zSTSU 2004

zSeries FICON Express Updates for FC and FCP

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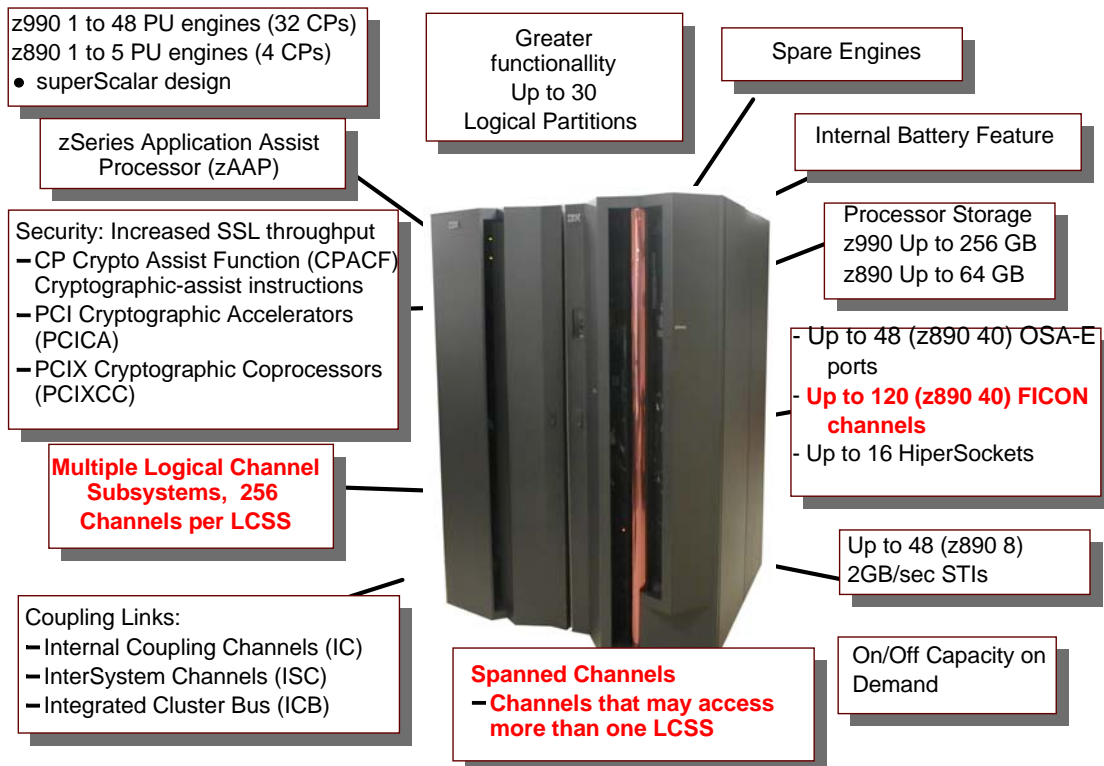

Agenda

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● zSeries FICON Express Updates for FC and FCP
  – Reviewing the latest FICON/FCP implementation considerations with zSeries (z990 and z890) servers.
  – Taking a closer look at how your customers can benefit from using spanned FICON channels in their environment.
  – Reviewing HCD scenarios on migrating from ESCON to FICON configuration as well as modifying from 1 byte to 2 bytes link address in support of cascading FICON Directors.
  – Reviewing the general planning approach to FICON migration and FICON performance evaluation.
  – A general update review of all supported FICON /FCP controllers/devices and FICON Directors.

Reviewing the latest FICON/FCP implementation considerations with zSeries (z990 and z890) servers
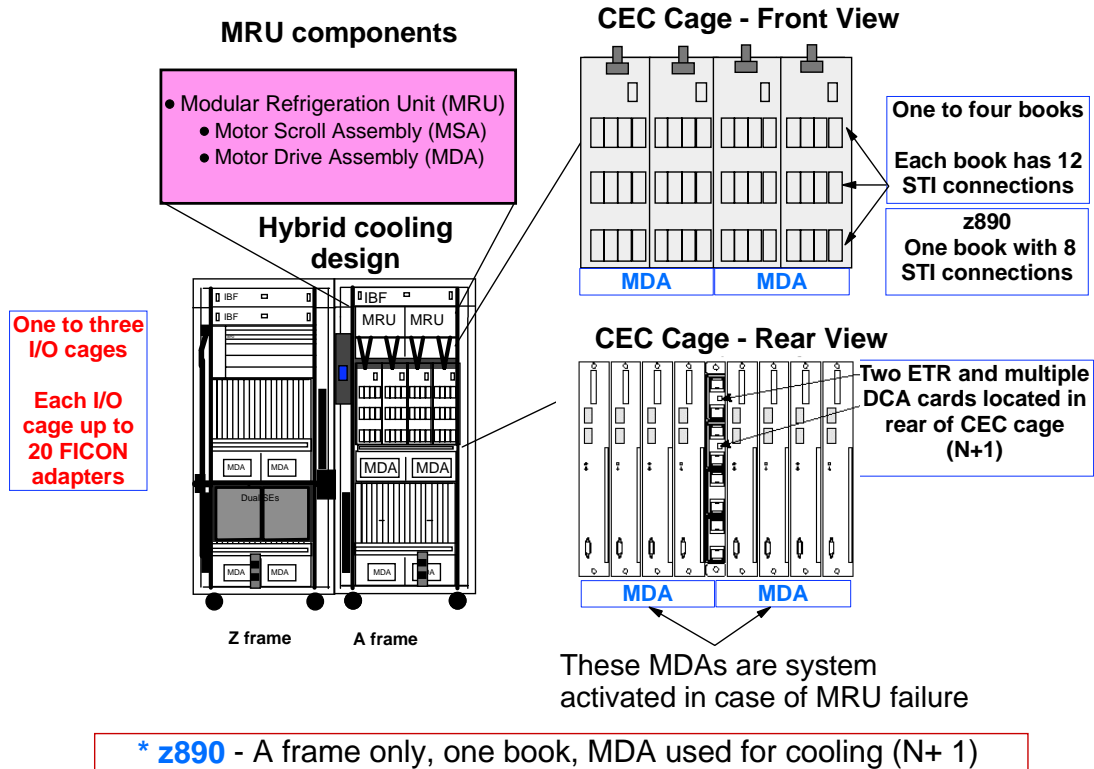
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- **IBM zSeries z990/z890 Features**
- **z990/z890 Processor Cage Design**
- **z990 / z980 Channel Subsystem Introduction**
- **z890 Multiple LCSS Concept (Up to 2 LCSSs)**
- **z990 Multiple LCSS Concept (Up to 4 LCSSs)**
- **Physical Channel ID (PCHID) Concept**
- **New Definition Requirements**
- **zSeries I/O Comparison**
- **Others**
  - Preview of FCP LUN access control
  - FICON™ purge path extended
- **Previous**
  - FCP channels can be implemented without config "off" and config "on"
  - FICON Express Performance Improvement
    - You may realize up to a 15% increase in maximum 4K I/O operations per second, relative to the original FICON Express numbers documented in the whitepaper FICON and FICON Express Channel Performance Version 2.0, dated November 2003. This performance improvement applies to FICON Express LX feature (#2319) and FICON Express SX feature (#2320) and applies exclusively to z8xx and z990 with the z8xx and z990 May 2004, levels of Licensed Internal Code.
- **z/VM V5**
  - Guest and native IPL from FCP-attached disks
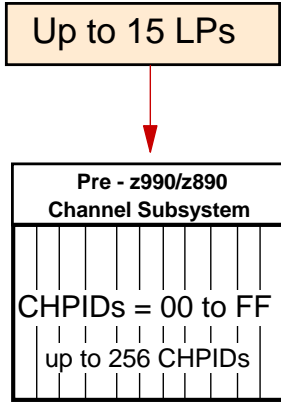

IBM ⓔserver zSeries 990/z890 Features

z990 1 to 48 PU engines (32 CPs)
z890 1 to 5 PU engines (4 CPs)
- superScalar design

Greater functionallity
Up to 30
Logical Partitions

Spare Engines

zSeries Application Assist Processor (zAAP)

Internal Battery Feature

Security: Increased SSL throughput
- CP Crypto Assist Function (CPACF) Cryptographic-assist instructions
- PCI Cryptographic Accelerators (PCICA)
- PCIX Cryptographic Coprocessors (PCIXCC)

Processor Storage
z990 Up to 256 GB
z890 Up to 64 GB

- Up to 48 (z890 40) OSA-E ports
- **Up to 120 (z890 40) FICON channels**
- Up to 16 HiperSockets

Multiple Logical Channel Subsystems, 256 Channels per LCSS

Up to 48 (z890 8) 2GB/sec STIs

Coupling Links:
- Internal Coupling Channels (IC)
- InterSystem Channels (ISC)
- Integrated Cluster Bus (ICB)

Spanned Channels
- **Channels that may access more than one LCSS**

On/Off Capacity on Demand

z990/z890 Processor Cage Design

MRU components

- Modular Refrigeration Unit (MRU)
  - Motor Scroll Assembly (MSA)
  - Motor Drive Assembly (MDA)

Hybrid cooling design

One to three I/O cages

Each I/O cage up to 20 FICON adapters

Z frame   **A frame**

CEC Cage - Front View

One to four books

Each book has 12 STI connections

z890 One book with 8 STI connections

MDA   **MDA**

CEC Cage - Rear View

Two ETR and multiple DCA cards located in rear of CEC cage (N+1)

MDA   **MDA**

These MDAs are system activated in case of MRU failure

* **z890** - A frame only, one book, MDA used for cooling (N+ 1)

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z990 / z980 Channel Subsystem Introduction

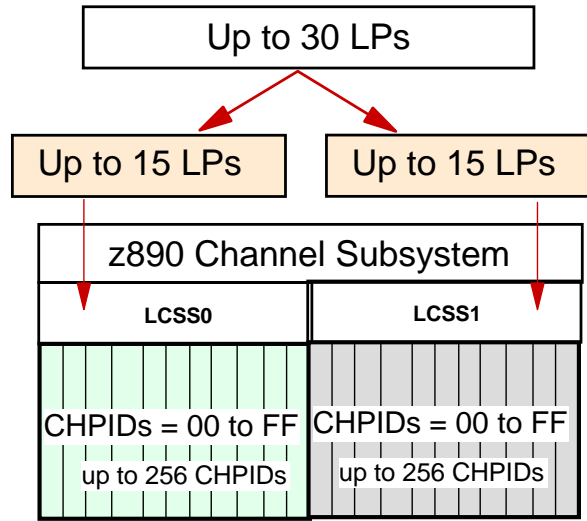## The new z990 and z890 Channel Subsystem - Breaks the barrier

- The zSeries 990/890 introduces the concept of Multiple Logical Channel Subsystems (LCSSs)
  - Each LCSS can contain one to 15 logical partitions
  - Each LCSS can contain up to 256 channels
- The z990 can have up to 1024 ESCON channels
- The z890 can have up to 420 ESCON channels
- The z990 channel subsystem manages the I/O subsystem that can be spread across three I/O cages
- The I/O subsystem is viewed as a single Input/Output Confuguration Data Set (IOCDS)
  - One IOCDS contains definitions for all channels

z890 Multiple LCSS Concept (Up to 2 LCSSs)

LPAR and CSS
support
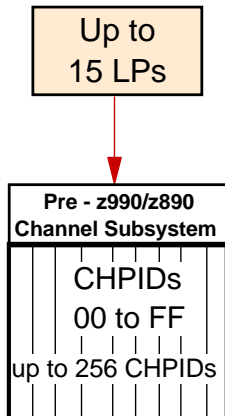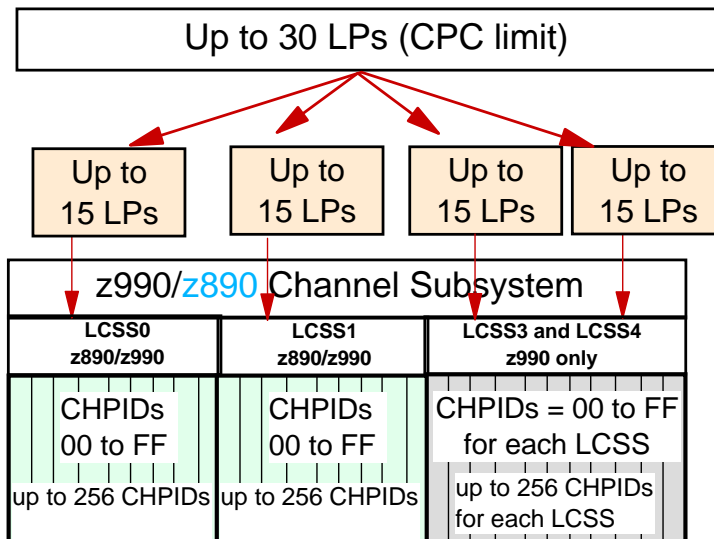Pre - z990/z890

z890 LP and CSS support

Up to 30 LPs

Up to 15 LPs

Up to 15 LPs

Up to 15 LPs

Pre - z990/z890
Channel Subsystem

CHPIDs = 00 to FF

up to 256 CHPIDs

z890 Channel Subsystem

LCSS0	LCSS1

CHPIDs = 00 to FF

up to 256 CHPIDs

CHPIDs = 00 to FF

up to 256 CHPIDs

- Each LP associated with one LCSS

256 Channel limitation per OS image remains unchanged!

z990 Multiple LCSS Concept (Up to 4 LCSSs)

LPAR and CSS
support
Pre - z990

z990 LP and CSS support

Up to 30 LPs (CPC limit)

Up to
15 LPs

Up to
15 LPs

Up to
15 LPs

Up to
15 LPs

Up to
15 LPs

Pre - z990/z890
Channel Subsystem

CHPIDs
00 to FF

up to 256 CHPIDs

z990/z890 Channel Subsystem

LCSS0 z890/z990	LCSS1 z890/z990	LCSS3 and LCSS4 z990 only

CHPIDs
00 to FF

up to 256 CHPIDs

CHPIDs
00 to FF

up to 256 CHPIDs

CHPIDs = 00 to FF
for each LCSS

up to 256 CHPIDs
for each LCSS

- Each LP associated with one LCSS
- 1024 channels supported

256 Channel limitation per OS image remains unchanged!

Physical Channel ID (PCHID) Concept

zSeries z800 or z900 Channel Subsystem

CHPIDs = 00 to FF

up to 256 CHPIDs
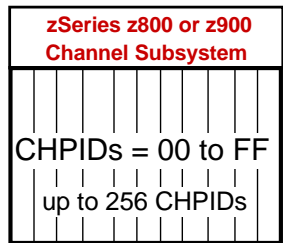
Any CHPID can be assigned to any channel location (channel card, port location) - Old terminology for physical location was Channel ID (CHID)
- Assigned by plant
- Customer assigned via CHPID Mapping Tool
- Assignment with SE panels
- CHID not defined to HCD (IOCP)

z990/z890 Channel Subsystem

LCSS0	LCSS1
CHPIDs = 00 to FF up to 256 CHPIDs	CHPIDs = 00 to FF up to 256 CHPIDs
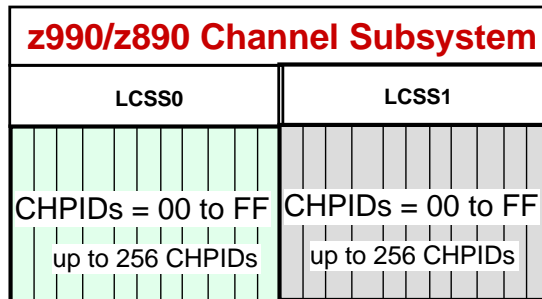
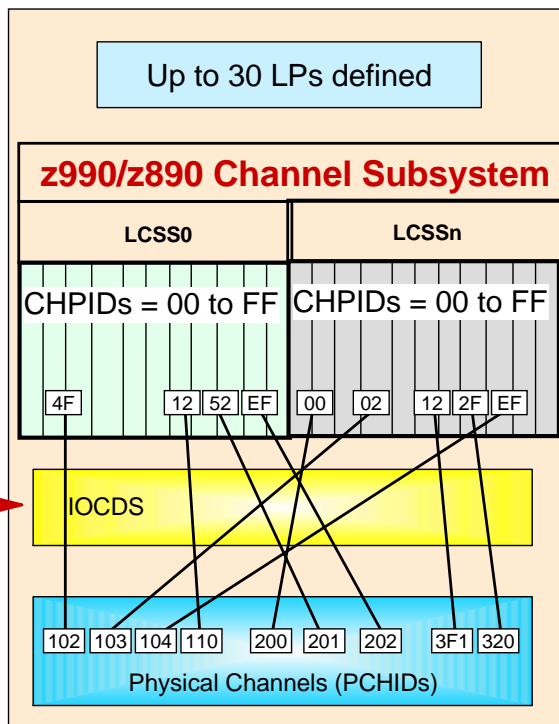Any CHPID can be assigned to any channel location - New terminolgy - PCHID
- PCHIDs unique across z990/z890 CPC
- Customer responsible for mapping CHPID to PCHID via
  - HCD (IOCP) process
  - CHIP Mapping Tool
- PCHIDs must be defined in HCD (IOCP)

New Definition Requirements

HCD (IOCP) definitions for the CHPID include -
- LCSS (id)
- PCHID
- Channel type and mode

One I/O subsystem using one IOCDS, controlling up to four LCSSs

Up to 30 LPs defined

z990/z890 Channel Subsystem

LCSS0	LCSSn
CHPIDs = 00 to FF	CHPIDs = 00 to FF
4F 12 52 EF	00 02 12 2F EF

IOCDS

102 103 104 110   200 201 202   3F1 320

Physical Channels (PCHIDs)

zSeries I/O Comparison

Maximums	z990	z900	z890	z800
STIs	48(2 GB)	24(1 GB)	8(2 GB)	6(1GB)
zSeries I/O Bandwidth	96GB/s	24GB/s	8GB/s	6GB/s
I/O cages	3	3	1	1
I/O Channel Subsystem	1	1	1	1
Logical CSS (LCSS)	4	N/A	2	N/A
CHPIDs (z990/z890 per LCSS)	256	256	256	256
ESCON channels	1024	256	420	240
FICON channels (2 per card)	**120**	**96**	**40**	**32**
PCI-CC cards (2 engines/card)	N/A	8	N/A	8
PCI-CA cards (2 engines/card)	6	6	2	6
PCIXCC cards (2 engines/card)	4	N/A	4	N/A
OSA-Express cards (2 ports/card)	24	12	20	12
ICB-4 CF links (2 GB)	16	N/A	8	N/A
ICB-3 CF links (1 GB)	16	16	16	6
ICB-2 CF links (333 MB)	8	32	N/A	N/A
ISC-3 CF links	48*	32	48*	24
Parallel channels	N/A	88	N/A	N/A

*Up to 48 ISC-3 when operating in peer mode, up to 32 when operating in compatibility mode.


Taking a closer look at how your customers can benefit from using spanned FICON channels in their environment.

- Spanned Channels
- z990 / z890 Channel Operation modes
- z990 / z890 Spanned Channel Concept
- Benefits of spanned channels
 - uses less channels, which uses less director ports and cabling

Channel Spanning

- Internal spanned channels
  - ▸ HiperSockets and Internal Coupling links
- External spanned channels
  - ▸ **FICON Express**
  - ▸ ISC-3, ICB-2, ICB-3, and ICB-4
  - ▸ OSA-Express
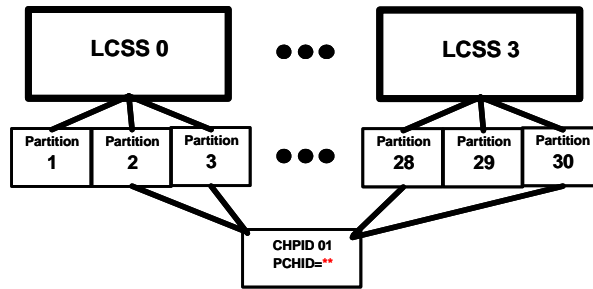
- ** No PCHID for HiperSockets and Internal Coupling links. It is required for FICON/OSA/External Coupling Links
- Spanning reduces the number of channels that can be defined for all LCSSs on CEC - Worst case - 256 if all channels are spanned between all CSSs
- ESCON, DCM and FICON™ Bridge will not support spanning

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z990 / z890 Channel Operation modes
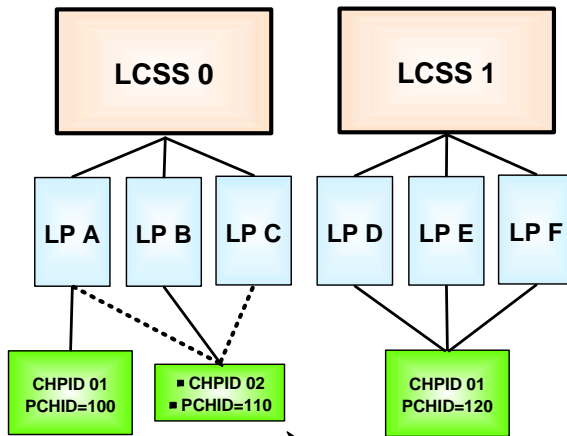
Supports previous channel operational modes (shown here)

z990/z890 introduces additional support :
- ● Spanned Channels

Dedicated channel
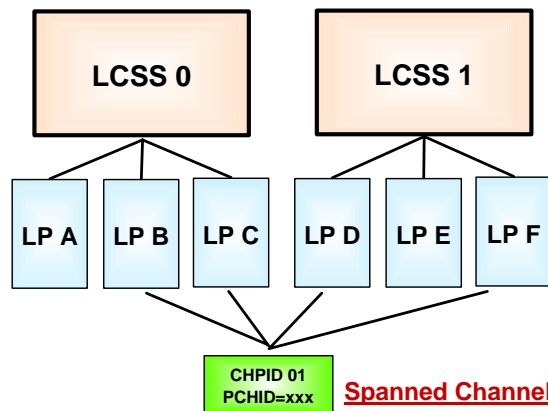- **Accessible from one and only one partition within a single LCSS**

Reconfigurable
- **May be configured online to only one partition at a time within a single LCSS**

Shared (MIF)
- **May be configured online and used by multiple partitions within an LCSS**

z990 / z890 Spanned Channel Concept

LCSS 0	LCSS 1

LP A	LP B	LP C	LP D	LP E	LP F

CHPID 01 PCHID=xxx <u>Spanned Channel</u>

z990/z890 provides new Spanned Channel support

- Spanned channels can connect to multiple LCSSs
- Supports HiperSockets(IQD) and Internal Coupling (IC) links
  - IQD and IC channels do not have an associated PCHID
- Spanning support also includes FICON Express, ICB, ISC-3 and OSA Express
  - All external CHPIDs have an associated PCHID

Reviewing HCD scenarios on migrating from ESCON to FICON configuration as well as modifying from 1 byte to 2 bytes link address in support of cascading FICON Directors.

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- HCD panels FICON Cascade
  - Hardware Configuration panel
  - Add switch panel
  - Port List panel
  - Switch List panel
  - Add Processor panel
  - Available Support Levels panel
  - Processor List panel
  - Partition List panel
  - Add Channel Path panel
  - Channel Path List panel
  - Add Control Unit
  - Select Processor / Control Unit panel

HCD - FICON Cascade Switch configuration support

```
                          OS/390 Release 9 HCD
Command ===> _____

                        Hardware Configuration

Select one of the following.                          FICON support of cascaded
                                                      Directors requires HCD
                                                      release 9 plus APARs
  __   1.  Define, modify, or view configuration data  OW48236 and OW54246
       2.  Activate or process configuration data
       3.  Print or compare configuration data
       4.  Create or view graphical configuration report
       5.  Migrate configuration data
       6.  Maintain I/O definition files
       7.  Query supported hardware and installed UIMs
       8.  Getting started with this dialog
       9.  What's new in this release

For options 1 to 5, specify the name of the IODF to be used.

I/O definition file . . . 'SYS6.IODFAF.WORK'                    +


  F1=Help     F2=Split    F3=Exit     F4=Prompt   F9=Swap    F12=Cancel
  F22=Command
```

Figure D-1   HCD Version

HCD - FICON Cascade - Switch support

```
                        Add Switch               For FICON switches there is a
                                                 need to define both the
                                                 Switch.ID and the
   Specify or revise the following values.       Switch.Address (switch.@).
                                                 The HCD switch.address field
                                                 is new with HCD FICON
   Switch ID . . . . . . . .   61  (00-FF)       cascade switching support.
   Switch type . . . . . . . 2032_____  +
   Serial number . . . . . . _____
   Description . . . . . . .
   Switch address  . . . . .  61  (00-FF) for a FICON switch

   Specify the port range to be installed only if a larger range
   than the minimum is desired.                  Actual port addresses specified on this panel
                                                  are switch vendor - switch specific.
   Installed port range  .   04  -  43  +        There is no need to include the CUP port.

   Specify either numbers of existing control unit and device, or
   numbers for new control unit and device to be added.

   Switch CU number(s) . . . 0c61   ____  ____  ____  ____  +
   Switch device number(s) . 0c61   ____  ____  ____  ____
   F1=Help    F2=Split   F3=Exit    F4=Prompt  F5=Reset  F9=Swap
   F12=Cancel
```

Figure D-2   Add Switch

HCD - FICON Cascade - Switch Port support

```
                              Port List                    Row 1 of 256
Command ===> _____  Scroll ===> CSR

Select one or more ports, then press Enter.

Switch ID . . . . : 61   Address : 61

                                -------------Connection-------------
/ Port H Name +                 Unit ID        Unit Type         O
_ 00    N _____                                   _
_ 01    N _____                                   _
_ 02    N _____                                   _
_ 03    N _____                                   _
_ 04    Y ISL sw 61 to sw 62                                     Y
_ 05    Y _____                                   N
_ 06    Y _____                                   N
_ 07    Y _____                                   N
_ 08    Y _____                                   N
_ 09    Y _____                                   N
_ 0A    Y _____                                   N
 F1=Help      F2=Split     F3=Exit     F4=Prompt    F5=Reset      F7=Backward
 F8=Forward   F9=Swap      F10=Actions F12=Cancel   F13=Instruct F22=Command
```

HCD switch Port List
Port = the 1-byte port address on the switch
Name = recommended to enter the ports in the name field
Occupied = recommended to be specified a Y for ISL ports

Figure D-3   Port List

HCD - FICON Cascade Switch support

```
                              Switch List          Row 1 of 4 More:      >
Command ===> _____  Scroll ===> CSR

Select one or more switches, then press Enter. To add, use F11.

                                                          CU    Dev
/ ID Type +       Ad Serial-# + Description               Num.  Num.
_ 61 2032         61 _____  _____    0C61  0C61
_ 62 2032         62 _____  _____    0C62  0C62
_ 63 2032         63 _____  _____    0C63  0C63
_ 64 2032         64 _____  _____    0C64  0C64
******************************* Bottom of data ***************************


 F1=Help      F2=Split     F3=Exit     F4=Prompt    F5=Reset     F7=Backward
 F8=Forward   F9=Swap      F10=Actions F11=Add      F12=Cancel   F13=Instruct
 F20=Right    F22=Command
```

HCD FICON switch list
Switches 61 to 64 defined
Note the new switch address field

Figure D-5   Switch List (Switches connected)

HCD - FICON Cascade Switch - Add Processor

```
                              Add Processor

       Specify or revise the following values.

       Processor ID . . . . . . . . . proc100_

       Processor type . . . . . . . . 2064____    +
       Processor model  . . . . . . . 116_____    +
       Configuration mode . . . . . . lpar    +

       Serial number  . . . . . . . . _____
       Description  . . . . . . . . . _____

       Specify SNA address only if part of an S/390 microprocessor cluster:

       Network name . . . . . . . . . usibmsc_    +
       CPC name . . . . . . . . . . . proc100_    +


        F1=Help     F2=Split    F3=Exit     P4=Prompt   F5=Reset    F9=Swap
       P12=Cancel
```

No change to the processor definition (1st panel, changes on next panel)

Figure D-6   Add processor

HCD - FICON Cascade Switch - Add Processor - Support Level

```
                       Available Support Levels
                                                          Row
       Command ===>  _____

       Select one.


         Support Level
         Basic 2064 support, IQD, FCP, CF Duplex

       #
         Basic 2064 support, IQD, FCP, CF Duplex, CAS
       #
       ****************************** Bottom of data ********


        F1=Help         F2=Split        F3=Exit         F7=Back
        F9=Swap         F12=Cancel       F20=Right       F22=Comm


       ┌──────────────────────────────────────────┐
       │ A support level selection is required.    │
       └──────────────────────────────────────────┘
```

Change to the processor support level panel for those processors that support FICON cascade switching (example: zSeries 900 and zSeries 800).
Select the line with the CAS feature included.

If you select cascade, and the actual processor does not support the FICON cascade switch function, you will be able to:
● Define CU using 2-byte link addresses for the processor
● Write IOCDSs for the processor
You will not be able to:
● Activate dynamic I/O reconfiguration
● POR using the 2-byte link address IOCDS

Figure D-7   Available Support Levels

HCD - FICON Cascade Switch - Processor List

```
                          Processor List           Row 1 of 1 More:          >
Command ===> _____ Scroll ===> CSR

Select one or more processors, then press Enter. To add, use F11.


/ Proc. ID Type +   Model +  Mode+ Serial-# + Description
_ PROC100  2064     116      LPAR _____ _____
  ****************************** Bottom of data ********************************
```

No change to the processor list panel

```
  F1=Help        F2=Split     F3=Exit       F4=Prompt     F5=Reset      F7=Backward
  F8=Forward     F9=Swap     F10=Actions  F11=Add       F12=Cancel   F13=Instruct
  F20=Right     F22=Command
```

Figure D-8   Processor List

HCD - FICON Cascade Switch - Processor - Partition List

```
                          Partition List
    Goto   Backup   Query  Help
  ---------------------------------------------------------------------
                                                          Row 1 of 3
  Command ===> _____ Scroll ===> CSR

  Select one or more partitions, then press Enter. To a

  Processor ID  . . . . : PROC100
  Configuration mode  . : LPAR

  / Partition Name   Number Usage + Description
  _ LP1            1      OS      _____
  _ LP2            2      OS      _____
  _ LP3            3      OS      _____
  **************************** Bottom of data ****************************
```

No change to the processor Partition definition or list panels

```
   F1=Help        F2=Split     F3=Exit       F4=Prompt     F5=Reset
   F7=Backward    F8=Forward   F9=Swap      F10=Actions  F11=Add
   F12=Cancel    F13=Instruct  F22=Command
```

Figure D-9   Partition List

HCD - FICON Cascade Switch - Processor - Add Channel

```
                         Add Channel Path


     Specify or revise the following values.

     Processor ID . . . : PROC100
     Configuration mode : LPAR

     Channel path ID  . . . . 84   +
     Number of CHPIDs . . . . 1
     Channel path type  . . . FC   +
     Operation mode . . . . . SHR  +
     Managed  . . . . . . . . No   (Yes or No)   I/O Cluster _____  +
     Description  . . . . . . _____

     Specify the following values only if connected to a switch:

     Dynamic entry switch ID  61  + (00 - FF)
     Entry switch ID  . . . .  61  +
     Entry port . . . . . . .  20  +
      F1=Help     F2=Split    F3=Exit     F4=Prompt   F5=Reset    F9=Swap
     F12=Cancel
```

For FICON (FC) channels the entry switch.ID value is required and the dynamic switch.ID value must specify the same switch.
At this time, managed CHPIDs are not supported.

Figure D-10   Add Channel Path

HCD - FICON Cascade Switch - Processor - Channel Path List

```
                         Channel Path List     Row 1 of 4 More:       >
     Command ===> _____ Scroll ===> CSR

     Select one or more channel paths, then press Enter. To add use F11.

     Processor ID . . . . : PROC100
     Configuration mode : LPAR

                        DynEntry Entry +
     / CHPID Type+ Mode+ Switch + Sw Port Con Mngd Description
     _ 84    FC    SHR   63       63 20       No   _____
     _ 86    FC    SHR   63       63 28       No   _____
     _ A2    FC    SHR   61       61 20       No   _____
     _ A8    FC    SHR   61       61 28       No   _____
     ***************************** Bottom of data *****************************




      F1=Help      F2=Split     F3=Exit     F4=Prompt   F5=Reset    F7=Backward
      F8=Forward   F9=Swap      F10=Actions F11=Add     F12=Cancel  F13=Instruct
     F20=Right     F22=Command
```

For FICON (FC) channels the entry switch.ID value is required and the dynamic switch.ID value must specify the same switch.

Figure D-11   Channel Path List

HCD - FICON Cascade Switch - Add Control Unit - Connections

```
                        Add Control Unit

  Specify or revise the following values.

  Control unit number  . . . . 1000  +
  Control unit type  . . . . . 2105_____  +

  Serial number  . . . . . . . _____
  Description  . . . . . . . . _____

  Connected to switches  . . . 63   63   61   61   __  __  __  __  +
  Ports  . . . . . . . . . . . 30   38   30   38   __  __  __  __  +

  If connected to a switch:

  Define more than eight ports . . 2   1.  Yes
                                       2.  No
  Propose CHPID/link addresses and
  unit addresses . . . . . . . . . 2   1.  Yes
                                       2.  No
   F1=Help    F2=Split    F3=Exit   F4=Prompt  F5=Reset   F9=Swap
  F12=Cancel
```

No change in the way this is specified for FICON (FC), it's the same as ESCON, and is the switch.ID and port addresses that the CU is physically connected to.

Figure D-12   Add Control Unit

HCD - FICON Cascade Switch - Control Unit - Path - Link Addresses

```
                     Select Processor / Control Unit
                                                Row
Command ===> _____

Select processors to change CU/processor parameters, the

Control unit number . . : 1000     Control unit type .

                  ----------------Channel Path ID   Link Address
/ Proc. ID 1------ 2------ 3------ 4------ 5------ 6---
_ PROC100   84.6330 86.6338 A2.6130 A8.6138 _____ ____
******************************** Bottom of data **********

 F1=Help         F2=Split       F3=Exit       F4=Prompt     F5=Reset
 F6=Previous     F7=Backward    F8=Forward    F9=Swap       F12=Cancel
 F20=Right       F22=Command
```

The CU path field allows specification of 2-byte link addresses. They must be specified when a CU is being accessed via a cascaded switch, or an entry and other CUs defined on the same channel (CHPID) have been defined using 2-byte link addresses (i.e., when a CU is defined on a channel path using a 2-byte link address, then all CUs defined on the same channel path (CHPID) must use a 2-byte link address.

Figure D-13   Select Processor / CU

HCD - FICON Cascade Switch - Control Unit - CUADD - UA

```
                        Select Processor / Control Unit
                                              Row 1 of 1 More: <        >
   Command ===> _____ Scroll ===> CSR

   Select processors to change CU/processor parameters, then press Enter.

   Control unit number . . : 1000     Control unit type .      No change in the specification
                                                               of the CUADD value or the CU
                CU+ ------------   Unit Address . Unit Ra      unit-address or range. Be
   / Proc. ID  Att ADD 1----- 2----- 3----- 4----- 5-----      aware that the CUADD field
   _ PROC100      0_   00.256 _____ _____ _____ _____      has been moved to this panel
   *********************************** Bottom of data ******    from the CU panel that
                                                               precedes this panel.




    F1=Help         F2=Split       F3=Exit      F4=Prompt      F5=Reset
                    =Backward      F8=Forward   F9=Swap        F12=Cancel
    Input required. =Right         F22=Command
```

Figure D-14   Control Unit CUADD

HCD - FICON Cascade Switch - Control Unit List - #s 1000 - 1700

```
                         Control Unit List                    Row 1 of 8
   Command ===> _____ Scroll ===> CSR

   Select one or more control units, then press Enter.  To add, use F11.

   Processor ID . . . : PROC100          Channel path ID  . : 84

   / CU   Type +        #PR #MC Serial-# + Description
   _ 1000 2105           1      _____ _____    No change to the Control Unit
   _ 1100 2105           1      _____ _____           List panel
   _ 1200 2105           1      _____ _____
   _ 1300 2105           1      _____ _____
   _ 1400 2105           1      _____ _____
   _ 1500 2105           1      _____ _____
   _ 1600 2105           1      _____ _____
   _ 1700 2105           1      _____ _____
   *************************** Bottom of data *******************************

    F1=Help       F2=Split     F3=Exit      F4=Prompt    F5=Reset     F7=Backward
    F8=Forward    F9=Swap      F10=Actions  F11=Add      F12=Cancel   F13=Instruct
    F22=Command
```

Figure D-15   Control Unit List

HCD - FICON Cascade Switch - Add Control Unit - Connections

```
                         Add Control Unit

   Specify or revise the following values.

   Control unit number  . . . . 9000  +
   Control unit type  . . . . . 2105_____  +

   Serial number  . . . . . . . _____
   Description  . . . . . . . . _____

   Connected to switches  . . . 62  62  64  64  __  __  __
   Ports  . . . . . . . . . . . 30  38  30  38  __  __  __

   If connected to a switch:

   Define more than eight ports . . 2   1.  Yes
                                        2.  No
   Propose CHPID/link addresses and
   unit addresses . . . . . . . . . 2   1.  Yes
                                        2.  No

    F1=Help     F2=Split    F3=Exit    F4=Prompt  F5=Reset    F9=Swap
   F12=Cancel
```

> No change in the way this is specified for FICON (FC), it's the same as ESCON, and is the switch.ID and port addresses that the CU is physically connected to. But see the ISL warning on a later foil.

Figure D-16   Add Control Unit

HCD - FICON Cascade Switch - Control Unit - Path - Link Addresses

```
                      Select Processor / Control Unit
                                             Row
   Command ===> _____

   Select processors to change CU/processor parameters, tl

   Control unit number . . : 9000     Control unit type .

                  ---------------Channel Path ID . Link Addres
   / Proc. ID 1------ 2------ 3------ 4------ 5------ 6--
   _  PROC100  84.6430 86.6438 A2.6230 A8.6238 _____ ____
   **************************** Bottom of data **********


    F1=Help         F2=Split       F3=Exit       F4=Prompt      F5=Reset
    F6=Previous     F7=Backward    F8=Forward    F9=Swap        F12=Cancel
    F20=Right       F22=Command
```

> The CU path field allows specification of 2-byte link addresses. They must be specified when a CU is being accessed via a cascaded switch, or an entry and other CUs defined on the same channel (CHPID) have been defined using 2-byte link addresses (i.e., when a CU is defined on a channel path using a 2-byte link address, then all CUs defined on the same channel path (CHPID) must use a 2-byte link address.

Figure D-17   CU 2-byte Link addresses

HCD - FICON Cascade Switch - Control Unit - CUADD - UA

```
                          Select Processor / Control Unit
                                              Row 1 of 1 More: <      >
  Command ===> _____ Scroll ===> CSR

  Select processors to change CU/processor parameters, then press Enter.

  Control unit number . . : 9000      Control unit type    No change in the specification
                                                            of the CUADD value or the CU
              CU+ ------------------Unit Address . Unit Ra  unit-address or range. Be
  / Proc. ID Att ADD 1----- 2------ 3----- 4----- 5----- 6  aware that the CUADD field
  _ PROC100      0_  00.256 _____ _____ _____ _____ _  has been moved to this panel
  ***************************** Bottom of data **********    from the CU panel that
                                                            precedes this panel.




     F1=Help        F2=Split      F3=Exit      F4=Prompt      F5=Reset
                    =Backward     F8=Forward   F9=Swap        F12=Cancel
    Input required. =Right        F22=Command
```

Figure D-18   CU unit-address

HCD - FICON Cascade Switch - Control Unit List - #s 100x - 900x

```
                          Control Unit List                 Row 2 of 16
  Command ===> _____ Scroll ===> CSR

  Select one or more control units, then press Enter.   To add, use F11.

  Processor ID . . . : PROC100          Channel path ID  . : 84

  / CU   Type +        #PR #MC Serial-# + Description
  _ 1100 2105           1      _____ _____  No change to the Control Unit
  _ 1200 2105           1      _____ _____       List panel
  _ 1300 2105           1      _____ _____
  _ 1400 2105           1      _____ _____
  _ 1500 2105           1      _____ _____
  _ 1600 2105           1      _____ _____
  _ 1700 2105           1      _____ _____
  _ 9000 2105           1      _____ _____
  _ 9100 2105           1      _____ _____
  _ 9200 2105           1      _____ _____
  _ 9300 2105           1      _____ _____
   F1=Help     F2=Split    F3=Exit    F4=Prompt   F5=Reset    F7=Backward
   F8=Forward  F9=Swap    F10=Actions F11=Add     F12=Cancel  F13=Instruct
  F22=Command
```

Figure D-19   Control Unit List

HCD - FICON Cascade Switch - CU ADD to ISL Port in Error

```
                        Add Control Unit


    Specify or revise the following values.

        Control unit number  . . . . 0011  +
        Control unit type  . . . . . 2105          +

        Serial number . . . . . . . _____
        Description . . . . . . . . _____

        Connected to switches  . . . 61  61   __  __  __  __
        Ports . . . . . . . . . . . 04  05   __  __  __  __

        If connected to a switch:

        Define more than eight ports . . 2   1.  Yes
                                             2.  No
        Propose CHPID/link addresses and
        unit addresses . . . . . . . . 2   1.  Yes

    ┌─────────────────────────────────────────────────────────┐
    │ Port 04 of switch 61 is flagged as occupied. If you want to connect │
    │ this port, change the port to not occupied first.        │
    └─────────────────────────────────────────────────────────┘
```

For this configuration an ISL is connected to switch 61 port 04, and on the switch port specification panel this port was specified as "occupied". This provides definition protection in cases like the one shown on this pane,l where it is attempted to define a CU to the same switch port.

Figure D-20   Add CU / ISL Port Error

HCD - FICON Cascade Switch - Add Device - 100x (Base)

```
                        Add Device


    Specify or revise the following values.

    Device number  . . . . . . . . 1000  (0000 - FFFF)
    Number of devices  . . . . . . 32__
    Device type  . . . . . . . . . 3390b_____  +

    Serial number . . . . . . . . _____
    Description . . . . . . . . . _____

    Volume serial number . . . . . _____  (for DASD)

    Connected to CUs . . 1000  ____  ____  ____  ____  ____  ____  ___  +



     F1=Help     F2=Split     F3=Exit     F4=Prompt     F5=Reset     F9=Swap
    F12=Cancel
```

No change to the Add Device panel (3390b - Base devices being defined)

Figure D-21   Add Device

HCD - FICON Cascade Switch - Add Device - for Processor

```
                         Device / Processor Definition
                                                          Row 1 of 1
   Command ===> _____ Scroll ===> CSR

   Select processors to change device/processor definitions, then press
   Enter.

   Device number  . . : 1000          Number of devices  . : 32
   Device type  . . . : 3390B


                                      Preferred Explicit Device
   / Processor ID   UA +  Time-Out  STADET  CHPID +  Candidate List
   _ PROC100         __     No       Yes      __        No
   **************************** Bottom of data ****************************
```

No change to the Devive/Processor Definition panel

```
      F1=Help      F2=Split     F3=Exit      F4=Prompt     F5=Reset
      F6=Previous  F7=Backward  F8=Forward   F9=Swap       F12=Cancel
   F22=Command
```

Figure D-22   Device / Processor Definition

HCD - FICON Cascade Switch - I/O Device List - 100x

```
                         I/O Device List       Row 1 of 32 More:      >
   Command ===> _____ Scroll ===> CSR

   Select one or more devices, then press Enter.  To add, use F11.

   Control unit number  : 1000    Control unit type  . : 2105

     -------Device------- --#-- --------Control Unit Numbers + --------
   / Number Type +        PR OS 1--- 2--- 3--- 4--- 5--- 6--- 7--- 8--- Base
   _ 1000   3390B         1     1000 ____ ____ ____ ____ ____ ____ ____
   _ 1001   3390B         1     1000 ____ ____ ____ ____ ____ ____ ____
   _ 1002   3390B         1     1000 ____ ____ ____ ____ ____ ____ ____
   _ 1003   3390B         1     1000 ____ ____ ____ ____ ____ ____ ____
   _ 1004   3390B         1     1000 ____ ____ ____ ____ ____ ____ ____
   _ 1005   3390B         1     1000 ____ ____ ____ ____ ____ ____ ____
   _ 1006   3390B         1     1000 ____ ____ ____ ____ ____ ____ ____
   _ 1007   3390B         1     1000 ____ ____ ____ ____ ____ ____ ____
   _ 1008   3390B         1     1000 ____ ____ ____ ____ ____ ____ ____
   _ 1009   3390B         1     1000 ____ ____ ____ ____ ____ ____ ____
    F1=Help      F2=Split     F3=Exit      F4=Prompt    F5=Reset     F7=Backward
    F8=Forward   F9=Swap      F10=Actions  F11=Add      F12=Cancel   F13=Instruct
   F20=Right    F22=Command
```

No change to the I/O Device List panel

Figure D-23   I/O Device List

HCD - FICON Cascade Switch - Add Device - 10Ax (Alias)

```
                              Add Device

  Specify or revise the following values.

  Device number . . . . . . . . . 10a0  (0000 - FFFF)
  Number of devices . . . . . . 96__
  Device type . . . . . . . . . 3390a_____  +

  Serial number . . . . . . . . _____
  Description . . . . . . . . . _____

  Volume serial number . . . . . _____  (for DASD)

  Connected to CUs . . 1000  ____  ____  ____  ____  ___  ___  ___  +


   F1=Help    F2=Split    F3=Exit    F4=Prompt   P5=Reset    F9=Swap
  F12=Cancel
```

No change to the Add Device panel
(3390a - Alias devices being
defined)

Figure D-24   Add Device

Sample IOCP:
Cascaded Directors (ESS 8000)

Sample FICON IOCP   ESS 8000

```
CHPID PATH=(96),SHARED,SWITCH=1B,TYPE=FC
CHPID PATH=(97),SHARED,SWITCH=1B,TYPE=FC
CHPID PATH=(A1),SHARED,SWITCH=65,TYPE=FC
CHPID PATH=(A2),SHARED,SWITCH=65,TYPE=FC

CNTLUNIT CUNUMBR=D000,PATH=(96,97,A1,A2),
   UNITADD=((00,256)),LINK=(132E,132F,6F1E,6F1F),
   CUADD=0,UNIT=2105
CNTLUNIT CUNUMBR=D100,PATH=(96,97,A1,A2),
   UNITADD=((00,256)),LINK=(132E,132F,6F1E,6F1F),
   CUADD=1,UNIT=2105
            *
            *
CNTLUNIT CUNUMBR=D700,PATH=(96,97,A1,A2),
   UNITADD=((00,256)),LINK=(132E,132F,6F1E,6F1F),
   CUADD=7,UNIT=2105

IODEVICE  (no change with FICON)
```
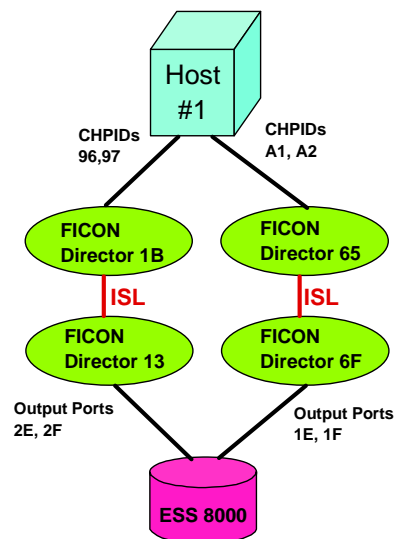
Host #1

CHPIDs 96,97

CHPIDs A1, A2

FICON Director 1B

FICON Director 65

ISL

ISL

FICON Director 13

FICON Director 6F

Output Ports 2E, 2F

Output Ports 1E, 1F

ESS 8000

Reviewing the general planning approach to FICON migration and FICON performance evaluation.

- Planning approach for FICON migration
- FICON Aggregation
- Contact Information
- FICON RMF Information
- Data Transfer Size Impact on Processor and Bus Utilization
- ESCON to FICON Channel/CU Port
- FICON CTC Performance Considerations
- Performance checklist (1 of 2)
- Performance checklist (2 of 2)

Planning approach for FICON migration

- **Use zSeries Techline "FICON Aggregation Study" offering "no charge"**
  - **Answers the what's ? and how many ?**
  - **http://w3.ibm.com/support/americas/atechline.html**
- **Use E-Config for FICON configuration planning considerations**
  - **Channel card limitations and installation considerations**
- **Use the RedBooks for resources on FICON implementation considerations**
  - **Processors, Directors, IOCP info, FCV and others**
    - **www.ibm.com/redbooks**
    - **SG24-6858 Getting Started with the INRANGE FC/9000 FICON Director**
    - **SG24-6857 Getting Started with the McDATA Intrepid FICON Director**
    - **SG24-6089 Getting Started with the 2109-M12 FICON Director**
    - **SG24-6397 Implementing the Cisco MDS 9000 Family in a FICON, FCP, and FCIP environment (Draft last update 24 September 2004)**
    - **SG24-5444-03 IBM eServer zSeries Connectivity Handbook**
- **Use IOCP User's Guide ICP IOCP SB10-7037 z990 and z890, IYP IOCP SB10-7029 z900 and z800**
  - **Appendix F : Machine Limits and Rules**
- **Use Cathy Cronin and Richard Basener white papers for FICON performance considerations**
  - **ibm.com/servers/eserver/zseries/connectivity**
    - **Performance Consideration for Cascading FICON Directors Environment V 0.2x**
- **Use IBM Network Integration and Deployment Services for Cabling Systems**
  - **http://www.ibm.com/services/networking/integration/**
- **Use IBMLearning Services for FICON education**
  - **Brian Hatfield brianh@us.ibm.com (770) 835-3746**
- **Use http://www-1.ibm.com/servers/eserver/zseries/connectivity for latest FICON /FCP news**

FICON Express - Breaking the Barrier

FICON ESS/FICON Channel Study Offerings: NO CHARGE!

If you are approaching the 256 physical channel limit, consolidating zSeries or S/390 servers or interested in migrating to FICON, IBM specialists are available to perform channel analyses to aggregate multiple ESCON channels to FICON Channels. This analyses uses your SMF and IOCP data, to determine which DASD or TAPE channels would be good candidates for aggregation to FICON Bridge, or native FICON, without negatively impacting performance. FICON aggregation requires either 9032-005 with FICON bridge cards, or native FICON point-to-point or via a FICON director (In Range or Mc Data). Analysis of the number of Native FICON channels required for ESS attachment is also available. In addition to a detailed report with charts on any of these analyses, the Techline Specialist is available to participate with you, and the IBM Sales Representative, via conference call. The model, once built, can be used by an IBM Sales representative, with CP2000 experience, on-site with you to do what-if scenarios for combining different combinations of channels. In most cases, the analysis can be completed within one week of receipt of data for single LPAR/CEC configurations. Contact your IBM marketing rep or the person who sent this flyer for further information on this offer.

I/O Operations per second*

Effective Bandwidth MBytes and Gbits / sec **
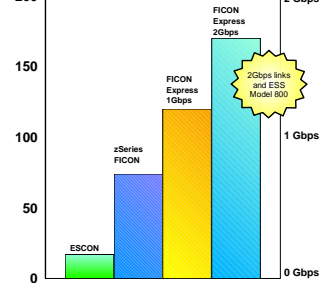
Results above are from an IO Driver program. Individual results will vary.
* Channel 100% utilized, 4K block sizes, FC = Native, 1 or 2 GBit
** Using highly sequential 6x 27k block size, mixed reads and writes

Sum of CHPID RMF Busy in Sample Company
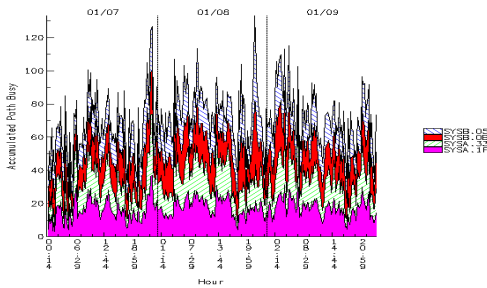
Sample Company
CP2000 allows you to evaluate the impact of combining the I/O configurations from multiple CECs. What would happen to the CHPID behavior if one combines CHPIDs when consolidating multiple CECs?

Channel Processor Busy for 9072(O5/G6) Native CHPID in SYSA
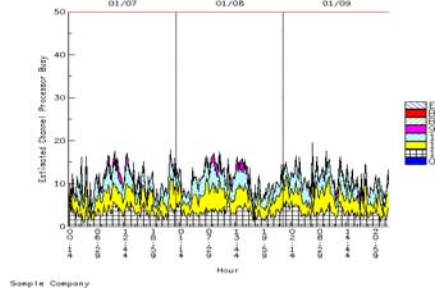
Sample Company
CP2000 allows you to evaluate the impact of combining ESCON or existing FICON CHPIDs to new FICON CHPIDs. What will be the new FICON Channel Processor Utilization if I combine these 8 ESCON CHPIDs? How will it look over time? Will you have a performance problem?

Contact Information

- **Contact**
  - **CP2000@us.ibm.com**
- **Intranet**
  - **http://w3.ibm.com/support/americas/wsc**
    Click on S/390, Capacity Planning (CPS), Tools, and press the Documentation push button after selecting the appropriate tool.
- **FTP Site**
  - **ftp://cpstools.washington.ibm.com**
   **Select CP2000, then WIN.**

FICON RMF Information

The primary RMF report of interest for FICON is the Channel Path Activity report

- The FICON channel adapter consists of two components, a processor and bus

- Processor and Bus utilization is reported in the Channel Path Activity report

- For good response time IBM recommends
  - keeping processor utilization below 50%
  - keeping bus utilization below 50%

- Different types of workload effect processor and bus utilization differently
  - small data transfer sizes drive processor utilization higher than bus utilization
  - large data transfer sizes drive bus utilization higher than processor utilization

---

Data Transfer Size Impact on Processor and Bus Utilization

One FC channel to two 2105 (ESS) 800 CU ports

FICON Express 4K Read Hit   FICON Express 27K Read Hit
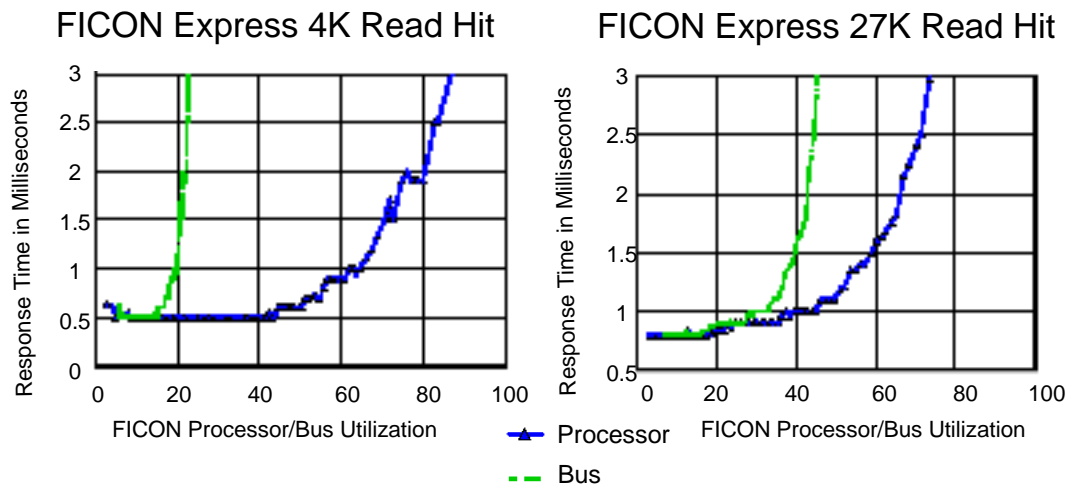
Processor
Bus

- Recommendation is to keep Processor and Bus utilization 50% or less for good response times
- Results based on lab tests as reported in FICON Performance white paper
- Processor/Bus utilization, reported by RMF will vary by workload and channel type

ESCON to FICON Channel/CU Port

In a multisystem I/O configuration the number of ESCON to FICON channels consolidated (4,6 or even 8 ESCON to 1 FICON) will typically be more then the number of ESCON to FICON ports consolidated at the DASD Control Unit end

- Different CU vendors can have different FICON port consolidation recommendations

- 2105 ROT (performance should be monitored, analyzed and tuned to ensure configuration meets performance objectives)
  - 2 ESCON ports to 1 FICON port for a highly utilized CU
  - 4 ESCON ports to 1 FICON port for a moderately utilized CU
  - 6 ESCON ports to 1 FICON port for a low utilized CU

- FICON port consolidation can also be influenced by type of workload and CU characteristics
  - OLTP, batch, small / large blocks, cache hit ratio, cache size....

- When adding additional storage, devices or LCUs behind an existing CU be aware that initial FICON port consolidation estimates may become invalid

FICON CTC Performance Considerations

FICON CTC provides improved performance when compared to ESCON CTCs and can be used simultaneously for CTC and storage traffic.

The main factor in CTC performance is transfer size of the CTC traffic

- Transfer sizes of 4K and larger generally have much better throughput compared to ESCON CTCs

- Transfer sizes of 1K and less may not provide significant throughput compared to ESCON CTCs
  - This is mainly a function of the CTC channel program

- Mixing other CUs on the same FICON channel with a FICON CTC that consists mainly of small transfer sizes (these are typically response time sensitive) are generally not recommended
  - This would only serve to increase the CTC response time

Note - In a Parallel Sysplex most XCF message traffic is response time sensitive and many XCF messages are 956 bytes.

Performance checklist (1 of 2)

With FICON, just as ESCON, DASD and TAPE activity reports should still be analyzed

- If response time is a problem
  - Review response time components
- If DISCONNECT time is a problem
  - Increasing CU cache size may help
- If IOSQ time is a problem
  - Using or increasing PAVs may help
- If PEND or CONNECT times are high
  - Channel processor or bus utilization above 50%
    - Over use of FICON channel may be the problem
  - Channel processor or bus utilization below 50%
    - Over use of director or CU port may be the problem

Performance checklist (2 of 2)

High PEND or CONNECT time (continued)

- CMR (command response) time is larger then normal (subset of PEND time)
  - CMR time is a field that has been added to the RMF Device Activity Report
  - CU is busy with other I/O operations or high number of open exchanges
- High director or CU port usage
  - CU port usage not reported directly on RMF report
  - Information can be found in the RMF FICON Director Activity Report
    - Port Bandwidth, Read and Write MB/sec, Average frame size, etc..
    - The Control Unit Port (CUP), FE port must be supported and coded for these SMF records to be reported

A general update review of all supported FICON /FCP controllers/devices and FICON Directors.

IBM Washington Systems Center

- FICON/FCP Director Matrix
  - McDATA
  - CNT
- FICON/FCP Director Matrix
  - Cisco
  - Brocade
- FICON attached directors, switches and devices
- FCP Connectivity Options supported

FICON/FCP Director/Switch Matrix   1 of 2

IBM Machine Type	2032-064	2032-140	2031-232 *4/23/04 FICON	2042-001	2042-128	2042-256	2042-N16 UMD
Vendor	McDATA	McDATA	McDATA	CNT (Inrange)	CNT (Inrange)	CNT (Inrange)	CNT(Inrange)
Vendor Type	ED-6064	ED-6140	ES-3232	FC/9000-001	FC/9000-128	FC/9000-256	UltrNet Multi Service
Min # Ports (increments)	16 (4)	16 (4)	8 (1)	16 (8)	24 (8)	32 (8)	32 (16)
Max # Ports	64	140	32	64	128	256	256
Distance - LW (km)	10 20, 35	10 20, 35	10 20,35	10 35, 80	10 35, 80	10 35, 80	10 35, 80
Trunking	Open Trunking	Open Trunking	Open Trunking	CWDM	CWDM	CWDM	?
Zoning	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FICON/FCP Intermix	Yes white paper	Yes white paper	Yes	Yes CNT website	Yes CNT website	Yes CNT website	Yes CNT website
1Gb & 2Gb Intermix	Yes But all 2Gb for 2Gb	Only 2Gb UPMs	Only 2Gb	Yes (2Gb capable)	Yes (2Gb capable)	Yes (2Gb capable)	Only 2 Gb
Cascading	Yes FC 6006	Yes FC 6007	Yes FC 3007	Yes FC 7203	Yes FC 7203	Yes FC 7203	Yes FC 7302
Control Unit Port (CUP)	Yes FC 6302	Yes FC 6003	Yes FC 3008	Yes FC 7202	Yes FC 7202	Yes FC 7202	Yes FC 7301
Performance Monitoring	Perf & Event Management Module	Perf & Event Management Module	Perf & Event Management Module	Enterprise Management Server	Enterprise Management Server	Enterprise Management Server	Enterprise Management Server

CUP functionality requires SA (System Automation) OS/390

FICON/FCP Director/Switch Matrix   2 of 2

IBM Machine Type	2062-D04 2062-T04	2062-D07 2062-T07	2062-D01	2109-M12	2109-M14	2109-F32
Vendor	Cisco	Cisco	Cisco	Brocade	Brocade	Brocade
Vendor Type	MDS 9506	MDS 9509	MDS 9216	Silkworm 1200	Silkworm 2400	Sikworm 3900
Min # Ports (increments)	16 (16*)	32 (16*)	16	32 (16 / 32)	32 (16 / 32)	32 (16 GBICs)
Max # Ports	64/128 **56 & 8 IP	112/224 **98 & 14 IP	32/48 **28 & 4 IP	2x64	128	32
Distance - LW (km)	10 100, CWDM 4:1 or 8:1	10 100 CWDM 4:1 or 8:1	10 100 CWDM 4:1 or 8:1	10 (5 w/ trkg) 35, 80 (no trkg)	10 (5 w/ trkg)? 35, 80 (no trkg)?	10 (5 w/ trkg)? 35, 80 (no trkg)?
Trunking	Yes 4, 6, ..., 32Gb	Yes 4, 6, ..., 32Gb	Yes 4, 6, ..., 32Gb	Yes 4, 6, 8Gb	Yes 4, 6, 8Gb	Yes 4, 6, 8Gb
Zoning	Yes, VSAN	Yes, VSAN	Yes, VSAN	Yes	Yes	Yes
FICON/FCP Intermix	Yes, VSAN	Yes, VSAN	Yes, VSAN	Yes	Yes	(Yes?)
1Gb & 2Gb Intermix	Yes 2Gb SFP	Yes 2Gb SFP	Yes 2Gb SFP	Yes 2Gb SFP	Yes 2Gb SFP	Yes 2Gb SFP
Cascading	Yes	Yes	Yes	Yes	Yes	(Yes?)
Control Unit Port (CUP) - local only	Yes	Yes	Yes	Target 10/04	Targeted 10/04	?
Performance Monitoring	Fabric Mgr. Server, Port Analyzer adapter	Fabric Mgr. Server, Port Analyzer adapter	Fabric Mgr. Server, Port Analyzer adapter	Frame Filtering & Fabric Watch	Frame Filtering & Fabric Watch	Frame Filtering & Fabric Watch

* 32-port modules have not been qualified for FICON attachment
** There are several IP configurations 4 IP, 8 IP port and 14 FC + 2 IP GA Oct. 2004

FICON attached directors, switches and devices

- CISCO MDS 9000 Family (IBM 2062)
- CNT INRANGE FC/9000 Directors (IBM 2042)
- McDATA Intrepid 6064 and 6140 Directors (IBM 2032)
- McDATA Sphereon 3232 Fabric Switch (IBM 2031)
- IBM TotalStorage SAN Switch M12 and M14 (IBM 2109)
- IBM TotalStorage Enterprise Storage Server Models 750 and 800 (IBM 2105)
- IBM TotalStorage Enterprise Tape Controller 3590 Model A60
- IBM TotalStorage Enterprise TapeController 3592 Model J70
- IBM TotalStorage Virtual Tape Server
- IBM Infoprint 4100, 2000, Color 130 Plus
- IBM 9032-005 ESCON Director with FICON Bridge

see: http://www-1.ibm.com/servers/eserver/zseries/connectivity/

FCP Connectivity Options supported:

In conjunction with the latest SuSE Linux Enterprise Server 8 (SLES 8) Linux distribution, the zSeries Fibre Channel Protocol (FCP) function is generally available for use with the following IBM products[1]

Devices (via switch)
IBM TotalStorage Enterprise Tape System 3590 (Interoperability Matrix)
IBM TotalStorage Enterprise Tape Drive 3592
IBM TotalStorage Enterprise Tape Library 3494
IBM TotalStorage Enterprise Storage Server Models 750, 800, F20, F10(Interoperability Matrix)
IBM TotalStorage UltraScalable Tape Library 3582, 3583 and 3584 w/ Ultrium 2 Fibre Channel Tape Drives (Interoperability Matrix)

Director/Switch Support
CISCO MDS 9000 Family (IBM 2062)
CNT (INRANGE) FC/9000 64-port, 128-port and 256-port models (IBM 2042)
McDATA Intrepid 6064 (IBM 2032)
McDATA Intrepid 6140 (IBM 2032)
McDATA 3232 (IBM 2031-232)
McDATA Sphereon 4500 Fabric Switch (IBM 2031-224)
IBM Total Storage SAN Switch 2109-M12
IBM TotalStorage SAN Switches 2109-F16 and S16/S08
McDATA ES-1000 Loop Switch (IBM 2031-L00)FCP-to-FC-AL Bridge
McDATA ED-5000 (IBM 2032-001)

IBM 2108-G07 SAN Data Gateway (parallel SCSI connectivity to non-IBM storage)

see: http://www-1.ibm.com/servers/eserver/zseries/connectivity/

IBM Washington
Systems Center

Others

FCP LUN access control

Preview

Host-based access control for operating system instances that share access to an FCP channel

- LUN masking and zoning only allow access control per FCP channel
    - Operating systems sharing an FCP channel have same access rights and no access protection.
- FCP LUN access control is providing controlled access via an FCP channel which is shared among multiple operating system instances.
    - Complements LUN masking and zoning

Exclusive to z990, z890 - CHPID type FCP only

When available will be supported by:

- z/VM V4.4, and later, with PTF for APAR VM63328
- Linux on zSeries

FCP LUN access control

➡ Without FCP LUN access control
   - LUN Masking and Zoning only allow access control per FCP Channel
   - No individual access control/protection for Operating Systems sharing a Channel

➡ **With FCP LUN access control**
   - **Can specify separate permissions for z/VM and each Linux guest sharing a Channel**
   - **Read-only Lun sharing**
   - **Provides improved security and access protection.**
   - **Planned Availability date to be announced**

Multiple Linux images in Logical Partitions

Multiple Linux images as z/VM Guests

Linux 1 | Linux 2 | Linux 3

Linux 4 | Linux 5 | Linux 6

zVM Control Program

Logical Partition (LPAR) Hipervisor

Host Adapter (FCP Channel)

WWPN 1   WWPN 2

SAN

WWPN 3
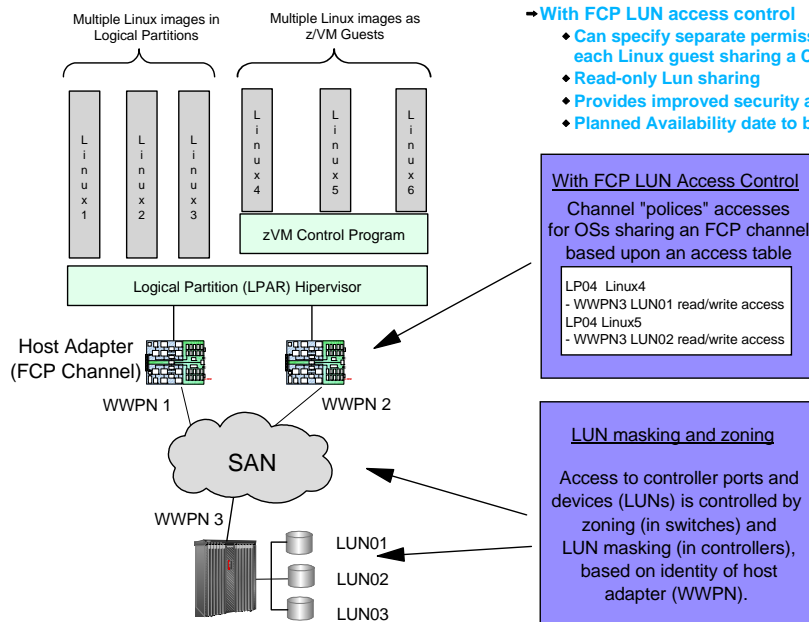
LUN01
LUN02
LUN03

With FCP LUN Access Control

Channel "polices" accesses for OSs sharing an FCP channel based upon an access table

LP04 Linux4
- WWPN3 LUN01 read/write access
LP04 Linux5
- WWPN3 LUN02 read/write access

Preview

LUN masking and zoning

Access to controller ports and devices (LUNs) is controlled by zoning (in switches) and LUN masking (in controllers), based on identity of host adapter (WWPN).

FICON purge path extended
for native FICON (CHPID type FC)

Enhanced FICON problem determination

Error-recovery function is extended

   Transfers error-related data and statistics

      Between the channel and entry switch

      Control unit and its entry switch

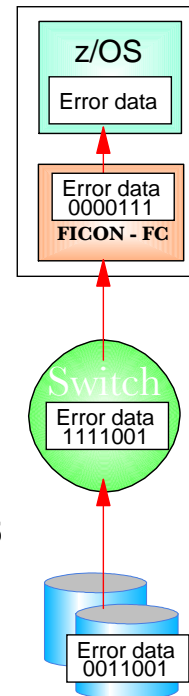   To the host operating system

         Reported in EREP

Exclusive to z990 and z890

Supported by z/OS and z/OS.e V1.4, and later,
with PTFs for APAR 0A06846 and EREP APAR IR51695

Requires supporting LIC on control units

~~Available on selected control units~~

   ~~Contact storage supplier~~

z/OS

Error data

Error data
0000111
FICON - FC

Switch

Error data
1111001

Error data
0011001

APARs for Hardware Planners

- ICPIOCP for z990
  - OA02897
  - IOCP User's Guide ICP IOCP (z990) - SB10-7037
- IYPIOCP - OS/390 and z/OS (See II02369) for z900 and z800
  - zSeries Driver 3G - Level 1.2.0 - OW52993
  - IOCP User's Guide IYP IOCP (z900/z800) - SB10-7029
- HCD Support for FCP and z900 2xx Models
  - OW48236
- HCD and HCM support for FICON Cascade
  - HCD - OW54246, HCM - IR46549 (HCM 2.9.0 Service Level 10)
- New FMID's for HCD and HCM w/z990 Compatibility
  - HCS7708 and HCM1510
- BCP Support for FICON Cascade - z/OS V1.3 & up
  - OW55511, OW55513, OW55514, OW55515
- RMF support for FICON Cascade - z/OS V1.3 & up
  - OW52396
- DCM toleration of FICON Cascade - OS/390 V2.10 & up
  Note: DCM does NOT support FICON (except FCV)
  - OW49661
- System Automation for OS/390 V2.2 toleration of FICON Cascade
  - OW54640 (was Open 2/4/03 now closed), rolled up in SA 2.3
  - OW56984 - support for FICON Cascade, rolled up in SA 2.3
  - OA04519 - remove the IGNORE from WRITESWCH, rolled up in SA 2.3
  - OA06371 - high CPU w/FICON Switch
  - OA07531 - Sample for controlling loopback
- Others
  - PQ17710 - DFSORT support
  - IR28516 - EREP FICON Support
  - IR44590 - EREP Support for FICON CTCs
  - PQ47472 - DSF Support for FICON (DSF R17 is now the standard and includes this FICON support)
  - PJ26144 - TPF support for FICON DASD

Subject: URGENT – 9032 withdrawal from marketing and HMC SOD

Two key items were announced in the announcement named HW WITHDRAWAL: ESCON DIRECTOR MODEL 005 AND ASSOCIATED FEATURES announced on April 7, 2004   (AG 904-055,   EMEA ZG04-0320,   AP WG04-0112)

1. **The 9032 Model will be withdrawn from marketing effective December 31, 2004**

   Note Feature Code 5109 Hardware Management Console support on the 9032-005

2. **Statement of Direction concerning future Hardware Management Consoles support**.

The summary of the announcement letter follows:

Hardware withdrawal: IBM ESCON Director Model 005 and associated features

Effective December 31, 2004, IBM will withdraw the ESCON® Director Model 005 and associated features from marketing. The last date you can order the withdrawn product is December 30, 2004.

To support the ESCON Director console application, it is recommended that each ESCON Director has a console, other than on an HMC. You may order console feature number 5900 on the ESCON Director Model 005 (9032-005) to obtain a console before the withdrawal date of December 31, 2004.

Statement of Direction - Hardware Management Console (HMC)

Beginning with the next zSeries® server, after the IBM zSeries 890 and 990, all new HMCs on all currently marketed zSeries servers are intended to become closed platforms. They will support only the HMC application and not the installation of other applications, such as the IBM ESCON® Director and the IBM Sysplex Timer® console applications.

When available, the next-generation HMC is expected to communicate only with G5 Servers and above (Multiprise® 3000, G5/G6, z800, z900, z890, z990). TCP/IP is intended to be the only communications protocol supported.

All statements regarding IBM's plans, directions, and intent are subject to change or withdrawal without notice.

Actions:

1. ensure that all future ESCON Director requirements are met while the capability exists to order the 9032 Model 005

2. if your believe your customer will be using ESCON for a number of years in the future, ensure your customers have a console to control any 9032s
     that today are controlled by the HMC.   This is due to the SOD above and the inability to order ESCON Director consoles after December 31, 2004.

If you have questions about this 5x5 please contact Jeff Seidell at tieline 224-6677, outside 914-642-6677, 914-767-0332 (home office), at Jeff Seidell/White Plains/IBM, or at jseide@us.ibm.com

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IBMLearning Services   FICON course outline
(2 days with HCD workshop)

Brian Hatfield brianh@us.ibm.com (770) 835-3746
Course Objectives:
Define the FICON Channel
Identify the Benefits of the FICON channel over other channel types
Identify the Fibre channel relationship in the SAN environment
Identify valid and invalid configurations with FICON
List requirments and possible impacts of FICON
Identify the FICON Architecture
Define the FICON Bridge card & requirments
Identify requirements of ESCD Mod-5 for the FICON bridge card
Identify available native FICON swithes
Identify native FICON switch terminolgy
Identify and list operational details and configurations of the native FICON switches
Identify FICON/OSA-E channel card locations as FICON cards are added to G5/G6 CPCs
Identify FICON/OSA-E channel card locations as FICON/OSA-E are added to z900 CPC
Use Chipid reports to identify FICON location & any impacts
Identify FICON cabling requirements
Define Mode Condititioning cables and use on G5/G6 and z900 CPCs
Identify potential future cabling requirements for z900 FICON channel cards
Identify where & how existing cable infrastructure can be reused for FICON
Identify performance consideration & characteristics of FICON & other channels
Identify fuctions in HCD to support FICON
Identify IOCP changes to support FICONh

References: FICON

SA24-7172	S/390 (FICON) I/O Interface Physical Layer
GA23-0367	Planning For Fiber Optic Links (ESCON, FICON, Coupling Links, and Open System Adapters
GC28-6824	zSeries 990 Installation Manual Physical Planning
SG24-5976-01	IBM zSeries 900 Technical Guide
SB10-7034	ESCON and FICON Channel to Channel Reference
redp0205.pdf	Getting Started with zSeries Fibre Channel Protocol
SB10-7029	IOCP User's Guide IYP IOCP (z900 and z800) appendix F for machine limits and rules
SB10-7037	IOCP User's Guide ICP IOCP (z990 and z890) appendix F for machine limits and rules

ibm.com/redbooks

   IBM Redbooks

ibm.com/common/ssi

   Announcement Letters

ibm.com/servers/resourcelink/ (registration required)

   "Fibre Channel Protocol (FCP) for Linux z800/z900 - Request Form"

ibm.com/servers/eserver/zseries/ connectivity

Protocol FICON and FCP Intermix

   www.mcdata.com/downloads/whitepapers/FICON%20FCP3.pdf

Documentation Pointers FCP

RedPaper "Getting Started with FCP" - updated version now available
  http://www.redbooks.ibm.com/redpapers/pdfs/redp0205.pdf
IGS Support Line for Linux
   http://www-1.ibm.com/services/e-business/linux_8.html
System Overview SA22-1027-03 (see ResourceLink)

SAPR Guide SA00-003-12 (see ResourceLink)

Service Guide G229-9027-04 (see ResourceLink)

I/O Connectivity Information Web Site
   http://www.ibm.com/servers/eserver/zseries/connectivity/#fcp
Information repository re: Device Drivers
   Tape: http://www.storage.ibm.com/hardsoft/tape/3590/3590opn.pdf
FCP Performance White Paper - Internal IBM Confidential
   Contact: Stefan Stahl (BOE) for "FCP_SCSI_WhitePaperFinal 02_04.doc"
ESS Fibre Channel Attachment White Paper (Phil Mills)
   http://www.storage.ibm.com/disk/ess/support/ess-fibrev60.pdf
Open Systems FC HBA's.
   http://ssddom02.storage.ibm.com/hba/hba_support.pdf
z/VM 4.3.0 General Information manual
   http://www.vm.ibm.com/pubs/pdf/HCSF8A50.PDF, Page 9 describes VM's support.

Redbooks and Redpapers on FICON

1. IBM S/390 FICON Implementation Guide, SG24-5169-00, December-1-1999
2. FICON Native Implementation and Reference Guide, SG24-6266-01, October-30-2002
3. FICON (FCV Mode) Planning Guide, SG24-5445-00, March-16-2000
4. Getting Started with the IBM 2109 M12 FICON Director, SG24-6089-00, Oct.-29-2003
5. Getting Started with the INRANGE FC/9000 FICON Director, SG24-6858-00, Mar.17-2003
6. FICON CTC Implementation, REDP-0158-00, January-10-2002, last updated January-11-2002
7. Getting Started with the McDATA Intrepid FICON Director, SG24-6857-00, April-4-2003
8. Introduction to IBM S/390 FICON, SG24-5176-00, October-11-1999
9. IBM Tape Solutions for Storage Area Networks and FICON, SG24-5474-02, September-26-2002
10. FICON support of cascaded Directors (IOCP definitions), TIPS0085 November-7-2002
11. FICON switched point-to-point (IOCP definitions), TIPS0084 November-7-2002
12. IBM ESCON Director 9032-5 Presentation, SG24-2005-00 October-6-1999
13. Binding and Insistent Domain IDs for FICON, TIPS0083 November-8-2002
14. DB2 for z/OS and OS/390 Version 7 Selected Performance Topics, SG24-6894-00 November-12-2002
15. zSeries channel and CHPID types, TIPS0086 November-7-2002
16. IBM Enterprise Storage Server, SG24-5465-01 October-1-2001
17. IBM TotalStorage Enterprise Storage Server: Implementing the ESS in Your Environment, SG24-5420-01 March-28-2002
18. IBM eServer zSeries Linux Fibre Channel Adapter Device Driver Configuration for Tape Devices, TIPS0249 July-16-2003
19. IMS Version 7 Performance Monitoring and Tuning Update, SG24-6404-00 January-14-2002
20. IBM eServer zSeries 900 Technical Guide , SG24-5975-01 September-6-2002
21. IBM eServer zSeries Connectivity Handbook, SG24-5444-03 May-30-2003
22. The IBM TotalStorage Solutions Handbook, SG24-5250-03 February-14-2003
23. IBM TotalStorage Enterprise Storage Server Model 800, TIPS0049 September-16-2002
24. IBM TotalStorage Enterprise Storage Server Model 800, SG24-6424-01 November-8-2002
25. ESS Copy Services - Connectivity Guidelines for Synchronous PPRC, TIPS0211 June-24-2003
26. SAN - Decomplexing Multiplexers, TIPS0058 September-27-2002

Redbooks and Redpapers on FCP

1. Linux with zSeries and ESS: Essentials, SG24-7025-00 September-2-2003
2. SAN - Open Trunking with McDATA, TIPS0200 June-11-2003
3. Getting Started with zSeries Fibre Channel Protocol, REDP-0205-00 last updated February-4-2003
4. Implementing Linux with IBM Disk Storage, SG24-6261-01 last updated June-27-2003
5. IBM eServer zSeries Linux Fibre Channel Adapter Device Driver Configuration for Tape Devices, TIPS0249 July-16-2003
6. IBM eServer zSeries 900 Technical Guide , SG24-5975-01 September-6-2002
7. Implementing an Open IBM SAN Featuring the INRANGE Portfolio, SG24-6413-00 December-20-2001
8. Implementing an Open IBM SAN Featuring the McDATA Portfolio, SG24-6414-00 December-20-2001
9. Implementing an Open IBM SAN Featuring the IBM 2109, 3534-1RU, 2103-H07, SG24-6412-00 December-30-2001
10. Implementing an Open IBM SAN, SG24-6116-03 October-8-2003
11. zSeries channel and CHPID types, TIPS0086 November-7-2002
12. SAN - differentiating Fibre Channel logins, TIPS0035 August-27-2002
13. IBM TotalStorage Enterprise Storage Server Model 800, TIPS0049 September-16-2002

Standard recommendation when implementing McDATA FICON Cascading directors

1. Connect the fabric hardware.
2. Make sure existing, non-cascaded functions still work (i.e. local FICON traffic still works).
3. Verify the ISLs are up (via EFCM).
4. Install SANtegrity Binding on both Directors.
5. Make sure all devices (channels and control units) are logged in (via EFCM node descriptor list).
6. Enable Enterprise Fabric Mode
   Fabric Binding
   Insistent Domain ID.
7. Verify all the devices (channels and control units) are still logged in.
8. If the environment is volatile, change the Switch Binding enforcement to E_Port only.
9. Update the HCD/IOCDS to two byte link addresses.
10. Verify the channels log back into the fabric (via EFCM node descriptors).
11. Verify traffic flow across the fabric (i.e. establish logic paths between channel and control unit).
12. Smile!

CNT FC/9000 ISL path balancing guidelines

Below are some initial, high-level guidelines for configuring ISL's between the FC/9000 directors. Following these guidelines should result in a more even allocation of the ISL connectivity.

1. The crucial point to remember is that if an ISL is added or if an existing one is moved, these actions will force all the existing ISL routing assignments to be recalculated. This is another reason for following the guidelines.
2. Distribute ISLs across FIOs, keeping to the same row. Each ISL should be on it's own FIO using the same horizontal row (e.g., port 1 on FIO's 1-3) as ISLs on other FIOs; never put more than one ISL on an FIO until all FIO's have at least one ISL.
3. If more than 8 ISLs in a 64, (16 ISLs in a 128), (32 ISLs in a 256) then start a new row in the other vertical half of the FIOs. If all FIO's each have one ISL, continue to evenly distribute any remaining ISLs across all the FIOs (same row) exactly four physical ports away from the existing ISL ports on the same blade.
4. If possible avoid even numbers of ISLs on the same FIO.
5. Local destinations: keep HBA and targets in the same horizontal 'stripe' to avoid B-bus. The stripe here is 2 ports tall.
6. A port on a given FIO, that also contains an ISL, will favor routing to that ISL versus an ISL on a different FIO.