

IBM Poughkeepsie
IBM @server zSeries 900

***zSeries FICON Introduction
and FICON Rollout
Presentation***

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zSeries - Channel Support

- S/390 and z900 processor channel to storage communication
 - ▶ Provided by different channel types and operating modes
 - Parallel
 - Byte multiplex (byte multiplexing of CCW data)
 - Block multiplex (block multiplexing of CCWs from a CCW chain)
 - ESCON
 - CNC - ESCON native (Point-to-Point or Switched Point-to-Point)
 - CTC - ESCON Channel-to-Channel
 - CVC - ESCON to Parallel Block conversion (needs 9034)
 - CBY - ESCON to Parallel Byte conversion (needs 9034)
 - FICON
 - FCV - FICON to ESCON conversion (needs 9032-5 Bridge)
 - FC - FICON native (SB-2) (P-to-P, Switched P-to-P, ** Cascade Switching)
 - FCP - **Fibre Channel Protocol (Fibre Channel SCSI)
 - ** not announced
 - ▶ Other channel types
 - Coupling facility - ISC - ICB - IC Channel
 - Open Systems Adapter - OSA-1 - OSA-2 and OSA-Express
 - Emulated I/O channels

zSeries - Channel Attributes

- S/390 and z900 processor channel to storage communication
 - ▶ Support standardized/common - Channel to CU communication
 - Parallel - ESCON - FICON
 - ▶ Increase the processors total usable I/O bandwidth
 - ▶ Increase the processors concurrent I/O connectivity
 - ▶ Increase the processor to storage connectivity distance
 - Maintain an acceptable I/O request response time
- Need to continue to review future approaches
 - ▶ Record format, communication links, communication protocol

zSeries - Channel Characteristics

- S/390 and z900 processor - Channel to CU connectivity
 - ▶ Parallel
 - Standard channel to CU connection (Bus-Tag cabling and OEMI protocol)
 - Standard command set
 - Static switch support (2914, 3814)
 - Standard distance support of up to 122 meters
 - ▶ ESCON
 - Increased data rates - 18MB (200 Mb links)
 - Reduced protocol handshake when compared to Parallel Channels
 - Increased channel to CU distance (up to 9km - before data droop)
 - Increased processor to CU sharing (ESS supports 2048 logical paths)
 - Dynamic switch support (9032-5 248 ports)
 - ▶ FICON
 - Share common Fibre Channel fabric (FC is an ANSI standard)
 - Increased data rates - up to 60 and 90 MB (1Gb links)
 - Reduced protocol handshakes when compared to ESCON
 - Increased channel to CU distance (up to 100km - before data droop)
 - Better utilization of the link bandwidth
 - CCW and Data pipe-lining (also supports CCW and Data pre-fetching)
 - Frame multiplex (better link utilization)
 - Better utilization of switch connections (connectionless communication)

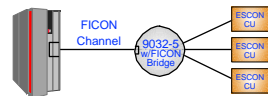
zSeries - FICON Channel Roll-out

- Initial 9672 G5/G6 and z900 FICON introduction
 - ▶ Point-to-Point (FC N_Ports to N_Port communication)
 - ▶ Switched Point-to-Point
 - Channel N_Ports to Switch F_Port - Switch F_Port to CU N_Port)
 - ▶ Supports only one dynamic switch in the z900 channel to CU path
- z900 FICON native 2-switch and Multi-switch cascade switching
 - ▶ Supports up two or more dynamic FC switches in the z900 channel to CU path
 - ▶ Increases z900 FICON inter-site connectivity options
 - Reduce inter-site channel quantity
 - Reduce inter-site switch ports quantity
 - Reduce inter-site links
 - ▶ 2-switch and multi-switch cascade switching introduced in separate phases
 - 2-switch cascade switching introduced - 3/02
 - Multi-switch cascade switching introduced - 9/02

zSeries - FICON SAN Roll-out

FICON Bridge: 8/99 Full Production Availability

zSeries and S/390 G5/G6 Servers



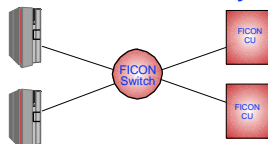
Native FICON Direct Attachment:

zSeries and S/390 G5/G6 Servers



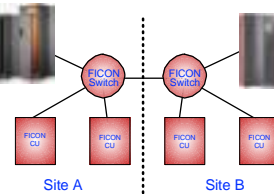
Native FICON Switched Connectivity:

zSeries and S/390 G5/G6 Servers



Native FICON Cascade Switch Connectivity:

zSeries and S/390 G5/G6 Servers (G5/G6 entry switch only)



- Exploits FICON Channel with Existing ESCON Control Units
 - FICON Bridge feature on 9032 Model 5, ESCON Director

- Native FICON Devices

- Tape - 12/00
- Printer - 12/00
- DASD - 09/01



- Full Dynamic Switching of FICON Control Units

- Reselling McDATA's ED5000 FC Director (2032)
 - ▶ 32 Ports + FICON CUP Port
 - ▶ For SAN, UNIX & NT (3/00 GA)
 - ▶ SAFOS/390 Inband Mgmt Support, (12/00 GA)
- ▶ Reselling McDATA ED6064 (09/01)
 - ▶ 64 Ports + FICON CUP Port

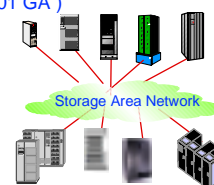


- Reselling INRANGE FC / FICON Director (2042)
 - ▶ 64 Ports, SOD 128 ports (09/01)
 - ▶ Inband Mgmt Support, SAFOS/390 (09/01 GA)



- FICON Architecture submitted to NCITS (ANSI)

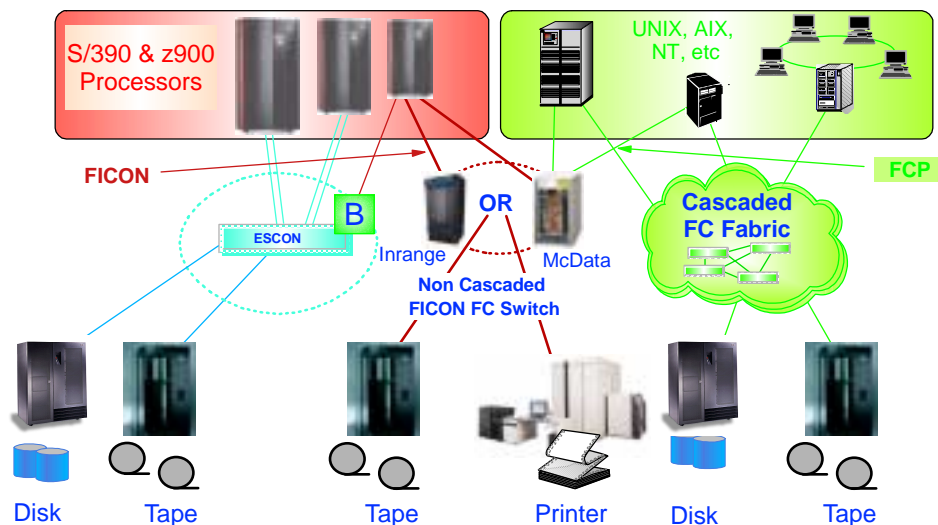
- FC-SB-2 (FICON)
- Anticipated Formal Adoption- 1Q/01



zSeries - FICON SAN Roll-out

8/99	12/00	3Q/01	3-4Q/01	1H/02	1H/02	2H/02
FICON (FCV) Channel	FICON Native (FC) Channel	FICON Shark 2105 ESS (Blue Shark)	FICON Native CTC CU Support	FICON Native (FCP) Linux Partition	FICON 2 Switch Cascade Support 2-byte link address	FICON Multi-switch Cascade Support 2-byte link address
9032-5 Bridge Adapter	3590 A60 Tape InfoPrint		New FICON Channel			
OS/390 2.6 FICON Support (Tape)		OS/390 2.9 FICON Support (DASD)	OS/390 2.9 z/OS HCD FICON CTC Support		z/OS 1.3? FICON 2 Switch Cascade Support	z/OS 1.4? FICON Multit-switch Cascade Support

z900 - FICON SAN Roll-out



Three separate networks:

- **ESCON, FICON FC Switched (Non-cascaded) , Cascaded FCP FC Switch**
- What follows, especially for S/390's and z900's support cascade switching and of FC SAN?

z900 and z/OS - FICON SAN Roll-out

● FICON and SAN

► The Storage Area Network (SAN) concept consists of:

A. Communication infrastructure and use by different protocols (FC-4 protocols)

- FICON (FC-SB-2) used by S/390 9672 G5/G6 and zSeries model 900
- FCP (FC-FCP) used by Open Systems (Unix, AIX and Linux System, etc)

B. Infrastructure management

- z/OS IO-OPs for a FICON environment
 - Centralized and co-ordinated fabric changes for all fabrics
 - Local images entry switch only
- Fabric manager (fabric vendor)
 - Centralized fabric changes, Fabric Monitor and Fabric Link status
- SAN manager
 - Centralized, non co-ordinated, fabric changes for all managed fabrics
 - Centralized fabric error collection and management

C. Exploitation services (management of - should be FICON independent)

- Serverless backup
- Tape sharing
- Other services

z900 and z/OS - FICON SAN Roll-out

● Address the FICON (SAN) infrastructure first (2000, 2001-2 and maybe 2003)

1.0 Direct or switch connect FICON Channel to CU (12/00)

- Introduces S/390 and z/Architecture use of the Fibre Channel architecture (FC-FS and FC-PI)
- Uses CCW and Data pipelining, and Fibre Channel multi-plexing

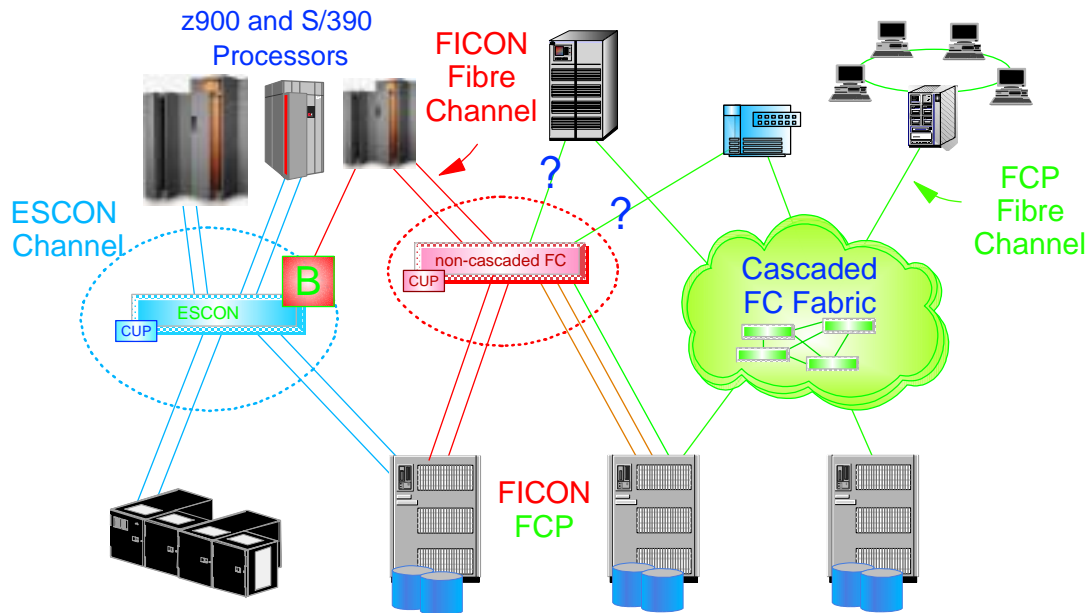
2.0 2-switch cascade switch connect FICON channel to CU (3/02)

- Supports up to 2 dynamic switch connections between a FICON channel and CU
- DCM- Static path I/O definitions support 2 switch cascade switching, managed paths on entry switch
- z/Architecture changes to support both the ESCON/FICON FLA and now the FICON cascade switch EFLA

2.5 Multi-switch cascade switch connect FICON channel to CU (9/02)

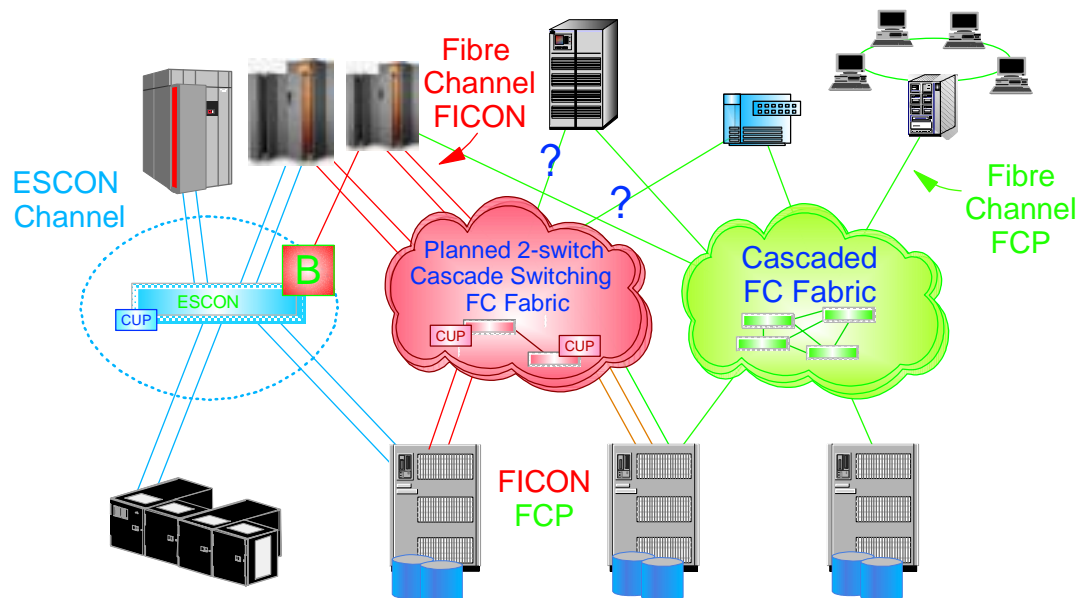
- Supports more than 2 dynamic switch connections between a FICON channel and CU, no architectures changes, z900 channel subsystem and CU dependent
- DCM - Static path I/O definitions support Multi-switch cascade switching, Managed paths entry switch

z900 - FICON Roll-out 2000-2001 (Phase 1.0)



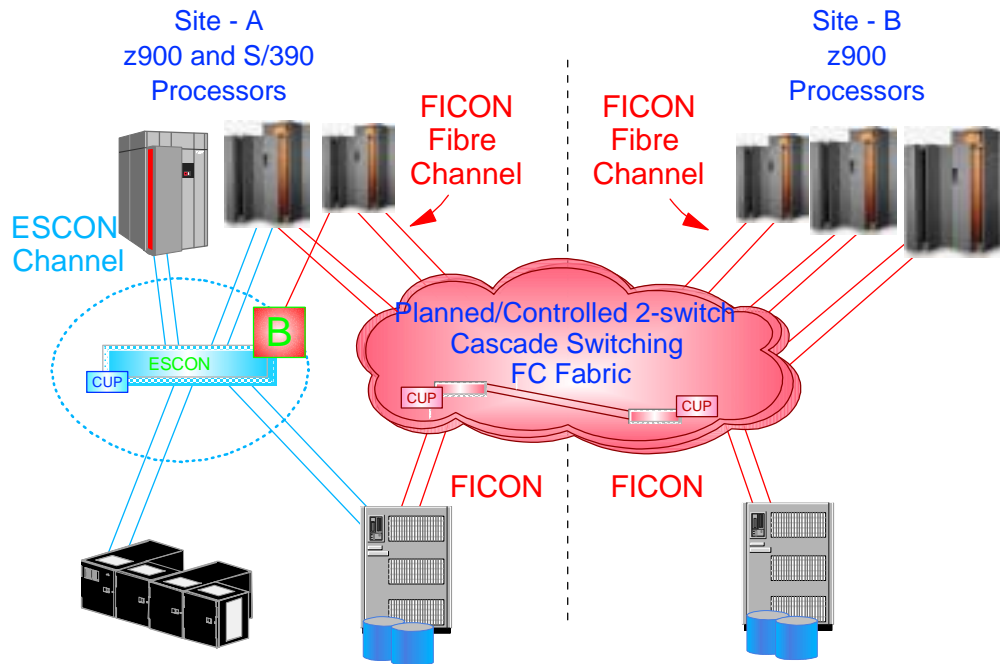
z900 initial participation - three networks: ESCON, Non-cascaded FC, Cascaded FC
 z/OS requires SB-2 protocol switch support and the S/390 FICON Switch CUP function, from switch vendors for z900 to start participating in a homogeneous protocol FC fabric

z900 and z/OS - FICON Roll-out 1H/02 (2.0)



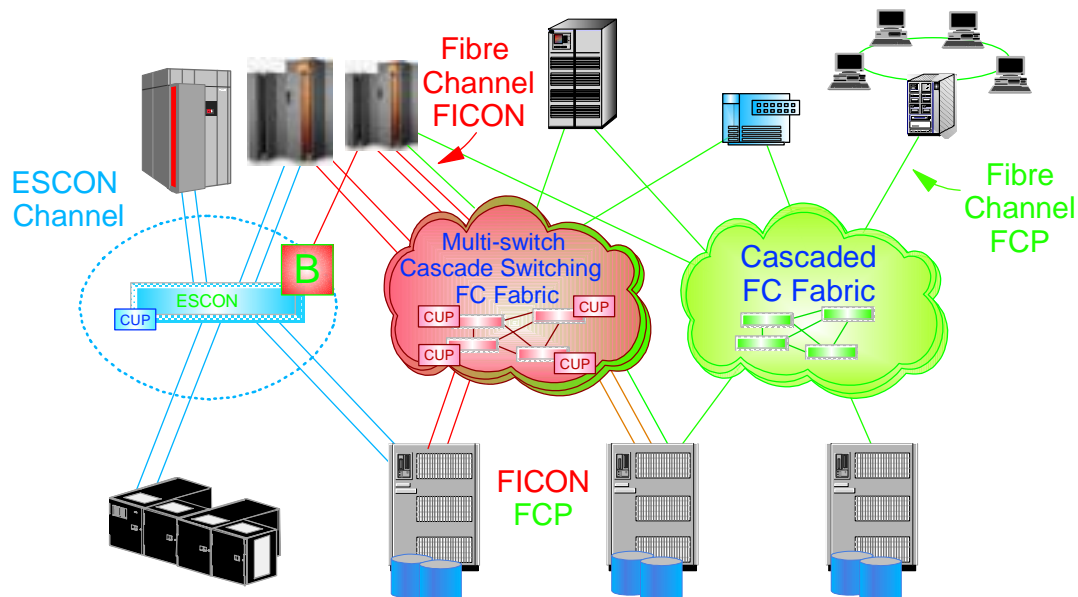
z900 participation - may require 3 networks: ESCON, Cascaded FICON, Cascaded FCP
 z/OS requires the S/390 switch CUP function for system controlled safe switching, error detection and reporting, high integrity, port usage measurement and topology information

z900 and z/OS - FICON SAN Roll-out 2H/02



The z900 will support up to 2 FICON switches in a Channel to CU path for a 2 switch cascade switching topology

z900 and z/OS - FICON Roll-out 2H/02 (2.5)



z900 participation - 2 or 3 networks: ESCON, Highly security and high integrity FICON Multi-switch cascaded switch FICON and FCP, and FCP Cascade Fabric
z/OS requires the S/390 switch CUP function for system controlled safe switching, error reporting, port usage measurement and topology information

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z900 and z/OS SAN
FICON Implementation Phase-2
2-Switch Cascade Switching

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FICON - Phase 2.0 Implementation

1. What is FICON (FC) 2-switch Cascade Switching

- ▶ **FICON 2-switch fibre channel cascade switch topology**
 - **Only two switches in the FICON channel to CU path**
 - **More than two switches may be in the fibre channel fabric, but no multiple routes from a channel to a CU**
 - **Any switch only has one route to another switch in the same fabric**
- ▶ **Allows for better sharing and use of inter-site connected resources via a common Fibre Channel communication resource**
 - **DASD, Tape, FICON CTC and Printer**
 - **Generally no need for cascade switching within a z900 host site**
- ▶ **Provides switch interconnection between z900 host processor sites**
 - **Multiple processors in two or more sites can access storage devices (DASD, Tape, CTC, Printers) in both local and remote sites via shared inter-site connection resources. The inter-site resources are accessed via FICON fibre channel cascade switching**

FICON - Phase 2.5 Implementation

1. What is FICON (FC) Multi-switch Cascade Switching

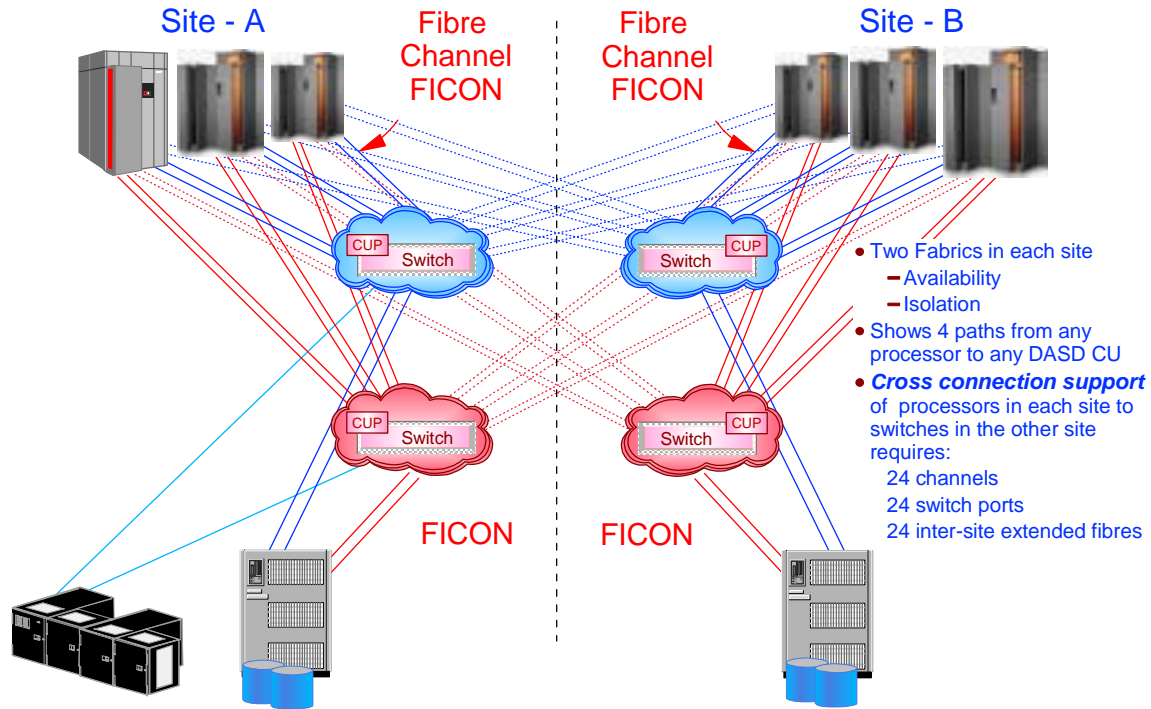
- ▶ FICON Multi-switch fibre channel cascade switch topology
 - Multiple switches in the FICON channel to CU path
 - Multiple switches may be in the fibre channel fabric, as well as multiple routes from a channel to a CU
 - Any switch can have any route to another switch in the same fabric
- ▶ Allows for better sharing and use of inter-site connected resources via a common Fibre Channel communication resource
 - DASD, Tape, FICON CTC and Printer
 - Generally no need for cascade switching within a host site
- ▶ Provides switch interconnection between z900 host processor sites
 - Multiple processors in two or more sites can access storage devices (DASD, Tape, CTCs) in both local and remote sites via shared inter-site connection resources. The inter-site resources are accessed via FICON fibre channel cascade switching

FICON 2nd Phase Implementation

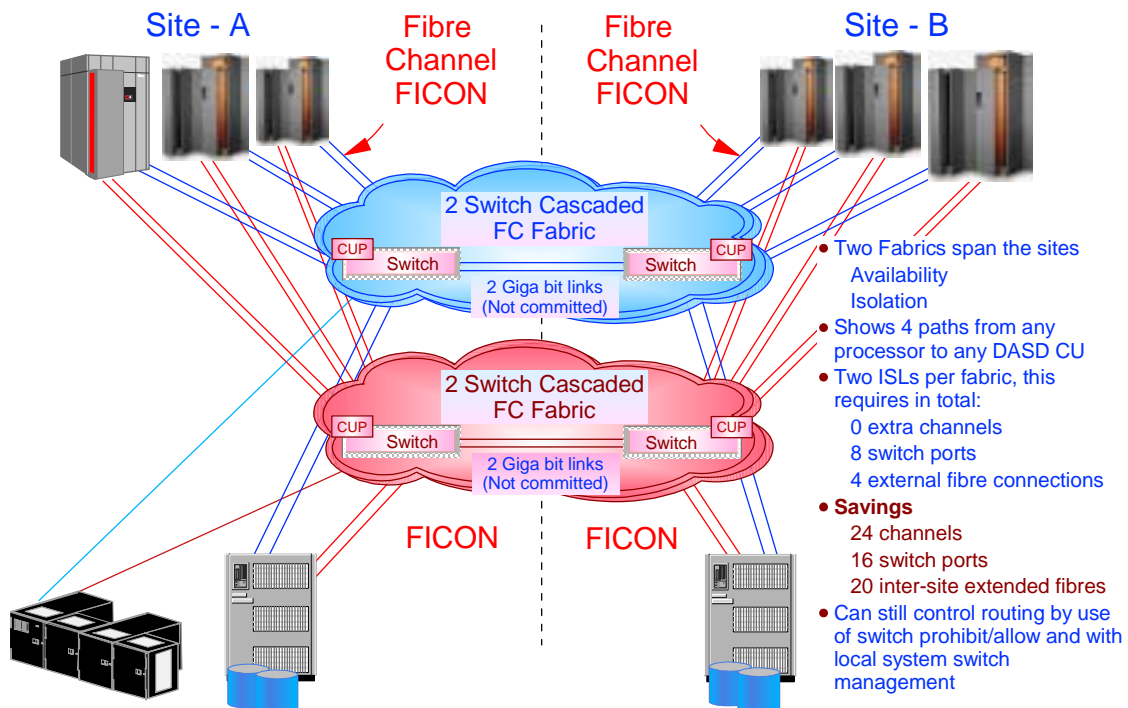
2. Why is it required (the benefit of FC Cascade Switching)

- ▶ Reduce the inter-site connection (ISL or IEL) costs of a GDPS or other extended distance remote connection solutions
- ▶ Eliminate the requirement of dedicated local to remote site FICON channels
- ▶ Eliminate the requirement of dedicated local to remote site FC switch F-Ports
- ▶ Reduces inter-site Fibre Channel fibre paths (connection paths)
- ▶ Requires less hardware and support requirement
 - Less FICON channels
 - Less switch ports
 - Less inter-site Fibre cabling (a big saving to most customers)
- ▶ Reduce complexity of configuration implementation requirements by customer's

Non-Cascade Switching - Connections



2-Switch Cascade Switching - Connections



FICON Introduction

● End of Presentation