

COMP 3400 Mainframe Administration¹

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¹These slides are based in part on materials provided by IBM's Academic Initiative.

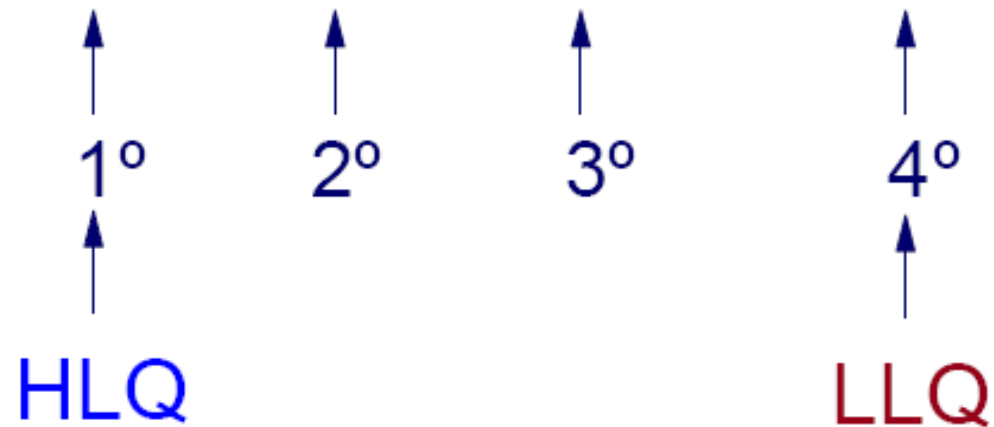


Data Sets

- A data set is a collection of logically related data records stored on one disk storage volume or a set of volumes.
- Data sets can be:
 - a source program
 - a library of macros
 - a set of data records used by a processing program
- Data sets can be printed or displayed on a terminal.
- The logical record is the basic unit of information used by a program running on z/OS (except z/OS UNIX)

Data Set Naming

HARRY.FILE.EXAMPLE.DATA



Naming Requirements

- Names must be upper case only and unique (kind of)
- Maximum of 44 characters; maximum of 22 name segments
- Each level qualifier can have 1 to 8 characters
- Each level qualifier must start with A-Z or specials “@#”
- Remaining characters can also contain 0-9 and hyphen (“-”)

Allocating Data Sets

Allocation methods:

- ISPF data set panel, option 3.2
- TSO ALLOCATE command
- Access Method Services (more later)
- Using the Job Control Language (JCL) – next lecture

During allocation, you must specify certain details about the size and structure of the data set.

ISPF-based Allocation

```
Lab System
File Edit View Communication Actions Window Help
  Menu RefList Utilities Help
-----
Option ==> a Data Set Utility
-----
  A Allocate new data set          C Catalog data set
  R Rename entire data set        U Uncatalog data set
  D Delete entire data set        S Short data set information
blank Data set information        V VSAM Utilities

ISPF Library:
Project . . . _____ Enter "/" to select option
Group . . . _____ / Confirm Data Set Delete
Type . . . . _____

Other Partitioned, Sequential or VSAM Data Set:
Data Set Name . . . 'zps.test1'
Volume Serial . . . vparc1 _ (If not cataloged, required for option "C")

Data Set Password . . . (If password protected)

MA a 18/032
```

Data Set List Utility

```

Lab System
File Edit View Communication Actions Window Help
Menu RefList RefMode Utilities Help

Data Set List Utility

Option ==>

blank Display data set list          P Print data set list
  V Display VTOC information          PV Print VTOC information

Enter one or both of the parameters below:
Dsname Level . . . zibm030
Volume serial . . .

Data set list options
Initial View . . . 1  1. Volume          Enter "/" to select option
                    2. Space           / Confirm Data Set Delete
                    3. Attrib          / Confirm Member Delete
                    4. Total           / Include Additional Qualifiers
                                   / Display Catalog Name

When the data set list is displayed, enter either:
"/" on the data set list command field for the command prompt pop-up,
an ISPF line command, the name of a TSO command, CLIST, or REXX exec, or
"=" to execute the previous command.

MA a 10/031
Connected to remote server/host 204.90.115.184 using lu/pool TCP00005 and port 623
PDF Writer (Ghostscript) on Ghostscript1:

```

ISPF-based Allocation

```

Lab System
File Edit View Communication Actions Window Help
  Menu RefList Utilities Help
-----
Allocate New Data Set
Command ==> _____
Data Set Name . . . : ZOS.TEST1
Management class . . . _____ (Blank for default management class)
Storage class . . . _____ (Blank for default storage class)
Volume serial . . . : VPARC1 (Blank for system default volume) **
Device type . . . _____ (Generic unit or device address) **
Data class . . . _____ (Blank for default data class)
Space units . . . : CYLINDER (BLKS, TRKS, CYLS, KB, MB, BYTES
or RECORDS)
Average record unit _____ (M, K, or U)
Primary quantity . . : 1 (In above units)
Secondary quantity . : 1 (In above units)
Directory blocks . . : _____ (Zero for sequential data set) *
Record format . . . : fb
Record length . . . : 80
Block size . . . . . : _____
Data set name type : _____ (LIBRARY, HFS, PDS, or blank) *
Expiration date . . . _____ (YY/MM/DD, YYYY/MM/DD
Enter "/" to select option YY.DDD, YYYY.DDD in Julian form
or blank)
- Allocate Multiple Volumes
( * Specifying LIBRARY may override zero directory block)
( ** Only one of these fields may be specified)
MA a 21/025
Connected to remote server/host 204.90.115.184 using lu/pool TCP00011 and port 623 PDF Writer (Ghostscript) on Ghostscript1:

```

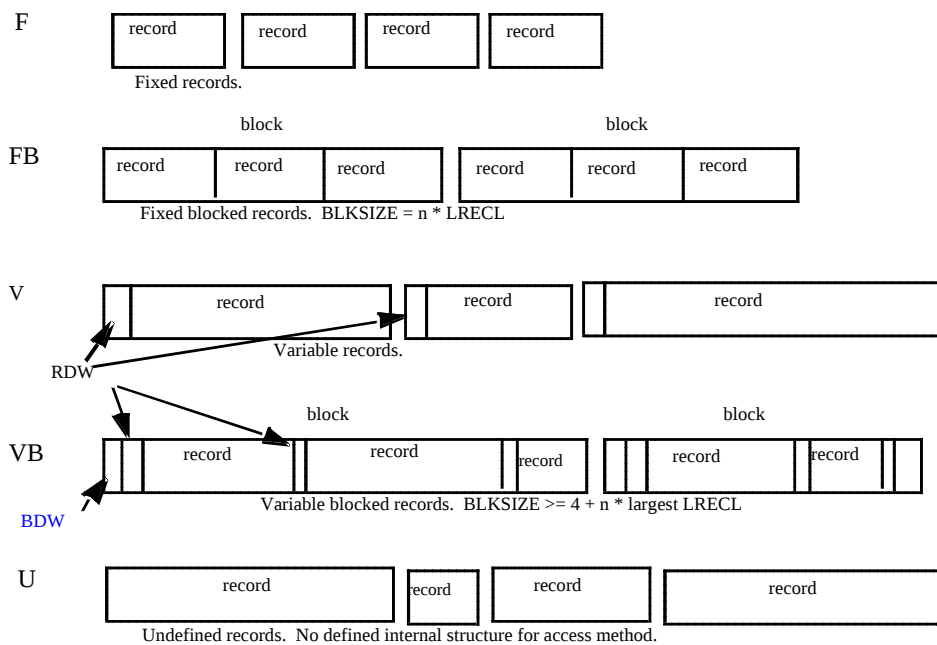

Records

- A record is the equivalent of a line in a textfile
- Data sets do not have EOL characters
- Records can be fixed-length or variable-length
- Record length (for fixed-length records) is referred to as the LRECL
- Indentation (offset of text in the record) often matters

Blocks

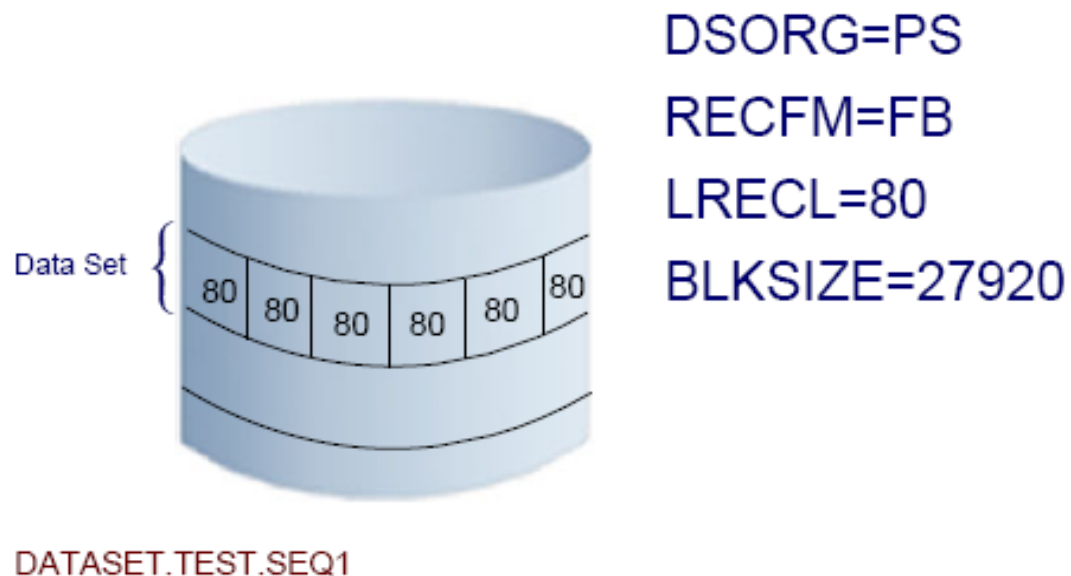
- Multiple records are grouped in a block
- Logical records are usually the smallest amount of data to be processed by applications
- Blocks are usually the unit of data read from or written to DASD

Data set record formats



Record and block descriptors words are each 4 bytes long

Example Data Set Specification

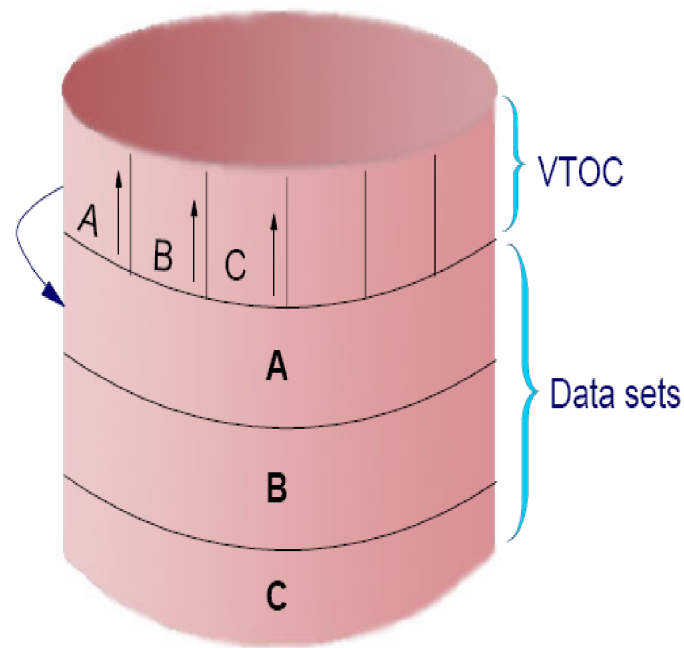


The Volume Table of Contents (VTOC)

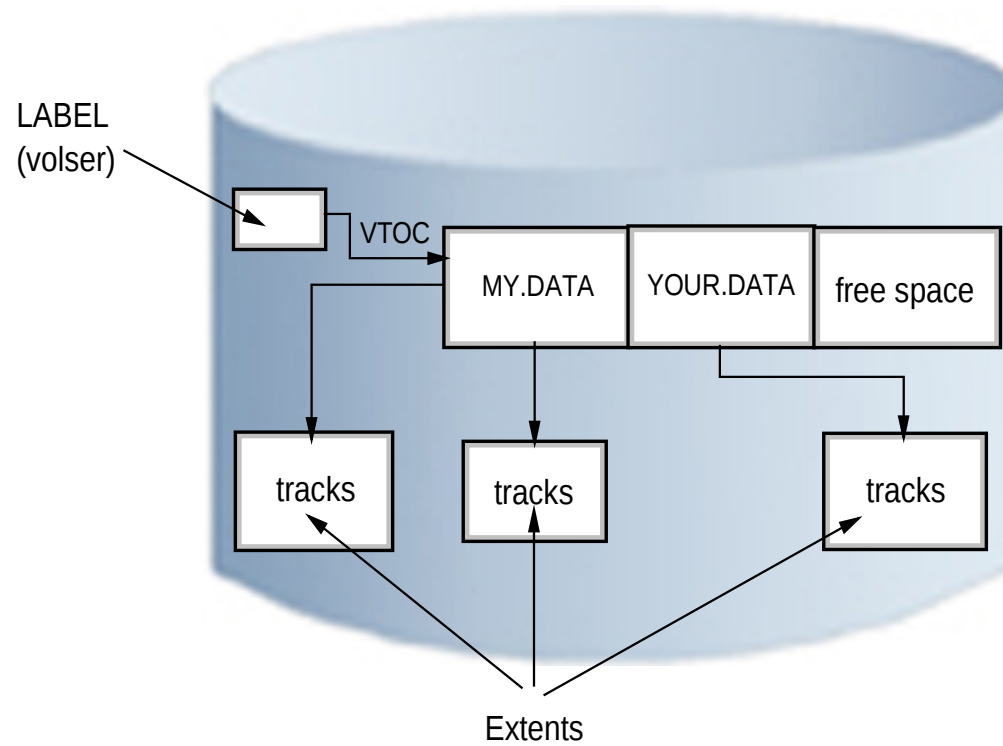
VTOC:

- Lists the data sets on a volume
- Lists the free space on the volume

The Volume Table of Contents (VTOC)



Extents



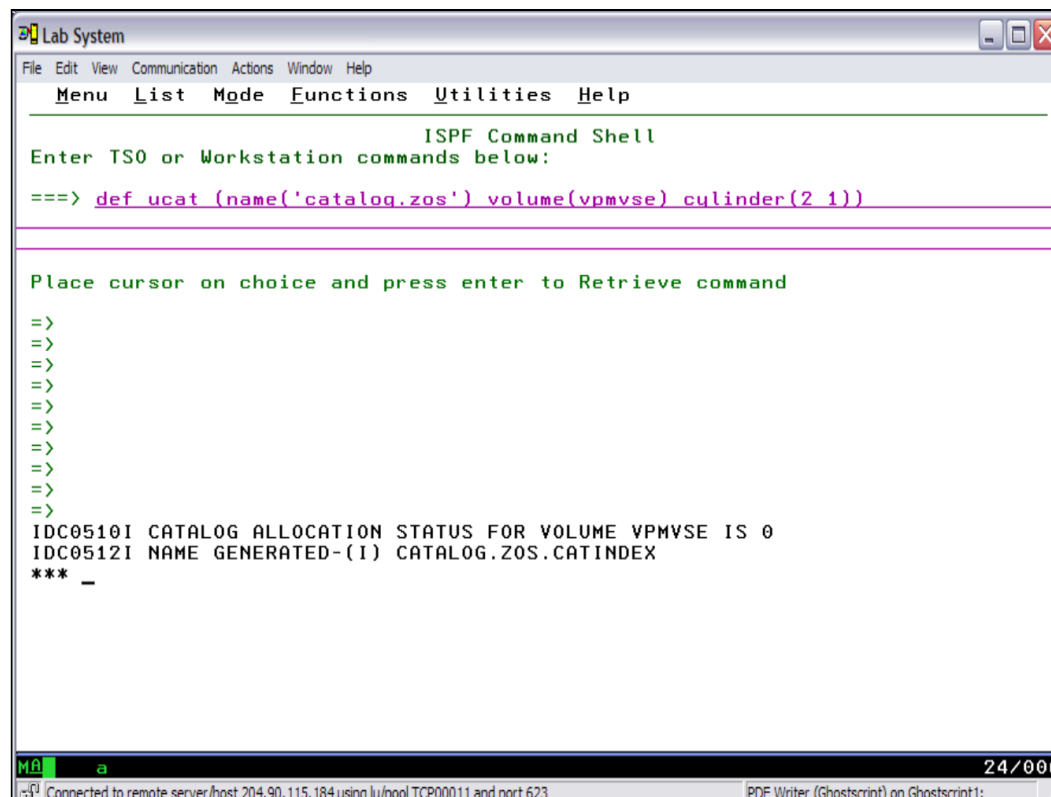
Catalogs

A catalog associates a data set name with the volume on which the data set is located; locating a data set requires:

- Data set name
- Volume name
- Unit (volume device type)

Typical z/OS systems include a master catalog and numerous user catalogs.

Creating a Catalog



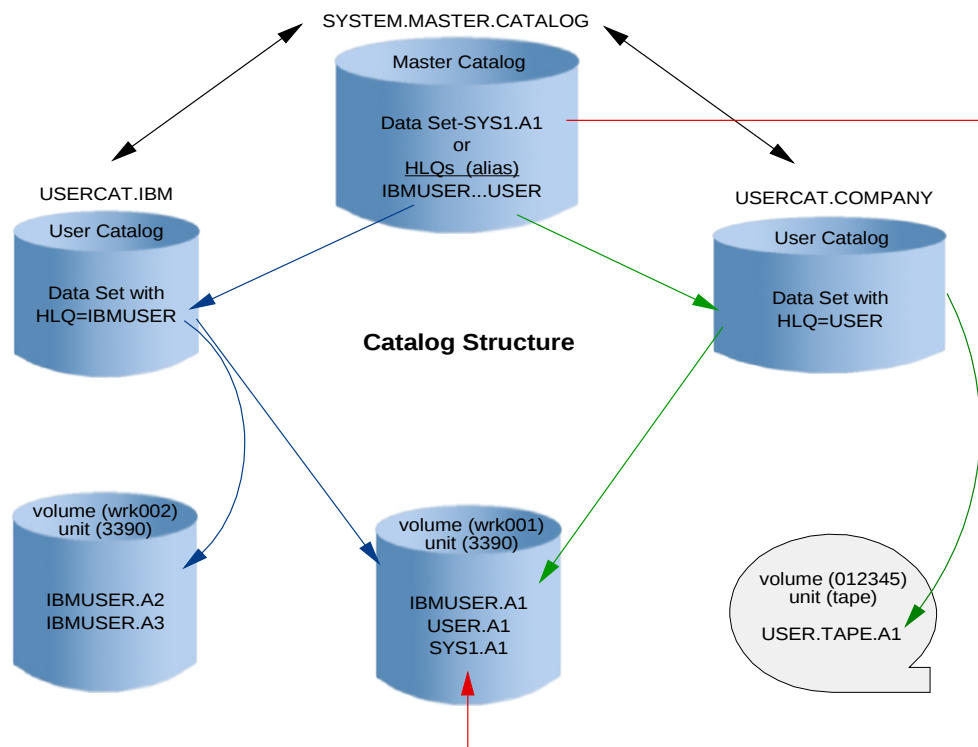
The screenshot shows a terminal window titled "Lab System" with a menu bar (File, Edit, View, Communication, Actions, Window, Help) and a sub-menu (Menu, List, Mode, Functions, Utilities, Help). The prompt is "ISPF Command Shell" and the instruction is "Enter TSO or Workstation commands below:". The user has entered the command: `===> def ucat (name('catalog.zos') volume(vpmvse) cylinder(2 1))`. Below the command, the prompt "Place cursor on choice and press enter to Retrieve command" is shown, followed by a series of arrow keys (=>) indicating the user's navigation. The output shows the catalog allocation status: `IDC0510I CATALOG ALLOCATION STATUS FOR VOLUME VPMVSE IS 0` and `IDC0512I NAME GENERATED-(1) CATALOG.ZOS.CATINDEX`, followed by `*** _`. The status bar at the bottom shows "MÄ a" and "24/006". The system tray at the bottom indicates the connection to a remote server and the use of PDF Writer (Ghostscript).

```
Lab System
File Edit View Communication Actions Window Help
  Menu List Mode Functions Utilities Help
ISPF Command Shell
Enter TSO or Workstation commands below:
===> def ucat (name('catalog.zos') volume(vpmvse) cylinder(2 1))

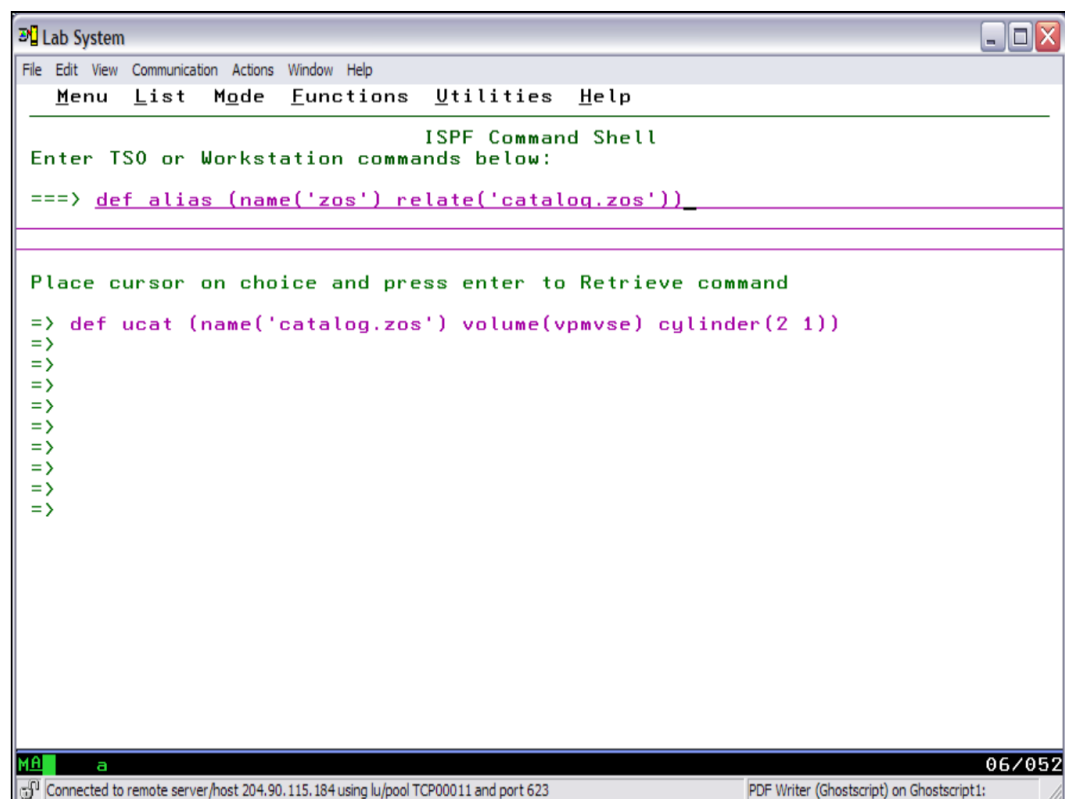
Place cursor on choice and press enter to Retrieve command
=>
=>
=>
=>
=>
=>
=>
=>
=>
=>
=>
IDC0510I CATALOG ALLOCATION STATUS FOR VOLUME VPMVSE IS 0
IDC0512I NAME GENERATED-(1) CATALOG.ZOS.CATINDEX
*** _

MÄ a 24/006
Connected to remote server /host 204.90.115.184 using lu/pool TCP00011 and port 623 PDF Writer (Ghostscript) on Ghostscript1:
```

Catalog Structure



Defining an Alias



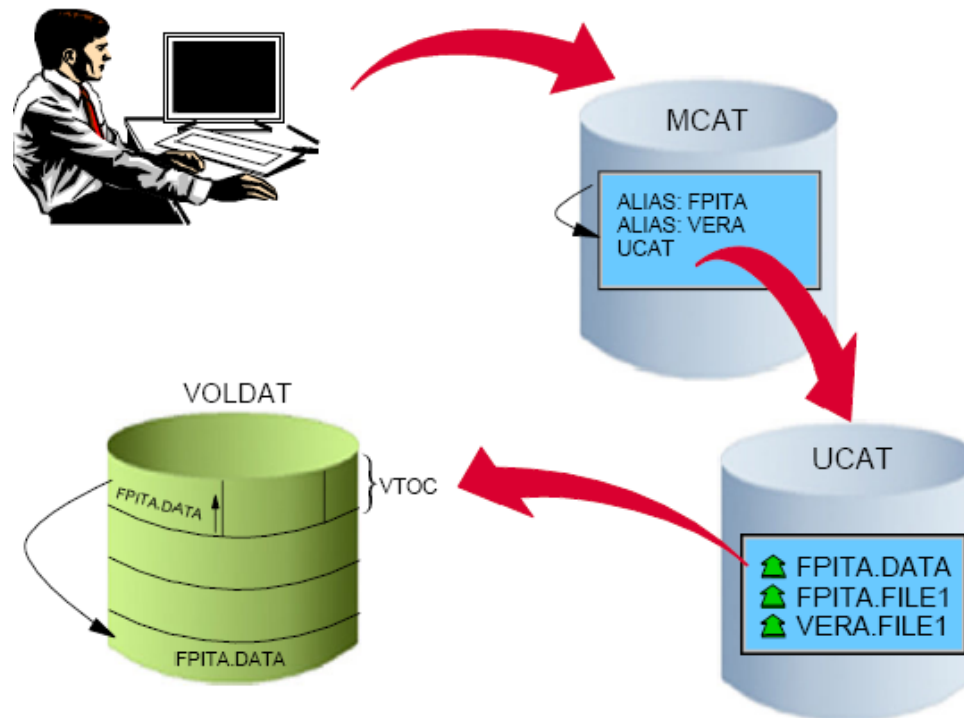
```
Lab System
File Edit View Communication Actions Window Help
Menu List Mode Functions Utilities Help

ISPF Command Shell
Enter TSO or Workstation commands below:
===> def alias (name('zos') relate('catalog.zos'))

Place cursor on choice and press enter to Retrieve command
=> def ucat (name('catalog.zos') volume(vpmvse) cylinder(2 1))
=>
=>
=>
=>
=>
=>
=>
=>
=>
=>
=>
=>

MA a 06/052
Connected to remote server /host 204.90.115.184 using lu/pool TCP00011 and port 623
PDF Writer (Ghostscript) on Ghostscript1:
```

Locating a data set in z/OS



Inspecting a Catalog

```

Lab System
File Edit View Communication Actions Window Help
READY
listc ent('zos.test1') all
NONVSAM ----- ZOS.TEST1
IN-CAT --- CATALOG.ZOS
HISTORY
  DATASET-OWNER----- (NULL)      CREATION-----2007.111
  RELEASE-----2          EXPIRATION-----0000.000
VOLUMES
  VOLSER-----VPARC1      DEVTYPE-----X'3010200F'    FSEQN-----
-----0
ASSOCIATIONS----- (NULL)
ATTRIBUTES
READY
listc ent('zos')
ALIAS ----- ZOS
IN-CAT --- MASTERV.CATALOG
READY
listc
IN CATALOG:CATALOG.USERAA
ZIBM030.DATA
ZIBM030.EXEC
ZIBM030.ISPF.ISPPROF
ZIBM030.JCL
ZIBM030.LOAD
ZIBM030.OUTPUT
ZIBM030.SOURCE
READY

```

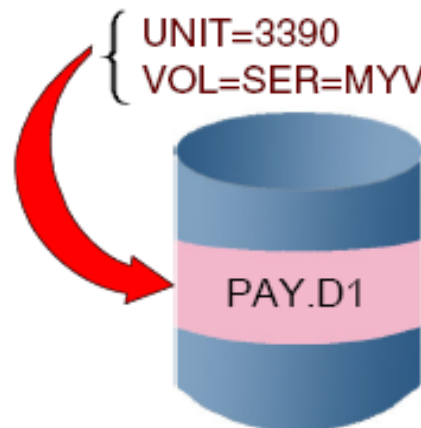
MA a 28/001

Connected to remote server/host 204.90.115.184 using lu/pool TCP00011 and port 623 PDF Writer (Ghostscript) on Ghostscript1:

Cataloged and Uncataloged Data Sets

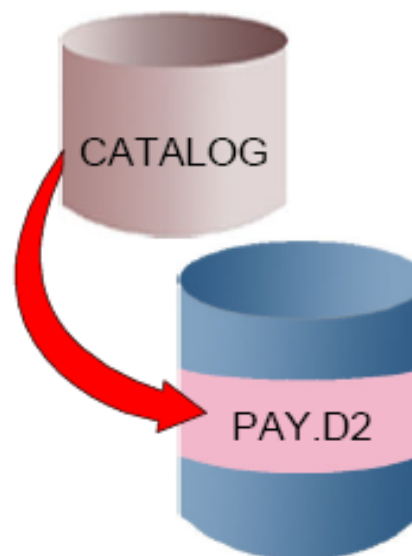
□ Uncataloged reference

```
// DD DSN=PAY.D1  
DISP=OLD  
{ UNIT=3390  
VOL=SER=MYVOL
```



□ Cataloged reference

```
// DD DSN=PAY.D2  
DISP=OLD
```



Types of Data Sets

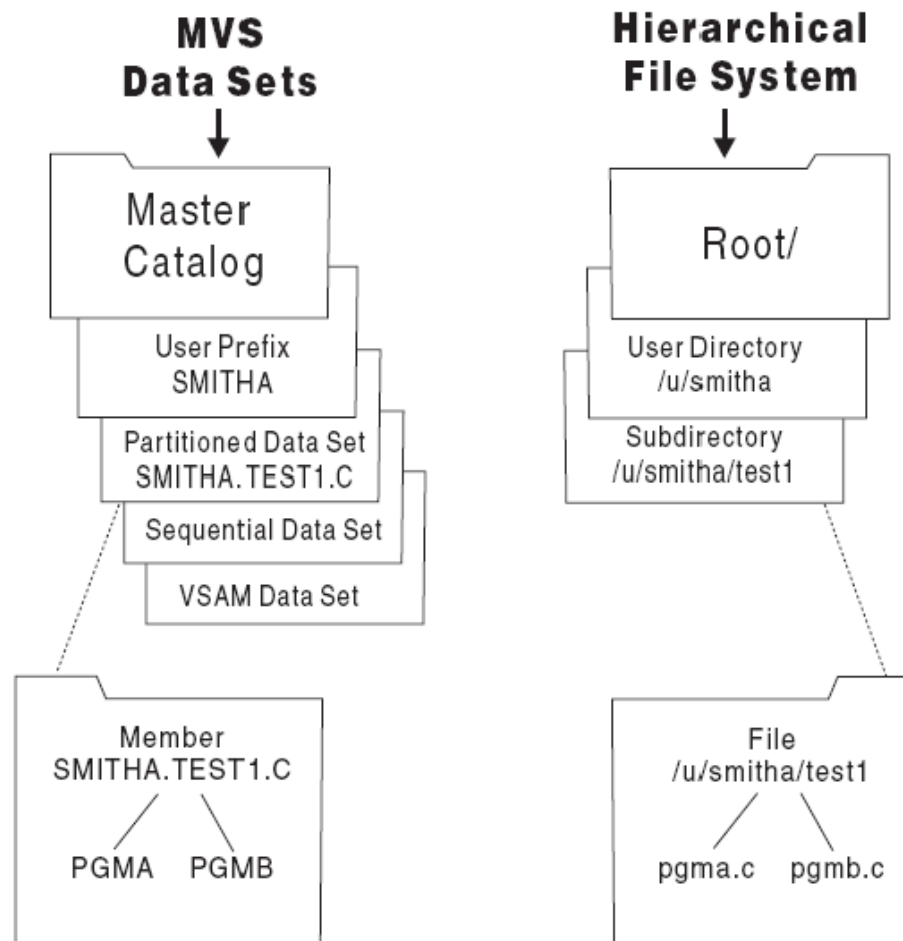
- Sequential Data Set: written and read in sequential order
- Partitioned Data Set (PDS or *library*):
 - Collection of a directory and sequential data sets (called members)
 - Member names can be 8 bytes long
- VSAM – both a type of data set and an *access method*

PDS vs. PDSE

PDS Extended (PDSE) is an extension of PDS with the following advantages:

- Space reclaimed automatically when a member is deleted (PDS has a compaction utility)
- Flexible size
- Can be shared
- Faster directory searches

Comparison of MVS Data Sets and UNIX HFS



Access Methods

- An *access method* defines the technique used to store and retrieve data
- This definition includes system-provided programs and utilities to define and process data sets.

Commonly Used Access Methods

QSAM Queued Sequential Access Method (for most simple data sets)

BSAM Basic Sequential Access Method (for special cases)

BDAM Basic Direct Access Method (becoming obsolete)

BPAM Basic Partitioned Access Method (for libraries)

VSAM Virtual Storage Access Method (for complex applications)

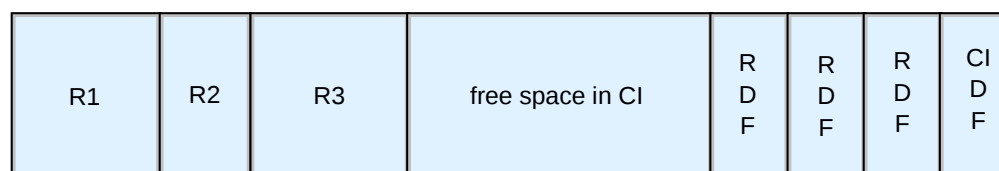
VSAM

VSAM provides more complex functions than other common disk access methods; VSAM knows four record formats:

- Key Sequence Data Set (KSDS) – most commonly used; like a hash table
- Entry Sequence Data Set (ESDS) – for simple sequential access
- Relative Record Data Set (RRDS) – access records by number
- Linear Data Set (LDS) – like UNIX files (and used by zFS)

Simple VSAM Control Interval

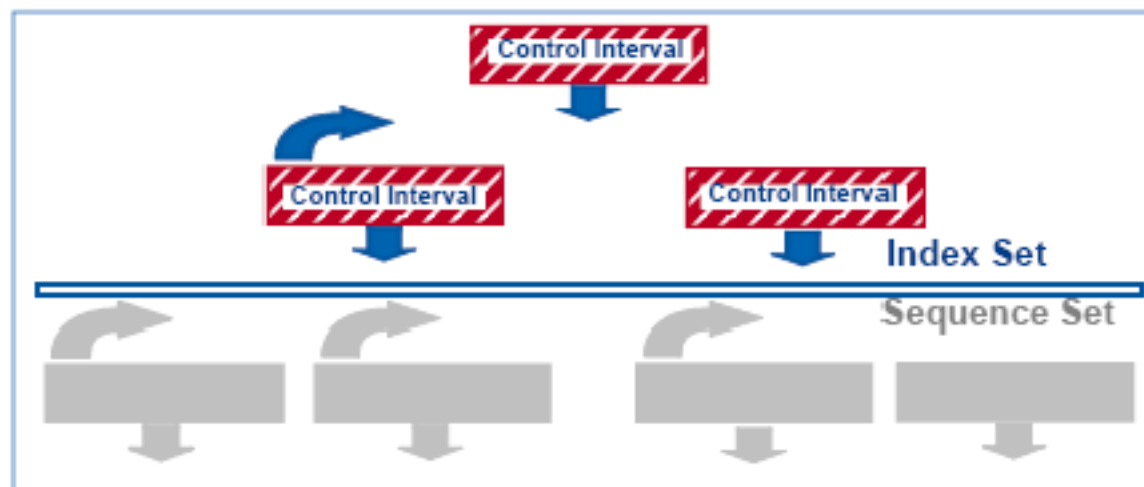
VSAM Control Intervals are the basic unit for DASD reads and writes used by VSAM. They contain records and meta data:



Record Descriptor Fields

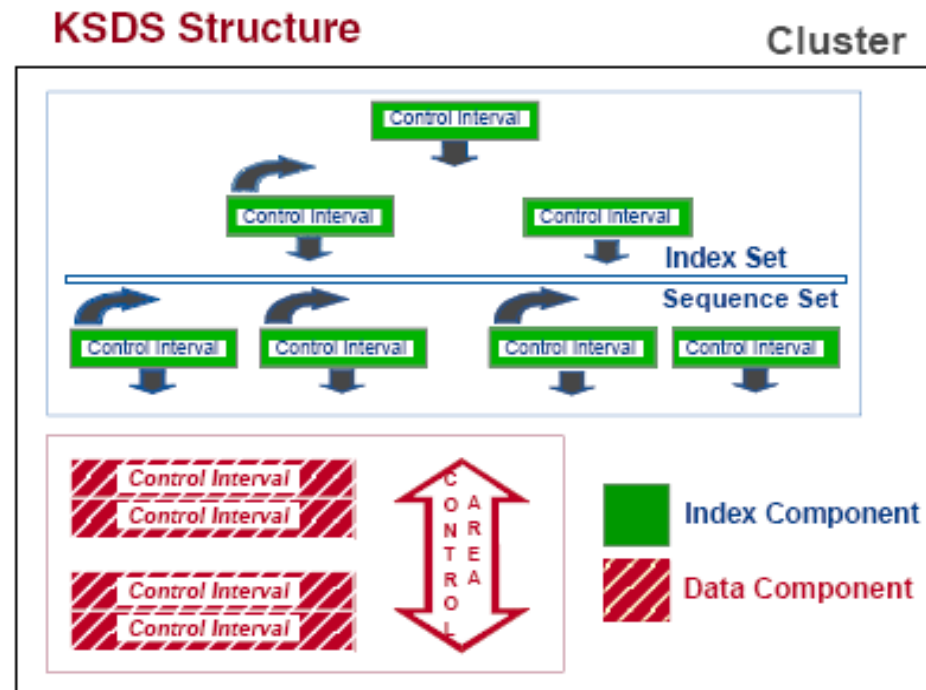
VSAM Index Structure

Index Set



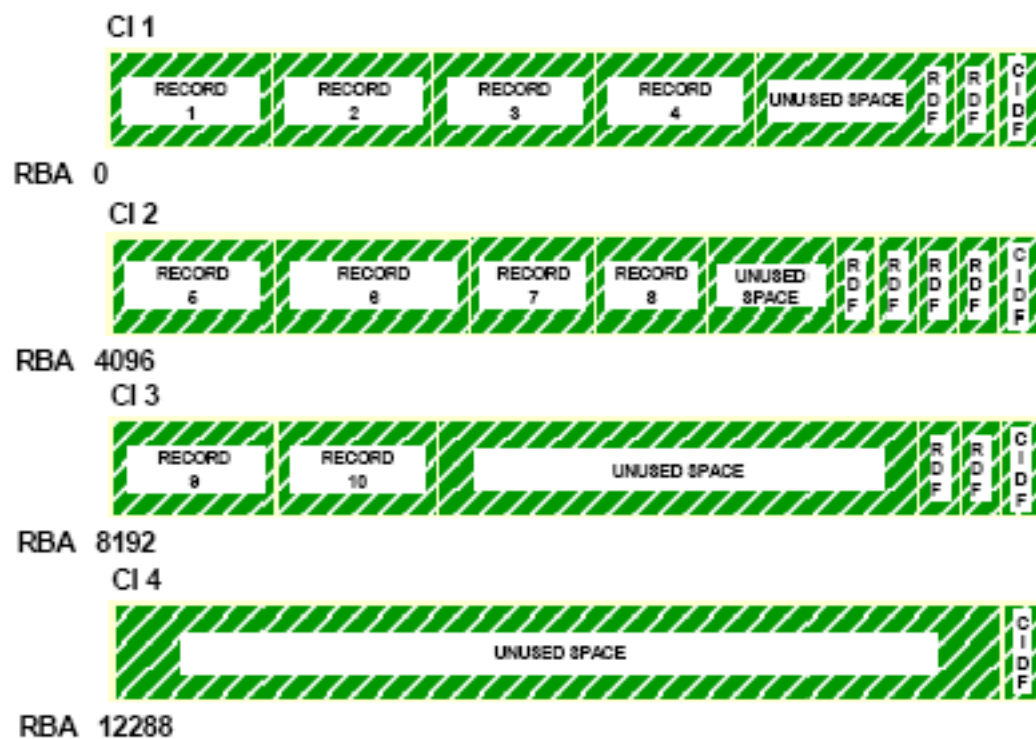
- Forward horizontal pointer at same level
- Vertical pointers to next lower level index records
- Just one CI in the top

Key Sequence Data Set (KSDS)



Entry Sequence Data Set (ESDS)

Entry Sequenced Data Set



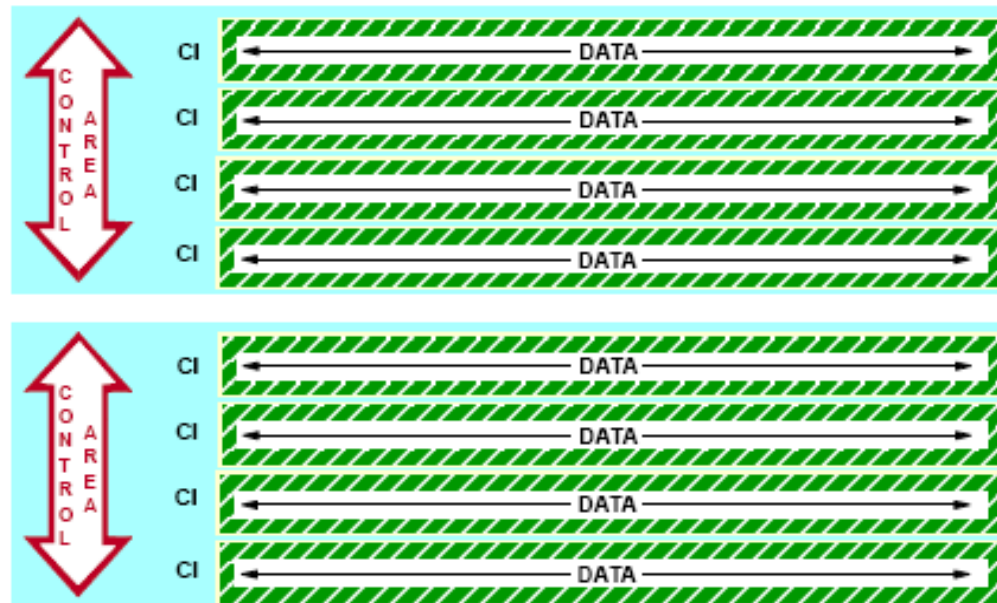
Relative Record Data Set (RRDS)

RELATIVE RECORD DATA SET (RRDS)



Linear Data Set (LDS)

LINEAR DATA SET (LDS)



Data Set List Utility: Listing

```

Lab System
File Edit View Communication Actions Window Help
Menu Options View Utilities Compilers Help
DSLIST - Data Sets Matching ZIBM030 Row 1 of 9
Command ==> Scroll ==> PAGE
Command - Enter "/" to select action Message Volume
-----
ZIBM030 *ALIAS
ZIBM030.DATA VPARC1
ZIBM030.EXEC VPARC1
ZIBM030.ISPF.ISPPROF VPMVSE
ZIBM030.JCL VPARC1
ZIBM030.LOAD VPARC1
ZIBM030.OUTPUT VPARC1
ZIBM030.SOURCE VPARC1
ZIBM030.SPFL0G1.LIST VPMVSC
***** End of Data Set list *****
MA a 04/015
Connected to remote server/host 204.90.115.184 using lu/pool TCP00005 and port 623 PDF Writer (Ghostscript) on Ghostscript1:

```

Data Set List Utility: Listing (More)

The screenshot shows a terminal window titled "Lab System" with a menu bar (File, Edit, View, Communication, Actions, Window, Help) and a toolbar. The main display shows the output of the DSLIST utility, listing data sets matching ZIBM030. The output includes a header row with columns for Dsorg, Recfm, Lrecl, and Blksz. The data sets listed are ZIBM030, ZIBM030.DATA, ZIBM030.EXEC, ZIBM030.ISPF.ISPPROF, ZIBM030.JCL, ZIBM030.LOAD, ZIBM030.OUTPUT, ZIBM030.SOURCE, and ZIBM030.SPFL0G1.LIST. The output ends with a line indicating the end of the data set list.

```

DSLIST - Data Sets Matching ZIBM030                               Row 1 of 9
Command ==> _____ Scroll ==> PAGE

Command - Enter "/" to select action                               Dsorg  Recfm  Lrecl  Blksz
-----
ZIBM030
ZIBM030.DATA                PS    F      170    170
ZIBM030.EXEC                PO-E  FB     80    32720
ZIBM030.ISPF.ISPPROF       PO    FB     80    6160
ZIBM030.JCL                 PO-E  FB     80     800
ZIBM030.LOAD                PO-E  U       0    6144
ZIBM030.OUTPUT              PO-E  FB     80     800
ZIBM030.SOURCE              PO-E  FB     80     800
ZIBM030.SPFL0G1.LIST       PS    VA    125    129
***** End of Data Set list *****
  
```

At the bottom of the window, there is a status bar showing "MA a" on the left, "04/015" on the right, and a connection status: "Connected to remote server /host 204.90.115.184 using lu/pool TCP00005 and port 623". A PDF Writer (Ghostscript) on Ghostscript1: is also visible in the bottom right corner.

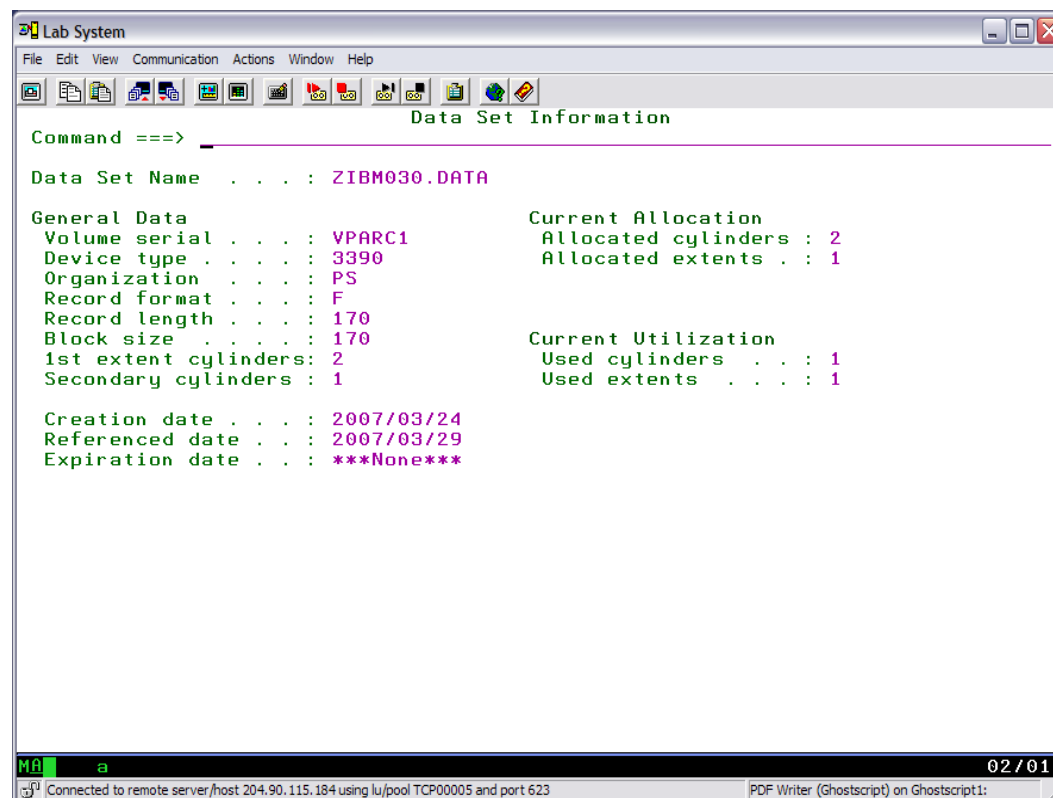
Data Set List Utility: Commands

```

Lab System
File Edit View Communication Actions Window Help
Menu Options View Utilities Compilers Help
DSLIST - Data Sets Matching ZIBM030 Row 1 of 9
Command ==> Scroll ==> PAGE
Command - Enter "/" to select action Message Volume
-----
i_ ZIBM030 *ALIAS
ZIBM030.DATA VPARC1
ZIBM030.EXEC VPARC1
ZIBM030.ISPF.ISPPROF VPMVSE
ZIBM030.JCL VPARC1
ZIBM030.LOAD VPARC1
ZIBM030.OUTPUT VPARC1
ZIBM030.SOURCE VPARC1
ZIBM030.SPFL0G1.LIST VPMVSC
***** End of Data Set list *****
MA a 09/003
Connected to remote server/host 204.90.115.184 using lu/pool TCP00005 and port 623
PDF Writer (Ghostscript) on Ghostscript1:

```

Data Set List Utility: Info



The screenshot shows a terminal window titled "Lab System" with a menu bar (File, Edit, View, Communication, Actions, Window, Help) and a toolbar. The main content area displays the output of a command, titled "Data Set Information". The output is as follows:

```
Command ==> _____  
Data Set Name . . . . : ZIBM030.DATA  
  
General Data  
Volume serial . . . . : VPARC1  
Device type . . . . . : 3390  
Organization . . . . . : PS  
Record format . . . . : F  
Record length . . . . : 170  
Block size . . . . . : 170  
1st extent cylinders: 2  
Secondary cylinders : 1  
  
Current Allocation  
Allocated cylinders : 2  
Allocated extents . : 1  
  
Current Utilization  
Used cylinders . . . : 1  
Used extents . . . . : 1  
  
Creation date . . . . : 2007/03/24  
Referenced date . . . : 2007/03/29  
Expiration date . . . : ***None***
```

The terminal status bar at the bottom shows "MA a" on the left, "02/015" on the right, and a connection message: "Connected to remote server/host 204.90.115.184 using lu/pool TCP00005 and port 623". A "PDF Writer (Ghostscript) on Ghostscript1:" status is also visible.

Data Set List Utility: Volume View

The screenshot shows a terminal window titled "Lab System" with a menu bar (File, Edit, View, Communication, Actions, Window, Help) and a toolbar. The main content is the "Data Set List Utility" interface. It prompts the user to enter an option (blank, V, P, or PV) and provides instructions for entering parameters like Dsname, Level, and Volume serial. The Volume serial is set to "vparc1". It also lists "Data set list options" such as Initial View (set to 1), and provides instructions on how to interact with the data set list once displayed.

```

Lab System
File Edit View Communication Actions Window Help
Menu RefList RefMode Utilities Help

Data Set List Utility

Option ==> _____

blank Display data set list          P Print data set list
  V Display VTOC information          PV Print VTOC information

Enter one or both of the parameters below:
Dsname Level . . . _____
Volume serial . . vparc1

Data set list options
Initial View . . . 1  1. Volume          Enter "/" to select option
                    2. Space           / Confirm Data Set Delete
                    3. Attrib          / Confirm Member Delete
                    4. Total           / Include Additional Qualifiers
                                   / Display Catalog Name

When the data set list is displayed, enter either:
"/" on the data set list command field for the command prompt pop-up,
an ISPF line command, the name of a TSO command, CLIST, or REXX exec, or
"=" to execute the previous command.

MA a 10/024
Connected to remote server/host 204.90.115.184 using lu/pool TCP00005 and port 623
PDF Writer (Ghostscript) on Ghostscript:

```

Data Set List Utility: Volume DS List

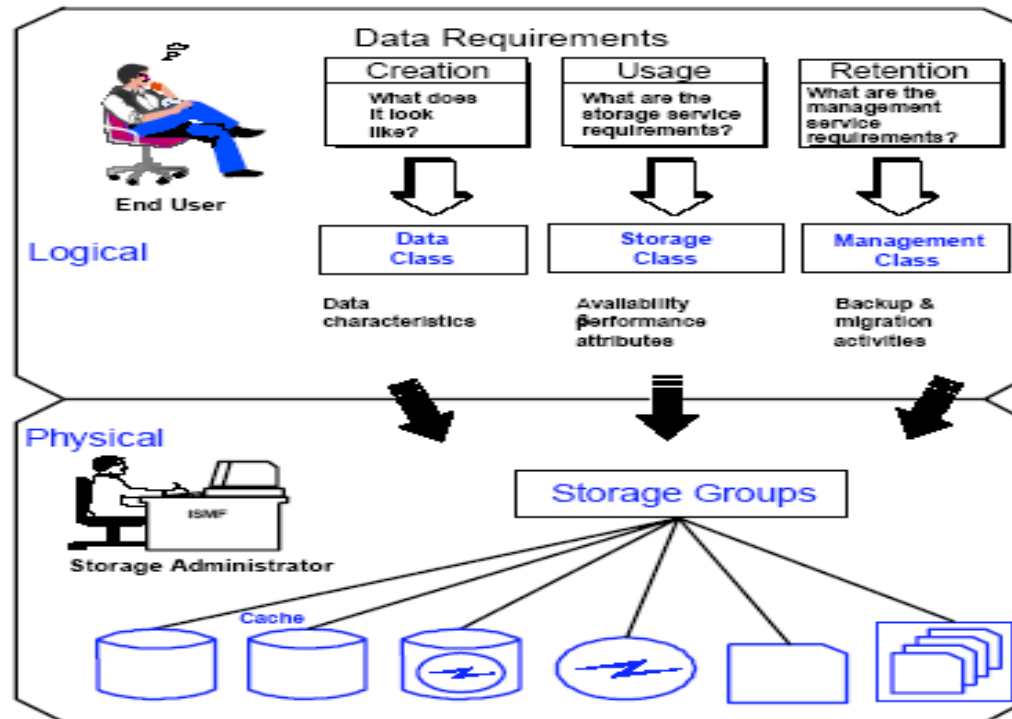
```

Lab System
File Edit View Communication Actions Window Help
Menu Options View Utilities Compilers Help
DSLIST - Data Sets on volume VPARC1 Row 1 of 181
Command ==> _____ Scroll ==> PAGE
Command - Enter "/" to select action Message Volume
-----
ACCOUNTS.DSNDBD.ACCOUNTS.ACCTS.I0001.A001 VPARC1
ACCOUNTS.DSNDBD.ACCOUNTS.XCLIENT.I0001.A001 VPARC1
COUPLE.ATR.SVSCPLEX.ARCHIVE.A0000000.DATA VPARC1
COUPLE.ATR.SVSCPLEX.DELAYED.UR.A0000000.D VPARC1
COUPLE.ATR.SVSCPLEX.RESTART.A0000000.DATA VPARC1
COUPLE.ATR.SVSCPLEX.RESTART.SVSCPLEX.DATA VPARC1
COUPLE.ATR.SVSCPLEX.RM.DATA.SVSCPLEX.DATA VPARC1
DB2CHECK.WORK VPARC1
IBMUSER.DDIR.D VPARC1
IBMUSER.DDIR.I VPARC1
IBMUSER.ISPF.ISPPROF VPARC1
SYS1.VTOCIX.VPARC1 VPARC1
SYS1.VVDS.VVPARC1 VPARC1
ZIBM001.DATA VPARC1
ZIBM001.JCL VPARC1
ZIBM001.LOAD VPARC1
ZIBM001.OUTPUT VPARC1
ZIBM001.SOURCE VPARC1
ZIBM002.DATA VPARC1
ZIBM002.JCL VPARC1
ZIBM002.LOAD VPARC1
ZIBM002.OUTPUT VPARC1
ZIBM002.SOURCE VPARC1
ZIBM003.DATA VPARC1
ZIBM003.ISPF.ISPPROF VPARC1
MA a 04/015
Connected to remote server/host 204.90.115.184 using lu/pool TCP00005 and port 623 PDF Writer (Ghostscript) on Ghostscript1:

```


DFSMS

What Is DFSMS?



Automatic Class Selection (ACS)

ACS uses coded criteria to determine allocation parameters:

1. Data Class (RECORG, RECFM, LRECL, PDS/PDSE, SPACE, ...)
2. Management Class (migration, backup frequency, automatic deletion, ...)
3. Storage Class
4. Storage Group (device media)

ACS uses the DD's DATACLS, MGMTMCLAS, STORCLAS, DSN and DISP operands for criteria determination.

Copying between Data Sets and UNIX Files

In order to copy files from or to UNIX, use the following commands in the ISPF Command Shell:

```
OGET '/u/$USER/file' KC02292.FOO(BAR)
OPUT KC02292.FOO(BAR) '/u/$USER/file'
```

Questions

