Extended

231014-0718

DFSMS1

z/OS Storage Management System

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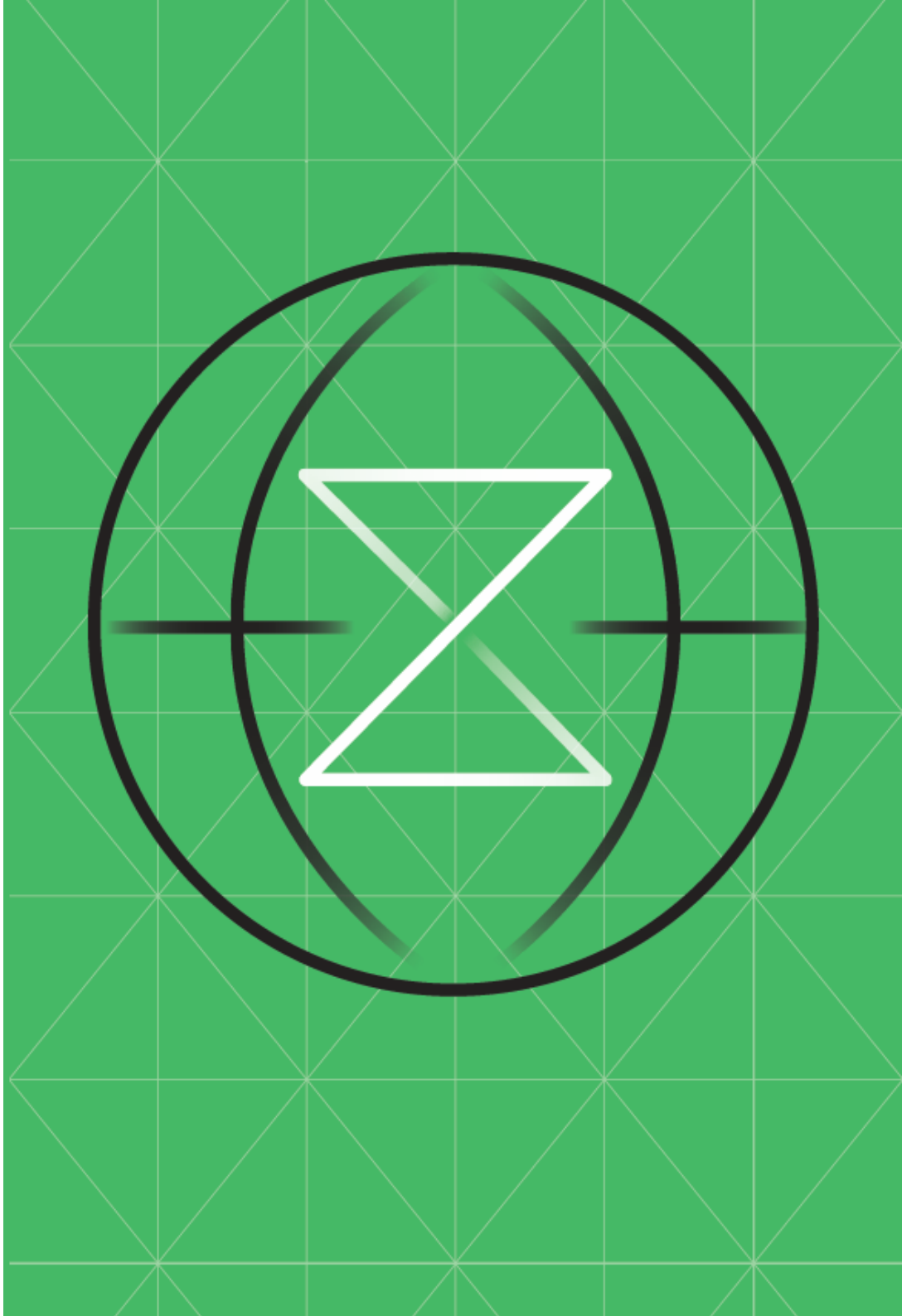

Z Xplore

STORAGE MANAGEMENT ON Z/OS

Getting started with the basics of storage management on z/OS using ISMF on TSO.

THE CHALLENGE

Data and disk storage management in z/OS is important to clients when handling high amounts of data at a time. The operating system, the application programs and business data are all on disk storage. DFSMS stands for Data Facility Storage Management Subsystem. In this challenge you will learn about disk storage managment discipline, including how to access DFSMS and storage attributes.

BEFORE YOU BEGIN

You will be using a 3270 terminal for this challenge. If you have not completed the TSO challenges, please complete those first.

INVESTMENT

Steps	Duration
9	90 minutes

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1 STORAGE TERMINOLOGY

GET FAMILIAR WITH STORAGE TERMINOLOGY

To more easily digest all DFSMS can do, let’s familiarize yourself with the terminology.

DASD

When a data set is allocated or a program is created, it is put on a DASD (Direct Access Storage Device). A DASD is the physical amount (volume) that it can hold.

Volume = Disk Storage = DASD

Allocating Space

Disk space is allocated either *explicitly* or *implicity* through DFSMS.

- Explicitly: Non-SMS-managed volumes

  You are in control

  Can be done through JCL, ALLOCATE (ISPF 3.4) and more

  In previous challenges when you have allocated a data set, you choose the different storage attributes

- Implicitly: SMS-managed volumes

  You are not in complete control

The system may assign space through Automatic Class Selection (ACS) routines. The storage administrator can create and edit ACS routines.

SMS can override you depending on what the storage administrator codes in the ACS routine.

The system may assign space or your explicit space allocation values would be changed by the ACS routine logic.

Extents

Data sets are assigned disk space through primary or secondary extents.

- You always get 1 primary extent for volume space on a disk.
- A secondary extent is created when primary is full. The limit for secondary extents depends on the type of data set

  Example: VSAM gets up to 255 secondaries vs. a PDS gets 15, and so on.

Space Units

At this point, you have allocated multiple data sets. In non-sms managed volumes, you have control of the data set attribute values. One of these attributes is the size of the data set you want to create. With sms-managed volumes on the IBM Z Xplore system, you are constrained to the size that the storage administrator sets for you. IBM Z Xplore has set a size limit for each data set. In a DASD volume, you can use different space units to state your size volumes. Common space units for sizing are:

- Blocks
- Tracks
- Cylinders

Each of these units contains a pre-determined amount of bytes (characters). The space units used are up to you (or the clients) preference or requirements.

2 INTRODUCTION TO DFSMS

When a client orders a mainframe, the mainframe is an empty box. So you might be wondering, how do the operating system, customer business applications and their data all get into the mainframe?

Answer: They are stored on disks managed by DFSMS.

DFSMS is:

- A part of z/OS
- Used to store, retrieve, and update data on attached disk storage
- Capable of assigning various attributes to data sets

DFSMS manages both non-SMS and SMS data sets and volumes. You will be focusing on SMS-managed.

- SMS (Storage Management Subsystem) uses policies to manage storage for the operating system. With SMS-managed data sets, you use ACS routines.

How do you access DFSMS and manage ACS routines? Through the ISMF panel on TSO.

3 INTRODUCTION TO ISMF PANEL

ISMF stands for Interactive Storage Management Facility. Storage administrators use ISMF to automate and simplify storage data tasks.

Inside ISMF, you can do a lot of different things. You will see options that work with SMS-managed objects within the ACS routines.

The objects you will be focusing on are:

- Data Class
- Storage Class
- Storage Group

Data Class

- Defines the way data sets are collected
- Can assign attribute values such as:

    Record Format (RECFM)

        EX. Fixed Block (RECFM = FB)

    Record Size (LRECL)

        EX. LRECL = 80

    Data Set Name Type (DSORG)

        EX. DSORG = PS

- You must have a data class in order to have data sets SMS-managed.
- Simply put, Data Classes are templates that standardize data set allocation for attributes.

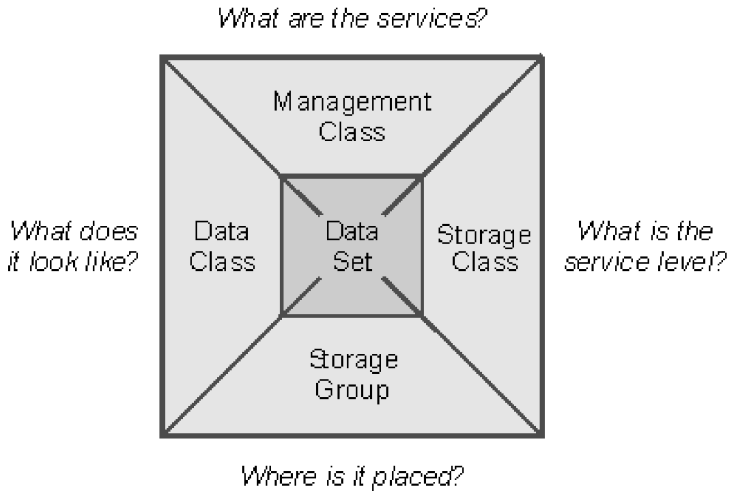
Storage Class

- Specify performance objectives and availability attributes that characterize a collection of data sets
- Must be assigned a storage class to be SMS-managed

Storage Groups

- Collection of storage volumes (the disks)
- Contains the physical volume labels for each disk
- The Storage Group volumes are determined by the Storage Class name
- Helps reduce users needing to understand the storage devices that contain their data

Terminology	Description
Data Class	Sets the attributes
Storage Class	Facilitates the volume it goes on in Storage Group
Storage Group	Contains the physical volumes



Let’s take a look into ISMF to view these groups more closely.

“ACS Routine for IBM Z Xplore”

IBM Z Xplore has an ACS routine to handle all of the different data sets that are created when you allocate your different data sets.

The ACS routine determines SMS classes and storage groups when data sets are created.

This is useful for IBM Z Xplore as there are a lot of different data sets being created that fall under similar storage constraints. The ACS routine allows these data sets to automatically have the different storage constraints depending on how they are named.

For more information, visit: ACS Routines.

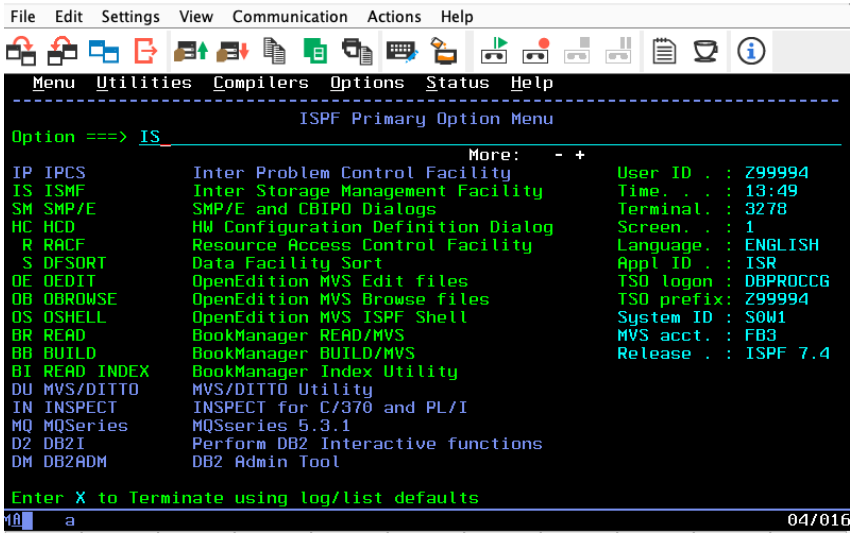
4 GET HANDS-ON

Let’s get started on working with DFSMS.

Open up your 3270 terminal and log in using your zID and password.

You should be familiar with the ISPF menu. For this challenge, you will be working with ISPF in addition to ISMF.

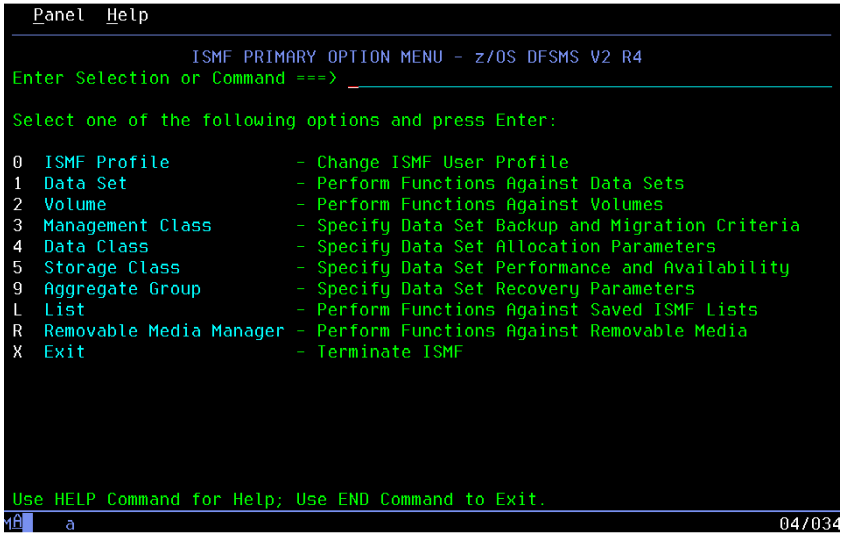
Scroll down and find and open ISMF.



In the ISMF Menu, you will see a lot of different areas to explore. Let’s set up your profile first to make sure you can view everything.

Find ISMF Profile, User Mode Selection, and make sure you are the storage administrator.

Once you have done this, head back to the ISMF panel and you should see a screen DIFFERENT than the image below. You will have more options available.



Now you can begin exploring ISMF. You will be focusing on Volume, Data Class, Storage Class and Storage Group.

5 VOLUME

You learned earlier that volumes are the same as disk storage which are the same as DASDs.

When clients purchase a mainframe, they also purchase disk storage. You will find all of the disk storage listed in the volumes panel in ISMF.

Volumes are either non-SMS-managed or SMS-managed. You can use your DASD volumes more efficiently by allowing SMS to manage data placement.

- Example: SMS can help you avoid running out of space and wasting system resources by repeatedly migrating and recalling relatively active data, while another user group has excess space that is either unused or used for data that is rarely needed.

1. Find the Volume section in ISMF
2. Go into DASD and view the panel screen that appears.
3. Change the panel so that you are viewing volumes that are:

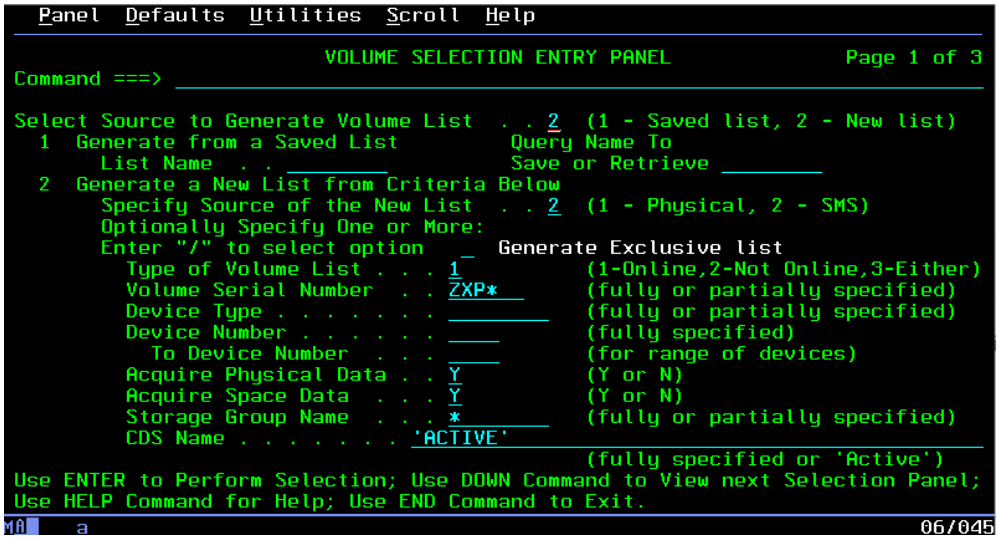
    SMS-managed

    Start with ZXP

    Aquiring Physical and Space data

    Viewing all storage groups

    Active



4. Press enter to view the volume list.

5. Look at the volume series and the other data listed about each DASD volume.

Remember to move right and left to view more information.

Below are a few descriptions of what you are seeing:

Terminology	Description
Volume Serial	The different disks named by storage administrator
Alloc Space	Facilitates the volume it goes on
Free Extents	How many secondary extents are available
Physical Status	Volume is SMS-managed (CONVERT) or not
Storage Group Name	Storage group it is assigned to

Remember, these are all of the volumes that are SMS-managed. ISMF can display all of the physical volumes controlled by the specific z/OS (both SMS and non-SMS). To view all volumes, you would change the source to be Physical in the volume selection panel.

Next, you are going to dive into the SMS-managed ACS routine.

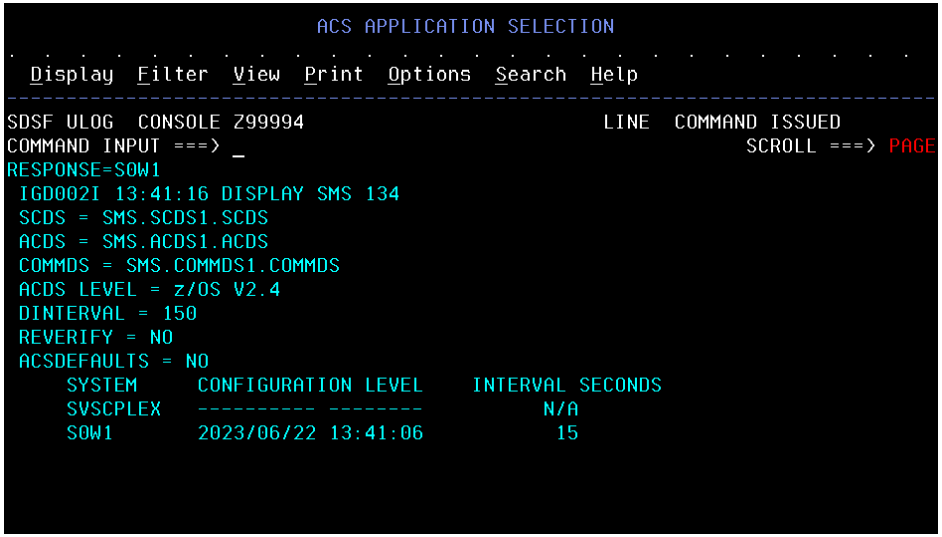
What are sms control data sets (CDS) and how do I find what they are called?

An ACS routine has two control data sets. 1. Active control data set (ACDS) 2. Source control data set (SCDS)

The SCDS is where you make changes that are used to create the ACDS. You can change the CDS name depending on which data set you are viewing.

To find the name of the ACS routine you will be using SDSF. Go to SDSF through ISPF, type `ulog` and hit enter, then type `/d sms`.

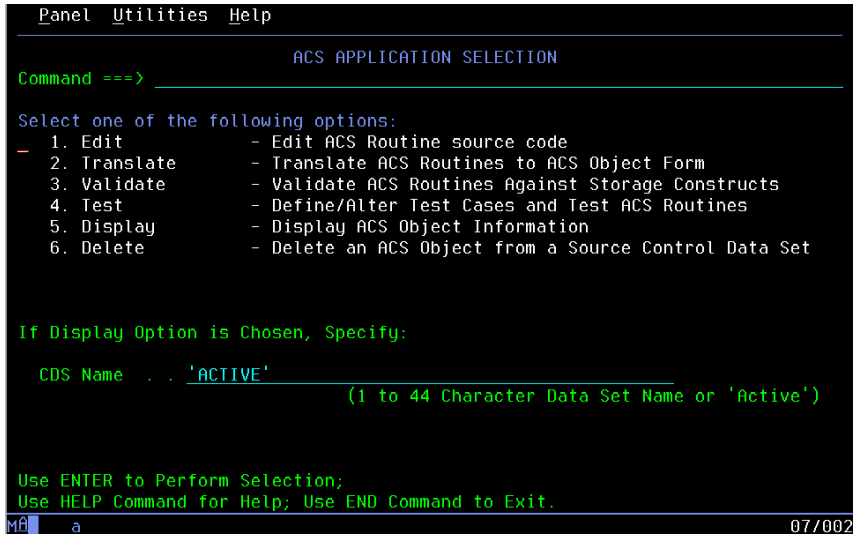
You will see your source control data set (SCDS) and your active control data set (ACDS). When working with your active data set, you can either use the full name of ACDS or you can type “Active”.



6 WHAT'S INSIDE THE ACS ROUTINE?

Find the ACS option in the ISMF Panel.

In the ACS panel under CDS name, when you see `'ACTIVE'`, it is referring to the ACDS.



1. Display the ACS routine created for IBM Z Xplore.
2. Browse the types of ACS objects that are in the control data set. These are the values that are used for IBM Z Xplore.
3. Look at `vendor.parmlib`. This is where the source code for the CDS is stored. A storage administrator can edit and change the ACS objects through `vendor.parmlib`.

Feel free to scroll around to view other information, like the members that hold each object and who last updated the CDS.

7 CONNECT THE DOTS

Now that you know the parts making up our ACS routine, you are going to look into each object type used for the IBM Z Xplore ACS routine.

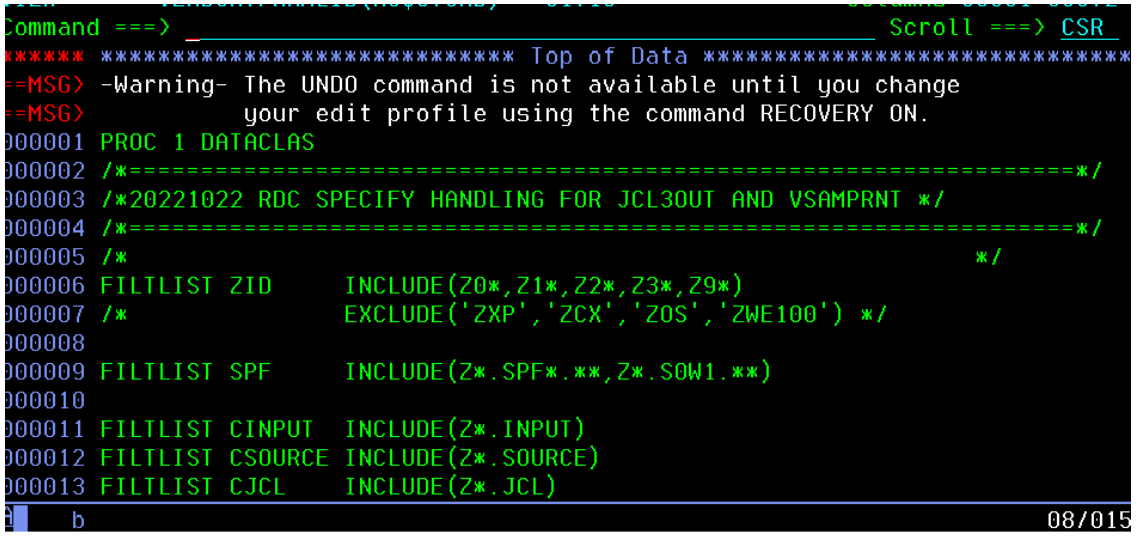
1. Head to ISPF display panel and observe the three members within the source data set. *Hint: They contain a $*

2. View the ACS routine for data class.

3. Look around and see how it is set up and what is happening.

    Key words to note/focus on:
    FILTLIST
    WHEN
    SET

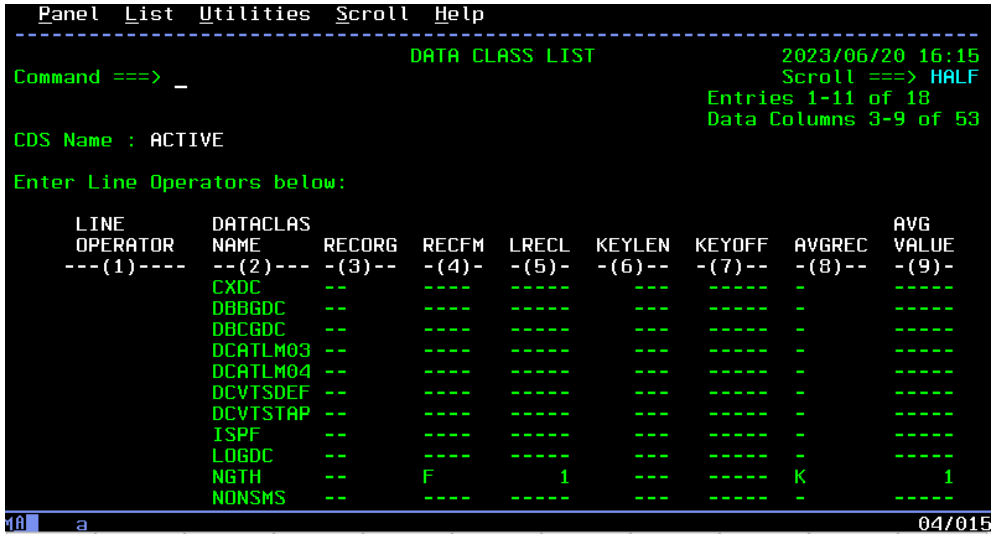
4. Do the same thing with storage class and storage group. Notice the naming conventions between the three routines and see how they all connect.



8 DATA CLASS, STORAGE CLASS, STORAGE GROUPS

You have seen what makes up each member for the active data set, but what are the volume constraints for each name within each type? For example, what are the data set attributes for a data set that is Z*.JCL?

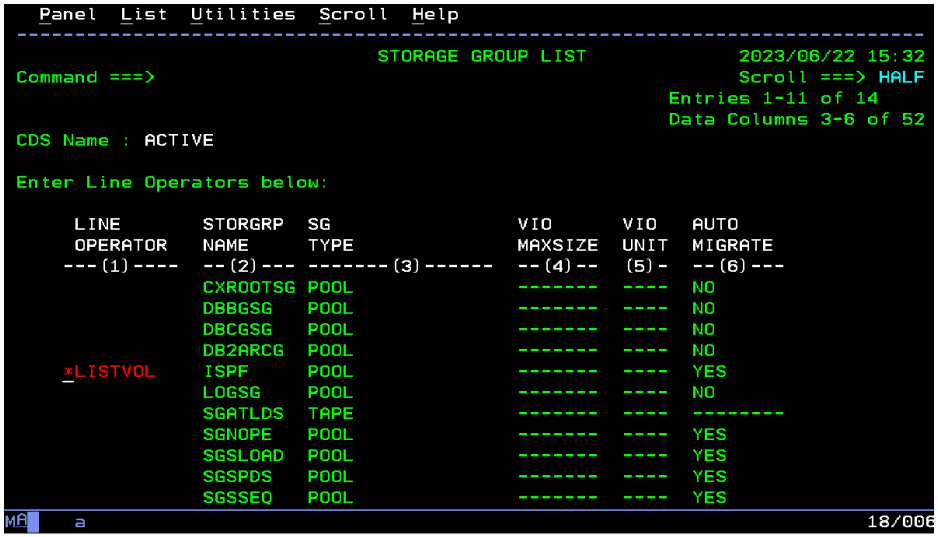
1. Make your way back to ISMF and find the data class panel.
2. Make sure you are using the 'ACTIVE' data set, type an * for data class name and list all data classes.
3. Review all of the data class names that are active. Try and find the names that are used in the ACS routine for IBM Z Xplore.
4. Look at the attributes assigned to some of the data classes. You can scroll to the right to view more.
5. Do the same thing for Storage Classes and Storage Groups. Are you understanding the pattern on how data class, storage class and storage group all connect?



How do I know which volume my storage groups are on?

You have seen how the data class, storage class and storage groups work together to make up the ACS routine. How do you know which volume serial each data set will go to?

In the storage group list, type `listvol` in the line operator column and you can view which storage groups are on each volume.



9 YOUR CHALLENGE

You have explored a lot of different parts of DFSMS, both non-SMS and SMS-managed. You now possess critical information to be a z/OS storage administrator.

Your challenge is to allocate two different data sets: Non-SMS-managed and SMS-managed.

Allocate your non-SMS-managed data set:

1. Find the ZXP* volume serial name that is non-SMS-managed.

   Hint: Remove storage group name and CDS from volume selection entry panel

2. In one of the objects of the ACS routine, find the correct naming convention for your data set that will make it non-SMS.

   Hint: a blank storage class (' ') results in non-SMS-managed data set allocation. Remember, the data class references the storage class.

3. Allocate a new data set with the information you found in step 1 and 2.

4. Attributes for your data set:

   The volume serial you found in step 1

   Space Unit: TRKS

   Primary Quantity: 5

   Secondary Quantity: 1

   Record Format: Fixed Block

   Record Length: 20

Data Set Name Type: Sequential Data Set

Hint: It is not PDS, what are your other options?

Note: The IBM Z Xplore ACS routine is set up to include any data set that starts with your zID. You will need to create a zID data set that will NOT be SMS-managed. That is why you are using the ACS routine to find the data set naming convention for a non-SMS-managed data set.

Allocate your SMS-managed data set:

1. Create a data set with `yourzid.toobig`.
2. Keep all of the attributes the same except:

   Remove volume serial

   Primary Quantity: 100 tracks

   Data set name type: Library (PDS/E)
3. What happens? Note the last three words that are said in message line.

   Some of your data set attributes were overridden by the ACS routine. You can view all of the attributes by typing i next to your new data set in 3.4.
4. Create a member in your new data set called `MESSAGE`.
5. Inside your member:

   Put the *last* three words found in step 3.

Once you have created your two data sets, check your work over to make sure you have everything correct. After you have successfully done this, find ZXP.PUBLIC.JCL and submit the member **CHKSMS1**

Nice job - let’s recap	Next up …
You have been introduced to DFSMS and the different ways volume storage is managed. You have gotten familiar with sms-managed volumes and ACS routines. You created two data sets that get you familiar with how the IBM Z Xplore ACS routine works and have tested the limits for storage space.	Keep completing challenges that use TSO or go back to challenges using VS Code. Stay tuned for more challenges on DFSMS and other z/OS topics.