME parameter allows new STACK|NOSTACK keywords to be specified. Specifying STACK|NOSTACK indicates to ARECOVER DATASETNAME processing whether or not the ABACKUP output was stacked. Whether output was stacked must be known before mounting the control file tape because ARECOVER has to allocate file sequence number 4 if STACKED or refrain from specifying a file sequence number if not STACKED.

The STACK|NOSTACK parameter is unnecessary on the ARECOVER command specified with the AGGREGATE parameter. ARECOVER AGGREGATE obtains all information about ABACKUP output files from the catalog. Thus it knows whether or not to allocate an appropriate file sequence number.

B.2 Up to 64 Concurrent Requests

ABARS has been enhanced to allow up to 64 concurrent ABARS address spaces. The current restrictions remain; that is, you cannot simultaneously back up the same aggregate group name or recover using the same aggregate group name or control file data set name.

B.2.1 Invocation

The existing SETSYS MAXABARSADDRESSSPACE(n) parameter has been enhanced to allow the value of *n* to range from 1 to 64, with the default remaining as 1.

The started task identifier contains the task number as part of the identifier. The identifier is currently ABARnntt, where nn is the task number, and tt is a time stamp. The value of nn can now range from 1 to 64. For example, Task 56 would have an identifier of ABAR56tt.

B.3 Invocation of ARCBEEXT Extended to DFSMSdss Processing

ABACKUP processing has been enhanced to extend the error conditions where the ARCBEEXT installationwide exit gets control. With this enhancement, ARCBEEXT gains control when DFSMSdss errors occur while dumping level 0 DASD data sets in the INCLUDE list.

The ARCBEEXT installation-wide exit is now called if SETSYS EXITON(BE) is specified and one of the following failures occurs:

- An *E* level DFSMSdss message is issued, indicating that a data set has failed dump processing.
- A *W* level DFSMSdss messages is issued and DFSMSdss does not indicate that the warning is OK.

When one of the above failures occurs, the name of the failing data set and an indicator that a DFSMSdss failure occurred are passed to ARCBEEXT. Thus you can determine whether the data set should be skipped. If ARCBEEXT does not indicate that the data set can be skipped, ABACKUP will fail at that point; otherwise the data set in error will be skipped and the next data set processed.

To enable this support, you must specify SETSYS EXITON(BE) before issuing the ABACKUP command.

B.4 GDG Base Name in ALLOCATE Statement

Customers have asked for a method where they can have ABARS define a GDG base at the recovery site without having to back up any of the GDSs. Older versions of DFSMShsm do not permit the specification of a GDG base name in the selection data set. If a GDS name was specified, however, ABARS automatically retrieved the GDG base definition and maintained it in the control file. This support will remain in effect.

ABARS has been enhanced so that you can specify a GDG base name in the ALLOCATE statement and have ABARS predefine the GDG base name during ARECOVER processing if it does not currently exist. You can specify a GDG base name even though you have not specified an associated GDS name in the selection data set.

During ARECOVER processing, all GDG base names are defined before any GDSs specified in the aggregate are restored.

B.5 Automatic Delete of ABARS Activity Log During Roll-Off Processing

A new SETSYS parameter, ABARSDELETEACTIVITY(Y | N), enables you to select whether or not you want to have DFSMShsm automatically delete the ABARS activity logs during ABARS roll-off processing or EXPIREBV ABARSVERSIONS processing.

If you select ABARSDELETEACTIVITY(Y), the ABARS activity log is deleted during either automatic roll-off of expired ABARS versions or EXPIREBV ABARSVERSIONS processing.

If you specify ABARSDELETEACTIVITY(N), there is no automatic deletion.

The default is ABARSDELETEACTIVITY(N).

B.6 CPU Time for Aggregate Processing in WWFSR

ABARS now maintains the CPU time for processing ABACKUP and ARECOVER requests in the WWFSR control block. A WWFSR is created at the completion of each individual ABACKUP and ARECOVER request and can be written as an SMF record if requested.

The ABR record has been enhanced to maintain an ABACKUP CPU time and an ARECOVER CPU time.

If an ARECOVER request fails and is reissued with a valid RESTART data set, the CPU time in the WWFSR reflects only the time needed to process the remaining data sets. The ABR record, however, accumulates the CPU times of each restart until the recovery of the aggregate is successful.

The ISMF aggregate group definition panels have been enhanced to allow specification of a 32-character accounting code. This accounting code is also written to the WWFSR control block, ABR record, and the ABACKUP control file. It is written to the control file so that the account code can be propagated to the recovery site without an aggregate definition at the recovery site.

If you specified SETSYS SMF(smfid), ABARS writes the WWFSR as an SMF record with the record number (smfid+1) in the SYS1.MANx or SYS1.MANy system data set. You can then use the reported CPU time to assist in charging back ABARS requests.

B.7 TGTGDS and OPTIMIZE Keyword Externalized

The TGTGDS and OPTIMIZE keywords that ABARS passes to DFSMSdss to dump and restore data sets are externalized.

B.7.1 TGTGDS Keyword

The TGTGDS keyword that ARECOVER processing passes to DFSMSdss during restore processing is externalized in this release of DFSMShsm. This provides greater flexibility for managing SMS-managed GDSs that are being restored to level 0 DASD.

ABARS introduces a new SETSYS ARECOVERTGTGDS(option) parameter.

Valid values for *option* are these:

- DEFERRED— Specifies that the target data set is to be assigned the DEFERRED status
- ACTIVE— Specifies that the target data set is to be assigned the ACTIVE status, for example, rolled into the GDG base
- ROLLEDOFF— Specifies that the target data set is to be assigned the ROLLEDOFF status
- SOURCE— Specifies that the target data set is to be assigned the same status as that of the source data set. This is the default; it maintains consistency with releases of DFSMShsm previous to DFSMShsm V1R4.

The installation can override the SETSYS ARECOVERTGTGDS with a new keyword on the ARECOVER command, TGTGDS(option). The values for option are the same as for ARECOVERTGTGDS.

B.7.2 OPTIMIZE Keyword

The OPTIMIZE keyword that ABACKUP processing passes to DFSMSdss during dump processing of level 0 data sets is externalized in this release of DFSMShsm. This keyword enables installations to adjust performance when backing up level 0 DASD data sets that are specified in the INCLUDE list.

ABARS introduces a new SETSYS ABARSOPTIMIZE(n) parameter. The value specified for *n* controls what ABACKUP will specify in the OPTIMIZE keyword when invoking DFSMSdss to back up level 0 DASD data sets.

Valid values for *n* are as follows:

- 1— DFSMSdss reads one track at a time.
- 2— DFSMSdss reads two tracks at a time.
- 3— DFSMSdss reads three tracks at a time.
- 4— DFSMSdss reads a cylinder at a time.

The default for *n* is 3.

The installation can override the specification for *n* in the SETSYS ABARSOPTIMIZE keyword by specifying a new OPTIMIZE(option) keyword on the ABACKUP command. The values for option are the same as for ABARSOPTIMIZE.

If ABACKUP OPTIMIZE is not specified, ABACKUP will use the value defined for *n* in the SETSYS ABARSOPTIMIZE(n) keyword.

B.8 ISMF Changes for ABARS Accounting Information

The following ISMF Aggregate Group Applications are affected by the ISMF changes:

- Aggregate Group Define/Alter
- Aggregate Group Display
- Aggregate Group List Display
- Aggregate Group List Sort
- Aggregate Group List View
- Aggregate Group List Print

B.9 Migration and Coexistence

There are migration and coexistence concerns if you have multiple systems with both DFSMShsm V1R4 and earlier releases of DFSMShsm installed.

B.9.1 Disaster Recovery Site Considerations

If you specify the NOSTACK parameter on the ABACKUP command when backing up on a DFSMShsm V1R4 system, you can successfully ARECOVER on an earlier version of DFSMShsm.

B.9.2 Migration

Use the NOSTACK parameter on the ARECOVER DATASETNAME command to ARECOVER backups performed on an earlier version of DFSMShsm.

B.9.3 Coexistence

Use the ARECOVER AGGREGATE command on a DFSMShsm V1R4 system to ARECOVER a backup performed on an earlier version of DFSMShsm. This command also allows an earlier version of DFSMShsm to ARECOVER an aggregate backed up on DFSMShsm V1R4, whether or not the output files are stacked.

Appendix C. Special Notices

This publication is intended to help storage administrators, system programmers, and experienced storage personnel to implement ABARS, ASAP, and ABARS Manager. The information in this publication is not intended as the specification of any programming interfaces that are provided by DFSMS/MVS V1R4. See the PUBLICATIONS section of the IBM Programming Announcement for DFSMS/MVS V1R4 for more information about what publications are considered to be product documentation.

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Appendix D. Related Publications

The publications listed in this section are considered particularly suitable for a more detailed discussion of the topics covered in this redbook.

D.1 International Technical Support Organization Publications

For information on ordering these ITSO publications see “How to Get ITSO Redbooks” on page 133.

- *Disaster Recovery Library: Data Recovery*, GG24-3994
- *Disaster Recovery Library: S/390 Technology Guide*, SG24-4210
- *Disaster Recovery Library: Fire in the Computer Room - What Now?*, SG24-4211

D.2 Redbooks on CD-ROMs

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CD-ROM Title	Subscription Number	Collection Kit Number
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AS/400 Redbooks Collection	SBOF-7270	SK2T-2849
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RS/6000 Redbooks Collection (PostScript)	SBOF-7205	SK2T-8041
Application Development Redbooks Collection	SBOF-7290	SK2T-8037
Personal Systems Redbooks Collection	SBOF-7250	SK2T-8042

D.3 Other Publications

These publications are also relevant as further information sources:

- *DFSMS/MVS V1R4 DFSMShsm Storage Administration Reference*, SH21-1075
- *DFSMS/MVS V1R4 DFSMShsm Storage Administration Guide*, SH21-1076
- *DFSMS/MVS V1R4 DFSMShsm Implementation and Customization Guide*, SH21-1078
- *DFSMS/MVS V1R4 DFSMSrmm Implementation and Customization Guide:ecit,. SC26-4932*
- IBM System Messages Volume 1*, GC28-1784*
- DB2 for MVS/ESA Version 4 Administration Guide*, SC26-3265.*

The following publications are available from Mainstar Software Corporation.

- ASAP User Guide V2 R4
- ABARS Manager User Guide V2 R4
- ABARS Manager/ASAP Disaster Recovery Planning Guide V2 R4
- ABARS Manager/ASAP Installation & Maintenance Guide V2 R4

How to Get ITSO Redbooks

This section explains how both customers and IBM employees can find out about ITSO redbooks, CD-ROMs, workshops, and residencies. A form for ordering books and CD-ROMs is also provided.

This information was current at the time of publication, but is continually subject to change. The latest information may be found at http://www.redbooks.ibm.com.

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- **GOPHER link to the Internet** - type GOPHER.WTSCPOK.ITSO.IBM.COM
- **Tools disks**

  To get LIST3820s of redbooks, type one of the following commands:

  ```
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  ```
  TOOLCAT REDBOOKS
  ```

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  ```
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  TOOLS SENDTO USDIST MKTTOOLS MKTTOOLS GET LISTSERV PACKAGE
  ```

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  ```
  TOOLS SENDTO WTSCPOK TOOLS ZDISK GET ITSOREGI 1998
  ```

  For a list of product area specialists in the ITSO: type the following command:

  ```
  TOOLS SENDTO WTSCPOK TOOLS ZDISK GET ORGCARD PACKAGE
  ```

- **Redbooks Web Site on the World Wide Web**

  http://w3.itso.ibm.com/redbooks

- **IBM Direct Publications Catalog on the World Wide Web**

  http://www.elink.ibmlink.ibm.com/pbl/pbl

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  Index # 4422 IBM redbooks
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- **On the World Wide Web**

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IBM Direct Publications Catalog	http://www.elink.ibmlink.ibm.com/pbl/pbl

- **Internet Listserver**

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Redpieces

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List of Abbreviations

ABARS	Aggregate Backup and Recovery Support
ABR	aggregate backup and recovery
ACS	automatic class selection
ADSM	ADSTAR Distributed Storage Manager
APF	authorized program facility
ASA	automatic selection and audit
ASAP	Automated Selection and Audit Process
ATL	automated tape library
BCDS	backup control data set
BIA	business impact analysis
BWO	backup while open
CDS	control data set
CICS	Customer Information Control System
CPU	central processing unit
CSR	Customer Service Representative
DASD	direct access storage device
DBA	Database Administrator
DBMS	database management system
DP	data processing
DR	disaster recovery
DSCB	data set control block
DSN	data set name
EOV	end of volume
FSR	function statistics record
FTP	file transfer protocol
GDG	generation data group
GDS	generation data sets
HSM	hierarchical storage management
IBM	International Business Machines Corporation
IC	image copy
ICF	integrated catalog facility
ID	identification
IDCAMS	IDC access method service
IDS	inventory data set
IMS	Information Management System
IS	information systems
ISMF	Interactive Storage Management Facility
ISPF	Interactive System Productivity Facility
IT	information technology
ITSO	International Technical Support Organization
JCL	job control language
MCDS	migration control data set
MVS	Multiple Virtual Storage
OAM	object access method
OCO	object code only
PDS	partitioned data set
PDSE	partitioned data sets extended
RACF	Resource Access Control Facility
RAID	redundant array of independent devices
RC	return code
RMF	resource measurement facility
RSP	real-time selection process
RTO	recovery time objective
SAM	sequential access method
SCDS	source control data set
SDS	selection data set
SDSF	Spool Display Screen Facility
SFM	sysplex failure management
SHCDS	sharing control data sets
SMB	system managed buffering
SMF	System Management Facility
SMS	storage management subsystem
SNA	Systems Network Architecture
TSO	Time Sharing Option
CICS/VR	CICS VSAM Recovery
VSAM	Virtual Sequential Access Method

VTAM Virtual Telecommunications Access Method

WWFSR See FSR

XDF extended destination facility

XSS Expanded Selection Support

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