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DFSMS Basics: SMS Configuration and ACS Routines Introduction / Demonstration

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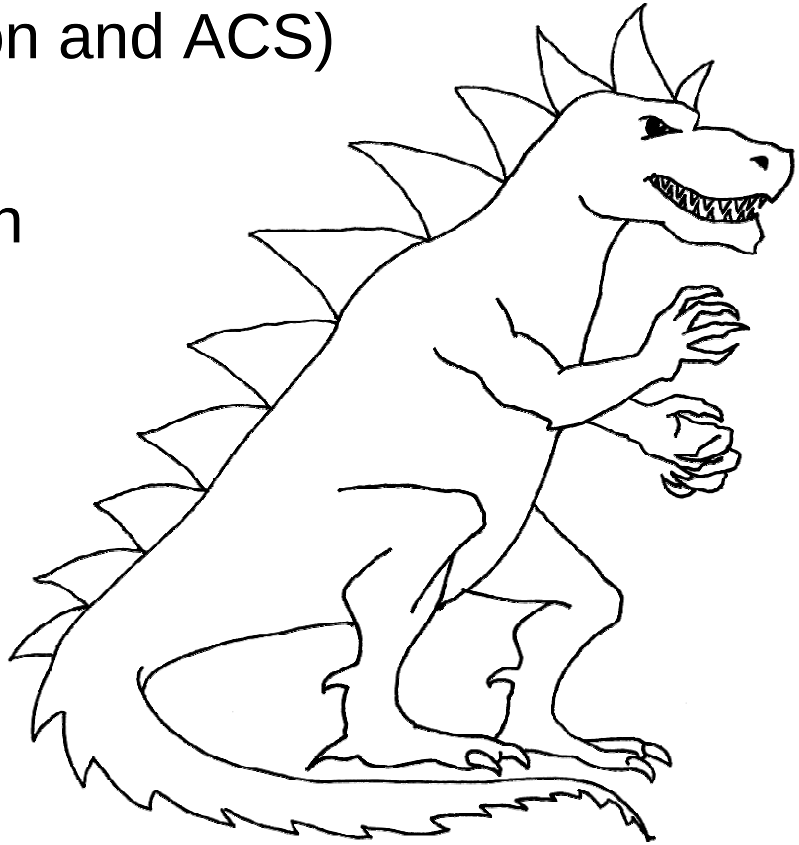
Agenda

- Intro to SMS (Configuration and ACS)
- Configuration Walkthrough
- ACS Walkthrough
- Summary



Introduction to SMS

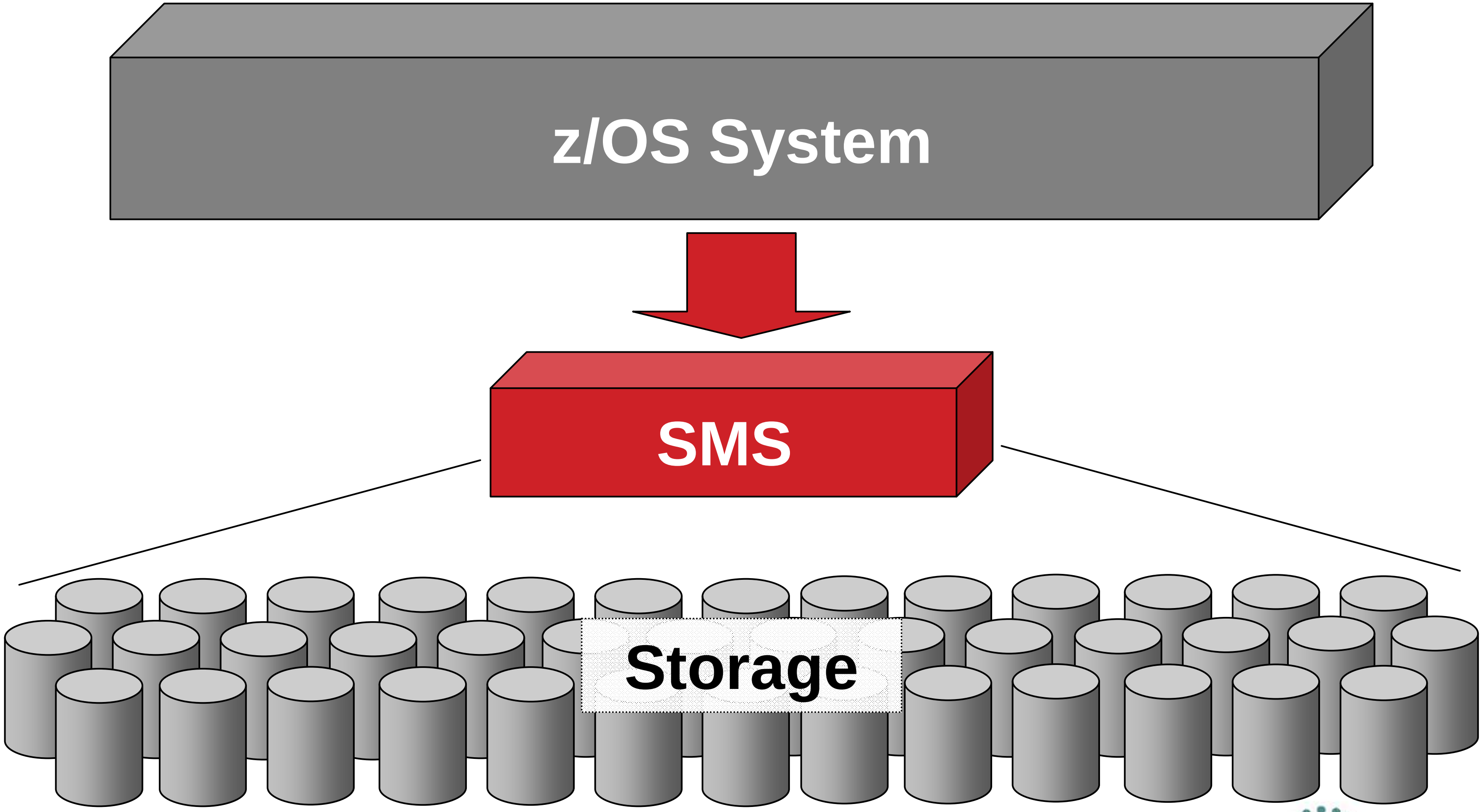
S STORAGE

M MANAGEMENT

S SUBSYSTEM

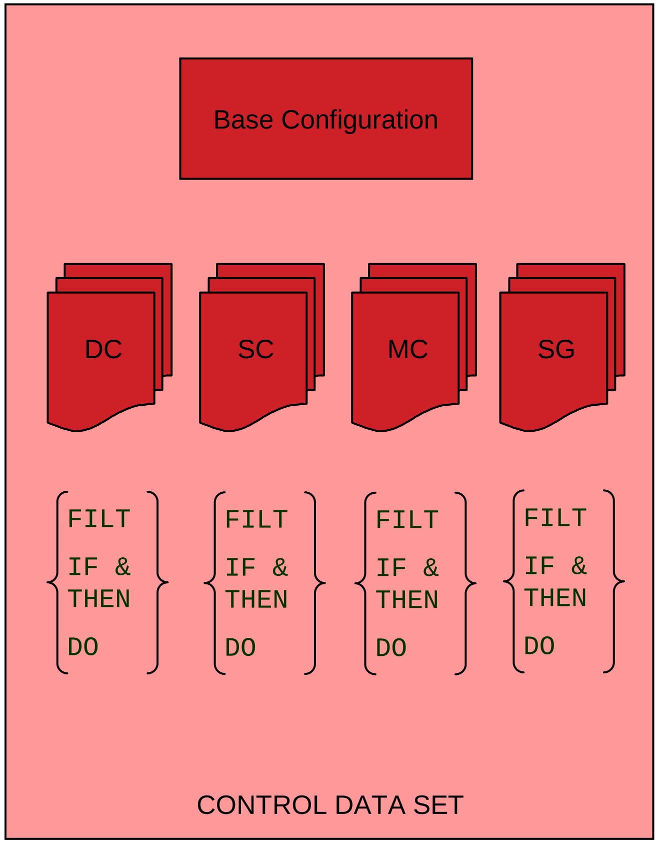
- DFSMS facility designed for automating and centralizing storage management.
- Allows you to define
  - data allocation characteristics
  - performance and availability goals,
  - backup and retention requirements
  - storage requirements
- Benefits:
  - Improves storage space use
  - Allows central control
  - Enables you to manage storage growth more efficiently

Introduction to SMS Environment



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)

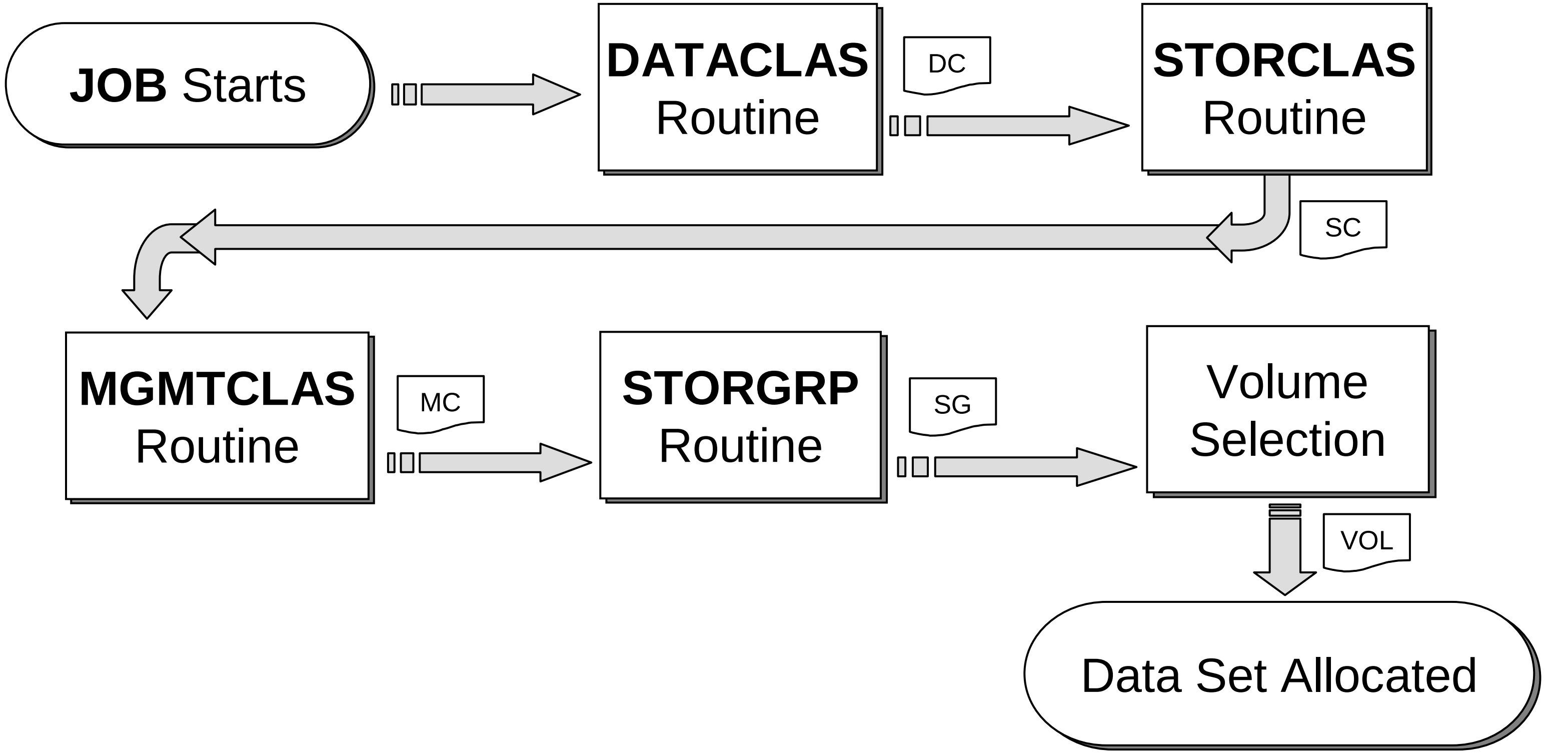
- **Write Your Routines**
  - Edit via your favorite editor

- **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



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

KISS

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
    - `&DATACLAS`
    - `&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***

DEMO

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

- BLANK SLIDE

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

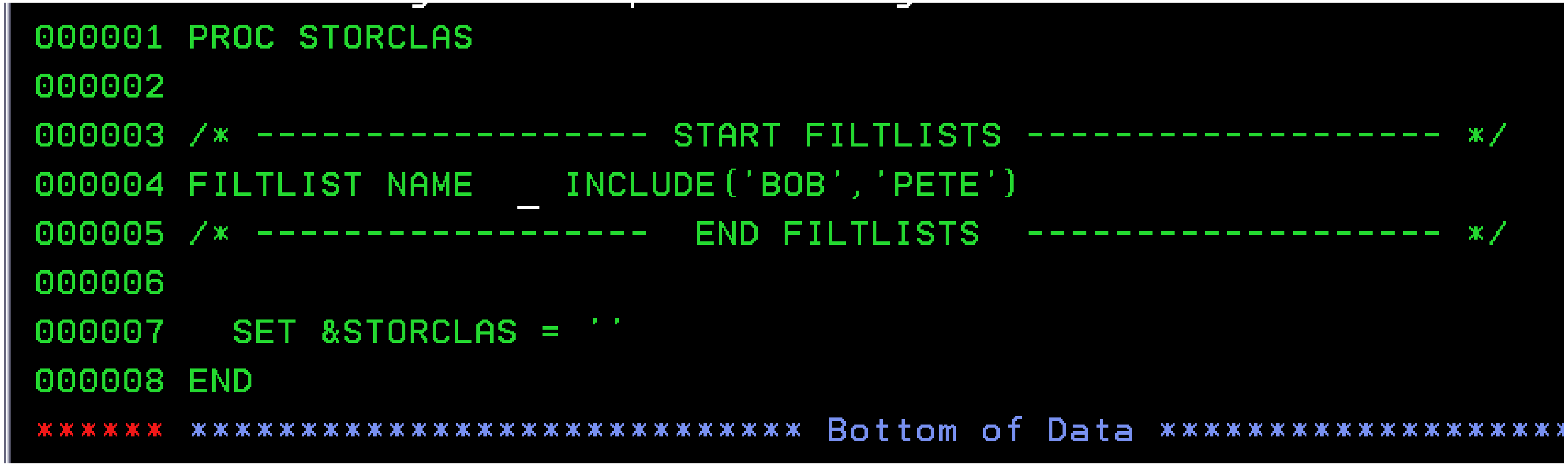
- **NOTE: These ACS exercises are an exercise in syntax, NOT logic.**

- 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

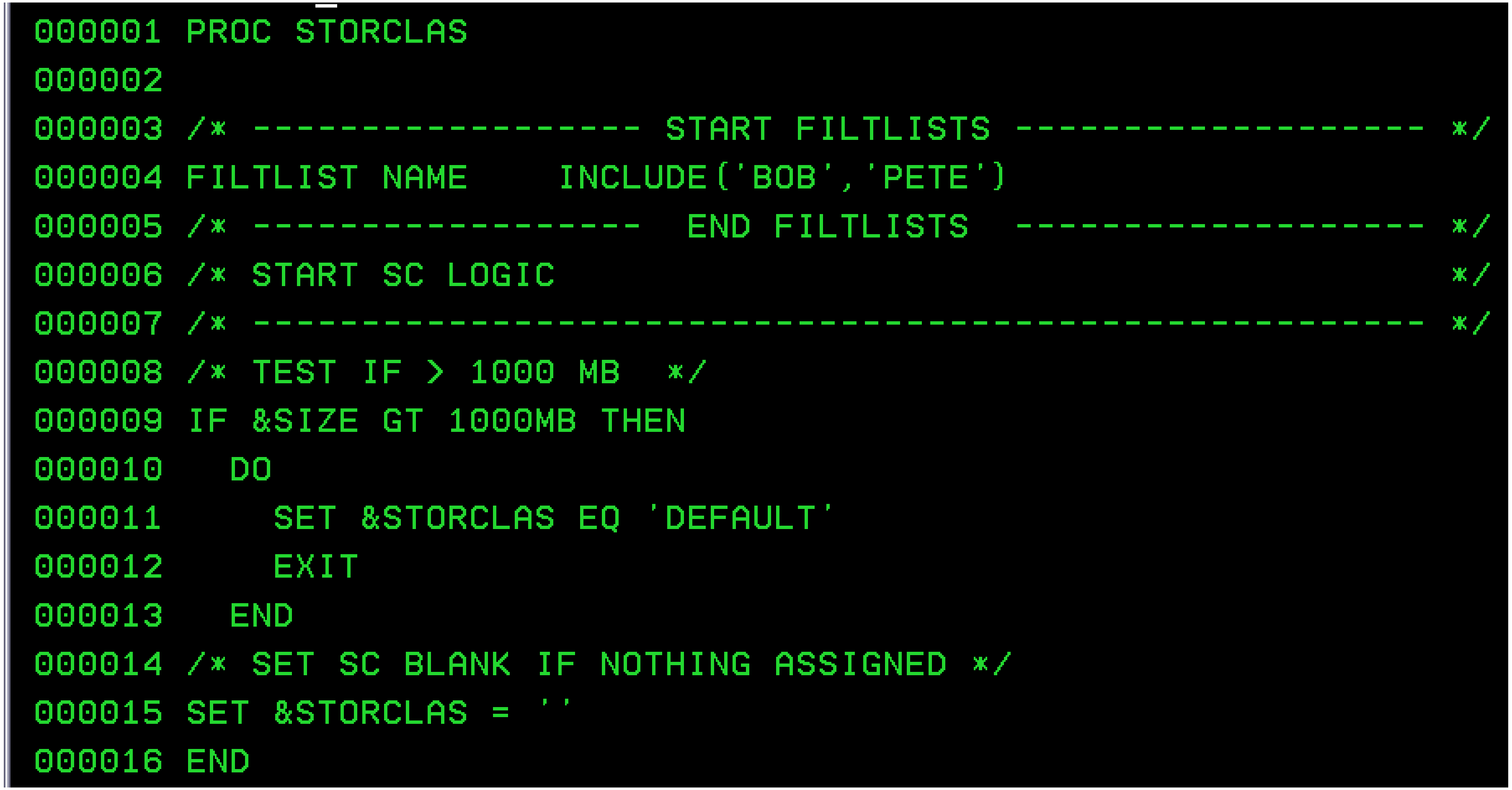


```
PROC STORCLAS

/* ------------------ START FILTLISTS ------------------- */
FILTLIST NAME   _ INCLUDE('BOB','PETE')
/* ------------------  END FILTLISTS  ------------------- */

  SET &STORCLAS = ''
END
****** ***************************** Bottom of Data *******************
```

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

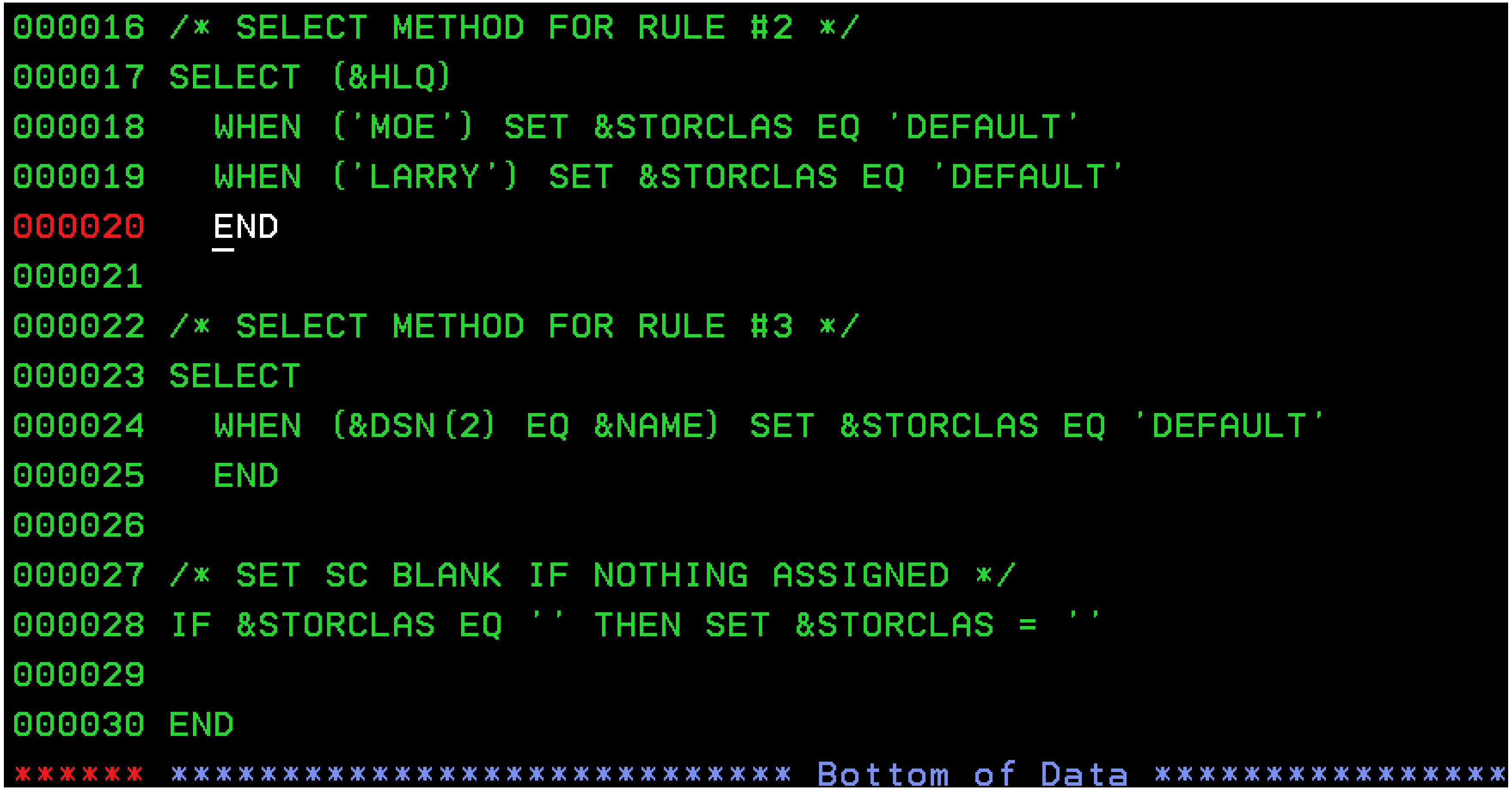


```
PROC STORCLAS

/* ------------------ START FILTLISTS ------------------- */
FILTLIST NAME    INCLUDE('BOB','PETE')
/* ------------------  END FILTLISTS  ------------------- */
/* START SC LOGIC                                          */
/* ------------------------------------------------------- */
/* TEST IF > 1000 MB  */
IF &SIZE GT 1000MB THEN
  DO
    SET &STORCLAS EQ 'DEFAULT'
    EXIT
  END
/* SET SC BLANK IF NOTHING ASSIGNED */
SET &STORCLAS = ''
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)

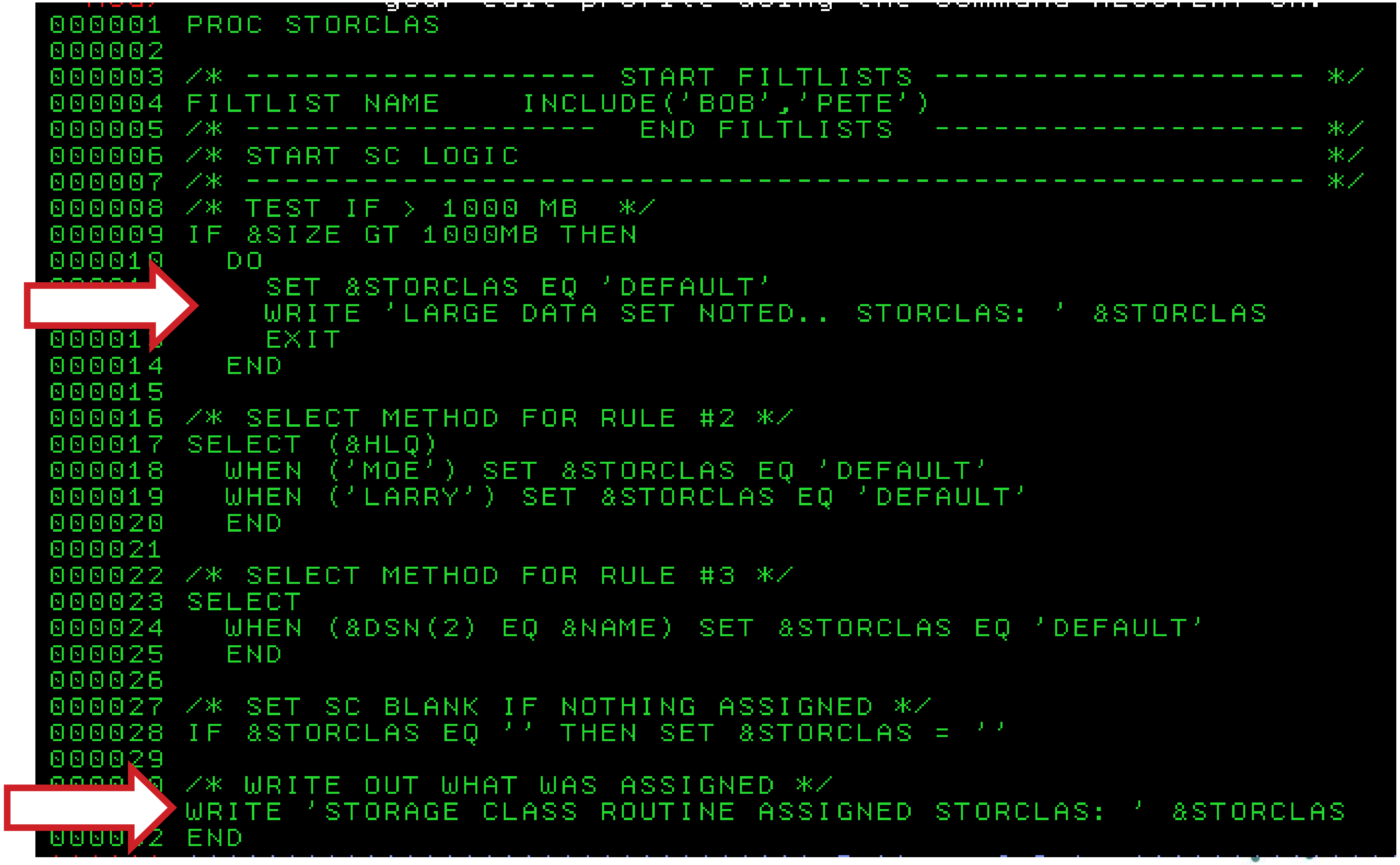


```
/* SELECT METHOD FOR RULE #2 */
SELECT (&HLQ)
  WHEN ('MOE') SET &STORCLAS EQ 'DEFAULT'
  WHEN ('LARRY') SET &STORCLAS EQ 'DEFAULT'
  END

/* SELECT METHOD FOR RULE #3 */
SELECT
  WHEN (&DSN(2) EQ &NAME) SET &STORCLAS EQ 'DEFAULT'
  END

/* SET SC BLANK IF NOTHING ASSIGNED */
IF &STORCLAS EQ '' THEN SET &STORCLAS = ''

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



```
PROC STORCLAS

/* ------------------  START FILTLISTS  ------------------- */
FILTLIST NAME    INCLUDE('BOB','PETE')
/* ------------------   END FILTLISTS   ------------------- */
/* START SC LOGIC                                          */
/* ------------------------------------------------------- */
/* TEST IF > 1000 MB  */
IF &SIZE GT 1000MB THEN
  DO
    SET &STORCLAS EQ 'DEFAULT'
    WRITE 'LARGE DATA SET NOTED.. STORCLAS: ' &STORCLAS
    EXIT
  END

/* SELECT METHOD FOR RULE #2 */
SELECT (&HLQ)
  WHEN ('MOE') SET &STORCLAS EQ 'DEFAULT'
  WHEN ('LARRY') SET &STORCLAS EQ 'DEFAULT'
  END

/* SELECT METHOD FOR RULE #3 */
SELECT
  WHEN (&DSN(2) EQ &NAME) SET &STORCLAS EQ 'DEFAULT'
  END

/* SET SC BLANK IF NOTHING ASSIGNED */
IF &STORCLAS EQ '' THEN SET &STORCLAS = ''

/* WRITE OUT WHAT WAS ASSIGNED */
WRITE 'STORAGE CLASS ROUTINE ASSIGNED STORCLAS: ' &STORCLAS
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
  - DB2 for z/OS
  - IBM Destination z
  - DB2utor

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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