



An Introduction to SAN and Fixed Block Disk for ECKD Users

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Overview

- z/OS uses primarily Variable-Block disk storage (aka Enhanced Count-Key-Data (ECKD)), while other zSystem operating systems can use ECKD and 512-byte Fixed Block (FB) disk.
- Accessing FB disk uses Fibre Channel instead of FICON
 - Same hardware
 - Different communication protocols
- This presentation will compare/contrast accessing ECKD disk vs. FB disk



Background: IOCDs

- I/O Configuration Dataset (IOCDs) defines pathing between zSystem and peripheral devices
- Path Management by I/O Subsystem (separate system within IBM zSystems)
- Primary Entries in IOCDs
 - CHPID (hardware connection)
 - CNTLUNIT (control unit to receive I/O and route to device)
 - Connected to CHPID(s)
 - IOADDR (individual storage devices)
 - Connected to CNTLUNIT



Background: FCP

- Fibre Channel Protocol (FCP) attachment is handled differently from FICON attachment
 - FCP port is assigned a World-Wide Port Name (WWPN)
 - One WWPN per port
 - An FC Port is to a WWPN as an OSA Port is to a MACADDR
 - Same concept
 - IBM zSystems define WWPNs based on CPU Serial number and PCHID
 - Multiple subchannels available but every subchannel sees the same traffic because traffic is routed between WWPNs on both sides of the connection
 - No path management by I/O subsystem
 - Path management by zSystems operating system(s)



Background: NPIV

- How do you keep traffic different FCP subchannels from seeing traffic on all other subchannels?
- Virtualization!!
- N_Port ID Virtualization (NPIV) creates a virtual WWPN for each channel
 - Limited to 64 subchannels per FCP port in z15
- Using NPIV, traffic between an FCP subchannel and a disk subsystem will not be seen by any other FCP subchannel
 - Traffic could be seen at the disk subsystem channel interface unless it also uses NPIV



Background: SAN “Fabric”

- IBM zSystems cannot directly connect to FC HBAs
 - Must use a SAN switch that is certified for use with zSystems
- SAN provides the path management between FC-attached devices
- “Zoning” is the process of pairing these FC attachments
 - WWPNs are used in the zoning process
 - Not limited to a single point-to-point definition at each end
 - Can have 1:1, 1:many, many:1 or many:many
 - Pathing is managed by a multipath background process/started task/daemon in the host operating system
 - Configured by querying the SAN and devices attached at other end of the zone
- Usually want 2 separate fabrics for redundancy



ECKD Storage Devices

- 1 or more Hardware Bus Adapters (e.g. FICON channel)
- Pre-defined Logical Control Units (LCUs = CUADDR on IOCCDS)
- Pre-defined Unit Addresses (0-255 per LCU)
 - Size of each logical disk is pre-defined
- IOCCDS should have configuration statements matching pre-defined definitions in disk subsystem



FB Storage Devices

- 1 or more Hardware Bus Adapters (e.g. FC channel)
- Pre-defined Host Addresses (WWPNs)
- **No** Logical Control Units
- Pre-defined Logical Units (LUNs)
 - Size of each LUN is pre-defined
- SAN Zones providing the linkage between zSystems and the disk HBAs
- Disk subsystem definitions for the zSystems WWPNs that will be accepted and matched with local LUNs



Lost Yet?





Examples from a real system

- IOCCDS source for an FCP channel

```
CHPID2D  CHPID  PATH=(CSS(0),20),TYPE=FCP,PART=((PROD,TEST)),PCHID=100
CU6600   CNTLUNIT CUNUMBR=2000,PATH=20,UNIT=FCP
DEV2000  IODEVICE ADDRESS=(2000,64),CUNUMBR=(2000),UNIT=FCP
```

- z/VM WWPNN Displays with NPIV active (2 LPARs)


```
q fcp wwpn 2000
FCP 2000          NPIV WWPNN C05076D691800380
      CHPID 20    PERM WWPNN C05076D691801141
      ATTACHED TO LNXUTILS
```

```
q fcp wwpn 2000
FCP 2000          NPIV WWPNN C05076D691800400
      CHPID 20    PERM WWPNN C05076D691801141
      FREE
```



Examples from a real system

- SAN Fabric Definitions
 - Aliases: Giving Names to WWPNs

Zone Configurations Zones **Zone Aliases** Preferences z_FCP2000 

Name

2 Items Members

<input type="checkbox"/>	Members	Type	Vendor	
<input type="checkbox"/>	c0:50:76:d6:91:80:03:80	WWN	-	▼
<input type="checkbox"/>	c0:50:76:d6:91:80:04:00	WWN	-	▼



Examples from a real system

- SAN Fabric Definitions
 - Zones: Linking Aliases to create a path between connections

Zone Configurations **Zones** Zone Aliases Preferences **z_FCP00_FS5030f**

Name

Type Standard

4 Items **Members**

<input type="checkbox"/>	Members	Type	
<input type="checkbox"/>	FS5030f_node1_p1_NPIV	ALIAS	▼
<input type="checkbox"/>	FS5030f_node2_p1_NPIV	ALIAS	▼
<input type="checkbox"/>	z_FCP2000	ALIAS	▼
<input type="checkbox"/>	z_FCP2200	ALIAS	▼



Examples from a real system

- Storage Subsystem
 - Host: Defining who can connect
 - Not needed with ECKD

Name	Status	Host Type	# of Ports	Host Mappings	Host Cluster ID	Host Cluster Name
z_Channel_00	✓ Online	Generic	8	Yes		

Name	Type	Status	# Nodes Logged In
C05076D691800080	FC (SCSI)	✓ Active	2
C05076D691800100	FC (SCSI)	● Offline	0
C05076D691800200	FC (SCSI)	✓ Active	2
C05076D691800280	FC (SCSI)	● Offline	0
C05076D691800380	FC (SCSI)	● Offline	0
C05076D691800400	FC (SCSI)	● Offline	0
C05076D691800500	FC (SCSI)	✓ Active	2
C05076D691800580	FC (SCSI)	● Offline	0

Showing 8 host ports | Selecting 0 host ports

SCSI ID	Name	UID	Caching I/O
0	z_Volume_00	6005076380812096E800000000000033	0
1	z_Volume_01	6005076380812096E80000000000003A	0
2	z_Volume_02	6005076380812096E800000000000041	0
3	z_Volume_03	6005076380812096E800000000000048	0
4	z_Volume_04	6005076380812096E80000000000004F	0
5	z_Volume_05	6005076380812096E800000000000050	0
6	z_Volume_06	6005076380812096E800000000000051	0

Showing 16 mappings | Selecting 0 mappings

Volume Overview Copy 0

Name:	z_Volume_00	Cache mode:	Enabled
Volume ID:	15	Cache state:	Not empty
State:	✓ Online	UDID (OpenVMS):	N/A
Capacity:	10.00 GiB	Volume UID:	6005076380812096E800000000000033
IOPS limit:	Disabled	I/O group:	Caching: io_grp0
Bandwidth limit:	Disabled		Accessible: io_grp0
Encrypted:	Yes	Preferred node:	node2
FlashCopy mappings:	0	Last Access Time:	4/8/2022 5:42:58 PM
Mirror sync rate:	100		



Questions?

