DFSMS Basics: SMS Configuration and ACS Routines Introduction / Demonstration

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Agenda

• Intro to SMS (Configuration and ACS)

• Configuration Walkthrough

• ACS Walkthrough

• Summary
Introduction to SMS

**S** TORAGE

- DFSMS facility designed for automating and centralizing storage management.
- Allows you to define
  - data allocation characteristics
  - performance and availability goals,
  - backup and retention requirements
  - storage requirements

**M** ANAGEMENT

**S** UBSYSTEM

- Benefits:
  - Improves storage space use
  - Allows central control
  - Enables you to manage storage growth more efficiently
Introduction to SMS Environment

z/OS System

SMS

Storage
SMS Configuration Includes

- **Base Configuration**
  - Installation defaults (device geometry)
  - Systems included in the *SMS complex*

- **Constructs**
  - Data Classes – basic allocation defaults
  - Storage Classes – access attributes
  - Management Classes – migration information
  - Storage Groups – collection of volumes

- **Automating Class Selection (ACS)**
  - User-defined script
  - One per construct
  - Selects construct based on various criteria

- **Stored in the Control Data Sets (CDS)**
  - Active CDS – ACDS
  - Source CDS – SCDS
  - Communication CDS - COMMDS
Introduction to an SMS Environment

• What is a Data Class?
  • RECORG / RECFM
  • LRECL
  • Space Parameters
  • DSNTYPE
  • Volume count
  • RETPD or EXPDT
  • Compaction
  • Space constraint relief
  • VSAM / RLS attributes

• Basically, everything you’d need to define a data set

DATACLAS defines Default JCL parameters
Introduction to an SMS Environment

- What is a Storage Class?
  - Defines performance and availability
  - This is the attribute that makes a data set SMS-managed
  - Performance attributes
    - Direct & sequential millisecond response
    - Direct & sequential bias
    - Initial access response time
  - Availability
  - Accessibility
  - Guaranteed space
  - Guaranteed synchronous write
  - RLS Cache / Lock information
Introduction to an SMS Environment

- **What is a Management Class?**
  - Space management attributes
    - Expiration & retention attributes
    - Migration attributes
    - GDG management attributes
  - Backup attributes
    - Backup frequency
    - Backup versions
    - Backup retention
  - Class transition attributes
  - Aggregate backup attributes

- It is not required to define these, but they are helpful when you do.

HSM references the MGMTCLAS to know how to handle each data set.
Introduction to an SMS Environment

• What is a Storage Group?
  • A storage group is a logical group of at least one volume
  • Physical storage managed by SMS
    • Collection of DASD volumes
    • Volumes in tape libraries
    • Volumes in optical libraries
    • Virtual I/O storage
  • Can be in ENABLE, QUINEW, QUIALL, DISNEW, DISALL or NOTCON status
  • Can be set to auto migrate, auto backup and/or auto dump
Introduction to an SMS Environment – Structure Summary

- Base Configuration – installation defaults

- DATACLAS – JCL defaults
- STORCLAS* – access requirements / required for SMS
- MGMTCLAS – migration / backup attributes
- STORGRP* – groups of volumes

- * at minimum, you need a storage class and storage group
Introduction to ACS Environment

- **What is an ACS Routine?**
  - User written code
  - Determines which SMS classes and storage groups are assigned
  - Used for both data sets and objects
  - One per type of construct
  - They run at ALLOCATION time
  - Process in this order:
    - DATACLAS
    - STORCLAS
    - MGMTCLAS
    - STORGRP
Introduction to ACS Environment (cont)

- **Write Your Routines**
  - Edit via your favorite editor

- **Translating ACS Routines**
  - Done via ISMF
  - Checks for syntax errors
  - Converts (compiles) ACS source into object and stores it into the SCDS

- **Validating the SMS Configuration**
  - Also done through ISMF
  - Verifies that all classes/groups assigned in the ACS routines exist

- **Activating the SMS Configuration**
  - Loads the SCDS into the ACDS
  - 3 Methods
    - SETSMS SCDS(scdsname) operator command
    - ISMF option 8 (Control Data Set Application) then select option 5 (Activate)
    - Type ACTIVATE on the ISMF command line
ACS Routine Process Flow

1. **JOB Starts**
2. **DATACLAS Routine**
   - DC
3. **STORCLAS Routine**
   - SC
4. **STORGRP Routine**
   - SG
5. **MGMTCLAS Routine**
   - MC
6. **Volume Selection**
   - VOL
7. **Data Set Allocated**
Introduction to ACS Environment (cont)

• ACS General Rules

  • Know your logic before you code

  • Keep them simple and straightforward
    • Minimize exceptions
    • Maximize FILTLIST usage

  • Keep them easy to maintain and understand
    • Use SELECT instead of IF when possible
    • EXIT the routine as soon as possible
    • Use OTHERWISE whenever possible
    • Comments, comments, comments
Introduction to ACS Environment (cont)

- ACS Language Statements
  - **PROC** - beginning of routine
  - **FILTLIST** – defines filter criteria
  - **DO** – start of statement group
  - **SELECT** – defines a set of conditional statements
  - **IF** – conditional statement
  - **SET** – assigns a read/write variable
  - **WRITE** – sends message to end user
  - **EXIT** – immediately terminates ACS routine
  - **END** – end of statement group
  - /** COMMENT */ - comments a line
Read Variables

- **READ ONLY Variables**
  - 47 different variables
  - Majority of the ACS variables
  - Contain data and system information
  - Reflect what is known at the time of the request
  - Can only be used for comparison
  - Examples:
    - &DSORG
    - &DSNTYPE
    - &SIZE
    - &HLQ

- **READ/WRITE Variables**
  - Used as values in comparisons (READ)
  - Used to assign values (WRITE)
  - 4 Read/Write variables
    - &DATAACLAS
    - &STORCLAS
    - &MGMTCLAS
    - &STORGRP
  - The PROC statement must identify which R/W variable it is setting
A Few “Gotchas”

- Numeric constants are easy: just numbers
  - &NQUAL = 5

- Suffixes: sizes require KB or MB suffix
  - &MAXSIZE = 100MB

- String literals are in single quotes
  - &HLQ = ‘TEST’

- Masks are in NOT in quotes
  - &DSN = SYS1.*LIB

- && is AND, | is OR

- DO / END mismatches

- Watch for fall-through logic in your IF and SELECT
Introduction to ACS Environment (cont)

- **Write the ACS Routines**
  - Saved in a text format

- **Translate ACS Routines**
  - Converts to object code and inserts into the SCDS

- **Validate the SMS Configuration**
  - Verifies your construct allocation (do they all exist?)

- **Activate the SMS Configuration**

  - *Note: translate / validate from the highest z/OS level in your PLEX*
Storage Administrator Setting

- Set yourself up as a Storage Administrator
  - ISMF
  - 0 - Profile Options
  - 0 - User Mode Selections
  - 2 – Storage Administrator
  - End/Exit 3 times to completely exit ISMF
Configuration Prep Walkthrough 1

• Create a SCDS
  • Submit DEFSCDS job
  • Verify via ISPF 3.4

• Complete the BCD (Base Configuration Definition)
  • ISMF 8 / 2
  • Default Device Geometry
  • Trks/Cyl - 56664
  • System Name – SYSTEM1
Configuration Prep Walkthrough 2

• Create a Storage Class named
  • Default
    • With the desired attributes
Configuration Prep Walkthrough 3

• Create a Storage Group named
  • Default

• Put at least 1 volume in it
ACS Walkthrough

• Always understand your logic BEFORE coding

• Logic for this demo:
  • Make data set SMS-managed (assign SC) IF:
    • The Data Set is large (> 1000 MB)
    • Or the HLQ matches one of a few USERIDs
    • Or if the second level qualifier matches a FILTLIST
  • Otherwise, leave it non-managed (no SC)
ACS Walkthrough 1

• **NOTE:** These ACS exercises are an exercise in syntax, NOT logic.

• Create an ACS Routine w/ PROC, FILTLIST and SET
  • Create a filter of NAME which encompasses BOB and PETE

• Translate the ACS routine
PROC, FILTLIST and Basic SET Examples

- Basic Framework

```plaintext
000001 PROC STORCLAS
000002
000003 */ ------------------------ START FILTLISTS ------------------------ */
000004 FILTLIST NAME INCLUDE('BOB','PETE')
000005 */ ------------------------ END FILTLISTS ------------------------ */
000006
000007 SET &STORCLAS = '
000008 END
```

********* ###################################################################

Complete your sessions evaluation online at SHARE.org/SanFranciscoEval
ACS Walkthrough 2

- If/Then Logic
  - ADD Rule #1 – IF data set is greater than 1000 MB
    - Compare the SIZE to 1000MB
    - If SIZE is larger, set SC to DEFAULT

- Translate the ACS routine
IF Example

000001 PROC STORCLAS
000002
000003 /* ------------------ START FILTLISTS ------------------ */
000004 FILTLIST NAME INCLUDE('BOB','PETE')
000005 /* ------------------ END FILTLISTS ------------------ */
000006 /* START SC LOGIC */
000007 /* */
000008 /* TEST IF > 1000 MB */
000009 IF &SIZE GT 1000MB THEN
000010   DO
000011     SET &STORCLAS EQ 'DEFAULT'
000012   EXIT
000013 END
000014 /* SET SC BLANK IF NOTHING ASSIGNED */
000015 SET &STORCLAS = ''
000016 END
ACS Walkthrough 3

- SELECT
  - Add a SELECT statements to implement rules #2 and #3

  - #2 - SELECT on Read Only variable &HLQ
    - Test for ‘LARRY’ or ‘MOE’
    - If it matches, set SC to DEFAULT

  - #3 - SELECT on Read Only variable &DSN(2)
    - Test for NAME filter
    - If it matches, set the SC to DEFAULT

- Translate the ACS routine
SELECT Example(s)

000016  /* SELECT METHOD FOR RULE #2 */
000017   SELECT (&HLQ)
000018   WHEN ('MOE') SET &STORCLAS EQ 'DEFAULT'
000019   WHEN ('LARRY') SET &STORCLAS EQ 'DEFAULT'
000020       END
000021
000022  /* SELECT METHOD FOR RULE #3 */
000023   SELECT
000024   WHEN (&DSN(2) EQ &NAME) SET &STORCLAS EQ 'DEFAULT'
000025       END
000026
000027  /* SET SC BLANK IF NOTHING ASSIGNED */
000028   IF &STORCLAS EQ '' THEN SET &STORCLAS = ''
000029
000030       END

******** ********** ********** ********** Bottom of Data ********** **********
ACS Walkthrough 4

• **WRITE**
  - Add a WRITE statement to show which SC assigned
    - WRITE ‘message’
  - **TIP**: try to have a write near every EXIT point

• Translate the ACS routine
WRITE Examples

000001 PROC STORCLAS
000002 /* --------------------------------- START FILTLISTS ------------------------------- */
000004 FILTLIST NAME INCLUDE('BOB','PETE')
000005 /* --------------------------------- END FILTLISTS ---------------------------------- */
000006 /* START SC LOGIC */
000007 /* --------------------------------- */
000008 /* TEST IF > 1000 MB */
000009 IF SIZE GT 1000MB THEN
000010 DO
000011     SET &STORCLAS EQ 'DEFAULT'
000012     WRITE 'LARGE DATA SET NOTED.. STORCLAS: ' &STORCLAS
000013     EXIT
000014 END
000015
000016 /* SELECT METHOD FOR RULE #2 */
000017 SELECT (&HLQ)
000018 WHEN ('MOE') SET &STORCLAS EQ 'DEFAULT'
000019 WHEN ('LARRY') SET &STORCLAS EQ 'DEFAULT'
000020 END
000021 /* SELECT METHOD FOR RULE #3 */
000022 SELECT
000023 WHEN (&DSN(2) EQ &NAME) SET &STORCLAS EQ 'DEFAULT'
000024 END
000025
000026 /* SET SC BLANK IF NOTHING ASSIGNED */
000027 IF &STORCLAS EQ '' THEN SET &STORCLAS = ''
000028
000029 /* WRITE OUT WHAT WAS ASSIGNED */
000030 WRITE 'STORAGE CLASS ROUTINE ASSIGNED STORCLAS: ' &STORCLAS
000031 END
Translate and Validate

- Translate the ACS routines via ISMF 7 / 2 to the configuration (SCDS) data set

- Validate the configuration with ISMF 7 / 3 to the configuration (SCDS) data set
Summary

• Upon completion of this session, you should…
  • Have a better understanding of the SMS environment.
  • Understand how to create/modify an SMS Configuration.
  • Understand how to write a basic ACS routine.
  • Understand how to Translate an ACS routine and Validate an SMS Configuration.
  • Understand how to determine what Translate and/or Validate error(s) occurred.
Resources

Books

• DFSMS Storage Administration Reference (SC26-7402)
• DFSMS Implementing System-Managed Storage (SC26-7407)
• DFSMS Using the Interactive Storage Management Facility (SC26-7411)

Labs:

• Next session, 12320 is the LAB. Come try your ACS!
• 1:30 - 2:30 PM, Union Square 23-24, Fourth Floor
System z Social Media Channels

- Top Facebook pages related to System z:
  - IBM System z
  - IBM Academic Initiative System z
  - IBM Master the Mainframe Contest
  - IBM Destination z
  - Millennial Mainframer
  - IBM Smarter Computing

- Top LinkedIn groups related to System z:
  - System z Advocates
  - SAP on System z
  - IBM Mainframe- Unofficial Group
  - IBM System z Events
  - Mainframe Experts Network
  - System z Linux
  - Enterprise Systems
  - Mainframe Security Gurus

- Twitter profiles related to System z:
  - IBM System z
  - IBM System z Events
  - IBM DB2 on System z
  - Millennial Mainframer
  - Destination z
  - IBM Smarter Computing

- YouTube accounts related to System z:
  - IBM System z
  - Destination z
  - IBM Smarter Computing

- Top System z blogs to check out:
  - Mainframe Insights
  - Smarter Computing
  - Millennial Mainframer
  - Mainframe & Hybrid Computing
  - The Mainframe Blog
  - Mainframe Watch Belgium
  - Mainframe Update
  - Enterprise Systems Media Blog
  - Dancing Dinosaur
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  - DB2utor
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DFSMS Basics: SMS Configuration and ACS Basics
Introduction / Demonstration

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Introduction to ACS Environment

- Specifications in assigned SMS Constructs are applied to the allocation

- You can override specifications of SMS classes and groups on:
  - JCL DD statements
  - Dynamic allocation requests
  - DFSMSdss COPY, RESTORE & CONVERTV
  - DFSMShsm RECALL & RECOVER
  - IDCAMS DEFINE, ALTER & IMPORT
  - OAM STORE, CHANGE & class transition