MICRO FOCUS® | SERENA™

ChangeMan® SSM
Getting Started Guide

Contents

Welcome to ChangeMan SSM

This document describes ChangeMan® SSM (System Software Manager for z/OS), a product of Serena Software, Inc., a Micro Focus company.

ChangeMan SSM detects and tracks changes within groups of applications or system data sets or files, synchronizes local or remote operating environments, and restores environments to a clean and working state. ChangeMan SSM detects changes to data sets, PDS members, full DASD volumes, or files using a unique fingerprinting technology.

Before You Begin   See the ReadMe file for the latest updates and corrections for this manual. You can download the ReadMe file from the Micro Focus SupportLine website at:

> https://supportline.microfocus.com/

Objective   The purpose of this manual is to:

- Provide a simplified overview of the three major ChangeMan SSM components:

  - Change Tracking

  - Detection and Synchronization

  - Data Extraction

- Explain how to set up your environment to get started quickly.

- Explain how to perform the most commonly used functions.

Audience   This manual is intended for anyone who wants an overview of ChangeMan SSM and wants to get started quickly.

Change Bars   Change bars in the left margin identify text that has changed for SSM 8.4.

Manual Organization

This chapter...	Contains this information...
1	Introduction. Gives an overview of ChangeMan SSM. Explains the three components and their implementation.
2	Change Tracking Component. Explains how to: ■ Define a Change Tracking environment. ■ Use the Change Tracking Menu. ■ Define critical system data sets for tracking. ■ Compare backup versions within the Delta Master.
3	Detection and Synchronization Component. Explains how to: ■ Fingerprint and Compare environments. ■ Fingerprint and Compare DASD volumes. ■ Verify the synchrony of two environments. ■ Synchronize environments. ■ Create and apply Change Baskets. ■ Create and apply Reverse Change Baskets. ■ Reject members during an Export and/or Import. ■ Undo an Import operation.
4	Data Extraction Component. Explains how to: ■ Work with VSAM (KSDS) data bases. ■ Work with other data files and data bases.
5	Redundancy Detection and Management. Explains how to: ■ Tokenize data sets on a DASD pool. ■ Restart the tokenizing process. ■ Determine the level of redundancy. ■ Report redundant data sets and members.
6	Snapshot Facility. Explains how to: ■ Collect information from a large pool of volumes. ■ Report exceptional conditions between two data centers, two CPUs, two LPARS, or within a pool of volumes over time.
7	Sample Reports
Appendix A	Describes the following: ■ DCB attributes of files used in synchronization. ■ System symbolics used in select parameters. ■ Wildcards used in online and batch synchronization facilities.
Glossary	Defines terms used in ChangeMan SSM.

ChangeMan SSM Documentation Suite

The following manuals are available in Adobe Acrobat format. They can be downloaded from the Micro Focus SupportLine website at:

https://supportline.microfocus.com/

Title	Description
ChangeMan SSM Getting Started Guide	■ Introduces the Change Tracking, Detection and Synchronization, and Data Extraction components of ChangeMan SSM. ■ Explains how to set up your environment to get started quickly. ■ Explains how to perform the most commonly used functions.
ChangeMan SSM Change Tracking User's Guide	Gives instructions for using the Change Tracking Component.
ChangeMan SSM Detection and Synchronization Guide	Gives instructions for using the Detection and Synchronization Component.
ChangeMan SSM Data Extraction User's Guide	Gives instructions for using the Data Extraction Component.
ChangeMan SSM Messages	Lists ChangeMan SSM error and informational messages and explains their meaning.
ChangeMan SSM Installation Guide	Provides instructions for installing the Change Tracking, Detection and Synchronization, and Data Extraction components of ChangeMan SSM.

Using the Online Manuals

The online manuals use the Adobe Portable Document Format (PDF). To view PDF files, use Adobe® Reader®, which is freely available from www.adobe.com.

> **NOTE** Be sure to download the *full version* of Reader. The more basic version does not include the search feature.

This section highlights some of the main Reader features. For more detailed information, see the Adobe Reader online help system.

The online manuals include the following features:

- **Bookmarks.** All of the online manuals contain predefined bookmarks that make it easy for you to quickly jump to a specific topic. By default, the bookmarks appear to the left of each online manual.

- **Links.** Cross-reference links within an online manual enable you to jump to other sections within the manual and to other manuals with a single mouse click. These links appear in blue.

- **Printing.** While viewing a manual, you can print the current page, a range of pages, or the entire manual.

- **Advanced search.** Starting with version 6, Adobe Reader includes an advanced search feature that enables you to search across multiple PDF files in a specified directory. (This is in addition to using any search index created by Adobe Catalog—see step 3 below.)

To search within multiple PDF documents at once, perform the following steps (requires Adobe Reader version 6 or higher):

1   In Adobe Reader, select Edit | Search (or press CTRL+F).

2   In the text box, enter the word or phrase for which you want to search.

3   Select the **All PDF Documents in** option, and browse to select the folder in which you want to search. (If you have a document open that has an Adobe Catalog index attached, you can leave the **In the index named...** option selected to search across all the manuals in the index.)

4   Optionally, select one or more of the additional search options, such as **Whole words only** and **Case-Sensitive**.

5   Click the **Search** button.

Optionally, you can click the **Use Advanced Search Options** link near the lower right corner of the application window to enable additional, more powerful search options. (If this link says **Use Basic Search Options** instead, the advanced options are already enabled.) For details, see Adobe Reader's online help.

Online Help

ChangeMan SSM includes an online help system that offers the following:

Attribute	Description
Guidance Information	Press F1 in the command field to display an overview of the current panel.
Index	A list of key words from which you can access detailed information on each subject. Press F1 from the main menu of each of the components to access the menu.
Field Sensitive Help	Field sensitive help is available for every field on the ISPF panels. Place the cursor on the field and press F1 for help.

Chapter 1

Introduction

ChangeMan® SSM is a comprehensive suite of change management solutions. Together, these solutions assist all organizational personnel in detecting, tracking, reporting, implementing, distributing, and recovering from changes to the MVS environment, including changes in Hierarchical File System (HFS) files. ChangeMan SSM provides solutions for both small data centers as well as large, complex environments with multiple LPARs, CPUs, and sites.

ChangeMan SSM also assists with data center consolidations and mergers/acquisitions.

ChangeMan SSM Components

ChangeMan SSM consists of three components:

- Change Tracking

- Detection and Synchronization

- Data Extraction

These components provide you with toolsets to detect changes and synchronize environments at the data set, PDS member, and VSAM record level.

Fingerprinting Technology

All ChangeMan SSM components use Fingerprinting technology. Like DNA mapping that uniquely identifies a human, Fingerprint technology uniquely identifies a file by creating a unique 8-byte *token* representing the contents *(the content Fingerprint)* of any PDS member or data set. When the contents of a data set or member change, so does its token. As long as the contents of the data set or member does not change, the generated token will not change. This means that a data set can be copied to another volume, distributed to a remote site, or reblocked without incurring a change to its token.

ChangeMan SSM uses Fingerprint technology to detect differences in the contents of one or more members, an entire data set, a group of data sets, a volume, or group of volumes regardless of the naming conventions. For partitioned data sets, one token is generated for each member, and one for the entire PDS.

For VSAM KSDS clusters, ChangeMan SSM generates one token per record, and one composite token for the entire data component. These tokens are stored externally in a Fingerprint data set. The VSAM Fingerprint representations are evaluated to determine the changed records. By comparing the current VSAM Fingerprint data set with a previous one, the added, updated, and deleted records are identified. To synchronize VSAM clusters, ChangeMan SSM creates a VSAM Change Basket containing only the added, deleted, and changed records. The Change Basket, created in a Base environment, is transferred to local or remote environments for Import processing to synchronize the Target cluster.

Flat files and flattened databases can also be Fingerprinted at the record level. Flat files can be Fingerprinted as either KEYED or TEXT format. A Fingerprint token is produced for each record of the flat file. The record token is a six-byte representation of the content of a record. If the flat file has a user specified key, then the token is the six-byte representation plus the key.

PDS member-level directory tokens can optionally be used as an additional determination of change (when a change occurs in the PDS directory during the comparison and synchronization processes). Refer to the EXTENDEDSYNC command in the *ChangeMan SSM Detection and Synchronization Guide*.

Change Tracking Component

This component provides two auditing/tracking facilities:

- Batch Interval Change Tracking (BICT)

- Real Time Change Tracking (RTCT)

Once application or system critical data sets are defined to the Change Tracking Component, any updates made (at the PDS member level) are identified and recorded in a ChangeMan SSM database. Regardless of the tool used to commit the change (online, batch, standard or non-standard), the change is detected. Using Fingerprinting technology, all updates are detected, even if the MVS system on one LPAR is brought down, or the HPSRTO task is stopped for a period of time.

When the Change Tracking Component detects a change, it can automatically back up the changed member to the *Delta Master* database (this is an optional user selection). By enabling you to recover prior versions of members, you can view and analyze changes in system, software product, or application software, for problem determination and immediate recovery.

The following optional features are available when using Real Time Change Tracking:

- Notification of Change Events

  Specified users can be notified when a change occurs in a tracked data set. The notification is available through E-mail or TSO.

- Member Level Security (MLS)

  MLS prevents unauthorized users from updating protected entities.

- Member Reference Tracking (MRT)

  If you only want to see "references" to data sets and members, you can use MRT to identify which users or jobs referenced the data set or member and when.

Batch Interval Change Tracking (BICT)

BICT requires that the HPSGLOBE program be executed at user-specified intervals of time to determine and identify changes to the environment being tracked. This facility does not require any intercepts to be placed on the system.

BICT identifies and captures any changes made to the tracked environment since the last GLOBAL capture. Interim changes are not captured.

The TSO and E-mail notification facilities are *not* available using the BICT method of change tracking.

Real Time Change Tracking (RTCT)

RTCT provides an automated facility to track system, software, and application changes. All changed members are stored in a ChangeMan SSM database along with specific information as to who made the change, the type of change, the program used, and the date and time the change occurred.

The ChangeMan SSM side-by-side compare facility determines the exact changes made to particular members (load or source); you can also use interfaces to COMPAREX or IBM's SuperC to determine the changes made to particular members.

RTCT supports the following data set types:

■ Partitioned Data Sets (PDS and PDSE)

■ Physical Sequential and Extended Sequential data sets (PS)
   NOTE Multivolume sequential data sets are supported

■ Direct Access data sets (DA)

> **NOTE** Tracking VSAM data sets (all types), however, requires a periodic run of the HPSGLOBE program with the PARM='GLOBAL,VSAMONLY', which can be initiated by your job scheduling software.

There are several intercepts that must be implemented for RTCT (described in the following topic "Dynamic SVC Interceptions" on page 15).

The TSO and E-mail notification facilities are available using the RTCT method of change tracking.

The following topics explain the three elements supporting RTCT:

■ SERNET Started Task

■ ChangeMan SSM Subtasks

■ Dynamic SVC Interceptions

SERNET Started Task

SERNET (previously called SERENA/Network) provides communication and other services on the mainframe server for Serena products. SERNET runs as a started task on an LPAR. Multiple SERNET started tasks can be run on a single processor.

RTCT runs as an application under a SERNET instance. The ChangeMan SSM started task (SSMSTAR) consists of the SERNET started task plus the ChangeMan SSM subtasks (HPSSTART and SSMSTAR).

ChangeMan SSM Subtasks

■ Synchronous Subtask (HPSSTART)

   After initialization, SERNET first attaches the ChangeMan SSM subtask (HPSSTART) and makes the SSCVT control block known to it. The HPSSTART program then attaches a second subtask (HPSRTO) that runs asynchronously.

■ Asynchronous Subtask (HPSRTO)

   Upon initialization, the subtask HPSRTO intercepts the CLOSE and STOW SVCs. HPSRTO uses the SVCUPDTE macro (recommended by IBM) to dynamically front-end

them. Additionally, HPSRTO allocates a storage table that is made available to the front-end code.

When HPSRTO is attached, the Serena® ChangeMan® SSM Site Master database is read to initialize a tracked object list in a tree data structure. Only the data sets or files (objects) in this tree are subject to tracking. This eliminates the tracking of undesired data sets or files.

When either a STOW or a CLOSE is detected for a tracked data set, the appropriate front-end code stores an information node in the storage table; this code is optimized for speed.

Asynchronously, HPSRTO compares the information in the storage table against the object tree. If an update to an object has occurred, HPSRTO triggers the CAPTURE function to record the update.

HPSRTO may attach additional subtasks as needed.

The ChangeMan SSM LOG data set contains messages issued by HPSRTO. The timestamp displayed in these messages is the date/time of when the message was issued, which corresponds to when the events were processed. To see when the events actually took place, run an Events Report or History Report. The ChangeMan SSM LOG is not meant to replace the Events Report, but to report on the activity of the started task.

Dynamic SVC Interceptions

The HPSFCLOS and HPSFSTOW intercepts are front-ended to the current CLOSE and STOW SVCs in the SVC table. If an SVC routine is already front-ended, the ChangeMan SSM intercept is added in front of the existing front-end for that SVC.

When the MRT feature is being used, the intercepts (HPSFATCH, HPSFBLDL, HPSFLINK, HPSFLOAD, and HPSFXCTL) are front-ended to the current ATTACH, BLDL, LINK, LOAD, and XCTL SVCs in the same manner as HPSFCLOS and HPSFSTOW.

When the subtask HPSRTO is quiesced, the intercepts are disabled but not removed from the system. So, the front-end code remains in the system without any effect until the ChangeMan SSM started task is brought up again or the next IPL occurs.

IEBCOPY or EXCP Updates

By intercepting the CLOSE SVC, the HPSRTO subtask differentiates between standard and EXCP updates. Using the MODE=SECURE, data sets updated in place are fingerprinted.

The StarTool FDM product, for example, makes global updates to partitioned data sets using EXCP processing. IEBCOPY, as another example, does not issue the STOW SVC, therefore MODE=SECURE (default) must be specified to track all member activities.

RTCT uses fingerprinting to detect all updates. Change events (ADD, UPDATE, DELETE, RENAME, ZAP and LINKEDIT) are recorded along with the time, USERID, JOBNAME and program used to make the change.

Sysplex Support

Multiple LPARs in a sysplex environment can share the same set of tracking databases across the environments. Regardless of which LPAR the change is committed on, RTCT detects the change and records the updates in the common databases.

Member Level Security

Data set and member patterns can be defined to the Member Level Security (MLS) feature as protected entities. MLS prevents unauthorized users from updating protected entities. If an update is attempted by an unauthorized user, the attempted member-level change will store the member under a new internally-generated name. Alternatively, MLS can be set up to abend the job with a U913-38 message when the update attempt is made. This feature prevents unauthorized updates, renames, or deletes at the member level.

To take advantage of MLS, you only need to define protected members to the MLS feature; it is *not* necessary to also define the data set to Change Tracking.

For more information, refer to the Site Administrator functions in the *ChangeMan SSM Change Tracking User's Guide*.

NOTE Entities defined to MLS are only protected from change through standard applications (such as TSO/ISPF) that issue the standard IBM STOW SVC. MLS does not protect entities from update if the entire PDS is overlaid (such as with IEBCOPY). For more information, refer to the *ChangeMan SSM Installation Guide*, under topic "Member-Level Security (MLS) - Optional".

Member Reference Tracking

The Member Reference Tracking (MRT) facility is installed with the Change Tracking component. MRT allows you to detect and report references to members of PDSs. Read and update access is tracked on existing members that you define to the MRT system, and where standard I/O routines are used.

NOTE The *creation* of a *new* member is not initially tracked by MRT; new members can be tracked using the core facilities of Change Tracking. However, subsequent references to new members will be tracked by MRT if they are defined to the MRT system.

LPA modules, which are loaded into memory at IPL time, are not tracked by MRT.

You can also define members to be excluded from MRT. This allows you to filter out references to high-activity members at the beginning of MRT processing, which greatly enhances performance. Member references that pass the exclusion check are then filtered against the PDS and member names that you defined for inclusion in MRT (by data set and member name).

The following diagram illustrates the MRT configuration:
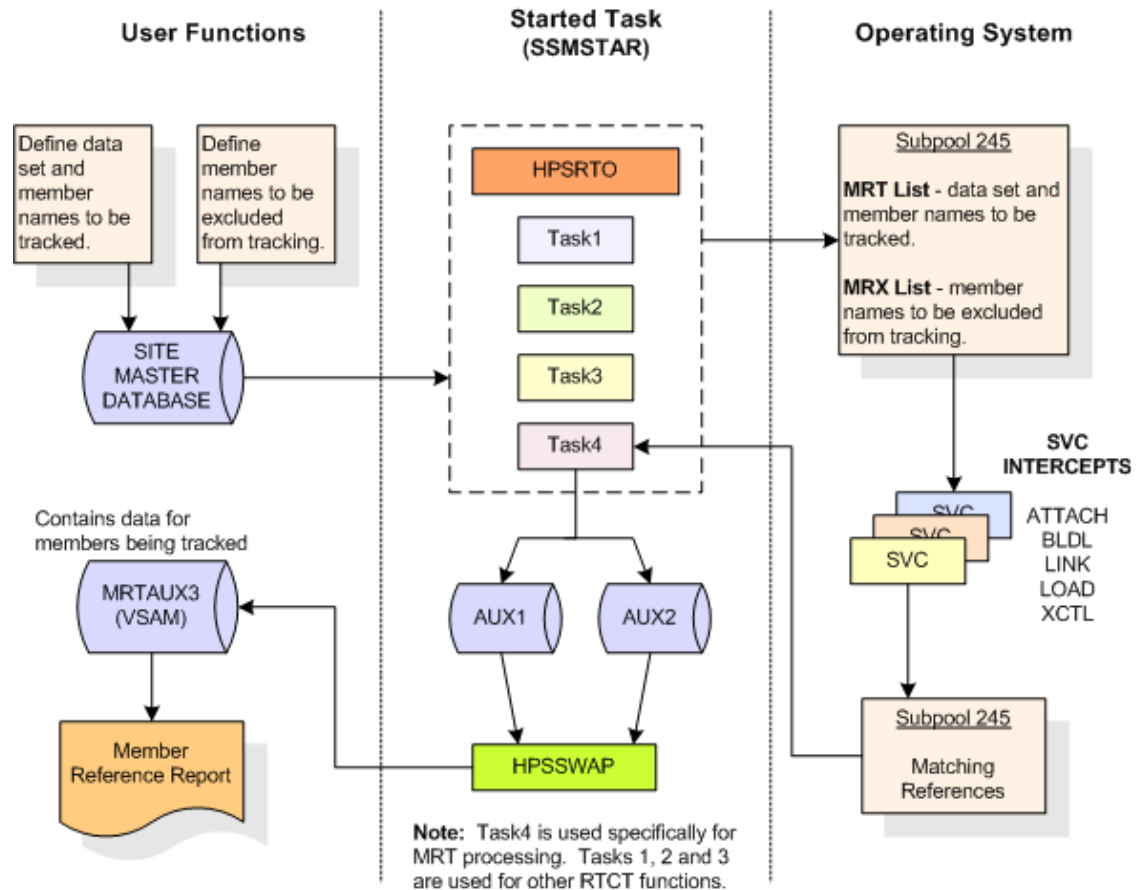
Processing flow:

1   You define which members are tracked and which are excluded by MRT, using online panels or batch commands. PDS/member names to be tracked, and member names to be excluded, are stored in the Site Master Database and also copied into two tables in storage (MRT List and MRX List).

2   The MRT system (which runs as part of the started task) collects information captured by 5 of the intercepts: HPSFATCH, HPSFBLDL, HPSFLINK, HPSFLOAD, and HPSFXCTL.

3   MRT first checks the exclusion table (MRX List) to see if the member is excluded from MRT tracking. Members defined as excluded are not processed any further. This allows high-activity members to be filtered out at the very beginning of the process.

4   When standard I/O routines are used, member names *not* in the exclusion table are then filtered against the tracking table (MRT List). References to data sets/members that match a pattern in the table are written to another table in storage (Matching References) by the intercepts.

5   An asynchronous task pulls entries out of the Matching References storage table and writes them to one of the Swap files (AUX1 or AUX2). When the current Swap file is full, the task starts writing to the other Swap file, and the contents of the first Swap file is used to update the MRTAUX3 VSAM file.

For example:

> When AUX1 fills up, a swap is done to AUX2, and the data on AUX1 is written to the AUX3 VSAM file. The cycle continues: When AUX2 fills up, a swap is done to AUX1 and the data on AUX2 is written to the AUX3 VSAM file, and so on.

A swap also occurs when the started task comes down.

To initiate a manual swap, issue the following command:

```
/F taskname,SYN,MRTSWAP
```

where *taskname* is the started task name, SYN is the application name, and MRTSWAP is the command name.

> **NOTE** If you are about to run an MRT report job to see the latest references (while the started task is up), a manual swap will ensure that the MRTAUX3 VSAM file contains the most recent data collected by the intercepts.

6 A batch report is available to see which data sets and members have been referenced; a batch program and JCL are provided. By specifying various filter parameters, you select the reference data that displays on the report. This report can also show which data sets and members have not been referenced (a Zero Reference Report). A Zero Reference Report is useful for determining, for example, which software modules are seldom or never used.

7 E-mail notifications are available for the post-approval of changes.

Detection and Synchronization Component

This component determines whether two environments, data sets, groups of data sets, or volumes (local or remote) differ. The following types of data sets are supported:

- Partitioned (PDS and PDSE)
- Physical Sequential (PS)
- Extended Sequential (PS)
- Direct Access (DA)

ChangeMan SSM creates fingerprint data sets that consist of tokens (called base and target fingerprints) representing the contents of each environment. Evaluating these tokens reveals any differences between the data sets in each base and target environment. This process also identifies missing data sets, missing members, and newly-allocated data sets. The Detection and Synchronization component can then synchronize the two environments (base and target) to make them identical.

To synchronize the data sets, the Detection and Synchronization component creates a change basket (a single PS data set) that contains all of the data components required to make the two environments identical. The change basket can be transferred (using NDM, FTP, or other communication software), and imported into one or more target environments.

Optionally, a reverse change basket can be generated during the import process. This enables a backup of the environment components affected by the APPLY process, thereby automating the back-out process (if necessary).

By using the fingerprint tokens, the Detection and Synchronization component can compare any two environments, regardless of size or naming conventions.

To detect changes over a period of time, a single previously-generated fingerprint data set may be referenced to provide the environment. This fingerprint data set represents the "before" change environment, while the current data sets on DASD are re-fingerprinted to represent the current environment. This is performed by the REFTARG command.

The Detection and Synchronization component provides extensive masking capabilities that enable you to look for the actual code differences in source/load modules, rather than search for superficial differences (such as an embedded date or time). In conversion projects, large groups of data sets can be scanned to locate a user-specified string. Masking is ignored during synchronization operations to ensure that the synchronized environments are identical.

Functions for HFS Files

For HFS files, you can compare local or remote software environments, detect changes, and verify synchronization. You can perform the following tasks for HFS files:

- Fingerprint a group of HFS files.

- Compare two HFS fingerprint data sets and report differences.

- Capture changes into an HFS change basket.

- Apply an HFS change basket to synchronize environments.

- Use path modeling to compare files in different locations, as well as update a location with a different path.

Data Extraction Component

The Data Extraction component uses record-level fingerprint tokens to detect changes in data files. This facility supports VSAM KSDS and any flattened file. Examples of flattened files are VSAM clusters (RRDS, ESDS, LDS) flattened with IDCAMS REPRO, DB2 tables flattened with DSN1COPY, and any other file type that can be flattened to a physical sequential file. VSAM KSDS is directly fingerprinted, with the keys and record-level tokens stored in a fingerprint data set. Flat files are fingerprinted as keyed or non-keyed files, depending on the nature of the data file.

The Data Extraction component is capable of synchronizing KSDS files. Two local or remote clusters can be fingerprinted to determine the differences, or the same cluster can be fingerprinted at two different times to determine the files changes over time. The record-level differences are exported to a VSAM change basket, and then imported to local or remote clusters for synchronization.

The same facility can be used to identify and package the daily updates in very large VSAM KSDS files and flat files. ChangeMan SSM provides optional parameters for selecting specific record types and fields, which allow field-level changes to be detected. Changed records are extracted and exported to a change basket. This change basket can then be used to update other databases (even those residing on other platforms). A facility for editing VSAM change baskets enables additional customizing options.

A live, side-by-side comparison, can be invoked for any two text files, including PDS members (source or load) and physical sequential files or flattened databases.

Uses of ChangeMan SSM

ChangeMan SSM is used primarily in the following areas:

- Change tracking and audit

- Systems assurance

- Centralized maintenance, software distribution, disaster recovery, and production site synchronization as an alternative to mirroring.

- Changed data extraction for VSAM KSDS and any flat files (unloaded DB2, IMS, and so on).

- Enhanced problem determination and recovery.

- Assistance with data center consolidations and mergers/acquisitions.

Each component of ChangeMan SSM has a specific design objective as outlined below.

Change Tracking Component

Use the Change Tracking Component to:

- Track changes in critical application and system components at the member level.

- Track data sets and members that have been referenced (Member Reference Tracking).

- Generate a custom-made change report or utilize online query functions.

- Automatically back up changed PDS members to a central location as the changes occur.

- Review prior member versions online.

- Restore the desired members online without operator interventions or tape mounts.

- Reconstruct an entire PDS as of a date-time.

- Report authorized and unauthorized changes.

- Determine the byte-level differences using ChangeMan SSM's side-by-side report facility, COMPAREX, or IBM's SuperC.

Detection and Synchronization Component

Use the Detection and Synchronization Component to:

- *Compare* local or remote software environments.

- *Detect* changes in local or remote software environments.

- *Verify* synchronization between local and remote software environments.

- *Report* byte-level differences in large environments, passing on *only the changed PDS members* to ChangeMan SSM's side-by-side compare facility, COMPAREX or IBM's SuperC.

- *Verify* that current source and production load modules match.

- *Ensure* that software has been properly distributed and installed.

- *Maintain* all LPARs from a central location.

- *Package* software changes in a single physical sequential file (Change Basket).

- *Save Resources* by transmitting only the changes to other sites using FTP, Connect:Direct or the user's preferred software.

- *Apply* Change Baskets using the IMPORT command.

- *Verify* the proper installation of the change package.

- Facilitate data center consolidation and migration.

- *Synchronize* multiple LPARs, operating environments and software packages in local or remote CPUs.

- *Eliminate* redundant data sets and members (by content) in either a group of concatenated data sets, a pool of volumes or the entire data center.

- *Avoid* full volume and data set transmissions from one location to another by transferring only the changed components.

- *Identify* mismatched/missing data sets, DCB differences, directory differences, and SPACE differences between environments.

Data Extraction Component

Use the Data Extraction component to:

- Fingerprint VSAM KSDS and any flat files (unloaded databases such as DB2 or IMS).

- Identify differences between two local or remote VSAM KSDS files.

- Compare data files at the record level for any flat files or unloaded databases.

- Detect changes in data files over time (VSAM, PS, DA, and flattened databases).

- Extract changed data to update other flat files or databases.

- Package VSAM KSDS changes in a single physical sequential file (change basket) to synchronize other clusters at local or remote environments.

- Apply VSAM change baskets using the VSAM IMPORT command.

- Undo the VSAM KSDS updates imported from a VSAM change basket (if necessary) using the VSAM reverse basket.

Security

Security measures already in place on your system are fully observed by ChangeMan SSM. When a file is fingerprinted, full track or cylinder read techniques are used instead of standard open/read. This approach, however, does not reveal any data, and does not violate security rules.

The result of a file fingerprint is a token that represents the data. Data cannot be reconstructed from a token. When a change basket is created, an open is issued to ensure the observance of security rules. At the time of applying a change basket, the same standards are observed.

For ISPF users, TSO authorization is established through the provided SVC 109 routine. ChangeMan SSM is also compatible with other authorization packages, such as RACF®, CA-ACF2®, or CA-Top Secret®.

APF Authorization

ChangeMan SSM modules are link-edited with the attribute AC=1. The modules must be executed from an APF-authorized library because they perform full track reads for 3380 devices, and full cylinder reads for 3390 devices.

Chapter 2
Change Tracking Component

The Change Tracking component monitors selected data sets and files for any change in content. You can also track references to selected members using the Member Reference Tracking (MRT) facility of Change Tracking.

NOTE The Change Tracking component intercepts all changes to data sets being tracked. However, it is possible for some changes that occur in rapid succession to be skipped while events are being recorded. For example, if member XYZ is updated by events A, B, and C within seconds of each other, it is possible that only events A and C will be recorded.

Main Menu

Following is the *ChangeMan SSM Main Menu*, the initial menu for ChangeMan SSM.

```
HPS@PRI1 ---- ChangeMan SSM Main Menu (Ver 8.4.0)   Time: 13:49:14 ------------
Option ===>

Select one of the highlighted functions:

0 Options                    - Review or Modify Parameters

A Administration             - Change Tracking Administrator Functions
C Change Tracking            - History, Problem Determination, Recovery
Z HFS Change Tracking        - HFS History, Problem Determination

S Detection and Synchronization - Detect Changes and Synchronize MVS data
H HFS - Detect and Synchronize  - Detect Changes and Synchronize HFS data
D Data Extraction            - Extract Changed Data in KSDS, other VSAM,
                               PS or DA files and Flattened Databases
U Utilities                  - Utilities and Self-guided Product Demos

X Exit
                          ChangeMan SSM
              Copyright (c) 1999-2013 - Serena Software, Inc.
                        All Rights Reserved.


Press END to Exit
```

The change tracking functions are available through the following options on this menu:

- Option C - Change Tracking
- Option Z - HFS Change Tracking

NOTE Only designated administrators can access the administrative functions, and only designated Change Tracking users can access the tracking functions.

For detailed instructions on all Group Administrator and Change Tracking functions, refer to the *ChangeMan SSM Change Tracking User's Guide*.

Fingerprinting or Tracking Large Load Modules

When fingerprinting or tracking large objects (for example, those with a large number of events), it may be necessary to increase the region size of the job to avoid S878-10 ABENDs. Eligible jobs are those that execute HPSTRACK, HPSINTEG, HPSMAINT, HPSTRANS, and also the SSMSTAR started task.

Defining a Change Tracking Environment

To monitor the changes in a software package, you must first define it to the Change Tracking component. Then, member-level changes such as *add, delete, update, rename, zap, link edit*, and so on are detected using either of the following options:

- in real time using Real Time Change Tracking (RTCT)

- by a batch program scheduled to run automatically at pre-determined intervals (Batch Interval Change Tracking or BICT)

The batch program can run for either all groups (HPSGLOBE), or for selected groups (CAPTURE).

If Real Time Change Tracking (RTCT) has been implemented, the HPSGLOBE program does not need to run. The HPSGLOBE facility, however, can be used to identify changes even if the HPSRTO started task is down for periodic system maintenance or other reasons.

To define a Change Tracking environment, three functions must be performed by a Group Administrator:

1 Define an Object Group.

2 Define Objects in the Group.

3 Authorize Users to work with the Group.

1. Define an Object Group

To define an object Group, enter Option 2 on the *Change Tracking Administration* menu.

If Option 2 is entered on the *Change Tracking Administration* menu and the Department name is also entered, skip the following panel.

If Option 2 is entered without entering the Department name, the following panel displays:

```
HPS@ADM2          Available Departments for User - USER001        Row 1 of 1
Command ====>                                               SCROLL===> CSR

Select (S) a department from the list below:

Press ENTER to continue or END to exit

   Department         Description          Group Count
   ----------------   --------------------   -----------
_  TECHDOCDEPT        Doc Development_____      0001

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

Type 'S' next to the department that you want to administer, then press Enter.

Type 'X' and press Enter to exit the panel.

The following table describes the functions available from the *ChangeMan SSM Available Departments for User* panel.

Parameter	Description
Line Command	The line command specification area, directly preceding each line of the department information area, is the active point of this panel. S select the Department
Department	The name of the department
Description	The description of the department
Group Count	The number of groups attached to the department

This is the menu for the Department Administrator.

```
HPSMNUDA ------- Department TECHDOCDEPT      Administrator Menu ---------------
Option ===>

Department Administrator Options:

1  Define Groups                   - Add new group(s) to the department
2  Delete Groups                   - Remove group(s) from the department
3  Display Groups                  - List all groups in the department

4  Define HFS Groups               - Add new group(s) to the department
5  Delete HFS Groups               - Remove group(s) from the department
6  Display HFS Groups              - List all groups in the department

7  Refresh ISPF Tables             - Refresh user authorization tables

X  Exit

Press END to Exit
```

Only a designated Department Administrator has access to this panel and its functions. The Department Administrator can create, remove, update, and display groups for the specified department. Type '1' for the Define Groups option, then press Enter.

Type 'X' and press Enter to exit the panel.

The following table describes the functions available from the *ChangeMan SSM Department Administrator Menu*.

Function	Description
1	Define Groups. This option enables the addition of groups to the department.
2	Delete Groups. This option enables the removal of groups from the department.
3	Display Groups. This option lists the groups, departments, their descriptions and their group counts.
4	Define HFS Groups. This option enables the addition of groups to the department.
5	Delete HFS Groups. This option enables the removal of groups from the department.

Function	Description
6	Display HFS Groups. This option lists the groups, departments, their descriptions and their group counts.
7	Refresh ISPF Tables. This option refreshes the user authorization tables.
X	Exit. This option exits the panel.

Option 1 of the Department Administrator menu defines groups. The Department Administrator can define new groups.

```
HPSCONG3    Define Groups - Department TECHDOCDEPT            Row 1 of 7
Command ===>                                          SCROLL===> CSR

To define Groups, enter each Group Name on a new line

Lcmd: (I)nsert, (D)elete a blank line or an empty (*) Group

Press ENTER to continue or END to exit

     Group Name   User Count   Object Count    Creation Date
_  * XYZ06DOC       0002           0000         2010/05/18
_     _____
_     _____
_     _____
_     _____
_     _____
_     _____

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

The Department Administrator may define one or more object groups for tracking objects. The object group is defined in the object master database. There are two restrictions for creating a group:

- The group name is limited to eight characters.

- The group name must be a unique name within the department.

If SAF security is in use, READ access to the department profile must be given to any Group Administrator within the department.

Enter the group name on an empty line or enter an "I" in the line command column to create an empty line, then press Enter to create a new group.

When the group is created, the department admin ID will be automatically added as a user in the new group.

Press End to exit the panel.

The following table describes the parameters displayed in the *Define Groups* panel.

Parameter	Description
Department	The name of the department is displayed on the top line.
Line Command	The line command specification area, directly preceding each line of the department information area, is the active point of this panel. I insert a blank line following the current line. D delete the current line or the empty group, which is indicated by an asterisk (*) to the left of the name of the group.
Group Name	The name of the group
User Count	The number of users attached to the group
Object Count	The number of objects attached to the group
Creation Date	The date on which the group was created

NOTE When you first enter ChangeMan SSM, ISPF tables are built from the Object master. The ISPF tables are automatically updated whenever you make online updates. The ISPF tables are *not* updated if a batch job, or another administrator acting on your behalf, updates information. To avoid exiting and re-entering ChangeMan SSM to rebuild the tables, you may enter Option R to issue the REFRESH command from the *Group Administrator Menu* to refresh the ISPF tables.

2. Define Objects in the Group

You can define objects within a group using either:

- the online Change Tracking Facility

- a batch job

The batch method is recommended over the online method when you have many data sets to be initialized to the Change Tracking component. This is because the online facility will tie up your ISPF session while defining the data sets.

The online method will be described first. The batch method is described in "Defining Objects Using JCL" on page 34.

To define objects in a Group, enter Option 3 on the *Change Tracking Administration* menu.

If Option 3 is entered on the Change Tracking Administration menu and the department name is also entered, skip the following panel.

If Option 3 is entered without entering the department name, the following panel displays:

```
HPS@ADM2           Available Departments for User - USER001         Row 1 of 3
Command ====>                                             SCROLL===> CSR

Select (S) a department from the list below:

Press ENTER to continue or END to exit

   Department        Description            Group Count
   ---------------   --------------------   -----------
_  UTLCOM            UtlCom Internal_____       0004
_  SOFTWAREDEVELOP   Software Development       0004
_  TECHDOCDEPT       Doc Development_____       0001

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

Type 'S' next to the department that you want to administer, then press Enter.

Type 'X' and press Enter to exit the panel.

The following table describes the functions available from the *ChangeMan SSM Available Departments for User* panel.

Parameter	Description
Line Command	The line command specification area, directly preceding each line of the department information area, is the active point of this panel. S select the department
Department	The name of the department
Description	The description of the department
Group Count	The number of groups attached to the department

This is the primary panel for the Group Administrators.

```
HPSMNUGA ------- Group Admin Menu - Department UTLCOM              --------------
Option ===>


Select one of the highlighted functions:

0  Data Set Filtering             - Update Excluded Data Set list

1  Define Objects                 - Add object(s) to Change Tracking
2  Delete Objects                 - Release object(s) from tracking
3  Display Objects Within Group   - All objects defined to the group
4  Display All Objects            - All objects defined to all groups
M  Move Objects                   - Move object(s) to another group

5  Authorize Users                - Make a group available to user(s)
6  Update Name or Profile         - Update user's name or SAF profile
7  Revoke Users                   - Make a group unavailable to user(s)
R  Refresh ISPF Tables            - Refresh user authorization tables

A  Alternate Group Administrators - Assign or Revoke

X  Exit


Press END to Exit
```

Only assigned Group Administrators have access to this panel and its functions. Group Administrators are named and managed by the Department Administrators. ChangeMan SSM Group Administrators manage one or more object groups by controlling:

■ All of the object groups currently defined in the selected Department.

■ Users' access to the object groups.

To set up the Change Tracking Component, you must execute Options 1 and 5 from this panel.

Type '1' to define objects, then press Enter.

The following table describes the functions available from the *ChangeMan SSM Group Admin Menu*.

Function	Description
0	Data set filtering. This option allows the user to update the Excluded Data Set list.
1	Define Objects. This option defines objects to a previously-defined object group.
2	Delete Objects. This option deletes objects (data sets) from an object group.
3	Display Objects Within Group. Displays all objects defined to the group.
4	Display All Objects. Display all objects defined to all groups.
5	Authorize Users. Make a group available to user(s).
6	Update Name or Profile. Update a user's name or SAF profile.
7	Revoke Users. Make a group unavailable to a user.
R	Refresh ISPF tables. Refresh the user authorization tables.

Function	Description
A	Alternate Group Administrators. Used in TSO ID Security.
X	Exit. Exits this panel.

Option 0 (zero) of the Group Admin Menu is the panel for updating the Excluded Data Set list. Only the designated Group Administrator has access to this panel and its functions.

This panel is used to create and maintain a persistent list of explicit DSNs or DSN patterns which you don't wish to track. Data set names, retrieved from the catalog and displayed using the *Define Objects* panel will not include those which match an entry in this list.

In Batch mode, an EXCL statement will be generated for each entry in this list.

```
HPSDSFLT Update Excluded Data Set List (Change Tracking)        Row 1 of 9
Command ===>                                            SCROLL===> CSR

Lcmd: (D)elete, (I)nsert, (R)epeat.

Press END to save changes, CANCEL to exit without saving.

   Data Set Name or Pattern

_   0LOG_____
_   3LOAD/_____
_   _____
_   _____
_   _____
_   _____
_   _____
_   _____
_   _____

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

The following table describes the functions available from the *Update Excluded Data Set List (Change Tracking)* panel.

Function	Description
Line Command	The line command specification area directly precedes each line of the data set name or pattern. D delete the current line. I insert a blank line following the current line. R repeat the current line.
Data Set Name or Pattern	The name of a data set to be excluded or a data set name pattern as described in the Appendix of the *Detection and Synchronization Guide*.

When you are finished, press End/PF3 to save your changes, or type CANcel on the command line and press Enter to exit the panel without saving.

Option 1 of the Group Admin menu defines objects for tracking in an object group. The object group must have been defined previously.

```
HPSCONG2     Define Objects - Department UTLCOM                    Row 1 of 4
Command ===>                                              SCROLL===> CSR


Enter S to Select the Group where Objects will be defined.


Lcmd: (S)elect


Delta Tracking      ===>  Y          (Y or N; applies to PDS(E) data sets only)
Cataloged Data Sets ===>  Y          (Y or N)
Object Define Mode  ===>  ONLINE     (ONLINE or BATCH)


Press ENTER to continue or END to exit


     Group Name    User Count    Object Count    Creation Date
_      ACCTSPAY      0001            0000           2010/04/28
_      ACCTSREC      0001            0001           2010/04/28
_      HUMANRSC      0001            0000           2010/04/28
_      LEGAL         0001            0001           2010/05/30
_      PAYROLL       0002            0004           2010/04/28


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

Data set change tracking can be done as delta, or non-delta tracking. Non-delta tracking only detects the change events without identifying the actual changes. Delta tracking detects the change events and backs up the changed members to the ChangeMan SSM database.

How to use this panel:

1   Change the default values for the Delta Tracking, Cataloged Data Sets, and Object Define Mode fields, if necessary.

2   Select the group where objects are to be defined by entering an S next to the group name.

3   Press Enter.

The following table describes the parameters displayed in the *Define Objects* panel.

Parameter	Description
Department	The name of the department is displayed on the top line.
Delta Tracking	Y indicates that the objects being defined will be delta tracked. At the time of capture, in addition to change events being detected, the new members and changed members are identified and backed up to the delta master database. N indicates that non-delta tracking is in force, and, therefore only change events are detected and stored in the site master database. If delta tracking is requested, the group admin will receive an HPS048E message to confirm the tracking request. This is a safeguard to eliminate any unnecessary expansion of the delta master database space requirements. Delta Tracking Facility is for PDS members only.

Parameter	Description
Cataloged Data Sets	Y indicates that the objects being defined are cataloged. In this case a catalog search is performed to show a list of all matching objects. N indicates that the objects are not cataloged. A panel is provided where the user can specify the required volser specification to build the JCL.
Object Define Mode	ONLINE indicates that a limited number of objects are being defined. BATCH indicates that a large number of data sets will be defined, and therefore, the batch method is the recommended method. BATCH will display a panel to create, save, and/or submit the batch JCL.
Line Command	S denotes Select, which causes the software to select the object group for next step processing.
Group Name	All of the object groups that are currently associated with this group admin UserID, and in which the Group Administrator is defined as a user.
User Count	The number of users currently assigned to each object group.
Object Count	The number of objects that are being tracked in each object group.
Creation-Date	The creation date of each object group.

The previously-selected object group is to have one or more objects defined as members of the object group. These are the data sets to be tracked.

```
HPSCONOR                        Define Objects                     Row 1 of 3
Command ====>                                            SCROLL===> CSR


Enter one or more explicit or generic DSN(s) on each line

Lcmd:  (I)nsert, (R)eplicate, (D)elete

Press ENTER to continue or END to exit

Department, Group Name ===> UTLCOM, ACCTSREC
Type of data set(s)     ===> NONVSAM              (VSAM, NONVSAM, All)

   Explicit or Pattern DSNs, similar to ISPF 3.4
_  _____
_  _____
_  _____

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

Type a value for the Type of data sets field, and data set names for the Explicit or Pattern DSN fields.

Note that any Data Set Filtering specified in Option 0 on the *Group Admin Menu* will be applied before the objects are defined. If the object or pattern of objects are filtered out by Data Set Filtering, they cannot be defined.

The following table describes the fields on the panel:

Parameter	Description
Department, Group Name	The department and the group name of the objects being defined.
Type of data sets	VSAM indicates that the objects being defined are VSAM clusters. Accordingly, only VSAM clusters are resolved from the pattern specified. NONVSAM indicates that objects being defined are not VSAM. This will cause suppression of VSAM clusters from the resolved list. ALL signifies that both VSAM and non-VSAM objects will be selected.
Line Command	I denotes Insert; insert a blank line following the current line. R denotes Replicate; repeat the current line. D denotes Delete; delete the current line.
Explicit or Pattern DSNs	Data Set Names (Objects) Type the explicit data set names and/or those generic data set names that you want to comprise this object group. Any number or type of data sets may be entered for an object group. There are no restrictions as to the type of data set in a group; different types of data sets (source, load) may coexist in a group. If necessary, use the Lcmd commands and scrolling to manipulate beyond the limits of the initial panel. Data sets can be added or deleted at any time to an existing group.

Optionally, enter line commands for the Explicit or Pattern DSN fields, then press Enter.

Defining Objects Using JCL

Objects can also be defined to the Change Tracking component in batch mode. The following JCL uses the DEFINEDS command to define the same objects shown in the previous online definition panels. The GENERIC parameter resolves data sets through a catalog search. Once the JCL is executed, the data sets are internally Fingerprinted and the tokens are saved in the Site Master. When delta tracking is requested (DELTA=Y), the members are initially backed up and stored in compressed form in the Delta Master.

```
//STEP1    EXEC PGM=HPSTRACK,REGION=4096K
//SYSPRINT DD  SYSOUT=*
//HPSIN    DD *
  DEFINEDS=(GROUP=NEWGRP01,
            DEPARTMENT=USER17,
            DELTA=Y,
            GENERIC=(USER17.LPARB))
  /*
```

NOTE This JCL will be built for you by selecting the BATCH option on the Define Objects panel.

For more batch examples, refer to the DEF* jobs in the SAMPLES library.

3. Authorize Users to Work with an Object Group

One or more users can be authorized to work with an Object Group.

When a Department Administrator defines a Group, that individual automatically becomes a user of that Group. Option 5 of the Group Admin menu authorizes other users to access the object group to view change events.

The reason for Groups, and users in Groups, is that ChangeMan SSM users want to see their tracking environment only (data sets they define to tracking that they are concerned with), not all tracked data sets.

First, select the desired object group.

```
HPSCONG3     Authorize Users - Department UTLCOM                    Row 1 of 4
Command ===>                                          SCROLL===> CSR

To Authorize User(s) to a Group, enter S to select the Group first.

Lcmd: (S)elect

Press ENTER to continue or END to exit

     Group Name    User Count    Object Count    Creation Date
_      ACCTSPAY      0001            0000           2010/04/28
_      ACCTSREC      0001            0001           2010/04/28
_      HUMANRSC      0001            0000           2010/04/28
_      LEGAL___      0001            0001           2010/05/30

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

Type the S (Select) command for the desired group name, then press Enter. This parameter is required.

The following table describes the parameters displayed in the *Authorize Users* panel:

Parameter	Description
Department	The department in which the groups exist is displayed on the top line.
Line Command	S denotes Select; it causes the software to select the object group for the next step of processing.
Group Name	All the groups that are currently associated with this Group Administrator.
User Count	The number of users currently assigned to each object group.
Object Count	The number of objects that are currently being tracked in each object group.
Creation Date	The creation date of each object group.

You must specify the TSO UserID for the user, and specify the name of the person receiving authorization associated with this TSO UserID.

```
HPSCONU2              Authorize Users - Group ACCTSREC              Row 1 of 4
Command ====>                                           SCROLL===> CSR

To authorize a User, enter the user's TSOid and name on a new line.

Lcmd: (I)nsert, (D)elete

Press ENTER to continue or END to exit

   Userid       Name
_  USER001_     UtlCom Internal_____
_  _____     _____
_  _____     _____
_  _____     _____

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

Enter one or more names in the UserID and Name fields, then press Enter.

NOTE If a group is authorized by a SAF profile, a slightly different panel will display where you may enter the SAF profile name.

The following table describes fields on this screen:

Parameter	Description
Group Name	The object group previously selected. This is not an editable field.
Line Command	I – Insert; insert a blank line following the current line. D – Delete; deletes the current line. A user already authorized cannot be deleted using this command. This is for editing only; lines generated in editing may be deleted.
UserID	The valid TSO UserID of the person being authorized as a user is entered.
Name	The name of the person being authorized as a user is entered. Names may be up to twenty characters.

A message (Authorized) indicates the result of the authorization request.

Using JCL to Authorize Users

Refer to the USERADD member in the SAMPLES library for a batch example of authorizing users.

Querying Change Events

Change events are stored in the Site Master database. Change events can be viewed for specific objects in a group or for all objects in a group. The ability to view the events for an entire object group allows you to quickly determine if there has been any particular activity (such as a ZAP) for any of the objects in the group. If you are tracking a group of critical load libraries, the fact that there have been no ZAP events in the entire set is very important information for auditors and quality assurance groups.

The Objects you define will be known to RTCT within 60 seconds. To query change events in this exercise, make a change to a tracked data set and browse the SYSPRINT of the started task to view the event (this requires that the SYSPRINT=YES parameter was specified in HPSPARMS during the product installation). If RTCT is not in use, then the batch capture must be used to detect changes.

1. Displaying the Query Panel

To get started, choose Option C from the *ChangeMan SSM Main Menu* to display the Change Tracking User Menu.

```
HPSMENUU ------------ Change Tracking User Menu - USER001 --------------------
Option ===>

1  Capture Object or Browse Events    - Make Object Tracking current
2  Capture Group and Browse Events    - Make Group Tracking current
3  Query Events and Report            - Show Events in an Object or Group

4  Recover Members                    - Recovery of changed members
5  Recover Entire PDS through Batch   - Recovery of all members to a date/time

6  Tracking Summary on an Object      - Object physical characteristics
7  Tracked Groups                     - List of Tracked Groups
8  Tracked Objects                    - Tracked Objects in all Groups

9  Compare Filtered Members           - Side by Side (Source or Load)

L  Load Tracking Data to a DB2 table  - Loads tracking data for DB2 query

V  View TSO notifications             - Receives RTO TSO notification messages

X  Exit

Press END to Exit
```

Option 3 allows you to query events by type or category.

Enter an S to select a single object, or G to include all objects events in the group. In the following example, all objects in the XYZ67DOC group will be selected.

```
HPSUGR2      Query Events  ( Last Global: 2010/09/26_17:24 )       Row 1 of 3
Command ===>                                              SCROLL===> CSR

To Query events, by TYPE or CATEGORY, enter a line command.

Lcmd: (S) Select a Department-Group and then an Object within the Group.
      (G) Select all the Objects within a Department-Group.

Press ENTER to continue or END to exit
                                            Total      Delta-Tracked
  Department        Group     Creation-Date Object Count  Object Count
_ TECHDOCDEPT       XYZ83DOC    2010/05/18       3             1
_ TECHDOCDEPT       TSTDEF01    2010/09/18       0             0
G TECHDOCDEPT       XYZ67DOC    2010/06/12       0             0
***************************** Bottom of data *******************************
```

After selecting a group (or a specific object within a group) from the *Query Events* panel, a statistical table of events is created for the object(s). In the following example, a summary of event statistics is displayed for all of the objects in the XYZ67D0C group.

```
HPSUEV1                 Events Statistics for Group: XYZ67D0C
 Command ====>


 Enter S to select Type(s) and/or Category from one column at a time.


 Object: All Objects in the Group have been evaluated       Events: 6,100
                                         Last Global:  2005/08/15_15:57
 ( _ )  1202 Added     ( _ )    47 Uncat    Last Capture: n/a
 ( _ )  1218 Delete    ( _ )     0 DS-upd
 ( _ )  1670 Update    ( _ )   198 Reloc
 ( _ )   276 Status    ( _ )    24 Comprs
 ( _ )    43 Linked    ( _ )     1 Scrtch   ( _ )     0 VS-upd
 ( _ )     0 Zapped    ( _ )    84 Migrat   ( _ )     0 VS-reo
 ( _ )     7 Rename    ( _ )     0 NameTo   ( _ )     0 VS-def
 ( _ )  1307 Backup    ( _ )     0 NameFr   ( _ )     0 VS-del
 ( _ )    23 Restore   ( _ )   354 DATASET  ( _ )     0 VSAM
 ( _ )  5746 MEMBER (Selects all events except Backup and Restore)


 Optional: Member Selection:      ==>                           * Pattern
           Other Filters: Jobname ==>          Userid ==>
           Period: Last n Hours   ==> 99                        1 thru 99
                 or Yesterday     ==>                           Y or blank
                 or Last n Days   ==>                           1 thru 999
                 or Date Range    ==>          To ==>           yyyy/mm/dd
```

The ability to view the events for an entire object group makes it possible to quickly determine if there has been any particular activity (such as a ZAP) for any of the objects in the group. If you are tracking a group of 100 critical load libraries, the fact that there have been no ZAP events in the entire set is very important information for auditors and quality assurance groups.

Items on the Event Statistics for Group panel:

Parameter	Description
Group name	The selected group name is displayed in the heading.
Object	The object name, if a specific object was selected; otherwise, "All Object(s) in the Group have been Evaluated" is displayed.
Events	The total number of events evaluated.
Event types and categories	Enter an S in the associated field to select event types or an event category. Event categories are displayed in upper case; the categories are: MEMBER – Includes all member type events in the 1st column. DATA SET – Includes all data set level events in the 2nd column. VSAM – Includes all VSAM types of events in the 3rd column. When a category is selected, all event types in the selected category are displayed (except as noted below). Selected events and categories can be restricted by using the optional *Member Selection*, *Other Filters*, and *Period* fields.

Parameter	Description
Event types and categories (continued)	Event types in the MEMBER category (column one): Added – Member added to a PDS. Delete – PDS member deleted from a PDS. Update – PDS member whose content has changed. Status – PDS member whose status has changed (ISPF user fields). Linked – A member in a load library has been link-edited. Zapped – A member in a load library has been zapped. Rename – A member in a PDS has been renamed. Backup – A member in a PDS has been updated and hence, backed up by the last capture. Restore – A member in a PDS has been restored by ChangeMan SSM's RESTORE/RECALL function. MEMBER category – Although the total includes all events in the MEMBER category, selecting this category for the statistics report will exclude Backup and Restore events.
	Event types in the DATA SET category (column two): Uncat – An object has been uncataloged. DS-upd – A non-PDS object has been updated. Reloc – An object has been relocated on the DASD. Comprs – A PDS object has been compressed. Scrtch – An object has been scratched. Migrat – An object has been migrated to another volume. NameTo – An object has been renamed to a new name. NameFr – An object has been renamed from an old name. DATA SET category – Includes all events in the data set category.
	Event types in the VSAM category (column three): VS-upd – VSAM data set has been updated. VS-reo – VSAM data set has been reorganized. VS-def – VSAM data set has been defined. VS-del – VSAM data set has been deleted. VSAM category – Includes all events in the VSAM category.
Member Selection	Optional. One or more explicit member names or member patterns can be specified, separated by commas. For example: HPS*,UTL*. To select all members, specify an *, or leave blank.
Other Filters	Optional. Select events by Jobname and Userid filters. Jobname – Enter an explicit or generic (ending in *) value. Events with a matching jobname will be included in the generated report. Userid – Enter an explicit or generic (ending in *) value. Events with a matching userid will be included in the generated report.

Parameter	Description
Period	Optional. A time range can be specified for the selected event types. Enter one of the following mutually-exclusive specifications; leave blank to *not* use the restriction: Last n Hours – Enter the number of hours to be included. For example, '24' indicates from the current time yesterday to the same time today. Yesterday – Enter a Y to restrict the statistics report to changes made yesterday. Last n Days – Enter the number of days to be included. For example, '002' indicates yesterday and today. Date Range – Enter the start date for a range of dates to be included in the statistics report. The *To* field is required when a start date is specified. The date format is yyyy/mm/dd.

To select event types or an event category:

1 Enter an S in the associated line command fields for the event or category.

2 Optionally, supply values for the Member Selection, Other Filters, and Period fields.

3 Press Enter to display a report of event statistics.

A report displays for the event types selected from the *Event Statistics for Group* panel. In this example, the MEMBER category was selected.

```
Menu  Utilities  Compilers  Help
 --------------------------------------------------------------------------------
 ISRBROBA   USER20.SYN05234.T1327294.OUTLIST           Line 00000000 Col 001 080
 Command ===>                                                  Scroll ===> PAGE
******************************** Top of Data *********************************
Command    Column  10        20        30        40        50        60        7
Count-seg  ....+....+....+....+....+....+....+....+....+....+....+....+....+....
   1-1  "EVENTS=(GROUP=XYZ67DOC,ADMIN=USER20,
    -2  "        INCLOBJ=/,
    -3  "        REPORT=(SELECT=(MEMBER),
    -4  "               HOURS=99))
       "*
  100 events currently for object: CEE.SCEERUN2
    1 events currently for object: XYZDEV.CMN5X0.TRACES.LINKLIB
    5 events currently for object: XYZDEV.CMN530I.CUSTOM.LINKLIB
  100 events currently for object: XYZDEV.CMN530U.ASSEMBLE
   89 events currently for object: XYZDEV.CMN530U.COPYLIB
   16 events currently for object: XYZDEV.CMN530U.DEVCUST.LINKLIB
  100 events currently for object: XYZDEV.CMN530U.LINKLIB
  100 events currently for object: XYZDEV.CMN540.BASE.LINKLIB
   15 events currently for object: XYZDEV.CMN540.DEVBASE.LINKLIB
   11 events currently for object: XYZDEV.CMN540.DEVSUBR.LINKLIB
    6 events currently for object: XYZDEV.CMN540.PROMO.LINKLIB
  100 events currently for object: XYZDEV.CMN540.TEST.LINKLIB
```

When you have completed reviewing the information, press End to specify the disposition for this report (print, delete, keep).

Then choose Option 3 from the *Change Tracking User Menu* to display the *Query Events* panel.

```
HPSUGR2     Query Events  ( Last Global: 2010/09/26_17:24 )       Row 1 of 3
Command ===>                                          SCROLL===> CSR

To Query events, by TYPE or CATEGORY, enter a line command.

Lcmd: (S) Select a Department-Group and then an Object within the Group.
      (G) Select all the Objects within a Department-Group.

Press ENTER to continue or END to exit
                                             Total      Delta-Tracked
  Department        Group     Creation-Date Object Count Object Count
_ TECHDOCDEPT       XYZ83DOC   2010/05/18       3             1
G TECHDOCDEPT       TSTDEF01   2010/09/18       0             0
_ TECHDOCDEPT       XYZ67DOC   2010/06/12       0             0
```

2. Selecting a Group or Object for Event Query

From the Query Events panel, select a group using one of the following line commands:

Line Command	Function
S	Displays the Tracked Objects in Group panel, where you can select the objects to be queried.
G	Selects all of the objects in the group.

In the previous example, all objects in the TSTDEF01 group are selected.

3. Selecting an Event Type or Category

After you have selected the objects to be queried, the Events Statistics panel displays, where you can select change events by Type or Category. Member and Date filters are available to optionally restrict the event selection.

```
HPSUEV1                    Events Statistics for Group: TSTDEF01
 Command ====>

 Enter S to select Type(s) and/or Category from one column at a time.

 Object: All Objects in the Group have been evaluated        Events: 6,100
                                                 Last Global:  2005/08/15_15:57
 ( _ )  1202 Added      ( _ )    47 Uncat     Last Capture: n/a
 ( _ )  1218 Delete     ( _ )     0 DS-upd
 ( _ )  1670 Update     ( _ )   198 Reloc
 ( _ )   276 Status     ( _ )    24 Comprs
 ( _ )    43 Linked     ( _ )     1 Scrtch     ( _ )     0 VS-upd
 ( _ )     0 Zapped     ( _ )    84 Migrat     ( _ )     0 VS-reo
 ( _ )     7 Rename     ( _ )     0 NameTo     ( _ )     0 VS-def
 ( _ )  1307 Backup     ( _ )     0 NameFr     ( _ )     0 VS-del
 ( _ )    23 Restore    ( _ )   354 DATASET    ( _ )     0 VSAM
 ( s )  5746 MEMBER (Selects all events except Backup and Restore)

 Optional: Member Selection:      ==>                           * Pattern
           Other Filters: Jobname ==>          Userid ==>
           Period: Last n Hours   ==> 99                        1 thru 99
                   or Yesterday   ==>                           Y or blank
                   or Last n Days ==>                           1 thru 999
                   or Date Range  ==>          To ==>           yyyy/mm/dd
```

Select any field with a non-zero value and press ENTER. In the above example, the MEMBER category is selected.

The following report shows the partial results from the previous selection.

```
 Menu  Utilities  Compilers  Help
 --------------------------------------------------------------------------------
 ISRBROBA   USER20.SYN05234.T1327294.OUTLIST          Line 00000000 Col 001 080
 Command ===>                                                Scroll ===> PAGE
 ******************************** Top of Data *********************************
 Command    Column  10       20       30       40       50       60       7
 Count-seg  ....+....+....+....+....+....+....+....+....+....+....+....+....+....
    1-1    "EVENTS=(GROUP=TSTDEF01,ADMIN=USER20,
     -2    "          INCLOBJ=/,
     -3    "          REPORT=(SELECT=(MEMBER),
     -4    "               HOURS=99))
         "*
   100 events currently for object: CEE.SCEERUN2
     1 events currently for object: XYZDEV.CMN5X0.TRACES.LINKLIB
     5 events currently for object: XYZDEV.CMN530I.CUSTOM.LINKLIB
   100 events currently for object: XYZDEV.CMN530U.ASSEMBLE
    89 events currently for object: XYZDEV.CMN530U.COPYLIB
    16 events currently for object: XYZDEV.CMN530U.DEVCUST.LINKLIB
   100 events currently for object: XYZDEV.CMN530U.LINKLIB
   100 events currently for object: XYZDEV.CMN540.BASE.LINKLIB
    15 events currently for object: XYZDEV.CMN540.DEVBASE.LINKLIB
    11 events currently for object: XYZDEV.CMN540.DEVSUBR.LINKLIB
     6 events currently for object: XYZDEV.CMN540.PROMO.LINKLIB
   100 events currently for object: XYZDEV.CMN540.TEST.LINKLIB
```

Querying Events in Batch

Refer to the EVENTS member in the SAMPLES library for batch examples of querying events.

Recovering and Comparing Backup Versions of a Member

In this example, selected versions of a member are recovered and compared.

> **NOTE** Additional examples of recalling members can be found in the RECALL* members of the SAMPLES library.

Select Option 4 from the Change Tracking User Menu.

This option allows you to query events by type or category.

Enter an S to select a single object, or G to include all objects events in the group. In the following example, all objects in the XYZ67DOC group will be selected.

```
HPSUGR2      Query Events  ( Last Global: 2010/09/26_17:24 )        Row 1 of 3
Command ===>                                             SCROLL===> CSR

To Query events, by TYPE or CATEGORY, enter a line command.

Lcmd: (S) Select a Department-Group and then an Object within the Group.
      (G) Select all the Objects within a Department-Group.

Press ENTER to continue or END to exit
                                           Total      Delta-Tracked
  Department        Group     Creation-Date Object Count Object Count
_ TECHDOCDEPT      XYZ83DOC    2010/05/18        3            1
_ TECHDOCDEPT      TSTDEF01    2010/09/18        0            0
G TECHDOCDEPT      XYZ67DOC    2010/06/12        0            0
****************************** Bottom of data ******************************
```

Select Event Type or Event Category

After selecting a group (or a specific object within a group) from the *Query Events* panel, a statistical table of events is created for the object(s). In the following example, a summary of event statistics is displayed for all of the objects in the XYZ67DOC group.

```
 HPSUEV1               Events Statistics for Group: XYZ67DOC
 Command ====>


 Enter S to select Type(s) and/or Category from one column at a time.

 Object: All Objects in the Group have been evaluated        Events: 6,100
                                                  Last Global:  2005/08/15_15:57
 ( _ )  1202 Added      ( _ )    47 Uncat     Last Capture: n/a
 ( _ )  1218 Delete     ( _ )     0 DS-upd
 ( _ )  1670 Update     ( _ )   198 Reloc
 ( _ )   276 Status     ( _ )    24 Comprs
 ( _ )    43 Linked     ( _ )     1 Scrtch    ( _ )      0 VS-upd
 ( _ )     0 Zapped     ( _ )    84 Migrat    ( _ )      0 VS-reo
 ( _ )     7 Rename     ( _ )     0 NameTo    ( _ )      0 VS-def
 ( _ )  1307 Backup     ( _ )     0 NameFr    ( _ )      0 VS-del
 ( _ )    23 Restore    ( _ )   354 DATASET   ( _ )      0 VSAM
 ( _ )  5746 MEMBER (Selects all events except Backup and Restore)


 Optional: Member Selection:     ==>                                 * Pattern
           Other Filters: Jobname ==>          Userid ==>
           Period: Last n Hours  ==> 99                        1 thru 99
                   or Yesterday   ==>                          Y or blank
                   or Last n Days ==>                          1 thru 999
                   or Date Range  ==>          To ==>          yyyy/mm/dd
```

The ability to view the events for an entire object group makes it possible to quickly determine if there has been any particular activity (such as a ZAP) for any of the objects in the group. If you are tracking a group of 100 critical load libraries, the fact that there have been no ZAP events in the entire set is very important information for auditors and quality assurance groups.

Items on the Event Statistics for Group panel:

Parameter	Description
Group name	The selected group name is displayed in the heading.
Object	The object name, if a specific object was selected; otherwise, "All Object(s) in the Group have been Evaluated" is displayed.
Events	The total number of events evaluated.
Event types and categories	Enter an S in the associated field to select event types or an event category. Event categories are displayed in upper case; the categories are: MEMBER – Includes all member type events in the 1st column. DATA SET – Includes all data set level events in the 2nd column. VSAM – Includes all VSAM types of events in the 3rd column. When a category is selected, all event types in the selected category are displayed (except as noted below). Selected events and categories can be restricted by using the optional *Member Selection*, *Other Filters*, and *Period* fields.

Parameter	Description
Event types and categories (continued)	Event types in the MEMBER category (column one): Added – Member added to a PDS. Delete – PDS member deleted from a PDS. Update – PDS member whose content has changed. Status – PDS member whose status has changed (ISPF user fields). Linked – A member in a load library has been link-edited. Zapped – A member in a load library has been zapped. Rename – A member in a PDS has been renamed. Backup – A member in a PDS has been updated and hence, backed up by the last capture. Restore – A member in a PDS has been restored by ChangeMan SSM's RESTORE/RECALL function. MEMBER category – Although the total includes all events in the MEMBER category, selecting this category for the statistics report will exclude Backup and Restore events.
	Event types in the DATA SET category (column two): Uncat – An object has been uncataloged. DS-upd – A non-PDS object has been updated. Reloc – An object has been relocated on the DASD. Comprs – A PDS object has been compressed. Scrtch – An object has been scratched. Migrat – An object has been migrated to another volume. NameTo – An object has been renamed to a new name. NameFr – An object has been renamed from an old name. DATA SET category – Includes all events in the data set category.
	Event types in the VSAM category (column three): VS-upd – VSAM data set has been updated. VS-reo – VSAM data set has been reorganized. VS-def – VSAM data set has been defined. VS-del – VSAM data set has been deleted. VSAM category – Includes all events in the VSAM category.
Member Selection	Optional. One or more explicit member names or member patterns can be specified, separated by commas. For example: HPS*,UTL*. To select all members, specify an *, or leave blank.

Parameter	Description
Other Filters	Optional. Select events by Jobname and Userid filters. Jobname – Enter an explicit or generic (ending in *) value. Events with a matching jobname will be included in the generated report. Userid – Enter an explicit or generic (ending in *) value. Events with a matching userid will be included in the generated report.
Period	Optional. A time range can be specified for the selected event types. Enter one of the following mutually-exclusive specifications; leave blank to *not* use the restriction: Last n Hours – Enter the number of hours to be included. For example, '24' indicates from the current time yesterday to the same time today. Yesterday – Enter a Y to restrict the statistics report to changes made yesterday. Last n Days – Enter the number of days to be included. For example, '002' indicates yesterday and today. Date Range – Enter the start date for a range of dates to be included in the statistics report. The *To* field is required when a start date is specified. The date format is yyyy/mm/dd.

To select event types or an event category:

1 Enter an S in the associated line command fields for the event or category.

2 Optionally, supply values for the Member Selection, Other Filters, and Period fields.

3 Press Enter to display a report of event statistics.

View Event Statistics

A report displays for the event types selected from the *Event Statistics for Group* panel. In this example, the MEMBER category was selected.

```
 Menu  Utilities  Compilers  Help
 ------------------------------------------------------------------------------
 ISRBROBA  USER20.SYN05234.T1327294.OUTLIST        Line 00000000 Col 001 080
 Command ===>                                                Scroll ===> PAGE
******************************* Top of Data ********************************
Command    Column  10       20       30       40       50       60        7
Count-seg  ....+....+....+....+....+....+....+....+....+....+....+....+....+....
   1-1   "EVENTS=(GROUP=XYZ67DOC,ADMIN=USER20,
    -2   "         INCLOBJ=/,
    -3   "         REPORT=(SELECT=(MEMBER),
    -4   "                 HOURS=99))
         "*
  100 events currently for object: CEE.SCEERUN2
    1 events currently for object: XYZDEV.CMN5X0.TRACES.LINKLIB
    5 events currently for object: XYZDEV.CMN530I.CUSTOM.LINKLIB
  100 events currently for object: XYZDEV.CMN530U.ASSEMBLE
   89 events currently for object: XYZDEV.CMN530U.COPYLIB
   16 events currently for object: XYZDEV.CMN530U.DEVCUST.LINKLIB
  100 events currently for object: XYZDEV.CMN530U.LINKLIB
  100 events currently for object: XYZDEV.CMN540.BASE.LINKLIB
   15 events currently for object: XYZDEV.CMN540.DEVBASE.LINKLIB
   11 events currently for object: XYZDEV.CMN540.DEVSUBR.LINKLIB
    6 events currently for object: XYZDEV.CMN540.PROMO.LINKLIB
  100 events currently for object: XYZDEV.CMN540.TEST.LINKLIB
```

When you have completed reviewing the information, press End to specify the disposition for this report (print, delete, keep).

Defining Critical System Data Sets for Tracking

In addition to the online facility described in the previous pages, you can use the batch facilities of ChangeMan SSM to define larger groups of system or application data sets for member-level Change Tracking.

In the following JCL example:

- The first DEFINEDS command in selects all load libraries that match a specified data set name pattern and reside on a specified volume group. The data sets are defined to normal tracking (DELTA=N).

- The second DEFINEDS command defines a data set pattern resolved from the catalog as Delta-Tracked objects (DELTA=Y).

  Delta Tracking means that the members are stored in compressed form in the Delta Master when the data set is defined. When a change is detected, the changed member is compressed and saved as a new version in the Delta Master.

```
//STEP1    EXEC  PGM=HPSTRACK,REGION=4096K
//SYSPRINT DD    SYSOUT=*
//HPSIN    DD    *
TRACE=ON                              /* DEFAULT TRACE=OFF      */
DEFINEDS=(GROUP=LOADAPPL,             /* EXISTING GROUP NAME    */
          DEPARTMENT=SER12,           /* GROUP ADMIN NAME       */
          DELTA=N,                    /* DEFAULT IS DELTA=N     */
          TYPE=LOAD,                  /* ONLY LOAD LIBS         */
          INCLDSN=SER12.HPS/,         /* NAMELIST PATTERN       */
          INCLVOL=SER*)               /* REQUIRED WITH INCLDSN  */
*                                     /* OR EXCLDSN             */
DEFINEDS=(GROUP=SYSTEM,
          DEPARTMENT=SER12,
          DELTA=Y,
          GENERIC=SYS1.*,
          TYPE=(SRC,LOAD))
/*
```

> **NOTE** The DEF* members in the SAMPLES library provide more examples.

Chapter 3
Detection and Synchronization Component

The Detection and Synchronization component offers several functions that help you compare two individual data sets or data set software groups, local or remote. All of the Detection and Synchronization functions are available from the *Detection and Synchronization Menu*. Other functions, such as transferring PDS data sets or Change Baskets are available from the *Utilities Menu*.

This chapter gives an overview of detection and synchronization functions. For more detailed information, refer to the *ChangeMan SSM Detection and Synchronization Guide*.

Detection and Synchronization Menu

Choose option **S** (Detection and Synchronization) from the ChangeMan SSM Main Menu to display the *Detection and Synchronization Menu*.

```
HPSMENUT ------------ Detection and Synchronization Menu --------------------
 Option ===>

 0  Masking and Filtering  - Detection masking and Synchronization filtering

 1  Fingerprint           - Fingerprint an Environment
 2  Review Changes        - Detect changes to a Fingerprinted Environment
 3  Package Changes *      - Changes to an Environment; Current vs. FGP
 4  Package Data Sets *    - Export full data sets into a Basket
 5  View Basket           - Display the list of data sets and their actions
 6  Apply Basket *        - Apply changes to the Target Environment

 7  View Fingerprint      - Display data set names, attributes, and members
 8  Detect Changes        - Compare the Fingerprints of two Environments
 9  Package Changes *      - Changes to an Environment; FGP vs. FGP

 G  Generate Token        - Fingerprint Token for a single file or PDS member
 C  Check Synchrony       - Compare selected members in Environment(s)
 P  PDS Compare           - Produce a MEMTOMEM compare report for two PDS's
 S  Synchronize *         - Two local Environments, or just save a Basket

 A  Advanced Operations   - Batch jobs suitable for large Environments

 X  Exit                  - Press END to Exit
```

Many of the functions available from this menu are interactive. Options that generate batch JCL with ChangeMan SSM commands are indicated with an asterisk next to the option name. To create and save batch JCL for these functions, choose option A (Advanced Operations), and then select the corresponding function from the Advanced Operations Menu.

The Detection and Synchronization Menu is arranged by process. For example, to monitor the changes to a development environment, and collect those changes to update a remote environment, the first three options would be used. Begin this process by Fingerprinting the environment using option 1. After changes have been made, review them using option 2. After all changes have been made, reviewed, and approved, option 3 can be used to package all the changes into a single Change Basket.

At the remote environment, options 5 and 6 would be used to view the Basket contents, and then apply the Basket.

JCL

The commands and JCL for many of the examples can be found in the SAMPLES library.

Fingerprinting or Tracking Large Load Modules

When fingerprinting or tracking large load modules, it may be necessary to increase the region size of the job to avoid S878-10 ABENDs. Eligible jobs are those that execute HPSTRACK, HPSINTEG, HPSMAINT, HPSTRANS, and also the SSMSTAR started task.

Comparing Local Environments

Two local environments can be compared to identify their differences. Furthermore, multiple sets of libraries can be compared when they are associated explicitly by multiple BASE and TARGET commands.

Comparing with JCL

The following JCL illustrates how to perform a comparison in batch:

```
//STEP1 EXEC PGM=HPSTRANS,REGION=4096K
//HPSIN DD *
* -----------------------------------------------------------
* Report the exceptions only.
* -----------------------------------------------------------
 SETPRINT=(SYNC=N,MISMATCH=Y,OUTSYNC=Y)

  BASE=DSN=SYS1.LPALIB                   BASE is defined.
  TARG=DSN=SYS2.LPALIB                   TARGET is defined.
  EXTENDED=Y
  COMPARE=MEMTOMEM

  BASE=RESET                             BASE is cleared
  TARG=RESET                             TARGET is cleared

  BASE=DSN=SYS1.PANELS                   BASE is redefined.
  TARG=DSN=SYS2.PANELS                   TARGET is redefined.
  EXTENDED=Y
  COMPARE=MEMTOMEM=DETECT=(SBS=YES,COMPLETE=NO,ADD,UPD,DEL)
/*
```

The first command in this JCL defines the user reporting requirements. The SETPRINT parameter requests a report of matching member names that are different in content (Out-of-Sync). It also requests that the mismatched member names exist only in the Base and Target groups regardless of their contents. To report only the exceptions, you can specify SETPRINT=EXCEPTIONS=Y.

The COMPARE command, in its simplest form, determines the mode of comparison. MEMTOMEM implies that there is one PDS in the BASE, and one PDS in the TARGET. When the DETECT subparameter is specified, the out-of-sync members are passed to the data compare engine for a byte-level comparison. This can be a side-by-side (SBS) or traditional line-report. For more examples, refer to the SYNFAST* members in the SAMPLES library and the *ChangeMan SSM Detection and Synchronization Guide.*

Using the RESET parameter, the Base and Target environments are first cleared from memory, then redefined with another pair of BASE and TARGET commands.

Stacking commands (using the RESET parameter) allows you to set up versatile jobs. For detailed information on all the available batch processing commands, refer to *"Batch Detection and Synchronization"* in the *ChangeMan SSM Detection and Synchronization Guide*.

Comparing with the ISPF Interface

Choose option C (Check Synchrony) from the *Detection And Synchronization Menu* to compare two sets of libraries, and then select pairs of members for a byte level comparison. An example of the ISPF interface is provided in "Verifying the Synchrony of Two Environments" on page 60.

Fingerprinting an Environment

To compare two remote environments, the data sets are Fingerprinted and the Fingerprint results are saved to a physical sequential file. This small file, which represents an environment, can be transferred to other environments for comparison and synchrony verification.

In this example, a Fingerprint data set for a group of files (or a software package) is generated. The Fingerprint data set can then be used as a reference to determine whether the package has changed over time. It can also be used to compare with the same software package at local or remote environments.

You can perform the Fingerprinting process either online or with batch JCL.

■ Batch - use either of the following methods:

- Use the batch JCL described in "Fingerprint JCL" on page 56.

- A more comprehensive free-form panel is available for fingerprinting in batch mode: choose option A (Advanced Operations) from the *Detection and Synchronization Menu*, and then choose option 4 (Fingerprinting Large Environments) from the *Advanced Operations* menu.

■ Online - choose option 1 (Fingerprint) from the *Detection and Synchronization Menu*.

The online method is described in the following three steps.

1. Specifying the Base Environment

To begin, choose option 1 from the *Detection and Synchronization Menu* to display the *Create Fingerprint Data Set* panel. The data sets that comprise the software environment are specified on this panel either explicitly or as a pattern.

```
HPSURMT1                   Create Fingerprint Data Set              Row 1 of 13
 Command ====>                                           SCROLL===> CSR

 Enter one or multiple Explicit DSN(s) and/or DSN Pattern(s) on the lines below.

  Specify a NEW or Existing Fingerprint DSN:
    Fingerprint DSN (PS) ===> LPARB.DATASETS.FGP
    Catalog Search       ===> Y      N or Y: Resolve data sets through catalog

  Explicit or Pattern DSNs similar to ISPF 3.4
  USER17.LPARB_____
  _____
  _____
  _____
```

The following table describes the parameters on the panel.

Parameter	Description
Fingerprint DSN (PS)	Enter the name of the Fingerprint Data Set that is to contain the Base environment Fingerprint tokens. Enclose it in quotes for an explicit name, or the current TSO userid will be prefixed. Fingerprint Data Sets must have the following attributes: DCB=(DSORG=PS,RECFM=FB,RECSIZE=512, BLKSIZE=4096)
Catalog Search	'Y' indicates that the data sets in the group are cataloged; a catalog search is performed to resolve the pattern. 'N' indicates that the data sets are not cataloged; a subsequent panel will be displayed where you can specify the VOLSER.
Explicit or Pattern DSNs	Specify the explicit data set names or data set patterns that comprise this environment. Both explicit and pattern data sets may be used concurrently.

To specify the Base environment:

1   Enter values for the *Fingerprint DSN*, *Catalog Search*, and *Explicit or Pattern DSN* fields. These parameters are required.

2   Press ENTER to proceed to the *Resolved Data Sets* panel or press END to return to the previous menu.

2. Resolving the Data Sets

The *Resolved Data Sets* panel displays the resolved data sets from the catalog and allows you to refine the list of data sets to be Fingerprinted.

```
HPSUSYNR ----------------Resolved Data Sets (BASE)----------------- Row 1 of 6
 Command ====>                                            SCROLL===> CSR

 Enter X to Exclude any data set.  Overtype Volser(s) for Uncataloged DSN(s).

 Lcmd:  X

 Press ENTER to continue or END to exit

   Data Sets Involved in the Verification Process    Volser
 _ USER17.LPARB.ADDED                                SRSM75
 _ USER17.LPARB.INSTALL                              SRSM59
 _ USER17.LPARB.LINKLIB                              SRSM74
 _ USER17.LPARB.MESSAGES                             SRSM70
 _ USER17.LPARB.NEWDSN                               SRSM7E
 _ USER17.LPARB.PANELS                               SRSM72
```

The following table describes the parameters displayed on the panel:

Parameter	Description
Data Sets Involved in the Verification Process	Specify an X in the line command field to exclude a data set from further processing. Multiple data sets may be excluded. **NOTE** If you exclude a data set, the list is repositioned at that point. You may have to scroll back to the top of the list.
Volser	The DASD volume serial number where the data set resides. Overtype the VOLSER to point to an uncataloged data set.

To resolve data sets in the Base environment:

1 Exclude any unwanted data sets that have been included within a pattern specification. If there are two sets of identical data set names (one set cataloged and the other uncataloged), the cataloged versions can be resolved first. This list can then be used to generate a list of uncataloged versions by supplying the appropriate VOLSER.

2 Press ENTER to resolve the data set list and proceed with the Fingerprinting process, or press END to return to the previous panel. The screen will be locked until Fingerprinting is complete.

3. Viewing the Fingerprint Data Set Pattern List

After the data sets have been Fingerprinted, the Fingerprint Data Set Pattern List displays with a message indicating the Fingerprint data set was created successfully.

```
HPSUFGPL ----------- SSM Fingerprint Data Set Pattern List -------------------
 Command ===>


  Optionally enter a description and a high level qualifier to identify
  the Fingerprint file. This allows future selection of FGP files for a
  given application or environment. Overtype entries to MODIFY or REMOVE.

  Fingerprint File ==> USER17.LPARB.DATASETS.FGP

 Press ENTER to continue or END to exit

 ------------------------------- FGP Patterns -------------------------------

     Description of environment            High Level Qualifier of FGP file

  _  _____      _____
  _  _____      _____
  _  _____      _____
  _  _____**************************************************_____
  _  _____* HPS262I Fingerprint Data Set is created successfully. *_____
  _  _____**************************************************_____
```

> **NOTE** The Fingerprint Data Set Pattern List can also be displayed by specifying * for the Fingerprint data set name pattern in the following panels:
>
> - View Fingerprint (Option 7)
>
> - Review Changes (Option 2)
>
> - Package Changes (Option 3)

The following table describes the parameters displayed on the panel:

Parameter	Description
Description of Environment	Use this field to enter a simple description of the environment that the Fingerprint data sets represent.
High Level Qualifier of FGP file	This is the High Level Qualifier that is common to all Fingerprint data set names for Fingerprints representing an environment.

Optionally, enter a description of the Fingerprinted environment, and the High Level Qualifier of the Fingerprint data set.

The populated Fingerprint Data Set can now be transferred to a remote site (for remote synchronization tasks), or saved for future change verifications during a change cycle.

If you modified the FGP Patterns table, press ENTER to store the change; a message displays indicating that the Fingerprint table was updated. Then press ENTER to return to the *Detection and Synchronization Menu*.

Fingerprint JCL

Following is a sample of the batch JCL to Fingerprint selected data sets from a pattern of volumes. This job uses the FGP PROC supplied in the INSTALL library.

```
//STEP EXEC FGP,FGPDSN=CMNSSM.PROD.FGP
//HPSIN DD *
*----------------------------------------------------------------
* Create a Fingerprint data set for all data sets with the
* 2nd node being V820 (A version of software) on a group of
* volumes, i.e.(SER*).
*----------------------------------------------------------------
 TRACE=ON
 BASE=VOL=(INCLVOL=SER*,INCLDSN=2V820/)
 BASE=SAVE=DD=DD1
/*
```

The first command in this JCL turns on the TRACE option. During a volume Fingerprinting operation (BASE=VOL), the data set names selected by the pattern are displayed only if the TRACE option has been turned on. During the catalog processing (BASE=GENERIC), however, data set names resolved from the catalog are always printed in the report.

The second command establishes the Base environment by providing a pattern of data sets from a pool of volumes. The pattern indicates the selection and fingerprinting of all the data sets with the second node of V820 (volume processing). All data sets with a second node of V820 on volumes with SER as the first 3 characters of the VOLSER are fingerprinted, and the results are saved in the pre-allocated Fingerprint data set (a physical sequential file) for future reference.

> **NOTE** For information on how to code data set patterns and volume patterns, refer to Appendix A of this book.

For more examples of creating Fingerprints, refer to the CRTFGP* members in the SAMPLES library.

Comparing Environments Using the MODEL Command

To compare two environments having different naming conventions, the modeling facility can be used to make the required associations. When data set names in the Base and Target environments are identical, ChangeMan SSM makes the associations internally. Otherwise, you must specify the MODEL command to define the data set name transformations.

> **NOTE** If there is only one data set in the Base and Target environments, the MODEL command is not needed.

In the following example:

Base Environment		Target Environment
SYS1.TEST.LINKLIB	==>	SYS1.PROD.LINKLIB
SYS1.TEST.PANELS	==>	SYS1.PROD.PANELS
SYS1.TEST.SRC	==>	SYS1.PROD.SRC

the data set names SYS1.TEST.* and SYS1.PROD.* can not automatically be associated by ChangeMan SSM. Specifying the MODEL command will direct ChangeMan SSM to make the required associations. Any data set that does not fall into this association is considered a mismatch. The associated data sets are then evaluated to identify the in-sync or out-of-sync conditions at the member level.

In the following JCL example:

```
//JOBCARD
//STEP1    EXEC PGM=HPSTRANS,REGION=4096K
//STEPLIB  DD   DSN=somnode.CMNSSM.LOAD,DISP=SHR
//         DD   DSN=somnode.SERCOMC.LOAD,DISP=SHR
//SYSPRINT DD   SYSOUT=*
//SYSUDUMP DD   SYSOUT=*
//FGPDD    DD   DSN=CMNSSM.TEST.FGP,DISP=SHR
//HPSIN    DD   *
 MODEL=(NAME=MODEL01,
        TRANSFORM=('2TEST'=>'PROD'))
 BASE=LOAD=DD=FGPDD
 TARG=GENERIC=(DSN=SYS1.PROD.*)
 EXTENDED=Y
 COMPARE=DSNBYDSN=(MODEL=MODEL01,SHORT)
/*
```

- Two data set groups on two different LPARs (or at two remote sites) are compared. This job is assumed to be run on the production system.

- The Base environment is established by recalling a previously generated fingerprint data set that contains the Fingerprint tokens of the Test environment.

- The Target (or production environment) is established by fingerprinting a pattern of active data sets.

- The MODEL command associates the data set names between the two environments. Data sets in the Base environment, having a second node of TEST, are associated with data sets in the Target environment having the second node of PROD.

To create, save, and submit this JCL, choose option A (Advanced Operations) from the *Detection and Synchronization Menu*. Then chose option 2 (Group Compare) from the *Advanced Operations* menu.

Fingerprinting an Entire DASD Volume

To detect changes at the volume level, the entire DASD volume is fingerprinted. The resulting Fingerprint data set, normally one to three cylinders, can be recalled as a reference to detect the changes introduced on the volume over time. Alternatively, volume Fingerprint data sets can be used to compare two volumes (for example, a production SYSRES with an alternate SYSRES), or volumes at two remote sites, to detect changes or differences.

In the following example, an entire volume is fingerprinted.

```
//JOBCARD
//STEP1    EXEC PGM=HPSTRANS,REGION=4096K
//STEPLIB  DD DSN=somnode.CMNSSM.LOAD,DISP=SHR
//         DD DSN=somnode.SERCOMC.LOAD,DISP=SHR
//SYSPRINT DD SYSOUT=*
//SYSUDUMP DD SYSOUT=*
//FGPDD    DD DSN=PROD.SYS42P.FGP(+1),DISP=(,CATLG,DELETE,)
//            UNIT=SYSDA,SPACE=(CYL,(1,1))
//HPSIN    DD *
*--------------------------------------------------------
* Fingerprint an entire volume and save the FGP data set
*--------------------------------------------------------
   TRACE=ON
   BASE=VOL=SER=SYS42P
   BASE=SAVE=DD=FGPDD
/*
```

The first BASE command establishes the Base environment. All non-VSAM data sets on the volume are processed. Fingerprint tokens for members of partitioned data sets and each PS, PO, or DA data set are evaluated. The results are stored in a Fingerprint data set as specified in the //FGPDD DD statement. GDG data sets can also be referenced in the DDs. Approximately one to three cylinders of disk space is sufficient to hold the Fingerprint tokens for all data sets on a fully loaded 3390-9 volume.

> **NOTE** The required DCB parameters for the FGPDD is:
>
> DSORG=PS,RECFM=FB,LRECL=512,BLKSIZE=4096
>
> Optionally, TRACE=ON can be specified as the first command to report the names of the data sets fingerprinted.

To create, save, and submit this JCL, choose option A (Advanced Operations) from the *Detection and Synchronization Menu*. Then chose option 4 (Fingerprinting) from the *Advanced Operations* menu.

Comparing DASD Volumes Data Set by Data Set

After applying an SMP/E maintenance to a volume, you may want to detect and verify the scope of the changes introduced.

In the following JCL example, two small representative DASD volume Fingerprint data sets are compared to detect the differences. A production volume Fingerprint is compared with an alternate volume Fingerprint after it has gone through a maintenance cycle.

```
//JOBNAME    JOB (Account),'DSNBYDSN',CLASS=W,NOTIFY=SER12
//STEP1      EXEC PGM=HPSTRANS,REGION=7096K
//STEPLIB    DD   DSN=somnode.CMNSSM.LOAD,DISP=SHR
//           DD   DSN=somnode.SERCOMC.LOAD,DISP=SHR
//SYSPRINT   DD   SYSOUT=*
//SYSUDUMP   DD   SYSOUT=*
//HPSIN      DD   *
  SETPRINT=EXCEPTIONS=YES
  BASE=LOAD=DSN=DETECT.SYS42P.FGP      NEW
  TARG=LOAD=DSN=DETECT.SYS42M.FGP      OLD
  EXTENDED=Y
  COMPARE=DSNBYDSN=SHORT
/*
```

The first command (SETPRINT) requests an exception report.

The second command (BASE) establishes the Base by recalling a previously generated Fingerprint data set of the production volume (before maintenance begins).

The third (TARG) command establishes the Target by recalling the Fingerprint data set of an alternate volume after completion of the maintenance cycle.

The last command specification, COMPARE=DSNBYDSN=SHORT, compares all corresponding data set tokens and, if different, the member tokens of the out-of-sync data sets. This comparison does not require any MODEL to define the name transformations because the data set names on both volumes should be identical; ChangeMan SSM internally associates the data set names.

To create, save, and submit this JCL, choose option A (Advanced Operations) from the *Detection and Synchronization Menu*. Then chose option 2 (Group Compare) from the *Advanced Operations* menu.

Comparing DASD Volumes by Reference

This example describes how to compare the data sets on one volume with a remote environment, using a volume Fingerprint and the REFTARG command.

The BASE environment is established by referring to the Fingerprint file. This ensures that the BASE environment matches the TARG environment data sets, even if there are more data sets at the BASE site.

For example, at a target site, a group of data sets resides on a specific volume. This group can be Fingerprinted using the BASE=VOL=(SER=volser) command. At the base site, these data sets may be scattered across many volumes. To simplify the comparison, the REFTARG command will only locate those data sets recorded in the loaded Fingerprint file (TARGET). This method also eliminates processing for data sets with the same-name pattern that do not belong to the previously fingerprinted group.

```
//JOBNAME    JOB (Account),'DSNBYDSN',CLASS=W,NOTIFY=SER12
//STEP1      EXEC PGM=HPSTRANS,REGION=7096K
//STEPLIB    DD   DSN=somnode.CMNSSM.LOAD,DISP=SHR
//           DD   DSN=somnode.SERCOMC.LOAD,DISP=SHR
//SYSPRINT   DD   SYSOUT=*
//SYSUDUMP   DD   SYSOUT=*
//DD1        DD   DISP=SHR,DSN=VOL001.FGP.NEWYORK
//HPSIN      DD   *
  SETPRINT=EXCEPTIONS=YES
  TARG=LOAD=DD=DD1    OLD FINGERPRINT CREATED IN NEW YORK
  REFTARG             BASE IS ESTABLISHED LIVE
  EXTENDED=Y
  COMPARE=DSNBYDSN=SHORT
/*
```

Verifying the Synchrony of Two Environments

To detect changes in a software package or to review the synchrony status of a software package after a maintenance cycle, you can compare two versions of the package online. Using the Sync Check facility, the focus of the verification process should be on the changed components, enabling the user to quickly identify those members of the package that have changed.

In the example that follows, data sets in two environments, LPARA and LPARB, are verified for synchrony. The synchronization results are reported on a subsequent panel. Pairs of members that are out-of-sync can be selected for reporting in a differences report.

NOTE Refer to the DETECT*, CPXFAST*, and SUPERC* members for a variety of batch examples in the SAMPLES library.

Choose option C (Check Synchrony) from the *Detection and Synchronization Menu* to enter the series of panels.

1. Specifying the Base Group

The following panel is the first to display.

```
HPSDSYN1                      BASE PDS (1 of 2)                  Row 1 of 13
Command ===>                                              SCROLL ===> CSR

Members reside within ONE environment  ==> N    Y: BASE only    N:BASE and TARG
Explicit Member/Pattern ending with *  ==> *
Compare like-named cataloged vs. non-cataloged DSNs/patterns ==> N   Y/N
                                           Specify VOLSER ==>

Reporting Options TYPE(S)  ==> ADD,UPD,DEL  Specify a list: ADD,UPD,DEL or ALL
Reporting Options RECORD   ==> Y            N: Report the first segment only
                                            Y: Report the entire record

Cataloged PDS (or Pattern) ==> Y  -(Y or N) Y: Resolve data sets from catalog
Sync                       ==> N  -(Y or N) N: Do not report equal members
OutSync                    ==> Y  -(Y or N) Y: Filter only the differences
Sort by Token              ==> N  -(Y or N) N: List sorted by Member Name

Press ENTER to continue or END to exit

   Explicit or Pattern DSNs similar to ISPF 3.4
_  user298.lpara.*_____

_  _____
_  _____
_  _____
```

The data sets that comprise the Base Sync Group are specified on this panel (either explicitly, using a pattern name, or both). In this example, one environment is defined as the base.

Data sets and patterns can be either cataloged or uncataloged. If you are comparing two groups of data sets, one cataloged and the other uncataloged, select the catalog search for both groups by specifying Y in the *Compare like-named cataloged vs. non-cataloged DSNs/patterns* field. Once the names are resolved from the catalog, override the VOLSERs to point to the uncataloged set.

NOTE If you supply the VOLSER where the uncataloged names reside, the VOLSER will be propagated to the subsequent target panels.

Press ENTER to display the *Resolved Data Sets* panel. Refer back to if you need more information about this panel.

```
HPSDSYNR ----------------Resolved Data Sets (BASE)----------------- Row 1 of 4
Command ====>                                              SCROLL===> CSR

Enter X to Exclude any data set.  Overtype Volser(s) for Uncataloged DSN(s).

Press ENTER to continue or END to exit

  Data Sets Involved in the Compare Process        Volser

_ USER298.LPARA.INSTALL                            SRQAE3
_ USER298.LPARA.LOAD                               SRQAD7
_ USER298.LPARA.MESSAGES                           SRQAD6
_ USER298.LPARA.PANELS                             SRQAE4
***************************** Bottom of data *****************************
```

Enter X next to any data sets to be excluded and press ENTER.

2. Specifying the Target Group

The next panel displays where you can specify the data sets that comprise the TargetSync Group.

```
HPSDSYN2                TARG PDS or a NULL Entry (2 of 2)           Row 1 of 13
Command ===>                                                SCROLL ===> CSR

Enter a second PDS, or press ENTER without a specification to denote NULL

Cataloged PDS (or pattern)  ===> Y  -(Y or N) N: For uncataloged PDS

   Explicit PDS (or a pattern); No entry means NULL
_  user298.lparb.*_____
_  _____
_  _____
_  _____
```

Press ENTER to display the *Resolved Data Sets* panel.

```
HPSDSYNR ----------------Resolved Data Sets (TARGET)--------------- Row 1 of 4
Command ====>                                               SCROLL===> CSR

Enter X to Exclude any data set.  Overtype Volser(s) for Uncataloged DSN(s).

Press ENTER to continue or END to exit

  Data Sets Involved in the Compare Process        Volser

_ USER298.LPARB.INSTALL                            SRQAE3
_ USER298.LPARB.LOAD                               SRQAE3
_ USER298.LPARB.MESSAGES                           SRQAE3
_ USER298.LPARB.PANELS                             SRQABD
****************************** Bottom of data ******************************
```

Enter X next to any data sets to be excluded and press ENTER.

3. Viewing the Sync Check Results

After the Fingerprinting process, a customized report is displayed. The following example is for *in-sync* and *out-of-sync* items. All members (in both groups) that differ in content are identified through their unique Fingerprint tokens. In the Message information area, the statistics show that 10 members differ in content (*OutSync*), whereas the remaining

2382 members match (*Sync*) regardless of whether the name matches. Notice that differing source or load modules are all specified on this single panel.

```
HPSDSYN3                      Member List To Compare                 Row 1 of 10
Command ===>                                                   SCROLL ===> CSR

(S)elect one pair of members to be compared

Press ENTER to continue or END to exit

  Group Type Member      Fingerprint     Volser Data Set Name

_ B         $ADMSET  C003B356-00002968 SRSM70 USER298.LPARA.INSTALL
_ T         $ADMSET  3C9570C3-00002968 SRSM7A USER298.LPARB.INSTALL
_ B         $AUTH    A18EB6C5-000003EA SRSM70 USER298.LPARA.INSTALL
_ T         $AUTH    CE72A1B9-000003EA SRSM7A USER298.LPARB.INSTALL
_ B         $BACKUP  13DC5575-000007A4 SRSM70 USER298.LPARA.INSTALL
_ T         $BACKUP  0754211B-000007A4 SRSM7A USER298.LPARB.INSTALL
_ B         $INIT    E272ACAD-00000997 SRSM70 USER298.LPARA.INSTALL
_ T         $INIT    408EF2F0-00000997 SRSM7A USER298.LPARB.INSTALL
_ B         $MAINT   4FCFEC61-00001FE2 SRSM70 USER298.LPARA.INSTALL
_ T         $MAINT   5EA9991B-00001FE2 SRSM7A USER298.LPARB.INSTALL
***************************** Bottom of data *****************************
--------------------------------------------------------------------------------
 HPS268I Completed. Sync=  2382, OutSync=   10, (S)elect pairs to COMPARE.
--------------------------------------------------------------------------------
```

NOTE To facilitate the viewing on this panel, the sync members are not displayed.

Select each pair of out-of-sync members to invoke ChangeMan SSM, SuperC, or Comparex in the foreground, and report the actual differences. Repeat this process as needed to verify all the differences.

A similar task could be accomplished by running the SUPERC3 job in the SAMPLES library.

4. Viewing the ChangeMan SSM Differences Report

If the ChangeMan SSM utility is specified as the default compare program, the following side-by-side differences report will be produced for members that differ.

```
 ISRBROBA   USER298.SYN10319.T1431202.OUTLIST          Line 00000000 Col 001 080
 Command ===>                                              Scroll ===> PAGE
******************************* Top of Data ********************************
Command    Column  10       20       30       40       50       60       7
Count-seg  ....!....!....!....!....!....!....!....!....!....!....!....!....!....
    1-1   "DATACOMP=(BASEDSN=USER298.LPARA.INSTALL,
     -2   "          BASEMEM=$ADMSET,BASEVOL=SRSM70,
     -3   "          TARGDSN=USER298.LPARB.INSTALL,
     -4   "          TARGMEM=$ADMSET,TARGVOL=SRSM7A,
     -5   "          REPORT=(SBS=Y,ADD,UPD,DEL,COMPLETE=Y))

Vol=(SRSM70)  Base=USER298.LPARA.INSTALL($ADMSET)
dsorg=PO  recfm=FB  lrecl=80  blksize=6,000

Vol=(SRSM7A)  Targ=USER298.LPARB.INSTALL($ADMSET)
dsorg=PO  recfm=FB  lrecl=80  blksize=6,000

 Base  Targ   0   0   1   1   2   2   2   3      0   0   1   1   2   2   2   3
  Nr    Nr  ...4...8...2...6...0...4...8...2   ...4...8...2...6...0...4...8...2
   1     1  //jobname  JOB                  <> //USER298  JOB
                                            ¦¦

HPS1617I  HPSDCOMP  14:31:20 Comparison Summary:
                                   0 Inserted =>
                                   0 Deleted  <=
                                   1 Updated  <> changed seg of updated
                                              ¦¦ unchanged seg of updat
                                   0 Moved       ~~
                                 268 Unchanged   ||
```

Synchronizing Similar Environments

After a maintenance cycle, you might want to propagate changes from the new maintenance environment to the current production environment.

In the following JCL example, two similarly mapped environments are synchronized. In this case, it is the user's responsibility to associate the data sets in the Base environment with their corresponding data sets in the Target environment. This example uses the EXTRACT, EXPORT, and IMPORT functions in a single step process.

```
//JOB
//*---------------------------------------------------------------
//* Synchronize the BASE and TARGET environments  (BASE to TARGET)
//*---------------------------------------------------------------
//SYNCUP    EXEC PGM=HPSTRANS,REGION=4096K        SKEL $$SYNC
//SYNCTRAC DD SYSOUT=*
//SYSPRINT DD SYSOUT=*
//DD1      DD DSN=&&HPSBASK,
//            DISP=(,DELETE),
//            UNIT=SYSDA,
//            DCB=(RECFM=U,DSORG=PS,LRECL=0,BLKSIZE=4096),
```

```
//              SPACE=(CYL,(1,1))
//SYSIN   DD DISP=(,DELETE),SPACE=(CYL,(1,1)),UNIT=SYSDA
//HPSWORK  DD DISP=(,DELETE),SPACE=(CYL,(5,5)),UNIT=SYSDA
//HPSWORK2 DD DISP=(,DELETE),SPACE=(CYL,(5,5,100)),UNIT=SYSDA,
//              DCB=(RECFM=U,BLKSIZE=27998)
//HPSIN   DD  *
  ENQ=Y
  EXTENDEDSYNC=Y
  *
  BASE=DSN=SER12.TEST.PANELS
  TARG=DSN=SER12.PROD.PANELS
  EXTRACT=NBYONE
  BASE=RESET
  TARG=RESET
 *
  BASE=DSN=SER12.TEST.LINKLIB
  TARG=DSN=SER12.PROD.LINKLIB
  EXTRACT=NBYONE
  *
  EXPORT=(BASKETDD=DD1)
  IMPORT=(BASKETDD=DD1,APPLY,DELETE)
 /*
```

Following is a summary of the commands used in the above example. There is no limit to the number of times these sets of commands can be stacked.

- The Base and Target environments are established by Fingerprinting two explicit data set names.

- The EXTRACT command identifies the members that have different Fingerprint tokens (by content). Once these members are identified, ChangeMan SSM creates the Super Directory in memory.

- The Base/Target environments are then cleared by the RESET commands, and redefined by two other Base/Target specifications.

- The EXPORT command uses the Super Directory to determine the members that should be off-loaded to the Change Basket.

- This Change Basket may be transferred to other environments for the Import operation. In this example, however, the Change Basket is directly Imported to the target libraries to make them match the base libraries.

NOTE The Export and Import functions internally invoke IEBCOPY or its functional equivalent PDSFAST (a product of Software Engineering of America).

To create, save, and submit this JCL, choose option S (Synchronize) from the *Detection and Synchronization Menu*.

Synchronizing Complex Environments

In large and more complex environments, software environments may not be similarly configured as they are in two software packages. For example, when synchronizing two SYSRES volumes or two LPARS, a dissimilar relationship might exist.

To create, save, and submit JCL for synchronizing environments, choose the following options from the *Detection and Synchronization Menu*:

- Option 9 (Package Changes) to create the change basket.

- Option 6 (Apply Basket) to apply the change basket.

The following is a recommended scenario:

- Fingerprint the maintenance volume before starting the maintenance. This Fingerprint data set is referred to as *previous*.

- Apply all SMP/E (and other) maintenance to the maintenance volume.

- Fingerprint the volume after the maintenance and testing has been completed. This Fingerprint data set is referred to as *current*.

- Extract/Export the changed members, the new data sets, and identify the scratched data sets by comparing the two Fingerprint Data Sets and placing the maintenance into the Change Basket data set.

- Import the changes to the target production alternate SYSRES. At the time of IMPORT, a Reverse Change Basket may optionally be created to undo the maintenance if required.

In the following examples, "1. Create the Change Basket" on page 66 and "2. Apply the Change Basket" on page 67:

- A maintenance SYSRES volume will be synchronized with the alternate SYSRES, which was fingerprinted immediately after it was copied from the production SYSRES. This Fingerprint is used as a reference to detect all changes made during the maintenance cycle.

- The changes are Extracted and Exported to a Change Basket data set.

- The Change Basket is then transferred to the production environment, or other sites, and Imported to the alternate production SYSRES.

1. Create the Change Basket

This example creates the Change Basket by comparing the *current* and *previous* Fingerprint data sets for the maintenance volume.

```
//JOBNAME  JOB (Account),'EXTRACT',CLASS=F,NOTIFY=USERid
//STEP1    EXEC PGM=HPSTRANS,REGION=7096K
//STEPLIB  DD DSN=somnode.CMNSSM.LOAD,DISP=SHR
//         DD DSN=somnode.SERCOMC.LOAD,DISP=SHR
//SYSPRINT DD SYSOUT=*
//SYSIN    DD SPACE=(TRK,(1,1)),DISP=(,DELETE),
//            UNIT=SYSDA,DSN=&&SYSIN
//HPSWORK  DD SPACE=(CYL,(5,5)),DISP=(,DELETE),
//            UNIT=SYSDA,DSN=&&HPSWORK
//HPSWORK2 DD SPACE=(CYL,(5,5,100)),DISP=(,DELETE),
```

```
//            UNIT=SYSDA,DSN=&&HPSWORK2,
//            DCB=(RECFM=U,BLKSIZE=27998)
//BASKETDD DD DSN=somnode.CHANGE.BASKET
//SYSPRINT DD SYSOUT=*
//FGPDD1   DD DSN=SER13.SYS42M.CURRENT,DISP=SHR
//FGPDD2   DD DSN=SER13.SYS42M.PREVIOUS,DISP=SHR
//HPSIN    DD    *
  EXTENDEDSYNC=Y
  BASE=LOAD=DD=FGPDD1
  TARG=LOAD=DD=FGPDD2
*
  EXTRACT=ALL
  EXPORT=DD=BASKETDD
/*
```

The EXTRACT=ALL command is used when the data sets' naming conventions are the same. The new data sets are copied in their entirety from the base.

To create, save, and submit this JCL, choose option 9 (Package Changes) from the *Detection and Synchronization Menu*.

2. Apply the Change Basket

This example applies the Change Basket created in the previous step to a Target volser.

```
//JOBCARD
//STEP1    EXEC PGM=HPSTRANS,REGION=2M
//*-------------------------------------------------------------
//*  This job can first simulate, then apply the maintenance.
//*-------------------------------------------------------------
//STEPLIB  DD DSN=somnode.CMNSSM.LOAD,DISP=SHR
//         DD DSN=somnode.SERCOMC.LOAD,DISP=SHR
//SYSPRINT DD SYSOUT=*
//SYSUDUMP DD SYSOUT=*
//DD1      DD DSN=somnode.BASKET,DISP=SHR
//DD2      DD DSN=somnode.BASKET.REV,DISP=SHR
//HPSSCR   DD DISP=(,PASS),            SCRATCH LIST
//            DSN=&&HPSSCR,
//            UNIT=SYALLDA,
//            SPACE=TRK,(1,1),RLSE),
//            DCB=(RECFM=FB,DSORG=PS,LRECL=80,BLKSIZE=6000)
//SYSIN    DD DISP=(,DELETE),
//            DSN=&&SYSIN,
//            UNIT=SYSALLDA,
//            SPACE=(TRK,(1,1))
//HPSWORK  DD DISP=(,DELETE),DSN=&&HPSWORK,
//            UNIT=SYSALLDA,SPACE=(CYL,(5,5))
//HPSWORK2 DD DISP=(,DELETE),DSN=&&HPSWORK2,
//            UNIT=SYSALLDA,SPACE=(CYL,(5,5,100)),
//            DCB=(RECFM=U,BLKSIZE=27998)
//HPSIN    DD *
  ENQ=Y
  IMPORT=(BASKETDD=DD1,      Basket data set pointed to by DD1
          REVERSDD=DD2,      Generate a Reverse Basket
          NEWDSNTOVOL=tgtvol, New/existing data set target volumes
          OLDDSNTOVOL=tgtvol, determined by catalog
```

```
                   APPLY,              Applies the updates
                   PRECOMPRESS=Y,      Performs a compress prior to  APPLY
                   DELETE,             Delete appropriate PDS member names
                   SCRATCH,            Generate scratch list on DD HPSSCR
                   CATLG=Y)
       /*
       //STEPSCR  EXEC PGM=IDCAMS,REGION=4096K
       //SYSPRINT DD SYSOUT=*
       //SYSIN    DD DISP=(OLD,DELETE),DSN=&&HPSSCR
```

The command ENQ=N directs the software to allocate data sets as shared. The CATLG parameter causes the new data sets from the Change Basket to be cataloged on the target system.

To create, save, and submit this JCL, choose option 6 (Apply Basket) from the *Detection and Synchronization Menu*.

Creating a Change Basket Using MODEL

If the naming conventions between two environments are different, they can still be easily synchronized with ChangeMan SSM.

The following example uses the MODELing facility to transform the names in the Base environment to the corresponding names in the Target environment. The SYS1 pattern data sets are to be synchronized with the SYS2 pattern data sets.

Similar to the previous example, , this process contains three logical steps: EXTRACT, EXPORT, and IMPORT.

```
//JOBCARD
//STEP1     EXEC PGM=HPSTRANS,REGION=7096K
//STEPLIB  DD DSN=somnode.CMNSSM.LOAD,DISP=SHR
//         DD DSN=somnode.SERCOMC.LOAD,DISP=SHR
//SYSPRINT DD SYSOUT=*
//SYSIN    DD SPACE=(TRK,(1,1)),DISP=(,DELETE),
//            UNIT=SYSDA,DSN=&&SYSIN
//HPSWORK  DD SPACE=(CYL,(5,5)),DISP=(,DELETE),
//            UNIT=SYSDA,DSN=&&HPSWORK
//HPSWORK2 DD SPACE=(CYL,(5,5,100)),DISP=(,DELETE),
//            UNIT=SYSDA,DSN=&&HPSWORK2,
//            DCB=(RECFM=U,BLKSIZE=27998)
//BASKETDD DD DSN=somnode.CHANGE.BASKET
//HPSSCR   DD DSN=somnode.SCRATCH.LIST,DISP=SHR
//SYSPRINT DD SYSOUT=*
//FGPDD1   DD DSN= somnode.SYS1.FGP,DISP=SHR
//FGPDD2   DD DSN= somnode.SYS2.FGP,DISP=SHR
//HPSIN    DD *
   MODEL=(NAME=MODEL01,
          TRANSFORM=('SYS1'=>'SYS2'))
   BASE=LOAD=DD=FGPDD1
   TARG=LOAD=DD=FGPDD2
   EXTENDEDSYNC=Y
   EXTRACT=ALL=(MODEL=MODEL01)
   EXPORT=DD=BASKETDD
```

```
/*
```

The EXTRACT command requires the MODEL parameter to associate the data set names properly. For example, SYS1.LINKLIB will be mapped to SYS2.LINKLIB, and so on.

> **NOTE** The EXTRACT=NEWDSN command specification causes only the new data sets found (BASE vs. TARG) to be copied to the Change Basket.
>
> The EXTRACT=SCRDSN command specification identifies data sets to be scratched in the Change Basket's Super Directory.
>
> The EXTRACT=ALL command specification replaces the need to individually specify the DSNBYDSN, NEWDSN, and SCRDSN parameters.
>
> The required DCB parameters for all ChangeMan SSM data sets can be found in Appendix A of this book.

To create, save, and submit this JCL, choose option 5 (Create Basket) from the *Advanced Operations Menu*.

Applying a Change Basket Using MODEL and Scratching Data Sets

When a Change Basket is created, it may be transferred to multiple local or remote environments to synchronize them with the Base environment.

The following example shows the Change Basket being created using MODEL, and then imported to the Target environment. The MODEL command insures that pairs of data sets involved in this update are properly associated in the Super Directory of the Change Basket. However, if this Change Basket is to be used for updating SYS3 data sets, to subsequently apply the changes to another environment using an unlike naming convention, a MODEL command must be specified to indicate this additional local transformation (TRANSFORM='SYS2'=>'SYS3').

```
           //JOBNAME JOB *(ACCOUNT),'MDLIMP1',CLASS=B,
           //         NOTIFY=Node USER ID,MSGCLASS=X
           //STEP1    EXEC PGM=HPSTRANS,REGION=2M
           //*----------------------------------------------------------------
           //*  This job applies the IMPORT process.
           //*----------------------------------------------------------------
           //STEPLIB  DD DSN=somnode.CMNSSM.LOAD,DISP=SHR
           //         DD DSN=somnode.SERCOMC.LOAD,DISP=SHR
           //SYSPRINT DD SYSOUT=*
           //SYSUDUMP DD SYSOUT=*
           //DD1      DD DSN=somnode.CHANGE.BASKET,DISP=SHR    tape or disk
           //DD2      DD DSN=somnode.REV.CHANGE.BASKET,DISP=SHR
           //HPSSCR   DD DISP=(,PASS),DSN=&&HPSSCR,             for IDCAMS
           //            UNIT=SYALLDA,SSPACE=TRK,(1,1),RLSE),
           //            DCB=(RECFM=FB,DSORG=PS,LRECL=80,BLKSIZE=6000)
           //SYSIN    DD DISP=(,DELETE),DSN=&&SYSIN,           for IEBCOPY
           //            UNIT=SYSALLDA,SPACE=(TRK,(1,1))
           //HPSWORK  DD DISP=(,DELETE),DSN=&&HPSWORK,         for IEBCOPY
           //            UNIT=SYSALLDA,SPACE=(CYL,(5,5))
           //HPSWORK2 DD SPACE=(CYL,(5,5,100)),DISP=(,DELETE),
           //            UNIT=SYSDA,DSN=&&HPSWORK2,
           //            DCB=(RECFM=U,BLKSIZE=27998)
           //STEPLIB  DD DSN=somnode.CMNSSM.LOAD,DISP=SHR
           //         DD DSN=somnode.SERCOMC.LOAD,DISP=SHR
           //SYSPRINT DD SYSOUT=*
           //SYSUDUMP DD SYSOUT=*
           //HPSIN    DD *
             ENQ=Y
             MODEL=(NAME=MODEL01,
                   TRANSFORM=('SYS2'=>'SYS3'))
           *
             IMPORT=(BASKETDD=DD1,       Basket data set pointed to by DD1
                     MODEL=MODEL01,      Transform data set names
                     REVERSDD=DD2,       Reverse Basket data set
                     PRECOMPRESS=Y,      Perform a  compress prior to APPLY
                     OLDDSNTOVOL=*,      Old dsn target vol using catalog
                     NEWDSNTOVOL=*,      New dsn target vol using catalog
                     APPLY,              Applies the updates
                     DELETE,             Delete appropriate PDS member names
                     SCRATCH)            Generate scratch list on DD HPSSCR
           *
           //* IDCAMS Scratch Step to Scratch Data Sets
           //* Identified in the '&&HPSSCR' data set (above)
           //SCRATCH  EXEC PGM=IDCAMS
           //SYSPRINT DD SYSOUT=*
           //SYSIN    DD DISP=(OLD,DELETE),DSN=&&HPSSCR
```

The MODEL command is required when the data set associations specified in the Change Basket are inappropriate for a given Target Environment. The Modeling facility (during Import) allows you to apply updates to multiple environments when different naming conventions exist.

Synchronizing Multiple Data Sets (1:N Association)

Sometimes there is a need to consolidate multiple libraries into a single library. An example would be a test environment with multiple LINKLIBs that needs to be consolidated into one production LINKLIB.

In the following example, three data sets in the test environment are synchronized with one data set in the production environment. The NBYONE mode of synchronization allows for N data sets (of similar types) to be synchronized with ONE data set. A special case for this mode is when one data set exists in the base and multiple data sets exist in the target.

```
//JOBCARD
//STEP1    EXEC PGM=HPSTRANS,REGION=4096K
//STEPLIB  DD DSN=somnode.CMNSSM.LOAD,DISP=SHR
//         DD DSN=somnode.SERCOMC.LOAD,DISP=SHR
//SYSIN    DD SPACE=(TRK,(1,1)),DISP=(,DELETE),
//            UNIT=SYSDA,DSN=&&SYSIN
//HPSWORK  DD SPACE=(CYL,(5,5)),DISP=(,DELETE),
//            UNIT=SYSDA,DSN=&&HPSWORK
//HPSWORK2 DD SPACE=(CYL,(5,5,100)),DISP=(,DELETE),
//            UNIT=SYSDA,DSN=&&HPSWORK2,
//            DCB=(RECFM=U,BLKSIZE=27998)
//DD1      DD DSN=somnode.CHANGE.BASKET,DISP=SHR
//SYSPRINT DD SYSOUT=*
//HPSIN    DD *
  EXTENDEDSYNC=Y
  BASE=GENERIC=(DSN=USER12.TEST.PANEL*)
  TARG=DSN=USER12.PROD.PANELS
  EXTRACT=NBYONE=(TONAME=USER12.PROD.PANELS,
                  INCLDSN=USER12.TEST.PANEL1)
  EXTRACT=NBYONE=(TONAME=USER12.PROD.PANELS,
                  INCLDSN=USER12.TEST.PANEL2)
  EXTRACT=NBYONE=(TONAME=USER12.PROD.PANELS,
                  INCLDSN=USER12.TEST.PANEL3)
  EXPORT=BASKETDD=DD1
  IMPORT=(BASKETDD=DD1,APPLY,DELETE)
/*
```

The above example assumes that both data set groups are accessible. This approach can also be implemented in multiple LPARs or sites.

The EXTRACT=NBYONE is useful when naming conventions disallow the use of EXTRACT=DSNBYDSN (automatic naming associations), and when no name patterns exist to set up the MODEL commands.

To create, save, and submit the JCL for the EXTRACT/EXPORT and IMPORT steps, choose option 5 (Create Basket) and option 6 (Import Basket) from the *Advanced Operations Menu*.

Rejecting Members During EXPORT

During the creation of a Change Basket, there may be some orphaned members which should be rejected from the process, or members that will never be exported due to target site requirements. The orphaned members are normally problematic, and should therefore be corrected. To allow the Change Basket creation to continue, however, these members must be rejected. An alternative to rejecting the orphaned members is the specification of ORPHANCHECK=NO. This command skips the orphan checking logic and propagates the orphaned members through the Change Basket to the other systems.

In the following example, multiple members of a data set can be rejected when separated by commas. There are no limits to the number of data sets or members in the list.

```
//JOBCARD
//STEP1    EXEC PGM=HPSTRANS,REGION=6796K
//STEPLIB  DD DSN=somnode.CMNSSM.LOAD,DISP=SHR
//         DD DSN=somnode.SERCOMC.LOAD,DISP=SHR
//SYSPRINT DD SYSOUT=*
//SYSUDUMP DD SYSOUT=*
//FGPDD1   DD DSN=somnode.SYS42P.NEW.FGP,DISP=SHR
//FGPDD2   DD DSN=somnode.SYS42P.OLD.FGP,DISP=SHR
//BASKET   DD DSN=somnode.SYS42P.BASKET,DISP=SHR
//SYSIN    DD SPACE=(TRK,(1,1)),DISP=(,DELETE),
//            UNIT=SYSDA,DSN=&&SYSIN
//HPSWORK  DD SPACE=(CYL,(5,5)),DISP=(,DELETE),
//            UNIT=SYSDA,DSN=&&HPSWORK
//HPSWORK2 DD SPACE=(CYL,(5,5,100)),DISP=(,DELETE),
//            UNIT=SYSDA,DSN=&&HPSWORK2,
//            DCB=(RECFM=U,BLKSIZE=27998)
//HPSIN    DD *
  EXTENDEDSYNC=Y
  ORPHANCHECK=NO  /* Alternative to specifying REJECT for ORPHANS */
  BASE=LOAD=DD=FGPDD1
  TARG=LOAD=DD=FGPDD2
*
  EXTRACT=DSNBYDSN=(REJECT=SYS1.HELP(SETCA),
                    REJECT=SYS1.LINKLIB(PASRTLIB),
                    REJECT=SYS1.LPALIB(IFG0194F,IFG0194J,
                                       IFG0194K,IFG0195G,
                                       IFG0204A,IFG0204J,
                                       IFG0234J,IFG0551L,
                                       IFG0554A,IFG0554C,
                                       IFG0554F,IFG0554J,
                                       IFG0554K,IGG0190A,
                                       IGG0550P),
                    REJECT=SYS1.NUCLEUS(IEANUC06),
                    REJECT=SYS1.PROCLIB(IPCS))
  *
  EXTRACT=ALL
  EXPORT=DD=BASKET
/*
```

To create, save, and submit this JCL, choose option 5 (Create Basket) from the *Advanced Operations Menu*.

Rejecting Members During IMPORT

When a Change Basket is received, the receiving site may want to reject certain local members from the IMPORT process. Additionally, if ChangeMan SSM detects any regression, such members may also need to be rejected from the update process. The target data set members, before being updated by data in the Change Basket, are re-fingerprinted internally to ensure that the tokens have remained unchanged. If the tokens have changed since the time they were fingerprinted, it is an indication of potential regression. Therefore, these members may need to be rejected.

The following example shows that more than one PDS member may be excluded with the REJECT parameter. If you choose to overwrite the members, approving the IMPORT operation to proceed, the FORCE parameter can be specified.

```
//JOBCARD
//STEP1    EXEC PGM=HPSTRANS,REGION=6796K
//STEPLIB  DD DSN=somnode.CMNSSM.LOAD,DISP=SHR
//         DD DSN=somnode.SERCOMC.LOAD,DISP=SHR
//SYSPRINT DD SYSOUT=*
//SYSUDUMP DD SYSOUT=*
//BASKET   DD DSN=somnode.SYS42P.BASKET,DISP=SHR
//SYSIN    DD SPACE=(TRK,(1,1)),DISP=(,DELETE),
//            UNIT=SYSDA,DSN=&&SYSIN
//HPSWORK  DD SPACE=(CYL,(5,5)),DISP=(,DELETE),
//            UNIT=SYSDA,DSN=&&HPSWORK
//HPSWORK2 DD SPACE=(CYL,(5,5,100)),DISP=(,DELETE),
//            UNIT=SYSDA,DSN=&&HPSWORK2,
//            DCB=(RECFM=U,BLKSIZE=27998)
//HPSIN    DD*
*
  ENQ=Y
*
  IMPORT=(BASKETDD=BASKET,
          NEWDSNTOVOL=*,
          OLDDSNTOVOL=*,
          APPLY,
          DELETE,
          REJECT=SYS1.HELP(SETCA,SETCB),
          REJECT=SYS1.LINKLIB(PASRTLIB))
/*
```

To create, save, and submit this JCL, choose option 6 (Import Basket) from the *Advanced Operations Menu*.

Creating a Reverse Change Basket During Import/ Apply Processing

Optionally, during the Importing of a Change Basket, those members and data sets in the Target environments that will be affected by updates can first be backed up automatically to ensure the ability to undo any, or all of the changes applied.

In the following example, the structure of the Reverse Change Basket is identical to a "typical" Change Basket. Therefore, to undo the changes, the Reverse Change Basket can be directly Imported. All functionality, such as the INCLDSN, EXCLDSN, and REJECT parameters, can be used during the Undo process.

```
//JOBCARD
//STEP1    EXEC PGM=HPSTRANS,REGION=6796K
//STEPLIB  DD DSN=somnode.CMNSSM.LOAD,DISP=SHR
//         DD DSN=somnode.SERCOMC.LOAD,DISP=SHR
//SYSPRINT DD SYSOUT=*
//SYSUDUMP DD SYSOUT=*
//DD1      DD DSN=somnode.BASKET,DISP=SHR
//DD2      DD DSN=somnode.REVERSE.BASKET,DISP=SHR
//SYSIN    DD SPACE=(TRK,(1,1)),DISP=(,DELETE),
//            UNIT=SYSDA,&&SYSIN
//HPSWORK  DD SPACE=(CYL,(5,5)),DISP=(,DELETE),
//            UNIT=SYSDA,DSN=&&HPSWORK
//HPSWORK2 DD SPACE=(CYL,(5,5,100)),DISP=(,DELETE),
//            UNIT=SYSDA,DSN=&&HPSWORK2,
//            DCB=(RECFM=U,BLKSIZE=27998)
//HPSIN    DD   *
*
  ENQ=Y
*
  IMPORT=(BASKETDD=DD1,
          REVERSDD=DD2
          NEWDSNTOVOL=*,
          OLDDSNTOVOL=*,
          DELETE,
          APPLY)
/*
```

To create, save, and submit this JCL, choose option 6 (Import Basket) from the *Advanced Operations Menu*.

Reversing an Import

The Reverse Change Basket created at the time of Import can optionally be applied to undo the effect of updates.

In the following example, the structure of the Reverse Change Basket is identical to a "typical" Change Basket. Therefore, to undo the changes, the Reverse Change Basket may be directly Imported. All functionality, such as the INCLDSN, EXCLDSN, and REJECT parameters, may be used during the Undo process.

```
//JOBCARD
//STEP1    EXEC PGM=HPSTRANS,REGION=6796K
//STEPLIB  DD DSN=somnode.CMNSSM.LOAD,DISP=SHR
//         DD DSN=somnode.SERCOMC.LOAD,DISP=SHR
//SYSPRINT DD SYSOUT=*
//SYSUDUMP DD SYSOUT=*
//DD1      DD DSN=somnode.REVERSE.BASKET,DISP=SHR
//SYSIN    DD SPACE=(TRK,(1,1)),DISP=(,DELETE),
//            UNIT=SYSDA,DSN=&&SYSIN
//HPSWORK  DD SPACE=(CYL,(5,5)),DISP=(,DELETE),
//            UNIT=SYSDA,DSN=&&HPSWORK
//HPSWORK2 DD SPACE=(CYL,(5,5,100)),DISP=(,DELETE),
//            UNIT=SYSDA,DSN=&&HPSWORK2,
//            DCB=(RECFM=U,BLKSIZE=27998)
//HPSIN    DD *
*
  ENQ=Y
*
  IMPORT=(BASKETDD=DD1,
          NEWDSNTOVOL=*,
          OLDDSNTOVOL=*,
          APPLY,
          DELETE,
          REVERSE)
/*
```

The REVERSE parameter indicates the application of the Reverse Change Basket. ChangeMan SSM can distinguish between a Reverse Change Basket and a "normal" Change Basket to prevent any confusion. for users.

To create, save, and submit this JCL, choose option 7 (Undo Import) from the *Advanced Operations Menu*.

Chapter 4

Data Extraction Component

The Data Extraction component determines the record-level changes in data files (VSAM or non-VSAM), and then extracts the records that are different. VSAM KSDS files can be updated (synchronized) by applying a Change Basket.

All of the Data Extraction functions are available either by running batch jobs or from the online Data Extraction Menu. The examples in this chapter illustrate the batch method. For detailed instructions on all of the functions, both batch and online, refer to the *ChangeMan SSM Data Extraction User's Guide.*

Fingerprinting a VSAM KSDS Cluster

VSAM fingerprinting can be used when VSAM KSDS clusters (local or remote) must be synchronized at the record level, or verified for synchrony. Without using ChangeMan SSM to fingerprint the clusters, the two entire files would have to be made available to the same processor. This would require transferring a prohibitively large amount of data.

The following example illustrates how three VSAM KSDS clusters are fingerprinted. The three VSAM Fingerprint data sets are pre-allocated.

```
//JOBCARD
//*
//STEP1    EXEC PGM=HPSTRANS,REGION=4096K
//STEPLIB  DD DSN=somnode.CMNSSM.LOAD,DISP=SHR
//         DD DSN=somnode.SERCOMC.LOAD,DISP=SHR
//VSAMWORK DD DISP=(,DELETE),
//         DSN=&&HPSWORK,
//         UNIT=SYSDA,
//         SPACE=(CYL,(5,5))
//DD0      DD DSN=somnode.VSFGP0,
//         DISP=SHR
//DD1      DD DSN=somnode.VSFGP1,
//         DISP=SHR
//DD2      DD DSN=somnode.VSFGP2,
//         DISP=SHR
//*----------------------------------------------------------------
//*        VSAM FINGERPRINT DATA SET DCB ATTRIBUES
//*        DCB=(LRECL=0,BLKSIZE=4096,RECFM=U,DSORG=PS)
//*----------------------------------------------------------------
//SYSPRINT DD   SYSOUT=*
//SYSUDUMP DD   SYSOUT=*
//HPSIN    DD   *
VSAMFGP=(DD=DD0,CLUSTER=CMNSSM.SITE.MASTER)
VSAMFGP=(DD=DD1,CLUSTER=CMNSSM.SITE.MASTER1)
VSAMFGP=(DD=DD2,CLUSTER=CMNSSM.SITE.MASTER2)
/*
```

Stacking commands allows you to fingerprint multiple VSAM KSDS data sets in one job step. Each VSAM Fingerprint is stored in a data set pointed to by the provided DDs.

Comparing VSAM Clusters

Through VSAM fingerprinting, local or remote clusters may be compared without requiring the clusters to be available for the comparison.

In the following example, the synchrony of three VSAM clusters is verified by comparing the Fingerprints of two clusters, with the first serving as a reference.

```
//JOBCARD
//*
//STEP1    EXEC PGM=HPSTRANS,REGION=4096K
//STEPLIB  DD DSN=somnode.CMNSSM.LOAD,DISP=SHR
//         DD DSN=somnode.SERCOMC.LOAD,DISP=SHR
//*
//DD0      DD DSN=somnode.VSFGP0,DISP=SHR
//DD1      DD DSN=somnode.VSFGP1,DISP=SHR
//DD2      DD DSN=somnode.VSFGP2,DISP=SHR
//*
//SYSPRINT DD SYSOUT=*
//SYSUDUMP DD SYSOUT=*
//HPSIN    DD   *
  VSAMCOMP=(BASEDD=DD0,
            TARGDD=DD1,
            REPORT=(NONE))
  VSAMCOMP=(BASEDD=DD0,
            TARGDD=DD2,
            REPORT=(NONE))
/*
```

Creating a VSAM Change Basket

In a production system, VSAM KSDS databases are constantly updated through CICS, IMS, and DB2. For the purpose of business resumption capability, remote copies of the critical VSAM data bases are kept off-site or in hot-site environments. The remote copies should be replaced with the production copy even if only a fraction of change is introduced.

A VSAM Change Basket can be used to identify and transfer only the changes (at the record level). This process dramatically reduces the resources required to keep multiple VSAM clusters synchronized locally and remotely.

The following example demonstrates the creation of a VSAM Change Basket. In this process, the new Fingerprint of a VSAM cluster is compared against a previous Fingerprint of the same cluster. Records identified as being updated, added, or deleted are off-loaded from the base cluster into a single physical sequential file referred to as a VSAM Change Basket.

```
//JOBCARD
//*
//STEP1    EXEC PGM=HPSTRANS,REGION=4096K
//STEPLIB  DD DSN=somnode.CMNSSM.LOAD,DISP=SHR
//         DD DSN=somnode.SERCOMC.LOAD,DISP=SHR
//SYSPRINT DD SYSOUT=*
//SYSUDUMP DD SYSOUT=*
//NEW      DD DISP=SHR,        /* REPRESENTS NEW ENVIRONMENT */
//         DSN=somnode.VSFGP(0)
//OLD      DD DISP=SHR,        /* REPRESENTS OLD ENVIRONMENT */
//         DSN=somnode.VSFGP(-1)
//BASKET   DD DISP=SHR,
//         DSN=somnode.VSBASKET
//HPSIN    DD   *
  REGRESSIONCHECK=Y
  VSAMEXPORT=(BASEDD=NEW,
              TARGDD=OLD,
              BASKETDD=BASKET,
              REPORT=YES)
/*
```

Applying a VSAM Change Basket

Once a VSAM Change Basket is created, it may be applied to one or multiple VSAM clusters for synchronization. Standard VSAM I/O routines are used to update the target clusters by using the data residing in the VSAM Change Basket.

The VSAM Change Basket is IMPORTED to the target cluster name specified in the VSAM Change Basket. If the target cluster name is different than what is encoded in the VSAM Change Basket, the override parameter TOCLUSTER may be used. During the Import process a VSAM Reverse Change Basket may be created using the REVERSDD parameter; this file can be used to undo the changes of the Import function.

The following example demonstrates the process of applying a VSAM Change Basket.

```
//JOB
//*
//STEP1    EXEC PGM=HPSTRANS,REGION=4096K
//STEPLIB  DD DSN=somnode.CMNSSM.LOAD,DISP=SHR
//         DD DSN=somnode.SERCOMC.LOAD,DISP=SHR
//DD1      DD DISP=SHR,
//         DSN=somnode.VSBASKET
//DD2      DD DISP=SHR,
//         DSN=somnode.VSBASKET.REVERSE
//SYSPRINT DD   SYSOUT=*
//SYSUDUMP DD   SYSOUT=*
//HPSIN    DD   *
  VSAMIMPORT=(BASKETDD=DD1,
              TOCLUSTER=DETECT.VSAM.SITE.MASTER3,
              REVERSDD=DD2,
              APPLY)
/*
```

The SIMULATE function is also available for VSAM processing.

Reversing a VSAM Import

If the updates applied from the Change Basket need to be reversed, the Reverse Change Basket can be Imported to the cluster to undo the updates.

The following example reverses any changes that were made during the previous Import update process (see "Applying a VSAM Change Basket" on page 80).

```
//JOBNAME  JOB(ACCOUNT),'VSAMUNDO',
//         CLASS=A,NOTIFY=USERID2,MSGCLASS=X
//*
//STEP1    EXEC PGM=HPSTRANS,REGION=4096K
//STEPLIB  DD DSN=somnode.CMNSSM.LOAD,DISP=SHR
//         DD DSN=somnode.SERCOMC.LOAD,DISP=SHR
//DD1      DD DISP=SHR,
//         DSN=somnode.VSBASKET.REVERSE
//SYSPRINT DD  SYSOUT=*
//SYSUDUMP DD  SYSOUT=*
//HPSIN    DD  *
  VSAMIMPORT=(BASKETDD=DD1,
            REVERSE,
            APPLY)
/*
```

Fingerprinting a Flat File

Flat files are divided into three types: KEYED, POSITIONAL, and TEXT.

- KEYED files have a unique field in each record that can be designated as the key.

- POSITIONAL files, such as direct access files, are accessed by record position.

- TEXT files have no specific key or relative position of records.

The following examples illustrate the fingerprinting process for flat files. Refer to the KEY*FGP, POS*FGP, and TXT*FGP members in the SAMPLES library for additional examples.

- Example 1. Fingerprinting a KEYED file

```
KEYEDFGP=(DSN=ACCT.COMPUTER.INVENTRY,
         FGPDD=DD1,
         KEYED=(4,8))
```

- Example 2. Fingerprinting a POSITIONAL file

```
POSFGP=(DSN=ACCT.COMP.TBL,
       FGPDD=DD1)
```

- Example 3. Fingerprinting a TEXT file

```
TEXTFGP=(DSN=ACCT.COMP.JCL,
        FGPDD=DD1)
```

Comparing Flat Files

Flat files can be compared in three ways.

- by using two live files directly

- by using two Fingerprint data sets

- by using a Fingerprint data set and a live file

The following examples illustrate various ways of comparing flat files. For additional examples, see the DATACOMP, KEY*CMP, POS*CMP, and TXT*CMP members in the SAMPLES library. The *ChangeMan SSM Data Extraction User's Guide* also contains examples.

- Example 1. Comparing live files

```
DATACOMP=(BASEDSN=ACCT.COMP.PDSINDX,
          BASEMEM=MEM01,
          TARGDSN=ACCT.COMP.INDX,
          REPORT=(SBS=YES,
          COMPLETE=NO,
          ADD,UPD,DEL))
```

- Example 2. Comparing KEYED files

```
DATACOMP=(BASEDSN=ACCT.COMP.INV,
          TARGDD=DD1,
          KEYED=(4,8))
```

- Example 3. Comparing POSITIONAL files

```
POSCOMP=(BASEDSN=ACCT.COMP.TBL,
         FGPDSN=ACCT.COMP.TBL.FGP
         REPORT=(ALL
         SBS=N,
         COMPLETE=Y)
```

- Example 4. Comparing TEXT files

```
TEXTCOMP=(BASEDSN=ACCT.COMP.JCL,
          FGPDD=DD1
          REPORT=ADD,UPD,DEL)
```

Creating a Data Change Basket

To create a Change Basket from a flat file, use the appropriate Extract/Export command. The Change Baskets must be pre-allocated.

- Example 1. Extracting/Exporting from a KEYED file

```
KEYEDEXP=(BASEDSN=ACCT.COMP.INV,
          FGPDD=DD1,
          KEYED=(4,8))
```

- Example 2. Extracting/Exporting from a POSITIONAL file

```
POSEXP=(BASEDSN=ACCT.COMP.TBL,
        FGPDD=DD1)
```

- Example 3. Extracting/Exporting from a TEXT file

```
TEXTEXP=(BASEDSN=ACCT.COMP.JCL,
         FGPDD=DD1)
```

For additional examples, see the KEY*EXP, POS*EXP, and TXT*EXP members in the SAMPLES library.

Chapter 5

Redundancy Detection and Management

ChangeMan SSM performs redundancy detection and management for data sets, concatenated libraries, DASD volumes, DASD pools, LPARs, and sites.

ChangeMan SSM is able to locate redundant (by content) PDS members and data sets. Maintaining redundant data may be acceptable to a certain level. However, it is important to manage redundancy to prevent over-populating your DASD pool.

You access the redundancy management function by choosing Option 7 from the *Utilities Menu.* This chapter gives an overview of reduncancy management functions. For detailed instructions on all of the Utilities, refer to the *ChangeMan SSM Detection and Synchronization Guide*.

Tokenizing a Pool of Volumes

In this example, redundant data sets in a pool of volumes are detected. The following discussion assumes a large pool of volumes are fingerprinted over non-contiguous time intervals.

A typical benchmark result indicates that for a fully loaded DASD 3390-3 device type, on average, it takes under four minutes (elapsed time) and under one minute CPU time to tokenize an entire volume.

When Tokenizing a pool of volumes, you may want to run multiple jobs. This allows for balancing of the workload, reducing the time required to complete the task.

If the job terminates due to clock expiration or any other interruption, it can be re-started with the RESTART command (discussed in the following topic). With a RESTART, ChangeMan SSM will automatically resume at the point of interruption, without losing the Fingerprint tokens already generated.

Once fingerprinting of the pool is completed, the tokens are externally sorted and identical data sets or members are grouped. In each group of redundant data sets, redundancy level and maximum recoverable space are reported.

JCL Example

```
//JOB
//STEP1    EXEC PGM=HPSTRANS,REGION=4096K
//STEPLIB  DD DSN=somnode.CMNSSM.LOAD,DISP=SHR
//         DD DSN=somnode.SERCOMC.LOAD,DISP=SHR
//SYSPRINT DD   SYSOUT=*
//SYSUDUMP DD   SYSOUT=*
//OUTDD    DD   DSN=somnode.TOKEN.DATASET,DISP=SHR
//HPSIN    DD   *
  CLOCK=45
  DASDRED=(INCLVOL=SER01*,DD=OUTDD)
/*
```

Commands Used in the JCL Example

Command	Description
CLOCK=45	Indicates the number of wall-clock minutes for the job to run. When this time expires, the job terminates but may be restarted (see "Restarting the Tokenizing Job" on page 87). All Fingerprint tokens created up to this point are saved in a token data set.
	A return code of 15 indicates that the CLOCK has expired. If no CLOCK command is specified, the job runs to completion.
	Note1: Do not specify this command if you require the job to run to successful completion in one run.
	Note2: If the job is cancelled, it can also be restarted without losing any of the processing.
	Note3: In some cases, you may only require redundancy checking at the data set level. This also reduces the size of the token data set PARM=NOMEM that is specified. This excludes the member tokens from being written to the output file. Only data set tokens are written.
DASDRED	Allows you to specify the volumes to be included/excluded in the Tokenizing process.
	The OUTDD parameter refers to the token data set, a physical sequential file. The attributes for this data set are:
	RECFM=VB,LRECL=1000,BLKSIZE=6000.
	A Fingerprint token is stored for each member of a PDS and for each data set. The size of the token data set depends on the number of data set members in the pool and can grow as large as two cylinders per Fingerprinted volume.

Restarting the Tokenizing Job

If the tokenizing job has been halted, either by the CLOCK parameter or operator intervention, it can be restarted by executing the following JCL. The Tokenizing process will continue from where it left off.

This example restarts the job from the previous example, "Tokenizing a Pool of Volumes" on page 86.

JCL Example

```
//JOB
//STEP1    EXEC PGM=HPSTRANS,REGION=4096K
//STEPLIB  DD DSN=somnode.CMNSSM.LOAD,DISP=SHR
//         DD DSN=somnode.SERCOMC.LOAD,DISP=SHR
//SYSPRINT DD   SYSOUT=*
//SYSUDUMP DD   SYSOUT=*
//RESTRTDD DD   DSN=somnode.TOKEN.DATASET,DISP=SHR
//HPSIN    DD   *
  TRACE=YES
  CLOCK=45
  RESTART=DD=RESTRTDD     Restart volume Fingerprinting
/*                        from where it left off.
```

Commands Used in the JCL Example

Command	Description
TRACE	Specify YES to turn on the TRACE option. This will display the data set names selected.
CLOCK=45	Same as the CLOCK command in the previous example.
RESTART	Requests a continuation of the job started in the previous example. The DD name specified (RESTRTDD) refers to the same token data set used in the previous example.

Determining the Level of Redundancy

The following job has three steps:

- The first step sorts the token data set in token number order. The SORTIN data set is input from the Tokenizing process (see).

- The second step builds a "grouped" record of redundant data sets/members.

- The third step sorts the file in descending order by either the *Maximum Recoverable Space* or the *Redundancy Level*.

```
//JOB
//*
//SORT1   EXEC PGM=SORT,REGION=2M
//SORTIN   DD DISP=SHR,DSN=somnode.TOKEN.DATASET
//SYSOUT   DD SYSOUT=*
//SORTWK01  DD UNIT=SYSDA,SPACE=(CYL,5)
//SORTWK02  DD UNIT=SYSDA,SPACE=(CYL,5)
//SORTWK03  DD UNIT=SYSDA,SPACE=(CYL,5)
//SORTOUT   DD DISP=(NEW,KEEP,DELETE),
//            DSN=&&TEMP,
//            UNIT=SYSDA,
//            SPACE=(CYL,(1,1)),
//            DCB=(RECFM=VB,LRECL=1000,BLKSIZE=6000)
//SYSIN    DD *
      SORT FIELDS=(05,60,CH,A)
      RECORD TYPE=VB,LENGTH=1000
//STEPGRP EXEC PGM=HPSGROUP,REGION=1M
//*------------------------------------------------------------
//* Input:  "Sorted" version of the REDundant file
//* Output: "Grouped" version of the REDundant files/members
//*------------------------------------------------------------
//STEPLIB  DD DSN=somnode.CMNSSM.LOAD,DISP=SHR
//         DD DSN=somnode.SERCOMC.LOAD,DISP=SHR
//SYSPRINT  DD SYSOUT=*
//INDD     DD DSN=&&TEMP,DISP=(OLD,KEEP,DELETE)
//OUTDD    DD DISP=(NEW,CATLG,DELETE),
//            DSN=somnode.DASDRED.GROUPED,
//            UNIT=SYSDA,
//            SPACE=(CYL,(20,5)),
//            DCB=(RECFM=VB,LRECL=23152,BLKSIZE=23200)
```

```
//SORT2   EXEC PGM=SORT,REGION=2M
//*-----------------------------------------------------------
//* Use either one of these sort fields:
//*  SORT FIELDS=(25,4,CH,D)  Max-recoverable
//*                           (excess tracks allocated)
//*  SORT FIELDS=(15,2,CH,D)  Highest to lowest Redundancy-
//*                           level
//*-----------------------------------------------------------
//SORTIN    DD DISP=SHR,DSN=somnode.DASDRED.GROUPED
//SORTOUT   DD DISP=(NEW,CATLG,DELETE),
//             DSN=somnode.DASDRED.GROUPED.SORTED,
//             UNIT=SYSDA,SPACE=(CYL,(20,5)),
//             DCB=(RECFM=VB,LRECL=23152,BLKSIZE=23200)
// SORTWK01  DD UNIT=SYSDA,SPACE=(CYL,5)
// SORTWK02  DD UNIT=SYSDA,SPACE=(CYL,5)
// SORTWK03  DD UNIT=SYSDA,SPACE=(CYL,5)
// SYSOUT    DD SYSOUT=*
// SYSIN     DD *
   SORT FIELDS=(25,4,CH,D)  /* Max recoverable tracks in */
   RECORD TYPE=VB           /* redundant groups        */
/*
```

Reporting Redundant Data Sets and Members

The following job reports the redundant data sets and members in the INDD data set (created in the token sorting process in "Determining the Level of Redundancy" on page 88).

```
//JOB
//REPORT   EXEC PGM=HPSREPRT,REGION=1M,PARM=DSN
//*
//STEPLIB  DD DSN=somnode.CMNSSM.LOAD,DISP=SHR
//         DD DSN=somnode.SERCOMC.LOAD,DISP=SHR
//SYSPRINT DD SYSOUT=*
//SYSUDUMP DD SYSOUT=*
//INDD     DD DISP=SHR,DSN=somnode.DASDRED.GROUPED.SORTED
```

The PARM value on the EXEC statement determines the types of reports generated:

PARM Value	Type of Report
PARM=DSN	Redundant data set report.
PARM=MEM	Redundant member report.
PARM='DSN,MEM'	Both reports.

Chapter 6
Snapshot Facility

ChangeMan SSM provides a Snapshot facility for comparing data set names and attributes in large environments.

This facility is used to compare pools of volumes at two data centers, such as after a data center migration. Missing data sets and data sets with differing last-reference dates are clearly identified. This facility can assist in data center consolidation, data center migration, and verification of the presence of data sets at a business recovery site. Additionally, exceptions in the DCB attributes and Directory Blocks of data sets can alert users to potential out-of-space and out-of-directory-space conditions.

This chapter introduces the key aspects of the Snapshot facility. For detailed instructions on all of the Utilities, refer to the *ChangeMan SSM Detection and Synchronization Guide*.

The Snapshot ISPF Interface

This utility is used to gather VTOC and VVDS information from one or more volumes. The Snap file generated by the Snapshot facility can be used to identify missing data sets, or data sets having unequal allocations/attributes, between two environments. Additionally it can identify allocated or deleted data sets, at a single environment over a period of time.

The Snapshot Report, described in , performs the actual comparison of Snap files generated with this option.

Choose Option 4 from the *Utilities Menu* to display the *Snapshot Facility* panel.

```
HPSUSNAP ----------------- SSM  Snapshot Facility ---------------------------
 Command ==>

 Specify the following parameters for the Snapshot facility:

 List explicit volsers or volser patterns ending with /:   ('/' for all volumes)
   VOLSER List             ==> SRSM*
   Exclude List            ==> SRSM7E

 New or Existing Snap file  ==> PROD.AM.SNAP
   (New only) DASD Unit     ==> SYSDA           (SYSDA,SYSALLDA...)
             Space Units    ==> TRK             (TRK,CYL,BLK)
             Primary        ==> 5               (1-99999)
             Secondary      ==> 5               (0-99999)

             Report?        ==> YES             (YES,NO)

 Member Name                ==> SNAPJCL         Member name in user JCL library

Press ENTER to create the JCL or press END to exit.
```

The panel parameters are described in the following table:

Parameter	Description
VOLSER List	Enter a specific VOLSER or VOLSER pattern name to be included in the snapshot. Enter '/' for all volumes.
EXCLUDE List	Specify volumes to be excluded from the snapshot. For multiple volumes, separate the list with commas; for example: volname1,volname2,...
New or Existing Snap file	Specify the name of the Snap file to be used for output. If this is a new file, specify the space allocation parameters.
Report?	Specify YES to generate a list of the data sets involved in the snapshot job; they will be reported in the output. The default is NO; the data set list is not reported to the output, but simply placed in the Snap file.
Member Name	Specify the member name in the user JCL library where the generated JCL will be saved.

Snapshot Comparison through ISPF

This utility is used to Report matches/mismatches in two Snap files. Snap files are generated by Option 4 (Snapshot) of the ChangeMan SSM *Utilities Menu*.

Choose Option 5 from the *Utilities Menu* to display the *Snapshot Report Menu*.

```
HPSUSNPR ----------- SSM  Snapshot Report Menu (Ver 8.4.0) -------------------
 Command ==>

 Specify the following parameters for the Snapshot Report:

 Specify two SNAP files to compare:
   First Snapfile on  SYSUT1 ==> PROD.AM.SNAP
   Second Snapfile on SYSUT2 ==> PROD.PM.SNAP

 (Optional) Include/Exclude a data set pattern ending with /:
   INCLDSN                  ==>
   EXCLDSN                  ==>

 Reporting Options:
   _ Matches                   Report of data sets present on both files
   Y Mismatches on SYSUT1    Report of SYSUT1 data sets missing on SYSUT2
   Y Mismatches on SYSUT2    Report of SYSUT2 data sets missing on SYSUT1
        - OR -

   _ Last Referenced Date Mismatches

 Member Name          ==> SNAPJCL        Member name in user JCL library

Press ENTER to create the JCL or press END to exit.
```

The panel parameters are described in the following table:

Parameter	Description
First Snapfile on SYSUT1	Specify the name of the first snap file used in the report.
Second Snapfile on SYSUT2	Specify the name of the second snap file used in the report.
INCLDSN	Specify up to three data set names or patterns to include in the report. Only the specified data sets are used in the report. Multiple data set names must be separated by commas. To include additional data sets, you may modify the generated JCL.
EXCLDSN	Specify up to three data set names or patterns to exclude from the report. Only the specified data sets are excluded from the report. Multiple data set names must be separated by commas. To exclude additional data sets, you may modify the generated JCL.
Matches	Specify a '/' in this box to display the matching data sets found between the two snapfiles.
Mismatches on SYSUT1	Specify a '/' in this box to display data sets found in the SYSUT1 snap file but not in the SYSUT2 snapfile.

Parameter	Description
Mismatches on SYSUT2	Specify a '/' in this box to display data sets found in the SYSUT2 snap file but not in the SYSUT1 snapfile.
Last Referenced Date Mismatches	Specify a '/' in this box to display matching data sets with differing last-referenced dates.
Member Name	Specify the member name in the user JCL library where the generated JCL will be saved.

The Snapshot Process

The Snapshot facility has the ability to quickly collect VTOC and VVDS information from a volume. It records this information along with DCB attributes, EXTENTs allocated, and SPACE and DIRECTORY information, in a physical sequential file. This file is referred to as a snapfile.

The snapshot command, without the optional PDS directory processing, operates at approximately 50 DASD volumes per minute wall time. The optional directory processing provides additional information such as directory blocks allocated and used, and the number of members in a PDS.

Once two snapfiles are created, a variety of reports can be produced to identify exceptional conditions.

The following JCL example shows how to snapshot a pool of DASD volumes:

```
//JOBCARD
//*----------------
//*  SNAPSHOT EXAMPLE WITH INCLVOL
//*    INCLVOL=(SYS/,WRK/)                   VOLUME PATTERNS
//*    INCLVOL=(SCP/,SPOOL*)                 VOLUME PATTERNS
//*    EXLCVOL=(SYSRES,WRKTMP)               EXPLICIT VOLUMES
//*    REPORT=NO                             SHORT REPORT
//*----------------
//STEP1    EXEC PGM=HPSSNAPV,REGION=4096K
//STEPLIB  DD DSN=somnode.CMNSSM.LOAD,DISP=SHR
//         DD DSN=somnode.SERCOMC.LOAD,DISP=SHR
//SNAPFILE DD DISP=SHR,DSN=somnode.SNAPFIL1    OUTPUT FILE
//SYSPRINT DD SYSOUT=*
//SYSUDUMP DD SYSOUT=*
//HPSIN    DD *
 VOLSER=/                          ALL VOLUMES         <==
 REPORT=YES                        DETAILED REPORTING  <==
/*
```

Comparing SNAPFILES

Following is a JCL example for generating a snapshot report of mismatched data sets. For additional examples, refer to the SNAP* members in the SAMPLES library.

```
//JOB
//*
//*         PARM='MISMATCHES'              SHOW ONLY MISMATCHES
//*         PARM='MATCHES'                 SHOW ONLY MATCHES
//*         PARM='ALL'                     SHOW ALL
//*         PARM='MISMATCH=SYSUT1'         SHOW SYSUT1 MISMATCHES
//*         PARM='MISMATCH=SYSUT2'         SHOW SYSUT2 MISMATCHES
//*         PARM='MATCHES MISMATCH=SYSUT1'
//*
//REPORT   EXEC PGM=HPSSNAPR,REGION=4096K,
//         PARM='MISMATCHES'               SHOW MISMATCHES
//STEPLIB  DD DISP=SHR,
//            DSN=STRSUP.SSM810.LOAD
//SYSUT1   DD DISP=SHR,
//            DSN=BSCHEED.PROD.AM.SNAP
//SYSUT2   DD DISP=SHR,
//            DSN=BSCHEED.PROD.PM.SNAP
//SYSPRINT DD SYSOUT=*
//SYSUDUMP DD SYSOUT=*
//HPSIN    DD *
INCLVOL=SRSM*
/*
```

Following is the report generated from the sample JCL:

```
Exec-Parm="MISMATCHES"

Report parameters: SYSUT1 Mismatches = Yes
                   SYSUT2 Mismatches = Yes
                             Matches = No


HPSIN         1    1    2    2    3    3    4    4    5    5    6    6    7    7
 NR....5....0....5....0....5....0....5....0....5....0....5....0....5....0....5

EOF

  -- S Y S U T 2 --     -- S Y S U T 1 -- Entry
Volser Blksi Lrecl   Volser Blksi Lrecl  Typ  Data Set/Cluster/Component Name
...... ..... ..... ¦ SRSM4A 32670 32670 ¦ N APM410.TFULLER.TEMPLIST
SRSM4A   129   129 ¦ ...... ..... ..... ¦ N ATAM2.SPFLOG1.LIST
...... ..... ..... ¦ SRSM5A  6000  6000 ¦ N BSCHEED.LPARA.INSTALL
SRSM4C 27948 27948 ¦ ...... ..... ..... ¦ N BSCHEED.PROD.AM.SNAP
...... ..... ..... ¦ SRSM4C  6000  6000 ¦ N CMNQA.TEST7.AREA1.CMNCLOD
...... ..... ..... ¦ SRSM7B  5928  5928 ¦ N CMNQA.TEST7.AREA1.CMNCLODL
...... ..... ..... ¦ SRSM7D  5904  5904 ¦ N CMNQA.TEST7.AREA1.CMNCLODO
...... ..... ..... ¦ SRSM4F  5888  5888 ¦ N CMNQA.TEST7.AREA1.CMNCOPS
...... ..... ..... ¦ SRSM70  6000  6000 ¦ N CMNQA.TEST7.AREA1.CMNDIRLO
...... ..... ..... ¦ SRSM51  5888  5888 ¦ N CMNQA.TEST7.AREA1.CMNDIRSR
...... ..... ..... ¦ SRSM5B  5920  5920 ¦ N CMNQA.TEST7.AREA1.CMNERROR
...... ..... ..... ¦ SRSM58 13680 13680 ¦ N DDELANO.ISR0001.BACKUP
```

```
SRSM58 32768 32768 ¦ ...... ..... ..... ¦ C RFERNAN.AM.D2009288.T2153242
SRSM58 32768 32768 ¦ ...... ..... ..... ¦ D RFERNAN.AM.D2009288.T2153242.DATA
SRSM58  4096  4096 ¦ ...... ..... ..... ¦ I RFERNAN.AM.D2009288.T2153242.INDEX
...... ..... ..... ¦ SRSM5B  1210  1210 ¦ N SYS03288.T122510.RA000.JJONES.R06017
...... ..... ..... ¦ SRSM5F  1210  1210 ¦ N SYS03288.T132500.RA000.TFONTA2.R0700
...... ..... ..... ¦ SRSM4F  4029  4029 ¦ N SYS03288.T132500.RA000.TFONTA2.R0700
...... ..... ..... ¦ SRSM4F  4096  4096 ¦ N SYS03288.T132500.RA000.TFONTA2.SPILL
...... ..... ..... ¦ SRSM58   800   800 ¦ N SYS03288.T142215.RA000.KPARKER.R0103
...... ..... ..... ¦ SRSM4C   800   800 ¦ N SYS03288.T142215.RA000.KPARKER.R0103
...... ..... ..... ¦ SRSM58  1210  1210 ¦ N SYS03288.T142215.RA000.KPARKER.R0103
...... ..... ..... ¦ SRSM58  1210  1210 ¦ N SYS03288.T142215.RA000.KPARKER.R0103
...... ..... ..... ¦ SRSM58  4029  4029 ¦ N SYS03288.T142215.RA000.KPARKER.R0103
...... ..... ..... ¦ SRSM77  4096  4096 ¦ N SYS03288.T142215.RA000.KPARKER.SPILL
...... ..... ..... ¦ SRSM4C   800   800 ¦ N SYS03288.T144847.RA000.USER73MX.R010
...... ..... ..... ¦ SRSM48   800   800 ¦ N SYS03288.T145003.RA000.ATAM2.R01032
...... ..... ..... ¦ SRSM49  4080  4080 ¦ N SYS03288.T145010.RA000.BSCHEEDS.SNA
...... ..... ..... ¦ SRSM4F     0     0 ¦ N SYS03288.T145011.RA000.TFULLER.R010
SRSM58   800   800 ¦ ...... ..... ..... ¦ N SYS03288.T145104.RA000.ATAM2.R01032
SRSM58   800   800 ¦ ...... ..... ..... ¦ N SYS03288.T145104.RA000.ATAM2.R01032
SRSM58  1210  1210 ¦ ...... ..... ..... ¦ N SYS03288.T145104.RA000.ATAM2.R01032
SRSM7D  1210  1210 ¦ ...... ..... ..... ¦ N SYS03288.T145104.RA000.ATAM2.R01032
SRSM52  4029  4029 ¦ ...... ..... ..... ¦ N SYS03288.T145104.RA000.ATAM2.R01032
SRSM77  4096  4096 ¦ ...... ..... ..... ¦ N SYS03288.T145104.RA000.ATAM2.SPILL.
SRSM79  6160  6160 ¦ ...... ..... ..... ¦ N SYS03288.T145108.RA000.SERSTAR3.R01
SRSM7C  8800  8800 ¦ ...... ..... ..... ¦ N SYS03288.T145108.RA000.SERSTAR3.R01
SRSM58   800   800 ¦ ...... ..... ..... ¦ N SYS03288.T145319.RA000.TFONTA2.R070
SRSM58   800   800 ¦ ...... ..... ..... ¦ N SYS03288.T145319.RA000.TFONTA2.R070
SRSM58  1210  1210 ¦ ...... ..... ..... ¦ N SYS03288.T145319.RA000.TFONTA2.R070
SRSM58  1210  1210 ¦ ...... ..... ..... ¦ N SYS03288.T145319.RA000.TFONTA2.R070
SRSM58  4029  4029 ¦ ...... ..... ..... ¦ N SYS03288.T145319.RA000.TFONTA2.R070
SRSM58  4096  4096 ¦ ...... ..... ..... ¦ N SYS03288.T145319.RA000.TFONTA2.SPIL
SRSM58  4080  4080 ¦ ...... ..... ..... ¦ N SYS03288.T145336.RA000.BSCHEEDS.SNA
...... ..... ..... ¦ SRSM4C   129   129 ¦ N TFONTA2.SPFLOG1.LIST
SRSM4C 27966 27966 ¦ ...... ..... ..... ¦ N TMAPLES.DB2.EXTRACTA
SRSM58 27966 27966 ¦ ...... ..... ..... ¦ N TMAPLES.DB2.EXTRACTB
SRSM7D 27966 27966 ¦ ...... ..... ..... ¦ N TMAPLES.DB2.EXTRACTC
...... ..... ..... ¦ SRSM58   800   800 ¦ N USERWRK.USER109.D288BA2D.T0F59F37


HPS3332I  HPSSNAPR  15:10:50 S U M M A R Y :
                                  SYSUT1      SYSUT2
                                  24,827      24,824 DSNs read
                                  24,827      24,824 DSNs selected
                                      26          23 DSNs not matched
                                  24,801      24,801 DSNs matches


HPS0000I  HPSSNAPR  15:10:50 Job Started: 2009/10/15_15:10:48
                            Job Ended  : 2009/10/15_15:10:50
                            Warning cnt: 0
                            Severe msgs: 0
```

Chapter 7
Sample Reports

The following sample reports illustrate the report output:

Online Out-of-Sync Report (Two PDSs)

This report was generated using *Option P - PDS Compare*, available from the *Detection and Synchronization Menu*. Refer to the *ChangeMan SSM Detection and Synchronization Guide* for more information about this option.

```
        BASE=RESET
        TARG=RESET
        EXTENDED=N
        BASE=DSN=STRSUP.SSM810.PANELS
        TARG=DSN=STRQA.SSM82Q.PANELS
        SETPRINT=(SYNC=N,OUTSYNC=Y,MISMATCH=Y)
        COMPARE=MEMTOMEM

HPS0904I  HPSTRANS  07:38:47 CATALOGED DSN added to Base: STRSUP.SSM810.PANELS
HPS0904I  HPSTRANS  07:38:54 CATALOGED DSN added to Targ: STRQA.SSM82Q.PANELS

                   MEMTOMEM REPORT:
Base-dsname/volser                              Targ-dsname/volser

STRSUP.SSM810.PANELS                            STRQA.SSM82Q.PANELS
SRSM4E            Member    Fingerprints Directory  Member    SRSM74
2009/09/30_12:00  HPS@DEMO   -OutSync -  -OutSync - HPS@DEMO  2009/09/09_16:38
2009/09/30_12:00  HPSDMEXA   -OutSync -  -OutSync - HPSDMEXA  2009/09/08_12:34
2009/09/30_12:00  HPSDMFGP   -OutSync -             HPSDMFGP  2009/09/08_12:34
                             -Mismatch-             HPSDMUND  2009/09/08_12:23
2009/09/30_12:00  HPSDMUP1   -OutSync -  -OutSync - HPSDMUP1  2009/09/08_12:35
2009/09/30_12:00  HPSERROR   -OutSync -  -OutSync - HPSERROR  2009/08/11_17:28
2009/09/30_12:00  HPSHDP04   -OutSync -             HPSHDP04  2009/09/08_12:37
                             -Mismatch-             HPSHDP11  2009/09/08_12:27
                             -Mismatch-             HPSHTFMN  2009/09/02_15:33
2009/09/30_12:00  HPSHU@10   -OutSync -  -OutSync - HPSHU@10  2009/07/29_16:40
2009/09/30_12:00  HPSHUF01   -OutSync -  -OutSync - HPSHUF01  2009/08/28_15:50
2009/09/30_12:00  HPSHUF27   -Mismatch-
2009/09/30_12:00  HPSHUF28   -OutSync -  -OutSync - HPSHUF28  2009/09/02_10:18
2009/09/30_12:00  HPSHUF29   -OutSync -  -OutSync - HPSHUF29  2009/09/02_10:18
2009/09/30_12:00  HPSHUF38   -OutSync -  -OutSync - HPSHUF38  2009/09/02_10:18
2009/09/30_12:00  HPSHUF39   -OutSync -  -OutSync - HPSHUF39  2009/08/28_15:51
2009/09/30_12:00  HPSHUF43   -Mismatch-
2009/09/30_12:00  HPSHUF44   -Mismatch-
2009/09/30_12:00  HPSHUF46   -OutSync -  -OutSync - HPSHUF46  2009/09/02_10:19
2009/09/30_12:00  HPSHUF47   -OutSync -  -OutSync - HPSHUF47  2009/09/02_10:19
2009/09/30_12:00  HPSHUF51   -Mismatch-
2009/09/30_12:00  HPSHUF77   -Mismatch-
2009/09/30_12:00  HPSIPTAB   -OutSync -  -OutSync - HPSIPTAB  2009/09/10_10:01
2009/09/30_12:00  HPSMRDEF   -OutSync -  -OutSync - HPSMRDEF  2009/09/02_15:22

HPS0555W  HPSTRANS  07:38:54          Base       Target
                                      886         886 Member name matches
                                      870         870 Synchronized members
                                       16          16 Out-of-sync members
                                        5           3 Member name mismatches

                                        0           0 Aliases (Non-orphaned)
                                        0           0 Orphaned aliases
```

Batch Out-of-Sync Report with Side-By-Side Comparison

ChangeMan SSM's internal byte-level comparison is invoked for each OutSync Member during the compare of two libraries. In this example, the side-by-side comparison is shown, with only added, updated, and deleted records displayed. See "DATACOMPARE" in the *ChangeMan SSM Data Extraction User's Guide*.

```
          EXTENDED=NO          /* extended synchronization is not in effect */
        *
          BASE=DSN=USER17.SSM820.INSTALL.PROD
          TARG=DSN=USER17.SSM820.INSTALL.TEST
          SETPRINT=(SYNC=N,OUTSYNC=Y,MISMATCH=Y)
          COMPARE=MEMTOMEM=DETECT=(SBS=Y,COMPLETE=N,ADD,UPD,DEL)

HPS0900I  HPSTRANS  08:08:33 EOF HPSIN:  Cards read=6   with 5 Commands.

HPS0904I  HPSTRANS  08:08:34 CATALOGED DSN added to Base: USER17.SSM820.INSTALL.PROD
HPS0904I  HPSTRANS  08:08:35 CATALOGED DSN added to Targ: USER17.SSM820.INSTALL.TEST


                    MEMTOMEM REPORT:
Base-dsname/volser                              Targ-dsname/volser
USER17.SSM820.INSTALL.PROD                      USER17.SSM820.INSTALL.TEST
SRSM5B        Member    Fingerprints Directory  Member    SRSM4F
2009/03/27_14:11 $GLOBAL    -OutSync -          $GLOBAL   2009/10/14_08:07
================= Comparison Invoked: $GLOBAL   =================

 Base  Targ   0   0   1   1   2   2   2   3      0   0   1   1   2   2   2   3
   Nr    Nr ...4...8...2...6...0...4...8...2    ...4...8...2...6...0...4...8...2
   2     2 //*                            <> //* Added comment (test first)

HPS1617I  HPSDCOMP  08:08:35 Comparison Summary:
                              0 Inserted =>
                              0 Deleted  <=
                              1 Updated  <> changed seg of updated record
                                 ¦¦ unchanged seg of updated record
                              0 Moved        ~~
                             31 Unchanged    ||


2009/08/13_11:57 $REORG      -Mismatch-

HPS0555W  HPSTRANS  08:08:35          Base      Target
                              76        76 Member name matches
                              75        75 Synchronized members
                               1         1 Out-of-sync members
                               1         0 Member name mismatches

                               0         0 Aliases (Non-orphaned)
                               0         0 Orphaned aliases


HPS0000I  HPSTRANS  08:08:35 Job Started: 2009/10/14_08:08:33
                             Job Ended  : 2009/10/14_08:08:35
                             Warning cnt: 1
                             Severe msgs: 0

                 Find "W  HPS" in col 9 for WARNING messages.
```

Report of Fingerprinting an Environment

The JCL to generate this type of report can be found in .

```
            BASE=VOL=(INCLVOL=(SRSM7*),
                     INCLDSN=(STRSUP.SSM810/))
            BASE=SAVE=DD=FGPDD

HPS0900I  HPSTRANS  08:31:59 EOF HPSIN:  Cards read=3   with 2 Commands.

HPS0902I  HPSTRANS  08:32:00 Volume SRSM7A selected:
HPS0911I  HPSTRANS  08:32:00 0 of 448 Data Sets Fingerprinted.

HPS0902I  HPSTRANS  08:32:00 Volume SRSM7C selected:
HPS0911I  HPSTRANS  08:32:00 2 of 620 Data Sets Fingerprinted.

HPS0902I  HPSTRANS  08:32:01 Volume SRSM7D selected:
HPS0911I  HPSTRANS  08:32:01 1 of 517 Data Sets Fingerprinted.

HPS0902I  HPSTRANS  08:32:01 Volume SRSM7E selected:
HPS0911I  HPSTRANS  08:32:01 1 of 529 Data Sets Fingerprinted.

HPS0902I  HPSTRANS  08:32:01 Volume SRSM7F selected:
HPS0911I  HPSTRANS  08:32:01 0 of 300 Data Sets Fingerprinted.

HPS0902I  HPSTRANS  08:32:03 Volume SRSM74 selected:
HPS0911I  HPSTRANS  08:32:03 1 of 510 Data Sets Fingerprinted.

HPS0902I  HPSTRANS  08:32:03 Volume SRSM75 selected:
HPS0911I  HPSTRANS  08:32:03 1 of 443 Data Sets Fingerprinted.

HPS0902I  HPSTRANS  08:32:04 Volume SRSM78 selected:
HPS0911I  HPSTRANS  08:32:04 1 of 292 Data Sets Fingerprinted.

HPS0902I  HPSTRANS  08:32:04 Volume SRSM79 selected:
HPS0911I  HPSTRANS  08:32:04 0 of 453 Data Sets Fingerprinted.

HPS0136I  HPSTRANS  08:32:05 Fingerprint data set created successfully
                            containing tokens for 7 data sets.
                            DSname = USER17.SSM810.MAR.FGP
                            DDname = FGPDD

HPS0905I  HPSTRANS  08:32:05 FGPDD Fingerprint data set saved successfully
HPS0000I  HPSTRANS  08:32:05 Job Started: 2009/10/14_08:31:59
                            Job Ended  : 2009/10/14_08:32:05
                            Warning cnt: 0
                            Severe msgs: 0
```

Report of Compare Software Environments Using Models

The JCL to generate this type of report can be found in "Comparing Environments Using the MODEL Command" on page 56.

```
            EXTENDED=YES     /* extended synchronization in effect? */
            MODEL=(NAME=MODEL01,
                   TRANSFORM=('USER17.LPARA'=>'USER17.LPARB'))
            *
            BASE=GENERIC=(DSN=USER17.LPARA)
            TARG=GENERIC=(DSN=USER17.LPARB)
            COMPARE=DSNBYDSN=(SHORT,MODEL=MODEL01,DISPLAYTOKENS=N)

HPS0900I  HPSTRANS  08:53:26 EOF HPSIN:  Cards read=7   with 5 Commands.

HPS0904I  HPSTRANS  08:53:27 CATALOGED DSN added to Base: USER17.LPARA.INSTALL
HPS0904I  HPSTRANS  08:53:28 CATALOGED DSN added to Base: USER17.LPARA.INSTALL.OLD
HPS0904I  HPSTRANS  08:53:29 CATALOGED DSN added to Base: USER17.LPARA.LINKLIB
HPS0904I  HPSTRANS  08:53:29 CATALOGED DSN added to Base: USER17.LPARA.MESSAGES
HPS0904I  HPSTRANS  08:53:30 CATALOGED DSN added to Base: USER17.LPARA.PANELS
HPS0904I  HPSTRANS  08:53:31 CATALOGED DSN added to Targ: USER17.LPARB.ADDED
HPS0904I  HPSTRANS  08:53:32 CATALOGED DSN added to Targ: USER17.LPARB.INSTALL
HPS0904I  HPSTRANS  08:53:33 CATALOGED DSN added to Targ: USER17.LPARB.LINKLIB
HPS0904I  HPSTRANS  08:53:34 CATALOGED DSN added to Targ: USER17.LPARB.MESSAGES
HPS0904I  HPSTRANS  08:53:35 CATALOGED DSN added to Targ: USER17.LPARB.NEWDSN
HPS0904I  HPSTRANS  08:53:37 CATALOGED DSN added to Targ: USER17.LPARB.PANELS


Transformation Model in effect: MODEL01

Dsname prior to transformation                Transformed dsname
USER17.LPARA.INSTALL                      => USER17.LPARB.INSTALL
USER17.LPARA.INSTALL.OLD                  => USER17.LPARB.INSTALL.OLD
USER17.LPARA.LINKLIB                      => USER17.LPARB.LINKLIB
USER17.LPARA.MESSAGES                     => USER17.LPARB.MESSAGES
USER17.LPARA.PANELS                       => USER17.LPARB.PANELS

REPORT OF UNMATCHED BASE DATA SETS
MemCnt Base-vol Dsname
    17  SRSM77  USER17.LPARA.INSTALL.OLD

17 Members in 1 UnMatched Base Data Sets
_____



REPORT OF UNMATCHED TARG DATA SETS
MemCnt Targ-vol Dsname
    13  SRSM75  USER17.LPARB.ADDED
     0  SRSM7E  USER17.LPARB.NEWDSN

13 Members in 2 UnMatched Targ Data Sets
_____

REPORT OF IN-SYNC DATA SETS
MemCnt Base-vol Base-dsname                   Targ-vol Targ-dsname
     4  SRSM75  USER17.LPARA.LINKLIB          SRSM74 USER17.LPARB.LINKLIB
     0  SRSM53  USER17.LPARA.MESSAGES         SRSM70 USER17.LPARB.MESSAGES

4 In-Sync Members in 2 In-Sync Data Sets
_____
```

```
                        MEMTOMEM REPORT:
Base-dsname/volser                                    Targ-dsname/volser

USER17.LPARA.INSTALL                                  USER17.LPARB.INSTALL
SRSM77           Member    Fingerprints Directory  Member    SRSM59
                           -Mismatch-               $ADMSET   2009/09/08_13:48
2009/09/08_13:48 RENAMEX   -Mismatch-

HPS0555W  HPSTRANS  08:53:37         Base      Target
                                       82         82 Member name matches
                                       82         82 Synchronized members
                                        0          0 Out-of-sync members
                                        1          1 Member name mismatches
```
_____

```
                        MEMTOMEM REPORT:
Base-dsname/volser                                    Targ-dsname/volser

USER17.LPARA.PANELS                                   USER17.LPARB.PANELS
SRSM5D           Member    Fingerprints Directory  Member    SRSM72
2009/10/13_12:30 ADDED     -Mismatch-
2009/10/13_12:29 HPSADM1   -OutSync -               HPSADM1   2009/03/25_09:31
                           -Mismatch-               HPSCONG2  2009/03/25_09:31
                           -Mismatch-               HPSCONOI  2009/03/24_14:09

HPS0555W  HPSTRANS  08:53:37         Base      Target
                                       55         55 Member name matches
                                       54         54 Synchronized members
                                        1          1 Out-of-sync members
                                        1          2 Member name mismatches
```
_____

```
 PS0932I  HPSTRANS  08:53:37 SHORT DSNBYDSN SUMMARY REPORT:

                        MATCHED DATA SETS:
                              2 In-Sync data sets:

                                    BASE    TARGET
                                      4        4    In-Sync Members

                              2 Out-of-Sync data sets:

                                    BASE    TARGET
                                      1        1    Out-of-Sync Members
                                    136      136    In-Sync Members
                                    137      137    Matched Members
                                      2        3    MisMatched Members
                                    139      140    Members

                        UNMATCHED DATA SETS:
                                    1 Unmatched  BASE data sets with 17
                                    2 Unmatched  TARG data sets with 13
                                    3 TOTAL Unmatched data sets with 30

HPS0000I  HPSTRANS  08:53:37 Job Started: 2009/10/14_08:53:26
                             Job Ended  : 2009/10/14_08:53:37
                             Warning cnt: 2
                             Severe msgs: 0

                        Find "W  HPS" in col 9 for WARNING messages.
```

Extract/Export Report

JCL to generate this type of report can be found in .

```
ENQ=YES
EXTENDED=YES           /* extended synchronization is in effect */
BASE=LOAD=DD=FGPDD1
TARG=LOAD=DD=FGPDD2
*
EXTRACT=ALL            /* NOTE: the single command EXTRACT=ALL is
*                      /* equivalent to the following 3 commands:
*                      /*    EXTRACT=DSNBYDSN
*                      /*    EXTRACT=NEWDSN
*                      /*    EXTRACT=SCRDSN
*
EXPORT=(DD=BASKETDD,
         COMMENT='THIS BASKET CONTAINS LPARA MAINT.')

HPS0900I  HPSTRANS  10:41:12  EOF HPSIN:  Cards read=13    with 6 Commands.

HPS0575I  HPSTRANS  10:41:12  Fingerprints loaded for  Dsn:  USER17.LPARA.AFTMAINT.FGP
HPS0575I  HPSTRANS  10:41:12  Fingerprints loaded for  Dsn:  USER17.LPARA.INSTALL
HPS0575I  HPSTRANS  10:41:12  Fingerprints loaded for  Dsn:  USER17.LPARA.LINKLIB
HPS0575I  HPSTRANS  10:41:12  Fingerprints loaded for  Dsn:  USER17.LPARA.MESSAGES
HPS0575I  HPSTRANS  10:41:12  Fingerprints loaded for  Dsn:  USER17.LPARA.PANELS
HPS0575I  HPSTRANS  10:41:12  Fingerprints loaded for  Dsn:  USER17.LPARA.PROCLIB
Masking in Effect:  NONE

HPS0142I  HPSTRANS  10:41:12  Fingerprint data set loaded successfully.
                             6 data sets included.
                             0 data sets excluded.
                             DSname = USER17.LPARA.AFTMAINT.FGP
                             DDname = FGPDD1

HPS0906I  HPSTRANS  10:41:12  Fingerprint data set loaded to the Base:

HPS0575I  HPSTRANS  10:41:12  Fingerprints loaded for Dsn:  USER17.LPARA.INSTALL
HPS0575I  HPSTRANS  10:41:12  Fingerprints loaded for Dsn:  USER17.LPARA.INSTALL.OLD
HPS0575I  HPSTRANS  10:41:12  Fingerprints loaded for Dsn:  USER17.LPARA.LINKLIB
HPS0575I  HPSTRANS  10:41:12  Fingerprints loaded for Dsn:  USER17.LPARA.MESSAGES
HPS0575I  HPSTRANS  10:41:12  Fingerprints loaded for Dsn:  USER17.LPARA.PANELS

HPS0142I  HPSTRANS  10:41:12  Fingerprint data set loaded successfully.
                             5 data sets included.
                             0 data sets excluded.
                             DSname = USER17.LPARA.BEFMAINT.FGP
                             DDname = FGPDD2
```

```
HPS0906I  HPSTRANS  10:41:12 Fingerprint data set loaded to the Targ:

HPS0937I  HPSTRANS  10:41:12 Added to Superdir:   ScrDSN = USER17.LPARA.INSTALL.OLD

HPS0916I  HPSTRANS  10:41:12 Added to Superdir:   NewDSN = USER17.LPARA.AFTMAINT.FGP
HPS0916I  HPSTRANS  10:41:12 Added to Superdir:   NewDSN = USER17.LPARA.PROCLIB

HPS0147I  HPSTRANS  10:41:12 Targ-Dsn : USER17.LPARA.LINKLIB
                             Base-dsn : USER17.LPARA.LINKLIB
                             Action   : NONE- base and target in sync.  No output.

HPS0147I  HPSTRANS  10:41:12 Targ-Dsn : USER17.LPARA.PANELS
                             Base-dsn : USER17.LPARA.PANELS
                             Action   : NONE- base and target in sync.  No output.

=======================  Data Set Actions  =========================================
New dsn: USER17.LPARA.AFTMAINT.FGP                     STORCLAS=COMMON   MGMTCLAS=STANDEF   DATACLAS=(NULL)
=======================  Data Set Actions  =========================================
<deletes>  ToVOL:  SRSM77  ToDSN:   USER17.LPARA.INSTALL
Name   Alias  Timestamp         Fingerprint
CONV1DOC       2001/01/31_14:54:00  C8AA15DC-0000005E5
CONV5RES       1999/03/23_10:44:00  49A13F5F-00000003
FGP            1999/03/23_10:44:00  B2BF3743-000001A2
FGPGDG         1999/09/15_12:31:00  72C2EDBD-00000186
FGPGDG0        1999/09/22_10:08:00  9A36A950-0000004EC

<new-add>  ToVOL:  SRSM77  ToDSN:   USER17.LPARA.INSTALL
           FromVOL: SRSM77  FromDSN: USER17.LPARA.INSTALL

Name   Alias  Timestamp         Fingerprint
ADDED1         2009/10/14_10:28:00  9B6917DB-00000005
NEWMEM         2009/10/14_10:27:00  9FCCC65A-00000007
RENCONV5       1999/03/23_10:44:00  49A13F5F-00000D03

<replace>  ToVOL:  SRSM77  ToDSN:   USER17.LPARA.INSTALL
           FromVOL: SRSM77  FromDSN: USER17.LPARA.INSTALL

Name   Alias  Timestamp         Fingerprint         Dir  Timestamp            Fingerprint
BOOKREAD       2009/10/14_10:26:00  A8512A33-000003BD5 ==> 2001/12/05_12:50:00 BE74A636-000003BCE
EXPORT         2009/10/14_10:26:00  14058DB3-00000022D <== 1999/03/23_10:44:00 C9091EA5-00000228
```

```
===========================   Data Set Actions   ==================================
Scr dsn: USER17.LPARA.INSTALL.OLD
===========================   Data Set Actions   ==================================
<new-add>  ToVOL:  SRSM53  ToDSN:   USER17.LPARA.MESSAGES
           FromVOL: SRSM53 FromDSN: USER17.LPARA.MESSAGES

Name   Alias  Timestamp             Fingerprint
MSG01         2009/10/14_10:32:00   405BA334-00000052
MSG02         2009/10/14_10:32:00   405BA334-00000052
MSG03         2009/10/14_10:32:00   405BA334-00000052
===========================   Data Set Actions   ==================================
New dsn: USER17.LPARA.PROCLIB              STORCLAS=COMMON    MGMTCLAS=STANDEF   DATACLAS=(NULL)
                                          ===================================

Copied to Basket: USER17.LPARA.AFTMAINT.FGP
=================   Begin IEBCOPY SYSPRINT   =======================================
           IEBCOPY MESSAGES AND CONTROL STATEMENTS
IEB1135I IEBCOPY  FMID HDZ11G0  SERVICE LEVEL NONE     DATED 20020718 DFSMS 01.03.00  z/OS 01.03.00 HBB7706
IEB1035I USER17D  EXPORT   10:41:13 TUE 14 OCT 2009 PARM=''
COPY OUTDD=HPSWORK,INDD=DDSOURCE
S M=ADDED1
S M=BOOKREAD
S M=EXPORT
S M=NEWMEM
S M=RENCONV5
IEB1013I COPYING FROM PDS    INDD=DDSOURCE VOL=SRSM77 DSN=USER17.LPARA.INSTALL
IEB1014I              TO PDSU OUTDD=HPSWORK  VOL=SRSM57 DSN=SYS03287.T104111.RA000.USER17D.R0200517
IEB167I FOLLOWING MEMBER(S) UNLOADED FROM INPUT DATA SET REFERENCED BY DDSOURCE
IEB154I ADDED1    HAS BEEN SUCCESSFULLY UNLOADED
IEB154I BOOKREAD HAS BEEN SUCCESSFULLY UNLOADED
IEB154I EXPORT   HAS BEEN SUCCESSFULLY UNLOADED
IEB154I NEWMEM   HAS BEEN SUCCESSFULLY UNLOADED
IEB154I RENCONV5 HAS BEEN SUCCESSFULLY UNLOADED
IEB1098I 5 OF 5 MEMBERS UNLOADED FROM INPUT DATA SET REFERENCED BY DDSOURCE
IEB147I END OF JOB - 0 WAS HIGHEST SEVERITY CODE
=================         End IEBCOPY SYSPRINT   ===================================

=================   Begin IEBCOPY SYSPRINT   =======================================
           IEBCOPY MESSAGES AND CONTROL STATEMENTS
IEB1135I IEBCOPY  FMID HDZ11G0  SERVICE LEVEL NONE     DATED 20020718 DFSMS 01.03.00  z/OS 01/03/00 HBB7706
```

```
IEB1035I USER17D   EXPORT   10:41:13 TUE 14 OCT 2009 PARM=''
COPY OUTDD=HPSWORK,INDD=DDSOURCE
 S M=MSG01
 S M=MSG02
 S M=MSG03
IEB1013I COPYING FROM PDS   INDD=DDSOURCE VOL=SRSM53 DSN=USER17.LPARA.MESSAGES
IEB1014I           TO PDSU OUTDD=HPSWORK  VOL=SRSM57 DSN=SYS03287.T104111.RA000.USER17.R0200517
IEB167I FOLLOWING MEMBER(S) UNLOADED FROM INPUT DATA SET REFERENCED BY DDSOURCE
IEB154I MSG01    HAS BEEN SUCCESSFULLY UNLOADED
IEB154I MSG02    HAS BEEN SUCCESSFULLY UNLOADED
IEB154I MSG03    HAS BEEN SUCCESSFULLY UNLOADED
IEB1098I 3 OF 3 MEMBERS UNLOADED FROM INPUT DATA SET REFERENCED BY DDSOURCE
IEB147I END OF JOB - 0 WAS HIGHEST SEVERITY CODE
==================================    End IEBCOPY SYSPRINT   =================================

=================================    Begin IEBCOPY SYSPRINT   ================================
            IEBCOPY MESSAGES AND CONTROL STATEMENTS
IEB1135I IEBCOPY  FMID HDZ11G0  SERVICE LEVEL NONE   DATED 20020718 DFSMS 01.03.00 z/OS 01/03/00 HBB7706
IEB1035I USER17D   EXPORT   10:41:13 TUE 14 OCT 2009 PARM=''
COPY OUTDD=HPSWORK,INDD=DDSOURCE
IEB1013I COPYING FROM PDS   INDD=DDSOURCE VOL=SRSM7B DSN=USER17.LPARA.PROCLIB
IEB1014I           TO PDSU OUTDD=HPSWORK  VOL=SRSM57 DSN=SYS03287.T104111.RA000.USER17.R0200517
IEB167I FOLLOWING MEMBER(S) UNLOADED FROM INPUT DATA SET REFERENCED BY DDSOURCE
IEB154I $$730UPG HAS BEEN SUCCESSFULLY UNLOADED
IEB154I $APFAUTH HAS BEEN SUCCESSFULLY UNLOADED
IEB154I $AUTH    HAS BEEN SUCCESSFULLY UNLOADED
IEB154I $BACKUP  HAS BEEN SUCCESSFULLY UNLOADED
IEB154I $DEFGDG  HAS BEEN SUCCESSFULLY UNLOADED
IEB154I $DEFINE  HAS BEEN SUCCESSFULLY UNLOADED
IEB154I $DETECT  HAS BEEN SUCCESSFULLY UNLOADED
IEB1098I 7 OF 7 MEMBERS UNLOADED FROM INPUT DATA SET REFERENCED BY DDSOURCE
IEB147I END OF JOB - 0 WAS HIGHEST SEVERITY CODE
==================================    End IEBCOPY SYSPRINT   =================================

HPS0176I  HPSTRANS  10:41:14

                     _____
                    |                                |
                    |   Basket created successfully.  |
                    |      2009/10/14_10:41:12        |
                    |'THIS BASKET CONTAINS LPARA MAINT.'|
                    |_____|

HPS0000I  HPSTRANS  10:41:14 Job Started: 2009/10/14_10:41:12
                             Job Ended  : 2009/10/14_10:41:14
                             Warning cnt: 0
                             Severe msgs: 0
```

Redundancy Reports

The following redundancy reports are available:

- *Data Set Redundancy Report*

- *Member Redundancy Report*

Both reports are followed by a summary report.

Commands to Create Report

Following are the commands used to generate the reports in this example:

```
 DASDRED=(INCLVOL=(SRSM7*),
          INCLDSN=(USER17/),
          TYPE=(PO),
          DD=REDDD,
*)IM $$EXCL
          EXCLDSN=(SYS?.HASPCKPT,
                   SYS1.BRODCAST,
                   SYS1.VTOCIX.*,
                   SYS1.MAN?,
                   SYS1.LOGREC,
                   SYS1.UADS,
                   SYS1.DAE,
                   SYS1.SMPDLOGA,
                   SYS1.SMPLOGA,
                   SYS1.SMPTLOGA,
                   SYS1.RACF))
```

Data Set Redundancy Report

```
                        ( D A T A S E T )     R E D U N D A N C Y     R E P O R T

Red   Total-Tracks  Recoverable  D R Volser                                         Tracks Tracks
Lev   Alloc  Used   Alloc  Used  S F     Dsname-------------  Alloc  Used  Hash-Time-Stamp  Referred

001    14    2        13    13   1 P F  SRSM70 USER17.LPARB.MSGS........    1     1   2009/10/14_11:10    NONE
                                   P F  SRSM7E USER17.LPARB.NEWDSN......   13     1   2009/10/14_11:10    NONE

001     8    6         4     4   3 P U  SRSM75 USER17.LPARA.LINKLIB.....    4     3   2009/10/14_11:10 2009/10/13
                                   P U  SRSM74 USER17.LPARB.LINKLIB.....    4     3   2009/10/14_11:10 2009/10/13


HPS0807I  HPSREPRT  11:10:21 **  R E D U N D A N C Y   S U M M A R Y   (DSN)  **
                        2 Redundant groups
                        4 Included dsns
                        1 Highest redundancy level
                       22 Total allocated tracks in all groups
                        8 Total used tracks in all groups
                       18 Recoverable tracks from all groups


HPS0000I  HPSREPRT  11:10:21 Job Started: 2009/10/14_11:10:21
                             Job Ended : 2009/10/14_11:10:21
                             Warning cnt: 0
                             Severe msgs: 0
```

Member Redundancy Report

```
( M E M B E R )   R E D U N D A N C Y   R E P O R T
```

Red Lev	Group-size Bytes	Recoverable Bytes	Member	Volser	Dsname	Member-size hash-bytes	Updat-Time-Stamp	Owner
010	231	210	XX	SRSM7C	USER17.DETECT.JCL.PDSE.........	21	2009/09/16_14:24	USER17
			X1	SRSM7C	USER17.DETECT.JCL.PDSE.........	21	2009/09/16_14:24	USER17
			X3	SRSM7C	USER17.DETECT.JCL.PDSE.........	21	2009/09/16_14:24	USER17
			X5	SRSM7C	USER17.DETECT.JCL.PDSE.........	21	2009/09/16_14:24	USER17
			X6	SRSM7C	USER17.DETECT.JCL.PDSE.........	21	2009/09/16_14:25	USER17
			X7	SRSM7C	USER17.DETECT.JCL.PDSE.........	21	2009/09/16_14:25	USER17
			X8	SRSM7C	USER17.DETECT.JCL.PDSE.........	21	2009/09/16_14:25	USER17
			Z1	SRSM7C	USER17.DETECT.JCL.PDSE.........	21	2009/09/16_14:25	USER17
			Z2	SRSM7C	USER17.DETECT.JCL.PDSE.........	21	2009/09/16_14:25	USER17
			Z3	SRSM7C	USER17.DETECT.JCL.PDSE.........	21	2009/09/16_14:25	USER17
			Z4	SRSM7C	USER17.DETECT.JCL.PDSE.........	21	2009/09/16_14:25	USER17
009	70	63	T1	SRSM76	USER17.DETECT.JCL..............	7	2009/09/16_14:01	USER17
			T2	SRSM76	USER17.DETECT.JCL..............	7	2009/09/16_14:01	USER17
			T3	SRSM76	USER17.DETECT.JCL..............	7	2009/09/16_14:01	USER17
			T4	SRSM76	USER17.DETECT.JCL..............	7	2009/09/16_14:01	USER17
			T5	SRSM76	USER17.DETECT.JCL..............	7	2009/09/16_14:01	USER17
			T6	SRSM76	USER17.DETECT.JCL..............	7	2009/09/16_14:01	USER17
			T7	SRSM76	USER17.DETECT.JCL..............	7	2009/09/16_14:01	USER17
			T8	SRSM76	USER17.DETECT.JCL..............	7	2009/09/16_14:01	USER17
			T9	SRSM76	USER17.DETECT.JCL..............	7	2009/09/16_14:01	USER17
			NEWMEM	SRSM77	USER17.DETECT.JCL.INSTALL......	7	2009/10/14_10:27	USER17
002	20,355	13,570	$$730UPG	SRSM77	USER17.LPARA.INSTALL..........	6,785	2001/02/13_17:39	VER730
			$$730UPG	SRSM7B	USER17.LPARA.PROCLIB..........	6,785	2001/02/13_17:39	VER730
			$$730UPG	SRSM75	USER17.LPARB.ADDED............	6,785	2001/02/13_17:39	VER730
002	6,270	4,180	$DEFGDG	SRSM77	USER17.LPARA.INSTALL..........	2,090	2009/07/25_10:11	SBARTH
			$DEFGDG	SRSM7B	USER17.LPARA.PROCLIB..........	2,090	2009/07/25_10:11	SBARTH
			$DEFGDG	SRSM75	USER17.LPARB.ADDED............	2,090	2009/07/25_10:11	SBARTH

Red Lev	Group-size Bytes	Recoverable Bytes	Member	Volser	Dsname	Member-size hash-bytes	Updat-Time-Stamp	Owner
002	3,477	2,318	$AUTH	SRSM77	USER17.LPARA.INSTALL.........	1,159	2009/05/27_11:08	SBARTH
			$AUTH	SRSM7B	USER17.LPARA.PROCLIB.........	1,159	2009/05/27_11:08	SBARTH
			$AUTH	SRSM75	USER17.LPARB.ADDED...........	1,159	2009/05/27_11:08	SBARTH
002	2,322	1,548	$APFAUTH	SRSM77	USER17.LPARA.INSTALL.........	774	2009/07/31_13:26	SBARTH
			$APFAUTH	SRSM7B	USER17.LPARA.PROCLIB.........	774	2009/07/31_13:26	SBARTH
			$APFAUTH	SRSM75	USER17.LPARB.ADDED...........	774	2009/07/31_13:26	SBARTH
002	11,637	7,758	$DETECT	SRSM77	USER17.LPARA.INSTALL.........	3,879	2009/03/27_14:09	IMACROB
			$DETECT	SRSM7B	USER17.LPARA.PROCLIB.........	3,879	2009/03/27_14:09	IMACROB
			$DETECT	SRSM75	USER17.LPARB.ADDED...........	3,879	2009/03/27_14:09	IMACROB
002	1,872	1,248	$DEFINE	SRSM77	USER17.LPARA.INSTALL.........	624	2009/08/13_15:28	SBARTH
			$DEFINE	SRSM7B	USER17.LPARA.PROCLIB.........	624	2009/08/13_15:28	SBARTH
			$DEFINE	SRSM75	USER17.LPARB.ADDED...........	624	2009/08/13_15:28	SBARTH
002	6,597	4,398	$BACKUP	SRSM77	USER17.LPARA.INSTALL.........	2,199	2009/07/29_08:24	SBARTH
			$BACKUP	SRSM7B	USER17.LPARA.PROCLIB.........	2,199	2009/07/29_08:24	SBARTH
			$BACKUP	SRSM75	USER17.LPARB.ADDED...........	2,199	2009/07/29_08:24	SBARTH
001	5,294	2,647	$INIT	SRSM77	USER17.LPARA.INSTALL.........	2,647	2009/08/27_10:31	SBARTH2
			$INIT	SRSM75	USER17.LPARB.ADDED...........	2,647	2009/08/27_10:31	SBARTH2
001	50,704	25,352	SERVERAO	SRSM75	USER17.LPARA.LINKLIB.........	25,352	2002/11/07_06:24	
			SERVERAO	SRSM74	USER17.LPARB.LINKLIB.........	25,352	2002/11/07_06:24	
001	2,492	1,246	$ADMSET2	SRSM77	USER17.LPARA.INSTALL.........	1,246	2009/06/24_08:22	SBARTH
			$ADMSET2	SRSM75	USER17.LPARB.ADDED...........	1,246	2009/06/24_08:22	SBARTH
001	762	381	$EXTEND	SRSM77	USER17.LPARA.INSTALL.........	381	1999/03/23_10:44	VER710
			$EXTEND	SRSM75	USER17.LPARB.ADDED...........	381	1999/03/23_10:44	VER710
001	5,982	2,991	EXPORT	SRSM76	USER17.DETECT.JCL............	2,991	2009/08/08_10:02	USER17
			FGPMP3	SRSM76	USER17.DETECT.JCL............	2,991	2001/06/18_09:11	USER17

Red Lev	Group-size Recoverable Bytes	Member	Volser	Dsname-------------------------	Member-size hash-bytes	Updat-Time-Stamp	Owner
001	8,914	RENAMEX	SRSM77	USER17.LPARA.INSTALL.............	4,457	2009/09/08_13:48	SBARTH2
		$ADMSET	SRSM75	USER17.LPARB.ADDED...............	4,457	2009/09/08_13:48	SBARTH2
001	26,080	HPSRTO	SRSM75	USER17.LPARA.LINKLIB.............	13,040	2009/09/19_11:39	
		HPSRTO	SRSM74	USER17.LPARB.LINKLIB.............	13,040	2009/09/19_11:39	
001	3,872	HPSISTOW	SRSM75	USER17.LPARA.LINKLIB.............	1,936	2009/09/30_09:17	
		HPSISTOW	SRSM74	USER17.LPARB.LINKLIB.............	1,936	2009/09/30_09:17	
001	592	LISTBASE	SRSM76	USER17.DETECT.JCL................	296	2001/08/19_17:38	USER17
		LISTBASE	SRSM7C	USER17.DETECT.JCL.PDSE...........	296	2009/09/16_14:23	USER17
001	3,400	$GLOBAL	SRSM77	USER17.LPARA.INSTALL.............	1,700	2009/03/27_14:11	IMACROB
		$GLOBAL	SRSM75	USER17.LPARB.ADDED...............	1,700	2009/03/27_14:11	IMACROB
001	3,816	$INTEG	SRSM77	USER17.LPARA.INSTALL.............	1,908	2009/10/09_13:16	SBARTH
		$INTEG	SRSM75	USER17.LPARB.ADDED...............	1,908	2009/10/09_13:16	SBARTH
001	28	X2	SRSM7C	USER17.DETECT.JCL.PDSE...........	14	2009/09/16_14:06	USER17
		X4	SRSM7C	USER17.DETECT.JCL.PDSE...........	14	2009/09/16_14:06	USER17
001	2,960	HPSIBLDL	SRSM75	USER17.LPARA.LINKLIB.............	1,480	2009/09/30_09:16	USER17
		HPSIBLDL	SRSM74	USER17.LPARB.LINKLIB.............	1,480	2009/09/30_09:16	USER17

```
HPS0808I HPSREPRT 11:10:22 ** R E D U N D A N C Y   S U M M A R Y   (MEM) **
                              22 Redundant groups
                              68 Included members
                              10 Highest redundancy level
                         167,727 Total bytes in all groups
                          92,741 Recoverable bytes from all groups
HPS0000I HPSREPRT 11:10:22 Job Started: 2009/10/14_11:10:22
                           Job Ended  : 2009/10/14_11:10:22
                           Warning cnt: 0
                           Severe msgs: 0
```

Appendix A
Wildcards, Symbolics, and DCB Attributes

This appendix provides:

- DCB attributes for files used in the Synchronization Component.

- Information about using system symbolics in parameters.

- Details and examples for each of the wildcards used in the parameters in the Online and Batch Synchronization facilities.

DCB Attributes

The following table provides the DCB attributes for files used in the Synchronization Component.

Data Set Type	DCB Attribute
Fingerprint	LRECL=512,BLKSIZE=4096,DSORG=PS,RECFM=FB
Change Basket	LRECL=0,BLKSIZE=4096,DSORG=PS,RECFM=U
Reverse Change Basket	LRECL=0,BLKSIZE=4096,DSORG=PS,RECFM=U
VSAM Fingerprint	LRECL=0,BLKSIZE=4096,DSORG=PS,RECFM=U
VSAM Change Basket	LRECL=4096,BLKSIZE=4096,DSORG=PS,RECFM=F
VSAM Reverse Change Basket	LRECL=4096,BLKSIZE=4096,DSORG=PS,RECFM=F
HFS Fingerprint	DSORG=PS,RECFM=FB LRECL= 80 or greater, but < or = 32K BLKSIZE= any multiple of LRECL up to 32K
HFS Change Basket	DSORG=PS,RECFM=FB LRECL= 80 or greater, but < or = 32K BLKSIZE= any multiple of LRECL up to 32K
HFS Reverse Change Basket	DSORG=PS,RECFM=FB LRECL= 80 or greater, but < or = 32K BLKSIZE= any multiple of LRECL up to 32K
Scratch List	LRECL=80,BLKSIZE=4000,DSORG=PS,RECFM=FB
Token	LRECL=1000,BLKSIZE=6000,DSORG=PS,RECFM=VB
DETECT DD SYNCTRAC DD	LRECL=133,BLKSIZE=6650,DSORG=PS,RECFM=FBA
"userid.SSM.LOG"	LRECL=133,BLKSIZE=6650,DSORG=PS,RECFM=FBA

System Symbolics

System symbolics can be used in a number of parameters in the Change Tracking and Detection and Synchronization batch facilities.

NOTE System symbolics are not supported in the ISPF panels.

Using Symbolics in Command Parameters

The following batch command parameters support system symbolic values:

VOLSER

INCLVOL

EXCLVOL

NEWDSNTOVOL

DSN

INCLDSN

EXCLDSN

CLUSTER

INCLCLUS

EXCLCLUS

GENERIC

Using Symbolics in HPSPARMS Parameters

The following HPSPARMS parameters support system symbolic values within the DSN specification:

SITEMASTER

OBJECTMASTER

DELTAMASTER

Wildcards

Wildcards, or patterns, can be used in a number of parameters in the Online and Batch Synchronization facilities. This section provides details and examples for each of the wildcards.

NOTE This section covers the Synchronization component. For wildcard usage in the Change Tracking component, see the Wildcards section of the Change Tracking User's Guide.

Data Set, Object, and Cluster Name Wildcards

The following special characters can be used to specify a pattern of data sets, objects, or clusters in the INCLDSN, EXCLDSN, INCLOBJ, EXCLOBJ, INCLCLUS, or EXCLCLUS parameters:

Wildcard	Definition
*	Node specification. If it is the only character in a node, then any character string in the node is accepted. If it is the last character in an otherwise specified string, then any node that begins with the specified string is selected, regardless of any final characters.
?	Character specification. Any character in the position specified by the ? satisfies the selection requirements.
/	Search terminator. Any characters beyond this character are accepted. A pattern without the / implies that the pattern characters correspond exactly to the data set name characters. For example, 2ABC selects all data sets in which the second node is exactly ABC, whereas 2ABC/ selects all data sets in which the second node begins with *ABC*.
!	String search delimiter. Any string in a data set name that matches the string delimited with ! meets the selection criteria. For example, !string!.
n	Node number indicator. *n* takes values from one to twenty-two, numbered left to right. The last (rightmost) node in a data set name is the zero node. For example, given node1.node2.node3.node4, then node4 could also be referenced as node0.

Examples with INCLDSN

- All three-node data sets that have a first node of AAA, a second node of BBB, and a third node of <anything> are included.

      INCLDSN=AAA.BBB.*

- All three-node data sets that have a first node of AAA, a second node of <anything>, and a third node of CCC are included.

      INCLDSN=AAA.*.CCC

- All minimum four-node data sets that have the first three nodes of AAA.BBB.CCC are included.

      INCLDSN=AAA.BBB.CCC./

- All data sets that have a first node of AAA, a second node of BBB, and a third node starting with C are included.

      INCLDSN=AAA.BBB.C/

- All three-node data sets that have a first node of AAA, a second node of three-character length starting with BB, and a third node of CCC are included.

      INCLDSN=AAA.BB?.CCC

Examples of INCLDSN used with the GENERIC Parameter

- Limits search results to data set names with an exact match of "ABC" on the 2nd node. Data set names with additional nodes (3 or more) will *not* be considered.

      INCLDSN=(2ABC)

- Limits search results to data set names with an exact match of "ABC" on the 2nd node. Data set names with 2 or more additional nodes will be considered.

      INCLDSN=(2ABC./)

- Limits search results to data set names with an exact match of "ABC" on the 2nd node. Data set names with 2 or 3 nodes only will be considered.

      INCLDSN=(2ABC.*)

- Limits search results to data set names with a 2nd node starting with "ABC". Data set names with 2 or more additional nodes will be considered.

      INCLDSN=(2ABC*)
      INCLDSN=(2ABC/)

Examples with EXCLDSN

- All data sets (of any number of nodes) with a final (last) node of LINK are excluded.

      EXCLDSN=0LINK (i.e. NODE1,NODE2,...LINK)

- All three-node data sets with a third node of LINK are excluded (node1.node2.LINK*).*

      EXCLDSN=3LINK

- All data sets with the third node starting with LINK are excluded (node1.node2.LINKLIB will be excluded).

      EXCLDSN=3LINK/

- In a search, all four-node data sets with a fourth node of <anything> are excluded (node1.node2.node3.anything).

      EXCLDSN=4*

Examples with INCLCLUS

- All three-node clusters that have a first node of AAA, a second node of BBB, and a third node of <anything> are included.

      INCLCLUS=AAA.BBB.*

- All three-node clusters that have a first node of AAA, a second node of <anything>, and a third node of CCC are included.

      INCLCLUS=AAA.*.CCC

- All minimum four-node clusters that have the first three nodes of AAA.BBB.CCC are included.

      INCLCLUS=AAA.BBB.CCC./

- All clusters that have a first node of AAA, a second node of BBB, and a third node starting with C are included.

      INCLCLUS=AAA.BBB.C/

- All three-node clusters that have a first node of AAA, a second node of three-character length starting with BB, and a third node of CCC are included.

      INCLCLUS=AAA.BB?.CCC

Examples with EXCLCLUS

- All clusters (of any number of nodes) with a final (last) node of MASTER are excluded. The following example is equivalent to NODE1,NODE2,...MASTER.

      EXCLCLUS=0MASTER

- All three-node clusters with a third node of MASTER are excluded. The following example is equivalent to node1.node2.MASTER.

      EXCLCLUS=3MASTER

- All data sets with the third node starting with MASTER are excluded. In the following example, node1.node2.MASTER will be excluded.

      EXCLCLUS=3MASTER/

- In a search, all four-node clusters are excluded (node1.node2.node3.<anything>).

      EXCLCLUS=4*

Examples with INCLOBJ

- All three-node objects that have a first node of AAA, a second node of BBB, and a third node of <anything> are included.

      INCLOBJ=AAA.BBB.*

- All three-node objects that have a first node of AAA, a second node of <anything>, and a third node of CCC are included.

      INCLOBJ=AAA.*.CCC

- All minimum four-node objects that have the first three nodes of AAA.BBB.CCC are included.

      INCLOBJ=AAA.BBB.CCC./

- All objects that have a first node of AAA, a second node of BBB, and a third node starting with C are included.

      INCLOBJ=AAA.BBB.C/

- All three-node objects that have a first node of AAA, a second three-character node starting with BB, and a third node of CCC are included.

      INCLOBJ=AAA.BB?.CCC

Examples with EXCLOBJ

- All objects (of any number of nodes) with a final (last) node of LINK are excluded.

  EXCLOBJ=0LINK

- All three-node objects with a third node of LINK (node1.node2.LINK*)* are excluded.

  EXCLOBJ=3LINK

- All objects with the third node starting with LINK (node1.node2.LINKLIB*)* are excluded.

  EXCLOBJ=3LINK/

- In a search, all four-node objects with a fourth node of <anything> (node1.node2.node3.<anything>) are excluded.

  EXCLOBJ=4*

Catalog Search

The Catalog Search Interface (CSI) of DFSMS, which is the same search facility used in ISPF Option 3.4, is used in the DSN sub-parameter of the GENERIC parameter and several of the online panels.

NOTE The panel fields that use the CSI are indicated with text that says the pattern name is similiar to ISPF 3.4. The commands that support pattern names in the DSN sub-parameter of the GENERIC parameter are noted in those command/parameter descriptions.

SSM supports all of the patterns that ISPF 3.4 supports; however, SSM does not use the option "Include Additional Qualifiers" because it can cause large numbers of catalog entries to be retrieved, which then have to be filtered by the user. If you need additional qualifiers, use * or ** to indicate which nodes you want beyond the nodes explicitly defined in the pattern.

The following table describes how to specify pattern names using wildcards with the CSI. For more information, refer to the IBM DFSMS documentation.

Character	Description
*	A single asterisk by itself indicates that either a qualifier or one or more characters within a qualifier can occupy that position. An asterisk can precede or follow a set of characters.
**	A double asterisk indicates that zero or more qualifiers can occupy that position. A double asterisk cannot precede or follow any characters; it must be preceded or followed by either a period or a blank.
%	A single percent sign by itself indicates that exactly one alphanumeric or national character can occupy that position.

Member Name Wildcards

The following special characters can be used to specify a pattern of members:

Wildcard	Definition
/,*	Search terminator. Any characters beyond this character are accepted. A pattern without the / implies that the pattern characters correspond exactly to the data set name characters. For example, ABC* indicates all members starting with ABC. ABC/ is identical to ABC*. Any character in the position specified by the wildcard character satisfies the inclusion or exclusion requirements.
?	Character specification. Any character in the position specified by the ? satisfies the selection requirements. For example, the pattern UT?A refers to those members where the first two characters are UT, the last character is A, and the third character is any legitimate character.
!	String search delimiter. Any string in a data set name that matches !<string>! meets the selection criteria. For example, !HPS! selects all members where the string !HPS! is found anywhere in the name.
X	Hex indicator. X notation allows for the specification of a hex character string in the member name. For example, X'C1C2??E5' indicates all members in which the first two characters are C1C2, the third character could be anything and the last character is E5.

Volume Name Wildcards

The following special characters can be used to specify a pattern of volumes:

Wildcard	Definition
/,*	Search terminator notation. Any character beyond this character in a volume specification is accepted. For example, in the pattern DEV*, all volumes that have DEV as the first three characters will be selected. The pattern DEV/ is identical to DEV*.
?	Wildcard character specification. Any character in the position specified by the ? character satisfies the selection requirements.

Glossary

Alternate Group Administrator	A person assigned by an existing Group Administrator to perform the primary tasks of that Group Administrator in his/her absence.
BICT (Batch Interval Change Tracking)	A batch program (HPSGLOBE) that performs the change-capture process for all tracked Objects at specified intervals. It should be scheduled to run minimally, once every 24 hours. This is an alternative to RTCT (Real Time Change Tracking).
Change Basket (keyed, positional, or text)	A single physical sequential data set that contains the changes between two keyed, positional, or text flat files. This file contains the changed data records. Add, update, and delete information is present, but is not currently used for synchronization by ChangeMan SSM.
	Definitions for file types:
	Keyed file: A physical sequential or direct access file that has a field in each record that can be used as a key. This key must be unique for each record in the file.
	Positional file: A physical sequential or direct access file containing records that are indexed by their physical position. For example, the first record is considered record 1, and the second is record 2.
	Text file: A physical sequential or direct access file with records that are in no particular order, and do not have a specific key.
Change Basket (non-VSAM)	A single physical sequential data set that contains the changes to an environment over time, or differences between two environments. For example: Test/Prod, SYSRES/ALTRES, and LPAR/LPAR. This file holds the data and information required to synchronize two environments, or propagate change form one system to another, locally or remotely.
Change Basket (VSAM)	A single physical sequential data set that contains the changes/differences between two VSAM clusters. This file contains the data records and required information to synchronize two VSAM KSDS data sets, locally or remotely.
Delta Master	A ChangeMan SSM database that contains the initial base version, plus subsequent changed versions, of a PDS/PDSE member (for data sets defined to ChangeMan SSM with Delta Tracking). Backup members are stored in compressed format.
Department Administrator	A person assigned by a Site Master Administrator to manage the Object Master database.

DSORG (Supported Types)	**DA** indicates a direct access data set.
	PO indicates a partitioned data set (PDS and PDS/E).
	PO type Format-3 data sets provide support for DFSMS Binder, NPO Format-3 load modules, and stored IBM JAVA files.
	PS indicates a physical sequential data set.
	VS indicates a VSAM data set.
	NOTE Data sets with no DSORG specified are not supported.
Extract/Export	Extract is the process that ChangeMan SSM uses to identify changes/differences, utilizing fingerprints and/or active data sets.
	Export is the process that packages the changes/differences into a Change Basket data set.
Event	A change event when ChangeMan SSM detects a variance in content or status of a tracked data set or data set member. There are 23 types of events distinguished by the software.
Fingerprint Dataset	A physical sequential data set containing all the data set and member tokens to identify the contents of that environment at the time the Fingerprint data set was generated. A Fingerprint data set can represent a single PDS member, or the contents of several DASD volumes.
Fingerprint Dataset (keyed, positional, or text	A physical sequential file that contains all the fingerprint tokens of all the records in a physical sequential file. This file represents a PS or DA file.
	Definitions for file types:
	Keyed file: A physical sequential or direct access file that has a field in each record that can be used as a key. This key must be unique for each record in the file.
	Positional file: A physical sequential or direct access file containing records that are indexed by their physical position. For example, the first record is considered record 1, and the second is record 2.
	Text file: A physical sequential or direct access file with records that are in no particular order, and do not have a specific key.
Fingerprint Dataset (VSAM)	A physical sequential data set containing tokens for every record in a VSAM KSDS cluster. This file represents the contents of a VSAM cluster at the time the Fingerprint data set was generated.
Fingerprint Token	A unique identity attribute for the content of a data set or data set member. The attribute is an eight-byte, hexadecimal value.

Fingerprint Token (keyed, positional, or text	A unique identity attribute for records of a keyed, positional, or text file. The attribute is a six-byte, hexadecimal value.
	Definitions for file types:
	Keyed file: A physical sequential or direct access file that has a field in each record that can be used as a key. This key must be unique for each record in the file.
	Positional file: A physical sequential or direct access file containing records that are indexed by their physical position. For example, the first record is considered record 1, and the second is record 2.
	Text file: A physical sequential or direct access file with records that are in no particular order, and do not have a specific key.
Fingerprint Token (VSAM)	A unique identity attribute for records of VSAM clusters. The attribute is a six-byte, hexadecimal value.
Group Administrator	A person assigned by a Department Administrator to manage one or more Object Groups.
HFS Change Basket	A single physical sequential data set that contains the changes/differences between two HFS files. This file contains the data records and required information to synchronize two HFS files, locally or remotely.
HFS Fingerprint Dataset	A physical sequential data set containing tokens for every record in an HFS file. This file represents the contents of an HFS file at the time the Fingerprint data set was generated.
HFS Fingerprint Token	A unique identity attribute for records of HFS files. The attribute is a six-byte, hexadecimal value.
HFS Reverse Change Basket	A single physical sequential data set created during an HFS Import operation. It contains the information and data to undo the effects of updates, as a result of an HFS Import operation. This file has an identical structure to an HFS Change Basket.
Import	Import is the process that ChangeMan SSM utilizes to apply the changes contained in a Change Basket data set, to target environments. During Import processing there are several parameters that can be specified to customize the apply process, as well as a SIMULATE feature, and the creation of a Reverse Change Basket.
MLS (Member Level Security)	This facility allows for the protection of PDS/PDSE members being updated. The software provides the capability for MLS Administrators to identify who is allowed to update specific members/member patterns for specified data sets, by specifying either TSO User IDs or a RACF profile name.
	If an attempt is made to update a protected member, ChangeMan SSM will either save the changes to an internally-generated member name or cancel the updates, depending on what option you selected for the RTORENAME parameter.
MRT (Member Reference Tracking)	This facility allows you to detect and report references to members of PDSs. Read and update access is tracked on existing members that you define to the MRT system, and where standard I/O routines are used.
	You can also define members to be excluded from MRT. This allows you to filter out references to high-activity members at the beginning of MRT processing, which greatly enhances performance.

Non-user	A person unknown, or not defined by a Group Administrator to any Object Group, but allowed access to the Synchronization and Detection functions of ChangeMan SSM.
Notifications	A ChangeMan SSM facility that provides change notifications to specified users about changes to tracked data sets and PDS members. There are both TSO User ID and E-mail notification facilities that can be used separately or together.
Object	A data set defined to the Change Tracking component of the tracking software. An object of the tracking function.
Object (Delta Tracked)	A PDS or PDS/E data set defined to the Change Tracking component, where Delta Tracking was specified during the initial define of the object. This specification creates an initial backup of all members into the Delta Master database. Subsequently, only changed members, and additions are backed up in compressed format.
	NOTE Seqential data sets cannot be delta-tracked; if they are defined as DELTA=Y, the object is defaulted to DELTA=N.
Object Group	A group of conceptually related data sets (Objects) that are associated for tracking, change detection, and reporting. There are no restrictions on mixing data set types in a group.
Object Master	A ChangeMan SSM database connected to the Site Master database, which contains definitions of all the Object Groups, their associated Group Administrators, and users defined to the Change Tracking environment.
RTO (Real Time Option)	RTO was the name used for Real Time Change Tracking (RTCT) for ChangeMan SSM Version 8.1 and earlier.
	See RTCT.
RTCT (Real Time Change Tracking)	The task of capturing data set or data set member information that allows the software to detect and identify change in real time.
Recall	A ChangeMan SSM facility to allow the recall of a backup version of selected (Delta Tracked) PDS or PDS/E members to a compatible data set. Expansion is performed automatically.
Recover	A ChangeMan SSM facility to allow the recovery of a Delta Tracked PDS or PDS/E data set, as it existed in some previous point in time, to a compatible data set. Expansion is performed automatically.
Redundancy Detection	A ChangeMan SSM facility that identifies duplicate data sets and PDS/PDSE members by content. A comprehensive reporting facility allows for the identification of duplicates to facilitate the deletion of those having duplicate content. This allows for recovery of DASD space and enhanced integrity (only one copy). This facility also assists in library cleanup and consolidation.
Restore	A ChangeMan SSM facility to allow the restore of a backup version of selected (Delta Tracked) PDS or PDS/E members to the original data set. Expansion is performed automatically.
Reverse Change basket	A single physical sequential data set, created during an Import operation, which contains the information and data to undo (entirely or partially) the effects of updates as a result of an Import operation. This file has an identical structure to a Change Basket.

Reverse Change Basket (VSAM)	A single physical sequential data set created during a VSAM Import operation. It contains the information and data to undo the effects of updates, as a result of a VSAM Import operation. This file has an identical structure to a VSAM Change Basket.
Site Master	The main ChangeMan SSM VSAM database, which contains information for all tracked data sets and their detected events.
Site Master Administrator	A person assigned (during installation) to manage the Site Master and define departments.
SMS	System Managed Storage. Enhanced data management software for MVS mainframes from IBM. Provides functions such as automatically allocating data, which prevents most out-of-space errors when disk volumes become full.
Snapshot	A ChangeMan SSM facility that interrogates the VTOC and VVDS to identify data sets existing on one or several volumes, and capture information about these data sets and their attributes. This information is stored in a SNAPSHOT data set, which can be used to compare to another SNAPSHOT data set generated at a different location. This comparison can verify that all data sets are available, and check for differences in any data set attributes or space allocations.
	The SNAPSHOT function is especially useful as a pre-step to performing DR testing, to verify that all the production data sets are available. In addition, it allows pre-screening to eliminate potential x37 type abends, where a data set was expanded at the source site, but not at the target, when applying maintenance.
Tracking	The function of monitoring a data set or data set member for events in real time (RTCT), or over a period of time (BICT).
User	A person defined to the Change Tracking component as a User in one or more groups by a Group Administrator, and allowed controlled access to its functions.

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? 120
* 120
/ 120

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