

DFSMS transparent cloud tiering
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Summary of Changes			
Version	Date	Change Description	Revision Tag
1.0	11/18/16	Initial Version	
1.1	12/06/16	<ul style="list-style-type: none"> Missing ABARS information Updated link to the DS8000 knowledge center	|
1.2	01/31/17	<ul style="list-style-type: none"> Fix SMS constants	|
1.3	03/02/17	<ul style="list-style-type: none"> Z/OS MVS Initialization and Tuning reference - Update AOM496I DEVSUPxx description z/OS MVS System Messages Vol 6 - Add IEA253I message z/OS DFSMSHsm Implementation and Customization Guide – update ARCUTIL section Add z/OS Access Method Services Commands – DCOLLECT info	|
1.4	06/06/17	<ul style="list-style-type: none"> z/OS Using the New Function – Added information for using a DS8000 object proxy z/OS DFSMSdfp Storage Administration – Added information for defining a DS8000 object proxy cloud 	
1.5	09/06/17	<ul style="list-style-type: none"> Add S3 support details 	
1.6	11/01/17	<ul style="list-style-type: none"> Update digital certificate 	

		information regarding SITE certificates	
1.7	12/22/17	<ul style="list-style-type: none"> Automatic migration support from OA52901, OA52912, OA52913, OA52914, OA52929, and OA53574 	
1.8	06/08/2018	<ul style="list-style-type: none"> FCWITHDRAW support from OA55043 	
1.9	11/22/2019	<ul style="list-style-type: none"> TS7700's DS8000 object store support from OA58221 	

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Preface

This document describes the IBM publication changes for DFSMS transparent cloud tiering. Transparent cloud tiering gives you the ability to define cloud constructs to DFSMS, to archive data sets to a defined cloud, and retrieve archived data sets from the cloud using DFSMSHsm and DFSMSdss commands.

List of Main APARs that provide the DFSMS transparent cloud tiering support:

OA51622
OA52901
OA58221

DFSMS Using the New Functions

Using DFSMS transparent cloud tiering

Cloud computing is a term that describes a new model for delivering services to consumers. One such service is data storage and retrieval for use of long term storage. Using a cloud storage service, consumers are able to store and retrieve data from anywhere in the world on any device using internet protocols. Providers of a cloud storage service are able to provide broad network access, pool storage resources, and rapidly respond to growing storage requirements. Because of the value that cloud service delivery provides, enterprise IT organizations are adopting this model within their own data centers, known as private clouds, to deliver storage services to their own internal organizations. The IBM System Storage DS8000 introduces the ability to store data to and retrieve data from a cloud.

For information about the IBM Object Cloud Storage offering, see <https://www.ibm.com/cloud-computing/products/storage/object-storage/>.

z/OS DFSMS introduces transparent cloud tiering, to enable data storage on a cloud in combination with support provided by the IBM System Storage DS8000. The following DFSMS cloud storage functions are included in transparent cloud tiering:

- Cloud connection definition using ISMF and SMS
- Migration and recall using DFSMSHsm
- DFSMSHsm Audit support
- Command-based backup and recovery to a cloud using DFSMSDss.

To prepare your system for Cloud data storage, perform the following steps:

1. Enable cloud functions on your DS8000, as specified in the DS8000 information. For information on setting up your DS8000, see http://www.ibm.com/support/knowledgecenter/HW213_7.5.0/com.ibm.storage.ssic.help.doc/f2c_trans_cloud_tiering.html
 - Note: Initially, the DS8000 only supports a single account. With only a single account, there is no way to separate test data from production data. Additionally, there is no way to separate HSM data from DSS data. It is recommended that using both DFSMSHsm and DFSMSDss for the same account should only be done in a test environment. DFSMSDss and DFSMSHsm should not share a single account in a production environment.
2. Ensure TCP/IP is enabled and active on your z/OS host.
3. Obtain the following information from your cloud provider or administrator:
 - Provider:
 - TAPE-OBJECT – when you are using a virtual storage system as an object store for transparent cloud tiering

- SWIFT - when your cloud is an Openstack-based Swift object storage cloud using the built-in Tempauth authorization system
 - SWIFT-KEYSTONE - when your cloud is an Openstack-based Swift object storage cloud using the Keystone Identity service
 - Identity: the information used to authenticate with the object store. This may be a username, or for swift based clouds, a concatenation of the tenant name and a user name in the form *tenant_name:user_name*.
 - In order to secure the cloud password, DFSMSHsm data must have it's own account and should not be intermixed with other data.
 - Endpoint: the Uniform Resource Identifier (URI) that DFSMS should use for authentication with your object storage cloud.
 - Port number: the port on which DFSMS is to communicate with the endpoint.
 - SSL version: the lowest acceptable level of SSL/TLS that should be used when establishing a secure connection.
4. Digital certificate setup for SSL/TLS: if your cloud provider uses SSL/TLS communication, then you must also obtain the necessary digital certificates and understand the type of SSL/TLS authentication the cloud performs. For details on these steps, see "Setting up digital certificates for the cloud" in *DFSMSdfp Storage Administration*.
5. Perform SMS setup:
- (optional) Allocate a backup SMS configuration data set (BACKUP.SCDS), a backup active configuration data set (BACKUP.ACDS), and a new active configuration data set (NEW.ACDS) that you will use for a new SMS configuration.
 - Make a backup of your existing SMS configuration, using the SETSMS SAVESCDS command.
 - Make a backup of your existing active SMS configuration data set, using the SETSMS SAVEACDS command.
 - Use new ISMF Cloud panels to define cloud construct(s) in the active SMS source configuration data set (required information: cloud name, provider, identity (credentials), endpoint, port, SSL version, SSL key)
 - Validate the new SMS configuration in the active source configuration data set, using ISMF.
 - Copy the active SCDS into the new ACDS, using the SETSMS COPYSCDS(active.scds , new.acds) command, where active.scds is the SCDS with defined cloud construct(s).
 - Activate the new SMS active configuration data set, using the SETSMS ACDS(new.acds) command.
6. SDM setup:
- Define SAF resources to control access to the OBJSTORE ILK on the ANTRQST API. It is recommended that the following FACILITY class profile is defined with a universal access of NONE:
 - a) STGADMIN.ANT.ESS.OBJSTORE
7. DFSMSdss setup:

- Define SAF resources to control access to the CLOUD keyword on the DFSMSdss DUMP and RESTORE commands, by granting READ access to FACILITY class profiles:
 - a) STGADMIN.ADR.DUMP.CLOUD
 - b) STGADMIN.ADR.RESTORE.CLOUD
8. DFSMShsm setup:
- Enable the CP Assist for Cryptographic Functions.
 - Define DFSMShsm to z/OS UNIX System Services as a superuser, and the RACF user ID must have a default RACF group which has an OMVS segment with a group id (GID). The user ID must also have an OMVS segment with the following parameters: UID(0) HOME('/').
 - Define SAF resources to control access to the CLOUD keyword on the HMIGRATE end user command, by granting READ access to FACILITY class profile:
 - a) STGADMIN.ARC.ENDUSER.HMIGRATE.CLOUD
 - Set the password that DFSMShsm uses when communicating with the Cloud Storage account:
 - a) Issue the following operator command: SETSYS CLOUD(NAME(cloud_name) CCREDS)
 - b) The system will prompt for the cloud password in a WTOR and the response will not be echoed back to the console. If the cloud password is case sensitive, use the System Command Extension from the SDSF log when replying to the WTOR. (The System Command Extension can be started by typing a forward slash (/) on the Command Input line in the SDSF system log.)
 - c) The cloud password must be secured. It is recommended that a security administrator who is administering the cloud storage accounts is the one who enters this password.
9. Enable status messages: ENABLE(AOM496I) in DEVSUPxx , when exceptions need to be looked at. Note: the default is DISABLE(AOM496I).
10. Inform users about cloud storage functions, including the new DFSMSdss and DFSMShsm commands.

SMS provides a new construct called a cloud, which contains a list of cloud attributes and their values. DFSMShsm and DFSMSdss use the attributes of a specified cloud definition on their commands to manage data set migration. A new ISMF option 'S' on the ISMF Primary Option Menu panel leads to a new Cloud Application Selection panel where storage administrators can select functions to define a cloud, display or alter a cloud, or generate a list of clouds. For details, see *DFSMSdfp Storage Administration Reference*.

DFSMShsm commands -- for details, see *DFSMShsm Storage Administration Reference*:

- MIGRATE and HMIGRATE commands include a new optional keyword, CLOUD(*cloudname*). When this keyword is specified, the named data set, or data sets on the named volume, is migrated to the requested cloud. The *cloudname* specified must match an existing SMS Cloud definition.

- LIST command processing is updated to display information about data sets migrated to cloud storage, as well as the cloud storage DFSMSShsm has used. The CLOUD optional keyword for DATASET SELECT will cause DFSMSShsm to list only those data sets that have been migrated to cloud storage.
- REPORT command is updated to include information about data sets migrated to cloud storage. New TOCLOUD and FROMCLOUD optional parameters on MIGRATION and RECALL (respectively) allow selection of records where cloud storage was involved.
- SETSYS command is updated with optional parameters CLOUDMIGRATION, to allow specification of Fast Subsequent Migration for data set migrated to storage in the cloud, and CLOUD, to specify properties for a particular Cloud Storage that DFSMSShsm uses to store migration copies of data sets.
- AUDIT command processing is modified to include migrated data sets that are stored in the Cloud. AUDIT MEDIACONTROLS adds a new CLOUD(cloudname) parameter. This function audits control information contained in migration copies that reside in the cloud. The cloudname refers to a defined SMS cloud construct name.

DFSMSDss commands -- for details, see DFSMSDss Storage Administration:

- DUMP and RESTORE commands have new keywords CLOUD, CONTAINER, OBJECTPREFIX, and CLOUDCREDENTIALS to support the placement of a DSS backup in cloud storage. The credentials specified in the CLOUDCREDENTIALS keyword must be kept secure. If there are batch JCL jobs that specify this keyword, then those jobs should be in a data set or library that has limited access and controlled by a security product. If the credentials cannot be kept secure then this keyword should not be used.

Tiering data to a TS7700

DFSMS can use a DS8000 to transparently tier data to a TS7700. To enable transparent cloud tiering to a TS7700, define a network connection construct using TAPE-OBJECT as the provider and a DS8000 as the endpoint. All administrative and metadata object requests originating from DFSMS are routed through the DS8000 HMC onto the TS7700. See the DFSMSdfp Storage Administration manual for information on how to setup a DS8000 as an object proxy server.

Tiering data to a S3 compatible object storage cloud

DFSMS does not natively support clouds that expose an S3 API, however, DFSMS can use a DS8000 to transparently tier data to an object storage cloud that exposes a S3 compatible API. To enable transparent cloud tiering to an S3 cloud, define a cloud construct using SWIFT authentication with the DS8000 as the endpoint. All object requests originating from DFSMS are routed through the DS8000 onto the S3 cloud. See the DFSMSdfp Storage Administration manual for information on how to setup a DS8000 as an object proxy server.

DFSMS Introduction

Understanding DFSMSdss

Backing Up and Restoring Data

Change the first sentence to read:

You can use DFSMSdss to back up data from DASD to tape, other DASD or object storage clouds.

z/OS DFSMS Access Method Services Commands

Interpreting DCOLLECT Output

DCOLLECT Output Record Structure

Management Class Construct Field MC

Summary of changes:

- Add field DMCL2DY at offset 312(X'138') with length of 2
- Add field DMCCLEN at offset 314(X'13A') with length of 2
- Add field DMCCLNAM at offset 316(X'13C') with length of 30
- Add field DMCSZLTE at offset 348(X'15C') with length of 4
- Add field DMCSZGT at offset 352(X'160') with length of 4
- Add field DMCACLTE at offset 356(X'164') with length of 1
- Add field DMCACGT at offset 357(X'165') with length of 1

Add changes in the following mapping for DCOLLECT record type 'MC'.

310 (X'136)	SIGNED	2	DMCCTCPY	HSM Class Transition Copy Technique 0 = Standard 1 = Fast Replication Prefer 2 = Fast Replication Request 3 = FlashCopy PresMirPref 4 = FlashCopy PresMirReq 5 = FlashCopy XRCPRIMARY
312 (X'138)	SIGNED	2	MCDL2DY	Min days/last to move to cloud
314 (X'13A)		32	DMCCLOUD	Cloud information
314 (X'13A)	SIGNED	2	DMCCLEN	The length of the cloud name
316 (X'13C)	CHARACTER	30	DMCCLNAM	Cloud name for migration
346 (X'15A)		2	*	RESERVED
348 (X'15C)	UNSIGNED	4	DMCSZLTE	Less than or equal to Data Size Threshold
352 (X'160)	UNSIGNED	4	DMCSZGT	Greater than Data Size Threshold
356 (X'164)	SIGNED	1	DMCACLTE	Action to take when less than or equal to the data set size 0 = NONE 1 = for CLOUD 2 = for ML1 3 = for ML2 4 = for MIG 5 = for Transition
357 (X'165)	SIGNED	1	DMCACGT	Action to take when greater than the data set size 0 = NONE 1 = for CLOUD 2 = for ML1

				3 = for ML2 4 = for MIG 5 = for Transition
358 (X'166)		4	*	Reserved
362 (X'16A)	CHARACTER		DMCDATAE	END OF DMCDATA

MIGRATED DATA SET INFORMATION (RECORD TYPE "M")

Offset	Type	Length	Name	Description
				MIGRATED DATA SET INFORMATION (DEFINED ON DCUDATA)
24 (18)	STRUCTURE	328	UMMDSI	
24 (18)	CHARACTER	44	UMDSNAM	DATA SET NAME
68 (44)	BITSTRING	1	UMFLAG1	INFORMATION FLAG #1
	11..	....	UMLEVEL	MIGRATED LEVEL (see Table 13)
	..1.	....	UMCHIND	CHANGED SINCE LAST BACKUP
	...1	....	UMSDSP	INDICATES SDSP MIGRATED DATA
	....	1111	*	RESERVED
69 (45)	CHARACTER	1	UMDEVCL	DEVICE CLASS OF MIGRATION VOL (see Table 13)
70 (46)	CHARACTER	2	UMDSORG	DATA SET ORGANIZATION AT TIME OF MIGRATION
72 (48)	SIGNED	4	UMDSIZE	MIGRATION COPY DATA SET SIZE IN KILOBYTES/ MEGABYTES
76 (4C)	STRUCTURE	8	UMMDATE	TIMESTAMP FIELD
76 (4C)	CHARACTER	4	UMTIME	MIGRATED TIME - HHMMSSTH FORMAT
80 (50)	CHARACTER	4	UMDATE	MIGRATED DATE - YYYYDDDF FORMAT
84 (54)	STRUCTURE	96	UMCLASS	
84 (54)	STRUCTURE	32	UMDCLAS	
84 (54)	SIGNED	2	UMDCLNG	DATA CLASS NAME LENGTH
86 (56)	CHARACTER	30	UMDATCL	DATA CLASS NAME
116 (74)	STRUCTURE	32	UMSCLAS	
116 (74)	SIGNED	2	UMSCLNG	STORAGE CLASS NAME LENGTH
118 (76)	CHARACTER	30	UMSTGCL	STORAGE CLASS NAME
148 (94)	STRUCTURE	32	UMMCLAS	
148 (94)	SIGNED	2	UMMCLNG	MANAGEMENT CLASS NAME LENGTH

150 (96)	CHARACTER 30	UMMGTC	MANAGEMENT CLASS NAME
180 (B4)	BITSTRING 1	UMRECRD	RECORD FORMAT BYTE
181 (B5)	BITSTRING 1	UMRECOR	VSAM RECORD ORGANIZATION
	1... ..	UMESDS	ENTRY-SEQUENCED DATA SET
	.1... ..	UMKSDS	KEY-SEQUENCED DATA SET
	..1.	UMLDS	LINEAR DATA SET
	...1	UMRRDS	RELATIVE-RECORD DATA SET
	.... 1111	*	RESERVED
182 (B6)	CHARACTER 2	UMBKLN	BLOCK LENGTH
184 (B8)	BITSTRING 1	UMFLAG2	INFORMATION FLAG #2
	1... ..	UMRACFD	RACF-INDICATED
	.1... ..	UMGDS	SET TO 1, GENERATION GROUP DATASET THIS FIELD IS ONLY VALID WHEN THE DATA SET IS SMS-MANAGED
	..1.	UMREBLK	SET TO 1, DATA SET IS SYSTEM-REBLOCKABLE THIS FIELD IS ONLY VALID WHEN THE DATA SET IS SMS-MANAGED.
	...1	UMPDSE	SET TO 1, DATA SET IS PDSE. THIS FIELD IS ONLY VALID WHEN THE DATA SET IS SMS-MANAGED.
	.... 1...	UMSMSM	SET TO 1, DATA SET IS SMS-MANAGED
	.... .1..	UMCOMPR	SET TO 1, DATA SET IS COMPRESSED FORMAT
	.... ..1.	UMLFS	SET TO 1, DATA SET IS LARGE FORMAT SEQUENTIAL
	.... ...1	*	RESERVED
185 (B9)	CHARACTER 1	*	RESERVED
186 (BA)	SIGNED 2	UMNMIG	NUMBER OF TIMES MIGRATED
188 (BC)	SIGNED 4	UMALLSP	ORIGINAL ALLOCATE SPACE (KB)
192 (C0)	SIGNED 4	UMUSESP	QUANTITY OF USER DATA (KB)
196 (C4)	SIGNED 4	UMRECSP	RECALL SPACE ESTIMATE (KB)
200 (C8)	CHARACTER 4	UMCREDT	CREATION DATE - YYYYDDDF
204 (CC)	CHARACTER 4	UMEXPDT	EXPIRATION DATE - YYYYDDDF
208 (D0)	CHARACTER 8	UMLBKDT	LAST BACKUP DATE- STCK FORMAT

			CONSISTENT WITH DCDLBKDT. THIS FIELD IS ONLY VALID WHEN THE DATA SET IS SMS-MANAGED.
216 (D8)	CHARACTER 4	UMLRFDT	LAST REFERENCE DATE-YYYYDDDF
220 (DC)	SIGNED 4	UM_USER_DATASIZE	VALID WHEN UMCOMPR SET, THIS VALUE REPESENTS, IN KB/MB WHAT THE DATA SIZE WOULD BE IF IT WERE NOT COMPRESSED
224 (E0)	SIGNED 4	UM_COMP_DATASIZE	VALID WHEN UMCOMPR SET, THIS VALUE REPESENTS, IN KB/MB THE ACTUAL (COMPRESSED) DATA SIZE
228 (E4)	CHARACTER 6	UMFRVOL	THE FIRST SOURCE VOLUME SERIAL OF THE MIGRATED DATA
234 (EA)	CHARACTER 4	UMLRECL	Data set LRECL
238 (EE)	BITSTRING 1	UMFLAG3	Information flag #3
	1... ..	UMEMPTY	ON, if data set was empty at the time of migration
	.111 1111	*	Reserved
239 (EF)	BITSTRING 1	UMFLAG4	Information flag #4
	1... ..	UMALLSP_FMB	Mbyte flag for UMALLSP
	.1... ..	UMUSESP_FMB	Mbyte flag for UMUSESP
	..1.	UMRECSP_FMB	Mbyte flag for UMRECSP
	...1	UMDSIZE_FMB	Mbyte flag for UMDSIZE
	.... 1...	UM_FMB	If ON, the following variables: - UM_USER_DATASIZE - UM_COMP_DATASIZE are in megabytes
	.... .111	*	Reserved
240 (F0)	STRUCTURE	UM_CLD_INFO	MCD extension for CLOUD info
240 (F0)	SIGNED 2	UM_CLOUD_NAME_LENGTH	CLOUD name length
242 (F2)	CHARACTER 30	UM_CLOUD_NAME	CLOUD name
272 (110)	CHARACTER 44	UM_CONTAINER_NAME	CLOUD container name
316 (13C)	SIGNED 4	UM_OBJ_NUMBER	Number of objects stored
320 (140)	CHARACTER 32	*	RESERVED SPACE
352 (160)	CHARACTER 0	UMMDSIE	END OF DCUMCDS

BACKUP DATA SET INFORMATION (RECORD TYPE "B")

Offset	Type	Length	Name	Description
24 (18)	STRUCTURE	204	UBBDSI	BACKUP DATA SET INFORMATION (DEFINED ON DCUDATA)
24 (18)	CHARACTER	44	UBDSNAM	DATA SET NAME
214 (D6)	BITSTRING	1	UBFLAG4	Information flag #4
	1... ..		UBALLSP_FMB	Mbyte flag for alloc size
	.1... ..		UBUSESP_FMB	Mbyte flag for used size
	..1.		UBRECSP_FMB	Mbyte flag for recovered
	...1		UBDSIZE_FMB	Mbyte flag for BU version
	.... 1...		UB_FMB	If ON, the following
	.... .111		*	RESERVED
215 (D7)	CHARACTER	13	*	RESERVED SPACE
228 (E4)	CHARACTER	0	UBBDSIE	END OF DCUBCDS

z/OS DFSMSdfp Storage Administration

Defining network connections

z/OS DFSMS simplifies the management of resources that are accessed using the hypertext transfer protocol/hypertext transfer protocol secure (http/https) over transport control protocol/internet protocol (tcp/ip) by introducing a network connection construct. This topic describes the DFSMS network connection construct and explains how you can define them with the ISMF network connection application.

Understanding network connections

A network connection is a set of attributes and their values used to connect to a resource over http/https. Defining a connection to a resource does not establish the connection. Applications that use the network connection are responsible for establishing and managing their own connection.

The network connection construct begins with a network connection name. The maximum length is 30 alphanumeric or national (\$, @, #) characters, or any combination. The first character cannot be numeric.

Securing your network communication

z/OS DFSMS supports the transport layer security (TLS) protocol and uses SAF keyrings to manage the digital certificates used during the TLS handshake. TLS is used to verify the authenticate the server and to ensure the cloud credentials are encrypted before transmitting over the IP network. For an overview of TLS see the ‘How System SSL works for secure socket communication’ chapter in the z/OS Cryptographic Services System SSL Programming manual.

Note
DFSMS supports server authentication using digital certificates. It does not support client, or mutual, authentication.

Setting up digital certificates for the cloud

The network resource you intend to communicate with may have a digital certificate that was self-signed or signed by a certificate authority. A self-signed certificate is generally not to be trusted, but it may be acceptable if the resource is on premise and part of your own private network.

Certificates signed by a certificate authority

1. Obtain the digital certificates from your object storage provider.

2. Upload the file(s) to your z/OS host. This upload must be done in ASCII.
3. Add the certificates to RACF under CERTAUTH

- a. Add the root CA certificate:

```
RACDCERT CERTAUTH ADD(<dataset containing cloud root CA>
WITHLABEL('Cloud Root CA') TRUST
```

- b. Add the intermediate CA certificate:

```
RACDCERT CERTAUTH ADD(<dataset containing cloud
intermediate CA>) WITHLABEL('Cloud Intermediate CA') TRUST
```

4. Authorize access to the virtual key ring for the DFSMSHsm address space (dfhsm-region-userid). Do this by administering a profile in the FACILITY class.

```
RDEFINE FACILITY IRR.DIGTCERT.LISTRING UACC(NONE)
```

```
PERMIT IRR.DIGTCERT.LISTRING CLASS(FACILITY) ID(dfhsm-
region-userid) ACCESS(READ)
```

- a. If the FACILITY class is not already active, activate and RACLIST it.
SETROPTS CLASSACT(FACILITY) RACLIST(FACILITY)
- b. If the FACILITY class is already active and RACLISTed, refresh it.
SETROPTS RACLIST(FACILITY) REFRESH

Note: RDATA LIB class could be used as well, but FACILITY class is simpler when using virtual keyrings.

5. When configuring ISMF, use the virtual key ring by specifying its fully qualified name for the KEYRING directive:
AUTH/*

Self-Signed Certificates

1. To get the HMC certificate, issue the following openssl command from a machine with openssl installed:

```
openssl x509 -in <(openssl s_client -connect DS8000-HMC-
IP:8452 -prexit 2>/dev/null) -text -out certificate.pem
```

Note: Substitute DS800-HMC-IP with the IP address of the HMC the certificate is being obtained from. This command will download the certificate for the HMC and store it in a file named certificate.pem.

2. Upload this file to your z/OS host. This upload must be done in ASCII.

3. Add the certificate to RACF under SITE

```
RACDCERT SITE ADD('DS8000.SITECERT') WITHLABEL('DS8000 SELF  
SIGNED SITE') TRUST
```

4. Authorize access to the virtual key ring for the DFSMSHsm address space (dfhsm-region-userid). Do this by administering a profile in the FACILITY class.

```
RDEFINE FACILITY IRR.DIGTCERT.LISTRING UACC(NONE)
```

```
PERMIT IRR.DIGTCERT.LISTRING CLASS(FACILITY) ID(dfhsm-  
region-userid) ACCESS(READ)
```

- a. If the FACILITY class is not already active, activate and RACLIST it.
SETROPTS CLASSACT(FACILITY) RACLIST(FACILITY)
- b. If the FACILITY class is already active and RACLISTed, refresh it.
SETROPTS RACLIST(FACILITY) REFRESH

Note: RDATA LIB class could be used as well, but FACILITY class is simpler when using virtual keyrings.

5. When configuring ISMF, use the virtual key ring by specifying its fully qualified name for the KEYRING directive:
SITE/*

Object storage network connections

A network connection is used to connect to an object storage cloud. The connection name specifies a name that DFSMS and the storage system use to coordinate data transfers.

After you define an object storage network connection, you can use DFSMSdss and DFSMSHsm commands to archive data sets to an object storage cloud.

Before you begin:

- For information about using DFSMSHsm commands to perform migrate, recall, list, audit, report and delete functions, see [z/OS DFSMSHsm Storage Administration](#).
- For information using DFSMSdss commands to perform dumps and restores, see [z/OS DFSMSdss Storage Administration](#).

Planning network connections

Obtain the following information from the owner of the network resource you are attempting to establish a connection to.

- Provider is the type of resource and protocol that will be used when communicating with the network resource.
- Identity is the username and for some providers, the tenant name, that is to be used when connecting to a network resource. Local directory access protocol (LDAP) usernames of the form user@domain and domain/user are supported.
- Endpoint is the Uniform Resource Identifier (URI) that DFSMS should use for authentication with your network resource.
- Port number is the port on which DFSMS is to communicate with the endpoint.
- SSL version is the lowest acceptable level of SSL/TLS that should be used when establishing a secure connection.

Defining network connections attributes

You can use ISMF to define, alter, list, or display network connection construct. This topic describes the ISMF panels that you use to define network connection attributes and outlines the steps you follow to define a cloud network connection.

Defining connections to object storage clouds

Using ISMF panels, define a network connection construct that corresponds in name to a cloud which is defined in the DS8000 configuration.

Defining connections to a TS7700 for DS8000 object store

DFSMS does not communicate directly with a virtual tape server that is acting as an object store, but it can use a DS8000 HMC as a gateway. Perform the following to configure DFSMS for a virtual tape server that is acting as an object store:

- On the ISMF Primary Option Menu panel, select 'S' to specify network connection attributes.
- On the Cloud Application Selection panel, specify the CDS name and the cloud network connection name, and select option 3 to Define a cloud
- On the Network Connection Define/Alter panel, fill in the following fields, with information obtained from your cloud provider or administrator:
 - cloud network connection name - the name of the cloud in the selected CDS.
 - Provider - TAPE-OBJECT
 - Endpoint - the Uniform Resource Identifier (URI) that DFSMS should use when authenticating with the object storage cloud.

Note

When configuring a connection to use a virtual tape server as an object store, the endpoint will point to a DS8000 HMC. This connection will be used for administrative commands and metadata transfers. If you have multiple DS8000's, specify one of them as the endpoint.

- Identity – The name of a user with monitor access to the DS8000 HMC. LDAP usernames are supported for those HMCs setup to use LDAP for authentication.
- Port - 8452
- SSL version – TLSV12
- SSL key should be either:
 - *AUTH*/* - when the storage systems HMC certificate was signed by a certificate authority
 - *SITE*/* - when the storage systems HMC certificate was not signed by a certificate authority. That is, it was self-signed.

Defining connections to a s3 based object storage cloud service provider

DFSMS does not natively support object stores that expose an S3 compatible interface, but it can use a DS8000 HMC as a gateway. Perform the following to configure DFSMS for an object store that exposes and S3 compatible API:

- On the ISMF Primary Option Menu panel, select 'S' to specify network connection attributes.
- On the Cloud Application Selection panel, specify the CDS name and the cloud network connection name, and select option 3 to Define a cloud
- On the Network Connection Define/Alter panel, fill in the following fields, with information obtained from your cloud provider or administrator:
 - cloud network connection name - the name of the cloud in the selected CDS.
 - Provider - SWIFT

Note

Even though the storage system is connected to an object store that exposes an S3 compatible API, DFSMS communicates with the DS8000 HMC using a Swift based protocol.

- Endpoint - the Uniform Resource Identifier (URI) that DFSMS should use when authenticating with the object storage cloud.

Note

When configuring a connection to an object store that exposes an S3 compatible API the endpoint will not be the object store itself, but it will be a storage systems HMC. This connection will be used for administrative commands and metadata transfers. If you have multiple storage systems, specify one of them as the endpoint.
--

- Identity – The name of a user with monitor access to the storage systems HMC. LDAP usernames are supported for those HMCs setup to use LDAP for authentication.
- Port - 8452
- SSL version – TLSV12
- SSL key should be either:
 - *AUTH*/* - when the storage systems HMC certificate was signed by a certificate authority
 - *SITE*/* - when the storage systems HMC certificate was not signed by a certificate authority. That is, it was self-signed.

Defining connections to an Openstack Swift based object storage cloud service provider

DFSMS does natively support object stores that expose a Openstack Swift compatible interface. Perform the following to configure DFSMS for an object store that exposes and S3 compatible API:

- On the ISMF Primary Option Menu panel, select 'S' to specify network connection attributes.
- On the Cloud Application Selection panel, specify the CDS name and the cloud network connection name, and select option 3 to Define a cloud
- On the Network Connection Define/Alter panel, fill in the following fields, with information obtained from your cloud provider or administrator:
 - cloud network connection name - the name of the cloud in the selected CDS.
 - Provider - SWIFT

Note

Even though the storage system is connected to an object store that exposes an S3 compatible API, DFSMS communicates with the DS8000 HMC using a Swift based protocol.
--

- Endpoint - the Uniform Resource Identifier (URI) that DFSMS should use when authenticating with the object storage cloud.

Note

When configuring a connection to an object store that exposes an S3 compatible API the endpoint will not be the object store itself, but it will be a storage systems HMC. This connection will be used for administrative commands and metadata transfers. If you have multiple storage systems, specify one of them as the endpoint.
--

- Identity – the credentials used when authenticating with the cloud. This is a concatenation of the tenant name and a username for that tenant in the form tenant_name:user_name
- Port - the remote port number to which to connect instead of the default HTTP or HTTPS port. Maximum length: five characters, valid values: 0 to 65535.
- SSL version – the lowest SSL version acceptable to use when making HTTP requests. Maximum length: eight characters, valid values: TLSV12, TLSV11, TLSV1, SSLV3, blank.
- SSL key should be either:
 - *AUTH*/* - when the object stores certificate was signed by a certificate authority
 - *SITE*/* - when the object stores certificate was not signed by a certificate authority. For example, if you are using the certificate that was defined when the DS8000 was delivered.

Defining additional network connections

You can copy existing network connection constructs and modify them to create new network connection constructs by using the COPY line operator, which is explained in Copying SMS components.

Chapter 7. Defining Management Classes

Defining management class migration attributes

Under 'Migration Attributes', update the last two (2) paragraphs to be the following:

A new Level 2 Days Non-usage attribute is used to describe direct migration to the cloud storage specified in the Cloud Name field. It currently supports two values, 0 and NOLIMIT. NOLIMIT is default. When NOLIMIT is specified, the data set will not migrate to cloud storage and will migrate based on the value of Level 1 Days Non-usage. When 0 is specified, the dataset will be migrated directly to the cloud specified by the Cloud Name field as long as the Primary Days Non-usage value is met, and the data set still resides on Level 0. This means Level 2 Days Non-usage takes priority over Level 1 Days Non-usage.

Note: DFSMSHsm does not support movement of migration copies from ML1 or ML2 to cloud storage.

If you do not want to migrate data sets that belong to a particular management class, specify NONE in the Command or Auto Migrate field. The data sets remain on primary storage until they expire. If you want data sets to be eligible for migration directly from Level 0 storage to Level 2, specify 0 in the Level 1 Days Non-usage field and NOLIMIT in the Level 2 Days Non-usage field. Otherwise, the data sets must first migrate to level 1 (the days spent on Level 0 count towards eligibility of moving to Level 2).

New migration actions can also be made based on the size of a data set (in tracks) as long as the Primary Days Non-usage criteria is met. Size Less Than or Equal To and Size Greater Than are optional fields that specify a size threshold. If the current size of the data set meets the threshold for Size Less Than or Equal To or Size Greater Than fields, then the specified action is taken. For example, if the Primary Days Non-usage criteria is met and the Size Greater Than field is set to 200 tracks, then a data set of 250 tracks will be migrated to where the Action field associated with the Size Greater Than field.

Primary Days Non-usage

Specifies the minimum number of days required to elapse for an unreferenced data set to be eligible for migration. Migration will take into effect when the necessary criteria are met and there is sufficient space on the volume. Default value is set to 2.

Level 1 Days Non-usage

Specifies the minimum number of nonused days for a data set before it becomes eligible for migration from Level 1 to Level 2. This includes unreferenced days in Level 0.

Accepted values are 0 to 9999, or NOLIMIT. 0 indicates that the data set migrates directly from Level 0 to ML2. If the data set already migrated to Level 1, then it immediately migrates to Level 2. A value of 1-9999 indicates that the data set may migrate first from Level 0 to Level 1. A value of NOLIMIT indicates that the data set that migrates to Level 1 will not migrate to Level 2, meaning there is no limit to how long the data set will stay in Level 1. Default value is set to 60.

Level 2 Days Non-usage

Specifies a direct migration to cloud storage. Current possible values are 0 and NOLIMIT. A blank value also indicates NOLIMIT. A value of NOLIMIT indicates a data set will migrate to Level 2 based on the value of Level 1 Days Non-usage. A value of 0 for this attribute indicates the data set will be migrated to the cloud storage specified by the Cloud Name field as long as the Primary Days Non-usage value is met and the data set still resides on Level 0. The Level 2 Days Non-usage processing takes precedence over Level 1 Days Non-usage value. Default value is NOLIMIT.

Command or Auto Migrate

Specifies if a data set is eligible to be migrated by both command and automatic processing, by command alone, or not at all. Possible values are BOTH, COMMAND, or NONE. BOTH indicates that both automatic and command migration can occur. COMMAND indicates that the data set cannot migrate automatically, but a migrate command for individual data sets can occur, regardless of the Primary Days Non-usage value. NONE specifies that the data set cannot migrate. Default value is BOTH.

Size Less Than or Equal To and Size Greater Than

Specifies the migration target based on size and action fields. Size Less Than or Equal To and Size Greater Than can have possible values of 1 to 4294967295, or blank. Blank will indicate that the migration based on size feature will not be used. The values 1 to 4294967295 are measured in TRACKS, and indicate the threshold values for when a migration will occur. If a threshold value AND Primary Days Non-usage value criteria are met, then the data set will migrate based on the specified ACTION of that threshold. Both Size Less Than or Equal To and Size Greater Than have their own ACTION field. Default value for size thresholds are blank.

The Action fields for 'Size Less Than or Equal To' and 'Size Greater Than' specify the migration action that will occur when the data set size threshold is met. Default value is blank.

Possible Action values are:

- NONE Data set should not be migrated. May be useful if you do not want to migrate data sets of below or above a certain size.
- ML1 Data set should be migrated to the ML1 tier.
- ML2 Data set should be migrated directly to the ML2 tier regardless of the values for Level 1 Days Non-usage.
- MIG Data set should be migrated to ML1, or ML2 according to the value of Level 1 Days Non-usage.
- TRANS Data set should have class transition processing performed on it.
- CLOUD Data set should be migrated to the cloud storage named in the Cloud Name field.

Cloud Name

Specifies the target for cloud storage migration. The SMS Cloud construct with the same name must also exist and the password for the cloud must be defined to DFSMSHsm. If Level 2 Days

Non-usage or CLOUD as an Action to the data set thresholds, Size Less Than or Equal To and Size Greater Than, then this Cloud Name attribute is required. If a data set is to be migrated to the cloud, then the volume that the data set resides on must be connected to cloud storage. Default value is blank.

z/OS DFSMSdfp Diagnosis

Storage Management Subsystem diagnostic aids

Storage Management Subsystem return and reason codes

Storage Management Subsystem reason codes

Configuration services reason codes

Update section “Configuration services reason codes” to add the following reason codes:

8000 (x'1F40) Cloud construct validation error. Construct name length invalid.

8001 (x'1F41) Cloud construct validation error. Construct name syntax invalid.

8002 (x'1F42) Cloud construct validation error. Identity invalid.

8003 (x'1F43) Cloud construct validation error. Cloud provider invalid.

8004 (x'1F44) Cloud construct validation error. URI endpoint invalid.

8005 (x'1F45) Cloud construct validation error. SSL version invalid.

8006 (x'1F46) Cloud construct validation error. SSL Key invalid.

VTOC/Data set services (VDSS) reason codes

Update section “VTOC/Data set services (VDSS) reason codes” with the following reason codes:

17337 (x'43B9') Error in AOM SFILIST

17338 (x'43BA') Cannot allocate data set with requested stripe count

17339 (x'43BB') Cannot allocate data set in one single SFI

z/OS DFSMS Installation Exits

Installation Exits

SRL: SC23-6850-30

ARCMDEXT: Space Management Exit

Characteristics of the ARCMDEXT

ARCMDEXT – Input Data Structure

The input flags have a change in the second byte as follows:

Second byte -input flags:

```
1... .... On-demand migration is in progress.
0... .... On-demand migration is not in progress.
.... 1... Data set is targeted to migrate to Cloud Storage
.... 0... Data set is not migrating to Cloud Storage
.xxx .xxx Reserved
```

Offset	Length	Description
48 (X'30')	4	Cloud name definition pointer. Zero, if a data set is not migrated to Cloud

Note.

Cloud name definition

Offset	Length	Description
0(0)	2	Cloud name length
2(2)	30	Cloud name

DFSMSdss Installation Exits

Options Installation Exit Routine (ADRUIXIT)

Installation-Supplied Options Exit Routine

ADRUF0 Parameter List

Make the following change to the UFOFUNCT section in Table 1 (ADRUF0 Parameter List) within the Options Installation Exit Routine (ADRUIXIT) section with the following:

Offset	Length or Bit Pattern	Name	Description
48 (X'30')			Force word alignment

Offset	Length or Bit Pattern	Name	Description
37 (X'25')	8	UFO_ZWEBT_DD	Web Toolkit Debug OutDD
45 (X'2D')			Force word alignment

Reblock Installation Exit Routine (ADRREBLK)

Installation-Supplied ADRREBLK Exit Routine

Add a note that reads the following:

Reblocking requests are ignored for data sets being restored from an object storage cloud.

z/OS DFSMSdss Storage Administration

Introduction to the DFSMSdss component of DFSMS

Understanding the role of DFSMSdss

Record counting

Add a note before the related reading content that says the following:

Note: DFSMSdss does not perform record counting for backups to or recoveries from an object storage cloud.

Managing availability with DFSMSdss

Modify the first paragraph to read:

DFSMSdss availability management consists of backing up data on DASD and restoring from the backup if the original is lost, damaged, or inadvertently changed. Backups can be directed to DASD, tape or an object storage cloud.

Add a third note at the end of the section:

Note:

3. Only logical data set backups can be directed to an object storage cloud.

Using Concurrent Copy

Add a third note at the end of the section:

Note:

3. Concurrent copy and virtual concurrent copy are not supported for backups directed to an object storage cloud.

Using object storage clouds

The DFSMSdss DUMP command provides the ability to backup DASD data to an object storage cloud. Backups in an object storage cloud consist of a set of objects. Backups within cloud storage are organized in a hierarchy with the top level of the hierarchy being the account.

Account

An account is the top level of the hierarchy. Accounts may also be referred to as projects or tenants and provide a namespace for the containers. An account has an owner associated with it and the owner of the account has full access to all the containers and objects within the account. Within DFSMS, the account information is stored in a cloud construct which is part of the SMS configuration.

Container

Containers are similar to folders on a workstation, and provide an area to organize and store objects. Containers may also be referred to as buckets by some cloud storage providers. DFSMSDss supports containers with names up to 128 bytes in length and the container name must be specified on the DUMP and RESTORE commands. When creating a backup, DFSMSDss will use a container if it already exists. Otherwise, if the container does not exist, it will be created as part of the backup operation.

Object

Objects represent meta data and track data (extents) that are created by DFSMSDss as part of the dump operation. DFSMSDss assigns a unique identifier, an object name, to the data stored in cloud storage. Because each object name has to be unique within a account and container pair, DFSMSDss requires an object prefix that is part of the object name.

Note: DFSMSDss logical data set DUMP is the only supported method for creating a backup to an object storage cloud.

Requirements for running DFMSdss

Hardware requirements

Add the following sentence to the end of the first paragraph:

You can also use DFSMSDss with object storage clouds.

Add a fourth note that reads:

Note:

...

4. DFSMSDss supports public and private clouds that use an Openstack Swift based API to put and get objects. The authentication methods supported are either version 1 or version 2 of the Openstack Identity API.

Protecting DFSMSdss functions

Add the following profile names to table 6:

Keyword or Function	Profile Name
CLOUD with DUMP	STGADMIN.ADR.DUMP.CLOUD
CLOUD with RESTORE	STGADMIN.ADR.RESTORE.CLOUD

Managing availability with DFSMSdss

Planning an availability strategy

Modify the bullet that discusses archival to read:

Archival—Backup of data that is unused for a long period of time. You remove the data from DASD and retain it on tape, or an object storage cloud, in case it is needed again.

Backup and recovery

Modify the last sentence in the first paragraph to read:

Logical backup, with the exception of logical backups to an object storage cloud, lets you restore data sets to unlike devices.

Disaster recovery

Storing at a remote site

Modify the first paragraph to read:

A basic difference between regular backups and disaster recovery backups is that disaster recovery backups must be available to be used in recovery at a different site. The remoteness of the recovery site depends upon the type of disaster you are preparing for (in the case of a fire, the recovery site can be around the corner; in the case of an earthquake or flood, it should be many miles away). The fact that the backups must be available for recovery at another site means that they must either be on a portable media, tape, or stored in an object storage cloud that both the primary and remote disaster recovery site can be connected to.

Using logical data set dump

- Add a note after the last sentence in the second paragraph:

Note: Logical data set backups directed to an object storage cloud cannot be restored to unlike devices.

- Add a second example for creating a disaster recovery backup to an object storage cloud

```
DUMP -  
  DATASET(INCLUDE(CRIT.**)) -  
          BY(MGMTCLAS,EQ,MCNAME)) -  
  CLOUD(cloud_name) -  
  CONTAINER(dss_dr_2016) -  
  OBJECTPREFIX(16100_dr_) -  
  CLOUDCREDENTIALS(cloud_password)
```

Maintaining vital records

- Add a note after the last sentence in the third paragraph:

Note: Vital record backups directed to an object storage cloud cannot be restored to unlike devices.

- Add a second example for creating a vital record backup to an object storage cloud

```
DUMP -  
  DATASET(INCLUDE(VR*.**)) -  
          BY(MGMTCLAS,EQ,MCNAME)) -  
  CLOUD(cloud_name) -  
  CONTAINER(dss_vr_2016) -  
  OBJECTPREFIX(16100_vr_) -  
  CLOUDCREDENTIALS(cloud_password)
```

Archiving data sets

- Add a note after the last sentence in the second paragraph:

Note: Archives directed to an object storage cloud cannot be restored to unlike devices.

- Add a second example for archiving a data set to an object storage cloud

Another example, the following logical DUMP command results in the archiving of all data sets in management class MCNAME1 that have not been referred to since April 10, 2016 to a cloud by the name of *cloud_name* in a container named *dss_archives_2016* with each object having a prefix of *100_*:

```
DUMP -  
  DATASET(BY((REFDT LT 16100) (MGMTCLAS EQ MCNAME1))) -  
  CLOUD(cloud_name) -  
  CONTAINER(dss_archives_2016) -  
  OBJECTPREFIX(100_) -  
  CLOUDCREDENTIALS(cloud_password) -  
  DELETE -  
  PURGE
```

Backing up data sets

Modify the first paragraph to read:

With the DUMP command, you can dump DASD data to a sequential data set, which can be a generation in a generation data group (GDG) or as objects in an object storage cloud. The storage medium for the sequential data set can be tape or DASD. When the output resides on DASD, it may be a basic, large or extended format sequential data set. When the output resides in cloud storage, data is storage as a set of objects.

Backup with concurrent copy

Add a 5th note that states:

5. When creating a backup to an object storage cloud, the use of concurrent copy and virtual concurrent copy is not supported.

Backing up data sets to an object storage cloud

Add a new section named 'Backing up data sets to an object storage cloud'. It should contain the following information:

DFSMSDss can create logical data set backups to an object storage cloud when the following requirements exist:

- The source device is in a storage controller that supports transparent cloud tiering.
- The source device is in a storage controller that is connected to an object storage cloud.
- The storage controller and z/OS host are both connected to the same object storage cloud.
- The data must not need manipulation. The following types of processing require data manipulation:
 - **Reblocking** - Reblocking occurs when you specify the REBLOCK keyword or when the VTOC indicates that the data set can be reblocked. The REBLOCK keyword and the indicator in the VTOC is ignored when a backup is being restored from an object storage cloud.
 - **PDS compression** – DFSMSDss compresses a PDS data set during backup processing, by default. You can specify the NOPACKING keyword to prevent DFSMSDss from compressing the PDS. There is no special action needed in order to backup a PDS to an object storage cloud. When creating a backup to an object storage cloud, DFSMSDss operates as if NOPACKING(**) is specified.
 - **Changing stripe counts** - The source stripe count must be the same as the target stripe count for a striped extended format data set. When restoring a backup from an object storage cloud, DFSMSDss ensures the stripe count does not change. If a data set cannot be created with the same amount of stripes the allocation will fail and the data set will not be restored.
 - **An individual stripe extending to more than one volume** - DFSMSDss cannot backup striped VSAM data sets when one or more of the stripes spans volumes. DFSMSDss also

cannot backup a single striped version 1 extended format sequential data sets that is multi-volume.

- **Block-by-block processing of direct access data sets** - Block-by-block processing occurs when you specify the RELBLOCKADDRESS OR the AUTORELOCKADDRESS keyword. When restoring a backup from an object storage cloud, DFSMSdss operates as if RELBLOCKADDRESS and AUTORELOCKADDRESS are not specified.

Designating cloud as a backup target

The CLOUD(*cloud_name*) keyword tells DFSMSdss that the backup is to be directed to an object storage cloud by the name of *cloud_name*. A cloud construct by the name of *cloud_name* must exist in the active SMS configuration. DFSMSdss uses the construct to obtain the information necessary to make a connection to the object storage cloud. When the CLOUD keyword is specified the following keywords must also be specified:

- CONTAINER
- OBJECTPREFIX
- CLOUDCREDENTIALS

The CONTAINER(*container_name*) specifies the container in which the objects are to be stored. The container specified as input does not have to exist at the time of the backup. If necessary, DFSMSdss will create it for you.

The OBJECTPREFIX(*object_prefix*) specifies a unique prefix that DFSMSdss is to use for all of the objects the make up a particular backup. The prefix provides uniqueness amongst multiple backups in the same container. At the beginning of the backup process, DFSMSdss will determine if a backup using the same *object_prefix* already exists in the specified *cloud_name* and *container_name*. If a backup already exists with the same *object_prefix* then DFSMSdss will fail the backup. If you wish to overwrite a backup using the same *object_prefix* you can set a patch at offset x'5D'.

The CLOUDCREDENTIALS(*cloud_credentials*) specifies the password for the account that is defined within the cloud construct. This password is case sensitive and is suppressed from SYSPRINT and SVCDUMPs. The cloud credentials must be kept secure. If there are batch JCL jobs that specify this keyword, then those jobs should be in a data set or library that has limited access and controlled by a security product. If the credentials cannot be kept secure then this keyword should not be used.

Restrictions:

- DFSMSdss does not set any expiration dates on objects created in cloud storage. It is up to the user to manage expiration of backups manually.
- Objects in cloud storage are not cataloged therefore it is up to the user to manage the location (cloud, container and object prefix) manually.

- The cloud credentials must be kept secure. If there are batch JCL jobs that specify this keyword, then those jobs should be in a data set or library that has limited access and controlled by a security product. If the credentials cannot be kept secure then this keyword should not be used.
- Since the DS8000 only supports a single account, it is recommended that using both DFSMSHsm and DFSMSdss for the same account should only be done in a test environment. DFSMSdss and DFSMSHsm should not share a single account in a production environment.

Invocation from an application program

Application programs can direct the DFSMSdss DUMP command to target an object storage cloud. UIM exit points 31, 32 and 33 are designed to aid application programs using DFSMSdss to create backups in an object storage cloud.

Applications can control where the z/OS Web Enablement Toolkit serviceability information is directed using `UFO_ZWEBT_DD` in the ADRUFO Installation Exit. The default where serviceability information is issued to is `SYSPRINT`. For more information about the installation options exit, refer to DFSMS Installation Exits.

Backing up data sets with special requirements

Dumping integrated catalog facility user catalogs

Add a note that states:

Note: DFSMSdss does not support backing up integrated catalog facility user catalogs to an object storage cloud.

Dumping indexed VSAM data sets

Add a note that states:

Note: DFSMSdss does not support `VALIDATE` processing when backing up indexed VSAM data sets to an object storage cloud.

Modify the existing note about extended-format VSAM data sets to read:

Note: Extended-format VSAM data sets cannot be dumped to DASD or tape with the `NOVALIDATE` keyword

Dumping data efficiently

Add a note at the end of the section that reads:

Note: When creating a backup to an object storage cloud the `OPTIMIZE`, `COMPRESS`, `HWCOMPRESS` and `ZCOMPRESS` keywords are not supported. Since the data movement of the user data is offloaded to the z/OS host to the storage controller the optimization and compression algorithms within DFSMSdss cannot be applied to the backup.

Restoring data sets

Change the first paragraph:

With the RESTORE command, you can restore data to DASD volumes from DFSMSdss-produced dump volumes. DFSMSdss backups can be identified either by using the INDDNAME keyword or the CLOUD keyword.

Format of the DFSMSdss dump data set

Format of the DFSMSdss dump data set

ADRTAPB data area

Add the following to table 18:

Data set header extension					
Offsets		Type	Len	Name (Dim)	Description
Dec	Hex				
0	(0)	STRUCTURE	24	DTDSHDRE	DATA SET HEADER EXTENSION
0	(0)	CHARACTER	2	DTDS_ACTUAL_CNT	ACTUAL VOLUME COUNT
0	(0)	UNSIGNED	1	DTDS_VCTD	DATA COMPONENT VOLUME COUNT
1	(1)	UNSIGNED	1	DTDS_VCTI	INDEX COMPONENT VOLUME COUNT
2	(2)	CHARACTER	2	DTDS_FLAGS	DATA SET HEADER EXTENSION FLAGS
		1... ..		DTDS_APPMETA	1=APPMETA OBJECT STORED
4	(4)	CHARACTER	20	*	RESERVED

Add the data set header extension constant after the check sum constant in table 18:

Self-Describing Record constants					
Offsets		Type	Len	Name (Dim)	Description
Dec	Hex				
...
CHECKSUM RECORD					
"1"		"CHAR HEX"	"05"	DTSDCHKSUM	CHECKSUM SELF-DESC REC TYPE
DATA SET HEADER EXTENSION RECORD					
"1"		"CHAR HEX"	"06"	DTSDSHDR	DATA SET HEADER EXTENSION

ADRTAPB constants

Add a constant to 'Table 19. ADRTAPB Mapping Macro:

Length	Type	Value	Name	Description
--------	------	-------	------	-------------

1	CONSTANT	X'05'	DTSDCHKSUM	CHECKSUM SELF-DESC REC TYPE
1	CONSTANT	X'06'	DTSDSHDR	DATA SET HEADER EXTENSION

ADRTAPB cross-reference

Add the following to the cross-reference:

Name	Hex Offset	Hex Value
DTSDSHDRE	0	
DTDS_ACTUAL_CNT	0	
DTDS_VCTD	0	
DTDS_VCTI	1	
DTDS_FLAGS	2	
DTDS_APPMETA	2	80
*	2	
*	4	

DFSMSDss patch area

Add information about new patch byte to overwrite existing objects during dump

Overwriting existing objects during logical data set DUMP to an object store cloud

During logical data set DUMP operations to an object storage cloud, DFSMSDss will perform a check to see if a backup using the same object prefix already exists in the specified container. If a backup already exists, then DFSMSDss will fail the backup.

You may allow DFSMSDss to overwrite existing backups. Use of this function will result in all pre-existing objects with the specified object prefix to be deleted. Use this patch only if you are willing to tolerate that all pre-existing objects in the specified object prefix will be lost.

The function is affected by setting the flag at offset X'5D' in ADPATCH. The settings are listed below:

x'00'

DFSMSDss functions normally. DFSMSDss looks for a backup in the object storage cloud and container with the specified object prefix. If a backup using the same object prefix exists, then DFSMSDss fails the backup.

Any setting other than x'00'

object prefix with pre-existing objects to be used. If a backup exists in the specified object storage cloud, container and object prefix then the objects will be deleted.

To set the flag to on dynamically, use the SET PATCH command.

ADRPTCHB data area

Add the following rows

Offsets		Type	Len	Name (Dim)	Description
Dec	Hex				
88	58	Unsigned	5	*	Reserved
93	5D	Unsigned	1	PBCLWDCNTR	When creating a backup to an object storage cloud allow existing objects to be overwritten

ADRPTCHB cross reference

Name	Hex Offset	Hex Value
PBCLWDCNTR	5D	

Syntax – DFSMSdss function commands

DUMP command for DFSMSdss

Modify the first paragraph to read:

With the DUMP command, you can dump DASD data to a sequential data set, which can be a generation in a generation data group (GDG) or as objects in an object storage cloud. The storage medium for the sequential data set can be tape or DASD. When the output resides on DASD, it may be a basic, large or extended format sequential data set. When the output resides in cloud storage, data is storage as a set of objects.

Add a note that states:

Note: When using the DUMP command to create a backup in an object storage cloud, DFSMSdss only supports logical processing.

DUMP DATASET syntax for logical data set

- Modify the first syntax diagram to the following:

```
>>-DUMp--+-DATASet+---(--+-| C |-----+---)----->
      '-DS-----'      '+-FILterdd+---(--ddn--)-'
                          '-FDD-----'

                          .-,---.
                          V      |
>--+-----+---+OUTDDname+---(----ddn+---)-----<<
      '-| D |-'  +-ODD-----+
              '---| E |---'
```

- Add the following syntax diagram before the C syntax diagram
E: Additional keywords with DUMP DATASET for logical data set:

```
|--CLOUD--(--cln--)--CONTAINER--(--con--)----->

>--+--OBJECTPREFIX+---(--opx--)----->
      '-OBJPFX-----'

>--+--CLOUDCREDENTIALS+---(--ccr--)-----|
      +-CLOUDCREDS-----+
      '-CCREDS-----'
```

- Add the following to the D syntax diagram:

```
>--+-----+----->
      '-DEBUG--(--+-CLMSG--(--+-MINimal-----+---)-'
                          +-SUMmarized-+
                          +-DETAILED---+
                          '-DTL-----'
```

Explanation of DUMP command keywords

Add the following keyword descriptions:

CLOUD

```
>>+-----+-----><
      '-CLOUD-- (---ccn---)-----'
```

ccn

Specifies the name of an SMS construct that identifies the cloud storage the dump is to be written to. A cloud construct by the name of *ccn* must exist in the active SMS configuration. DFSMSDss uses the construct to obtain the information necessary to make a connection to the object storage cloud.

Notes:

1. Do not specify CLOUD during DUMP with OUTDD and CONCURRENT, COMPRESS, HWCOMPRESS, ENCRYPT, ZCOMPRESS or RSA. If you specify VALIDATE or OPTIMIZE those keywords will be ignored.
2. You must specify the CLOUDCREDENTIALS, CONTAINER and OBJECTPREFIX keywords when specifying the CLOUD keyword.
3. To specify CLOUD, RACF authorization may be required.

CLOUDCREDENTIALS

```
>>+-----+-----><
      '-+-CLOUDCREDENTIALS-+--- (---ccr---) - '
      '-CCREDS-----'
```

ccr

Specifies an up to 64 character credential (in EBCDIC) that is used when authenticating with a cloud. Valid characters are upper and lower-case letters A through Z, numerals 0-9, and the following characters: !@#%&*-_=:<>?|}. You cannot use imbedded spaces, commas (,), forwardslash (/), parentheses (), or semi-colons. DFSMSDss removes leading and trailing blanks.

Notes:

1. The credentials that is specified in your input command stream is not printed to the SYSPRINT output.
2. The credentials must be kept secure. If there are batch JCL jobs that specify this keyword, then those jobs should be in a data set or library that has limited access and controlled by a security product. If the credentials cannot be kept secure then this keyword should not be used.

CONTAINER

```
>>+-----+-----><
      '-CONTAINER-- (---con---) - '
```

con

Specifies the container in which the objects are to be stored. The container specified as input does not have to exist at the time of the backup. If necessary, DFSMSdss will create it for you.

Notes:

1. Do not specify CONTAINER during DUMP with OUTDD and CONCURRENT, COMPRESS, HWCOMPRESS, ENCRYPT, ZCOMPRESS or RSA. If you specify VALIDATE or OPTIMIZE those keywords will be ignored.
2. You must specify the CLOUD, CLOUDCREDENTIALS and OBJECTPREFIX keywords when specifying the CONTAINER keyword.

OBJECTPREFIX

```
>>+-----+-----<<
'--OBJECTPREFIX--- (---opx---) - '
' -OBJPFX----- '
```

opx

Specifies a unique prefix that DFSMSdss is to use for all of the objects the make up a particular backup. The prefix provides uniqueness amongst multiple backups in the same container. At the beginning of the backup process, DFSMSdss will determine if a backup using the same *opx* already exists in the specified cloud and container. If a backup already exists with the same *opx* then DFSMSdss will fail the backup. If you wish to overwrite a backup using the same *opx* you can set a patch at offset x'5D'.

Notes:

1. Do not specify OBJECTPREFIX during DUMP with OUTDD and CONCURRENT, COMPRESS, HWCOMPRESS, ENCRYPT, ZCOMPRESS or RSA. If you specify VALIDATE or OPTIMIZE those keywords will be ignored.
2. You must specify the CLOUD, CONTAINER and CLOUDCREDENTIALS keywords when specifying the OBJECTPREFIX keyword.

DEBUG

```
>>+-----+-----<<
'-DEBUG-- (---CLMSG-- (---MINimal---+---) - '
      +-SUMmarized-+
      +-DETAILED---+
      '-DTL----- '
```

You can use DEBUG as a diagnostic tool. When you specify the CLMSG subkeyword, DFSMSdss issues messages that provide details on the progress of a backup to an object storage cloud. When

DEBUG(CLMSG) is not specified, MINimal is the default. Specify DEBUG(CLMSG) with one of the following sub-keywords:

CLMSG(MINimal) - Specifies that DFSMSdss is not to issue any messages that provide detail on the progress of a backup to an object storage cloud.

CLMSG(SUMMarized) – Specifies that DFSMSdss is to issue an informational message for each object that is stored to an object storage cloud.

CLMSG(DETAILED) – Specifies that DFSMSdss is to provide detailed information about each HTTP request that is made to an object storage cloud.

RESTORE command for DFSMSdss

RESTORE DATASET command syntax for logical data set

- Modify the first syntax diagram to the following:

```
>>-RESTore--+-DATASet+--- (---+| C |-----+---)----->
          '-DS-----'      '---+FILterdd+--- (--dnn--)-'
                              '-FDD-----'
```

```
>---+-----+---+INDDname+--- (dnn)-----><
    '-| D |-'  +-IDD-----+
              '---| E |--'
```

- Add the following syntax diagram before the C syntax diagram E: Additional keywords used for logical data sets:

```
|--CLOUD-- (--cnn--)--CONTAINER-- (--con--)----->
```

```
>---+--OBJECTPREFIX+--- (--opx--)----->
    '-OBJPFX-----'
```

```
>---+--CLOUDCREDENTIALS+--- (--ccr--)-----|
    +-CLOUDCREDS-----+
    '-CCREDS-----'
```

- Add the following to the D syntax diagram:

```
>--+-----+----->
  '-DEBUG-- (--+-CLMSG-- (--+-MINimal-----+--)-'
                                +-SUMmarized--+
                                +-DETAILED----+
                                '-DTL-----'
```

Explanation of RESTORE command keywords

CLOUD

```
>>+-----+-----<<
  '-CLOUD-- (---ccn---)-----'
```

ccn

Specifies the name of an SMS construct that identifies the cloud storage the restore is to occur from. A cloud construct by the name of *ccn* must exist in the active SMS configuration. DFSMSdss uses the construct to obtain the information necessary to make a connection to the object storage cloud.

Notes:

1. Do not specify CLOUD during RESTORE with INDD, REBLOCK, RELBLOCKADDRESS, AUTORELBLOCKADDRESS, WRITECHECK, and TTRADDRESS.
2. You must specify the CLOUDCREDENTIALS, CONTAINER and OBJECTPREFIX keywords when specifying the CLOUD keyword.
3. To specify CLOUD, RACF authorization may be required.

CLOUDCREDENTIALS

```
>>+-----+-----<<
  '-+-CLOUDCREDENTIALS-+-- (---ccr---)-'
  '-CCREDS-----'
```

ccr

Specifies an up to 64 character credential (in EBCDIC) that is used when authenticating with a cloud. Valid characters are upper and lower-case letters A through Z, numerals 0-9, and the following characters: !@#%&*-_=:<>?|}. You cannot use imbedded spaces, commas (,), forwardslash (/), parentheses (()), or semi-colons. DFSMSdss removes leading and trailing blanks.

Notes:

1. The credentials that is specified in your input command stream is not printed to the SYSPRINT output.

2. The credentials must be kept secure. If there are batch JCL jobs that specify this keyword, then those jobs should be in a data set or library that has limited access and controlled by a security product. If the credentials cannot be kept secure then this keyword should not be used.

CONTAINER

```
>>+-----+-----><
```

```
'-CONTAINER-- (---con---) -'
```

con

Specifies the container in which the objects are to be restored from.

Notes:

1. Do not specify CLOUD during RESTORE with INDD, REBLOCK, RELBLOCKADDRESS, AUTORELBLOCKADDRESS, WRITECHECK, and TTRADDRESS\.
2. You must specify the CLOUD, CLOUDCREDENTIALS and OBJECTPREFIX keywords when specifying the CONTAINER keyword.

OBJECTPREFIX

```
>>+-----+-----><
```

```
'-+-OBJECTPREFIX-+--- (---opx---) -'
```

```
'-OBJPFX-----'
```

opx

Specifies a unique prefix that DFSMSDss is to use when restoring objects from a particular cloud and container.

Notes:

1. Do not specify CLOUD during RESTORE with INDD, REBLOCK, RELBLOCKADDRESS, AUTORELBLOCKADDRESS, WRITECHECK, and TTRADDRESS.
2. You must specify the CLOUD, CONTAINER and CLOUDCREDENTIALS keywords when specifying the OBJECTPREFIX keyword.

DEBUG

```
>>+-----+-----><
```

```
'-DEBUG-- (---CLMSG-- (---MINimal---+---) -'
```

```
+-SUMmarized-+
```

```
+-DETAILED---+
```

```
'-DTL-----'
```

You can use DEBUG as a diagnostic tool. When you specify the CLMSG subkeyword, DFSMSdss issues messages that provide details on the progress of a restore from an object storage cloud. When DEBUG(CLMSG) is not specified, MINimal is the default. Specify DEBUG(CLMSG) with one of the following sub-keywords:

CLMSG(MINimal) - Specifies that DFSMSdss is not to issue any messages that provide detail on the progress of a restore from an object storage cloud.

CLMSG(SUMmarized) – Specifies that DFSMSdss is to issue an informational message for each object that is restored from an object storage cloud.

CLMSG(DETAILED) – Specifies that DFSMSdss is to provide detailed information about each HTTP request that is made to an object storage cloud.

Data security and authorization checking

General data security information

Protecting the usage of DFSMSdss

Add the following profile names to table 27:

Keyword or Function	Profile Name
CLOUD wth DUMP	STGADMIN.ADR.DUMP.CLOUD
CLOUD with RESTORE	STGADMIN.ADR.RESTORE.CLOUD

Data integrity – serialization

Backup-while-open data sets (IMS)

Add a second note after the first:

Note: DFSMSdss does not support backup-while-open (IMS) for backups directed to an object storage cloud.

Object serialization (New section)

DFSMSdss uses an enqueue for cloud processing that serializes access to objects in an object storage cloud. The enqueue prevents multiple DFSMSdss writers from accessing the same object. It also prevents concurrent DFSMSdss readers and writers. The enqueue is obtained such that multiple DFSMSdss readers will be allowed. DFSMSdss will request an exclusive enqueue using major name SYSZADRO and minor name of *cloud_name/container/objectprefix* with a scope of SYSTEMS. The object prefix is specified under the new OBJECTPREFIX keyword.

Application programming interface

System programming information

Change the following paragraph:

Two additional bits indicate the existence or absence of an input restore/copydump data set or an output dump/copydump data set: UFNOIN and UFNOOUT respectively. Refer to z/OS DFSMS Installation Exits for more information about the installation options exit routine.

It should read:

Two additional bits indicate the existence or absence of an input restore/copydump data set or an output dump/copydump data set: UFNOIN and UFNOOUT respectively. UFNOIN and UFNOOUT are not supported for backups to, and restores from, an object storage cloud. Refer to z/OS DFSMS Installation Exits for more information about the installation options exit routine.

User interaction module exit option descriptions

Data set processed notification exit (Eioption 23) – Changed

Add the following bullet to the section that describes the information passed at the conclusion of processing for a logical data set dump:

DFSMSdss provides the UIM with the following information at the conclusion of processing for logical dump of each data set:

- The number of bytes processed in the source data set. When a backup is directed to a data set on DASD or tape, the number of bytes processed reflects the actual number of bytes read by DFSMSdss for the data set. When a backup is directed to an object storage cloud, the number of bytes reflects the number of tracks processed in the source data set times the number of bytes in a track. The reason for this difference is because when a backup is directed to an object storage cloud, the actual user data is not read into the host memory and the byte count is not available to DFSMSdss.

Store application metadata object (Eioption 31) – New

This exit lets the UIM write an application metadata object to be stored in the cloud. This exit point is given control through the UIM at the conclusion of logical data set dump processing for each data set. If you provide an object at this exit point, DFSMSdss marks it as an application meta data object.

The EIRECPTR points to the buffer that contains the data to be stored and EIRECLEN is the length of the meta data to be stored. When EIRC08 is passed, this instructs DSS to store the buffer passed back as an object. The maximum length cannot be greater than 4063. The valid return codes are:

- 0 Continue normal processing
- 8 Store Object
- 32 End function.

Note:

1. On a Store request (EIRC08), if the length is zero or greater than 4063 DFSMSdss sets the error flag, EIXERR, on in the exit identification block and invokes the UIM again.
2. Application metadata objects are named as follows:

object_prefix/dsname/appmeta where object_prefix is the object prefix specified on the DFSMSdss control statements. Appmeta is a fixed string appended to the object prefix and data set name.

Retrieve application metadata object (Eioption 32) - New

This exit lets the UIM read an application metadata object stored in the cloud. This exit point is given control through the UIM at the beginning of logical data set restore processing for each data set. The EIRECPTR points to the buffer that contains the object and EIRECLEN is the length of the metadata stored. The maximum length cannot be greater than 4063. The valid return codes are:

- 0 Continue normal processing
- 32 End function

Output object notification (Eioption 33) - New

This exit indicates to the UIM the object name that was written to the cloud during logical dump processing for meta data and data objects associated to individual data sets that were stored to the cloud whether they were successful or not, as indicated by the return code. DFSMSdss provides the UIM with information through the EIREC33 structure within the exit identification block, ADREID0. EIREC33 is shown in the EIREC33 table.

DFSMSdss provides the UIM with the following information at the conclusion of processing for logical dump of each data set:

- The header or data set name that was dumped
- An indication of object type (meta object or data object)
- The object name
- The track count for data objects
- The byte count for meta and data objects
- A return code for the data set that indicates whether processing was successful:
 - 0 Object store successful (informational)
 - 8 Object store unsuccessful (error)

ADREID0 data area

Add the following:

Note: The following maps the record presented by exit 33 (object name notification exit)					
Offsets		Type	Len	Name (Dim)	Description
Dec	Hex				
0	(0)	STRUCTURE	184	EIREC33	
0	(0)	CHARACTER	154	EI33CNST	CONSTANT LENGTH PORTION OF CONTROL BLK
0	(0)	CHARACTER	2	EI33FLGS	OBJECT FLAGS
		1... ..		EI33META	ON=META OBJECT
		.1.. ..		EI33DATA	ON=USER DATA OBJECT
0	(0)	BITSTRING	14	*	RESERVED
2	(2)	CHARACTER	128	EI33OBJN	OBJECT NAME
130	(82)	UNSIGNED	2	EI33OBJL	OBJECT NAME LENGTH
132	(84)	UNSIGNED	2	*	RESERVED
134	(86)	CHARACTER	8	EI33TRKC	TOTAL TRACKS STORED
142	(8E)	CHARACTER	8	EI33BYTES	TOTAL TRKS/BYTES STORED
150	(96)	UNSIGNED	2	*	RESERVED
152	(98)	SIGNED	2	EI33RTC	RC FOR STORING OBJ
154	(9A)	CHARACTER	30	*	RESERVED

Constants for ADREID0

Add the following constants and change the EIMAXOP value:

Length	Type	Value	Name	Description
2	DECIMAL	31	EIOP31	APPLICATION STORE META DATA
2	DECIMAL	32	EIOP32	APPLICATION RETRIEVE META DATA
2	DECIMAL	33	EIOP33	OBJECT NAME NOTIFY
2	DECIMAL	33	EIMAXOP	MAX VALID EXIT NUMBER

Cross reference for ADREID0

Name	Offset
EIREC33	0
EI33CNST	0
EI33FLGS	0
EI33META	0
EI33DATA	0
EI33OBJN	2
EI33OBJL	82
EI33TRKC	86
EI33BYTES	83
EI33RTC	98

Example: invoking DFSMSdss by using an application program

How to determine DFSMSdss version, release, and modification level

Modify byte 0 of register 14 information:

Byte 0 Feature Flags:

...

Bit 4, when set to 1, means the PTF that introduced transparent cloud tiering cloud/archive (OA48365) is applied.

Bits 5-7 are reserved.

DFSMSHsm Implementation and Customization Guide

Book# SC23-6869-02 for z/OS 2.2

Implementing

Authorizing and protecting commands and resources

Identifying DFSMSHsm to z/OS Unix System Services

Add a paragraph as follows:

If you plan to use DFSMSHsm with Cloud storage, DFSMSHsm must have a RACF® user ID with an OMVS segment associated with it.

DFSMSHsm must be defined to z/OS UNIX System Services as a superuser, and the RACF user ID must have a default RACF group which has an OMVS segment with a group id (GID). The user ID must also have an OMVS segment with the following parameters: UID(0) HOME('/).

Add a new chapter at the end of Part 1 (after DFSMSHsm in a multiple-image environment) as follows:

DFSMSHsm and Cloud storage

DFSMSHsm supports Object Storage in a Cloud as a location for migration copies in addition to DASD and Tape. A TS7700 can be defined as an object storage target and DS8000 transparent cloud tiering can offload data sets directly to a TS7700. When preparing to use the Cloud as a target for DFSMSHsm Migration, two things need to be considered: Communicating the Cloud password to DFSMSHsm, and Enabling Fast Subsequent Migration.

DFSMSHsm requires the CP Assist for Cryptographic Functions to be enabled for this support.

Communicating the Cloud password to DFSMSHsm

In order for DFSMSHsm to communicate with the Cloud, it needs to know the password for the account/userid that is configured in the SMS Cloud construct. Before using any functions that will communicate with the Cloud, the password must be communicated with DFSMSHsm. The SETSYS CLOUD command is used to communicate the password to DFSMSHsm. Once set, DFSMSHsm stores the password in encrypted form in one of the Control Data Sets so that it does not have to be specified again every time DFSMSHsm starts. IBM recommends that a Security Administrator who is managing the Cloud Storage passwords be the individual who also manages the password for DFSMSHsm.

Example:

If there is an SMS Cloud definition called PRODCLOUD, the following command will allow the storage administrator to communicate the password for PRODCLOUD to DFHSM. In this example, DFHSM is the name of the DFSMSHsm procedure.

```
F DFHSM, SETSYS CLOUD (NAME (PRODCLOUD) CREDENTIALS)
```

A WTOR will be issued requesting the password that is associated with PRODCLOUD

```
*0007 ARC1585A ENTER PASSWORD FOR CLOUD PRODCLOUD
```

From the SDSF SYSLOG, System Command Extension, a reply to the WTOR can be issued. It is important to note that the password is case sensitive. If the password for PRODCLOUD includes uppercase and lowercase letters, it needs to be surrounded by single quotes and be issued from the System Command Extension. Any WTOR reply issued from the SDSF SYSLOG is folded to uppercase by the system regardless of single quotes.

Note: Entering a forward-slash on the Command Input line in the SDSF SYSLOG and hitting Enter will open the System Command Extension

Example:

```
System Command Extension

Type or complete typing a system command, then press Enter.

===> R 7, 'Pr0DCloudpassw0rd'
===>

Place the cursor on a command and press Enter to retrieve it.

More:      +

=> F DFHSM, SETSYS CLOUD (NAME (PRODCLOUD) REFRESH)
=> F DFHSM, SETSYS CLOUD (NAME (PRODCLOUD) REMOVE)
=> R 6, 'Badpassw0rd'
=> F DFHSM, SETSYS CLOUD (NAME (PRODCLOUD) CCREDS)
=>
=>
=>

Wait 1 second to display responses (specify with SET DELAY)
Do not save commands for the next SDSF session

F1=Help  F5=FullScr  F7=Backward  F8=Forward  F11=ClearLst  F12=Cancel
```

DFSMSHsm will try to authenticate with the Cloud using the specified password. If the password is incorrect, a message is issued. (See the DFSMSHsm Diagnosis manual for other possible errors and messages that may be issued.)

```
ARC1581I UNEXPECTED HTTP STATUS 401 DURING A POST FOR URI
ARC1581I (CONT.) http://prodcloud.ibm.com/v2.0/tokens/ ERRTXT
HTTP/1.1 401
ARC1581I (CONT.) Unauthorized
```

Cloud Password Change

When the password for a Cloud is changed, the Storage Administrator will have to update the password stored by DFSMSHsm. Simply issuing the SETSYS CLOUD(NAME(PRODCLOUD) CREDENTIALS) and entering the new password in response to the WTOR is enough to overwrite the old password. However, in a multiple-image environment (multiple DFSMSHsm hosts), subsequent actions need to be taken to ensure that all DFSMSHsm hosts have the updated encrypted password. A SETSYS CLOUD(NAME(PRODCLOUD) REFRESH) command issued to each host will cause the updated encrypted password to be read.

Cloud Password Cleanup

It may become necessary to cleanup some of the DFSMSHsm stored information for Cloud. The information is stored in the MHCR record. A Storage Administrator can use the FIXCDS command to display the MHCR record. (FIXCDS S MHCR DISPLAY) The Cloud information entries can be found at the end of the record, where the Cloud name is in plaintext, but the password is encrypted.

The SETSYS CLOUD(NAME(OLDENTRY) REMOVE) command can be used to remove entries from the Cloud information known to DFSMSHsm.

Enabling Fast Subsequent Migration to Cloud

With fast subsequent migration, data sets recalled from the Cloud (but not changed or recreated) can be reconnected to the original migration copy in the Cloud. This eliminates unnecessary data movement resulting from remigration. Reconnection can occur during individual data set migration or during volume migration. Reconnection is only supported in a SETSYS USERDATASETSERIALIZATION environment.

To enable Fast Subsequent Migration for data sets that have been recalled from the Cloud, issue SETSYS CLOUDMIGRATION(RECONNECT(ALL)) .

Note: DFSMSHsm performs fast subsequent migration only if the data set has not changed since recall. DFSMSHsm determines this based on flags in the Format 1 DSCB that are set when the data set is recalled. This allows DFSMSHsm to be compatible with other backup applications as DFSMSHsm no longer relies on the change bit in the Format 1 DSCB, which may be set or reset by other data set backup products.

OVMS Segment for DFSMSHsm

Additionally, the DFSMSHsm userid will need to have an OMVS Segment defined to it. See the section titled, "Identifying DFSMSHsm to z/OS UNIX System Services" for details. This is required for DFSMSHsm to communicate with the Cloud over TCP/IP.

Customizing

User application interfaces

The data collection environment

Invoking the data collection interface

Direct invocation of ARCUTIL load module

Modify the bullet for ARCDATA to reflect the larger LRECL of 368 as follows:

Specify a DDNAME of ARCDATA that contains the records collected. ARCUTIL opens this data set with LRECL=368, RECFM=VB options.

Chapter 17. Tuning DFSMSHsm

New tuning patches supported by DFSMSHsm are added

PSM earlier checking

Allowing primary space management to start before midnight

Many Primary Space Management windows start after midnight to allow data sets to be processed as soon as their non-referenced day count reaches the threshold in the management class.

The MIGRATEPSMEARLY parameter on the SETSYS command can be used to let DFSMSHsm process a data set early. If the Primary Space Management window begins after 6pm, one day will be added to the data set age up until the current time is midnight. Afterwards, the current age is used in the calculation.

If the cutoff time of 6pm needs to be changed, the following patch can be used to modify the cutoff time:

```
PATCH .MGCB.+98 X'hhmm'
```

Where *hh* – is hours and *mm* - is minutes when PSM earlier checking begins.

The default value is X'1800' (6pm).

Maximum number of CEC volumes migrated to Cloud simultaneously

During Automatic Space Management and MIGRATE STORAGEGROUP processing, DFSMSHsm will select volumes for processing such that no more than 6 requests are issued for any volume within the same CEC. Once 6 volumes within the same CEC are being processed, no more volumes within that CEC will be selected for processing, until one of those volumes completes. This limit is used to match the maximum number of cloud data movement tasks per CEC within a DS8800.

MIGRATE DATASET and MIGRATE VOLUME processing do not participate in the distribution of work, so care must be taken when issuing these commands during Automatic Space Management and MIGRATE STORAGEGROUP processing, as queueing may still occur.

'Since the number of concurrent cloud tasks per DS8880 CEC may change in the future, the number of DFSMSHsm tasks is provided as a patchable value that may be changed to remain consistent with the DS8880 value.

This number be set by the following PATCH:

```
PATCH .MCVT.+494 X' nnnn'
```

Where *nnnn* – is the maximum number of volumes.

The default value is X'0006'.

Set the wait time before large data set processing restarts

Only two large data sets (greater than 5BG) will be migrated per CEC at any one time. These large data sets will be revisited later if there are currently two being migrated. When only the large data sets remain to be processed, DFHSMShsm will wait this interval before the next scan.

The following PATCH can be used to change this interval.

```
PATCH .MGCB.+152 X' nnnn'
```

Where *nnnn* – the time in seconds.

The default value is X'001E' (30 seconds).

DFSMSHsm Managing Your Own Data

SC23-6870-02

In Chapter 18, HMIGRATE: Migrating Data Sets, make the following updates:

Syntax – Add the CLOUD keyword as follows:

```
>---+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----><
  +-MIGRATIONLEVEL2-----+  +-WAIT----+  '-MOVE-'  '-EXTENDRC-'
  +-ML2-----+  '-NOWAIT-'
  +-TRANSITION-----+
  '-CLOUD (SMScloudname) -+
```

Under the Optional parameters section add the following:

CLOUD: Specifying Migration of a Data Set directly to Cloud Storage

Explanation: CLOUD is an optional parameter specifying that a data set migrates from an SMS managed volume to the requested Cloud storage. The SMScloudname is defined in the SMS Cloud construct. When specified, the data set is migrated to the requested Cloud storage, regardless of the data set's management class attributes, with the exception of migration not being allowed.

The CLOUD parameter may not be specified with the following parameters: MIGRATIONLEVEL1, MIGRATIONLEVEL2, and CONVERT.

Note: There are some DFSMSHsm SETSYS settings that will not be applicable when performing a Migrate to Cloud storage. They are:

COMPACT, COMPACTPERCENT – COMPACT(ALL) will not apply when CLOUD is specified. Because no data movement is being performed by the host, we do not have the opportunity to perform compression on the backup on Cloud Storage.

CONVERSION(REBLOCKTOANY) – Because data movement is not performed by the host, there is no opportunity to perform reblocking of a data set.

CONCURRENT: Migrating a data set to Cloud storage will ignore any current setting relating to Concurrent.

In Chapter 22: Using DFSMSHsm user macros, make the following updates:

For ARCHMIG

Syntax

```
>>-ARCHMIG--DSN=dsnaddr,--WKAREA=waaddr-----+----->
|                                     .-NO--. |
|                                     '-,WAIT=--+YES--+-'
>--+-----+--+-----+-----+----->
|                                     .-ML1-. |   '-,SNAPDCB=dcbaddr-'
+-,MIGLVL=--+ML2-+-----+
>--+-----+--+-----+-----+----->
|                                     .-NO--. | |                                     .-NO--. |
|                                     '-,TEST=--+YES--+-'   '-,FORCML1=--+YES--+-'
>--+-----+--+-----+-----+----->
|                                     .-NO--. | |                                     .-NO--' |
|                                     '-,TRANSITION=+-YES--+-'   '-,MOVE=+-YES--+-'
```

>---+-----+-----><

'-CLOUD=cldnameaddr-'

Under the Optional parameters heading, add the following:

CLOUD

specifies the address of a 30 byte area containing the name of an SMS cloud construct. The data set will be migrated to the cloud storage defined in the SMS cloud construct, overriding any other specification in the data set's management class, other than eligibility for migration. Non-SMS managed data sets are not eligible for migration to cloud storage. The name must be left-justified and padded with blanks. The CLOUD keyword cannot be specified with MIGLVL.

DFSMSHsm Storage Administration Guide

Chapter 1. Welcome to DFSMSHsm

The section titled, “Devices Supported by DFSMSHsm”, will have the following updates:

- Object storage in the cloud
 - A TS7700 can be defined as an object storage target and DS8000 can offload data sets directly to it
 - Object storage with OpenStack Swift API using Keystone or tempauth authorization

Chapter 2. Space management of SMS-managed storage

Space management functions

Under Space management functions, Automatic primary space management, the third bullet discussing fast subsequent migration is updated to the following:

During data set and volume processing, fast subsequent migration reconnects eligible data sets to the ML2 tape or cloud from which they were most recently recalled. Under the Automatic secondary space management section, add the following paragraph:

On the first day of the secondary space management cycle, DFSMSHsm will examine the containers in the clouds that are defined to DFSMSHsm, looking for containers that do not have objects. Any empty containers will be deleted. If the end of the Secondary Space Management window has been reached and not all containers have been examined, the processing will continue in the next Secondary Space Management window.

Tasks for automatic space management

Under Tasks for automatic space management, Specifying the DFSMSHsm hosts that process each storage group, modify the first paragraph as follows:

When DFSMSHsm processes an SMS-managed volume for space management, it records the time at which the volume was processed for cloud or non-cloud migrations. If another DFSMSHsm host attempts to process the same volume for space management to cloud or non-cloud migrations, it checks the time at which the volume was last processed. If the volume was processed within the last 14 hours, DFSMSHsm does not process the volume again for that type of target. A volume may be processed by one host for non-cloud migrations, and later processed by another host for cloud migrations.

Under Tasks for automatic space management, Specifying the DFSMSHsm hosts that process each storage group, add the following paragraph after the Example.

If you find that a single DFSMSHsm system is insufficient to complete processing of a storage group, the SETSYS STORAGEGROUPAFFINITY command can be used to allow a particular DFSMSHsm host to process storage groups assigned to other systems.

Example: If you wish to allow DFSMSHsm on z/OS image 2 to process the storage group in the example above, you would specify the following STORAGEGROUPAFFINITY to DFSMSHsm on z/OS image 2

```
F HSMIMG2, SETSYS STORAGEGROUPAFFINITY (PRC1)
```

Under Tasks for automatic space management, Specifying how groups of data sets are managed, the Migration attributes bullet is updated to the following:

- Migration attributes

```
COMMAND OR AUTO MIGRATE  
PRIMARY DAYS NON-USAGE  
SIZE LESS THAN OR EQUAL TO  
ACTION  
SIZE GREATER THAN  
ACTION  
LEVEL 1 DAYS NON-USAGE  
LEVEL 2 DAYS NON-USAGE  
CLOUD NAME
```


The subsection, Specifying migration attributes, is updated as follows:

Additional bullets are added:

- When a data set is eligible to migrate to cloud storage.
- The cloud storage name
- The migration tier to move a data set to when it is less than a fixed size.
- The migration tier to move a data set to when it is greater than a fixed size.

A new paragraph is added after the paragraph describing PRIMARY DAYS NON-USAGE as follows:

- The SIZE LESS THAN OR EQUAL TO attribute specifies a size threshold. If a data set meets the PRIMARY DAYS NON-USAGE criteria, and the current size of the data set is less than or equal to the threshold, then the specified Action is taken.
- The action can be NONE, indicating that the data set should not be migrated. This can be useful if you don't want to migrate data sets below a certain size, even if they have not been referenced.
- The action can be ML1, indicating that the data set should be migrated to the ML1 tier.
- The action can be ML2, indicating that the data set should be migrated directly to the ML2 tier regardless of the values for LEVEL 1 DAYS NON-USAGE
- The action can be MIG, indicating that the data set should be migrated to ML1, or ML2 according to the value of LEVEL 1 DAYS NON-USAGE.
- The action can be CLOUD, indicating that the data set should be migrated to the cloud storage named in the CLOUD NAME field.
- The action can be TRANS, indicating that the data set should have class transition processing performed for it.

After the descriptions for LEVEL 1 DAYS NON-USAGE, the following text is added:

The LEVEL 2 DAYS NON-USAGE attribute allows migrations to be directed to cloud storage. It has two values, 0 and NOLIMIT. When NOLIMIT is specified (or defaulted to because blank), the data set will migrate to the ML2 tier based on the value of LEVEL 1 DAYS NON-USAGE. When 0 is specified, the data set will be migrated to the cloud specified in the CLOUD NAME field as long as the PRIMARY DAYS NON-USAGE value is met and the data set still resides on Level 0. The LEVEL 1 DAYS NON-USAGE value does not apply in this case. The default value for LEVEL 2 DAYS NON-USAGE is NOLIMIT.

Note: DFSMSHsm does not support movement of migration copies from ML1 or ML2 to cloud storage. To move existing migrated data on ML1 or ML2 to cloud storage, the data must be recalled to primary disk and then re-migrated to cloud storage.

Note: The data set must reside on a volume that is connected to cloud storage. Additionally, the SMS Cloud construct named must exist and the password for the cloud must be defined to DFSMSHsm.

Under the subsection, Using the default management class, the table is updated to have new rows for SIZE LESS THAN OR EQUAL TO, SIZE GREATER THAN, LEVEL 2 DAYS NON-USAGE, CLOUD as follows:

Management Class Attribute	Default Value
EXPIRE AFTER DAYS NON-USAGE	NOLIMIT
EXPIRE AFTER DATE/DAYS	NOLIMIT
PARTIAL RELEASE	N
PRIMARY DAYS NON-USAGE	2
SIZE LESS THAN OR EQUAL TO	no default
SIZE GREATER THAN	no default
LEVEL 1 DAYS NON-USAGE	60
LEVEL 2 DAYS NON-USAGE	NOLIMIT
CLOUD NAME	no default
# GDG ELEMENTS ON PRIMARY	no default
ROLLED-OFF GDS ACTION	no default
BACKUP FREQUENCY	1
NUMBER OF BACKUP VERS (Data Set Exists)	2
NUMBER OF BACKUP VERS (Data Set Deleted)	1
RETAIN DAYS ONLY BACKUP VER (Data Set Deleted)	60
RETAIN DAYS EXTRA BACKUP VERS	30
ADMIN OR USER COMMAND BACKUP	BOTH
AUTO BACKUP	Y

Under the Tasks for automatic space management section, Specifying how groups of data sets are managed, Management class examples, a new example is added as follows:

Enhanced management class 1 attributes: Small data sets should not be migrated, but as they grow in size, the location can be ML1 or ML2. Data sets that use this management class receive the following processing:

- The data sets expire if they are not used in 120 days and 360 days have passed since they were created.

- Unused allocated space is released from physical sequential, partitioned, and extended format VSAM data sets.
- Data sets that are not used for 10 days are eligible to migrate. If the size of the data set is less or equal to 20 tracks, it is not migrated. If the size is between 20 and 4000 tracks, it is migrated to ML1. If the size is larger than 4000 tracks, it is migrated directly to ML2.
- Data sets that are not used for 60 days are eligible for migration. If the size is less than or equal to 20 tracks, it is not migrated. If the size is greater than 20 tracks, it is migrated to ML2 if it is on level 0 DASD or ML1.

These are the attributes of ENHMC1:

```
EXPIRE AFTER DAYS NON-USAGE ===> 120
EXPIRE AFTER DATE/DAYS      ===> 360
PARTIAL RELEASE              ===> Y
PRIMARY DAYS NON-USAGE      ===> 10
SIZE LESS THAN OR EQUAL     ===> 20
  SIZELTE ACTION            ===> NONE
SIZE GREATER THAN           ===> 4000
  SIZEGT ACTION             ===> ML2
LEVEL 1 DAYS NON-USAGE     ===> 60
LEVEL 2 DAYS NON-USAGE     ===> NOLIMIT
CLOUD NAME                   ===>
COMMAND OR AUTO MIGRATE     ===> BOTH
```

Enhanced management class 2 attributes: Small data sets in this management class are never migrated. Medium size data sets go to ML1 or ML2. Large data sets are migrated to the cloud. Data sets in this management class receive the following processing:

- The data sets expire if they are not used in 120 days and 360 days have passed since they were created.
- Unused allocated space is released from physical sequential, partitioned, and extended format VSAM data sets.
- Data sets that are not used for 10 days are eligible to migrate. If the size of the data set is less or equal to 20 tracks, it is not migrated. If the size is between 20 and 6000 tracks, it is migrated to ML1. If the size is larger than 6000 tracks, it is migrated to the cloud storage defined in the LOCALCLOUD SMS cloud construct.
- Data sets that are not used for 60 days are eligible for migration. If the size is less than or equal to 20 tracks, it is not migrated. If the size is between 20 and 6000 tracks, it is migrated to ML2 if it is on level 0 DASD or ML1.

These are the attributes of ENHMC2:

```
EXPIRE AFTER DAYS NON-USAGE ===> 120
EXPIRE AFTER DATE/DAYS      ===> 360
PARTIAL RELEASE              ===> Y
PRIMARY DAYS NON-USAGE      ===> 10
SIZE LESS THAN OR EQUAL     ===> 20
```

```

    SIZELTE ACTION          ===> NONE
SIZE GREATER THAN         ===> 6000
    SIZEGT ACTION          ===> CLOUD
LEVEL 1 DAYS NON-USAGE    ===> 60
LEVEL 2 DAYS NON-USAGE    ===> NOLIMIT
CLOUD NAME                 ===> LOCALCLOUD
COMMAND OR AUTO MIGRATE   ===> BOTH

```

Most to Cloud management class attributes: Small data sets are not migrated. All other data sets migrate to cloud storage.

Data sets that use this management class receive the following processing:

The data sets expire if they are not used in 120 days and 360 days have passed since they were created.

Unused allocated space is released from physical sequential, partitioned, and extended format VSAM data sets.

Data sets that are not used for 10 days are eligible to migrate. If the size of the data set is less or equal to 150 tracks, it is not migrated. If the size is greater than 150 tracks, it is migrated to the cloud storage defined in the LOCALCLOUD SMS construct.

These are the attributes of MOST2CLOUD:

```

EXPIRE AFTER DAYS NON-USAGE ===> 120
EXPIRE AFTER DATE/DAYS      ===> 360
PARTIAL RELEASE              ===> Y
PRIMARY DAYS NON-USAGE      ===> 10
SIZE LESS THAN OR EQUAL     ===> 150
    SIZELTE ACTION          ===> NONE
SIZE GREATER THAN           ===>
    SIZEGT ACTION          ===>
LEVEL 1 DAYS NON-USAGE      ===> 0
LEVEL 2 DAYS NON-USAGE      ===> 0
CLOUD NAME                   ===> LOCALCLOUD
COMMAND OR AUTO MIGRATE     ===> BOTH

```

Big To Cloud management class: Very big data sets migrate to cloud storage. Other sizes migrate to ML1 or ML2 normally. Data sets with this management class receive the following processing:

- The data sets expire if they are not used in 120 days and 360 days have passed since they were created.
- Unused allocated space is released from physical sequential, partitioned, and extended format VSAM data sets.
- Data sets that are not used for 10 days are eligible to migrate. If the size of the data set is less or equal to 7500 tracks, it is migrated to ML1. If the size of the data set is greater than 7500 tracks, it is migrated to the cloud storage described by the LOCALCLOUD SMS construct.

- Data sets that are not used for 20 days are eligible for migration. If the size is less than 7500 tracks, it is migrated to ML2 if it is on level 0 DASD or ML1.

These are the attributes of BIG2CLOUD:

```

EXPIRE AFTER DAYS NON-USAGE ==> 120
EXPIRE AFTER DATE/DAYS      ==> 360
PARTIAL RELEASE              ==> Y
PRIMARY DAYS NON-USAGE      ==> 10
SIZE LESS THAN OR EQUAL     ==>
  SIZELTE ACTION            ==>
SIZE GREATER THAN           ==> 7500
  SIZEGT ACTION             ==> CLOUD
LEVEL 1 DAYS NON-USAGE      ==> 20
LEVEL 2 DAYS NON-USAGE      ==> NOLIMIT
CLOUD NAME                   ==> LOCALCLOUD
COMMAND OR AUTO MIGRATE     ==> BOTH

```

Under the Tasks for automatic space management section, a new subsection titled, Specifying the allowed target tiers, as follows:

Specifying the allowed target tiers

The MIGRATIONAUTO CLOUD parameter on the SETSYS command can tailor the migration tiers that a DFSMSHsm host can target. Migrating data sets to cloud storage can be time-consuming and could possibly cause all planned migrations to not complete during the existing Primary Space Management window. It may be desirable to have some DFSMSHsm hosts only perform migrations to ML1 and ML2, and other hosts only target cloud storage for the migrations.

If MIGRATIONAUTO CLOUD(CLOUDONLY) is in effect during the Automatic migration (Primary Space Management, Interval Management, On Demand Management), only data sets that meet the criteria to migrate to cloud storage will be moved. All other eligible data sets that would be migrated to ML1 or ML2 or transitioned would not be migrated by this host.

If MIGRATIONAUTO CLOUD(NOCLOUD) is in effect, only data sets that would target ML1 or ML2, or transition will be processed. Any eligible data sets that would target cloud storage will not be migrated by this host during the automatic migration.

If MIGRATIONAUTO CLOUD(ALL) is in effect, any eligible data set will be migrated to the tier indicated by the management class. MIGRATIONAUTO CLOUD(ALL) is the default value if not specified.

Under the section, Specifying when automatic primary space management can process, a new paragraph is added before the note about Backup of control data sets interfering with space management, as follows:

Allowing primary space management to start before midnight.

Many Primary Space Management windows start after midnight to allow data sets to be processed as soon as their non-referenced day count reaches the threshold in the management class. The MIGRATEPSMEARLY parameter on the SETSYS command can be used to let DFSMSHsm process a data set early. If the Primary Space Management window begins after 6pm, one day will be added to the data set age up until the current time is midnight. Afterwards, the current age is used in the calculation.

If the cutoff time of 6pm needs to be changed, a patch (MGCB.+98 X'hhmm') can be used to modify the cutoff time. See the z/OS DFSMSHsm Implementation and Customization Guide, Chapter 17, Tuning DFSMSHsm, PSM Earlier Checking for more details.

Under the section, Specifying the maximum automatic secondary space management tasks, add the following paragraph at the end, after the note:

The MAXSSMTASKS(EMPTYCONTAINERDELETION(n)) parameter on the SETSYS command allows management of the processing of empty containers. A value of 0 or 1 may be specified. 0 indicates that DFSMSHsm is not to examine the known clouds for containers that are empty. A value of 1 indicates that DFSMSHsm should look for empty containers to delete.

Under the section titled, Automatic space management operation examples, a new section, titled, Integrating cloud storage into a DFSMSHsm automatic space management environment, is added before the section Starting automatic primary space management as follows:

Integrating cloud storage into a DFSMSHsm automatic space management environment

Because the performance characteristics of migrating data sets to cloud storage are different than ML1 and ML2, it may be desirable to set up a separate DFSMSHsm host that will be tasked with performing migrations to cloud storage. The MIGRATIONAUTO CLOUD, STORAGEGROUPAFFINITY, and MIGRATEPSMEARLY parameters on the SETSYS command can be used to tailor the processing done by DFSMSHsm hosts.

HSM1, and HSM2 are hosts that should process migrations to ML1 and ML2. HSMC is a host that should process migrations to cloud storage. SYS1 is the system HSM1 runs on, and storage group SG1 is defined to be processed by SYS1. Similarly, SYS2 is the system HSM2 runs on and storage group SG2 is defined to be processed by the SYS2.

First we want to segregate the cloud processing to only HSMC. MIGRATIONAUTO CLOUD(CLOUDONLY) is specified to HSMC. MIGRATIONAUTO CLOUD(NOCLOUD) will be specified to HSM1 and HSM2. This will cause HSM1 and HSM2 to skip any data sets it finds in SG1 and SG2, respectively, that are eligible to migrate to cloud storage as they perform Primary Space Management. HSMC will skip any data sets it finds that are not directed to cloud storage.

STORAGEGROUPAFFINITY(SYS1, SYS2) is specified to HSMC. This allows it to process SG1 and SG2 (storage groups that are associated with both SYS1 and SYS2 in the MIGRATE SYSTEM/SYS PLEX NAME field of the storage group definition), even though HSMC runs on SYSC.

The EARLYMIGRATION(YES) parameter is specified to HSMC, along with PRIMARYSPMGMTSTART(1800 0400). This will cause the HSMC host to start its primary space management processing at 6pm. HSMC will examine data sets in SG1 and SG2, and will only migrate data sets that are that would be eligible after midnight to cloud storage.

Command space management tasks

The following is to be added in the 'Reconnecting data sets using fast subsequent migration' section under the 'Space management of SMS-managed storage' chapter and 'Command space management tasks' sub-section.

The first paragraph is modified to the following:

Using the standard migration and recall method, a data set can be migrated to an ML2 tape volume or cloud container and later be recalled. When the data set is recalled, the migrated copy of the data set remains on the ML2 tape volume or cloud container and is marked not valid in the CDS record for the data set. If the recalled data set is later migrated using the standard migration method, it is moved to a

new ML2 tape volume or cloud container (even if the data set has not changed). This process results in unnecessary data movement and if stored on an ML2 tape volume causes the original ML2 tape volume to become fragmented which requires the tape to be recycled.

Fast subsequent migration allows an unchanged data set that is recalled from a single ML2 tape volume or cloud container to be reconnected to that ML2 tape volume or cloud container during data set or volume migration. Using fast subsequent migration:

- eliminates the unnecessary data movement and tape mounts caused by migrating a data set again that is unchanged.
- involves creating and updating DFSMSHsm control records only.
- reduces the need for recycling the ML2 tape.

The 'Enabling fast subsequent migration' is modified as follows:

There are four methods of enabling fast subsequent migration:

- Add the SETSYS TAPEMIGRATION command with the RECONNECT(ALL) or RECONNECT(ML2DIRECTEDONLY) parameter to the ARCCMDxx parmlib member of SYS1.PARMLIB. Then restart DFSMSHsm.
- Issue the SETSYS TAPEMIGRATION command with the RECONNECT(ALL) or RECONNECT(ML2DIRECTEDONLY) parameter after DFSMSHsm is started.
- Add the SETSYS CLOUDMIGRATION command with the RECONNECT(ALL) parameter to the ARCCMDxx parmlib member of SYS1.PARMLIB. Then restart DFSMSHsm.
- Issue the SETSYS CLOUDMIGRATION command with the RECONNECT(ALL) parameter after DFSMSHsm is started.

The 'Disabling fast subsequent migration' is modified as follows:

There are four methods of disabling fast subsequent migration:

- Add the SETSYS TAPEMIGRATION command with the RECONNECT(NONE) parameter to the ARCCMDxx parmlib member of SYS1.PARMLIB. Then restart DFSMSHsm.
- Issue the SETSYS TAPEMIGRATION command with the RECONNECT(NONE) parameter after DFSMSHsm is started.
- Add the SETSYS CLOUDMIGRATION command with the RECONNECT(NONE) parameter to the ARCCMDxx parmlib member of SYS1.PARMLIB. Then restart DFSMSHsm.
- Issue the SETSYS CLOUDMIGRATION command with the RECONNECT(NONE) parameter after DFSMSHsm is started.

In the 'Fast subsequent migration (reconnection) eligibility requirements' section, make the following changes:

Add a new bullet to the 'Conditions that always prevent fast subsequent migration' list.

- The SETSYS CLOUDMIGRATION command with the RECONNECT(NONE) setting is in effect for migrations directed to cloud.

Modify the last bullet in the list of 'Requirements that must be satisfied when a fast subsequent migration reconnect is attempted on the data set'.

- The SETSYS TAPEMIGRATION command with the RECONNECT(ALL) or RECONNECT(ML2DIRECTEDONLY), or SETSYS CLOUDMIGRATION command with the RECONNECT(ALL) setting is in effect.

Chapter 4. Other space management considerations

Object storage in cloud

DFSMSHsm can utilize object storage in the cloud as a destination for migrated data set images. Data movement is offloaded to the storage controller, while other management functions are performed directly using the z/OS Client Web Enablement Toolkit. This allows DFSMSHsm to avoid extra processing such as RECYCLE.

System setup to use the Cloud

In order for DFSMSHsm to use the cloud, some setup first needs to be done. A full list of requirements can be found in the DFSMS Using the New Functions publication in the section Using DFSMS transparent cloud tiering.

- DASD volumes in a DS8700 or higher with transparent cloud tiering need to be attached to the system. DFSMSHsm can only migrate data sets residing on a device with transparent cloud tiering to the cloud.

- SMS configuration – An SMS Cloud Attribute entry needs to be created with the same name as what is configured in the DS8700, along with the endpoint, and other cloud attributes.

DASD volumes

Ensure that the first volume in an LSS that other volumes are attached from is attached to the system. Failure to do this can lead to Attention messages from the DS8000 being missed.

SETSYS Commands

Decide on Reconnect

When enabled, DFSMSHsm will reconnect eligible data sets without performing data movement. If SETSYS CLOUDMIGRATION(RECONNECT(NONE)) is in effect, a subsequent migration of a data set that was otherwise eligible to be reconnected, will cause the previous migration copy to be deleted and a new migration copy created.

Cloud Password

The SETSYS CLOUD command is used to give the cloud password for the userid defined in the SMS Cloud construct to DFSMSHsm. Great care needs to be taken with this password. DFSMSHsm will keep the password in encrypted form for later use. This means that anyone else with access to this password can access the cloud directly and delete the migration copies, thus making DFSMSHsm unable to Recall those data sets. IBM recommends that the Security Administrator issue this command in order to protect the access to the cloud.

Using the Cloud

Workload Distribution

Currently, the Disk Subsystem has a maximum of 6 threads per CEC for processing data to or from the cloud. Care must be taken to ensure that the workload of Migrate and Recall processing is evenly distributed otherwise queueing will occur within the storage controller.

During Automatic Space Management and MIGRATE STORAGEGROUP processing, DFSMSHsm will select volumes for processing such that no more than 6 requests are issued for any volume within the same CEC. Once 6 volumes within the same CEC are being processed, no more volumes within that CEC will be selected for processing, until one of those volumes completes.

Additionally, only two large data sets (greater than 5BG) will be migrated per CEC at any one time. These large data sets will be revisited later if there are currently two being migrated.

Note: The 6 concurrent request value may be changed via PATCH of MCVT.+494 X'nnnn'. See z/OS DFSMSHsm Implementation and Customization Guide Chapter 17 Tuning DFSMSHsm, Maximum number of CEC volumes migrated to cloud simultaneously for details.

MIGRATE DATASET and MIGRATE VOLUME processing do not participate in the distribution of work, so care must be taken when issuing these commands during Automatic Space Management and MIGRATE STORAGEGROUP processing, as queueing may still occur.

Migration

Migrating data sets to the cloud gives you another level or target for your migration copies. Some types of data may need to be retained, but keeping that data on ML1 DASD or ML2 tape is undesirable. Migrating those data sets to the cloud may be desirable. The ideal types of data sets to migrate to the cloud are large data sets that aren't expected to be referenced for a long time.

Migration of a data set to the cloud will utilize off-board data movement provided by the hardware. The elapsed time for data set migrations to and recalls from cloud storage will be longer than the time for these functions on FICON attached storage. With cloud storage, data transfer is performed with

TCP/IP across ethernet connections. IBM recommends that installations perform tests to determine the expected elapsed time degradation unique for their environment. DFSMSHsm FSR records can be used to determine both elapsed time and CPU consumption for these functions. Based on the expected degradation, only migrate to cloud storage those data sets for which the degradation is acceptable. For example, migrated data sets that must be recalled within a specific time frame to achieve an application SLA should not be migrated to cloud storage if the expected degradation is unacceptable. Recommended data set types are those that are both large in size and that are rarely or never recalled.

Because the backup format is different between an ML1/ML2 migration copy and a cloud migration copy, a data set cannot be moved from ML1/ML2 directly to the cloud. The data set will have to be recalled to L0 DASD first, and then remigrated to the cloud.

Note: When migrated to the cloud, the catalog entry for the data set will have a volser of MIGRAT, like other migrations. However, the Device Type field in the catalog entry will be x'00018000'. The third byte x'80' indicates it is a tape, however, the second byte x'01' indicates it is a cloud type.

Recall

Recall of data sets from the cloud will be performed by the RECALL or HRECALL commands, or when the data set is referenced. No change to the command syntax is necessary. After a Recall, the migration copy of the data set will not be deleted. This enables subsequent reconnection if desired. When Secondary Space Management is performed, the Migration Control Data Set records will be cleaned up and the migration copies in the cloud will be deleted if the RETAIN DAYS number has been exceeded. DFSMSHsm will not delete empty containers, however. If empty containers are an issue, they can be deleted using a cloud management tool.

Delete

When you delete a migrated data set with the DELETE or HDELETE command, the migration copy in the cloud is also deleted.

Listing information

You can use the DFSMSHsm LIST command to get more information about data sets that have been migrated to the cloud. The LIST DATASETNAME MCDS command will show where the migration copy is stored in the cloud. Details such as the SMS Cloud construct name representing the cloud, the container name, and object prefix are included in the output.

The LIST CLOUD command allows you to get successively more detailed views on the contents of the cloud. One way to use it would be to first get a view of what DFSMSHsm created containers are in the cloud through issuing the LIST CLOUD(<SMS Cloud construct name>) TERM command. Next, a more detailed view of one of the containers could be obtained through issuing LIST CLOUD(<cloudname>) CONTAINER(<container_name>) TERM. This will return a list of all the pseudo-directories within that container. Each pseudo-directory is a single migration copy of a data set.

A migration copy of a single data set is made up of many objects. They are grouped together in a pseudo-directory. DFSMSHsm object names use forward slash characters to delineate different levels. DFSMSHsm Storage Administrators may be familiar with the DFSMSHsm migration copy data set names. DFSMSHsm uses this same naming convention in the pseudo-directory name or object prefix. If details are wanted about the objects that make up a particular migration copy, the LIST CLOUD(<cloudname>) CONTAINER(<container_name>) PREFIX(<pseudo-directory_name>) TERM command can be issued.

Auditing information

The AUDIT DATASETCONTROLS(MIGRATION) command has been updated to include migration copies in the cloud. While examining these records, if the record indicates the data set was migrated to the cloud, DFSMSHsm will check the cloud storage to verify that the expected number of objects for that prefix exist in the cloud. If the expected number of objects does not match what is found in the cloud it is likely that the migration copy has been corrupted.

Additionally, you can use the new AUDIT MEDIACONTROLS(CLOUD(<cloudname>)) command to request DFSMSHsm examine the DFSMSHsm containers found in the cloud. DFSMSHsm will examine each container in turn, comparing what is found in the container with the DFSMSHsm Migration Control Data Set records. The FIX parameter will cause DFSMSHsm to repair many of the errors it finds.

Aggregate backup and recovery support (ABARS)

In the introduction, after the sentence, “DFSMSdss is used to move level 0 DASD data sets during aggregate backup and recovery processing”, add the following:

DFSMSHsm can include ML1 and ML2 migration copies of data sets within the aggregate backup. Migration copies that are stored in the cloud (MLC) will not be included and will cause the backup to fail. ABACKUP does not support data sets migrated to the cloud. If the selection criteria results in any of these data sets being selected, then the ABACKUP command will fail.

Chapter 14. Obtaining information from DFSMSHsm

The new ARCGS00A sample will be added to the following list and panel:

...

Running new reports with report generator

DFSMSHsm reports can be run with the DFSMSrmm Report Generator. The reports are based on FSR and WWFSR (SMF) data and DFSMSHsm control data set data obtained by DCOLLECT.

For HSM FSR Records

- ARCGAB01 ABARS ABACKUP Statistics
- ARCGAR01 ABARS ARECOVER Statistics
- ARCGS00A Statistics for Automatic Space Management
- ARCGS001 Statistics for DFSMSHsm
- ARCGS002 Statistics for Backup
- ARCGS003 Statistics for Migration
- ARCGS004 Statistics for Recall
- ARCGS005 Statistics for Recovery
- ARCGS006 Statistics for Volume Dump
- ARCGS007 Statistics for Restore from Dump Copy
- ARCGS008 Statistics for FRBACKUP
- ARCGS009 Statistics for FRRECOVER
- ARCGS010 DFSMSHsm Thrashing Report
- ARCGS011 Statistics for Class Transition
- ...
- ...

Panel Help

DFSMSrmm Report Definitions

Row 1 to 17 of 44

Command ==>

Scroll ==> PAGE

The following line commands are valid: A,D,G,H,J,L,M,N,S, and T

S Name	Report title	Report type	User id
ARCGAB01	ABARS ABACKUP Statistics	DFSMSHsm ABARS Report	HSM
ARCGAR01	ABARS ARECOVER Statistics	DFSMSHsm ABARS Report	HSM
ARCGDB01	DCOLLECT BACKUP DATA	DFSMSHsm DCOLLECT BACKUP	HSM
ARCGDD01	DCOLLECT DASD CAPACITY PLANNIN	DFSMSHsm DCOLLECT DASD CAP	HSM
ARCGDM01	DCOLLECT MIGRATION DATA	DFSMSHsm DCOLLECT MIGRATION	HSM
ARCGDT01	DCOLLECT TAPE CAPACITY PLANNIN	DFSMSHsm DCOLLECT TAPE CAP	HSM
ARCGS00A	Statistics for Automatic Space	DFSMSHsm FSR-SMF Records	HSM
ARCGS001	Statistics for DFSMSHsm	DFSMSHsm FSR-SMF Records	HSM
ARCGS002	Statistics for Backup	DFSMSHsm FSR-SMF Records	HSM
ARCGS003	Statistics for Migration	DFSMSHsm FSR-SMF Records	HSM
ARCGS004	Statistics for Recall	DFSMSHsm FSR-SMF Records	HSM
ARCGS005	Statistics for Recovery	DFSMSHsm FSR-SMF Records	HSM
ARCGS006	Statistics for Volume Dump	DFSMSHsm FSR-SMF Records	HSM
ARCGS007	Statistics for Restore from Du	DFSMSHsm FSR-SMF Records	HSM
ARCGS008	Statistics for FRBACKUP	DFSMSHsm FSR-SMF Records	HSM
ARCGS009	Statistics for FRRecover	DFSMSHsm FSR-SMF Records	HSM
ARCGS010	DFSMSHsm Thrashing Report	DFSMSHsm FSR-SMF Records	HSM

DFSMShsm Storage Administration Reference

ABACKUP

ABACKUP command: Backing up aggregated data sets

In the Optional parameters of the ABACKUP command, under the PROCESSIONLY keyword add a note as follows:

Note: Migration copies of data sets that reside in the cloud are not supported. If any are selected, the ABACKUP command will fail.

ARECOVER

ARECOVER command: Recovering a specific aggregate group.

In the Optional parameters of the ARECOVER command, under the MIGRATEDDATA keyword, add a note as follows:

Note: Since ABACKUP of data sets migrated to the cloud is not supported, none will be included in the recovery.

AUDIT

Chapter 30. AUDIT Command: Auditing DFSMShsm

Add a bullet to: You can use AUDIT to cross-check the following sources of control information:

- DFSMShsm-owned Cloud containers

In the Syntax of the enhanced AUDIT commands, add the following to Fragment C for MEDIACONTROLS.

```
|---+-----+-----+-----+-----+-----+-----+-----+-----|
| +- (---CLOUD (--cloudname--) ---) -----+
| +- (-+-SMALLDATASETPACKING-+-) -----+ '-| Fragment B |- '
|   '-SDSP-----'
|           .----- .
|           V         |
| '-VOLUMES (---volser-+-) -+-----+-'
|                                     '-RESUME-'
```

In the Required and optional parameters of the AUDIT command section, the MEDIACONTROLS section needs to be updated as follows:

MEDIACONTROLS VOLUMES, MEDIACONTROLS(SDSP) VOLUMES and MEDIACONTROLS(CLOUD): Requesting an audit of control information

After the paragraph starting with “In either case,” add the following:

MEDIACONTROLS(CLOUD(cloudname)) audits control information contained in migration copies that reside in the cloud. The cloudname refers to a defined SMS cloud construct name. This command will examine containers belonging to this

HSMPlex. The CLOUD parameter is mutually exclusive with the VOLUMES and SMALLDATASETPACKING parameters. The RESUME parameter does not apply.

LIST

In the Categories of information table, add a new entry for: Cloud container and object information, see “CLOUD: Listing information for containers and objects”

Syntax changes:

Add the new CLOUD parameter:

```
>>-LIST----->
>--+AGGREGATE--(+agname+-)--+-----+-----+><
|      '*-----'  +DATE(yyyy/mm/dd)+  '-| Fragment A |-'      |
|      '-VERSION(nnnn)----'          |                          |
+--+BACKUPVOLUME-+--+-----+--+-----+-----+-----+
| '-BVOL-----' '-(volser)-' '-| Fragment A |-' '-SELECT(EMPTY)-' |
+--+CLOUD(SMScloudname)-+-----+-----+-----+-----+
|      '-CONTAINER(ctname)-+-----+-----+-----+-----+
|      '-PREFIX(objprefix)-'          |                          |
+--+COPYPOOL-+--+-----+--+-----+-----+-----+
| '-CP-----' '-(cpname)-+-----+-----+-----+-----+
|      '-| Fragment C |-'          |                          |
```

Update Fragment E DATASETNAME SELECT with the Cloud optional parameter:

```
E: DATASETNAME SELECT optional parameters
|--+-----+-----+-----+-----+----->
+ACTIVE-----+
|  .0-----.      |
+AGE-(+mindays-+--+-----+--+)-+
|      | .999999--. | |
|      '+--maxdays-+-' |
+EMPTY-----+
+--+MIGRATIONLEVEL1-+-----+-----+
| '-ML1-----'      |
+--+MIGRATIONLEVEL2-+-----+-----+
| '-ML2-----'      |
+CLOUD-----+
+RETAIN_DAYS-----+
'-VOLUME(volser)-----'
```

In the Required parameters of the LIST command section, add a section for CLOUD as follows:

CLOUD: Listing information from Cloud storage

Explanation: CLOUD is a required parameter that you specify to retrieve information about Containers, and Objects in Cloud storage.

CLOUD(SMScloudname)

is specified with the name of an SMS construct that describes cloud storage. It will list the DFSMSHsm containers currently existing in the specified Cloud.

CONTAINER(ctname)

is specified with a particular container name within the cloud storage. It will list the pseudo-directories or prefixes that are found within the requested container. A pseudo-directory is the first part of the object name ending with a forward-slash character (/).

PREFIX(objprefix)

is specified to list all of the objects found under a specific prefix or pseudo-directory. It is a maximum 44 byte prefix that can match to specific objects contained within the specified container.

Fragment A indicates that output can be written to SYSOUT, OUTDATASET, and TERMINAL.

MIGRATE

Update the Syntax of the MIGRATE command to include the new CLOUD parameter.

```
>> _MIGRATE_____ DATASETNAME_____ (dsname)_____ >
  | |___DSNAME___| | |_____ TRANSITION___| | |_____
  | | |_____ TRN | | |_____
  | | |_____ MOVE___| | |_____
  | |_____
  | |_____ MIGRATIONLEVEL1_____
  | |___ML1___| | |_____
  | |___VOLUME (volser1_____ ) _____ BOTH_____
  | | |_____ _MIGRATE (0)_ | | |_____ TRANSITIONONLY___| |
  | | |_____ ,_____ | | |_____ |_____ TO_____ |
  | | |_____ |_____ | | |_____ MIGRATIONONLY___|
  | | ___STORAGEGROUP__ ( ___V_sgn_ |___ )_ | | |_____ MONLY_____ |
  | | ___SG_____ | | |_____ MOVE_____ |
  | |_____
  | |_____
  | |___CONVERT_____ | | ___DAYS (0)_ | | |_____ MIGRATIONLEVEL1_____|
  | | ___(volser2_____ )_ | | |_____ |_____ ML1_____ |
  | | |_____ _unittype_ | | |_____ |_____ CLOUD ( _cloudname_ ) |
  | |_____
  | |_____
  | |___MIGRATIONLEVEL2_| | |___TERMINAL_|
><<
```

Under the Optional parameters of the MIGRATE command section, add a new explanation for CLOUD as follows:

CLOUD: Specifying Migration of a data set directly to Cloud

Explanation: CLOUD(cloudname) is an optional parameter specifying that a data set migrates from an SMS managed volume to the specified Cloud storage. The cloudname is the name of the SMS Cloud construct. When specified, the data set is migrated to the requested Cloud storage, regardless of the data set's management class attributes, with the exception of migration not being allowed.

The CLOUD parameter may not be specified with the following parameters: MIGRATIONLEVEL1, MIGRATIONLEVEL2, and CONVERT.

Note: There are some DFSMSHsm SETSYS settings that will not be applicable when performing a Migrate to Cloud storage. They are:

COMPACT, COMPACTPERCENT – COMPACT(ALL) will not apply when CLOUD is specified. Because no data movement is being performed by the host, we do not have the opportunity to perform compression on the backup on Cloud Storage.

CONVERSION(REBLOCKTOANY) – Because data movement is not performed by the host, there is no

opportunity to perform reblocking of a data set.

CONCURRENT: Migrating a data set to Cloud storage will ignore any current setting relating to CONCURRENT.

REPORT

The Syntax diagram for the REPORT command is updated as follows:

Fragment A: MIGRATION optional parameters

```

    .-FROMANY----- .-TOANY-----
|-----|
| +-+FROMANY+-----+ +-+TOMIGRATIONLEVEL1+-+
| | '-FRANY---' | | '-TOML1-----' | |
| +-+FROMMIGRATIONLEVEL1+-+ | +-+TOMIGRATIONLEVEL2+-+ |
| | '-FRML1-----' | | | '-TOML2-----' |
| '-+FROMPRIMARY+-----' | '-+TOCLOUD-----+' |
| '-FRPRI-----' | | '-TOCLD-----' |

```

Fragment B: RECALL optional parameters

```

    .-FROMANY-----
|-----|
| +-+FROMANY+-----+
| | '-FRANY---' |
| +-+FROMMIGRATIONLEVEL1+-+
| | '-FRML1-----' |
| +-+FROMMIGRATIONLEVEL2+-+
| | '-FRML2-----' |
| '-+FROMCLOUD+-----'
| '-FRCLD-----'

```

Under the Optional parameters of the REPORT command section, update the following:

For FUNCTION(MIGRATION): Requesting statistics of the migration function, update the table to include new rows for TOCLOUD.

Source Volume	Subparameter Target Volume	Subparameter Type of Migration on Statistics Report
FROMANY	TOANY	Primary to Level 1 Primary to Level 2 Primary to Cloud SUBSEQUENT MIGS
FROMANY	TOMIGRATIONLEVEL1	Primary to Level 1
FROMANY	TOMIGRATIONLEVEL2	Primary to Level 2 SUBSEQUENT MIGS
FROMANY	TOCLOUD	Primary to Cloud
FROMMIGRATIONLEVEL1	TOANY	SUBSEQUENT MIGS

FROMMIGRATIONLEVEL1	TOMIGRATIONLEVEL1	
FROMMIGRATIONLEVEL1	TOMIGRATIONLEVEL2	SUBSEQUENT MIGS
FROMPRIMARY	TOANY	Primary to Level 1 Primary to Level 2
FROMPRIMARY	TOMIGRATIONLEVEL1	Primary to Level 1
FROMPRIMARY	TOMIGRATIONLEVEL2	Primary to Level 2
FROMPRIMARY	TOCLOUD	Primary to Cloud

For FUNCTION(RECALL): Requesting statistics of the recall function, add the new description for FROMCLOUD.

FROMCLOUD

specifies that DFSMSHsm should create a statistics report of the data sets recalled from cloud storage.

SETSYS

Update the Syntax diagram for the SETSYS command to include the following new sections:

```
>> ___SETSYS_____<<
      |
      |___CLOUDMIGRATION___(___RECONNECT___(___NONE___)_)_|
      |___ALL___|
<<

>> ___SETSYS_____<<
      |
      +-CLOUD (NAME (<cloudname>) ---CLOUDCREDENTIALS--) +
      CLD
      +-CCREDS-----+
      +-REMOVE-----+
      +-REM-----+
      +-REFRESH-----+
      '-REF-----'
<<

>> ___SETSYS_____<<
      |___MIGRATIONAUTOCLD___(___ALL___)_|
      |___MAC_____| |___CLOUDONLY___|
      |___NOCLOUD___|
<<

>> ___SETSYS_____<<
      |___STORAGEGROUPAFFINITY___(_____)_|
      |___SGA_____| |
      |
      |___V_systemn___|
      |
      |
<<

>> ___SETSYS_____<<
      |___MIGRATEPSMEARLY___(___NO___)_|
      |___MPE_____| |___YES___|
<<
```

```
>> SETSYS _____ <<
      | _ MAXSSMTASKS _ ( _____ ) _ |
      | _ EMPTYCONTAINERDELETION ( _ 1 _ ) _ |
      | _ ECD _____ | | _ 0 _ |
```

Table 60

Table 60. Space management functions and SETSYS parameters.

Space management function	SETSYS parameter
Interval Migration	MIGRATIONAUTO CLOUD STORAGEGROUPAFFINITY
Migration	MIGRATEPSMEARLY MIGRATIONAUTO CLOUD STORAGEGROUPAFFINITY
On-demand Migration	MIGRATIONAUTO CLOUD STORAGEGROUPAFFINITY

Summary of DFSMShsm default values

Table 64. Summary of DFSMShsm Default Values

DFSMShsm default value	Result
MAXSSMTASKS (CLEANUP (2), TAPEMOVEMENT (1), EMPTYCONTAINERDELETION (1))	DFSMShsm concurrently processes a limited number of secondary space management tasks. The statistics and migration cleanup tasks limit is 2, the automatic tape migration task limit is 1, empty cloud container deletion task limit is 1
MIGRATEPSMEARLY (NO)	The actual data set age is used during Primary Space management
MIGRATIONAUTO CLOUD (ALL)	Any eligible data set will be migrated to the tier indicated by the management class.

In the Optional parameters of the SETSYS command section, add the following two sections:

CLOUDMIGRATION: Specifying the type of migration to CLOUD

Explanation

CLOUDMIGRATION is an optional parameter specifying that you want DFSMShsm to attempt to use fast subsequent migration when migrating to the CLOUD.

The following are required parameters of the CLOUDMIGRATION parameter:

RECONNECT

Data sets eligible for fast subsequent migration can be reconnected to the CLOUD from which they were recalled. A data set can be reconnected if *all* fast subsequent migration requirements are satisfied. For more information about these requirements, see Fast Subsequent Migration (reconnection) eligibility requirements.

NONE

Data sets are not eligible for fast subsequent migration and are not reconnected to the CLOUD from which they were recalled.

ALL

All data sets that are eligible for standard migration and satisfy fast subsequent migration eligibility requirements are reconnected to the CLOUD the data set was recalled from; including data sets that would have otherwise been migrated to an ML1 or ML2 volume.

CLOUD: Specifying CLOUD properties

CLOUD is an optional parameter that allows specification of properties specific to a particular Object Storage that DFSMSHsm uses to store migration copies of data sets. If specified in a DFSMSHsm parmlib member, this parameter will be ignored.

The following are required and optional keywords for the CLOUD parameter:

NAME(<cloudname>): cloudname is the name of a defined SMS Cloud Construct. This is a required parameter. If the named cloud construct does not exist in the current SMS configuration, the command will not succeed.

CLOUDCREDENTIALS: Specifying this optional keyword requests that DFSMSHsm request the password associated with the Object Storage account from the Storage Administrator via WTOR. The reply to the WTOR will be suppressed on the console. If the password is mixed case, and the system has a dual-case console, enclosing the password in single quotes will ensure that it is passed as-is to DFSMSHsm. DFSMSHsm will store the password for future requests to the Cloud Storage. The cloud password must be secured. It is recommended that the security administrator who is administering the cloud storage accounts is the one who enters this password.

REMOVE: Specifying this optional keyword requests that DFSMSHsm delete the information related to the Object Storage account from its record. This can be used to remove old invalid entries. The FIXCDS command to display the MHCR record can be used to display the Object Storage accounts known to DFSMSHsm.

REFRESH: Specifying this optional keyword requests that DFSMSHsm refresh its in-storage copy of the Object Storage accounts on a particular host. If the password for an Object Storage account has been updated on a different host in an HSMPLEX, the in-storage version on the other hosts may need to be updated as well to avoid Authorization failures when communicating with the Object Storage account.

Note: DFSMSHsm can only store 7 CLOUD property entries.

MAXSSMTASKS

MAXSSMTASKS: Specifying the maximum number of concurrent automatic secondary space management tasks

Explanation: MAXSSMTASKS(CLEANUP(nn) | TAPEMOVEMENT(mm) | EMPTYCONTAINERDELETION(kk)) is used to define the maximum number of secondary space management tasks that can run concurrently.

EMPTYCONTAINERDELETION

EMPTYCONTAINERDELETION(kk) MAXSSMTASKS(EMPTYCONTAINERDELETION(kk)) specifies the number of Cloud Storage containers processing tasks. Only 0 or 1 values are acceptable. A value 0 indicates that Cloud Storage containers deletion task will not be submitted

Alias: ECD

DFSMSHsm default: If you do not specify the CLEANUP parameter on any SETSYS command, the DFSMSHsm default for *nn* is 2. If you do not specify the TAPEMOVEMENT parameter on any SETSYS command, the DFSMSHsm default for *mm* is 1. If you do not specify the EMPTYCONTAINERDELETION parameter on any SETSYS command, the DFSMSHsm default for *kk* is 1.

MIGRATEPSMEARLY

MIGRATEPSMEARLY: Activate the new PSM earlier checking option

Explanation: MIGRATEPSMEARLY is an optional parameter, activating the new PSM earlier checking option. If this option is activated, one day will be added to the age check, up until midnight.

Required subparameter of the SETSYS MIGRATEPSMEARLY Command:

YES – One day will be added to the age check, up until midnight.

NO – The actual data set age is always used.

Alias: MPE

Default: NO

MIGRATIONAUTO CLOUD

MIGRATIONAUTO CLOUD: Allow the host to execute Cloud migration

Explanation: MIGRATIONAUTO CLOUD(ALL | CLOUDONLY | NOCLOUD) is an optional parameter that defines the possible target tier during automatic migration.

ALL: Specifying that data set migration to ML1, ML2, transition, and migration to Cloud storage are performed.

CLOUDONLY: Specifying that only data set migration to Cloud storage is performed.

NOCLOUD: Specifying that only data set migration to ML1, ML2, and transition are performed.

Alias: MAC

The default value of this parameter is ALL.

STORAGEGROUPAFFINITY

STORAGEGROUPAFFINITY: Define the set of host names that have affinity to process a storage group migration

Explanation: STORAGEGROUPAFFINITY is an optional parameter that specifies a set of hosts that have affinity to process a storage group. Up to 15 host names can be specified.

Required subparameters of the SETSYS STORAGEGROUPAFFINITY

Command:

A set of hosts that have affinity to process a storage group. Up to 15 host names can be specified. If a set of hosts name is empty, the list of previously defined hosts name will be removed.

Alias: SGA

Using the AUDIT command

In Chapter 68, Using the AUDIT command, the table for AUDIT commands that Audit and Report errors, an new row should be added as follows:

AUDIT MEDIACONTROLS (CLOUD(cloudname)) “Using the AUDIT MEDIACONTROLS (CLOUD) command on pagexxx”

A new section will be added under the section, “Using the enhanced AUDIT command to audit DFSMSHsm control information”, titled, “Using the AUDIT MEDIACONTROLS (CLOUD) command”

Using the AUDIT MEDIACONTROLS (CLOUD) command

When you specify the AUDIT MEDIACONTROLS (CLOUD(cloudname)) parameter, Audit examines the control information located in each APPMETA object for each possible DFSMSHsm image of a user data set in each of the HSMplex containers in the specified cloud. AUDIT then produces a list of errors.

Errors detected when using AUDIT MEDIACONTROLS for Cloud storage

DFSMSHsm will examine each container that matches the name SYSZARC.<plexname>.MIG.<yyyddd> for migrated data set images. For each pseudo-directory,

which is an object name that has a forward-slash within it, DFSMSHsm will examine that group of objects for validity as a migrated data set image.

- If no object ending with APPMETA (which contains the CDD record) can be found, AUDIT reports *ERR 210 with the container and prefix names.
- Using the CDD information, the MCDS is checked.
 - If there is no record in the MCDS,
 - If a catalog entry indicates the data set is migrated, AUDIT reports *ERR 133.
 - If a catalog entry indicates the data set is not migrated, AUDIT reports *ERR 208.
 - If there is no catalog entry for the data set, AUDIT reports *ERR 207.
 - If there was a record in the MCDS,
 - If there is no catalog entry for the data set, AUDIT reports *ERR 207
 - If a catalog entry indicates the data set is not migrated, AUDIT reports *ERR 208
 - If a catalog entry indicates the data set is migrated, but the data set record in the MCDS indicates the data set has been recalled, AUDIT reports *ERR 133
 - If a catalog entry indicates the data set is migrated, but the data set record in the MCDS indicates the data set is migrated to ML1 or ML2, or is a different migration copy, AUDIT reports *ERR 211.

Error Codes (*ERR) and diagnosis

Description	AUDIT Repair Action	Troubleshooting Hints
*ERR206 MCD INDICATES dsn IS IN CLOUD cloudname BUT NO CONTAINER contname OR OBJECTS WITH THE PREFIX prefix EXISTS		
MCD indicates that the data set is migrated to cloud but no container or no objects with the prefix that is stored in MCD exists.		If the data set is invalid and you want it deleted, you should issue an HSEND DELETE command, to have associated records deleted.
*ERR207 dsn NOT CATALOGED, HAS {VALID | INVALID} COPY IN CLOUD IN CONTAINER container		
The data set has a migration copy of userdsn in cloud, but that data set is not cataloged. The message text indicates whether the data set appears to be valid or invalid.	<p>If there is no data set D record, and no catalog entry, the migration copy (object) is deleted from cloud.</p> <p>If the D record identifies the data set is recalled and the data set is not cataloged, and the D record does not indicate that the migration copy needs to be scratched, a FIXCDS PATCH command is generated by</p>	<p>If there is a D record, but no catalog entry, and the D record appears to represent a valid migration copy, you should determine one of the following:</p> <p>If data set is invalid and you want it deleted, you should issue FIXCDS D dsn DELETE to delete MCD record and run AUDIT MEDIACONTROLS(CLOUD(cloudn</p>

	AUDIT to turn on the “needs scratch” indicator.	ame)) command with FIX option to remove migration copy from cloud. DFSMSdss can be used to Restore the data set directly.
*ERR208 dsn NOT MIGRATED, HAS COPY IN CLOUD IN CONTAINER container		
The data set have a migration copy of userdsn in cloud, but catalog indicates that dataset is not migrated.	If there is no data set D record and data set not cataloged as MIGRAT (recalled),the migration copy is deleted from cloud. If there is a D record, but the catalog does not indicate MIGRAT, and the D record is flagged other than "needs scratch," the D record is patched to indicate that the migration copy be scratched.	DFSMSdss can be used to restore the data set directly.
*ERR 209 NUMBER OF OBJECTS FOR dsn IN CLOUD IS NOT EQUAL TO THE VALUE THAT IS STORED IN MCD		
Real number of objects for data set dsn migrated to cloud is not equal to the number of objects value that is stored in MCD. Migration copy can be invalid.		Contact IBM support.
*ERR 210 CDD IS NOT FOUND FOR PREFIX prefix IN CONTAINER container		
Objects were found for pseudo-directory <i>prefix</i> but an APPMETA object could not be found to further examine the migration copy.		Use the LIST CLOUD command to list what objects exist for that prefix. It may be possible to use the DFSMSdss RESTORE command to recover the data set.
*ERR 211 prefix IS OLD MIGRATION COPY OF dsname IN CONTAINER containername		
A migration copy for <i>dsname</i> was found in container <i>container</i> , but it is not the most recent version	The migration copy will be deleted.	If desired, the old migration copy may be recovered using the DFSMSdss RESTORE command.

Using the LIST command

The table listing what categories of information you can list is updated to include “Cloud storage”.

The table under “Requesting data set information from the MCDS” is updated with the additional information:

The description for MIGVOL is updated to include:

If the data set has been migrated to cloud storage, this field contains %CLOUD.

The description for QTY 16K BLKS is modified as follows:
 This field does not apply to DASD migration volumes, or cloud.

Printer Output Label (OUTDATASET or SYSOUT)	Terminal Label	Description
****	CLOUD	SMS Cloud construct name for target Cloud storage
****	CONTAINER	Name of container where the migration copy was placed
****	OBJECT PREFIX	Pseudo-directory name for the migration copy. It is a common unique prefix for all objects that make up a migration copy.

Add a new section titled, “Requesting information for Cloud storage” as follows:

Requesting information for Cloud storage

You specify LIST CLOUD(cloudname) to get a list of the contents of cloud storage at various levels. The first level, LIST CLOUD(cloudname), will return a list of the DFSMSHsm containers that are found in the specified cloud. The next level, LIST CLOUD(cloudname) CONTAINER(containername), will return a list of the pseudo-directories found within the container. The pseudo-directory name is simply a prefix for all of the objects within a particular migration copy. The last level, LIST CLOUD(cloudname) CONTAINER(containername) PREFIX(objectprefixname), will return a list of all of the objects that make up that migration copy.

Printer Output Label (OUTDATASET or SYSOUT)	Terminal Label	Description
CLOUD NAME	CLOUD NAME	SMS Cloud construct name that listing was retrieved from.
CONTAINER NAME	CONTAINERS	Name of container
PREFIX NAME	OBJECT PREFIXES	Pseudo-directory name for the migration copy. It is a common unique prefix for all objects that make up a migration copy.
CLOUD INFORMATION FOR DATASET	DATASET NAME	The name of the original data set that was migrated, if an APPMETA object is found with valid DFSMSHsm information.
OBJECT NAME	OBJECT NAMES	The full object name.

Using the REPORT command

The section, “Requesting a report of the daily statistics for all functions”, will have the row for **12 and 13** updated as follows:

Under MIGRATION, a sentence at the end of the paragraph will be added with the following:
The PRIMARY to CLOUD category includes data set migrations by reconnection.

The section, “Requesting a report of the volume statistics for all functions”, will have an additional row type 7 added as follows:
NUMBER OF TRACKS RECONNECTED TO CLOUD=*xxxxxx* This field shows the number of tracks on level 0 volumes that were freed by reconnection.

The row for line number 11 and 12, under MIGRATION, a sentence at the end of the paragraph will be added with the following:

The PRIMARY to CLOUD category includes data set migrations by reconnection.

Using the QUERY command

Under the SETSYS section, add a new message ARC444I as follows:

ARC0444I CLOUDMIGRATION RECONNECT(ALL | NONE)

Under the STATISTICS section, update ARC157I as follows:

ARC0157I DS MIGRATE L1=*nlev1*, DS MIGRATE L2=*nlev2*, DS MIGRATE CLOUD=*ncloud*, DS EXTENT REDUCTIONS=*exts*, DS MIGRATE FAIL=*fails*, TRKS MIGRATED=*tracks*, {KBYTES | MBYTES | GBYTES | TBYTES} MIGRATED=*nbytes*

Under the STATISTICS section, update ARC158I as follows:

ARC0158I DS RECALLED L1=*nlev1*, DS RECALLED L2=*nlev2*, DS RECALLED CLOUD=*ncloud*, DS RECALL FAIL=*fails*, {BYTES | KBYTES | MBYTES | GBYTES | TBYTES} RECALLED=*nbytes*, RECALL MOUNTS AVOIDED=*avoided*, EXTRA ABACKUP MOUNTS=*extras*

DFSMSHsm Diagnosis

The DFSMSHsm Diagnosis manual, GC52-1387-00, is updated as follows:

Chapter 8. Diagnosing from Return codes and reason codes, Table 3. Entries That Pass Error Codes to ARCERP , rows for ARCCLSRV and ARCMLECD are added to the table.

Error Code Process Level Description of Problem

ARCCLSRV

400	SNAP	Invalid macro ID
401	SNAP	No function specified
402	SNAP	More than 1 function specified
403	SNAP	Check Password input bad

- 404 SNAP Invalid object name (Delete object function)
- 405 SNAP Invalid input for Retrieve Object
- 406 SNAP Invalid input for List Prefix
- 407 SNAP No ZWEBP pointer passed in continuous mode
- 408 SNAP Count object request with blank object or
container name
- 409 SNAP List object request with blank object or
container name

ARCMLECD

- 400 SNAP Invalid Task ID
- 401 SNAP Invalid MTCB ID
- 402 SNAP No RCB provided
- 403 SNAP RCB contains invalid information

In Chapter 9, after the section titled, “Analyzing the CELL POOL free chain”, add the following:

Requesting Verbose Output from the z/OS Client Web Enablement Toolkit

DFSMSHsm utilizes the z/OS Client Web Enablement Toolkit for its communication with the Cloud. The HTTP/HTTPS Enabler Portion allows callers to request Verbose output to aid in diagnosing errors. This patch command causes both DFSMSHsm and DFSMSdss to request the verbose output. DFSMSHsm will dynamically allocate a DD for the verbose output when the patch is turned on. If DFSMSdss is executing within the DFSMSHsm address space, the verbose output from its calls to the HTTP/HTTPS Enabler Portion will also be put into that DD. If DSSXMMODE(MIGRATION(Y)) is in effect, the verbose output will be in dynamically allocated DDs in the Joblog for the ARCxMIGR address space.

The following PATCH command causes the Verbose output to be requested:

```
PATCH .ARCCVT.+5D4 BITS(.....1..)
```

The following PATCH command will cease the recording of verbose output:

```
PATCH .ARCCVT.+5D4 BITS(.....0..)
```

Diagnosing Errors when Accessing the Cloud

When setting the password for a particular cloud, DFSMShsm will attempt communication with the cloud using the credentials in the SMS Cloud construct. If there is an issue, an error message will be issued.

HWTHCONN Return code x'00000106'

- Verify that the URL in the SMS Cloud construct is correct. (Look for missing characters in http://, or the name is correct.)

Possible Message
ARC1582I UNEXPECTED RETURN CODE X'00000106' FROM SERVICE HWTHCONN WITH ARC1582I (CONT.) RSN=X'001C0001' SVC=X'00000001' AND ERRTXT=EDC9501I The name ARC1582I (CONT.) does not resolve for the supplied parameters.
ARC1582I UNEXPECTED RETURN CODE X'00000106' FROM SERVICE HWTHCONN WITH ARC1582I (CONT.) RSN=X'000B0000' SVC=X'00000468' AND ERRTXT=EDC8128I ARC1582I (CONT.) Connection refused.

HTTP 404 return code (Not Found)

- Verify that the Port in the SMS Cloud construct is correct for the Cloud server.
- Verify the Authentication type required by the Cloud Object Storage. (Tape-Object, Swift or Swift-Keystone)

Possible Message:
ARC1581I UNEXPECTED HTTP STATUS 404 DURING A GET FOR ARC1581I (CONT.) URI http://127.0.0.1/auth/v1.0 ERRTXT No ARC1581I (CONT.) Reply from Server
ARC1581I UNEXPECTED HTTP STATUS 404 DURING A GET FOR ARC1581I (CONT.) URI http://127.0.0.1/auth/v1.0 ERRTXT HTTP/1.1 404 ARC1581I (CONT.) Not Found

HTTP 401 (Unauthorized)

- Verify that the tenant and userid for the Cloud storage is correct. (These credentials are often case sensitive, so also check that the correct uppercase and lowercase letters are used.)
- Ensure that the password is correct. A common error is the password being made Uppercase by the system because single quotes were not used around the password, or it was not entered from the System Command Extension popup panel.
- Check the Cloud server for full logs or other issues.

Possible Message:

```
ARC1581I UNEXPECTED HTTP STATUS 401 DURING A POST FOR URI
ARC1581I (CONT.) http://127.0.0.1/v2.0/tokens/ ERRTXT HTTP/1.1 401
ARC1581I (CONT.) Unauthorized
```

DFSMShsm Data Areas

The following data areas are updated as follows:

DSR – Daily Statistics Record

The length of the Daily Statistics Record is increased to 2048 bytes

The list of functions (1-14) is updated to include:

15. Primary to Cloud Migration

16. Recall from Cloud to primary

The first line of the DSRFSTAT is updated to be 16 entries long as follows:

182(B6)	118(76)	CHARACTER	64(16)	DSRFSTAT
---------	---------	-----------	--------	----------

FSR – Function Statistics Record

The FSRTYPE values are extended to include:

25 = Primary to Cloud migration

26 = Recall from Cloud to primary

The FSRFLG6 field at offset 298 (12A) is updated with a new bit as follows:

```
.1... ....          FSRFXPLC          When set to 1, indicates that the
                                     data set being expired is from
                                     Cloud storage.
```

Additionally, when the FSRTYPE is 25 or 26 (related to Cloud), the area following the FSR (starting at offset 300 (12C) contains the following fields.

300	(12C)	STRUCTURE	174	FSRCLLOUD	Cloud Location entry
300	(12C)	FIXED	2	FSRCLNML	Length of Cloud Construct Name
302	(12E)	CHARACTER	30	FSRCLNM	Cloud Construct Name
332	(14C)	CHARACTER	44	FSRCLCNT	DFSMShsm Container name used
376	(178)	FIXED	4	FSRCLOB#	Count of objects created
380	(17C)	CHARACTER	44	FSRPFXNM	Prefix of objects
424	(1A8)	CHARACTER	50	*	Reserved

MCD – Migration Control Data Set Data Set Record

For data sets migrated to Object storage in the cloud, the length of the MCD is 520 bytes long, plus 80 (for the Cloud information).

A new bit is added to the MCDMDEVT field for entries in the Cloud.

153 (99)	89 (5)	BITSTRING	1	*	
		.... ..1		MCDFMVCL	On for Cloud type (in conjunction with MCDTPDEV)

A new bit is added to the MCDFLGS3 field.

448 (1C0)	384 (180)	BITSTRING	1	MCDFLGS3	
		.... ..1.		MCDF_CLOUD	On indicates MCD is for a migration copy stored in Cloud Storage.

A new field is added.

454 (1C6)	390 (186)	CHARACTER	1	MCD_MCDMCANM_FCHAR	First char from MCDMCANM after Recall.
-----------	-----------	-----------	---	--------------------	--

The following structure exists for MCD records that MCDF_CLOUD is ON. It is located immediately after the MCD structure.

0 (0)	456 (1C8)	STRUCTURE	80	MCD_CLD_INFO	MCD extension for Cloud information
0 (0)	456 (1C8)	FIXED	2	MCD_CLOUD_NAME_LENGTH	Length of Cloud Construct Name
2 (2)	458 (1CA)	CHARACTER	30	MCD_CLOUD_NAME	Name of Cloud Construct
32 (20)	488 (1E8)	CHARACTER	44	MCD_CONTAINER_NAME	Name of Container
76 (4C)	532 (214)	FIXED	4	MCD_OBJ_NUMBER	Number of objects stored (Not including multi-part objects)

MCVT – Management Communication Vector Table

A new field allowing specification of the interval between when Containers are created is created.

661	(295)	BITSTRING	1	*	This byte contains the following flags:
		.... ..1		MCVTF_CLOUD_PSWD_SET	ON-At least one

					Cloud password is set
1172	(494)	FIXED	2	MCVT_CEC_MAX	MAX processes per CEC
1295	(50F)	FIXED	1	MCVT_CONT_P	Interval of days before creating a new container, calculated from the beginning of the year. Default to 7
1316	(524)	FIXED	4	* (2)	Reserved
1324	(52C)	CHARACTER	4	MCVT_CONT_DATE	Cloud storage container creation date
1328	(530)	ADDRESS	4	MCVT_CLD@	Pointer to Cloud Control Block
1332	(534)	FIXED	4	* (4)	Reserved
1492	(5D4)	CHARACTER	4	MCVT_TRACEFLG	Trace flags plus
		.... .1..			MCVT_WEBTKDBG Enable Web Toolkit Verbose output
1496	(5D8)	ADDRESS	4	MCVTWDBGD	Web Toolkit Debug DCB pointer

The following structure contains information about the Cloud object storage servers DFSMShsm knows about. It is addressed by the MCVT_CLD@ pointer:

0	(0)	STRUCTURE	824	MCLD	
0	(0)	CHARACTER	8	MCLD_ID	Control block eyecatcher MCVTCLDE
8	(8)	FIXED	2	MCLD_ENTRY#	Number of cloud information entries
10	(A)	BITSTRING	2	MCLD_FLAGS	Flags

The following cloud information entries, starting at offset 12 (C) hold information about Cloud Object Storage servers.

12	(C)	STRUCTURE	116	MCLD_ENTRY	
12	(C)	CHARACTER	30	MCLD_NM	Name of Cloud Construct
14	(E)	FIXED	2	MCLD_NM#	Length of Cloud construct
16	(10)	BITSTRING	4	MCLD_FLG	Flags for cloud entry
		1...			MCLD_VALID This entry is valid
20	(14)	CHARACTER	80	MCLD_PW	Encrypted Password area

Table 110. MCVT Data Area Cross-Reference Table (continue)

Name	Hex Offset	Hex Value	Struct Level
MCVTF_CLOUD_PSWD_SET	295	01	3
MCVT_CEC_MAX	494		2

Table 100. MCR—Management Control Record (continue)

Offsets	Actual /	FIXCDS	Type	Length	Name	Description
---------	----------	--------	------	--------	------	-------------

```

64(40) 0(0) BITSTRING 4 MCRFLAGS      The next 4 bytes contain
                                          the following DFSMSHsm
                                          control flags:
66(42) 2(2) ...1 .... MCRF_ECDP      ON, Empty container
                                          deletion function is running
          .... 1... MCRF_ECDF        ON, Empty container
                                          deletion function has run as
                                          needed
          .... .1.. MCRF_ECD_NEEDED ON, Empty container
                                          deletion function should be
                                          done
          .... ..xx *                Reserved

```

MCR Data Area Cross-Reference

Table 101. MCR Data Area Cross-Reference Table (continue)

Name	Hex Offset	Hex Value	Struct Level
MCRF_ECD_NEEDED	42	08	4
MCRF_ECDF	42	10	4
MCRF_ECDP	42	04	4

MCV—Migration Control Data Set Volume Record

Table 106. MCV—MCDS Volume Record (continue)

Offsets

Actual /	FIXCDS	Type	Length	Name	Description
288(120)	224(E0)	CHARACTER	2	MCVFLGS5	Flag bits
		...1	....	MCVF_WORM	ON if device reported WORM media
		....	1...	MCVF_CLOUD_MIG	ON if Cloud migration was performed during PSM
		....	.1..	MCVF_NOCLOUD_MIG	ON if migration to non-Cloud tier was performed during PSM
		....	..xx	*	Reserved

MCV Data Area Cross-Reference

Table 107. MCV Data Area Cross-Reference Table (continue)

Name	Hex Offset	Hex Value	Struct Level
MCVF_CLOUD_MIG	120	08	4
MCVF_NOCLOUD_MIG	120	04	4
MCVF_WORM	120	10	4

MGCB – Migration Global Control Block

New fields are added at the following offsets.

148	(94)	ADDRESS	4	MGCB_MC_PTR	Pointer to the MC array area If a byte of this array is not zero, ARC0279I was not issued for the corresponding Management Class.
152	(98)	CHARACTER	2	MGCB_MPE_TIME	PSM earlier checking time in HHMM
154	(9A)	FIXED	2	*	Reserved
156	(9C)	FIXED	4	*(2)	Reserved
164	(A4)	FIXED	2	*	Reserved
274	(112)	BITSTRING	2	MGCB_FLAGS_CLD	Flags for Cloud Storage
		1... ..		MGCBF_CLD_RCN_ALL	ON = Reconnect(All) specified for migration to Cloud
		.1... ..		MGCBF_CLD_RCN_NONE	ON = Reconnect(None) specified for migration to Cloud
		...1		MGCBF_AM_CLOUD	ON = MAC(CLOUDONLY | ALL) is Specified
		.... 1...		MGCBF_AM_NOCLOUD	ON = MAC(ALL | NOCLOUD) is specified
		.... .1..		MGCBF_CLOUD_SAVE	Copy of MGCBF_AM_CLOUD at the AM start
		.... ..1.		MGCBF_NOCLOUD_SAVE	Copy of MGCBF_AM_NOCLOUD at the AM start
		.... ...1		MGCBF_MPE	ON = MIGRATIONPSMEARLY(YES) is specified
275	(113)	1... ..		MGCBF_ECD	ON = MAXSSMTASK(ECD()) value is set
		.1... ..		MGCF_NEW_MVT_CHAIN ON	- SMS MVT chain should be rebuilt
		..xx xxxx		*	Reserved
279	(117)	FIXED	1	MGCB_ECD#	Number of SSM tasks for empty Cloud storage container deletion
338	(152)	FIXED	2	MGCB_WAIT_CEC	Wait time in sec. before the skipped MDQE/VOLUME will be processed
352	(160)	ADDRESS	4	MGCB_AFF_LISTP	Affinity hosts list PTR
356	(164)	SIGNED	4	*(2)	Reserved

Table 114. MGCB Data Area Cross-Reference Table

Name	Hex Offset	Hex Value	Struct Level
MGCB_AFF_LISTP	160		3
MGCB_ECD#	117		5
MGCB_MC_PTR	94		3

MGCB_MPE_TIME	98		3
MGCB_WAIT_CEC	152		3
MGCBF_AM_CLOUD	112	10	7
MGCBF_AM_NOCLLOUD	112	08	7
MGCBF_CLOUD_SAVE	112	04	7
MGCBF_ECD	113	80	7
MGCBF_MPE	112	01	7
MGCBF_NOCLLOUD_SAVE	112	02	7
MGCF_NEW_MVT_CHAIN	113	40	7

MHCR – Multiple – DFSMSHsm-Host Control Record

New fields are added at the following offsets.

852 (354)	788 (314)	CHARACTER	64	Reserved	
916 (394)	852 (354)	STRUCTURE	824	MHCR_CLD	
916 (394)	852 (354)	CHARACTER	30	MHCR_CLDNM	Cloud Construct name
946 (3B2)	882 (372)	FIXED	2	MHCR_CLDNM#	Cloud Construct name len
948 (3B4)	884 (374)	BITSTRING	4	MHCR_CLDFLG	Flags for this entry
		1... ..		MHCR_CLD_VALID	This entry is valid
952 (3B8)	888 (378)	CHARACTER	80	MHCR_CLDPW	Encrypted Password area

MVT—Mounted Volume Table Entry

Table 119. MVT—MCDS Volume Record

Offsets

Decimal (Hex)	Type	Length	Name	Description
89 (59)	.... 1...		MVTF_CLD	ON = unit is connected to Cloud
	.... .1..		MVTF_CEC_BUSY	ON - Volume CEC threads are busy

Table 120. MVT Control Block Cross-Reference Table

Name	Hex Offset	Hex Value	Struct Level
MVTF_CEC_BUSY	59	04	4
MVTF_CLD	59	08	4

VSR – Volume Statistics Record

The Volume Statistics Record is expanded to be 2048 bytes long.

The VSRVTYP field can now additionally have the type of 'C' for a volume type of Cloud.

The VSRFSTAT array is expanded to include two more entries.

15 – Automatic Primary primary to cloud

16 – Recall from Cloud to automatic primary

z/OS MVS Diagnosis: Reference

System Reference

Serialization summary

ENQ/DEQ Summary

Add the following row to the table:

Major (QNAME)	Minor (RNAME)	Resource – Using modules
SYSZADRO	Object prefix	Serializes a set of objects in cloud storage for DFSMS

z/OS MVS Initialization and Tuning Reference

Members of SYS1.PARMLIB

DEVSUPxx (device support options)

IBM-supplied defaults for DEVSUPxx

Add a bullet before DISABLE(PPRCMT):

- DISABLE(AOM496I)

Statements and parameters for DEVSUPxx

Add the following feature to the {ENABLE|DISABLE} description:

AOM496I

Enables or disables the issuing of the AOM496I status message on the console for transparent cloud tiering operations

DISABLE(AOM496I)

When the AOM496I feature is disabled, the AOM496I status message for transparent cloud tiering operations is not issued to the console. The following message is issued when ENABLE(AOM496I) is present in the DEVSUPxx member:

'IEA253I DEVSUP AOM496I IS DISABLED'

ENABLE(AOM496I)

When the AOM496I feature is enabled, the AOM496I status message for transparent cloud tiering operations is issued to the console. The following message is issued when DISABLE(AOM496I) is present in the DEVSUPxx member:

'IEA253I DEVSUP AOM496I IS DISABLED'

Default: DISABLE(AOM496I)

z/OS MVS System Messages, Vol 1 (ABA-AOM)

ADR Messages

ADR048T (New)

ADR048T (ttt)-mmmmm(yy), THE INVOKING APPLICATION IS NOT LICENSED TO USE A REQUESTED FEATURE, reason_code

Explanation: DFSMSdss has been requested to perform a function that requires a license agreement when invoked via an application. The reason codes are:

1 Transparent cloud tiering operation using a tape object store.

System action: The job ends. The return code is 12.

Operator response: None.

Application Programmer Response: If you are a licensed to use the reported feature, ensure the correct license is being passed and re-attempt the function.

Source: DFSMSdss

ADR380E (Changed)

The message explanation area will be updated to include a new reason code:

89

Restore from cloud storage encountered a preallocated target volume that is not supported.

The Programmer Response section will be updated to provide an explanation for the new reason code:

89

Delete the data set on DASD, and resubmit the job.

ADR600E (New)

ADR600E (ttt)-mmmmm(yy), DATA SET *data_set_name* [ON VOLUME *volume_serial_number*] | VOLUME *volume_serial_number* FAILED, RETURN CODE *error_code*.

Explanation: DFSMSdss could not process the data set due to the condition code detected. The return codes are:

X'1' The data set resides on a 3380 device type.

X'2' The data set is a multi layered VSAM data set

X'3' The data set is a single striped multi-volume version 1 type

- X'4' The blocksize between the source and target does not match
- X'5' The data set is a VSAM data set that has key ranges
- X'6' The data set is a KSDS that has imbedded indexes
- X'7' The data set is a VSAM data set where high used RBA equals to the high allocated HBA
- X'8' CA/CI sizes between source and targets do not match
- X'9' The data set is a VSAM data set that has an incompatible CA size
- X'A' The data set is an integrated catalog facility user catalog.
- X'B' The data set is a multi-volume extended format version 2 sequential data set has an end of file on a volume other than the last.
- X'C' The VSAM data set has a CA size less than 15, was allocated by tracks, and has a track count greater than 16,777,215.

System Action: The return code is 8. The data set is not processed. Processing continues with the next data set, if any.

Operator Response: None.

Application Programmer Response: None

ADR601E (Changed)

ADR601E (*ttt*)-*mmmm*(*yy*), THE ANTRQST MACRO FAILED DURING {STORE | RETRIEVE} REQUEST FOR {OBJECTPREFIX *object_prefix_name* | OBJECT *object_name*} ON VOLUME *volume_serial_number* WITH RETURN CODE *return_code* AND REASON CODE *reason_code*
RETINFO RETURN CODE *retinfo_rc* REASON CODE *retinfo_rsn*
[AOMSERV RETURN CODE *aomserv_rc* REASON CODE *aomserv_rsn*
[CONTROLLER SENSE DATA *sense_data*
[CLOUD MESSAGE HEADER *cloud_header*
[STATUS CODE: *storage_controller_msg*

Explanation: DFSMSDss invokes the ANTRQST macro for a STORE or RETRIEVE request and ANTRQST fails with the listed hex return code *return_code*, reason code *reason_code*, and return information. For explanation of the return information refer to [ANTRQST return and reason codes](#).

The return information is formatted as follows:

retinfo_rc
return information return code (bytes 1-4)
retinfo_rsn
return information reason code (bytes 5-8)
aomserv_rc
return code from AOMSERV (bytes 9-10)

aomserv_rsn

reason code from AOMSERV (bytes 11-12)

sense_data

sense data returned from DS8000 Disk Controller (bytes 13-44)

cloud_header

Cloud Message Header (bytes 45-76)

Certain occurrences of this message will include additional messages from the storage controller *storage_controller_msg*. These are used by IBM support.

System Action: This error precludes the use of using cloud storage. The return code is 8.

Operator Response: None.

Application Programmer Response: See *z/OS DFSMS Advanced Copy Services* for an explanation of *return_code*, *reason_code*, and *ret_info*.

Source: DFSMSdss

ADR602E (New)

ADR602E (ttt)-mmmmm (yy), OBJECT PREFIX object_prefix ALREADY EXISTS IN THE SPECIFIED CONTAINER

Explanation: DFSMSdss found that a backup exists with the same object prefix in the specified container. By default, DFSMSdss will not overwrite existing backups in an object storage cloud.

System Action: The backup is not performed and processing continues with the next control statement. The return code is 8.

Operator Response: None

Programmer Response: Specify a different container or object prefix and rerun the job. If you would like to overwrite an existing backup there is a patch byte at offset x'5D' that can be used.

Source: DFSMSdss

ADR603I (New)

ADR603I (ttt)-mmmmm(yy), OBJECT object-prefix-name WAS {STORED TO | RETRIEVED FROM} THE CLOUD

Explanation: DFSMSdss was able to successfully store or retrieve object to or from the cloud.

System Action: Processing continues.

Operator Response: None.

Application Programmer Response: None.

Source: DFSMSdss

ADR604E (New)

ADR604E (ttt)-mmmmm(yy), **THE OBJECTS WITH** object-prefix-name **IN THE SPECIFIED CLOUD AND CONTAINER HAVE BECOME UNUSABLE**

Explanation: A failure occurred while trying to store an object related to the dump process or a data set and all related objects stored using the object-prefix-name are not usable due to a previous error encountered.

System Action: Processing continues. The return code is set to 8.

Operator Response: None.

Application Programmer Response: Prior to resubmitting the job using the same object-prefix-name, cloud, and container combination you have to delete all objects.

Source: DFSMSdss

ADR606E (New)

ADR606E (ttt)-mmmmm(yy), Z/OS HTTP/HTTPS CALLABLE SERVICES ENCOUNTERED AN ERROR WHILE PERFORMING A { HWTHCONN | HWTHINIT |HWTHRQST | HWTHDISC | HWTHSET } SERVICE, RETURN CODE rc

DIAGINFO: Diag_ReasonCode Diag_ServiceNum Diag_ErrorString

Explanation: A failure occurred while performing the identified z/OS Client Web Enablement Toolkit service.

System Action: This error precludes the use of using cloud storage. The return code is 8.

Operator Response: None.

Programmer Response: Refer to the identified z/OS HTTP/HTTPS callable service return code in the z/OS MVS Programming: Callable Services for High-Level Languages for an explanation of the encountered error.

Source: DFSMSdss

ADR607E (New)

ADR607E (ttt)-mmmmm(yy), Z/OS CLIENT WEB ENABLEMENT TOOLKIT FAILED WHILE PERFORMING A { CONNECT | STORE | RETRIEVE | CREATE CONTAINER | DISCONNECT } REQUEST [FOR OBJECT 'objectname']

Explanation: A failure occurred while performing the identified request.

System Action: The return code is 8.

Operator Response: None.

Programmer Response: None.

Source: DFSMSdss

ADR608E (New)

ADR608E (ttt)-mmmmm(yy), INPUT META-DATA OBJECT 'objname' NOT PRODUCED BY DFSMSDSS

Explanation: Either the input object is invalid for the type of RESTORE desired or the input was not produced by DFSMSdss.

System Action: The task ends. Processing continues with the next control statement. The return code is 8.

Operator Response: None.

Programmer Response: Take the appropriate action, depending on the error, and rerun the job.

Source: DFSMSdss

ADR609E (New)

ADR609E (ttt)-mmmmm(yy), I/O ERROR ON OBJECT 'objname' WHILE PROCESSING meta-record

Explanation: I/O errors were encountered while the indicated type of dump meta-record was being read during logical data set RESTORE processing.

System Action: The task ends. Processing continues with the next control statement. The return code is 8.

Operator Response: None.

Programmer Response: Use an alternate backup copy to restore the data set.

Source: DFSMSdss

ADR610E (New)

ADR610E (ttt)-mmmmm(yy), AN UNEXPECTED ERROR HAS BEEN ENCOUNTERED, *reason_code*

Explanation: DFSMSdss detected an unexpected internal error during processing of an HTTP/HTTPS request. The reason codes are:

- 0 An expected container name was not found
- 1 An expected object name was not found
- 2 An expected parameter list was not found

System Action: The operation is not performed and processing continues with the next control statement. The return code is 8.

Operator Response: None

Programmer Response: Search problem reporting databases for a fix for the problem. If no fix exists, contact the IBM® Support Center.

Source: DFSMSdss

ADR611W (New)

ADR611W (ttt)-mmmmm(yy), THE OBJECTS UNDER THE FOLLOWING NAMES WERE NOT SUCCESSFULLY PROCESSED

Explanation: A failure occurred while trying to store an object related to the dump process or a data set and all related objects that relate to the following need to be deleted since the dump failed for the data set

System Action: Processing continues. The return code is set to 4.

Operator Response: None.

Application Programmer Response: None.

Source: DFSMSDss

ADR612E (New)

ADR612E (ttt)-mmmmm (yy), AN ERROR WAS ENCOUNTERED WHILE ATTEMPTING AN ENQUEUE ON THE SPECIFIED CLOUD/CONTAINER/OBJECTPREFIX

Explanation: DFSMSDss encountered an error obtaining a SYSZADRO enqueue, the resource may already be in use.

System Action: The operation is not performed and processing continues with the next control statement. The return code is 8.

Operator Response: None

Programmer Response: Rerun the job when the backup is not in use by other users.

Source: DFSMSDss

ADR613I (New)

ADR613I (ttt)-mmmmm (yy), ATTEMPTING TO PERFORM *action*

Explanation: Either DEBUG(CLMSG(DETAILED)) was specified or message ADR606E follows this message. This message describes the action that was performed using the z/OS Web Enablement Toolkit. The *action* may be one of the following:

- 'TERMINATE A CONNECTION'
- 'INITIALIZE A CONNECTION HANDLE'
- 'INITIALIZE A REQUEST HANDLE'
- 'SET THE CLOUD URI'
- 'SET VERBOSE DEBUG OPTION'
- 'SET VERBOSE OUTPUT DD'
- 'SET SERVER PORT'
- 'CONNECT TO SERVER'
- 'DISCONNECT FROM SERVER'
- 'SET STORAGE-PASSWORD INFO'
- 'SET SSL OPTION'
- 'SET SSL VERSION'
- 'SET SSL KEY TYPE'
- 'SET SSL KEY'
- 'REQUEST OBJECT RETRIEVE'
- 'REQUEST OBJECT STORE'
- 'REQUEST AUTHENTICATION'
- 'REQUEST CONTAINER STATUS'
- 'REQUEST DELETE CONTAINER'
- 'REQUEST DELETE OBJECT'
- 'REQUEST LIST OBJECTS'

System Action: The operation continues. The return code is zero.

Operator Response: None

Programmer Response: None

Source: DFSMSDss

ADR614W (New)

ADR614W (ttt)-mmmmm(yy), HTTP COMMUNICATION SECURITY WAS NOT SPECIFIED, SENSITIVE PRIVATE DATA WILL NOT BE PROTECTED

Explanation: The specified cloud was not configured for SSL communication. Cloud account information is sent over the IP network unencrypted and is at risk of exposure.

System Action: Processing Continues. The return code is 4.

Operator Response: None.

Programmer Response: It is recommended that you configure your cloud construct for SSL communication. See the DFSMSdftp Storage Administration manual for information on defining the cloud construct.

Source: DFSMSdss

ADR615E (New)

ADR615E (ttt)-mmmmm(yy), CLOUD CONFIGURATION ERROR ENCOUNTERED [WHILE PROCESSING DATA SET dsname] [ON VOLUME volser], reason_code

Explanation: DFSMSdss encountered a problem with the provided cloud environment.

dsname The data set that was being processed at the time of the error.

volser The volume that was being processed at the time of the error.

reason_code The reason codes are:

1. The specified CLOUD provider type is not supported.
2. A volume was encountered that resides on a storage system that does not support the TAPE-OBJECT protocol.
3. The specified CLOUD has a provider type that does not match the endpoint's provider type.

System action: The return code is 8. If the message indicates a data set, it is not processed. If the message indicates a volume, the volume is not processed.

Operator response: None.

Application Programmer Response: Take the following action, depending on the reason code (reason_code):

1. Ensure the CLOUD being specified is one of the following DFSMSdss supported provider types:
 - a. SWIFT
 - b. SWIFT-KEYSTONE
 - c. TAPE-OBJECT
2. If a data set is being processed, ensure the data set resides on volume(s) that support the requested operation. Otherwise, specify a volume that resides on a storage system that supports the requested operation.
3. Ensure the CLOUD specified is properly configured. The provider type must be compatible with the endpoint.

Source: DFSMSdss

ADR705E (Changed)

ADR705E (ttt)-mmmmm(yy), INVALID {STORAGE CLASS | MANAGEMENT CLASS | CLOUD} NAME
{storage_class_name | management_class_name | cloud_name} SPECIFIED

Explanation: A nonexistent storage class, management class or cloud was specified in the STORCLAS, MGMTCLAS or CLOUD keyword.

System Action: Task ends with return code 8.

Operator Response: None.

Application Programmer Response: Specify a valid storage class/management class/cloud and rerun the job.

Source: DFSMSDss

ADR707E (Changed)

ADR707E (ttt)-mmmmm(yy), NOT AUTHORIZED TO USE {ADMINISTRATOR | BYPASSACS | CGCREATE | CONCURRENT | CONSOLID | CONVERTV | DEFRAG | DELCATE | FCCGFREEZE | FCFASTREVERSERESTORE | FCSETGTOK | FCTOPPRCPRIARY | IMPORT | INCAT | MANAGEMENT CLASS | PROCESS(SYS1) | RESET STORAGE CLASS | TOLERATE(ENQF) | PATCH | ZCOMPRESS | CLOUD} {KEYWORD | storage_class_name | management_class_name} FOR DATA SET dsname

Explanation:

Add the following bullet after the ZCOMPRESS line.

- CLOUD keyword – RACF FACILITY class authority to use the cloud feature.

Programmer Response:

Add the following bullet after the ZCOMPRESS line.

- CLOUD – You must be permitted READ access to either the STGADMIN.ADR.DUMP.CLOUD or STGADMIN.ADR.RESTORE.CLOUD profiles

ADR487W (Changed)

Need to change explanation to indicate not found in backup, which could include tape, dasd, or cloud.

ADR943E (Changed)

Change the explanation of the message:

DFSMSDss was requested to dump the data set as an open data set by a data base application, such as Information Management System (IMS™), through the application programming interface. But the data set is an indexed VSAM data set, and VALIDATE is required to dump that type of data set as an open data set. When dumping to an object storage cloud the data set cannot be processed as an open data set.

Change the programmer response:

You must change the data base application to specify VALIDATE rather than NOVALIDATE. When dumping to an object storage cloud the data set cannot be backed up while open (BWO).

ADR971E (Changed)

Add the following reason code.

09

The source data set is an extended format VSAM Alternate Index (AIX) and the target data set could not be allocated as an extended format Alternate Index because the entire sphere is not being processed. If the source is an extended format AIX, then the target must be an extended format AIX and in order to process it as such SPHERE must be specified.

ANT messages

ANTRQST return codes and reason codes

- Add the following reason code to the list of reason codes in
RQST_PESTPAIR_IO_ERROR EQU 7218 X'1C32'

RQST_PESTPAIR_IO_ERROR_CLOUD EQU 0032 X'0020'

*

* Meaning: The primary or secondary volume must not
* be participating in a Store Cloud or Retrieve Cloud
* Data operation.

*

* Action: Re-submit the command when the Store Cloud Data
* Cloud Data operation is complete.

*

- Add the following reason code to the list of reason codes in
RQST_FCESTABLISH_ERROR EQU 7610 X'1DBA'

RQST_FCESTABLISH_REAS_CLOUD_ERROR EQU 0200 X'00C8'

*

* Meaning: The specified target volume is participating
* in a Store Cloud Data or Retrieve Cloud Data operation.

*

* Action: Re-submit the command when the Store Cloud
* Data or Retrieve Cloud Data operation is complete.

*

- Add the following reason codes:

RQST_STORE_ERROR_REQUEST_NOT_SUPPORTED EQU 7805 X'1E7D'

*

* Meaning: The OBJSTORE STORE request is not supported by
* host software on the subsystem identified in the request.
* The specified subsystem microcode (LIC) level is less
* than the minimum microcode level required for the function.

*

* Action: Determine the microcode level (LIC) of
* the subsystem identified in the request.
* Ensure that the microcode is at the required level.
* After making changes or corrections,
* resubmit the Advanced Copy Services request.

*

RQST_STORE_IO_ERROR EQU 7806 X'1E7E'

*

* Meaning: For an OBJSTORE STORE request an I/O error
* was detected. Bytes 5-8 of the RETINFO field will contain
* an error reason code. These reason codes are documented below,
* and will have names that start with RQST_STORE_IO_REAS_xxx.

* Action: Take the action described in the reason code
* documentation.

RQST_STORE_IO_REAS_EXTENTS_NOT_VALID EQU 0001 X'0001'

* Meaning: When TYPE is set to CKDOBJ,
* the specified extents are not valid for the volume.

* Action: Correct the EXTENTS field value
* and reissue the request.

RQST_STORE_IO_REAS_DEVICE_NOT_BASE_VOL EQU 0002 X'0002'

* Meaning: The volume processing the command
* is not a base volume address.

* Action: Reissue the request to a base volume address.

RQST_STORE_IO_REAS_SOURCE_IS_PPRC_SEC EQU 0003 X'0003'

* Meaning: The source volume is the secondary
* of a Peer-to-Peer Remote Copy pair.

* Action: Make sure you specified the correct source volume.
* If the volume is correct, delete the PPRC pair
* for that volume and reissue the request.

RQST_STORE_IO_REAS_UNSUPPORTED_DATATYPE EQU 0004 X'0004'

* Meaning: The TYPE parameter is not set to one
* of the values supported by the storage control.

* Action: Make sure the operation specified by the
* TYPE parameter is supported by the storage control.
* After making changes or corrections, resubmit the request.

* If the problem persists, contact IBM support.

*

RQST_STORE_IO_REAS_CU_SERIAL_INCORRECT EQU 0005 X'0005'

*

* Meaning: The specified Control Unit Serial Number
* is not the serial number of the DS8000 Disk Controller
* processing the command.

*

* Action: Contact IBM support.

*

RQST_STORE_IO_REAS_VOL_ADDRESS_INCORRECT EQU 0006 X'0006'

*

* Meaning: When the TYPE is set to CKDOBJ,
* the specified source volume address is not the channel
* connection address of the volume that is processing
* this command.

*

* Action: Contact IBM support.

*

RQST_STORE_IO_ERROR_2 EQU 7807 X'1E7F'

*

* Meaning: For an OBJSTORE STORE request an I/O error
* was detected. Bytes 5-8 of the RETINFO field will contain
* an error reason code. These reason codes are documented below,
* and will have names that start with RQST_STORE_IO_2_REAS_XXX.

*

* Action: Take the action described in the reason code
* documentation.

*

RQST_STORE_IO_2_REAS_UNKNOWN_CLOUD_NAME EQU 0001 X'0001'

*

* Meaning: The specified Cloud Name is not configured
* to this DS8000 Disk Controller.

*

* Action: Correct the CLOUD field value
* and reissue the request.

*

RQST_STORE_IO_2_REAS_CLOUD_UNAVAILABLE EQU 0002 X'0002'

*

* Meaning: The specified Cloud is unavailable.

*
 * Action: Contact the cloud service provider
 * for the recommended action.
 *

RQST_STORE_IO_2_REAS_UNKNOWN_ACCOUNT EQU 0003 X'0003'
 *

* Meaning: The specified Account Name does not exist
 * in the specified Cloud.
 *

* Action: Correct the ACCOUNT field value
 * and reissue the request.
 *

RQST_STORE_IO_2_REAS_CONT_QUOTA_EXCEED EQU 0006 X'0006'
 *

* Meaning: The specified Container has exceeded
 * the container quota.
 *

* Action: Contact the cloud service provider
 * for the recommended action.
 *

RQST_STORE_IO_2_REAS_CLOUD_OUT_OF_SPACE EQU 0007 X'0007'
 *

* Meaning: The Cloud is out of space.
 *

* Action: Contact the cloud service provider
 * for the recommended action.
 *

RQST_STORE_IO_2_REAS_TRANSFER_ERROR EQU 0008 X'0008'
 *

* Meaning: A transfer error between the Cloud
 * and DS8000 Disk Controller has occurred.
 *

* Action: Contact the cloud service provider
 * for the recommended action.
 *

RQST_STORE_IO_2_REAS_CONCURRENT_TASKS EQU 0011 X'000B'
 *

* Meaning: The maximum number of concurrent cloud tasks
 * has been exceeded.
 *

* Action: Contact IBM support.

*

RQST_STORE_IO_2_REAS_INTERNAL_ERROR EQU 0012 X'000C'

*

* Meaning: An internal error occurred when synchronizing
* the Cloud task between the DS8000 Disk Controller CECs.

*

* Action: Contact IBM support.

*

RQST_STORE_IO_2_REAS_CLOUD_NOT_OPERAT EQU 0013 X'000D'

*

* Meaning: The required Cloud environment is not operational.

*

* Action: Contact IBM support.

*

RQST_STORE_IO_2_REAS_SOURCE_NOT_OPERAT EQU 0014 X'000E'

*

* Meaning: The designated source volume is not operational.

*

* Action: Make sure the correct source volume is specified
* in the request. After making changes or corrections, resubmit
* the request. If the problem persists, contact IBM support.

*

RQST_STORE_IO_2_REAS_OVERLAP_EXT EQU 0016 X'0010'

*

* Meaning: The extents specified in the store request overlap

*

* Action: Correct specified extents

*

RQST_STORE_IO_2_TAPE_OBJ_NOT_CONFIG EQU 0018 X'0012'

*

* Meaning: The application indicated the storage system
* should use tape object support, but the storage system is not
* configured for tape objects.

*

* Action: Ensure the storage system cloud provider is one
* supports tape objects.

*

RQST_STORE_IO_2_REAS_OBJ_STORE_IS_TPOBJ EQU 0019 X'0013'

*

* Meaning: The storage system is configured for tape object support, but the application did not indicate tape object is supported.

* Action: Ensure the cloud provider is one that supports tape objects.

RQST_STORE_IO_2_REAS_PROTOCOL_IS_NOT_SUP EQU 0020 X'0014'

* Meaning: The storage system is configured for tape object support, but the application did not indicate tape object is supported.

* Action: Ensure the cloud provider is one that supports tape objects.

RQST_STORE_IO_2_REAS_SOURCE_IN_FLASHCPY EQU 0240 X'00F0'

* Meaning: The source volume is in a FlashCopy relationship.

* Action: Make sure you specified the correct source volume. If the volume is correct, withdraw the FlashCopy relationship and reissue the request.

RQST_STORE_IO_2_REAS_SOURCE_PPRC_PRIM EQU 0242 X'00F2'

* Meaning: The source volume is a primary of a Peer-to-Peer Remote Copy pair.

* Action: Make sure you specified the correct source volume. If the volume is correct, delete the PPRC pair and reissue the request.

RQST_STORE_IO_2_REAS_SOURCE_IN_XRC EQU 0244 X'00F4'

* Meaning: The source volume is the primary in an XRC session.

* Action: Make sure you specified the correct source volume. If the volume is correct, delete the volume from the XRC

* session and reissue the request.

*

RQST_STORE_UNEXPECTED_ERROR EQU 7808 X'1E80'

*

* Meaning: For an OBJSTORE STORE request an unexpected error
* has occurred. The RETINFO field may contain diagnostic
* information:

* - return code from AOMSERV (bytes 9-10)

* - reason code from AOMSERV (bytes 11-12)

* - sense data returned from DS8000 Disk Controller (bytes 13-

*

* Action: Contact IBM support.

*

RQST_STORE_REQUEST_LOST_BY_SUBSYSTEM EQU 7809 X'1E81'

*

* Meaning: For an OBJSTORE STORE request the storage control
* lost knowledge of the asynchronous operation.

*

* Action: Contact IBM support.

*

RQST_STORE_ERROR EQU 7810 X'1E82'

*

* Meaning: For an OBJSTORE STORE request an error was
* detected. Bytes 5-8 of the RETINFO field will
* contain an error reason code. These reason codes
* are documented below, and will have names
* that start with RQST_STORE_REAS_XXX.

*

* Action: Take the action shown in the reason code
* documentation.

*

RQST_STORE_REAS_INVALID_TYPE_VALUE EQU 0004 X'0004'

*

* Meaning: The value supplied in the TYPE field
* is invalid. The TYPE field value must be CKDOBJ or METADATA.

*

* Action: Supply a correct TYPE field value.

*

RQST_STORE_REAS_INVALID_CLDLEN_VALUE EQU 0008 X'0008'

*

* Meaning: The value supplied in the CLOUDLEN field
* is invalid. The CLOUDLEN field must have a value
* from 1 to 30.

* Action: Supply a correct CLOUDLEN field value.

RQST_STORE_REAS_INVALID_OBJLEN_VALUE EQU 0012 X'000C'

* Meaning: The value supplied in the OBJECTLEN field
* is invalid. The OBJECTLEN field must have a value
* from 1 to 128.

* Action: Supply a correct OBJECTLEN field value.

RQST_STORE_REAS_INVALID_CNTRLEN_VALUE EQU 0016 X'0010'

* Meaning: The value supplied in the CONTAINERLEN field
* is invalid. The CONTAINERLEN field must have a value
* from 1 to 256.

* Action: Supply a correct CONTAINERLEN field value.

RQST_STORE_REAS_INVALID_ACCLLEN_VALUE EQU 0020 X'0014'

* Meaning: The value supplied in the ACCOUNTLEN field
* is invalid. The ACCOUNTLEN field must have a value
* from 1 to 256.

* Action: Supply a correct ACCOUNTLEN field value.

RQST_STORE_REAS_EXTENTS_COUNT_ERROR EQU 0024 X'0018'

* Meaning: The value supplied in the EXTENTS count field
* is invalid. The EXTENTS count field must have a value
* from 1 to 123.

* Action: Supply a correct EXTENTS count field
* value. This error can also be caused by the
* EXTENTS parameter pointing to an invalid storage
* location.

*
RQST_STORE_REAS_METADATA_LEN_ERROR EQU 0028 X'001C'

*
* Meaning: The value supplied in the BUFFERLEN field
* is invalid. The BUFFERLEN field must have a value
* from 1 to 4063.

*
* Action: Supply a correct BUFFERLEN field value.

*
RQST_STORE_REAS_INVALID_DEVICE EQU 0032 X'0020'

*
* Meaning: The specified device could not be accessed.

*
* Action: Supply a correct UCBPTR or DEVN.

*
RQST_STORE_REAS_CLOUD_ABEND EQU 0040 X'0028'

*
* Meaning: The value supplied in the CLOUD parameter
* is invalid or caused an abend when referencing
* the CLOUD parameter list.

*
* Action: Make sure that the CLOUD parameter
* points to a valid location in memory, and that if
* an ALET was specified on the ANTRQST macro,
* the ALET value is correct.

*
RQST_STORE_REAS_CONTAINER_ABEND EQU 0044 X'002C'

*
* Meaning: The value supplied in the CONTAINER parameter
* is invalid or caused an abend when referencing
* the CONTAINER parameter list.

*
* Action: Make sure that the CONTAINER parameter
* points to a valid location in memory, and that if
* an ALET was specified on the ANTRQST macro,
* the ALET value is correct.

*
RQST_STORE_REAS_OBJECT_ABEND EQU 0048 X'0030'

*
* Meaning: The value supplied in the OBJECT parameter

* is invalid or caused an abend when referencing
* the OBJECT parameter list.
*
* Action: Make sure that the OBJECT parameter
* points to a valid location in memory, and that if
* an ALET was specified on the ANTRQST macro,
* the ALET value is correct.
*
RQST_STORE_REAS_ACCOUNT_ABEND EQU 0052 X'0034'

*
* Meaning: The value supplied in the ACCOUNT parameter
* is invalid or caused an abend when referencing
* the ACCOUNT parameter list.
*
* Action: Make sure that the ACCOUNT parameter
* points to a valid location in memory, and that if
* an ALET was specified on the ANTRQST macro,
* the ALET value is correct.
*

RQST_STORE_REAS_EXTENTS_ABEND EQU 0056 X'0038'

*
* Meaning: The value supplied in the EXTENTS parameter
* is invalid or caused an abend when referencing
* the EXTENTS parameter list.
*
* Action: Make sure that the EXTENTS parameter
* points to a valid location in memory, and that if
* an ALET was specified on the ANTRQST macro, the
* ALET value is correct.
*

RQST_STORE_REAS_METADATA_ABEND EQU 0060 X'003C'

*
* Meaning: The value supplied in the BUFFER parameter
* is invalid or caused an abend when referencing
* the BUFFER parameter list.
*
* Action: Make sure that the BUFFER parameter
* points to a valid location in memory, and that if
* an ALET was specified on the ANTRQST macro, the
* ALET value is correct.

*
RQST_STORE_REAS_MESSAGE_ABEND EQU 0064 X'0040'

*
* Meaning: The value supplied in the MESSAGE parameter
* is invalid or caused an abend when referencing
* the MESSAGE parameter list.

*
* Action: Make sure that the MESSAGE parameter
* points to a valid location in memory, and that if
* an ALET was specified on the ANTRQST macro, the
* ALET value is correct.

*
RQST_STORE_REAS_INVALID_BPENC_VALUE EQU 0068 X'0044'

*
* Meaning: The value supplied in the BYPASSENC field
* is invalid. The BYPASSENC field value must be NO or YES.

*
* Action: Supply a correct BYPASSENC field value.

*
RQST_STORE_REAS_INVALID_UCBPTR EQU 0072 X'0048'

*
* Meaning: The specified device could not be accessed.

*
* Action: Supply a correct UCBPTR or DEVN.

*
RQST_STORE_REAS_INVALID_PROTOCOL_VALUE EQU 0076 X'004C'

*
* Meaning: The value supplied in the PROTOCOL field
* is invalid. The PROTOCOL field value must be S3,
* or SWIFT, or TAPE-OBJECT.

*
* Action: Supply a correct PROTOCOL field value.

*
RQST_STORE_SERVICE_ERROR EQU 7811 X'1E83'

*
* Meaning: A request has been made to an OBJSTORE STORE
* subsystem handler, and an error has been detected.

*
* Action: Contact IBM.

*

RQST_STORE_CLOUD_OPERATION_ERROR EQU 7812 X'1E84'

*
* Meaning: For an OBJSTORE STORE request an error
* has been detected for the cloud operation.
* RETINFO contains the following diagnostic information:
* - sense data returned from the Disk Controller (bytes 13-44)
* - Cloud Message Header (bytes 45-76)
*
* In addition, the MESSAGE field may contain additional informat
* from the cloud host.
*
* Action: Refer to the Cloud Message description.
*

RQST_RETRV_ERROR_REQUEST_NOT_SUPPORTED EQU 7813 X'1E85'

*
* Meaning: The OBJSTORE RETRIEVE request is not supported by
* host software on the subsystem identified in the request.
* The specified subsystem microcode (LIC) level is less
* than the minimum microcode level required for the function.
*
* Action: Determine the microcode level (LIC) of
* the subsystem identified in the request.
* Ensure that the microcode is at the required level.
* After making changes or corrections,
* resubmit the Advanced Copy Services request.
*

RQST_RETRV_IO_ERROR EQU 7814 X'1E86'

*
* Meaning: For an OBJSTORE RETRIEVE request an I/O error
* was detected. Bytes 5-8 of the RETINFO field will contain
* an error reason code. These reason codes are documented below,
* and will have names that start with RQST_RETRV_IO_REAS_XXX.
*
* Action: Take the action described in the reason code
* documentation.
*

RQST_RETRV_IO_REAS_EXTENTS_NOT_VALID EQU 0001 X'0001'

*
* Meaning: When TYPE is set to CKDOBJ,
* the specified extents are not valid for the volume.

*
* Action: Correct the EXTENTS field value
* and reissue the request.
*

RQST_RETRV_IO_REAS_DEVICE_NOT_BASE_VOL EQU 0002 X'0002'

*
* Meaning: The volume processing the command
* is not a base volume address.
*

* Action: Reissue the request to a base volume address.
*

RQST_RETRV_IO_REAS_IS_PPRC_SEC EQU 0003 X'0003'

*
* Meaning: The Channel Connection Address is
* the secondary of a Peer-to-Peer Remote Copy pair.
*

* Action: Make sure you issued the request to the correct
* volume. If the volume is correct, delete the PPRC pair
* for that volume and reissue the request.
*

RQST_RETRV_IO_REAS_UNSUPPORTED_DATATYPE EQU 0004 X'0004'

*
* Meaning: The TYPE parameter is not set to one
* of the values supported by the storage control.
*

* Action: Make sure the operation specified by the
* TYPE parameter is supported by the storage control.
* After making changes or corrections, resubmit the request.
* If the problem persists, contact IBM support.
*

RQST_RETRV_IO_REAS_CU_SERIAL_INCORRECT EQU 0005 X'0005'

*
* Meaning: The specified Control Unit Serial Number
* is not the serial number of the DS8000 Disk Controller
* processing the command.
*

* Action: Contact IBM support.
*

RQST_RETRV_IO_ERROR_2 EQU 7815 X'1E87'

*

* Meaning: For an OBJSTORE RETRIEVE request an I/O error
* was detected. Bytes 5-8 of the RETINFO field will contain
* an error reason code. These reason codes are documented below,
* and will have names that start with RQST_RETRV_IO_2_REAS_xxx.

* Action: Take the action described in the reason code
* documentation.

RQST_RETRV_IO_2_REAS_UNKNOWN_CLOUD_NAME EQU 0001 X'0001'

* Meaning: The specified Cloud Name is not configured
* to this DS8000 Disk Controller.

* Action: Correct the CLOUD field value
* and reissue the request.

RQST_RETRV_IO_2_REAS_CLOUD_UNAVAILABLE EQU 0002 X'0002'

* Meaning: The specified Cloud is unavailable.

* Action: Contact the cloud service provider
* for the recommended action.

RQST_RETRV_IO_2_REAS_UNKNOWN_ACCOUNT EQU 0003 X'0003'

* Meaning: The specified Account Name does not exist
* in the specified Cloud.

* Action: Correct the ACCOUNT field value
* and reissue the request.

RQST_RETRV_IO_2_REAS_UNKNOWN_CONTAINER EQU 0004 X'0004'

* Meaning: The specified Container does not exist
* in the specified Account.

* Action: Correct the CONTAINER field value
* and reissue the request.

RQST_RETRV_IO_2_REAS_UNKNOWN_OBJECT EQU 0005 X'0005'

*
 * Meaning: The specified Object does not exist
 * in the specified Container.
 *
 * Action: Correct the OBJECT field value
 * and reissue the request.
 *

RQST_RETRV_IO_2_REAS_TRANSFER_ERROR EQU 0008 X'0008'

*
 * Meaning: A transfer error between the Cloud
 * and DS8000 Disk Controller has occurred.
 *
 * Action: Contact the cloud service provider
 * for the recommended action.
 *

RQST_RETRV_IO_2_REAS_INSUFFIC_EXTENTS EQU 0009 X'0009'

*
 * Meaning: The number of bytes in cloud Object
 * will exceed the capacity of the extents
 * defined in the Target Volume Extent Entries.
 *
 * Action: Correct the EXTENTS field value to increase
 * the capacity and reissue the request.
 *

RQST_RETRV_IO_2_REAS_TARGET_NOT_GROUPED EQU 0010 X'000A'

*
 * Meaning: One or more of the target devices are not
 * in the grouped state to the same Path Group
 * as the volume processing the command.
 *
 * Action: Make sure the correct target volumes
 * are specified in the EXTENTS field value.
 * After making changes or corrections, resubmit
 * the request.
 *

RQST_RETRV_IO_2_REAS_CONCURRENT_TASKS EQU 0011 X'000B'

*
 * Meaning: The maximum number of concurrent cloud tasks
 * has been exceeded.
 *

* Action: Contact IBM support.

*

RQST_RETRV_IO_2_REAS_INTERNAL_ERROR EQU 0012 X'000C'

*

* Meaning: An internal error occurred when synchronizing
* the Cloud task between the DS8000 Disk Controller CECs.

*

* Action: Contact IBM support.

*

RQST_RETRV_IO_2_REAS_CLOUD_NOT_OPERAT EQU 0013 X'000D'

*

* Meaning: The required Cloud environment is not operational.

*

* Action: Contact IBM support.

*

RQST_RETRV_IO_2_REAS_TARGET_NOT_OPERAT EQU 0015 X'000F'

*

* Meaning: One or more of the designated target volumes
* are not operational.

*

* Action: Make sure the correct target volumes are specified
* in the request. After making changes or corrections, resubmit
* the request. If the problem persists, contact IBM support.

*

RQST_RETRV_IO_2_REAS_OVERLAP_EXT EQU 0016 X'0010'

*

* Meaning: The extents specified in the retrieve request overlap

*

* Action: Correct specified extents

*

RQST_RETRV_IO_2_REAS_TAPE_OBJ_NOT_CONFIG EQU 0018 X'0012'

*

* Meaning: The application indicated the storage system
* should use tape object support, but the storage system is not
* configured for tape objects.

*

* Action: Ensure the storage system cloud provider is one
* supports tape objects.

*

RQST_RETRV_IO_2_REAS_OBJ_STORE_IS_TPOBJ EQU 0019 X'0013'

*
* Meaning: The storage system is configured for tape object
* support, but the application did not indicate
* tape object is supported.

*
* Action: Ensure the cloud provider is one that supports
* tape objects.

RQST_RETRV_IO_2_REAS_PROTOCOL_IS_NOT_SUP EQU 0020 X'0014'

*
* Meaning: The storage system is configured for tape object
* support, but the application did not indicate
* tape object is supported.

*
* Action: Ensure the cloud provider is one that supports
* tape objects.

RQST_RETRV_IO_2_REAS_TARGET_IN_FLASHCPY EQU 0241 X'00F1'

*
* Meaning: One or more of the target volumes
* is in a FlashCopy relationship.

*
* Action: Make sure you specified the correct target volumes.
* If the volumes are correct, withdraw the FlashCopy relationshi
* for these volumes and reissue the request.

RQST_RETRV_IO_2_REAS_TARGET_IN_PPRC EQU 0243 X'00F3'

*
* Meaning: One or more of the target volumes is a primary
* or a secondary of a Peer-to-Peer Remote Copy pair.

*
* Action: Make sure you specified the correct target volumes.
* If the volumes are correct, delete the PPRC pairs
* for these volumes and reissue the request.

RQST_RETRV_IO_2_REAS_TARGET_IN_XRC EQU 0245 X'00F5'

*
* Meaning: One or more of the target volumes
* is the primary volume in an XRC session.

* Action: Make sure you specified the correct target volumes.
* If the volumes are correct, delete them from the XRC
* session and reissue the request.

RQST_RETRV_UNEXPECTED_ERROR EQU 7816 X'1E88'

*
* Meaning: For an OBJSTORE RETRIEVE request an unexpected error
* has occurred. The RETINFO field may contain diagnostic
* information:

- * - return code from AOMSERV (bytes 9-10)
- * - reason code from AOMSERV (bytes 11-12)
- * - sense data returned from DS8000 Disk Controller (bytes 13-

* Action: Contact IBM support.

RQST_RETRV_REQUEST_LOST_BY_SUBSYSTEM EQU 7817 X'1E89'

*
* Meaning: For an OBJSTORE RETRIEVE request the storage control
* lost knowledge of the asynchronous operation.

* Action: Contact IBM support.

RQST_RETRV_CLOUD_OPERATION_ERROR EQU 7818 X'1E8A'

*
* Meaning: For an OBJSTORE RETRIEVE request an error
* has been detected for the cloud operation.
* RETINFO contains the following diagnostic information:
* - sense data returned from the Disk Controller (bytes 13-44)
* - Cloud Message Header (bytes 45-76)

* In addition, the MESSAGE field may contain additional informat
* from the cloud host.

* Action: Refer to the Cloud Message description.

RQST_RETRV_ERROR EQU 7819 X'1E8B'

*
* Meaning: For an OBJSTORE RETRIEVE request an error was
* detected. Bytes 5-8 of the RETINFO field will

* contain an error reason code. These reason codes
* are documented below, and will have names
* that start with RQST_RETRV_REAS_XXX.

*
* Action: Take the action shown in the reason code
* documentation.

RQST_RETRV_REAS_INVALID_TYPE_VALUE EQU 0004 X'0004'

*
* Meaning: The value supplied in the TYPE field
* is invalid. The TYPE field value must be CKDOBJ or METADATA.

*
* Action: Supply a correct TYPE field value.

RQST_RETRV_REAS_INVALID_CLDLEN_VALUE EQU 0008 X'0008'

*
* Meaning: The value supplied in the CLOUDLEN field
* is invalid. The CLOUDLEN field must have a value
* from 1 to 30.

*
* Action: Supply a correct CLOUDLEN field value.

RQST_RETRV_REAS_INVALID_OBJLEN_VALUE EQU 0012 X'000C'

*
* Meaning: The value supplied in the OBJECTLEN field
* is invalid. The OBJECTLEN field must have a value
* from 1 to 128.

*
* Action: Supply a correct OBJECTLEN field value.

RQST_RETRV_REAS_INVALID_CNTRLEN_VALUE EQU 0016 X'0010'

*
* Meaning: The value supplied in the CONTAINERLEN field
* is invalid. The CONTAINERLEN field must have a value
* from 1 to 256.

*
* Action: Supply a correct CONTAINERLEN field value.

RQST_RETRV_REAS_INVALID_ACCLLEN_VALUE EQU 0020 X'0014'

* Meaning: The value supplied in the ACCOUNTLEN field
* is invalid. The ACCOUNTLEN field must have a value
* from 1 to 256.

* Action: Supply a correct ACCOUNTLEN field value.

RQST_RETRV_REAS_EXTENTS_COUNT_ERROR EQU 0024 X'0018'

* Meaning: The value supplied in the EXTENTS count field
* is invalid. The EXTENTS count field must have a value
* from 1 to 123.

* Action: Supply a correct EXTENTS count field
* value. This error can also be caused by the
* EXTENTS parameter pointing to an invalid storage
* location.

RQST_RETRV_REAS_METADATA_LEN_ERROR EQU 0028 X'001C'

* Meaning: The value supplied in the BUFFERLEN field
* is invalid. The BUFFERLEN field must have a value
* from 1 to 4063.

* Action: Supply a correct BUFFERLEN field value.

RQST_RETRV_REAS_INVALID_DEVICE EQU 0032 X'0020'

* Meaning: The specified device could not be accessed.

* Action: Supply a correct UCBPTR or DEVN.

RQST_RETRV_REAS_CLOUD_ABEND EQU 0040 X'0028'

* Meaning: The value supplied in the CLOUD parameter
* is invalid or caused an abend when referencing
* the CLOUD parameter list.

* Action: Make sure that the CLOUD parameter
* points to a valid location in memory, and that if
* an ALET was specified on the ANTRQST macro,

* the ALET value is correct.
*
RQST_RETRV_REAS_CONTAINER_ABEND EQU 0044 X'002C'

* Meaning: The value supplied in the CONTAINER parameter
* is invalid or caused an abend when referencing
* the CONTAINER parameter list.

* Action: Make sure that the CONTAINER parameter
* points to a valid location in memory, and that if
* an ALET was specified on the ANTRQST macro,
* the ALET value is correct.

RQST_RETRV_REAS_OBJECT_ABEND EQU 0048 X'0030'

* Meaning: The value supplied in the OBJECT parameter
* is invalid or caused an abend when referencing
* the OBJECT parameter list.

* Action: Make sure that the OBJECT parameter
* points to a valid location in memory, and that if
* an ALET was specified on the ANTRQST macro,
* the ALET value is correct.

RQST_RETRV_REAS_ACCOUNT_ABEND EQU 0052 X'0034'

* Meaning: The value supplied in the ACCOUNT parameter
* is invalid or caused an abend when referencing
* the ACCOUNT parameter list.

* Action: Make sure that the ACCOUNT parameter
* points to a valid location in memory, and that if
* an ALET was specified on the ANTRQST macro,
* the ALET value is correct.

RQST_RETRV_REAS_EXTENTS_ABEND EQU 0056 X'0038'

* Meaning: The value supplied in the EXTENTS parameter
* is invalid or caused an abend when referencing
* the EXTENTS parameter list.

*
* Action: Make sure that the EXTENTS parameter
* points to a valid location in memory, and that if
* an ALET was specified on the ANTRQST macro, the
* ALET value is correct.
*
RQST_RETRV_REAS_METADATA_ABEND EQU 0060 X'003C'

*
* Meaning: The value supplied in the BUFFER parameter
* is invalid or caused an abend when referencing
* the BUFFER parameter list.
*

* Action: Make sure that the BUFFER parameter
* points to a valid location in memory, and that if
* an ALET was specified on the ANTRQST macro, the
* ALET value is correct.
*

RQST_RETRV_REAS_MESSAGE_ABEND EQU 0064 X'0040'

*
* Meaning: The value supplied in the MESSAGE parameter
* is invalid or caused an abend when referencing
* the MESSAGE parameter list.
*

* Action: Make sure that the MESSAGE parameter
* points to a valid location in memory, and that if
* an ALET was specified on the ANTRQST macro, the
* ALET value is correct.
*

RQST_RETRV_REAS_VOLUMES_COUNT_ERROR EQU 0072 X'0048'

*
* Meaning: The value supplied in the EXTENTS volume count
* field is invalid. The EXTENTS volume count field must
* have a value from 1 to 64.
*

* Action: Supply a correct EXTENTS volume count field
* value. This error can also be caused by the
* EXTENTS parameter pointing to an invalid storage
* location.
*

RQST_RETRV_EXTENTS_DEV_ERROR EQU 7820 X'1E8C'

*
* Meaning: The specified EXTENTS parameter for a
* retrieve request contains an invalid device.
*
* Action: Correct the extents parameter
* and resubmit the request.

ANT messages

ANTP0279E (New)

ANTP0279E PPRC command COMMAND FAILED FOR DEVICE device. A STORE CLOUD OR RETRIEVE CLOUD DATA OPERATION IS IN PROGRESS FOR SPECIFIED PRIMARY OR SECONDARY

Explanation

The PPRC command issued to the MVSTTM device number, has failed because a cloud storage operation was in progress while processing the command.

System Action

The command is rejected.

System Programmer Response

Re-try the request.

Source

Peer-to-peer remote copy (PPRC).

ANTF0516E (New)

ANTF0516E FLASHCOPY ESTABLISH COMMAND FAILED FOR DEVICE device. A STORE CLOUD OR RETRIEVE CLOUD DATA OPERATION IS IN PROGRESS FOR THE TARGET VOLUME

Explanation

The FlashCopy[®] command issued to device has failed because a cloud storage operation was in progress while processing the command.

System Action

The command is rejected.

System Programmer Response

Re-try the request.

Source

ESS FlashCopy

AOM messages

AOM496I

AOM496I devn,ID=xxxxxxxx,(Active, Queued, or Failed),T=nnn(s),Queue=mm,(Stored or Retrieved)/Total=yyyyyyyy/zzzzzzzz(tracks)

Explanation:

- devn: Device number that a cloud operation I/O was issued against.
- xxxxxxxx: A hexadecimal value as an ID to identify a cloud operation.
- Active, Queued, Failed: There are three possible statuses for a cloud operation.
- nnn: Decimal amount of time in seconds for a cloud operation.
- mm: Hexadecimal number to identify the position of a cloud operation in its queue before it starts.
- Stored or Retrieved: Two states of a cloud operation to store or retrieve object from a cloud.
- yyyyyyyy: Decimal value in tracks of the current amount of an object that has been moved.
- zzzzzzzz: Decimal value in tracks of the total amount of an object that needs to be moved.

System Action:

None

Programmer Response:

None

Source:

AOMDMIH

z/OS MVS System Messages, Vol 2 (ARC-ASA)

ARC messages

ARC0103I (changed)

ARC0103I INVALID SETSYS PARAMETER

Explanation: A SETSYS command was issued to establish or change the current setting of a parameter. The new keyword "MAXSSMTASKS" will be added:

MAXSSMTASKS (EMPTYCONTAINERDELETION)

This parameter is outside the range of 0 - 1.

ARC0138I (Changed)

ARC0138I NO {MCDS | BCDS | CLOUD | UNIQUE} INFORMATION FOUND FOR {VOLUME | DATASET | DUMPVOLUME | DUMPCCLASS | LEVEL | COPYPOOL | AGGREGATE GROUP | OBJECT PREFIX | CONTAINER NAME} key {VERSION(vvvv) | DATE(yyyy/mm/dd)}

Explanation:

A LIST or HLIST command was issued to list the following:

- Backup control data set (BCDS) information about a data set, volume key, dump class, aggregate group or copy pool key.
- Migration control data set (MCDS) information about a data set or volume key.
- Information from both MCDS and BCDS about a data set or volume key.
- AGGREGATE GROUP key -- The ABR record information was requested by the LIST command. key was the aggregate group name specified. * indicates that ABR record information was requested for all aggregate groups.
- VERSION(vvvv) -- VERSION was specified on the LIST AGGREGATE command. ABR records for VERSION(vvvv) for the specified aggregate groups were to be listed.
- DATE(yyyy/mm/dd) -- DATE was specified on the LIST AGGREGATE command. ABR records dated yyyy/mm/dd for the specified aggregate groups were to be listed.
- Cloud information about containers, prefixes, or objects.

No information was found for the data set, volume, level, dump class, aggregate group, copy pool, container or Cloud object with the serial number or name of key.

The special case of "NO UNIQUE INFORMATION FOUND FOR OBJECT PREFIX ...". This may be issued for a LIST CLOUD(cloud_name) CONTAINER(container_name) PREFIX(object_prefix)

command. When several pseudo-directories with that matching prefix are found in the Cloud, DFSMSHsm cannot determine which pseudo-directory to list.

System Action:

LIST or HLIST processing ends. DFSMSHsm processing continues.

Programmer Response:

The command might have been issued with the wrong control data set specified or implied. Reissue the LIST or HLIST command with the correct parameters.

Source:

DFSMSHsm

ARC0139I (changed)

**ARC0139I MAXINTERVALTASKS = *xx*, ONDEMANDMIGRATION={YES|NO},
ODMNOTIFICATIONLIMIT=*limit* MAXSSMTASKS (TAPEMOVEMENT=*mm*,
CLEANUP=*nn*, EMPTYCONTAINERDELETION=*kk*)**

The new keyword "EMPTYCONTAINERDELETION" will be added:

Explanation: A QUERY command was issued with the SETSYS parameter.

This message is issued by DFSMSHsm to describe its current operating environment.

EMPTYCONTAINERDELETION=*kk* specified the number of Cloud storage containers processing tasks. Only 0 or 1 values are acceptable. A value 0 indicates that Cloud storage containers deletion task will not be submitted.

System Action:

Processing fails. DFSMSHsm processing continues.

User Response:

Specify correct parameter.

Source:

DFSMSHsm.

ARC0157I (Changed)

**ARC0157I DS MIGRATE L1=*nlevel1*, DS MIGRATE L2=*nlevel2*, DS MIGRATE CLOUD=*ncloud*,
DS EXTENT REDUCTIONS=*exts*, DS MIGRATE FAIL=*fails*, {TRKS | KTRKS}
MIGRATE=*ntracks*, {BYTES | KBYTES | MBYTES | GBYTES | TBYTES} MIGRATE=*nbytes***

The Explanation for ARC0157I should have the following added:

- ncloud indicates the number of data sets that have migrated to Cloud Storage.

ARC0158I (Changed)

ARC0158I DS RECALL L1=ndatasets1, DS RECALL L2=ndatasets2, DS RECALL CLOUD=ndatasetscloud, DS RECALL FAIL=fails, {BYTES | KBYTES | MBYTES | GBYTES | TBYTES} RECALL=nbytes, RECALL MOUNTS AVOIDED=avoided, EXTRA ABACKUP MOUNTS=extras

The Explanation for ARC0158I should have the following added:

- ndatasetscloud indicates the number of data sets recalled from Cloud storage.

ARC0279I (changed)

ARC0279I { **MIGRATE | LIST | OPERATION** } REJECTED - { **SYSTEM** *system* **NOT FOUND | PASSWORD FOR** *nnnnnnnn* **NOT DEFINED | MANAGEMENT CLASS** *nnnnnnnn* **NOT FOUND | STORAGE CLASS** *nnnnnnnn* **NOT FOUND | STORAGE GROUP** *nnnnnnnn* **NOT FOUND | CLOUD NAME** *nnnnnnnn* **NOT FOUND | SMS NOT ACTIVE | SMS SUBSYSTEM ERROR** }

Explanation:

Migrate or List commands, Service Cloud operations, or automatic migration was submitted with incorrect parameter or SMS error occurs:

- Password for Cloud is not set.
- System, Management Class, Storage Class, Storage Group, or Cloud name was not found in SMS configuration.
- SMS not active.
- SMS subsystem error.

System Action:

Command fails. DFSMSHsm processing continues.

Operator Response:

None.

User Response:

Specify correct parameter, correct the SMS configuration, or set the password for the specified Cloud using the SETSYS CLOUD command with the CREDENTIALS parameter.

Application Programmer Response:

None.

System Programmer Response:

None.

Storage Administrator Response:

None.

Security Administrator Response:

None.

Problem Determination:

None.

Source:

DFSMSHsm.

ARC0444I (changed)

ARC0444I CLOUDMIGRATION RECONNECT(NONE | ALL), MIGRATEPSMEARLY(NO | YES), MIGRATIONAUTOCLOUD(ALL | CLOUDONLY | NOCLOUD)

Explanation:

A DFSMSHsm QUERY command was issued with the SETSYS parameter. DFSMSHsm issues this message to describe its current operating environment.

If RECONNECT(NONE) is displayed, DFSMSHsm will not attempt to reconnect to the CLOUD copy that the data set was most recently recalled from, but will, instead, migrate the data set in a normal manner. In addition, DFSMSHsm will not mark as reconnection candidates any data sets recalled while this setting is in effect.

If RECONNECT(ALL) is displayed, DFSMSHsm will attempt to reconnect to the CLOUD copy that the data set was most recently recalled from, even if the target level for a normal migration would be ML1 or ML2.

If MIGRATEPSMEARLY(YES) is displayed the new PSM earlier checking option is activated. If this option is activated, one day will be subtracted from the age check, up until midnight.

If MIGRATEPSMEARLY(NO) is displayed, then no data set age modifications will be done.

If MIGRATIONAUTO CLOUD(ALL) is displayed then data set migration to ML1, ML2, transition, and migration to Cloud storage are performed.

If MIGRATIONAUTO CLOUD(CLOUDONLY) is displayed than only data set migration to Cloud storage is performed.

If MIGRATIONAUTO CLOUD(NOCLOUD) is displayed than only data set migration to ML1, ML2, and transition is performed.

System Action:

DFSMSHsm processing continues.

Operator Response:

None.

User Response:

None.

Application Programmer Response:

None.

System Programmer Response:

None.

Storage Administrator Response:

None.

Security Administrator Response:

None.

Problem Determination:

None.

Source:

DFSMSHsm.

ARC0446I (new)

ARC0446I STORAGEGROUPAFFINITY(*system1, system2,... system15*)

Explanation:

A DFSMSHsm QUERY command was issued with the SETSYS parameter. DFSMSHsm issues this message to describe its current operating environment.

This message specifies a set of hosts that have affinity to process a storage group. Up to 15 host names can be specified.

System Action:

DFSMSHsm processing continues.

Source:

DFSMSHsm.

ARC0526I (changed)

ARC0526I { MIGRATION CLEANUP | EMPTY CONTAINER DELETION } STARTING AT *time* ON *date*, SYSTEM *sysid*, AT {BEGINNING RECORD | *cdskey* | *cloudname*} { RECORD | CLOUD }

Explanation:

Migration cleanup or empty container deletion is starting on *sysid* at the time *time* expressed as *hh:mm:ss* (hours, minutes, seconds), and date *date* expressed as *yy/mm/dd* (year, month, day), beginning at the control data set (CDS) record key *cdskey* or at the beginning of the migration control data set data set record (MCD) or at the beginning of the cloud array or from the *cloudname* cloud. The System Management Facility (SMF) system identifier of the system on which the migration is processed is *sysid*.

Source:

DFSMSHsm.

ARC0527I (changed)

ARC0527I { MIGRATION CLEANUP | EMPTY CONTAINER DELETION } ENDED AT *time*, *num* { MCDS RECORDS | EMPTY CONTAINERS } DELETED

The new positionals "EMPTY CONTAINER DELETION" and "EMPTY CONTAINERS" will be added:

Explanation:

DFSMSHsm migration cleanup or empty container deletion has ended. The number of MCDS records or the number of empty containers that was deleted is *num*. The completion time of the operation is *time*, expressed as *hh:mm:ss* (hours, minutes, seconds).

Source:

DFSMSHsm.

ARC0570I (changed)

ARC0570I {PRIMARY SPACE MANAGEMENT | INTERVAL MIGRATION | ON-DEMAND MIGRATION | COMMAND MIGRATION | AUTOMATIC BACKUP | COMMAND BACKUP | AUTOMATIC DUMP | COMMAND DUMP | RESTORE | RECOVERY | FRBACKUP | FRRECOV} FOR {ALL SMS MANAGED | *volser* | *volser*,SGROUP=*sg* | ALL COPY POOL | COPY POOL=*cpname* | SGROUP,SGROUP=*sg*} VOLUME(S) TERMINATED, RC=*return-code*, REASON=*reason-code*

The new return code will be added:

Retcode Meaning

39 The volume being processed is not connected to the Cloud storage

Retcode Action

39 Either alter the management class to not select cloud object storage or move the data set to a volume that is cloud storage capable.

ARC0734I (changed)

ARC0734I is modified as follows:

1. The meanings of variable VOLSER2 when action is MIGRATE will be modified:

Variable

Meaning

volsr2

The serial number of the volume to which the data set migrated. If no migration volumes were available, this field contains ***.

If this field contains %CLOUD, the data set was migrated to Cloud Storage.

2. The meanings of variable VOLSER2 when action is MIG-RCN will be modified:

Variable

Meaning

volsr2

The serial number of the migration level 2 tape on which the migration copy being reconnected to resides.

If this field contains %CLOUD, the migration copy being reconnected to Cloud Storage.

3. The new Return Code 32 will be added to "Table 13. Return Codes for Message ARC0734I When the Action is SCRATCH":

Table 13. Return Codes for Message ARC0734I When the Action is SCRATCH

Retcode	Meaning
32	Migration cleanup was trying to scratch an old migration copy from CLOUD, but the scratch attempt failed. The reason code is the return code from ARCCLSRV cloud service module.

The explanation for "ACTION=DELETED" will be changed:

DELETED — Delete a control data set record for a data set that is scratched or an empty container during SSM.

...

The meanings of variables "volser2" and "dsn" will be changed.

A new return code 93 will be added.

The meanings of variables when action is DELETED are:

Variable

Meaning

volser1

*** (not applicable).

volser2

This field is blank or *** (not applicable).

tracks

*** (not applicable).

retcode

If the last two digits of *retcode* are nonzero, see message ARC12nnI where *nn* is the last two digits of *retcode*.

If *retcode* is 9nn, an abend occurred after the return code was set to *nn*. There may be an associated ARC0003I message with more information about the abend. If *retcode* is 9nn (where *nn* is greater than 0), see message ARC12nnI where *nn* is the last two digits of *retcode*.

If *retcode* is 400–499, see the explanation of message ARC9998I for problem determination.

reascode

If *reascode* is nonzero, see the return code in message ARC12nnI where *nn* is the last two digits of *retcode*.

days

The number of days since the last backup of the data set or *** (not applicable).

dsn

Deleted container name or blank if *retcode* is not zero for empty container deletion function.

ARC1208I (changed)

Change the explanation as follows:

During a space management operation, the dynamic allocation or CLOUD service routine has attempted to allocate a migration data set. The allocation has failed with other than a no space indication. In message ARC1001I or ARC0734I, the reason codes *reascode* have the following values:

ARC1220I (new) (z/OS V2R1)

ARC1220I DATA SET NOT ELIGIBLE FOR MIGRATION

Explanation

Reascode Meaning	Explanation
38	MIGRATE DATASETNAME command was issued with CLOUD parameter, but the data set is non-SMS managed

System Action:

DATASET migration fails. DFSMSHsm processing continues.

Operator Response:

None.

User Response:

Specify correct cloud name.

Application Programmer Response:

Reascode	Meaning
38	Non-SMS data sets are not supported

System Programmer Response:

None.

Storage Administrator Response:

None.

Security Administrator Response:

None.

Problem Determination:

None.

Source:

DFSMSHsm.

ARC1220I (changed) (z/OS V2R2)

ARC1220I DATA SET NOT ELIGIBLE FOR MIGRATION

Explanation

Reascode	Meaning
36	Management class attributes restrict transition of this data set. MIGRATE DATASETNAME command was issued with TRANSITION keyword, but the ACS routines returned a management class, storage class and storage group

	that match the existing assigned constructs or management class, storage class or storage group specified by the optional parameters of TRANSITION or TRANSITIONONLY keyword are the same as the current SMS construct of this data set.
38	MIGRATE DATASETNAME command was issued with the TRANSITION or CLOUD parameter, but the data set is non-SMS managed

System Action:

DATASET migration fails. DFSMSHsm processing continues.

Operator Response:

None.

User Response:

Specify correct cloud name.

Application Programmer Response:

Reascode	Meaning
38	Non-SMS data sets are not supported

System Programmer Response:

None.

Storage Administrator Response:

None.

Security Administrator Response:

None.

Problem Determination:

None.

Source:

DFSMSHsm.

ARC1232I (Changed)

Add bullets to the explanation and programmer response

Explanation:

- The CLOUD parameter is specified in the migration request for the non-SMS managed or a non-primary volume. DFSMSHsm does not support space management for these volumes.

Programmer Response:

- If the space management command is a volume command with CLOUD parameter that failed because the volume is a non-SMS managed or non-primary volume, retry the migration command without CLOUD parameter.

ARC1245I (changed)

ARC1245I DATA SET NOT ELIGIBLE FOR MIGRATION

The new reason codes 9,10,11,12,13 will be added.

Explanation:

A space management operation has been requested for a data set that is not eligible for space management processing. In the preceding ARC1001I message or in the ARC0734I message, the values for *reascode* and its meaning are:

Reascode

Meaning

- | | |
|----|---|
| 9 | The SMS-managed data set is not eligible for migration or transition because the action, NONE, is specified for that data set size. |
| 10 | Primary volume, where the data set resides is not connected to the cloud storage. |
| 11 | Data set migration is denied by SETSYS MIGRATIONAUTOCLOUD parameter. (For example: Data set should go to ML1 or ML2, but MIGRATIONAUTOCLOUD(CLOUDONLY) is in effect. Or: Data set should go to cloud, but MIGRATIONAUTOCLOUD(NOCLLOUD) is in effect.) |
| 12 | Data set is not eligible for migration to cloud storage. |
| 13 | Password is not defined for cloud. |

Reascode

Action

- | | |
|----|--|
| 9 | None. |
| 10 | Either alter the management class to not select cloud object storage or move the data set to a volume that is cloud storage capable. |
| 11 | Data set is eligible to be processed by a host enabled for migrations to the appropriate tier. |
| 12 | Change Management Class parameters to make data set eligible for migration to cloud storage. |
| 13 | Define a password for cloud. |

ARC1293I (new)

ARC1293I ERROR OCCURRED DURING EMPTY CONTAINER DELETION FUNCTION

Explanation:

Empty container deletion function was performed during Secondary Space Management but an error occurred. The ARC0734I message, the values for *reascode* and its meaning are:

Reascode

Meaning

- 0 Unexpected error occurs during calls to the cloud using z/OS Client Web Enablement Toolkit. The empty container deletion function ends.
- 1 FREEMAIN error. The empty container deletion function ends.

ARC1379I (new)

ARC1379I CANNOT BACKUP DATA SET MIGRATED TO CLOUD

Explanation:

The data set identified in message ARC1001I resides in a CLOUD. Backup from CLOUD is not supported.

System action:

The backup operation ends. DFSMSHsm processing continues.

Programmer response:

A data set must be on a level 1 or primary volume to be eligible for DFSMSHsm backup. If you want to back up a data set migrated to CLOUD, you must recall it.

Source

DFSMSHsm

ARC1581I (new)

ARC1581I UNEXPECTED HTTP STATUS <status> DURING A {GET | PUT | POST | DELETE}
FOR URI <uri> ERRTEXT <error text>

Explanation:

While performing an HTTP request, an unexpected status code was returned. The URI used in the request is displayed, as well as the error text returned with the request.

System Action:

The current request fails. DFSMSHsm processing continues.

Operator Response:

None.

User Response:

None.

Application Programmer Response:

None.

System Programmer Response:

None.

Storage Administrator Response:

If you receive HTTP status 401, this may indicate that the password used to connect to the server is invalid.

Security Administrator Response:

None.

Problem Determination:

None.

Source:

DFSMSHsm.

ARC1582I (new)

ARC1582I UNEXPECTED RETURN CODE <rc> FROM SERVICE <service name> WITH
RSN=<rsn> SVC=<svc> AND ERRTEXT=<error text>

Explanation:

While performing an HTTP request, an unexpected return code was returned from the z/OS Client Web Enablement Toolkit.

System Action:

The current request fails. DFSMSHsm processing continues.

Operator Response:

None.

User Response:

None.

Application Programmer Response:

None.

System Programmer Response:

None.

Storage Administrator Response:

Ensure that the Unix System Services environment is set up correctly for the z/OS Client Web Enablement Toolkit to successfully issue HTTP requests over TCP/IP.

Security Administrator Response:

None.

Problem Determination:

None.

Source:

DFSMSHsm.

ARC1583I is no longer issued, being replaced by ARC0279I

ARC1584I (new)

ARC1584I SETSYS CLOUD - { SMS NOT ACTIVE | SMS SUBSYSTEM ERROR | NAME <cloud name> NOT FOUND | NO SLOTS AVAILABLE | NOT KNOWN TO DFSMSHSM }

Explanation:

The SETSYS CLOUD command was issued but an error occurred:

SMS NOT ACTIVE –SMS is not active for verification of the Cloud name.

SMS SUBSYSTEM ERROR –When communicating with the SMS subsystem, an error was returned.

NAME <cloud name> NOT FOUND –The specified cloud name is not defined to SMS

NO SLOTS AVAILABLE –A password is being set, but too many cloud names/passwords are defined to DFSMSHsm.

NOT KNOWN TO DFSMSHSM –A valid cloud name was specified, but it is not defined to DFSMSHsm.

System Action:

DFSMSHsm processing continues.

Operator Response:

None.

User Response:

None.

Application Programmer Response:

None.

System Programmer Response:

None.

Storage Administrator Response:

For the NO SLOTS AVAILABLE, use the FIXCDS S MHCR DISPLAY command to view the MHCR record. This record contains the cloud name definitions defined to DFSMSHsm. Verify that the listed Cloud names are valid. Use the SETSYS CLOUD(NAME(cloudname) DEL) command to remove invalid/unwanted entries.

Security Administrator Response:

None.

Problem Determination:

None.

Source:

DFSMSHsm.

ARC1585A (new)

ARC1585A ENTER PASSWORD FOR CLOUD <cloudname>

Explanation:

A Storage Administrator issued the SETSYS CLOUD(NAME(<cloudname>) PW) command. This WTOR requests a reply with the password that is used to connect to the Object Storage. Because this WTOR is security related, the reply is suppressed on the console. If the password contains lowercase characters, and the console is dual-case, then you can reply with single quotes around the password to preserve the case of the password. Once entered, this password will be used for all future requests to the Object Storage.

System Action:

DFSMSHsm processing continues.

Operator Response:

None.

User Response:

None.

Application Programmer Response:

None.

System Programmer Response:

None.

Storage Administrator Response:

Reply with the current password for the Object Storage described by the SMS Cloud construct, <cloudname>

Security Administrator Response:

None.

Problem Determination:

None.

Source:

DFSMSHsm.

ARC1587I (new)

ARC1587I { DATA SET PROCESSING | VOLUME SELECTION } HAS PAUSED

Explanation:

Migration processing has paused because all of the Storage Controller tasks are busy.

ARC6172E (changed)

The Application Programmer Response of ARC6172E is modified as follows:

Application Programmer Response:

For ABACKUP, ensure that all data sets specified in the INCLUDE, ALLOCATE, or ACCOMPANY lists are acceptable for processing. Some examples of unsupported situations are:

- data-set-name is a data set migrated to cloud storage.

z/OS MVS System Messages, Vol 6 (GOS-IEA)

IEA messages

IEA253I

Add new message texts for the existing IEA253I message.

'IEA253I DEVSUP AOM496I IS ENABLED'

'IEA253I DEVSUP AOM496I IS DISABLED'

z/OS MVS System Messages, Vol 8 (IEF-IGD)

- A new reason text will be added to existing messages, IGD17269I and IGD17279I, to summarize the number of the volumes that are rejected for volume selection as they are not cloud eligible.

IGD17269I n VOLUMES WERE REJECTED BECAUSE THEY WERE NOT CLOUD ELIGIBLE

IGD17279I n VOLUMES WERE REJECTED BECAUSE THEY WERE NOT CLOUD ELIGIBLE

- A new reason text will be added to existing messages, IGD17269I and IGD17279I, to summarize the number of the volumes that are rejected for volume selection because the SFI does not contain a sufficient number of candidate volumes for allocation.

IGD17269I n VOLUMES WERE REJECTED BECAUSE OF INSUFF VOLUMES IN THE SFI

IGD17279I n VOLUMES WERE REJECTED BECAUSE OF INSUFF VOLUMES IN THE SFI

- A new message, IGD17337I, will be issued when SMS invokes AOM SFILIST to determine the cloud eligibility of each candidate volume, but AOM SFILIST encounters an error condition.

IGD17337I AOM SFILIST SERVICE RETURNED AN ERROR WHILE DEFINING DATA SET (dsn)
CLOUD NAME IS (cloud_name)
RETURN CODE IS (rc) REASON CODE IS (rsn)

Explanation: This is a failure message issued by SMS when recovering a data set from the specified cloud. SMS invokes AOM SFILIST service to determine the cloud eligibility of each candidate volume, but AOM SFILIST encountered an error or exceptional condition.

In the message text:

dsname	The data set name
cloud_name	Name of the cloud that a data set is being recovered from
rc	The return code
rsnc	The reason code

System Action: The SMS VTOC data set services define request fails.

System Programmer Response: Refer to the DFSMSdfp Diagnosis manual for an explanation of the return and reason codes from AOM SFILIST service. If the problem cannot be determined, Contact the IBM Support Center for assistance.

Application Programmer Response: Refer to DFSMSdfp Diagnosis for an explanation of the return and reason codes from AOM SFILIST service.

Source: Data Facility Product (DFSMS)

- A new message, IGD17338I, will be issued when SMS is not able to allocate the target data set to the target stripe count when recovering a data set from the cloud

IGD17338I ALLOCATION FAILED FOR DATA SET (dsn) BECAUSE THE TARGET STRIPE COUNT (n) COULD NOT BE MET. CLOUD NAME IS (cloud_name)

Explanation: This is a failure message issued by SMS when recovering a data set from the specified cloud. SMS was not able to allocate the target data set to the requested stripe count.

In the message text:

dsn	Data set name
n	Target stripe count requested by the caller
cloud _	name Name of the cloud that a data set is being recovered from

System Action: Processing stops.

Application Programmer Response: Ensure that the candidate storage groups have a sufficient number of cloud-eligible volumes to satisfy the requested stripe count.

System Programmer Response: Ensure that the candidate storage groups have a sufficient number of cloud-eligible volumes to satisfy the requested stripe count.

Source: Data Facility Product (DFSMS)

- A new message, IGD17339I, will be issued when SMS is not able to allocate the entire multi-volume target data set in one single SFI.

IGD17339I ALLOCATION FAILED FOR MULTI-VOLUME DATA SET (dsn) BECAUSE IT COULD NOT BE ALLOCATED IN A SINGLE SFI.

CLOUD NAME IS (cloud_name)

Explanation: This is a failure message issued by SMS when recovering a data set from the specified cloud. For a cloud operation, the target multi-volume data set must reside in a single SFI. The allocation failed as SMS was not able to allocate the entire multi-volume data set in one SFI.

In the message text:

dsn	Data set name
cloud_name	Name of the cloud that a data set is being recovered from

System Action: The SMS VTOC data set services define request fails.

System Programmer Response: Ensure that the candidate storage groups have a sufficient number of cloud-eligible volumes in the SFI to satisfy the multi-volume allocation.

Application Programmer Response: Ensure that the candidate storage groups have a sufficient number of cloud-eligible volumes in the SFI to satisfy the multi-volume allocation.

Source: Data Facility Product (DFSMS)

IGD17345I is changed as follows:

IGD17345I UNEXPECTED CATALOG ERROR WHEN DELETING DATA SET (dsn) FOR (alloctype) ALLOCATION. CATALOG RC (rc) RSN (rsnc) IGG0CLxx.

Explanation: This is an informational message issued by SMS during the deletion of a data set that is intended to be the target of a cloud or fast replication operation. Catalog management module IGG0CLxx return return code rc, and reason code rsnc.

In the message text:

dsn

The data set name being deleted

alloctype

Allocation type, which can be one of the following:

- CLOUD
- FAST REPLICATION

rc

Return Code returned by Catalog

rsnc

Reason Code returned by Catalog

System action: Processing continues.

Application Programmer Response: None. This is an informational message only.

System programmer response: See message IDC3009I for an explanation of catalog return and reason codes rc and rsnc. Use the record in the logrec data set if you still cannot correct the error.

Source: Data Facility Product (DFSMS)

New bits are added to the fail_flags in IGD17389I

- bytes 5 and 6 indicate:

1..... not cloud capable
.1..... rejected due to not enough vols in SFI
..111111 11111111 not used

ICKDSF User's Guide and Reference (GC35-0033)

ICK34153I COMMAND FAILED - A STORE CLOUD OR RETRIEVE CLOUD DATA OPERATION IS IN PROGRESS, RSN= XX

Explanation: The PPRCOPY ESTPAIR, or FLASHCPY ESTABLISH command cannot complete due to a Store Cloud Data or Retrieve Cloud Data operation in progress.

Reason code xx indicates the reason for the error:

FE A Store Cloud Data operation or a Retrieve Cloud Data operation is in progress for the target volume specified in the FLASHCPY ESTABLISH command..

FF A Store Cloud Data operation or a Retrieve Cloud Data operation is in progress for either the primary or secondary volume specified in the PPRCOPY ESTPAIR command.

System action: Command processing ends.

Operator response: None.

System programmer response: Re-issue the command when the Store Cloud Data or Retrieve Cloud Data operation has been completed.

z/OS ISPF User's Guide Vol II

Utilities (option 3)

Data set list utility (option 3.4)

Data set list utility options

Blank – display data set list

Data set list panel fields

In the Volume section, add another indicator that may be displayed beside the Volume field:

C Migrated to cloud