z/VM and LINUX Considerations for FCP Storage Environments

The Technology Partner for Business Results

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Introduction

➢ This presentation reviews topics related to using Fibre Channel Protocol connected storage with z/VM and Linux running on IBM Z and LinuxONE

➢ There is very good documentation and examples available to help you configure this environment and these documents are listed at the end of this presentation

➢ This presentation will discuss some important things to keep in mind when configuring your FCP connections and items that seem to cause a bit of confusion when configuring FCP attached devices

➢ Once you understand the concepts , FCP connectivity is fairly straight forward to implement from a z/VM and Linux standpoint

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What is FCP attached storage

➢ FICON – Traditional mainframe disk – ECKD / 3390 etc.

    ➢ Addressed by a device address

    ➢ Multipathing handled by the hardware

➢ Fiber Channel Protocol - same card , different microcode – SCSI Luns

    ➢ Addressed by a device address + WWPN + Lun number

    ➢ Multipathing handled by the OS

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➢Traditional mainframe customers start out using Ficon storage
  ➢ Familiarity with Ficon, management and capabilities
  ➢ Utilize existing free storage or easily add additional storage
  ➢ No need for additional San equipment
  ➢ Existing DR / Backup & Recovery tools and processes
  ➢ Can utilize z/OS GDPS
  ➢ Supports z/VM SSI Clustering
  ➢ Most are using a combination of Ficon for the OS's and FCP for the data
  ➢ Larger storage requirements for databases , OCP and SSC appliances are driving more adoption of FCP

➢New to z costumers tend to go with FCP attached storage
  ➢ Familiarity with FCP attached storage
  ➢ Familiarity with San architecture and configuration with multipathing and Lun management
  ➢ Fewer size limitation on Luns
  ➢ Larger OS and Application storage requirements

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➢ Ficon Attached Storage
  ➢ Multipathing is independent of the OS
  ➢ Can be direct attached
  ➢ Can utilize zHPF
  ➢ Size restrictions on disk sizes
  ➢ Reduction of usable disk space
  ➢ Required for z/VM SSI

➢ FCP Attached Storage
  ➢ Multipathing is handle by the OS
  ➢ Must be attached through San switches
  ➢ Possible changes to the type of connectors
  ➢ Storage subsystem and switches need configured for zoning and masking of the Luns
  ➢ Faster than FICON without zHPF
  ➢ Native storage format for Linux
  ➢ Larger Lun sizes with fewer size restrictions
  ➢ Can not run z/VM SSI

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Process Differences

➢ Areas that will be impacted
- ➢ Who is going to manage and provision the storage
- ➢ What skills do you have today and what skills will you need with either option or a mix
- ➢ How is DR going to be architected?
- ➢ What will be used for backup and restore for Linux and z/VM?
- ➢ How will machine recovery work?
- ➢ Do you need to utilize z/OS GDPS?
- ➢ Do you need to run z/VM SSI?
- ➢ Should you do both?

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Hardware Considerations

➢ FICON/FCP cards can have either long or short wave connections

  ➢ **Make sure your connections match between the FCP port and SAN switch**

➢ Plan out your storage configuration to account for redundancy and throughput requirements - multiple cards connected to multiple switches

➢ Balance multiple workloads across ports and don't forget about planning for fail over usage

➢ Decide on Failover , Multibus or Group by Priority multipathing , then configure accordingly

➢ **Check with your storage/San/SVC (if used) switch vendor/doc for support/requirements - verify this information with your IBM/BP Representative**

➢ IBM System Storage Interoperation Center (SSIC)

  ➢ http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss

➢ WWPN Tool - Used to predict wwpns for new installations and upgrades allowing the SAN and Storage configurations to be done prior to the installation of the physical processor

  ➢ IBM Resource Link: WWPN tool

IOCP CONFIGURATION

➢A port can be either FICON or FCP – the IOCP definition for the port(chpid) tells the hardware which micro code to load – type=FCP on channel definitions and unit=FCP for control units and devices

➢FCP channels can be shared between LPARs or dedicated to specific LPARs just like other Ficon channels

➢All z/VM guests and all native Linux LPARs that share a FCP channel can potentially see the Luns available on these paths – This is why we use San switch zoning and storage subsystem Lun masking between LPARs and NPIV to isolate z/VM guests in the same LPAR as well as OS's in different LPARs

➢Check with your storage subsystem/San provider to verify if there are any limits on how many devices you can have defined on a single chpid

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IOCP EXAMPLE

```
CHPID PATH=(CSS(0),A1),SHARED,                                  *
      PARTITION=((AH,AH2,BP,EMR,IT,PS,TA),(=)),PCHID=10D,       *
      TYPE=FCP
CNTLUNIT CUNUMBR=A100,PATH=((CSS(0),A1)),UNIT=FCP
IODEVICE ADDRESS=(A100,032),CUNUMBR=(A100),UNIT=FCP


CHPID PATH=(CSS(0),A2),SHARED,                                  *
      PARTITION=((AH,AH2,BP,EMR,IT,PS,TA),(=)),PCHID=12C,       *
      TYPE=FCP
CNTLUNIT CUNUMBR=A200,PATH=((CSS(0),A2)),UNIT=FCP
IODEVICE ADDRESS=(A200,032),CUNUMBR=(A200),UNIT=FCP
```
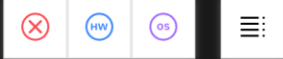
2 CHPIDs with 32 device addresses each – As an example this configuration could be used to create 32 primary paths and 32 fail over paths to any reasonable number of Luns addressed over the device address + WWPN path

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NPIV Configuration

➢N-Port ID Virtualization – Share one FCP adapter between several virtual ports

➢NPIV is used to help isolate Luns between Linux guests running in a z/VM LPAR by creating a virtual WWPN for each sub channel address

➢Zone Luns between Linux guests running in a z/VM LPAR by creating a virtual WWPN for each sub channel address

➢NPIV is defined by channel and by LPAR

➢NPIV needs to be supported by the switch that the FCP channel connects to directly. Other switches in the SAN do not need to support NPIV

➢**NPIV needs to be activated on the switch first then you need to enable it on the channel**

➢Enabling NPIV requires you to configure the channel offline and then back online - disruptive

➢You should review your switch and storage subsystem limits when deciding on the number of sub channel and LPAR limits for your iocp when using NPIV

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Enabling NPIV on a Channel

➢ **This process is disruptive to the channel(s) you are modifying**

➢ Go into Single Object Operations

➢ Select the FCP channel you want and then select CHPID Operations

➢ Select Configure On/Off – Configure the chpid off

➢ Select FCP NPIV Mode On/OFF / Select NPIV Mode Enabled for the partitions you wish to use

➢ Select Configure On/Off – Configure the chpid on

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IBM **Hardware Management Console**

SEARCH   FAVORITES   ahartma ▾

Home

Systems Management > **P00298A8**

Partitions | Adapters

Filter   Tasks ▾   Views ▾

Select	Name	Status	Activation Profile	Last Used Profile	OS Name	OS Type	OS Level	Recovery Boost
○	AH	⊖ ✓ Operating	AH		ZVM72TST	z/VM	7.2.0 - 2102	
○	AH2	⊖ ✓ Operating	AH2		Linux	Linux	5.14.0	
○	BP	⊖ ✓ Operating	BP		BPZVM72	z/VM	7.2.0 - 2001	
○	EMR	⊖ ✗ Not operating	EMR	EMR	IBMVMRAM	z/VM	7.3.0	
○	IT	⊖ ✓ Operating	IT		MISZVM72	z/VM	7.2.0 - 2001	
○	MP	⊚ ✓ Operating	MP		MISZOS	z/OS	V2R5	
○	PS	⊖ ✗ Not activated	PS					
○	TA	⊖ ✓ Operating	TA	TA	INSTALL	SSC	1.1.0	

Max Page Size: 500   Total: 8   Filtered: 8   Selected: 0

Tasks: P00298A8

System Details
Toggle Lock
⊞ Daily
⊟ Recovery
    Single Object Operations

⊞ Service
⊞ Change Management
⊞ Remote Customization
⊞ Operational Customization

⊞ Configuration
⊞ Energy Management
⊞ Monitor

Welcome
Systems Management
  P00298A8
  Unmanaged Systems
Custom Groups
HMC Management
Service Management
Tasks Index

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IBM **Support Element**   ⊗   HW   ⊖   ☰   🔍 SEARCH   FAVORITES   ahartma(HMC1) ▼

Home

System Management > P00298A8 > **Channels**

| Channels | Topology |

▦ ⊞ 🔧 🔨 ⚙ 🗔 ☐ ▾ Filter   Tasks ▾ Views ▾

Select	PCHID	IDs	Status	State	Swapped	Location	Type
○	▤ 010C	0.A3	⊗ Not operational link	Online		A01B-D105-J.01	FICON Express16S+
⊙	▤ 010D⊡	0.A1	✓ Operating	Online		A01B-D205-J.01	FICON Express16S+
○	⧉ 0114	0.11	✓ Operating	Online		A01B-D108J.01-D208J.01	OSA-Express6S
○	⧉ 0118	0.12	✓ Operating	Online		A01B-D109J.01-D209J.01	OSA-Express6S
○	⧉ 0120	0.21	✓ Operating	Online		A01B-D112J.01-D212J.01	OSA-Express6S
○	▤ 0124	0.32	✓ Operating	Online		A01B-D113-J.01	FICON Express16S+
○	▤ 0125	0.42	✓ Operating	Online		A01B-D213-J.01	FICON Express16S+
○	▤ 0128		⊗ Not defined	Reserved		A01B-D114-J.01	FICON Express16S+
○	▤ 0129		✓ Not defined	Reserved		A01B-D214-J.01	FICON Express16S+
○	▤ 012C	0.A2	✓ Operating	Online		A01B-D115-J.01	FICON Express16S+
○	▤ 012D	0.A4	⊗ Not operational link	Online		A01B-D215-J.01	FICON Express16S+
○	⧉ 0134	0.13	✓ Operating	Online		A01B-D118J.01-D218J.01	OSA-Express6S
○	⧉ 013C		⊗ Not defined	Reserved		A01B-D120J.01-D220J.01	RoCE Express2
○	▦ 07C0	0.FC	✓ Operating	Online			HiperSockets - Externally Bridged
○	▦ 07C1	0.FD	✓ Operating	Online			HiperSockets
○	▦ 07C2	0.FE	✓ Operating	Online			HiperSockets
○	▦ 07C3	0.FF	✓ Operating	Online			HiperSockets

Max Page Size: 500   Total: 23   Filtered: 23   Selected: 1

▼

Tasks: 010D ⧉ ⧉ ⊞

Adapter Details   ⊟ **CHPID Operations**   ⊞ **Channel Operations**
                                               Channel Problem Determination
                                               Configure On/Off
                                               FCP NPIV Mode On/Off
                                               Release I/O Path
                                               Show LED

https://10.0.10.86:9951/hmc/bonsai/action/T63e#

Identifying the Real FCP Port WWPN

➢Follow these steps to locate the FCP Port WWPN

➢Go into Single Object Operations

➢Select the FCP channel you want and then select Channel Problem Determination

➢Select the Partition / CSS.CHID from the list

➢Select Analyze Channel Information

➢The WWPN for that FCP port is located in the bottom left corner of the screen – you will need to give this to your Storage/SAN Administrator(s)

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IBM **Support Element**

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Home

System Management > P00298A8 > **Channels**

Channels | Topology

Filter | Tasks ▼ | Views ▼

Select	PCHID	IDs	Status	State	Swapped	Location	Type
○	010C	0.A3	⊗ Not operational link	Online		A01B-D105-J.01	FICON Express16S+
⦿	010D	0.A1	✓ Operating	Online		A01B-D205-J.01	FICON Express16S+
○	0114	0.11	✓ Operating	Online		A01B-D108J.01-D208J.01	OSA-Express6S
○	0118	0.12	✓ Operating	Online		A01B-D109J.01-D209J.01	OSA-Express6S
○	0120	0.21	✓ Operating	Online		A01B-D112J.01-D212J.01	OSA-Express6S
○	0124	0.32	✓ Operating	Online		A01B-D113-J.01	FICON Express16S+
○	0125	0.42	✓ Operating	Online		A01B-D213-J.01	FICON Express16S+
○	0128		⊗ Not defined	Reserved		A01B-D114-J.01	FICON Express16S+
○	0129		✓ Not defined	Reserved		A01B-D214-J.01	FICON Express16S+
○	012C	0.A2	✓ Operating	Online		A01B-D115-J.01	FICON Express16S+
○	012D	0.A4	⊗ Not operational link	Online		A01B-D215-J.01	FICON Express16S+
○	0134	0.13	✓ Operating	Online		A01B-D118J.01-D218J.01	OSA-Express6S
○	013C		⊗ Not defined	Reserved		A01B-D120J.01-D220J.01	RoCE Express2
○	07C0	0.FC	✓ Operating	Online			HiperSockets - Externally Bridged
○	07C1	0.FD	✓ Operating	Online			HiperSockets
○	07C2	0.FE	✓ Operating	Online			HiperSockets
○	07C3	0.FF	✓ Operating	Online			HiperSockets

Max Page Size: 500   Total: 23   Filtered: 23   Selected: 1

Tasks: 010D

Adapter Details

⊟ CHPID Operations

⊞ Channel Operations

Channel Problem Determination
Configure On/Off
FCP NPIV Mode On/Off
Release I/O Path
Show LED

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Home   Channel Problem Determ... ✕

Select Partition and CSS.CHPID - PCHID010D

Select a partition and CSS.CHPID combination, then click "OK"

Select	Partition	CSS.CHPID
○	IT	0.A1
○	TA	0.A1
○	PS	0.A1
○	BP	0.A1
●	AH	0.A1

OK   Cancel

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P00298A8: Primary Support Element Workplace (Version 2.15.0) - Google Chrome — □ ×

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IBM Support Element   ⊗ HW ⊖   ☰   🔍 SEARCH   FAVORITES   ahartma(HMC1) ▼

| Home | Channel Problem Determ... ⧉ ✕ |

Channel Problem Determination - PCHID010D

CSS.CHPID: 0.A1

Select the operation to perform.

- ⦿ Analyze channel information...
- ○ Analyze subchannel data...
- ○ Analyze control unit header...
- ○ Analyze paths to a device...
- ○ Analyze device status...
- ○ Analyze serial link status...
- ○ Display message buffer status...
- ○ Fabric login status...
- ○ SAN explorer
- ○ Analyze link error statistics block...
- ○ Optical Power Measurement...

[OK] [Cancel]

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Home   Channel Problem Determ... ⬈ ✕

Analyze Channel Information - PCHID010D

Channel type:	Fibre Channel Protocol for SCSI Devices	Hardware type:	E3
		Hardware subtype:	07
Partition ID:	06	2 byte control unit link address defined:	No
MIF image ID:	6		
Channel mode:	Shared	Absolute address:	000000048E643400
CSS.CHPID:	0.A1		
PCHID:	010D		
Switch number:	00		
Switch number valid:	0	IFCC threshold:	4
		Channel link address:	011100
State:	Online	Temp error threshold:	4
Status:	Operating	Suppress:	0000000000000000
Image chnl state:	Online	SAP Affinity:	01
Image chnl status:	Operating		
Error code:	00	Card description:	FICON Express16S+ SX
Ber inbound:	0	Connection rate:	16Gbps
Ber outbound:	0		
Node type:	Self	Node type:	Attached
Node status:	Valid	Node status:	Valid
Flag/parm:	100001A1	Flag/parm:	00200A11
Type/model:	008562-T02	Type/model:	002498-F48
Product of:	IBM	Product of:	IBM
Plant:	02	Plant:	CA
Seq. number:	0000000298A8	Seq. number:	1000010148GV
Tag:	80A1	Tag:	0012
World wide node name:	5005076400C298A8	World wide node name:	10000027F808C33A
World wide port name:	C05076E6410010D1	World wide port name:	20120027F808C33A

OK   Error Details...   Refresh

Identifying the Real FCP Port WWPN (2)

➢Follow these steps to locate the FCP Port WWPN

  ➢From the HMC

  ➢Select FCP Configuration

  ➢Select the FCP channel you want and then select Channel Problem Determination

  ➢Select the Partition / CSS.CHID from the list

  ➢Select Analyze Channel Information

  ➢The WWPN for that FCP port is located in the bottom left corner of the screen – you will need to give this to your Storage/SAN Administrator(s)

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IBM Hardware Management Console

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Home

Systems Management > **P00298A8**

| Partitions | Adapters |

Filter ▾   Tasks ▾   Views ▾

Select	Name	Status	Activation Profile	Last Used Profile	OS Name	OS Type	OS Level	Recovery Boost
○	AH	⊖ ✓ Operating	AH		ZVM72TST	z/VM	7.2.0 - 2102	
○	AH2	⊖ ✗ Exceptions	AH2					
○	BP	⊖ ✓ Operating	BP		BPZVM72	z/VM	7.2.0 - 2001	
○	EMR	⊖ ✗ Not operating	EMR	EMR	IBMVMRAM	z/VM	7.3.0	
○	IT	⊖ ✓ Operating	IT		MISZVM72	z/VM	7.2.0 - 2001	
○	MP	⊖ ✓ Operating	MP		MISZOS	z/OS	V2R5	
○	PS	⊖ ✗ Not activated	PS					
○	TA	⊖ ✓ Operating	TA	TA	INSTALL	SSC	1.1.0	

Max Page Size: 500   Total: 8   Filtered: 8   Selected: 0

Tasks: P00298A8

Welcome
Systems Management
   P00298A8
   Unmanaged Systems
Custom Groups
HMC Management
Service Management
Tasks Index

     System Details   ⊞ Service   ⊟ Configuration
     Toggle Lock   ⊞ Change Management   Advanced Facilities
⊞ Daily   ⊞ Remote Customization   Channel PCHID Assignment
⊞ Recovery   ⊞ Operational Customization   Cryptographic Configuration
                                                              Cryptographic Management
                                                               Display Adapter ID
                                                                FCP Configuration
                                                              Input/output (I/O) Configuration
                                                              Manage System Time
                                                              Perform Model Conversion
                                                          System Input/Output Configuration Analyzer
                                                         Transmit Vital Product Data
                                                       View Frame Layout
                            ⊞ Energy Management
                            ⊞ Monitor

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IBM **Hardware Management Console**

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Home   FCP Configuration - P00298... ✕

FCP Configuration - P00298A8

Manage FCP channel World Wide Port Names (WWPN) and N_Port ID Virtualization (NPIV) configuration.

Action:

○ Display all NPIV port names that are currently assigned to FCP subchannels...
● Display WWPN for the physical ports of FCP channels...

○ Import or export configuration...

○ Release all port names that had previously been assigned to FCP subchannels and are now locked
○ Release a subset of the port names that had previously been assigned to FCP subchannels and are now locked...

○ Reset WWPN assignments for physical ports

OK   Cancel   Help

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IBM **Hardware Management Console**

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Home   FCP Configuration - P00298... ✕

Display WWPN for the Physical Ports of FCP Channels - P00298A8

PCHID	WWPN
010C	C05076E6410010C1
010D	C05076E6410010D1
012C	C05076E6410012C1
012D	C05076E6410012D1

Items found: 4

Cancel   Help

Identifying NPIV WWPN Information

➢Go into Single Object Operations

➢Expand the CPC Configuration menu

➢Select NPIV Configuration

➢Select Display all NPIV Port Names

➢Select Display all assigned ports

➢You can export the NPIV configuration to a flat file to give to your Storage/SAN Administrator

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Home

Welcome

System Management
  P00298A8
    Processors
    Channels
    Cryptos
    Partitions

Custom Groups

SE Management

Service Management

Tasks Index

System Management > **P00298A8**

System Resources | Topology

Filter   Tasks ▼ Views ▼

Select	Name / ID	Status	Type	Description
○	⊞ 🦀 Processors	✓ OK		All Processors of the System
○	⊞ 📊 Channels	✗ Exceptions		All Channel Physical Channel Identifiers of the System
○	⊞ 🧩 Cryptos	✓ OK		All Crypto Physical Channel Identifiers of the System
○	⊞ 📊 Partitions	✗ Exceptions		All Partitions of the System

Max Page Size: 500   Total: 4   Filtered: 4   Selected: 0

Tasks: P00298A8

System Details
Toggle Lock
⊞ Daily
⊞ Recovery

⊞ Service
⊞ Change Management
⊞ Remote Customization
⊞ Operational Customization

⊟ Configuration
    Channel PCHID Assignment
    Cleanup Discontinuance
    Cryptographic Configuration
    Cryptographic Management
    Display Adapter ID
    FCP Configuration
    Input/output (I/O) Configuration
    Perform Model Conversion
    Prepare System For Discontinuance
    System Input/Output Configuration Analyzer
    Transmit Vital Product Data
    View Frame Layout
    View Hardware Configuration
⊞ Channel Operations
⊞ Energy Management
⊞ Monitor

https://10.0.10.86:9951/hmc/bonsai/action/T744#

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Home   FCP Configuration - P002... ⧉ ✕

FCP Configuration - P00298A8

Manage FCP channel World Wide Port Names (WWPN) and N_Port ID Virtualization (NPIV) configuration.

Action:

- ⦿ Display all NPIV port names that are currently assigned to FCP subchannels...
- ○ Display WWPN for the physical ports of FCP channels...
- ○ Import or export configuration...
- ○ Release all port names that had previously been assigned to FCP subchannels and are now locked
- ○ Release a subset of the port names that had previously been assigned to FCP subchannels and are now locked...
- ○ Reset WWPN assignments for physical ports

OK   Cancel   Help

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Home   FCP Configuration - P002... ⌧ ✕

Display Assigned Port Names - P00298A8

☑ Show only entries defined with current configuration.
☑ Show only entries with 'NPIV On'.

Partition	CSS	IID	CHPID	SSID	Device Number	WWPN	NPIV Mode	Current Configured
AH	00	06	a1	00	a100	c05076e641000780	On	Yes
AH	00	06	a1	00	a101	c05076e641000784	On	Yes
AH	00	06	a1	00	a102	c05076e641000788	On	Yes
AH	00	06	a1	00	a103	c05076e64100078c	On	Yes
AH	00	06	a1	00	a104	c05076e641000790	On	Yes
AH	00	06	a1	00	a105	c05076e641000794	On	Yes
AH	00	06	a1	00	a106	c05076e641000798	On	Yes
AH	00	06	a1	00	a107	c05076e64100079c	On	Yes
AH	00	06	a1	00	a108	c05076e6410007a0	On	Yes
AH	00	06	a1	00	a109	c05076e6410007a4	On	Yes
AH	00	06	a1	00	a10a	c05076e6410007a8	On	Yes
AH	00	06	a1	00	a10b	c05076e6410007ac	On	Yes

Items found: 64 for LPAR AH

[Apply] [Transfer via FTP] [Cancel] [Help]

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Enabling and Identifying NPIV WWPN Information

```
## Version: 1.0
## Machine serial number: 0000200298A8
## Current configuration filter enabled: Yes
## NPIV ON filter enabled: Yes
## Items for LPAR: AH
## partitionName,cssId,iid,chpidId,ssId,deviceNumber,wwpn,npiv mode,current
configured,pchid,phys. wwpn,
AH,00,06,a1,00,a100,c05076e641000780,On,Yes,010d,c05076e6410010d1
AH,00,06,a1,00,a101,c05076e641000784,On,Yes,010d,c05076e6410010d1
AH,00,06,a1,00,a102,c05076e641000788,On,Yes,010d,c05076e6410010d1
AH,00,06,a1,00,a103,c05076e64100078c,On,Yes,010d,c05076e6410010d1
AH,00,06,a1,00,a104,c05076e641000790,On,Yes,010d,c05076e6410010d1
AH,00,06,a1,00,a105,c05076e641000794,On,Yes,010d,c05076e6410010d1
AH,00,06,a1,00,a106,c05076e641000798,On,Yes,010d,c05076e6410010d1
AH,00,06,a1,00,a107,c05076e64100079c,On,Yes,010d,c05076e6410010d1
AH,00,06,a1,00,a108,c05076e6410007a0,On,Yes,010d,c05076e6410010d1
AH,00,06,a1,00,a109,c05076e6410007a4,On,Yes,010d,c05076e6410010d1
AH,00,06,a1,00,a10a,c05076e6410007a8,On,Yes,010d,c05076e6410010d1
AH,00,06,a1,00,a10b,c05076e6410007ac,On,Yes,010d,c05076e6410010d1
AH,00,06,a1,00,a10c,c05076e6410007b0,On,Yes,010d,c05076e6410010d1
AH,00,06,a1,00,a10d,c05076e6410007b4,On,Yes,010d,c05076e6410010d1
AH,00,06,a1,00,a10e,c05076e6410007b8,On,Yes,010d,c05076e6410010d1
AH,00,06,a1,00,a10f,c05076e6410007bc,On,Yes,010d,c05076e6410010d1
AH,00,06,a1,00,a110,c05076e6410007c0,On,Yes,010d,c05076e6410010d1
AH,00,06,a1,00,a111,c05076e6410007c4,On,Yes,010d,c05076e6410010d1
AH,00,06,a1,00,a112,c05076e6410007c8,On,Yes,010d,c05076e6410010d1
AH,00,06,a1,00,a113,c05076e6410007cc,On,Yes,010d,c05076e6410010d1
```

z/VM SCSIDISC EXEC Usage

➢ Can be used to determine the WWPN addresses of the FCP ports on IBM Z and LinuxONE and the Storage Subsystem WWPN addresses

➢ Can be used to test connectivity to a specific Lun before using the Lun on Linux

➢ Can be used to determine which Luns are available from a particular FCP port or ports

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INFORMATION SYSTEMS

```
Ready; T=0.01/0.01 07:33:45
q fcp all
FCP   A100 ATTACHED TO RHANSXN1 A100 CHPID A1
      WWPN C05076E641000780
FCP   A200 ATTACHED TO RHANSXN1 A200 CHPID A2
      WWPN C05076E641000D80
FCP   A101 FREE    , FCP   A102 FREE    , FCP   A103 FREE    , FCP   A104 FREE
FCP   A105 FREE    , FCP   A106 FREE    , FCP   A107 FREE    , FCP   A108 FREE
FCP   A109 FREE    , FCP   A10A FREE    , FCP   A10B FREE    , FCP   A10C FREE
FCP   A10D FREE    , FCP   A10E FREE    , FCP   A10F FREE    , FCP   A110 FREE
FCP   A111 FREE    , FCP   A112 FREE    , FCP   A113 FREE    , FCP   A114 FREE
FCP   A115 FREE    , FCP   A116 FREE    , FCP   A117 FREE    , FCP   A118 FREE
FCP   A119 FREE    , FCP   A11A FREE    , FCP   A11B FREE    , FCP   A11C FREE
FCP   A11D FREE    , FCP   A11E FREE    , FCP   A11F FREE    , FCP   A201 FREE
FCP   A202 FREE    , FCP   A203 FREE    , FCP   A204 FREE    , FCP   A205 FREE
FCP   A206 FREE    , FCP   A207 FREE    , FCP   A208 FREE    , FCP   A209 FREE
FCP   A20A FREE    , FCP   A20B FREE    , FCP   A20C FREE    , FCP   A20D FREE
```

```
Ready; T=0.01/0.01 07:36:10
att a101 *
FCP A101 ATTACHED TO MAINT A101
Ready; T=0.01/0.01 07:36:20
att a201 *
FCP A201 ATTACHED TO MAINT A201
Ready; T=0.01/0.01 07:36:27
q a101
FCP   A101 ATTACHED TO MAINT      A101 CHPID A1
      WWPN C05076E641000784
Ready; T=0.01/0.01 07:36:31
q a201
FCP   A201 ATTACHED TO MAINT      A201 CHPID A2
      WWPN C05076E641000D84
Ready; T=0.01/0.01 07:36:36




















scsidisc

                                                        RUNNING   ZVM72TST
```

```
 MAINT      FILELIST A0   V 169   Trunc=169 Size=121 Line=1 Col=1 Alt=0
Cmd    Filename Filetype Fm Format Lrecl       Records       Blocks   Date      Time
█       SCSIDISC OUT      A1 V        183          3            1   5/31/23   7:42:44
        SCSIDISC LOG      A1 V         19          1            1   5/31/23   7:38:34
        RACF     DATA     A1 V         41          1            1   4/24/23  16:23:19
        RHEL91XX DIRECT   A0 F         80         20            1   4/24/23  15:29:21
        MAINT    NETLOG   A0 V        107         46            2   4/24/23  14:49:25
        RHEL91XX DRCTORIG A0 F         80         15            1   4/21/23  17:24:45
```

```
Ready; T=0.01/0.01 07:46:18
type scsidisc out a

SCSIDISC LEVEL 0002
_FCP_CH_ _____WWPN_____ _____LUN_ID_____ _____UUID___
_____ _VENDOR_ PROD MODL _SE
0000A101 50050763071B14DA 4000401300000000                                 60050
76307FFD4DA0000000000000013 IBM      2107 900  75F

Ready; T=0.01/0.01 07:46:28
type scsidisc log a

SCSIDISC LEVEL 0002

Ready; T=0.01/0.01 07:46:36
```

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INFORMATION SYSTEMS

```
SCSIDISC LEVEL 0002


_FCP_CH_ _____WWPN_____ _____LUN_ID_____
0000A101 50050763071B14DA 4000401300000000


_____UUID_____
                             6005076307FFD4DA0000000000000013




_VENDOR_ PROD MODL _SERIAL_ CODE
IBM      2107 900  75FXR310 .159


_BLK_SIZE_ _DISKBLKS_ __LUN_SIZE_(bytes)__
      512   20971520         10737418240
```

HMC/SE SAN Explorer

➢SAN Explorer can be used with both z/VM and Linux only LPARs

➢Provides information on the connectivity to the Luns defined on your storage subsystem

➢This can be used in conjunction with the San Fabric Logins and the Analyze Channel Information menus

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HMC/SE SAN Explorer

➢ Go into Single Object Operations

➢ Select Channels in the left pane

➢ Select the FCP PCHPID you want to examine

➢ Expand Chpid Operations at the bottom

➢ Select Channel Problem Determination

➢ Select the LPAR you want to examine

➢ Select SAN Explorer – Fabric Status and Analyze Channel Information contain useful information as well

➢ Select the Device Number line you want to examine

➢ Select the Affinity Tab – Affinity shows you which zone member ships you belong to on the storage subsystem side

➢ Select the Zone Members Tab – This gives you access to the WWPN of the storage subsystem

➢ Select the WWPN link of you target storage subsystem

➢ Select the LUN you wish to examine

➢ You have different tabs to select from – the Read Capacity tab will show you the Lun size along with other information

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IBM **Support Element**

SEARCH   FAVORITES   ahartma(HMC1)

Home   Channel Problem Determ...

Select Partition and CSS.CHPID - PCHID010D

Select a partition and CSS.CHPID combination, then click "OK"

Select	Partition	CSS.CHPID
○	IT	0.A1
○	TA	0.A1
○	PS	0.A1
○	BP	0.A1
●	AH	0.A1

OK   Cancel

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IBM **Support Element**

SEARCH   FAVORITES   ahartma(HMC1) ▼

Home   Channel Problem Determ... ⊐ ✕

Channel Problem Determination - PCHID010D

CSS.CHPID: 0.A1

Select the operation to perform.

○ Analyze channel information...
○ Analyze subchannel data...
○ Analyze control unit header...
○ Analyze paths to a device...
○ Analyze device status...
○ Analyze serial link status...
○ Display message buffer status...
○ Fabric login status...
● SAN explorer
○ Analyze link error statistics block...
○ Optical Power Measurement...

OK   Cancel

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IBM **Support Element**   🔍 SEARCH   FAVORITES   ahartma(HMC1) ▼

Home   Channel Problem Determ... ⧉ ✕

🩺 SAN Explorer - PCHID010D   ℹ

CSS.CHPID: 0.A1   PCHID: 010D

Partition ID: AH   MIF Image ID: 6

NPIV: Enabled   Physical WWPN: C05076E6410010D1   Physical FC-ID: 011100

Devices | Diagnostic Data |

--- Select Action --- ▼ | ▼ Filter |

Select ^	Device Number ^	World Wide Port Name ^	FC-ID ^
○	A100	C05076E641000780	01113E
○	A101	C05076E641000784	011123
○	A102	C05076E641000788	-Not Logged In-
○	A103	C05076E64100078C	-Not Logged In-
○	A104	C05076E641000790	-Not Logged In-
○	A105	C05076E641000794	-Not Logged In-
○	A106	C05076E641000798	-Not Logged In-
○	A107	C05076E64100079C	-Not Logged In-
○	A108	C05076E6410007A0	-Not Logged In-
○	A109	C05076E6410007A4	-Not Logged In-
○	A10A	C05076E6410007A8	-Not Logged In-
○	A10B	C05076E6410007AC	-Not Logged In-
○	A10C	C05076E6410007B0	-Not Logged In-
○	A10D	C05076E6410007B4	-Not Logged In-
○	A10E	C05076E6410007B8	-Not Logged In-
○	A10F	C05076E6410007BC	-Not Logged In-
○	A110	C05076E6410007C0	-Not Logged In-
○	A111	C05076E6410007C4	-Not Logged In-

| Page 1 of 1 | | Total: 32   Filtered: 32   Displayed: 32 |

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IBM **Support Element**   SEARCH   FAVORITES   ahartma(HMC1)

Home | Channel Problem Determ...

NPIV: Enabled   Physical WWPN: C05076E6410010D1   Physical FC-ID: 011100

Device Number: A100   Logical WWPN: C05076E641000780   Logical FC-ID: 01113E

Zone Members | Affinity

--- Select Action ---   Filter

Select ∧	World Wide Port Name ∧	FC-ID ∧	Product of ∧	Type/Model ∧	Sequence number ∧	Plant ∧	Tag ∧	World Wide Node Name ∧	Symbolic Port Name ∧	Connection Security ∧
○	C05076E641000604	01110D	IBM	008562/T02	0000000298A8	02	80A1	5005076400C298A8	IBM 8562 020000000298 A8 PCHID: 010D NP IV UlpId: 00A10201 DEVNO: 0.0.a101 NAME: tassc	
○	C05076E641000608	011110	IBM	008562/T02	0000000298A8	02	80A1	5005076400C298A8	IBM 8562 020000000298 A8 PCHID: 010D NP IV UlpId: 00A10202 DEVNO: 0.0.a102 NAME: tassc	
○	C05076E641000580	01111D	IBM	008562/T02	0000000298A8	02	80A1	5005076400C298A8	IBM 8562 020000000298 A8 PCHID: 010D NP IV UlpId: 00A10100 DEVNO: 0.0.a100 NAME: sles001	
○	C05076E641000784	011123	IBM	008562/T02	0000000298A8	02	80A1	5005076400C298A8	IBM 8562 020000000298 A8 PCHID: 010D NP IV UlpId: 00A10601	
○	C05076E641000584	011148	IBM	008562/T02	0000000298A8	02	80A1	5005076400C298A8	IBM 8562 020000000298 A8 PCHID: 010D NP IV UlpId: 00A10101 DEVNO: 0.0.a100 NAME: sles002	
○	50050763071B14DA	011200	IBM	002107/980	0000000FXR31	75	0330	5005076307FFD4DA		

Page 1 of 1   Total: 6   Filtered: 6   Displayed: 6

INFORMATION SYSTEMS

IBM Support Element

SEARCH   FAVORITES   ahartma(HMC1) ▾

Home   Channel Problem Determ... ⬏ ✕

SAN Explorer - Remote N_Port - PCHID010D

Local Port

CSS.CHPID:	0.A1	PCHID:	010D
Partition ID:	AH	MIF Image ID:	6

NPIV: Enabled Physical WWPN: C05076E6410010D1 Physical FC-ID: 011100

Device Number: A100   Logical WWPN: C05076E641000780 Logical FC-ID: 01113E

Remote Port

WWPN: 50050763071B14DA   FC-ID: 011200

Symbolic Port Name:

| LUNs | Node ID | Diagnostic Data |

--- Select Action ---   ▾ Filter

Select ▲	LUN ▲
○	4000400100000000
○	4000400200000000
○	4000400300000000
○	4000400400000000
○	4000400500000000
○	4000400600000000
○	4000400D00000000
○	4000400E00000000
○	4000400F00000000
○	4000401000000000
○	4000401100000000
○	4000401200000000
○	4000401300000000
○	4000401400000000
○	4000401500000000
○	4000401600000000

| Page 1 of 1 | | Total: 16   Filtered: 16   Displayed: 16 |

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IBM **Support Element**   SEARCH   FAVORITES   ahartma(HMC1)

Home   Channel Problem Determ...

SAN Explorer - LUN Details - PCHID010D

Local Port

CSS.CHPID:	0.A1	PCHID:	010D
Partition ID:	AH	MIF Image ID:	6

NPIV: Enabled   Physical WWPN: C05076E6410010D1   Physical FC-ID: 011100

Device Number: A100   Logical WWPN: C05076E641000780   Logical FC-ID: 01113E

Remote Port

WWPN: 50050763071B14DA   FC-ID: 011200

Symbolic Port Name:

Logical Unit

LUN: 4000401300000000

Inquiry	Test Unit Ready	Extended Inquiry	**Read Capacity**

```
Read Capacity(16):
    Last Logical Block Address: 20971519 (0x13fffff)
    Number of Logical Blocks: 20971520 (0x1400000)
    Lowest Aligned Block Address: 0 (0x0)
    Logical Block Length: 512 bytes
    Protection:
      PROT_EN=0  P_TYPE=0  P_I_EXP=0
    Logical Blocks per Physical Block Exponent: 0
    Logical Block Provisioning Management Enable (LBPME)= 0
    Logical Block Provisioning Read Zeros (LBPRZ) = 0

Device size: 10737418240 bytes, 10240.0 MB, 10.0 GB

Raw Read Capacity Data:
0000: 00000000 013FFFFF 00000200 00000000
0010: 00000000 00000000 00000000 00000000
```

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IBM **Support Element**   🔍 SEARCH   FAVORITES   ahartma(HMC1) ▾

Home   Channel Problem Determ... ⧉ ✕

Channel Problem Determination - PCHID010D

CSS.CHPID: 0.A1

Select the operation to perform.

○ Analyze channel information...
○ Analyze subchannel data...
○ Analyze control unit header...
○ Analyze paths to a device...
○ Analyze device status...
○ Analyze serial link status...
○ Display message buffer status...
● Fabric login status...
○ SAN explorer
○ Analyze link error statistics block...
○ Optical Power Measurement...

OK Cancel

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IBM **Support Element**

Home | Channel Problem Determ...

Fabric Login Status - PCHID010D

Partition ID:	06	
MIF image ID:	6	
CSS.CHPID:	0.A1	Enforced security attributes (from last QSA): 00000000
PCHID:	010D	Extended security attributes (from last QSA): 00000000

Note: the attributes columns are in reference to requested Fabric Security Attributes.

Device Number	Subchannel Set	WWPN	N_Port ID	Status	QSA Status	Enforced Attributes	Extended Attributes
****	*	**************	********	**************	********	********	********
A101	0	C05076E641000784	00011123	Logged in	Registered	00000000	00000000
****	*	**************	********	**************	********	********	********
A101	0	C05076E641000784	00011122	Logged out	Registered	00000000	00000000
A101	0	C05076E641000784	00011121	Logged out	Not registered	00000000	00000000
A101	0	C05076E641000784	00011120	Logged out	Not registered	00000000	00000000
A101	0	C05076E641000784	0001111F	Logged out	Not registered	00000000	00000000
A101	0	C05076E641000784	0001111E	Logged out	Not registered	00000000	00000000
A101	0	C05076E641000784	0001111C	Logged out	Not registered	00000000	00000000
A101	0	C05076E641000784	0001111B	Logged out	Not registered	00000000	00000000
A101	0	C05076E641000784	0001111A	Logged out	Not registered	00000000	00000000
A101	0	C05076E641000784	00011119	Logged out	Not registered	00000000	00000000
A101	0	C05076E641000784	0001117D	Logged out	Not registered	00000000	00000000
A101	0	C05076E641000784	00011160	Logged out	Not registered	00000000	00000000
A101	0	C05076E641000784	0001115F	Logged out	Not registered	00000000	00000000
A101	0	C05076E641000784	0001112F	Logged out	Not registered	00000000	00000000
A101	0	C05076E641000784	0001112E	Logged out	Registered	00000000	00000000

Save | Refresh | Search | Cancel

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Different Ways to use SCSI Luns under z/VM

➢ Used as direct attached devices to z/VM Guests

➢ Used with z/VM to emulate FBA devices

➢ Edevices are defined for example if you are going to install z/VM on FCP attached storage or take advantage of larger storage sizes offered by Luns

➢ Use a different FCP_DEV and WWPN when defining multiple paths to an EDEVICE

➢ Review the storage subsystem for any special features such as preferred pathing , etc. when setting up EDEVICES

➢ Use the correct fcp attr for the storage subsystem type – 2107, XIV etc....

z/VM EDEVICE Configuration

➢Dirmaint is highly recommended for this environment

➢Put set edev statements in Rexx execs to make it easier to define

➢Fcp devices can not be attached to a guest before creating an edev

➢Use ickdsf to format/label the new Lun

➢The edevice is treated just like any other dasd device so you can use ddr under z/VM to copy from one disk to another for example

➢You should always use multiple paths to a Lun

➢Add edevice statements to system config file to make the Luns persistent across ipl's

```
    EDEVSET   EXEC        A1   V 130   Trunc=130 Size=4 Line=0 Col=1 Alt=0

00000 * * * Top of File * * *
00001 /* */
00002 SET EDEVICE 888 TYPE FBA ATTRIBUTE 2107 ,
00003 FCP_DEV a101  WWPN 50050763071B14DA LUN 4000401000000000 ,
00004 FCP_DEV a201  WWPN 50050763071014DA LUN 4000401000000000
00005 * * * End of File * * *
```

```
Ready; T=0.01/0.01 10:27:26
edevset
EDEV 0888 was created.
Ready; T=0.01/0.01 10:27:29
q edev 888 details
EDEV  0888 TYPE FBA ATTRIBUTES 2107
  PATHS:
    FCP_DEV: A101 WWPN: 50050763071B14DA LUN: 4000401000000000
    FCP_DEV: A201 WWPN: 50050763071014DA LUN: 4000401000000000
Ready; T=0.01/0.01 10:27:41
q 888
DASD  0888 OFFLINE
Ready; T=0.01/0.01 10:27:55
vary on 888
0888 varied online
1 device(s) specified; 1 device(s) successfully varied online
Ready; T=0.01/0.47 10:28:01
att 888 *
DASD 0888 ATTACHED TO MAINT 0888
Ready; T=0.01/0.01 10:28:12
q 888
DASD  0888 ATTACHED TO MAINT    0888 R/W FVMS01
Ready; T=0.01/0.01 10:28:20
```

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```
Ready; T=0.01/0.01 10:46:27
Q 888
DASD  0888 ATTACHED TO MAINT     0888 R/W AHTEST
Ready; T=0.01/0.01 10:46:35
ACC 888 K
DMSACC723I K (0888) R/W - OS
Ready; T=0.01/0.01 10:46:57
FORMAT 888 K (BLKSIZE 512
DMSFOR603R FORMAT will erase all files on disk K(888). Do you wish to continue?
Enter 1 (YES) or 0 (NO).
1
DMSFOR605R Enter disk label:
AHTEST
DMSFOR733I Formatting disk K
DMSFOR732I 20971520 FB-512 blocks formatted on K(888)
Ready; T=0.01/0.09 10:50:02
Q DISK
LABEL   VDEV M   STAT    CYL TYPE BLKSZ    FILES   BLKS USED-(%) BLKS LEFT   BLK TOTAL
MNT191 191   A    R/W    175 3390 4096      122        364-01      31136      31500
MNT5E5 5E5   B    R/O     40 3390 4096      139       2111-29       5089       7200
MNT2CC 2CC   C    R/W     10 3390 4096        5        168-09       1632       1800
MNT51D 51D   D    R/O     26 3390 4096      216       1225-26       3455       4680
PMT551 551   E    R/O     40 3390 4096       10        132-02       7068       7200
AHTEST 888   K    R/W     FB 9336  512        0      10326-00   20961194   20971520
MNT190 190   S    R/O    207 3390 4096      693      18461-50      18799      37260
MNT19D 19D   X/X R/O     292 3390 1024      412      70668-49      73872     144540
MNT19E 19E   Y/S R/O     500 3390 4096     1121      35140-39      54860      90000
AJH999 120   Z    R/W   1000 3390 4096      238      62838-35     117162     180000
Ready; T=0.01/0.01 10:50:23
Q EDEV 888 DETAILS
EDEV  0888 TYPE FBA ATTRIBUTES 2107
  VENDOR: IBM PRODUCT: 2107900 REVISION: .159
  BLOCKSIZE: 512 NUMBER OF BLOCKS: 20971520
  PATHS:
    FCP_DEV: A101 WWPN: 50050763071B14DA LUN: 4000401000000000
      CONNECTION TYPE: SWITCHED STATUS: ONLINE
    FCP_DEV: A201 WWPN: 50050763071014DA LUN: 4000401000000000
      CONNECTION TYPE: SWITCHED STATUS: ONLINE
  EQID: 6005076307FFD4DA00000000000000F1F000000000013FFFFF
  SERIAL NUMBER: 75FXR310010
Ready; T=0.01/0.01 10:51:59
```

Example of a fcp Lun as a minidisk – Blocks instead of Cylinders

```
USER        DIRECT      X1   F 80    Trunc=72 Size=3829 Line=3282 Col=1 Alt=1


03282 USER PMAINT      NOLOG        128M 1000M G
03283  AUTOLOG AUTOLOG1 OP1 MAINT
03284  ACCOUNT IBM
03285  MACH ESA
03286  POSIXINFO UID 0 GNAME system
03287  OPTION LNKS LNKE
03288  IPL 190
03289  NAMESAVE GCS
03290  NAMESAVE VTAM
03291  CONSOLE 009 3215 T
03292  LINK MAINT 190 190 RR
03293  LINK MAINT 193 193 RR
03294  LINK MAINT 19E 19E RR
03295  LINK MAINT 19D 19D RR
03296  LINK MAINT 402 402 RR
03297  SPOOL 00C 2540 READER *
03298  SPOOL 00D 2540 PUNCH  A
03299  SPOOL 00E 1403 A
03300  MDISK 141 FB-512 000000 END ENCOM1 MR
03301  MDISK 2CC FB-512 001200 014400 ENCOM1 MR READ   WRITE   MULTIPLE
03302  MDISK CF0 FB-512 575600 172800 EN1RES RR READ   WRITE   MULTIPLE
03303  MDISK 191 FB-512 00015600 0252000 ENCOM1 MR READ    WRITE    MULTIPLE
03304  MDISK 41D FB-512 00267600 0037440 ENCOM1 MR READ    WRITE    MULTIPLE
03305  MDISK 550 FB-512 00305040 0028800 ENCOM1 MR READ    WRITE    MULTIPLE
03306  MDISK 551 FB-512 00333840 0057600 ENCOM1 MR ALL     WRITE    MULTIPLE
```

IPL SCSI Feature

➢Used to have to order it – no charge – Now included on newer processors

➢This is used for both Linux native LPARs and z/VM LPARs when either is installed on FCP attached Luns

➢This feature has been virtualized under z/VM to provide the same functionality to second level guests

z/VM SCSI Install

➢Requires the use of the correct install media – z/VM install media is shipped for both ECKD DASD and FCP SCSI installation

➢Follow the z/VM Automated Installation Guide for step by step instructions on installing z/VM on SCSI disk

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⚠ **Not secure** | ~~https~~://10.0.10.86/hmc/connects/mainuiFrameset.jsp

IBM **Hardware Management Console**

Home   Load - P00298A8:AH2

Load - P00298A8:AH2

CPC:	P00298A8
Image:	AH2
Load type:	◯ Standard load
	⦿ SCSI load
	◯ SCSI dump
	◯ NVMe load
	◯ NVMe dump
	☐ Enable Secure Boot for Linux
	☐ Clear the main memory on this partition before loading it
Load address:	✱ `0A100`
Load parameter:	`SYSG`
Worldwide port name:	`50050763071B14D`
Logical unit number:	`400040130000000`
Boot program selector:	`0`
Boot record logical block address:	`C8`
Operating system specific load parameters:	

[OK] [Reset] [Cancel] [Help]

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INFORMATION SYSTEMS

STAND ALONE PROGRAM LOADER: z/VM VERSION 7 RELEASE 3.0

DEVICE NUMBER: A100   MINIDISK OFFSET: 57200   EXTENT: 1

MODULE NAME: CPLOAD   LOAD ORIGIN: 2000

--IPL PARAMETERS---------------------------------------
FN=SYSTEM FT=CONFIG PDNUM=4 PDVOL=8013

--COMMENTS--

9= FILELIST 10= LOAD 11= TOGGLE EXTENT/OFFSET

                                                                                          3/19

Z/VM SCSI IPL and SAIPL Parameters

➤ Specify C8 for the boot record logical block address (BR_LBA) if the IPL device has been CP-formatted by ICKDSF or CPFMTXA. The SALIPL utility writes the SCSI boot record to block 200 (X'C8') of a CP-formatted device. For a CMS-formatted device, SALIPL writes the SCSI boot record at block 200 (X'C8') into the RECOMP area of the minidisk.

➤ PDVOL=addr specifies the edeivce address of the volume on which a parm disk resides that you wish CP to access.

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➢ Under z/VM

    ➢ Add a dedicate statement for each sub channel you wish to use

    ➢ Add the LOADDEV PORT and LOADDEV LUN statements to the guest's directory entry to complete the path definition to the Lun

    ➢ Then follow the normal install process – you will use the loaddev port and Lun and device addresses you added to your directory entries to allow you to boot from this Lun

➢ Native into an LPAR

    ➢ This requires the IPL from SCSI feature be active on your mainframe

    ➢ Follow the normal install process – you will need the sub channel ,WWPN and Lun address for the Lun you wish to access – These parameters will be used to fill in the SCSI fields on the load screen for subsequent IPLs that point to the Lun you wish to boot from

Linux SCSI Boot under z/VM

- ➢ Z/VM directory entries:
  - ➢ loaddev portname 50050763071B14DA
  - ➢ loaddev Lun 4000400100000000 bootprog 1

  - ➢ Dedicate A100 A100
  - ➢ Dedicate A200 A200

- ➢ Profile exec entries:
  - ➢ Ipl A100 clear

- ➢ Bootprog number relates to the menu entry you wish to execute
- ➢ Lun address needs to point to the Lun containing the /boot partition

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Check your Linux Documentation for details on boot parameters

Multipathing FCP Attached Luns

➢Edevices can be configured with the edevice statement in the system config file or using set edevice commands

➢Linux multipathing can be setup during installation or added after installation

➢Multipathing is used to give fail over or load balancing over multiple paths to the same Lun

➢Multipathing configuration is simple in most environments

➢Remember that you need to address the multipathed device name not the individual devices that make up the group

➢Multipathed devices can be used standalone or as part of an LVM configuration

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Z/VM Multipath Example

```
************************************************************/
 /* SCSI Definition Statements */
/************************************************************/
edevice 8011 type fba attr 2107,
fcp_dev A101 wwpn 50050763071B14DA lun 4000401100000000 ,
fcp_dev A201 wwpn 50050763071014DA lun 4000401100000000

edevice 8012 type fba attr 2107,
fcp_dev A101 wwpn 50050763071B14DA lun 4000401200000000,
fcp_dev A201 wwpn 50050763071014DA lun 4000401200000000

edevice 8013 type fba attr 2107,
fcp_dev A100 wwpn 50050763071B14DA lun 4000401300000000,
fcp_dev A200 wwpn 50050763071014DA lun 4000401300000000

edevice 8014 type fba attr 2107,
fcp_dev A101 wwpn 50050763071B14DA lun 4000401400000000 ,
fcp_dev A201 wwpn 50050763071014DA lun 4000401400000000

edevice 8015 type fba attr 2107,
fcp_dev A101 wwpn 50050763071B14DA lun 4000401500000000 ,
fcp_dev A201 wwpn 50050763071014DA lun 4000401500000000
```

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Linux Multipathing Example

[andy@ahmanocpkvm ~]$ lszfcp -P -H -D
0.0.a100 host0
0.0.a200 host1

0.0.a100/0x50050763071b14da rport-0:0-0
0.0.a200/0x50050763071014da rport-1:0-0

0.0.a100/0x50050763071b14da/0x4000400100000000 0:0:0:1073823744
0.0.a100/0x50050763071b14da/0x4000400200000000 0:0:0:1073889280
0.0.a100/0x50050763071b14da/0x4000400300000000 0:0:0:1073954816
.
.
.
0.0.a200/0x50050763071014da/0x4000400100000000 1:0:0:1073823744
0.0.a200/0x50050763071014da/0x4000400200000000 1:0:0:1073889280
0.0.a200/0x50050763071014da/0x4000400300000000 1:0:0:1073954816
.
.
.

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Linux Multipathing Example

```
[root@ahmanocpkvm ~]# multipath -ll
mpatha (36005076307ffd4da0000000000000001) dm-0 IBM,2107900
size=240G features='1 queue_if_no_path' hwhandler='1 alua' wp=rw
`-+- policy='service-time 0' prio=50 status=active
  |- 1:0:0:1073823744 sda  8:0    active ready running
  `- 0:0:0:1073823744 sdq  65:0   active ready running
mpathb (36005076307ffd4da0000000000000002) dm-1 IBM,2107900
size=240G features='1 queue_if_no_path' hwhandler='1 alua' wp=rw
`-+- policy='service-time 0' prio=50 status=active
  |- 1:0:0:1073889280 sdb  8:16   active ready running
  `- 0:0:0:1073889280 sdr  65:16  active ready running
mpathc (36005076307ffd4da0000000000000003) dm-2 IBM,2107900
size=240G features='1 queue_if_no_path' hwhandler='1 alua' wp=rw
`-+- policy='service-time 0' prio=50 status=active
  |- 1:0:0:1073954816 sdc  8:32   active ready running
  `- 0:0:0:1073954816 sds  65:32  active ready running
mpathd (36005076307ffd4da0000000000000004) dm-6 IBM,2107900
size=240G features='1 queue_if_no_path' hwhandler='1 alua' wp=rw
`-+- policy='service-time 0' prio=50 status=active
  |- 1:0:0:1074020352 sdd  8:48   active ready running
  `- 0:0:0:1074020352 sdt  65:48  active ready running
```

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Things To Remember

➢Backup and Recover Considerations / Disaster Recovery Considerations

➢Remember you use the storage subsystem's HBA WWPN(s) when configuring a Lun to Linux or z/VM

➢You can have many Luns behind one FCP device address and WWPN combination

➢There are differences between Linux distributions and versions of the same Linux distribution on how Zfcp and multipathing are implemented

➢Remember that device address plus WWPN plus Lun address represents a path to a Lun not a true device

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QUESTIONS ?

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Resources

- [Configuring FCP devices - IBM Documentation](#)
- [How to use FC-attached SCSI devices - IBM Documentation](#)
- [Linux on IBM Z and LinuxONE: When to Use SCSI Versus DASD Storage | TechChannel](#)
- [Fibre Channel Protocol for Linux and z/VM on IBM IBM Z and LinuxONE](#) - Older document – Good reference for FCP concepts on IBM Z
- [SCSI-over-Fibre Channel device driver - IBM Documentation](#) – SLES 15.4
- [SCSI-over-Fibre Channel device driver - IBM Documentation](#) – RHEL 9.2
- [SCSI-over-Fibre Channel device driver - IBM Documentation](#) – UBUNTU 22.04
- [SLES 15 SP4 | Deployment Guide (suse.com)](#)
- [Performing a standard RHEL 9 installation Red Hat Enterprise Linux 9 | Red Hat Customer Portal](#)
- [Interactive live server installation on IBM z/VM (s390x) | Ubuntu](#)
- [Interactive live server installation on IBM Z LPAR (s390x) | Ubuntu](#)

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