



**Uni Hamburg – Mainframe Summit
z/OS – The Mainframe Operating**

Part 3 – z/OS data sets

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Introduction to the new mainframe

Chapter 5: Working with data sets




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Chapter 5 objectives

Be able to:

- Explain what a data set is
- Describe data set naming conventions and record formats
- List some access methods for managing data and programs
- Explain what catalogs and VTOCs are used for
- Create, delete, and modify data sets
- Explain the differences between UNIX file systems and z/OS data sets
- Describe the z/OS UNIX file systems' use of data sets.




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Key terms in this chapter

- block size
- catalog
- data set
- high level qualifier or HLQ
- library
- logical record length or LRECL
- member
- PDS and PDSE
- record format or RECFM
- system managed storage or SMS
- virtual storage access method or VSAM
- volume table of contents or VTOC

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What is a data set?


A data set is a collection of logically related data records stored on one disk storage volume or a set of volumes.

A data set can be:

- a source program
- a library of macros
- a file of data records used by a processing program.

You can print a data set or display it on a terminal. The logical record is the basic unit of information used by a program running on z/OS.

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How data is stored in a z/OS system

- Data is stored on a direct access storage device (DASD), magnetic tape volume, or optical media.
- You can store and retrieve records either directly or sequentially.
- You use DASD volumes for storing data and executable programs, including the operating system itself, and for temporary working storage.
- You can use one DASD volume for many different data sets, and reallocate or reuse space on the volume.

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Data management in z/OS

Data management involves all of the following tasks:

- allocation, placement, monitoring, migration, backup, recall, recovery, and deletion.

Storage management is done either manually or through automated processes (or through a combination of both).

In z/OS, Data Facility: System-Managed Storage (DFSMS) is used to automate storage management for data sets.

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What an access method is

- Defines the technique used to store and retrieve data.
- Includes system-provided programs and utilities to define and process data sets.
- Commonly used access methods include the following:
 - VSAM, QSAM, BSAM, BDAM, and BPAM.

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DASD: Use and terminology

Direct Access Storage Device (DASD) is another name for a disk drive.

DASD volumes are used for storing data and executable programs.

Data sets in a z/OS system are organized on DASD volumes.

- A disk drive contains cylinders
- Cylinders contain tracks
- Tracks contain data records

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Using a data set

To use a data set, you first *allocate* it. Then, access the data using macros for the access method that you have chosen.

Various ways to allocate a data set:

- ISPF data set panel, option 3.2
- Access Method Services
- TSO ALLOCATE command
- job control language (JCL)

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Allocating space on DASD volumes

How space is specified:

- explicitly (SPACE parameter)
- implicitly (SMS data class)

Logical records and blocks:

- Smallest amount of data to be processed
- Grouped in physical records named blocks

Data set extents:

- Space for a disk data set is assigned in extents

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Data set record formats

F record record record record
Fixed records.

FB record record record record record record
Fixed blocked records. BLKSIZE = n * LRECL.

V record record record
Variable records.

VB record record record record record record
Variable blocked records. BLKSIZE >= 4 + n * largest LRECL.

U record record record record
Undefined records. No defined internal structure for access method.

Record and block descriptor words are each 4 bytes long.

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Types of data sets

We discuss three types in this class:

- Sequential, partitioned, and VSAM

A sequential data set is a collection of records written and read in sequential order from beginning to end.

A partitioned data set (PDS) is a collection of sequential data sets, called members.

- Consists of a directory and one or more members.
- Also called a library.

A PDSE is a partitioned data set extended.

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PDS versus PDSE

PDS data sets:

- Simple and efficient way to organize related groups of sequential files.

PDSE data sets:

- Similar to a PDS, but advantages include:
 - Space reclaimed automatically when a member is deleted
 - Flexible size
 - Can be shared
 - Faster directory searches

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What is a data set, and how is it stored

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VSAM

VSAM is *Virtual Storage Access Method*

VSAM provides more complex functions than other disk access methods

VSAM record formats:

- Key Sequence Data Set (KSDS)
- Entry Sequence Data Set (ESDS)
- Relative Record Data Set (RRDS)
- Linear Data Set (LDS)

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Simple VSAM control interval

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How data sets are named

Data set naming convention

- Unique name
 - Maximum 44 characters
- Maximum of 22 name segments: level qualifier
 - The first name in the left: high level qualifier (HLQ)
 - The last name in the right: low level qualifier (LLQ)
 - Level qualifiers are separated by '.'
- Each level qualifier:
 - From 1 up to 8 characters
 - The first must be alphabetical (A-Z) or special (@ # \$)
 - The 7 remaining: alphabetical, national, numeric (0-9) or hyphen (-)
 - Upper case only
- Example: MYID.JCL.FILE2 HLQ: MYID 3 qualifiers

Member name of partitioned data set

- 8 bytes long
- First byte: alphabetical (A-Z) or special (@ # \$)
- The 7 remaining: alphabetical, special, numeric (0-9)

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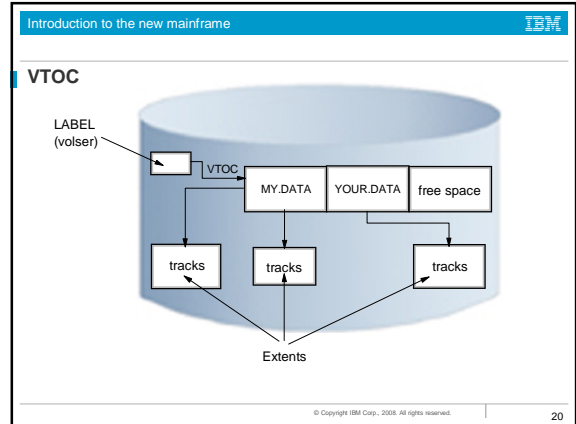
Catalogs and VTOCs

z/OS uses a catalog and a volume table of contents (VTOC) on each DASD volume to manage the storage and placement of data sets.

VTOC:

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

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How a catalog is used

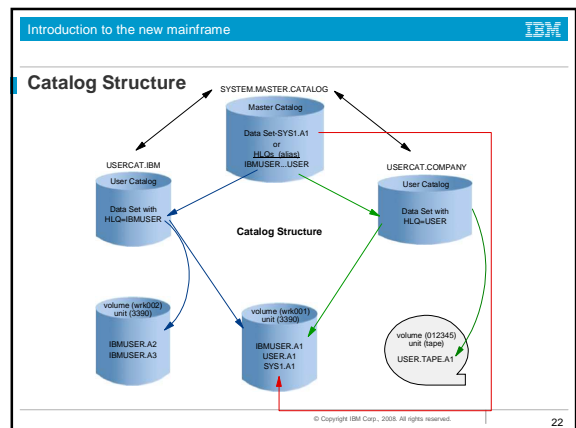
A catalog associates a data set with the volume on which the data set is located.

Locating a data set requires:

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

Typical z/OS system includes a master catalog and numerous user catalogs.

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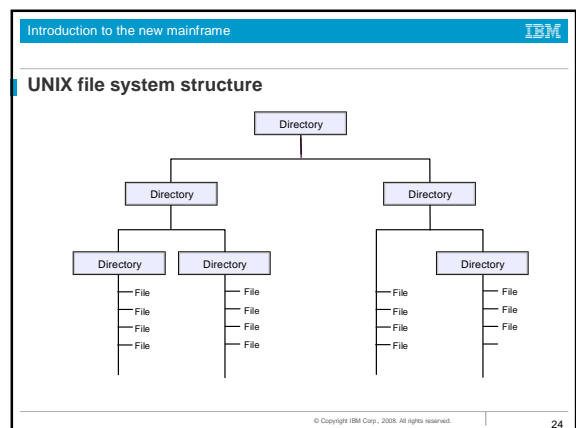


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z/OS UNIX file systems

- z/OS UNIX System Services (z/OS UNIX) allows z/OS to access UNIX files.
- A z/OS UNIX file system is hierarchical and byte-oriented.
- Files in the UNIX file system are sequential files and are accessed as byte streams.
- UNIX files and traditional z/OS data sets can reside on the same DASD volume.

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Summary

- A data set is a collection of logically related data (programs or files)
- Data sets are stored on disk drives (DASD) and tape.
- Most z/OS data processing is record-oriented. Byte stream files are not present in traditional processing, except in z/OS UNIX.
- z/OS records follow well-defined formats, based on record format (RECFM), logical record length (LRECL), and the maximum block size (BLKSIZE).
- z/OS data set names have up to 44 characters, divided by periods into qualifiers.

Summary (continued)

- Catalogs are used to locate data sets.
- VSAM is an access method that provides more complex functions than other disk access methods.
- z/OS libraries are known as partitioned data sets (PDS or PDSE) and contain members.
- A file in the hierarchical file system can be either a text file or a binary file.
- z/OS treats an entire UNIX file system hierarchy as a collection of "data sets." Each data set is a mountable file system.