

# DFSMSHsm: Managing PDSE V2 Data Sets

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The aim of this IBM® Redpaper™ publication is to provide a simple scenario to demonstrate how the PDSE V2 data sets with member generation can be integrated into existing storage management policies and processes. It shows how DFSMSHsm can manage both PDSE version 1 and 2 data sets by showing the sample plan and implementation we used in a controlled test environment. It also demonstrates that DFSMSHsm can migrate, recall, backup and recover these data sets.

This paper includes the following sections:

- ▶ PDSE Version 2
- ▶ DFSMSHsm enhancements to support PDSE version 2
- ▶ Planning for DFSMSHsm PDSE Management
- ▶ Sample plan for implementation
- ▶ Sample DFSMSHsm Deployment
- ▶ Define the management class in ISMF
- ▶ Define the storage group in ISMF
- ▶ Edit Automatic Class Selection routines
- ▶ Translate and validate the new ACS routine.
- ▶ Validate and activate the SMS BCDS to ACDS
- ▶ Set up DFSMSHsm environment
- ▶ Customize ARCCMDxx
- ▶ Allocate data sets for DFSMSHsm processing
- ▶ PDSE V2 GDS migration
- ▶ PDSE V2 GDS Recall
- ▶ PDSE V2 GDS Backup
- ▶ PDSE V2 GDS Recover

## PDSE Version 2

IBM z/OS® 2.1 introduced a new format of partitioned data set extended (PDSE) V2. This format includes a number of internal design changes that can improve PDSE's overall performance, including space utilization in the data set, and reduction of CPU usage, I/O, and index searches.

At z/OS 2.1 or later, z/OS supports both PDSE versions. There are no external differences between the two versions, so the data sets appear the same.

### Restructure of IMF/BMF code

The IMF/BMF coded has been restructured to improve PDSE performance by reducing the code path lengths and improving index searches.

### Increase the number of records a PDSE member can contain

The number of records a PDSE dat set member can hold has been increased from 15,728,639 to 2,146,435,071.

### Generation data sets support for PDSE members

Datasets that are part of a generation data group (GDG) are referred to as generation data sets (GDS). PDSE V2 data set members can now be used as GDS. Both versions of PDSE are supported in the same GDG.

### PDSE member generation 'undo' now possible

When updating the members of PDS or PDSE, check your modification before saving during the edit process because a backup is required before the update to recover to the previous version.

PDSE V2 supports multiple levels or generations of PDSE members, the new member generation can be created automatically for replace or delete of a member. This allows you to reverse or access the recent change to a member.

## DFSMSHsm enhancements to support PDSE version 2

PDSE V2 data sets containing member GDS are eligible for the DFSMSHsm backup, recovery, migration, recall, aggregate backup, and aggregate restore functions.

DFSMSdss has been updated to support the PDSE V2 data sets and is the utility used by DFSMSHsm to manage the PSDE V2 data sets.

See Figure 1 for DFSMSHsm Space Management and Availability Management.

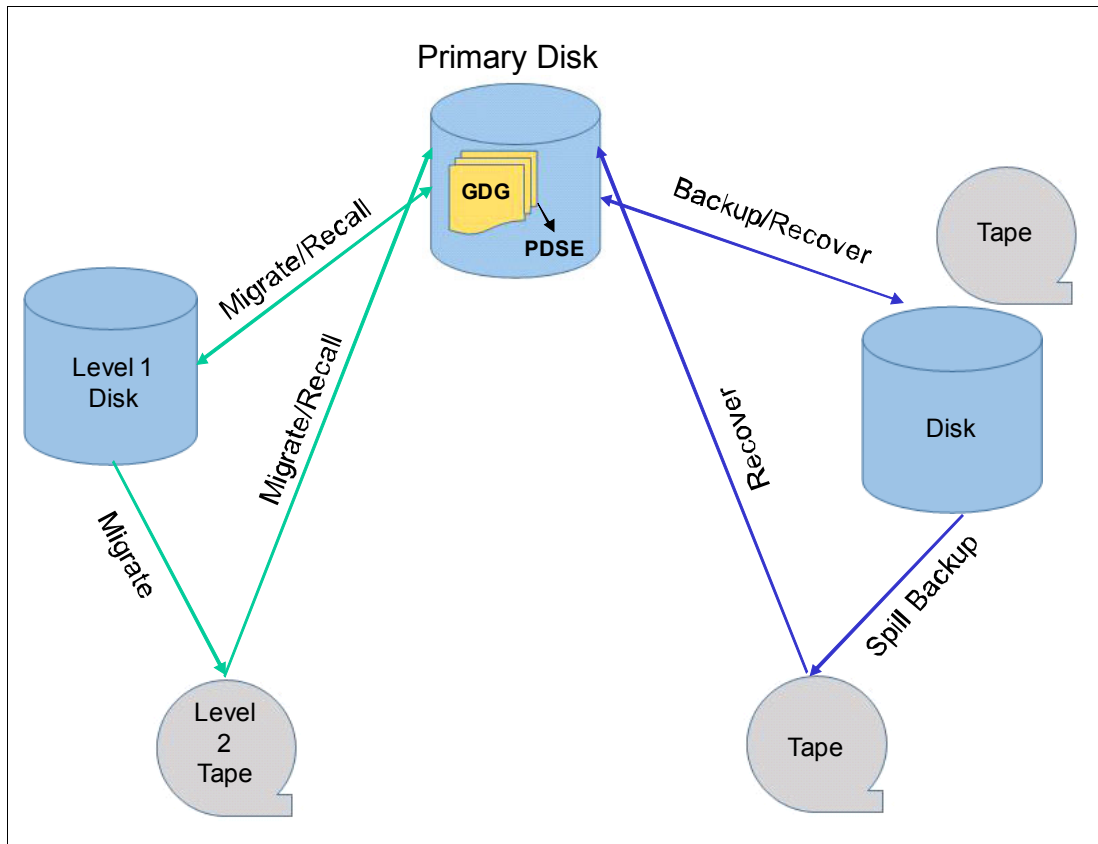


Figure 1 DFSMSHsm Space Management and Availability Management

## Planning for DFSMSHsm PDSE Management

The basic scenario of our sample implementation is to create two separate management classes called MCPDSE1 and MCPDSE2. A Storage group called SGHUGE is defined and ACS routines coded to direct the data sets in the new management classes to the group. DFSMSHsm is configured, data sets created, and tests are run to prove that DFSMSHsm can successfully manage them.

Here are a few considerations for you before implementing DFSMSHsm management of PDSE V2 data sets.

### Software and hardware considerations

The PDSE V2 data sets cannot be created on systems before DFSMS V2.1, but they can be accessed by DFSMS V1.12 and DFSMS V1.13. Keep this in mind when planning for a multi-LPAR environment with shared storage devices. If the PDSE V2 has member generations, they are ignored/inaccessible from 1.12 and 1.13 systems. Because HSM gets the whole PDSE dataset, it still backs up/migrates the whole PDSE including member generations regardless of z/OS level.

There are no specific hardware requirements for PDSE to create and access member GDS.

## SMS prerequisites

The following SMS prerequisites must be in place to enable DFSMSHsm space management and availability management functions:

- ▶ SMS must be running on the system.
- ▶ Management class and storage groups must be defined in the SMS control data set.
- ▶ Management class and storage groups must be defined in the SMS ACS routines.

## DFSMSHsm prerequisites

The following DFSMSHsm requirements must be met:

- ▶ DFSMSHsm must be running on the system.
- ▶ The DFSMS control data sets must be correctly defined.
- ▶ The primary space management or interval must be enabled.
- ▶ Auto Backup should be enabled if automatic backup is wanted.
- ▶ The aggregate backup and recovery (ABAR) must be enabled in ARCCMDxx if wanted.

## Sample plan for implementation

Table 1 outlines the tasks we undertook in a controlled test environment to implement the DFSMSHsm management of the GDG with PDSE data sets.

*Table 1 Tasks list for implementing DFSMSHsm management of GDG with PDSE*

Step No.	Task
1	Activate SMS
2	Define Management Class in ISMF
3	Define Storage Group in ISMF
4	Edit ACS routine
5	Translate, Validate New ACS routine
6	Validate, Activate updated SMS BCDS to ACDS
7	Set up DFSMSHsm environment
8	Customize ARCCMDxx to enable basic HSM functions
9	Allocate different type of PDSEs as GDS
10	Migrate PDSE as GDS
11	Recall PDSE as GDS
12	Back up PDSE as GDS
13	Recover PDSE as GDS

## Sample DFSMShsm Deployment

To implement DFSMShsm functions, ensure that SMS is running on your system. You can issue the D SMS command to check whether SMS is active on the system as shown in Example 1.

*Example 1 Check SMS status in current system*

---

```
-D SMS
IGD002I 13:20:54 DISPLAY SMS 447
SCDS = SYS1.SMS.MHLRES3.SCDS
ACDS = SYS1.SMS.ACDS.NEW
COMMDS = SYS1.SMS.COMMDS
ACDS LEVEL = z/OS V2.1
DINTERVAL = 150
REVERIFY = NO
ACSDEFAULTS = NO
      SYSTEM      CONFIGURATION LEVEL      INTERVAL SECONDS
      SC63        2014/11/06 13:20:37        15
      SC64        2014/11/06 13:20:26        15
      SC65        2014/11/06 13:20:31        15
      SC70        2014/11/06 13:20:41        15
```

---

## Define the management class in ISMF

Add a management class to SMS. In the example, we added the management class MCPDSE1 for PDSE Version 1 data sets with the Primary Days Non-usage value set to 0. This means that data sets with the MCPDSE1 management class are migrated to migration level 1 when the auto migration function runs. See Example 2.

*Example 2 Add new management class in ISMF*

---

```
Command ==>

CDS Name . . . . . : SYS1.SMS.MHLRES3.SCDS
Management Class Name . . . : MCPDSE1

Partial Release . . . . . : NO

Migration Attributes
  Primary Days Non-usage . : 0
  Level 1 Days Date/Days . : 90
  Command or Auto Migrate . : BOTH

GDG Management Attributes
  # GDG Elements on Primary :
  Rolled-off GDS Action . . :

Backup Attributes
  Backup frequency . . . . . : 1
  Number of backup versions . . . . . : 3
  (Data set Exists)
  Number of backup versions . . . . . : 1
  (Data set Deleted)
```

```

Retain days only backup version . . . . : 10
(Data set Deleted)
Retain days extra backup versions . . . : 30

Admin or User Command Backup . . . . . : BOTH
Auto Backup . . . . . : YES
Backup copy technique . . . . . : STANDARD

```

---

A second management class called MCPDSE2 was added, also with the Primary Days non-usage value set to 0,. For the purposes of this exercise, we set the Level 1 Days Date/Days to 0. This setting results in the PDSE data sets assigned to this management class being migrated to migration level 2 directly when the auto migration function runs. See Example 3.

*Example 3 Add another management class in ISMF*

---

```

CDS Name . . . . . : SYS1.SMS.MHLRES3.SCDS
Management Class Name . . . : MCPDSE2

```

```

Partial Release . . . . . : NO

```

```

Migration Attributes
  Primary Days Non-usage . : 0
  Level 1 Days Date/Days . : 0
  Command or Auto Migrate . : BOTH

```

```

GDG Management Attributes
  # GDG Elements on Primary :
  Rolled-off GDS Action . . :

```

```

Backup Attributes
  Backup frequency . . . . . : 1
  Number of backup versions . . . . . : 3
  (Data set Exists)
  Number of backup versions . . . . . : 1
  (Data set Deleted)
  Retain days only backup version . . . . : 10
  (Data set Deleted)
  Retain days extra backup versions . . . : 30

Admin or User Command Backup . . . . . : BOTH
Auto Backup . . . . . : YES
Backup copy technique . . . . . : STANDARD

```

---

## Define the storage group in ISMF

Add a storage group in your current SMS policy. In this example, we added the storage group SGHUGE with the Auto Migrate value set to INTERVAL so that the data sets defined with this storage group and a management class ready for migration are eligible for interval migration. Setting the Auto Backup option to YES indicates that the data sets in this storage group are available for automatic backup.



The storage group's corresponding migration thresholds and backup frequency also need to be specified with the Allocation/Migration Thresholds values. The Guaranteed Backup Frequency is also set to a value of 1 as shown in Example 4.

*Example 4 Add a storage group in ISMF*

---

```

POOL STORAGE GROUP DISPLAY                               Page 1 of 2
Command ==>

CDS Name . . . . . : SYS1.SMS.MHLRES3.SCDS
Storage Group Name : SGHUGE

Description :

Auto Migrate . . . . . : INTERVAL
Auto Backup . . . . . : YES
Auto Dump . . . . . : NO
Overflow . . . . . : NO
Migrate Sys/Sys Group Name . :
Backup Sys/Sys Group Name . :
Dump Sys/Sys Group Name . . :
Extend SG Name . . . . . : SGXTRA
Copy Pool Backup SG Name . . :
Dump Class . . . . . :
Dump Class . . . . . :
Allocation/Migration Threshold - High . : 90
                                   Low . . : 50
Alloc/Migr Threshold Track-Managed - High: 90
                                   Low : 50
Guaranteed Backup Frequency . . . . . : 1
BreakPointValue . . . . . :
Processing Priority . . . . . : 50

```

---

## Edit Automatic Class Selection routines

The management class and storage groups have now been defined in the active ACDS. The next step was to add the automatic class selection (ACS) routine to allow new allocated data sets to be assigned with the appropriate management class and storage group attributes.

Example 5 shows the ACS routine for the Management Class.

*Example 5 Partial example of Management Class script in ACS routines*

---

```

...
/*****
/* FILTLIST DEFINITIONS */
/*****
FILTLIST PDSE1 INCLUDE(CHXMA.TEST1.**) /* @06 */
FILTLIST PDSE2 INCLUDE(CHXMA.TEST2.**) /* @06 */
...
/*****
/* MAIN SELECTION ROUTINE */
/*****
IF &DSN EQ &PDSE1 /* @06 */

```

```

THEN DO                                     /* @06 */
SET &MGMTCLAS = 'MCPDSE1'                 /* @06 */
EXIT
END

IF &DSN EQ &PDSE2                          /* @06 */
THEN DO                                     /* @06 */
SET &MGMTCLAS = 'MCPDSE2'                 /* @06 */
EXIT
END

```

---

Example 6 shows the ACS routine for the aligning the Storage Class.

*Example 6 Partial example of Storage Group script in ACS routines*

---

```

...
/*****
/* MAIN STORAGE GROUP SELECTION ROUTINE
*****/
FILTLIST PDSE1  INCLUDE(CHXMA.TEST1.***)    /* @08 */
FILTLIST PDSE2  INCLUDE(CHXMA.TEST2.***)    /* @08 */
...
WHEN (&DSN = &PDSE1) DO                    /* @08 */
  SET &STORGRP = 'SGHUGE','SGXTRA','SGSPARE' /* @08 */
  WRITE 'STORAGE GROUP SET TO : ' &STORGRP  /* @08 */
  EXIT                                       /* @08 */
END                                         /* @08 */
WHEN (&DSN = &PDSE2) DO                    /* @08 */
  SET &STORGRP = 'SGHUGE','SGXTRA','SGSPARE' /* @08 */
  WRITE 'STORAGE GROUP SET TO : ' &STORGRP  /* @08 */
  EXIT                                       /* @08 */
END                                         /* @08 */
...

```

---

The sample ACS routine was added. Data sets prefixed CHXMA.TEST1 and CHXMA.TEST2 are assigned to the new storage groups that we created.

## Translate and validate the new ACS routine.

Translate and validate the updated ACS routine using the ISMF Automatic Class Selection feature as shown in Example 7.

*Example 7 ACS APPLICATION SELECTION panel in ISMF*

---

```

                                ACS APPLICATION SELECTION

Command ==>

Select one of the following options:
2  1. Edit           - Edit ACS Routine source code
   2. Translate      - Translate ACS Routines to ACS Object Form
   3. Validate       - Validate ACS Routines Against Storage Constructs
   4. Test           - Define/Alter Test Cases and Test ACS Routines

```

- 5. Display - Display ACS Object Information
- 6. Delete - Delete an ACS Object from a Source Control data set

If Display Option is Chosen, Specify:

CDS Name . . 'SYS1.SMS.MHLRES3.SCDs'  
 (1 to 44 Character data set Name or 'Active')

---

## Validate and activate the SMS BCDS to ACDS

We validated and activated the source control data sets (SCDSs) to enable the new management class and storage groups as shown in Example 8.

*Example 8 iCDS APPLICATION SELECTION panel in ISMF*

---

CDS APPLICATION SELECTION

Command ==>

To Perform Control data set Operations, Specify:

CDS Name . . 'SYS1.SMS.MHLRES3.SCDs'  
 (1 to 44 Character data set Name or 'Active')

Select one of the following Options:

- 4 1. Display - Display the Base Configuration
- 2. Define - Define the Base Configuration
- 3. Alter - Alter the Base Configuration
- 4. Validate - Validate the SCDS
- 5. Activate - Activate the CDS
- 6. Cache Display - Display CF Cache Structure Names for all CF Cache Sets
- 7. Cache Update - Define/Alter/Delete CF Cache Sets
- 8. Lock Display - Display CF Lock Structure Names for all CF Lock Sets
- 9. Lock Update - Define/Alter/Delete CF Lock Sets

If CACHE Display is chosen, Enter CF Cache Set Name . . \*

If LOCK Display is chosen, Enter CF Lock Set Name . . . \*

---

On successful activation, the message in Example 9 appeared.

*Example 9 Successful message of CDS activation*

---

IGD008I NEW CONFIGURATION ACTIVATED FROM SCDS SYS1.SMS.MHLRES3.SCDs BY CHXMA

---

## Set up DFSMSHsm environment

We assume that the DFSMSHsm environment already exists for the purposes of this exercise.

## Customize ARCCMDxx

ARCCMDxx contains DFSMSHsm customization parameters that define the basic functions. The SETSYS command is included to set up the migration and backup policy.

Example 10 shows a partial sample of the ARCCMDxx that HSM is uses.

*Example 10 Partial example of ARCCMDxx*

---

```

SETSYS                /* ALLOW DFSMSHSM TO MIGRATE      */ -
  TAPEMIGRATION(      /* data sets TO LEVEL 2 TAPE     */ -
    ML2TAPE(TAPE(VT3590)) /* TO VOLUMES                   */ -
    RECONNECT(ALL))   /* USE FSM IF POSSIBLE          */

SETSYS                /* SPECIFY PROCESSING WINDOW FOR  */ -
  PRIMARYSPMGMTSTART  /* PRIMARY SPACE MANAGEMENT (LEVEL 0 */ -
  (0000 0000)         /* TO LEVEL 1 MIGRATION          */

DEFINE                /* RUN PRIMARY SPACE MGMT EVERY   */ -
  PRIMARYSPMGMTCYCLE /* DAY, STARTING MARCH 02, 1998   */ -
  (YYYYYYY -         /*                                */ -
  CYCLESTARTDATE(1998/03/02))

SETSYS MIGRATIONSUBTASKS(YES ADDITIONALSUBTASKS(2))

SETSYS                /* A data set THAT HAS NOT BEEN   */ -
  DAYS(10)            /* REFERRED TO (OPENED) FOR 10 DAYS */ -
                    /* IS ELIGIBLE FOR MIGRATION      */

SETSYS                /* SPECIFY A HIGH-LEVEL QUALIFIER  */ -
  MIGRATEPREFIX(HSM) /* WITH WHICH DFSMSHSM RENAMES    */ -
                    /* MIGRATED data sets.           */

SETSYS                /* DO NOT PERFORM MIGRATION       */ -
  NOINTERVALMIGRATION /* THROUGHOUT THE DAY.           */

...

SETSYS                /* KEEP MCDS RECORDS FOR RECALLED  */ -
  MIGRATIONCLEANUPDAYS(10 30 3) /* data sets FOR 10 DAYS. KEEP    */ -
                    /* VOLUME OR DAILY STATISTICS RECORDS*/ -
                    /* FOR 30 DAYS. KEEP RECORDS TO    */ -
                    /* RECONNECTABLE data sets 3 DAYS  */ -
                    /* BEYOND EARLIEST ELIGIBILITY.    */

SETSYS                /* MIGRATE data sets FROM LEVEL 1  */ -
  MIGRATIONLEVEL1DAYS(45) /* VOLUMES TO LEVEL 2 VOLUMES IF THE */ -
                    /* data sets HAVE NOT BEEN REFERRED */ -
                    /* TO FOR 45 DAYS.                 */

...

SETSYS                /* MIGRATE SMALL data sets AS     */ -
  SMALLDATASETPACKING /* RECORDS TO SMALL data set PACKING */ -
  (KB(100))           /* (SDSP) data sets.              */

SETSYS                /* LIMIT THE NUMBER OF CONCURRENT  */ -
  MAXMIGRATIONTASKS(14) /* AUTOMATIC VOLUME MIGRATION TASKS */

```

```

SETSYS                                /* LIMIT THE NUMBER OF CONCURRENT */ -
  TAPEMAXRECALLTASKS(4)              /* RECALL TASKS */
                                      /* TO THREE. */                          */

/*                                     */

...
SETSYS UNITNAME(VT3590)
  BACKUP(TAPE(VT3590))
  RECYCLEOUTPUT(BACKUP(VT3590))

...
/*****
/*          DFSMSHSM CONTROL data set BACKUP PARAMETERS          */
*****/

SETSYS                                /* MAINTAIN FOUR BACKUP VERSIONS */ -
  CDSVERSIONBACKUP(                 /* OF THE CONTROL data sets. BACK */ -
    BACKUPCOPIES(4)                 /* UP THE CONTROL data sets TO   */ -
    BACKUPDEVICECATEGORY(DASD) /* USING DASDS                    */ -
    MCDSBACKUPPSN(HSM.MCDS.BACKUP) -
    BCDSBACKUPPSN(HSM.BCDS.BACKUP) -
    OCDSBACKUPPSN(HSM.OCDS.BACKUP) -
    JRNLBACKUPPSN(HSM.JRNL.BACKUP) -
                                      /* USING DSS AS THE DATAMOVER    */ -
    DATAMOVER(DSS))                 /*                                */ -

...
/*****
/*          DFSMSHSM BACKUP PARAMETERS                            */
*****/

ONLYIF                                /* THE FOLLOWING DEFINE COMMAND WILL */ -
  HSMHOST(1)                          /* EXECUTE ONLY IF THE ACTIVE HOST ID*/ -
                                      /* MATCHES THE HOST SPECIFIED.    */

-
DEFINE BACKUP(Y 1                     /* DIRECT DFSMSHSM TO BACKUP ELIGIBLE*/ -
  CYCLESTARTDATE(1998/03/02)) /* data sets DAILY (A 1 DAY CYCLE) */
                                      /* TO A SINGLE BACKUP VOLUME, STARTING*/
                                      /* MARCH 02, 1998.                */

SETSYS DSBACKUP(DASDSELECTIONSIZE(3000 250) DASD(TASKS(2)) -
  TAPE(TASKS(2) DEMOUNTDELAY(MINUTES(60) MAXIDLETASKS(0))))
                                      /* BALANCE THE WORKLOAD BETWEEN TAPE */
                                      /* AND DASD FOR WAIT TYPE BACKDS      */
                                      /* COMMANDS. LIMIT THE NUMBER OF DATA*/
                                      /* SET BACKUP TAPE AND DASD TASKS.   */
                                      /* LIMIT THE NUMBER AND LENGTH OF    */
                                      /* TIME A TAPE TASK CAN REMAIN IDLE  */
                                      /* BEFORE BEING DEMOUNTED.           */

SETSYS                                /* ACTIVATE THE BACKUP AND DUMP     */ -
  BACKUP(TAPE(VT3590))              /* FUNCTION OF DFSMSHSM            */

```

```

/* VTFM          NORBERT */

ONLYIF          /* THE FOLLOWING SETSYS COMMAND WILL */ -
  HSMHOST(2)    /* EXECUTE ONLY IF THE ACTIVE HOST ID*/ -
                /* MATCHES THE HOST SPECIFIED.      */ -

SETSYS -
  AUTOBACKUPSTART(1730 1750 0000)
                /* SPECIFY THE TIME FOR AUTOMATIC   */ -
                /* BACKUP TO BEGIN, THE LATEST START  */ -
                /* TIME THAT AUTOMATIC BACKUP CAN   */ -
                /* BEGIN, AND THE QUIESCE TIME FOR   */ -
                /* AUTOMATIC BACKUP. NO AUTOMATIC   */ -
                /* BACKUP OCCURS UNTIL THESE TIMES  */ -
                /* ARE SPECIFIED.                  */ -

SETSYS          /* SPECIFY A HIGH-LEVEL QUALIFIER   */ -
  BACKUPPREFIX(HSM) /* WITH WHICH DFSMSHSM RENAMES BACKED*/ -
                /* UP data sets                          */ -

SETSYS          /* KEEP ONE VERSION OF EACH BACKED UP*/ -
  VERSIONS(1)   /* data set.                            */ -
  FREQUENCY(0)

SETSYS          /* LIMIT THE NUMBER OF CONCURRENT   */ -
  MAXBACKUPTASKS(3) /* BACKUP TASKS TO THREE, BACK UP ALL*/ -
  NOSKIPABPRIMARY /* DFSMSHSM-MANAGED VOLUMES THAT HAVE*/ -
                /* THE AUTO BACKUP ATTRIBUTE.        */ -

SETSYS          /* DURING DAILY BACKUP, MOVE        */ -
  SPILL         /* data sets FROM FULL DAILY        */ -
                /* DASD VOLUMES TO SPILL VOLUMES.   */ -

SETSYS          /* MAKE INITIAL BACKUP COPIES OF DATA*/ -
  INCREMENTALBACKUP(CHANGEDONLY) /* DESPITE THE SETTING OF THE */ -
                /* CHANGE BIT.                        */ -

```

---

**Note:** You can use QUERY SETSYS command to check the active configuration of the running DFSMSHsm.

## Allocate data sets for DFSMSHsm processing

In this step, we allocated different types of data sets in our test environment. These included a mixture of standard partition data sets, standard PDSE data sets, and the new PDSE V2 with member generation. A mixture of fixed block and variable block were also included.

Table 2 shows the data sets to be created and their attributes. The migration levels are assigned by the ACS routine.

Table 2 Attributes of test data sets

Data set name	Attributes	Migration Levels
CHXMA.TEST1.GDGPDSSE.D S1	GDG base	N/A
CHXMA.TEST1.GDGPDSSE.D S1.G0001V00	PDS, FB	ML1
CHXMA.TEST1.GDGPDSSE.D S1.G0002V00	PDSE, FB	ML1
CHXMA.TEST1.GDGPDSSE.D S1.G0003V00	PDSE version 2 with Member Generation, FB	ML1
CHXMA.TEST1.GDGPDSSE.D S1.G0004V00	PDSE version 2 with Member Generation, VB	ML1
CHXMA.TEST2.GDGPDSSE.D S1	GDG base	N/A
CHXMA.TEST2.GDGPDSSE.D S1.G0001V00	PDS, FB	ML2
CHXMA.TEST2.GDGPDSSE.D S1.G0002V00	PDSE version 2 with Member Generation, FB	ML2

Example 11 shows the details of each data set organization (DSORG).

Example 11 Attributes of test data sets

- Enter "/" to select action	Dsorg	Recfm	Lrecl	Blksz
-----				
CHXMA.TEST1.GDGPDSSE.DS1				
CHXMA.TEST1.GDGPDSSE.DS1.G0001V00	P0	FB	80	27920
CHXMA.TEST1.GDGPDSSE.DS1.G0002V00	P0-E	FB	80	27920
CHXMA.TEST1.GDGPDSSE.DS1.G0003V00	P0-E	FB	80	27920
CHXMA.TEST1.GDGPDSSE.DS1.G0004V00	P0-E	VB	80	32760
CHXMA.TEST2.GDGPDSSE.DS1				
CHXMA.TEST2.GDGPDSSE.DS1.G0001V00	P0	FB	80	27920
CHXMA.TEST2.GDGPDSSE.DS1.G0002V00	P0-E	FB	80	27920

To allocate PDSE V2 with member generation, ensure that the MAXGENS\_LIMIT has been specified in IGDSMSxx. This value specifies the maximum number of generations. In this example deployment, MAXGENS\_LIMIT(5) is specified. The value in the parenthesis indicates that the maximum generation limit and is *system wide*. The SET SMS=xx parameter can be used to activate the value. If the value has not been set, then the message in Example 12 is issued when attempting to allocate a PDSE V2 data set with member generation.

Example 12 Error messages for the failed allocation of PDSE member generation

IEF344I ALLCGDS ALLOC ALLOC - ALLOCATION FAILED DUE TO DATA FACILITY SYSTEM ERROR IGD17312I THE VALUE FOR THE KEYWORD MAXGENS SPECIFIED ON THE JCL EXCEEDS THE MAXIMUM ALLOWED BY THE INSTALLATION. THE MAXIMUM ALLOWED IS (0). ALLOCATION
---

A sample JCL for allocating a PDSE V2 data set with member generation is shown in Example 13.

*Example 13 Sample JCL for allocating PDSE Version 2 with member generation*

---

```
//ALLOC EXEC PGM=IEFBR14
//SYSPRINT DD SYSOUT=*
//ALLOC DD DSN=CHXMA.TEST2.GDGPDS1(+1),DSNTYPE=(LIBRARY,2),
// DISP=(NEW,CATLG,DELETE),MAXGENS=5,
// RECFM=FB,BLKSIZE=27920,LRECL=80,
// SPACE=(CYL,(1200,1000,100)),UNIT=3390
```

---

## PDSE V2 GDS migration

The new management class, the storage group, and the ACS routine defined for this exercise result in the PDSE V2 data sets being migrated to migration level 1 and migration level 2 if the conditions listed below are satisfied:

- ▶ The storage group has the Auto Migrate set to INTERVAL.
- ▶ The management class migration attributes are met.
- ▶ DFHSSMShsm is running with the INTERVAL migration enabled.
- ▶ The volume utilization exceeds the LOW threshold defined in the storage group.
- ▶ The PDSE V2 data set is larger than the other data sets on the volume.

The DFSMSHsm interval migration runs every hour. The scenario should trigger the migration process. Example 14 shows the volume information of data sets after migration.

*Example 14 Data sets after migration in ISPF*

---

Command - Enter "/" to select action	Message	Volume
CHXMA.TEST1.GDGPDS1		??????
CHXMA.TEST1.GDGPDS1.G0001V00		MIGRAT1
CHXMA.TEST1.GDGPDS1.G0002V00		MIGRAT1
CHXMA.TEST1.GDGPDS1.G0003V00		MIGRAT1
CHXMA.TEST1.GDGPDS1.G0004V00		MIGRAT1
CHXMA.TEST2.GDGPDS1		??????
CHXMA.TEST2.GDGPDS1.G0001V00		MIGRAT2
CHXMA.TEST2.GDGPDS1.G0002V00		MIGRAT2

---

## PDSE V2 GDS Recall

For this scenario, the HRECALL command is used. See Example 15.

*Example 15 Manually recall migrated data sets*

---

Command - Enter "/" to select action	Message	Volume
CHXMA.TEST1.GDGPDS1		??????
CHXMA.TEST1.GDGPDS1.G0001V00		MIGRAT1
CHXMA.TEST1.GDGPDS1.G0002V00		MIGRAT1
<b>HRECALL</b> CHXMA.TEST1.GDGPDS1.G0003V00		MIGRAT1
CHXMA.TEST1.GDGPDS1.G0004V00		MIGRAT1

---



CHXMA.TEST2.GDGPDSE.DS1	??????
CHXMA.TEST2.GDGPDSE.DS1.G0001V00	MIGRAT2
CHXMA.TEST2.GDGPDSE.DS1.G0002V00	MIGRAT2

---

After the recall has completed, DFSMSHsm issues the message shown in Example 16.

*Example 16 Messages for successful Recall*

---

```
ARC1000I CHXMA.TEST1.GDGPDSE.DS1.G0003V00 RECALL PROCESSING ENDED
RECALL REQUEST 00000603 SENT TO DFSMSHSM
***
```

---

The PDSE V2 GDS can now be opened to validate the recall and that the member has maintained its integrity. See Example 17.

*Example 17 PDSE generation display in ISPF*

---

```

                                EDIT Entry Panel
                                More:      +

Object Name:
'CHXMA.TEST1.GDGPDSE.DS1.G0003V00(TEST1) '
* No workstation connection
  Initial Macro . .
  PDSE Generation. . -2
  Line Command Table
  Profile Name . . .      (Blank defaults to Type)
  Format Name . . .
  Panel Name . . . .     (Leave blank for default)

Options                               Data Encoding
  Confirm Cancel/Move/Replace         1. ASCII
  EDIT Mixed Mode                      2. UTF-8
  EDIT host file on
  Workstation
  Preserve VB record length
```

---

The content as shown in Example 18 has not changed.

*Example 18 Content of PDSE member with generations*

---

```
EDIT      CHXMA.TEST1.GDGPDSE.DS1.G0003V00(TEST1) - 01.00 Columns 00001 00072
Command ===>                               Scroll ===> PAGE
***** ***** Top of Data *****
==MSG> -Warning- The UNDO command is not available until you change
==MSG>           your edit profile using the command RECOVERY ON.
==MSG> -CAUTION- Edit session has been invoked for generation 1
==MSG>           High generation number is currently 2
000100 THIS IS TEST 1
000200 TEST 1
```

---

To browse the member generation information in ISPF, select the enhanced member list from the data set List Settings menu as shown in Example 19.

*Example 19 Setting for PDSE member generation display in ISPF*

---

```
File Colors Workstation Help
  sssssssssssssssssssssssssssssssssssssssssssssssssssssssssssssssssss
      Data set List Settings Main
                                     More:      +

  General Options
  Enter "/" to select option
  / Display Edit/View/Browse entry panel (*)
  / Automatically update reference lists
  / List pattern for MO, CO, D, and RS actions
  / Show status for MO, CO, D, and RS actions
  / Confirm Member delete
  / Confirm data set delete
  / Do not show expanded command
  / Enhanced member list for Edit, View, and Browse
  Display Total Tracks
  / Execute Block Commands for excluded data sets
  Display Expiration Date
```

(\*) Requires enhanced member list option to be selected

---

## PDSE V2 GDS Backup

In the created scenario, after the following conditions have been satisfied, DFSMSHsm will back up the PDSE V2 GDS:

- ▶ The storage group has the Auto Backup set to YES.
- ▶ The management class backup attributes are specified.
- ▶ DFHSSMSHsm is running with autoBackup enabled.

Example 20 shows the backup attributes configuration for the management class.

*Example 20 Backup attributes in management class*

---

```
Backup Attributes
Backup frequency . . . . . : 1
Number of backup versions . . . . . : 3
  (Data set Exists)
Number of backup versions . . . . . : 1
  (Data set Deleted)
Retain days only backup version . . . . : 10
  (Data set Deleted)
Retain days extra backup versions . . . : 30

Admin or User Command Backup . . . . . : BOTH
Auto Backup . . . . . : YES
Backup copy technique . . . . . : STANDARD
```

---

After DFSMSshm Autobackup has run, all the eligible data sets will be backed up. See Example 21.

*Example 21 Output of TSO HLIST BCDS*

---

```

DSN=CHXMA.TEST1.GDGPDS5.DS5.G0003V00          BACK FREQ = ***  MAX ACTIVE B
ACKUP VERSIONS = ***

      BDSN=HSM.BACK.T122711.CHXMA.TEST1.A4310      BACKVOL=VT0138  FRVOL=SBOX3B
      BACKDATE=14/11/06  BACKTIME=11:27:12  CAT=YES  GEN=000  VER=004  UNS/RET= NO
      RACF IND=NO  BACK PROF=NO  NEWNM=NO  NOSPH=***  GVCN=***  RETDAYS=*****

TOTAL BACKUP VERSIONS = 0000000001

DSN=CHXMA.TEST1.GDGPDS5.DS5.G0004V00          BACK FREQ = ***  MAX ACTIVE B
ACKUP VERSIONS = ***

      BDSN=HSM.BACK.T564810.CHXMA.TEST1.A4310      BACKVOL=VT0133  FRVOL=SBOX3A
      BACKDATE=14/11/06  BACKTIME=10:48:56  CAT=YES  GEN=000  VER=001  UNS/RET= NO
      RACF IND=NO  BACK PROF=NO  NEWNM=NO  NOSPH=***  GVCN=***  RETDAYS=*****

TOTAL BACKUP VERSIONS = 0000000001

```

---

## PDSE V2 GDS Recover

The HRECOVER/REPLACE 1 command is issued to recover from the backed up data set. The 1 indicates that the backup version to be used for the recovery. See Example 22.

*Example 22 HRECOVER the backed up data set in ISPF panel*

---

```

Command ==>                               Scroll ==> CSR

Command - Enter "/" to select action          Message          Volume
-----
      CHXMA.TEST1.GDGPDS5.DS5                  ??????
      CHXMA.TEST1.GDGPDS5.DS5.G0002V00        SBOX3A
HRECOVER / REPLACE 1.GDGPDS5.DS5.G0003V00  SBOX3A
      CHXMA.TEST1.GDGPDS5.DS5.G0004V00        SBOX3A
      CHXMA.TEST1.GDGPDS5.DS5.G0005V00        SBOX3A
      CHXMA.TEST1.GDGPDS5.DS5.G0006V00        SBOX3B

```

---

## Summary

This paper was produced to illustrate how both PDSE Version 1 and Version 2 data set scan be managed by providing you with sample scenarios and examples of how DFSMSshm migrates, recalls, backups and retrieves PDSE Version 2 data sets that use member generations and that the integrity of the data sets remains intact.

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