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International Business Machines Corporation (IBM) and Cisco Systems, Inc. have successfully completed connectivity testing of the Cisco MDS family of switches (9216, 9134, and 9222i) and directors (9506, 9509, and 9513) in IBM System z server environments with Cisco NX-OS 4.1(1c) and Cisco Fabric Manager 4.1. This release contains support for the initial release of the 24 port, 48 port, and 4/44 port 8 Gb/sec port blades.

**Intended support is for the following environments:**

- \* FICON attached to zSeries 900 (z900) and zSeries 800 (z800) at driver 3GF
- \* FICON attached to the zSeries 990 (z990) and zSeries 890 (z890) at driver 55K
- \* FICON attached to the System z9 Enterprise Class and Business Class (z9 EC and z9 BC) at driver 67L
- \* FICON attached to the System z10 Enterprise Class (z10 EC) at drivers 73G and 76D
- \* FICON attached to the System z10 Business Class (z10 BC) at driver 76D
- \* Fibre Channel Protocol (FCP) attached to z900, z800, z990, z890, z9 EC, z9 BC, z10 EC, and z10 BC running under Linux on System z (either Novell SUSE SLES 9 and SLES 10 or Red Hat RHEL 3, RHEL 4, and RHEL 5) at the same driver levels as above.
- \* FCP N-Port ID Virtualization (NPIV) support for z990, z890, z9 EC, z9 BC, z10 EC, and z10 BC.
- \* Intermix of FICON and FCP traffic within the same fabric
- \* Input/Output (I/O) attachment to the IBM TotalStorage Enterprise Storage Server (ESS) (2105-800)
- \* I/O attachment to the IBM System Storage DS8000 series
- \* I/O attachment to the IBM System Storage DS6000 (1750)
- \* I/O attachment to the IBM System Storage Virtualization Engine TS-7700 (3957)
- \* I/O attachment to the IBM TotalStorage Virtual Tape Server (3494)
- \* I/O attachment to the IBM TotalStorage Enterprise Tape Controller model J70 (3592-J70)
- \* I/O attachment to the IBM System Storage TS1120 Tape Controller model C06 (3592-C06)
- \* IBM System Storage Metro Mirror (formerly PPRC) using Fiber Channel Protocol (FCP) and z/OS Global Mirror (formerly XRC) environments support using native FICON
- \* It is anticipated that the Cisco switches and directors could attach to any System z FICON supported device and other FICON devices that adhere to the FICON architecture.
- \* It is also anticipated that the Cisco switches and directors will operate with System z and operating systems such as z/OS V1.7 and later, System Automation for OS/390 (SA OS/390), z/VM, z/VSE, and z/TPF that currently support FICON and FCP.
- \* Fibre Channel over IP at distances up to 300 km (performance characteristics can vary depending on environment)
- \* FICON Tape Acceleration with compression and encryption over FCIP links up to distances of 3000 km for supported devices.
- \* Optical (2, 4, and 10 Gb/sec InterSwitch Links (ISLs) extended up to 300 km through supported extension products – 8 Gb/sec ISLs were not extended due to availability of extension equipment for 8 Gb/sec traffic
- \* Optica PRIZM for FICON to ESCON conversion is supported. Please see latest Optica PRIZM qualification letter for the list of supported devices.
- \* Optical 2 Gb/sec ISLs extended up to 100 km through Cisco extended long wave CWDM optics
- \* Optical 4 Gb/sec ISLs extended up to 40 km through Cisco extended long wave CWDM optics
- \* DWDM optic installed in MDS series switches and directors may be used for 2 Gb/sec links up to 300 km
- \* DWDM optic installed in 9200/9500 series switches and directors may be used for 10 Gb/sec links up to 100 km

**Notes:**

- 1) Machine environments mentioned previously should be at the latest release patch levels as of December 1, 2008.
- 2) Cascading of directors and switches is limited to one hop for a FICON environment
- 3) Testing was completed on Cisco NX-OS 4.1.1c with Cisco Fabric Manager 4.1:

MDS-9216i	MDS-9222i	MDS-9134
MDS-9506	MDS-9509	MDS-9513

**Deployment and Design Considerations:**

- o FICON Tape Pipelining over FCIP was not tested – refer to IBM storage compatibility for current status.
- o 8 Gb/sec ports were only tested as ISLs (no host or device attachment is available). All host and I/O device attachment was done on 4 Gb/sec interfaces.
- o The preferred method of connection for 8 Gb/sec short wavelength (SX) small form factor pluggable optics (SFPs) is through 50 micron multimode fiber optic cabling rated at 2000 MHz-km (OM3 fiber). Other 50 micron and 62.5 micron multimode fiber may be used as an alternative, but distance limitations may exist.

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**Observations:**

- There is limited risk that Interface Control Checks (IFCCs) may be seen on the FC/IP 14+2 blade when using encryption and port channels with both IP ports. This problem appears to be seen when only small packets are used under high stress conditions. This was not seen under z/OS.
- When a zone with more than 250 members is created, there is a rare chance that all ports in a switch can fail to log in during a System z processor Power On Reset (POR) in an FCP environment. This problem has not been seen in FICON environments. To work around this issue, customers can bring ports up after the POR in smaller groups or use smaller zones per Cisco's recommended best-practices for zoning.
- For concurrent code load (3.3.1c ⇔ 4.1.1c) on blade switches, you must disable NTP time server or IFCCs may result.
- Concurrent code downgrade from 4.1(1c) to 3.x.x is not supported.

**Additional Qualification Status Information:**

- On the MDS 9513 (only), new fabric switch modules (DS-13SLT-FAB2) are required when using the 24-port 8G FC/FICON module (DS-X9224-96K9) or the 48-port 8G FC/FICON module (DS-X9248-96K9).

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The following table contains the test cases run against the Cisco switches and directors during IBM's testing:

Test Case Name	Test Complete	Test Case Description
Unit Level Tests	✓	Verify concurrent code load, power requirements, port swap, IML, LPAR act./deact...
Fabric Security and Fabric Event Notification Tests	✓	Basic security tests for cascaded switches and fabric change notification (RSCN) tests in different configurations. This testing should be implicit (completed while doing other work).
CEC IMLs	✓	Run EXEC that does system resets forcing light on channels up and down
Mixed Workload Test	✓	Combination of SAK and z/OS runs made in an LPAR environment with several partitions.
EXPING/INGCTV all configurations		SAK exerciser for FTV (emulated I/O) which checks basic architecture.
SAK EXCITE / ICTVDR Non-RCV DPU with Real I/O Tape and DASD		EXCITE runs traffic at a maximum data rate (data pusher mode) followed by traffic with halts, clears, and resets. In recovery mode the program may also inject interface errors. The program is run with a high ratio of output ports in order to maximize switching.
ITAPE0, IFTAPE, ITAPEX		
SAK EXCTCP / IOCTCP		SAK exerciser for FICON CTC.
All Applicable SAK EXDASD (IDASD0, IDSCAN, IDASDX)		Includes IDASD0, IDASDX, UDESSI all run to 2105-800/DS-8000/DS-6000 to maximize data transfer.
SAK OFCPIO, OSASF		FCP I/O driver program under SAK.
PAWS (not SAK)		Stand alone FCP test program.
CHNLDRVR		z/OS program to drive data on FICON channels.
Verify 4, 8, and 10 Gb/sec speed on ports	✓	Verify 4, 8, and 10 Gb/sec port speed with Finisar analyzer
Verify 8 Gb to 4 Gb/sec Auto-negotiation Verify 8 Gb to 2 Gb/sec Auto-negotiation	✓	Test auto-negotiation from 8 Gb/sec to x Gb/sec. New Switch ==> Old Switch New switch ==> Shark New Switch ==> CEC
Extend 2 Gb/sec ISL on CWDM	✓	Extend 2 Gb/sec ISL up to 100 km through a CWDM
Extend 4 Gb/sec ISL on CWDM	✓	Extend 2 Gb/sec ISL up to 40 km through a CWDM
Extend 4 Gb/sec ISL on DWDM	✓	Extend 4 Gb/sec ISL up to 300 km through a DWDM
Extend 10 Gb/sec ISL on DWDM	✓	Extend 10 Gb/sec ISL up to 100 km through a DWDM with DWDM optic and 300 km with DWDM transponder
Extend FCIP Link	✓	Verify FCIP Link traffic with Anue tester for distance up to 300 km.
NPIV	✓	NPIV tests to verify RSCN counts
Serviceability Test	✓	Fail different cards in switch to make sure error reporting is correct. May require cards or code from vendor to allow error injection.
SAK IRNDUP Single LPAR, Multi-channel Path, Single Switch Partition, Multiple Copies, Split Port Range, and FAF	✓	SAK exerciser for switch CUP functions. A CU exerciser for the CUP. Run on 2 partitions with 2 paths from each (requires MULT parm).
SA OS/390 (I/O Ops)	✓	This is the real program used for "in band management" of the fabric through the CUP feature under z/OS.
Improvised Testing	✓	This is additional testing initiated by the Test Team Leader which is intended to uncover latent problems in the equipment under test.
Regression	✓	Verify that no breaks in code were introduced while fixing problems found during test.

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