#SHAREorg

SHARE
Technology · Connections · Results

Why Customers Should Deploy Switches In Their SAN and FICON Environments

- David Lytle, BCAF
- Brocade Communications Inc.

- Monday August 6, 2012 – 1:30pm to 2:30pm

- Session Number - 12078

SHARE in Anaheim 2012

Legal Disclaimer

- All or some of the products detailed in this presentation may still be under development and certain specifications, including but not limited to, release dates, prices, and product features, may change. The products may not function as intended and a production version of the products may never be released. Even if a production version is released, it may be materially different from the pre-release version discussed in this presentation.
- NOTHING IN THIS PRESENTATION SHALL BE DEEMED TO CREATE A WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, STATUTORY OR OTHERWISE, INCLUDING BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NONINFRINGEMENT OF THIRD-PARTY RIGHTS WITH RESPECT TO ANY PRODUCTS AND SERVICES REFERENCED HEREIN.
- Brocade, Fabric OS, File Lifecycle Manager, MyView, and StorageX are registered trademarks and the Brocade B-wing symbol, DCX, and SAN Health are trademarks of Brocade Communications Systems, Inc. or its subsidiaries, in the United States and/or in other countries. All other brands, products, or service names are or may be trademarks or service marks of, and are used to identify, products or services of their respective owners.
- There are slides in this presentation that use IBM graphics.

Notes as part of the online handouts

I have saved the PDF files for my presentations in such a way that all of the audience notes are available as you read the PDF file that you download.

If there is a little balloon icon in the upper left hand corner of the slide then take your cursor and put it over the balloon and you will see the notes that I have made concerning the slide that you are viewing.

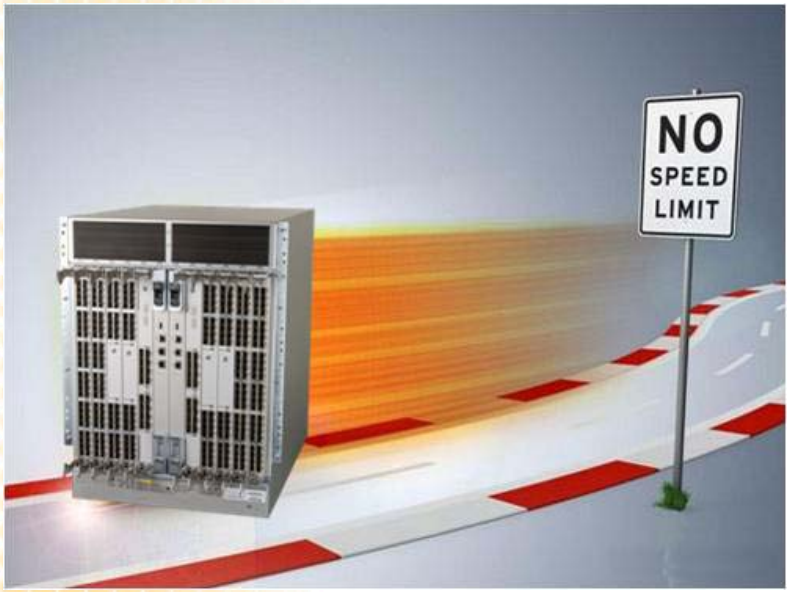
This will usually give you more information than just what the slide contains.

I hope this helps in your educational efforts!

8GIG AND 16Gbps

First, an Overview of Brocade's Current Generation of FC Products

- Supported for FICON and for FCP!



After All ----

I Am A Vendor!

Brocade B-Series 8Gbps Fabric Solutions

Best-in-class solutions for FICON

DCX and DCX-4S

DS-5300B

48, 64, 80 ports

8 Gbps

DS-5100B

24, 32, 40 ports

7800 FX8-24

SAN Extension Solutions

FC8-16 – 16 FC Ports
FC8-32 – 32 FC Ports
FC8-48 – 48 FC Ports
FX8-24 – 12xFC, 10x1GE, and 2x10 GE

Brocade B-Series 16Gbps Fabric Solutions

DCX 8510-8B
DCX 8510-4B

Best-in-class Solutions for FICON

6510 (FCP only)

24-48 ports

16 Gbps

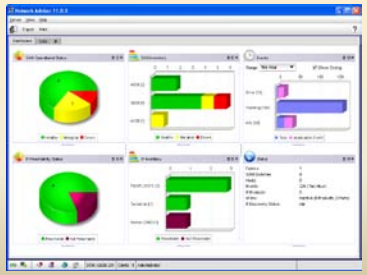
7800

FX8-24

SAN Extension Solutions

Brocade Network Advisor

F C



I P

FC16-32 – 32 FC Ports
FC16-48 – 48 FC Ports
FX8-24 – 12xFC, 10x1GE, and 2x10 GE

Switched-FICON is a Best Practice for System z

- Brocade FICON switching devices do not cause performance problems within a local data center
- Architected and deployed correctly, Brocade FICON switching devices do not cause performance problems even across very long distances
- In fact, use of Brocade switched-FICON and Brocade FCIP long distance connectivity solutions can even enhance DASD replication performance and long distance tape operations effectiveness and performance
- Switched-FICON is the only way to efficiently and effectively support Linux on System z connectivity
- Switched-FICON is the only way to really take advantage of the full value of the System z I/O subsystem

Why A Customer Should Consider Deploying Switched-FICON

- A smaller or older System z can start at about US$50,000 while an IBM System z196 can be a little more ☺
- z196 provides a max of 320 FICON Express8S CHPIDs
- z114 provides a max of 128 FICON Express8S CHPIDs
  - CHPID ports to storage ports/mainframe are limited
  - Large Sequential throughput per CHPID/System z is limited
    - z196: 320 x 620MBps=198,400MBps– or 39% of full duplex 8G
    - z114: 128 x 620MBps= 79,360MBps– or 39% of full duplex 8G

Why A Customer Should Consider Deploying Switched-FICON

- Direct–attached FICON, along with direct-attached SAN, simply provides very little value for your expensive enterprise computing environment
  - Direct-attached connections lacks performance and scalability!
- Switched-FICON and/or switched-SAN can overcome these two basic limitations as well as providing many more benefits!
  - Can utilize 8Gbps Directors…or…
  - 16Gbps Directors

System z: Why Deploy Switched-FICON

- With direct-attached FICON you must consume one CHPID to access one storage port
  - Very wasteful since neither CHPIDs nor DASD storage ports can make use of the full bandwidth of any of the channel paths
  - So CHPIDs and Storage Ports are always under-utilized resources that you have paid full price to deploy

- The CHPIDs on most mainframe channel cards cannot really perform at their listed line rate -- FICON Express8S running zHPF is the exception
  - In real use cases the data rate is about ½ the performance these channel CHPIDs are rated to achieve

….BUT….

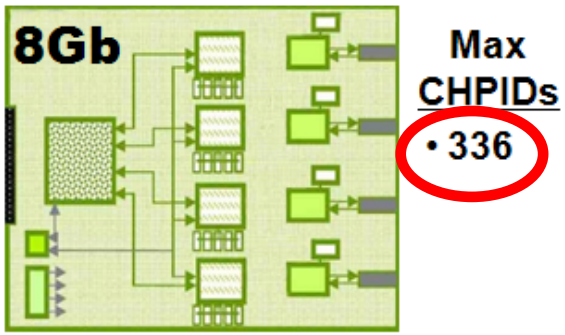
Customer's can use switched-FICON, making use of Fan In – Fan Out, to mitigate these limitations!

Mainframe Channel Cards

FICON Express4 – 4 ports
400MBps+400MBps = 800MBps

FICON Express4

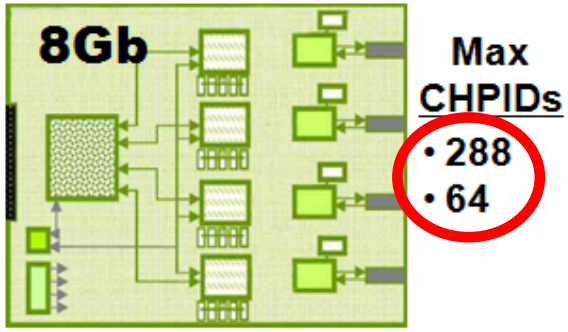
- z196, z114, z10, z9
- 1, 2 or 4 GBps link rate
- **Cannot Perform at 4Gbps!**
- Standard FICON Mode:
  44% <= 350MBps Full Duplex out of 800 MBps
- zHPF FICON Mode:
  65% <= 520MBps Full Duplex out of 800 MBps
- 200 Buffer Credits per port
  - Out to 50km assuming 1K frames



FICON Express8 – 4 ports
800MBps+800MBps = 1,600MBps

FICON Express8

- z10
- 2, 4 or 8 GBps link rate
- **Cannot Perform at 8Gbps!**
- Standard FICON Mode:
  32% <= 510 MBps Full Duplex out of 1600 MBps
- zHPF FICON Mode:
  46% <=740 MBps Full Duplex out of 1600 MBps
- **40 Buffer Credits per port**
  - Out to 5km assuming 1K frames

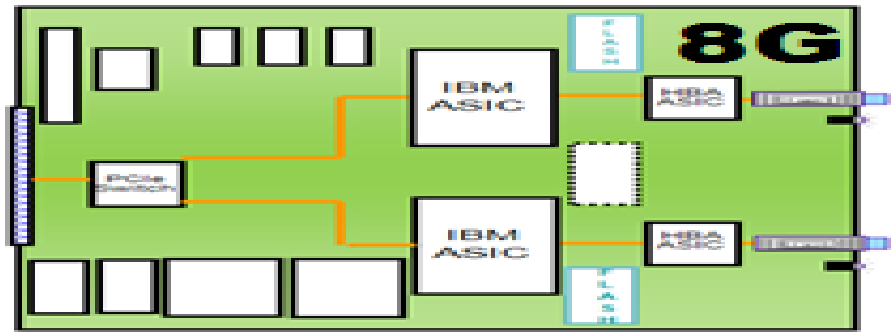


FICON Express8 – 4 ports
800MBps+800MBps = 1,600MBps

FICON Express8

- z196, z114
- 2, 4 or 8 GBps link rate
- **Cannot Perform at 8Gbps!**
- Standard FICON Mode:
  32% <= 510 MBps Full Duplex out of 1600 MBps
- zHPF FICON Mode:
  46% <=740 MBps Full Duplex out of 1600 MBps
- **40 Buffer Credits per port**
  - Out to 5km assuming 1K frames

Mainframe Channel Cards



FICON Express8S – 2 ports
800MBps+800MBps=1600MBps

320
128

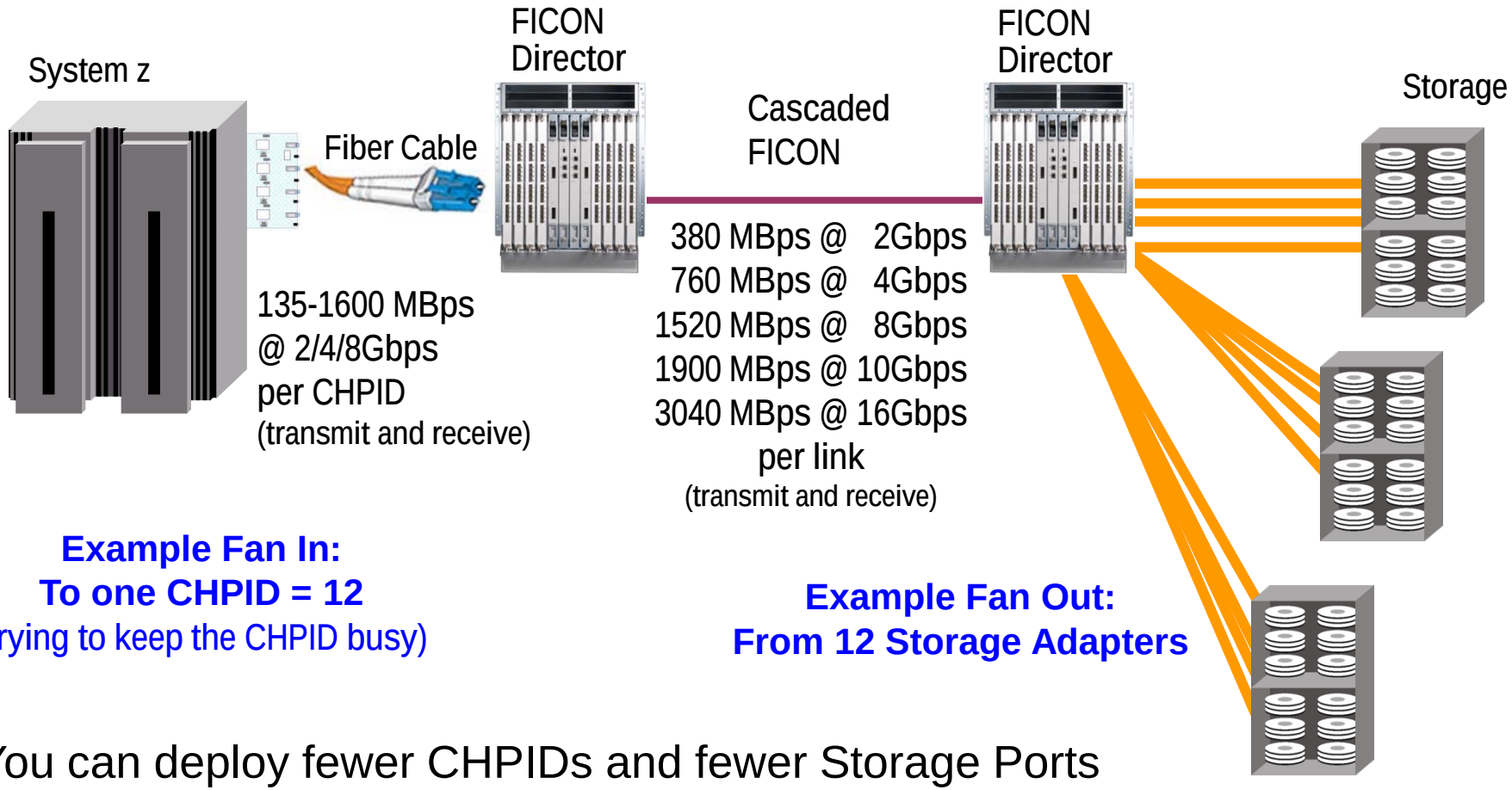
Compared to System z10, the new FICON Express8S reduces total CHPIDs per Channel Card and per Mainframe

FICON Express8S

- z196, z114
- 2, 4 or 8 GBps link rate
- zHPF Performs at 8Gbps!
- Standard FICON Mode: <= 620MBps Full Duplex out of 1600 MBps (39%)
- zHPF FICON Mode: <=1600 MBps Full Duplex out of 1600 MBps (100%)
- 40 Buffer Credits per port
  - Out to 5km assuming 1K frames

- FICON Express8S (Speedy):
  - New IBM ASIC which supports...
  - PCIe 8 GBps host bus in a new...
  - PCIe I/O drawer
  - Increased start I/Os
  - Improved throughout for zHPF and FCP
  - Introduction of a hardware data router
  - Increased port granularity – 2 CHPIDs/FX8S

Fan In-Fan Out Reduces System Bottlenecks



Example Fan In:
To one CHPID = 12
(trying to keep the CHPID busy)

Example Fan Out:
From 12 Storage Adapters

- You can deploy fewer CHPIDs and fewer Storage Ports
- You can utilize the assets you have purchased at 100%
- You can scale up very easily without purchasing a lot of hardware
- You actually achieve a higher level of system availability

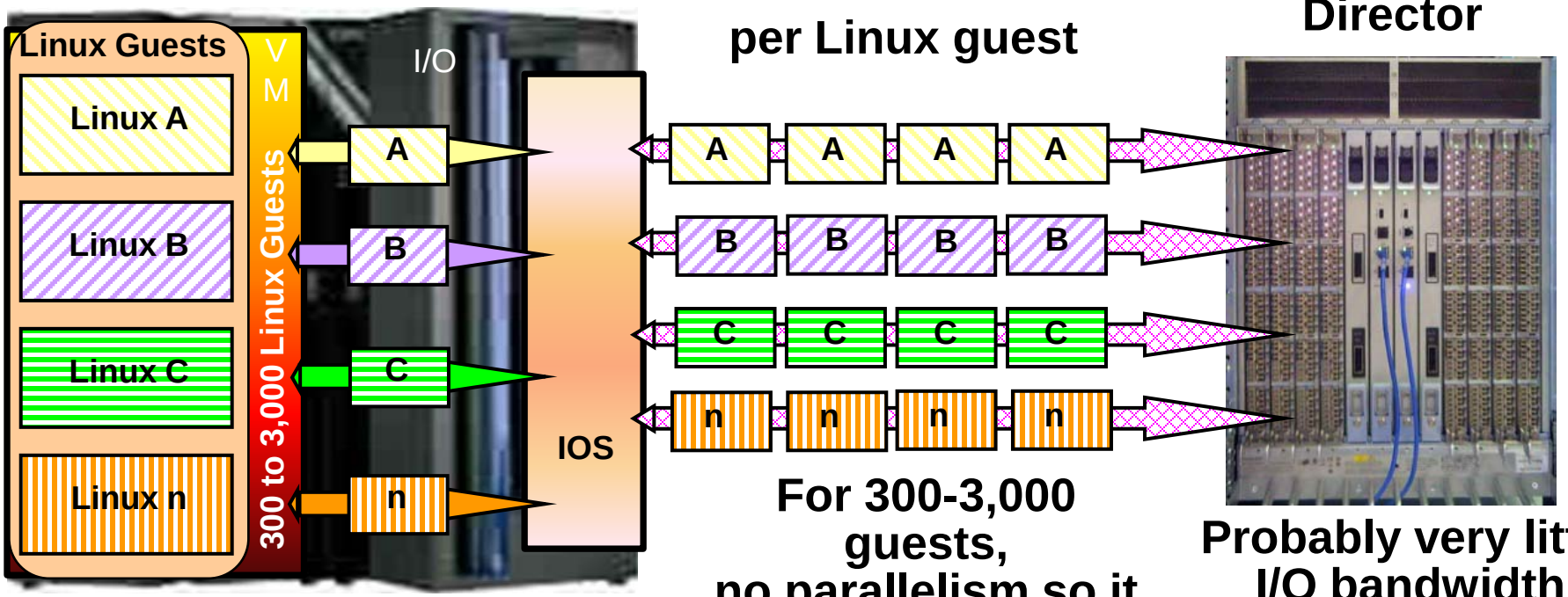
New z/OS and System z Functionality

System z functionality that REQUIRES customers to deploy switched–FICON:

- **FICON Express8 CHPID buffer credits:** Only 40 BCs per FICON Express8 and FICON Express8S CHPID limits long distance direct connectivity to ~5km. So customers can use up to 1,300 BCs at 8G and about 7,000 BCs at 16G, on a port on FICON switching devices, for longer distances.
- **FICON Dynamic Channel Management:** Ability to dynamically add and remove channel resources at Workload Manager discretion can be accomplished only in switched-FICON environments.
- **zDAC:** Simplified configuration of FICON connected disk and tape through z/OS FICON Discovery and Auto Configuration (zDAC) capability of switched-FICON fabrics.
- **NPIV:** Excellent for Linux on the Mainframe, Node_Port ID Virtualization allows many FCP I/O users to interleave their I/O across a single physical channel path

A Simplified Schematic - Linux without NPIV

An Example of Linux on System z without NPIV



One FCP CHPID per Linux guest

FICON Director

Linux on System z can run in its own LPAR(s) but usually it is deployed as guests under VM

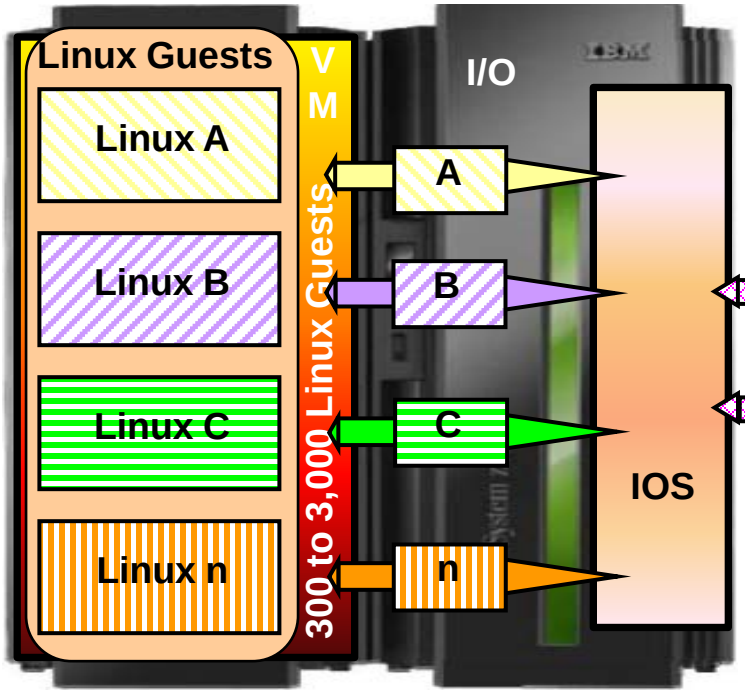
For 300-3,000 guests, no parallelism so it is very difficult to drive I/O for lots of Linux images with only 256 CHPIDs

Probably very little I/O bandwidth utilization per CHPID and switch port

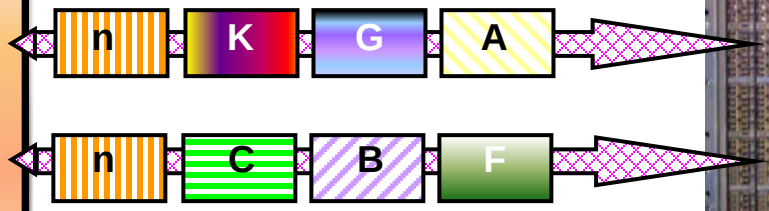
A Simplified Schematic - Linux with NPIV

NPIV is ONLY available in a switched-FICON fabric!

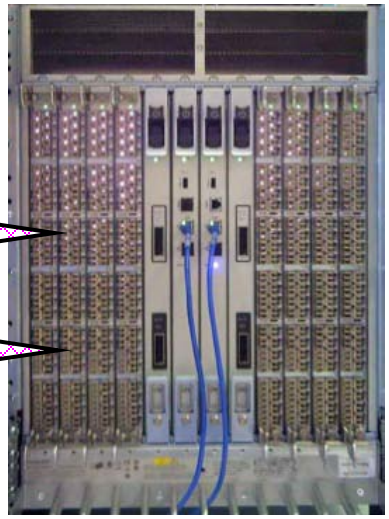
An example of System z when using NPIV



One FCP channel for many Linux guests



FICON Director NPIV enabled



Lots of Parallelism

Fewer switch ports required!

Much better I/O bandwidth utilization per path

8Gbps Is Great For NPIV!

Some of my favorite photos

In Technical Sessions, Your Brain Should Be Allowed To Take A Break!

America's Historic Roads

Beautiful Palma de Mallorca

Looking Glass Arch, Utah

Arkansas River and its Suspension Bridge

Brain Interlude Is Over….

Back to Work!

Using FICON Dynamic Channel Mgmt

FICON Dynamic Channel Path Management (DCM) provides the ability for the z/OS system to manage FICON channel path assignment dynamically based on current workload conditions and availability characteristics.

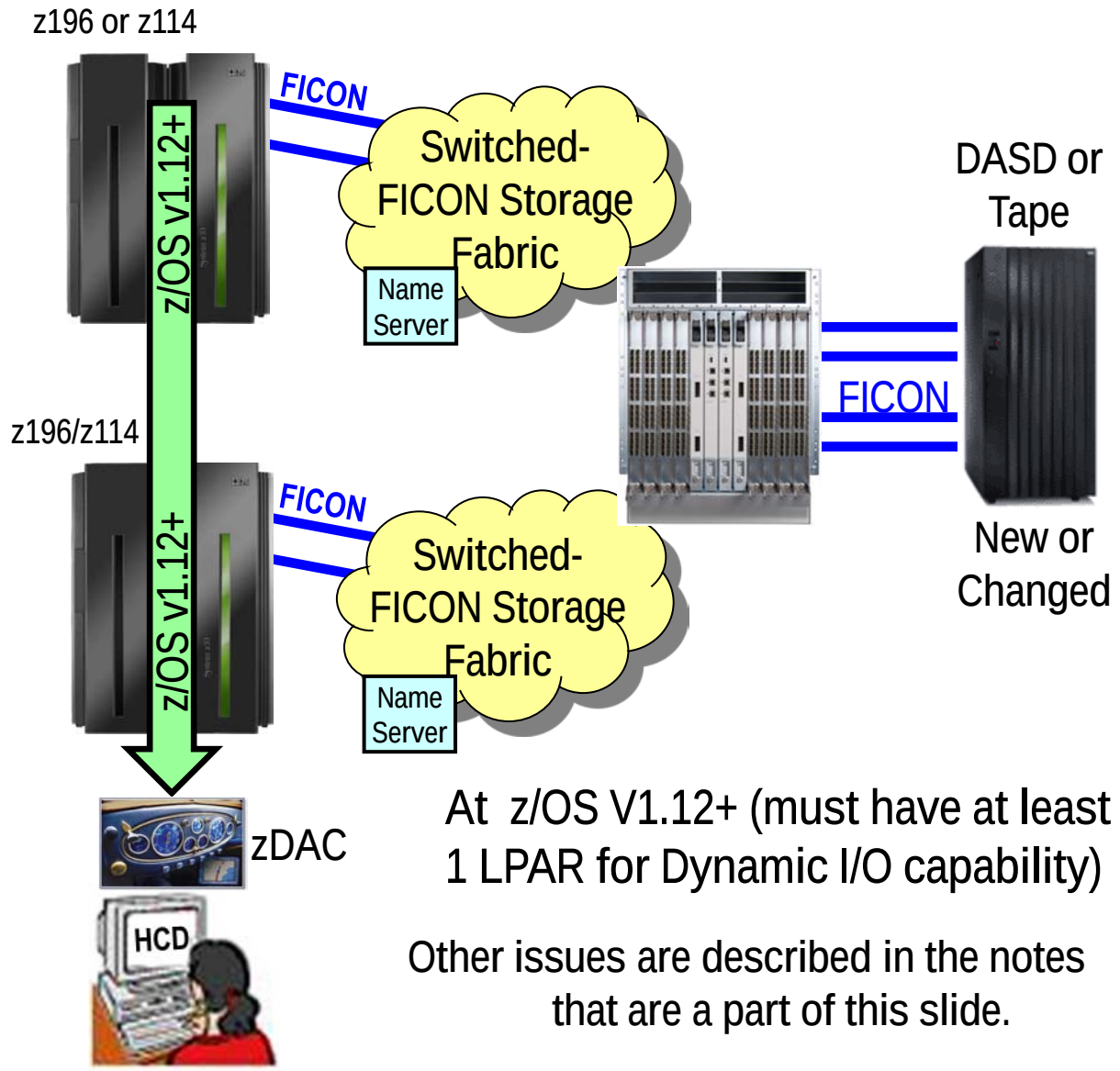
- z/OS allows pools of FICON CHPIDs to be unassigned so that workload manager can use them when it is operating in GOAL mode.
- But mainframe channels and control units must be Switch Attached in order to make use of Dynamic Channel management (DCM)

Using zDAC with System z196 and z114

Simplified configuration for FICON connected DASD and tape through z/OS FICON Discovery and Auto Configuration (zDAC)

- zDAC is only useful for switched-FICON storage/host connections
  - zDAC must make use of the FICON fabric name server
- Uses intelligent analysis to help validate that server and storage definitions are compatible with each other
- Transparent to existing configurations and settings
- Invoked through and integrated with z/OS Hardware Configuration Definition (HCD) and z/OS Hardware Configuration Manager (HCM)
- Use on single systems or across your Sysplex's

Using zDAC with System z196 and z114



At z/OS V1.12+ (must have at least 1 LPAR for Dynamic I/O capability)

Other issues are described in the notes that are a part of this slide.

- The Fabric Name Server makes it possible to automatically discover what is new or has been changed in the fabric
- When a change is discovered, zDAC proposes a channel configuration based on:
  - High availability best practices
  - Customer configuration policies
  - Existing configurations
- zDAC attempts to make a symmetric configuration:
  - And this is repeated for each server in a sysplex

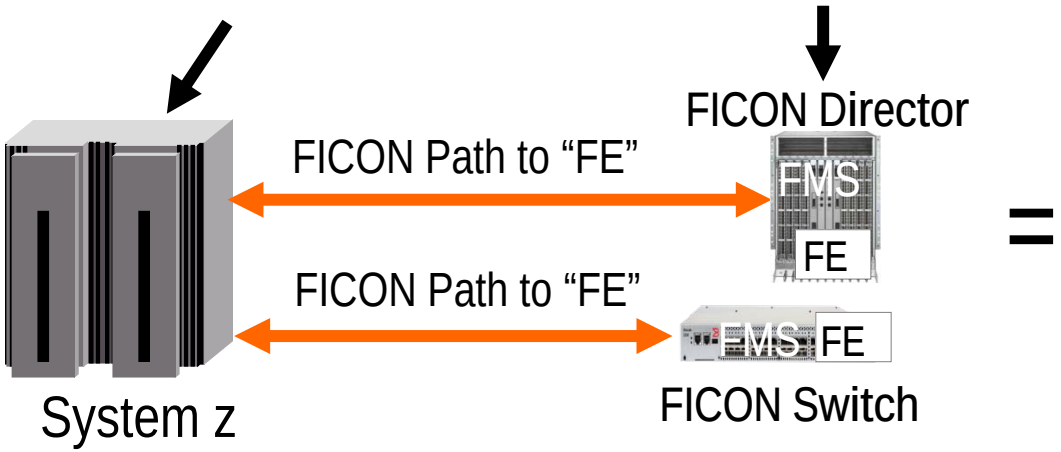
More Reasons For Deploying Switched-FICON

- Switched-FICON for RMF reports and z/OS Systems Automation control

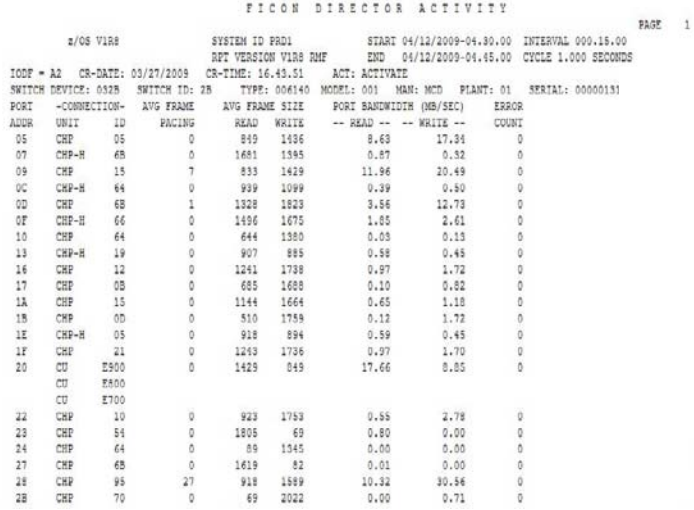
CUP on a FICON Switch For Use By RMF

Sys1.Parmlib options allow RMF to produce the RMF FICON Director Activity Report

Control Unit Port (CUP) on a FICON switching device allows z/OS to access switch and fabric information and provide that into RMF



FICON Director Activity Report per FICON Domain ID per Interval



F I C O N D I R E C T O R A C T I V I T Y

PAGE 1

z/OS V1R8 SYSTEM ID PRD1 START 04/12/2009-04.30.00 INTERVAL 000.15.00
RPT VERSION V1R8 RMF END 04/12/2009-04.45.00 CYCLE 1.000 SECONDS

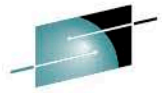
IODF = A2 CR-DATE: 03/27/2009 CR-TIME: 16.43.51 ACT: ACTIVATE
SWITCH DEVICE: 052B SWITCH ID: 2B TYPE: 006140 MODEL: 001 MAN: MCD PLANT: 01 SERIAL: 00000131

PORT ADDR	-CONNECTION- UNIT	ID	AVG FRAME PACING	AVG FRAME SIZE READ	WRITE	PORT BANDWIDTH (MB/SEC) -- READ --	-- WRITE --	ERROR COUNT
05	CHP	05	0	849	1436	8.63	17.34	0
07	CHP-H	6B	0	1681	1395	0.87	0.32	0
09	CHP	15	7	833	1429	11.96	20.49	0
0C	CHP-H	64	0	939	1099	0.39	0.50	0
0D	CHP	6B	1	1328	1823	3.56	12.73	0
0F	CHP-H	66	0	1496	1675	1.85	2.61	0
10	CHP	64	0	644	1380	0.05	0.13	0
13	CHP-H	19	0	907	885	0.58	0.45	0
16	CHP	12	0	1241	1738	0.97	1.72	0
17	CHP	0B	0	685	1688	0.10	0.82	0
1A	CHP	15	0	1144	1664	0.65	1.18	0
1B	CHP	0D	0	510	1759	0.12	1.72	0
1E	CHP-H	05	0	918	894	0.59	0.45	0
1F	CHP	21	0	1243	1736	0.97	1.70	0
20	CU	E900	0	1429	849	17.66	8.85	0
	CU	E800						
	CU	E700						
22	CHP	10	0	923	1753	0.85	2.78	0
23	CHP	54	0	1805	69	0.80	0.00	0
24	CHP	64	0	89	1345	0.00	0.00	0
27	CHP	6B	0	1619	82	0.01	0.00	0
28	CHP	95	27	918	1589	10.92	30.56	0
2B	CHP	70	0	69	2022	0.00	0.71	0

- FICON Management Server (FMS) is a license to enable Control Unit Port (CUP) on a FICON switching device – always uses the "embedded" port x"FE"
- FICON Director Activity Reports are very useful to customers who would like to understand their average frame sizes traversing their fabrics as well as information about how buffer credits are being utilized

Using Buffer Credits is how FC does Flow Control, also called "Frame Pacing"

FICON Director Activity Report



```
                                F I C O N   D I R E C T O R   A C T I V I T Y                                  PAGE    1
            z/OS V1R8                    SYSTEM ID ABCD              START 04/12/2009-04.30.00  INTERVAL 000.15.00
                                         RPT VERSION V1R8 RMF        END   04/12/2009-04.45.00  CYCLE 1.000 SECONDS
IODF = A2   CR-DATE: 03/27/2009   CR-TIME: 18.43.51     ACT: ACTIVATE
SWITCH DEVICE: 032B   SWITCH ID: 2B     TYPE: 006140   MODEL: 001   MAN: MCD   PLANT: 01   SERIAL: 0000CHIJKLMN
PORT     -CONNECTION-      AVG FRAME     AVG FRAME SIZE      PORT BANDWIDTH (MB/SEC)      ERROR
ADDR     UNIT      ID       PACING       READ    WRITE      -- READ --   -- WRITE --     COUNT
 05      CHP-H     05            0        849     1436          8.63         17.34          0
 07      CHP       6B            1       1681     1395         50.87         10.32          0
 09      CHP       15            0        833     1429         11.96         20.49          0
 0C      CHP-H     64            0        939     1099          0.39          0.50          0
 0D      CHP       6B            0       1328     1823          3.56         12.73          0
 0F      CHP-H     66            0       1496     1675          1.85          2.61          0
 10      CHP       64            0        644     1380          0.03          0.13          0
 13      CHP-H     19            0        907      885          0.58          0.45          0
 16      CU      C800            0       1241      738         20.97          5.72          0
         CU      CA00                                          70.10          3.82          0
 1A      CHP       15            0       1144     1664          0.65          1.18          0
 1B      CHP       0D            0        510     1759          0.12          1.72          0
 1E      CHP-H     05            0        918      894          0.59          0.45          0
 1F      CHP       21            0       1243     1736          0.97          1.70          0
 20      CU      E900            0       1429      849         17.66          8.85          0
         CU      E800
         CU      E700
 22      CHP       10            0        923     1753          0.55          2.78          0
 23      CHP       54            0       1805       69         20.80          7.30          0
 24      CHP       64            0         89     1345          0.00          0.00          0
 27      CHP       6B            0       1619       82          0.01          0.00          0
 28      SWITCH    95          270        [illegible]  789     50.32         10.56          0
 2B      CHP       70            0         69     2022          0.00          0.71          0
```

In the last 15 minutes

This port had a frame to send but did not have any Buffer Credits left to use to send them.

And this happened 270 times during the interval.

And this is an ISL Link!

Indicators of Potential Buffer Credit Starvation

Fabric with zHPF Enabled

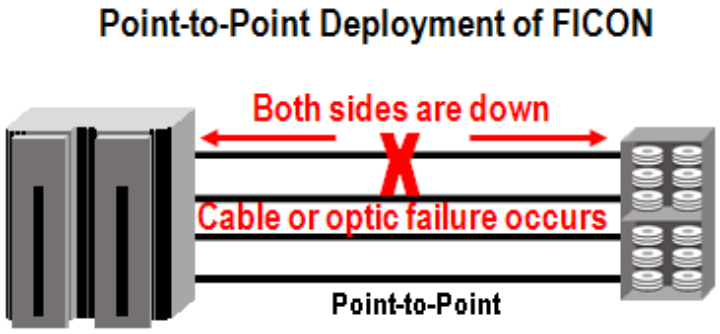
More Reasons For Deploying Switched-FICON

- Point-to-Point versus switched-FICON Reliability and Availability
- Can host both SAN and FICON on the same I/O infrastructure

Reliability versus Availability

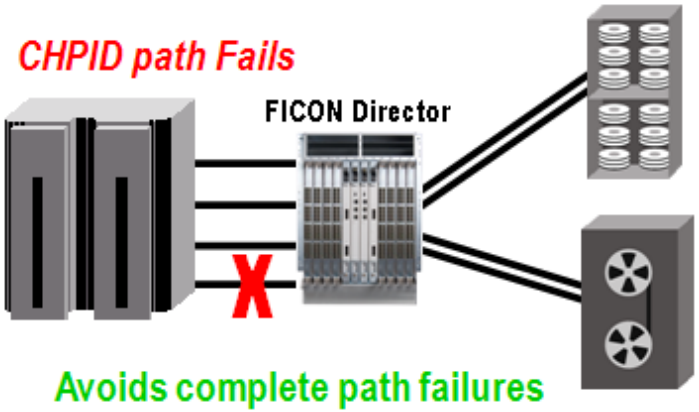
- **Reliability is NOT the same as Availability!**
- **Reliability is a measurement of the dependability of the customer's system, fabric and/or devices**
- Often characterized as Mean Time Before Failure (MTBF)
- **Availability is the ability of a system, fabric and/or device to continue to provide services when they are needed, without delay, even if reliability has failed**
- In the data center this is typically discussed as a percentage such as two-9s, three-9s, four-9s or five-9s (99.999%) of availability
- The calculation for this percentage is the length of time that a given system, fabric and/or device will be online and functioning during the course of a years worth of time – it is really an up-time ratio
- So Availability is NOT the same as Reliability and customers do realize that it is very difficult to achieve High Availability unless a system, fabric and/or device does have High Reliability!

Availability After A Component Failure



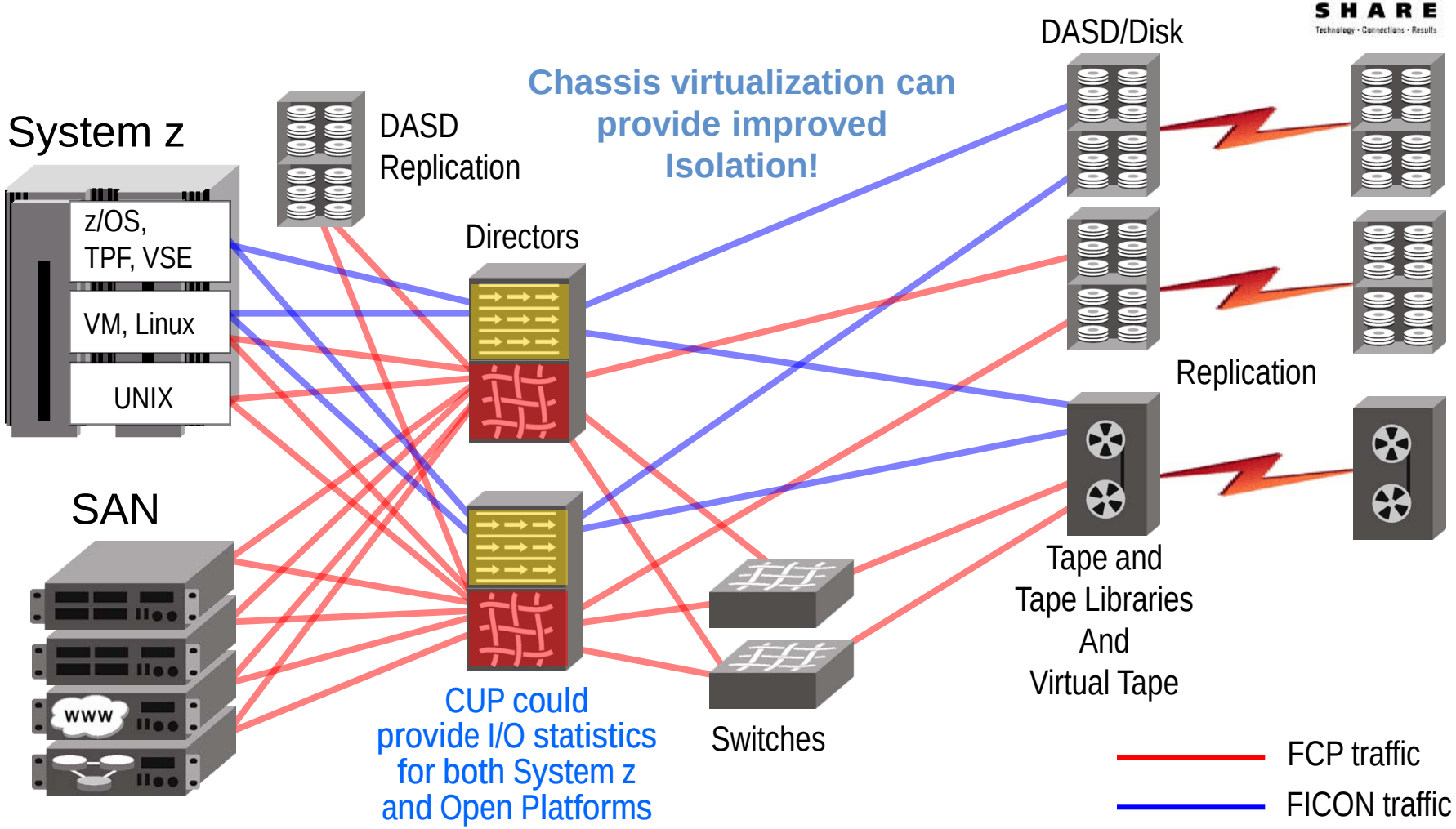
...BUT... Storage Port Remains Available!

- A failure of a FICON CHPID or cable or storage port means that you lose two valuable resources:
  - Channel port will become unavailable AND
  - Storage port becomes unavailable for everyone!
- A failure ***anywhere*** affects both the mainframe connection and the storage connection
  - The WORST possible reliability and availability is provided by a direct-attached FICON and/or SAN storage topology!



- In a switched-FICON environment, only a connection segment is rendered unavailable:
  - The non-failing side remains available
  - If the storage port has not failed, its port is still available to be used by other CHIPDs
  - If the CHPIP has not failed, its port is still available to be used by other storage ports

FICON and FCP Intermix



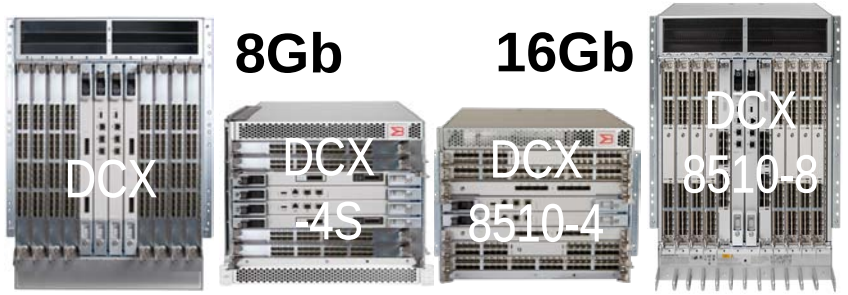
- FICON infrastructure vendors support a variety of Directors/switches that will allow you to host FICON and FCP connectivity intermixed together on the same chassis

And There Are Many More Reasons For Deploying Switched-FICON in Mainframe Shops

- Balancing workload across all the ports in a Port Group
- Intermixing Long wave and Short wave FICON Connections As You Desire
- B-Series switching devices provide lots of scalability not possible with direct attached FICON
- Consolidation of Channel Cards, CHPIDs and Storage

How Are Directors and Switches Different

B-Series can run at up to 1600MBps on a port-by-port basis



FICON Switches

- Good Availability up to **99.99%**
- Based upon ***motherboard*** design
- Some redundant components like power supplies and fans
- **24-80** Fiber Channel ports
- Decent fabric Scalability (100's of ports)
- Motherboard problems will require the switch to be replaced!

It is not when it is working, but rather when a problem occurs, that truly differentiates a Director from a Switch!

FICON Directors

- Superb Availability up to **99.999%**
- Based on **discrete, redundant** parts
- Complete Redundancy and hot swap FRUs throughout the architecture
- Highest port counts – up to **384** ports
- Superior fabric Scalability (1,000s of ports)
- + Online Error Recovery (non-disruptive failover)
- + *Online Repair of the error* (hot swap)

99% of System z Customers should deploy Director-based FICON Fabrics!

How Are Directors and Switches Different Physical Differences

- **Since switches are motherboard-based, they are engineered to run at the then current line rate – cannot be upgraded -- and**
  - Each port of an 8Gbps switch can be run using 4Gbps or 8Gbps SFPs
  - Each port of a 16Gbps switch can be run using 8Gbps or 16Gbps SFPs
  - Failing SFPs can be hot-swapped but physical ports cannot be replaced
  - A switch must be completely replaced to repair a failed physical port(s) or ASIC

- **Directors have discrete, redundant components that are engineered to run at current line rate – but can be upgraded – and non-disruptive firmware loads**
  - Today each port of a 16Gbps Director can run using 8Gbps or 16Gbps SFPs
  - Failing SPFs can be hot-swap replaced (along with fans and power supplies…)
  - New blades can replace blades that have failing or failed physical ports

- **It is likely that IBM will have 16Gbps CHPIDs within a couple of years**
  - The next gen mainframe will probably be engineered to handle 16G CHPIDs
  - Our older 8Gbps Directors will be upgradable to 16Gbps by YE 2012 to 16Gbps
    - Once again providing our customers with investment protection!
  - But existing 8G switches will have to be completely swapped out and replaced with newer 16G capable switches in order to achieve 16G fabrics

How Are Directors and Switches Different Availability

- **Complete non-disruptive Hot Code Load is supported on Director class switches**
  - Since 2000
- **Comprehensive, non-disruptive Hot Code Load is not currently supported for FCIP blades and extension switches**:
  - On extension switches and blades, the FCIP tunnels will go down for 10-15 seconds and all traffic in the tunnels will be disrupted.
- **Brocade FICON switches do try to support non-disruptive firmware upgrades but when upgrading firmware on any fixed port, motherboard-based switch, customers may experience recoverable IFCCs**.
  - The IFCCs are for dropped frames that are part of normal fibre channel recovery so this recovery happens with FCP and FICON channels and devices as well.
  - The only difference is that mainframes report absolutely everything. For most of our mainframe customers, they just need a warning that they may see a few IFCCs during firmware upgrades
  - IFCCs, regardless of the impact to traffic flow, then their best option is to always deploy a Director-class platform.

Brocade Proudly Presents…
Our Industries ONLY FICON Certification

Brocade
Certified Architect
for FICON

Industry Recognized Professional Certification

We Can Schedule A Class In Your City – Just Ask!

SHARE
Technology · Connections · Results

Brocade FICON Certification

Brocade Certified Architect for FICON

Certification for Brocade Mainframe-centric Customers – Available since Sept 2008

For people who do or will work in FICON environments

Brocade provides a free on-site or in area 2-day class (Brocade Design and Implementation for FICON Environments – FCAF200), to assist customers in obtaining the knowledge to pass this certification examination – ask your local sales team about this training – also look at www.brocade.com under Education

Certification tests a person's ability to understand IBM System z I/O concepts, and demonstrate knowledge of Brocade FICON Director and switching fabric components

After the class a participant should be able to design, install, configure, maintain, manage, and troubleshoot Brocade hardware and software products for local and metro distance (100 km) environments

Check the following website for complete information:

- http://www.brocade.com/education/certification-accreditation/certified-architect-ficon/index.page

#SHAREorg

SHARE
Technology · Connections · Results

.....My Next Presentation.....

A First Look at the Inner Workings and Hidden Mechanisms of FICON Performance

- David Lytle, BCAF
- Brocade Communications Inc.
- Tuesday August 7, 2012 -- 1:30pm to 2:30pm
- Session Number - 12072

SHARE in Anaheim 2012

SAN Sessions at SHARE this week

Tuesday:

Time-Session

0930 – 11152: DLm 'Tape on Disk' VTL Customer Experience & Benefits

1330 - 12072: A First Look at the Inner Workings and Hidden Mechanisms of FICON Performance

1500 - 12071: A Deeper Look Into the Inner Workings and Hidden Mechanisms of FICON Performance

Wednesday:

Time-Session

0800 - 12076: Buffer-to-Buffer Credits, Exchanges, and Urban Legends

1330 - 12077: ESCON I/O Will Not Be Supported On Future System z Platforms. What Do I Do?

1500 - 12075: zSeries FICON and FCP Fabrics - Intermixing Best Practices

Thursday:

Time-Session

1630 - 12084: Buzz Fibrechannel - To 16G and Beyond

Mainframe Resources For You To Use

Visit Brocade's Mainframe Blog Page at:

http://community.brocade.com/community/brocadeblogs/mainframe

Also Visit Brocade's New Mainframe Communities Page at:

http://community.brocade.com/community/forums/products_and_solutions/mainframe_solutions

#SHAREorg

SHARE
Technology · Connections · Results

Please Fill Out Your Evaluation Forms!!

This was session: 12078

And Please Indicate On Those Forms If There Are Other Presentations That You Would Like To See In This SAN Track At SHARE.

Thank You.

SHARE in Anaheim 2012

Questions?