IBM Flex System CN4058 8-port 10Gb Converged Adapter

IBM Redbooks Product Guide

The IBM Flex System™ CN4058 8-port 10Gb Converged Adapter is an 8-port 10Gb converged network adapter (CNA) for Power Systems compute nodes that supports 10 Gb Ethernet and FCoE.

With hardware protocol offloads for TCP/IP and FCoE standard, the CN4058 8-port 10Gb Converged Adapter provides maximum bandwidth with minimum use of CPU resources. This is key in IBM Virtual I/O Server (VIOS) environments because it enables more VMs per server, providing greater cost saving to optimize return on investment. With eight ports, it takes full advantage of capabilities of all Ethernet switches in the IBM Flex System portfolio.

Figure 1 shows the adapter.

Figure 1. IBM Flex System CN4058 8-port 10Gb Converged Adapter

Did you know?

IBM Flex System is a new category of computing that integrates multiple server architectures, networking, storage, and system management capability into a single system that is easy to deploy and manage. IBM Flex System has full built-in virtualization support of servers, storage, and networking to speed provisioning and increase resiliency. In addition, it supports open industry standards, such as operating systems, networking and storage fabrics, virtualization, and system management protocols, to easily fit within existing and future data center environments. IBM Flex System is scalable and extendable with multi-generation upgrades to protect and maximize IT investments.

Part number information

Table 1. Ordering part numbers and feature codes

Description	Part number	Feature code (x-config)	Feature code (e-config)
IBM Flex System CN4058 8-port 10Gb Converged Adapter	None	None	EC24

Features

The IBM Flex System CN4058 8-port 10Gb Converged Adapter has these features:

● Eight-port 10 Gb Ethernet adapter
● Dual-ASIC controller using the Emulex XE201 (Lancer) design
● PCIe Express 2.0 x8 host interface (5 GT/s)
● MSI-X support
● IBM Fabric Manager support

Ethernet features

● IPv4/IPv6 TCP and UDP checksum offload; Large Send Offload (LSO); Large Receive Offload; Receive Side Scaling (RSS); TCP Segmentation Offload (TSO)
● VLAN insertion and extraction
● Jumbo frames up to 9000 Bytes
● Priority Flow Control (PFC) for Ethernet traffic
● Network boot
● Interrupt coalescing
● Load balancing and failover support, including adapter fault tolerance (AFT), switch fault tolerance (SFT), adaptive load balancing (ALB), link aggregation, and IEEE 802.1AX

FCoE features

● Common driver for CNAs and HBAs
● 3,500 N_Port ID Virtualization (NPIV) interfaces (total for adapter)
● Support for FIP and FCoE Ether Types
● Fabric Provided MAC Addressing (FPMA) support
● 2048 concurrent port logins (RPIs) per port
● 1024 active exchanges (XRIs) per port

Note: The CN4058 does not support iSCSI hardware offload.

Standards

The adapter supports the following IEEE standards:

- PCI Express base spec 2.0, PCI Bus Power Management Interface, rev. 1.2, Advanced Error Reporting (AER)
- IEEE 802.3ap (Ethernet over Backplane)
- IEEE 802.1q (VLAN)
- IEEE 802.1p (QoS/CoS)
- IEEE 802.1AX (Link Aggregation)
- IEEE 802.3x (Flow Control)
- Enhanced I/O Error Handing (EEH)
- Enhanced Transmission Selection (ETS) (P802.1Qaz)
- Priority-based Flow Control (PFC) (P802.1Qbb)
- Data Center Bridging Capabilities eXchange Protocol, CIN-DCBX and CEE-DCBX (P802.1Qaz)

Supported servers

The following table lists the IBM Flex System compute nodes that support the adapters.

Table 2. Supported servers

Description	Feature code	x220 (7906)	x222 (7916)	x240 (8737, E5-2600)	x240 (8737, E5-2600 v2)	x240 M5 (9532)	x440 (7917)	x280 / x480 / x880 X6 (7903)	p24L (1457)	p260 (7895)	p270 (7954)	p460 (7895)
IBM Flex System CN4058 8-port 10Gb Converged Adapter	EC24	N	N	N	N	N	N	N	Y	Y	Y	Y

See IBM ServerProven at the following web address for the latest information about the expansion cards that are supported by each blade server type:
http://ibm.com/servers/eserver/serverproven/compat/us/

I/O adapter cards are installed in the slot in supported servers, such as the p260, as highlighted in the following figure.
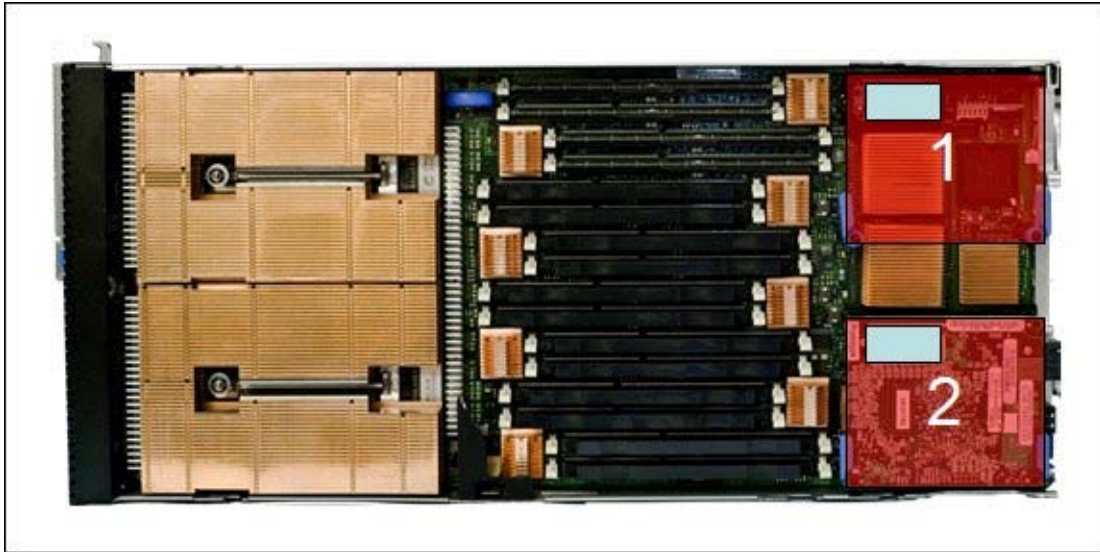

Figure 2. Location of the I/O adapter slots in the IBM Flex System p260 Compute Node

Supported I/O modules

These adapters can be installed in any I/O adapter slot of a supported IBM Flex System compute node. One or two compatible 1 Gb or 10 Gb I/O modules must be installed in the corresponding I/O bays in the chassis. The following table lists the switches that are supported. When connected to the 1Gb switch, the adapter will operate at 1 Gb speeds.

To maximize the number of adapter ports usable, switch upgrades must also be ordered as indicated in the following table. Alternatively, for CN4093, EN4093R, and SI4093 switches, you can use Flexible Port Mapping, a new feature of Networking OS 7.8, that allows you to minimize the number of upgrades needed. See the Product Guides for the switches for more details:
http://www.redbooks.ibm.com/portals/puresystems?Open&page=pg&cat=switches

The table also specifies how many ports of the CN4058 adapter are supported once all indicated upgrades are applied. Switches should be installed in pairs to maximize the number of ports enabled and to provide redundant network connections.

Table 3. I/O modules and upgrades for use with the CN4058 adapter

Description	Feature code (e-config)	Port count (per pair of switches)*	Internal switch ports enabled
IBM Flex System Fabric CN4093 10Gb Converged Scalable Switch + CN4093 10Gb Converged Scalable Switch (Upgrade 1) #ESU1 + CN4093 10Gb Converged Scalable Switch (Upgrade 2) #ESU2	ESW2	6	INTAx INTBx INTCx
IBM Flex System Fabric EN4093R 10Gb Scalable Switch + EN4093 10Gb Scalable Switch (Upgrade 1) #3596 + EN4093 10Gb Scalable Switch (Upgrade 2) #3597	ESW7	6	INTAx INTBx INTCx
IBM Flex System Fabric EN4093 10Gb Scalable Switch + EN4093 10Gb Scalable Switch (Upgrade 1) #3596 + EN4093 10Gb Scalable Switch (Upgrade 2) #3597	3593**	6	INTAx INTBx INTCx
IBM Flex System EN4091 10Gb Ethernet Pass-thru	3700	2	INTAx
IBM Flex System Fabric SI4093 System Interconnect Module + SI4093 System Interconnect Module (Upgrade 1) #ESW8 + SI4093 System Interconnect Module (Upgrade 2) #ESW9	ESWA	6	INTAx INTBx INTCx
IBM Flex System EN2092 1Gb Ethernet Scalable Switch + EN2092 1Gb Ethernet Scalable Switch (Upgrade 1) #3594	3598	4	INTAx INTBx
IBM Flex System EN4023 10Gb Scalable Switch + IBM Flex System EN4023 10Gb Scalable Switch (Upgrade 1) + IBM Flex System EN4023 10Gb Scalable Switch (Upgrade 2)	ESWD ESWE ESWF	6	INTAx INTBx INTCx
Cisco Nexus B22 Fabric Extender for IBM Flex System	ESWB	2	INTAx

* This column indicates the number of adapter ports that will be active if all upgrades are installed.
** Withdrawn from marketing

Note: Adapter ports 7 and 8 are reserved for future use. The chassis supports all eight ports but there are currently no switches available that connect to these ports.

The following table shows the connections between adapters installed in the compute nodes to the switch bays in the chassis.

Table 4. Adapter to I/O bay correspondence

I/O adapter slot in the server	Port on the adapter*	Corresponding I/O module bay in the chassis			
		Bay 1	Bay 2	Bay 3	Bay 4
Slot 1	Port 1	Yes	No	No	No
	Port 2	No	Yes	No	No
	Port 3	Yes	No	No	No
	Port 4	No	Yes	No	No
	Port 5	Yes	No	No	No
	Port 6	No	Yes	No	No
	Port 7**	Yes	No	No	No
	Port 8**	No	Yes	No	No
Slot 2	Port 1	No	No	Yes	No
	Port 2	No	No	No	Yes
	Port 3	No	No	Yes	No
	Port 4	No	No	No	Yes
	Port 5	No	No	Yes	No
	Port 6	No	No	No	Yes
	Port 7**	No	No	Yes	No
	Port 8**	No	No	No	Yes
Slot 3 (p460 only)	Port 1	Yes	No	No	No
	Port 2	No	Yes	No	No
	Port 3	Yes	No	No	No
	Port 4	No	Yes	No	No
	Port 5	Yes	No	No	No
	Port 6	No	Yes	No	No
	Port 7**	Yes	No	No	No
	Port 8**	No	Yes	No	No
Slot 4 (p460 only)	Port 1	No	No	Yes	No
	Port 2	No	No	No	Yes
	Port 3	No	No	Yes	No
	Port 4	No	No	No	Yes
	Port 5	No	No	Yes	No
	Port 6	No	No	No	Yes
	Port 7**	No	No	Yes	No
	Port 8**	No	No	No	Yes

* The use of adapter ports 3, 4, 5, and 6 require upgrades to the switches as described in Table 3. The EN4091 Pass-thru only supports ports 1 and 2 (and only when two Pass-thru modules are installed).
** Adapter ports 7 and 8 are reserved for future use. The chassis supports all eight ports but there are currently no switches available that connect to these ports.

The following figure shows the internal layout of the CN4058 for consideration when ports are assigned for use on VIOS for TCP and FCP traffic when used with a CN4093, EN4093R, or SI4093 switch. Red lines indicate connections from ASIC 1 on the CN4058 adapter and blue lines are the connections from ASIC 2. The dotted blue lines are reserved for future use when switch are offered that support all 8 ports of the adapter.
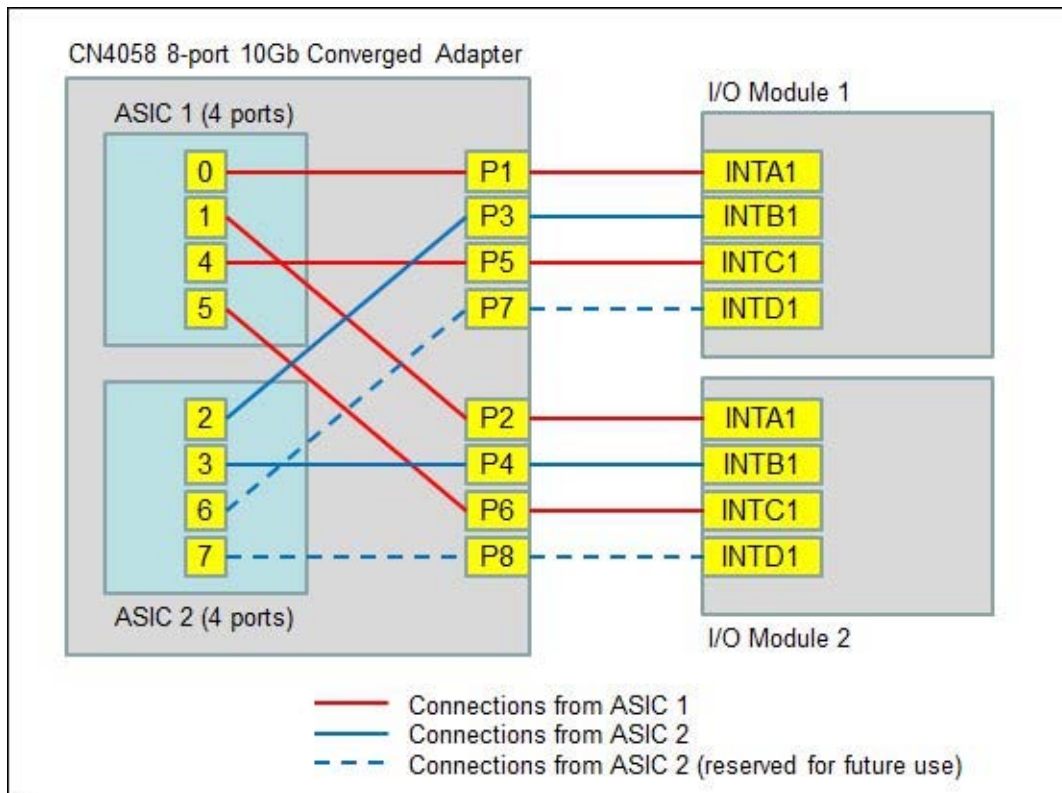

Figure 3. Internal layout of the CN4058 adapter connected to CN4093, EN4093R, or SI4093 switch

Table 3 indicates which internal switch ports are enabled (INTAx, INTBx, etc) when all switch upgrade are enabled.

Dual VIOS note: Enabling both switch upgrade licenses enables all 42 internal ports, the "A", "B", and "C" sets. The first ASIC connects to one "A", one "B", and two "C" ports (the red lines). The second ASIC connects to one "A" and one "B" port (the solid blue lines). The other two ports from the second ASIC are unused (dotted blue lines). The implication is if each ASIC is assigned to a different VIOS and both upgrades are installed, the first VIOS has four active ports and the second VIOS has two active ports.

The connections between the CN4058 8-port adapters installed in the compute nodes and the switch bays in the chassis are shown diagrammatically in the following figure. The figure shows both half-wide servers, such as the p260 or p270 with two adapters, and full-wide servers, such as the p460 with four adapters.
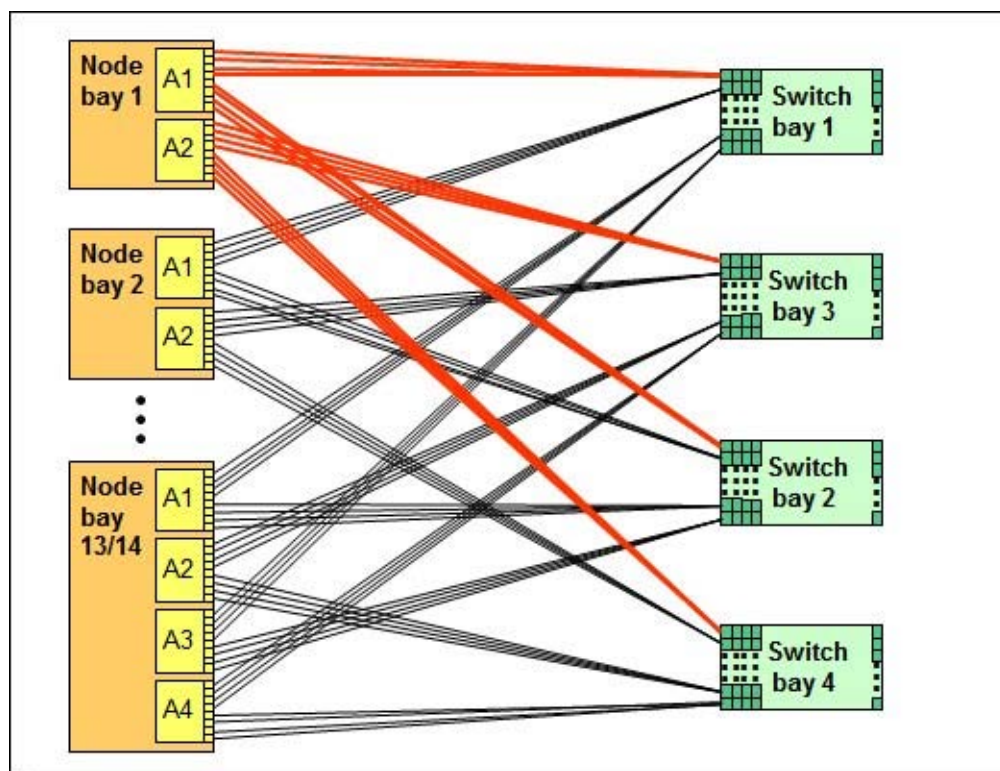

Figure 4. Logical layout of the interconnects between I/O adapters and I/O modules

FCoE support

The following two tables list FCoE support using Fibre Channel targets for the CN4058 8-port 10Gb Converged Adapter.

Tip: Use these tables only as a starting point. Configuration support must be verified through the IBM System Storage® Interoperation Center (SSIC) web site:
http://ibm.com/systems/support/storage/ssic/interoperability.wss

Table 5. FCoE support using FC targets

Flex System I/O Module	FC Forwarder (FCF)	Supported SAN Fabric	Operating system	Storage targets
CN4093 10Gb Converged Switch		IBM B-type Cisco MDS	AIX 6.1 AIX 7.1 VIOS 2.2 SLES 11.2 RHEL 6.4	IBM DS8000 IBM SVC IBM Storwize V7000 V7000 Storage Node IBM XIV
EN4093 10Gb Switch EN4093R 10Gb Switch	Brocade VDX 6730	IBM B-type		
EN4093 10Gb Switch EN4093R 10Gb Switch	Cisco Nexus 5548 Cisco Nexus 5596	Cisco MDS		

The following table lists FCoE support using native FCoE targets (that is, end-to-end FCoE).

Table 6. FCoE support using FCoE targets (end-to-end FCoE)

Flex System I/O Module	Operating system	Storage targets
CN4093 10Gb Converged Switch	AIX 6.1 AIX 7.1 VIOS 2.2 SLES 11.2 RHEL 6.4	IBM Storwize V7000 Storage Node (FCoE)

Operating system support

The IBM Flex System CN4058 8-port 10Gb Converged Adapter supports the following operating systems:

- AIX Version 6.1
- AIX Version 7.1
- IBM i 6.1
- IBM i 7.1
- IBM Virtual I/O Server
- Red Hat Enterprise Linux 5 for IBM POWER
- Red Hat Enterprise Linux 6 for IBM POWER
- SUSE LINUX Enterprise Server 11 for IBM POWER

Support for operating systems is based on the combination of the expansion card and the blade server on which it is installed. See the IBM ServerProven website for the latest information about the specific versions and service packs supported. Select the blade server, and then select the expansion card to see the supported operating systems: http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/

For the latest information about installing Linux on IBM Power Systems, see:
http://www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html

Warranty

There is a 1-year, customer-replaceable unit (CRU) limited warranty. When installed in a server, these adapters assume your system's base warranty and any IBM ServicePac® upgrade.

Physical specifications

The dimensions and weight of the adapter are as follows:

- Width: 100 mm (3.9 in.)
- Depth: 80 mm (3.1 in.)
- Weight: 13 g (0.3 lb)

Shipping dimensions and weight (approximate):

- Height: 58 mm (2.3 in.)
- Width: 229 mm (9.0 in.)
- Depth: 208 mm (8.2 in.)
- Weight: 0.4 kg (0.89 lb)

Regulatory compliance

The adapter conforms to the following regulatory standards:

- United States FCC 47 CFR Part 15, Subpart B, ANSI C63.4 (2003), Class A
- United States UL 60950-1, Second Edition
- IEC/EN 60950-1, Second Edition
- FCC - Verified to comply with Part 15 of the FCC Rules, Class A
- Canada ICES-003, issue 4, Class A
- UL/IEC 60950-1
- CSA C22.2 No. 60950-1-03
- Japan VCCI, Class A
- Australia/New Zealand AS/NZS CISPR 22:2006, Class A
- IEC 60950-1(CB Certificate and CB Test Report)
- Taiwan BSMI CNS13438, Class A
- Korea KN22, Class A; KN24
- Russia/GOST ME01, IEC-60950-1, GOST R 51318.22-99, GOST R 51318.24-99, GOST R 51317.3.2-2006, GOST R 51317.3.3-99
- IEC 60950-1 (CB Certificate and CB Test Report)
- CE Mark (EN55022 Class A, EN60950-1, EN55024, EN61000-3-2, EN61000-3-3)
- CISPR 22, Class A

Popular configurations

The adapters can be used in various configurations.

Ethernet configuration

The following figure shows CN4058 8-port 10Gb Converged Adapters installed in both slots of the p260, which in turn is installed in the chassis. The chassis also has four IBM Flex System Fabric EN4093R 10Gb Scalable Switches, each with both Upgrade 1 and Upgrade 2 installed, enabling 42 internal ports on each switch. The switch configuration enables 6 of the 8 ports on the CN4058 adapter.
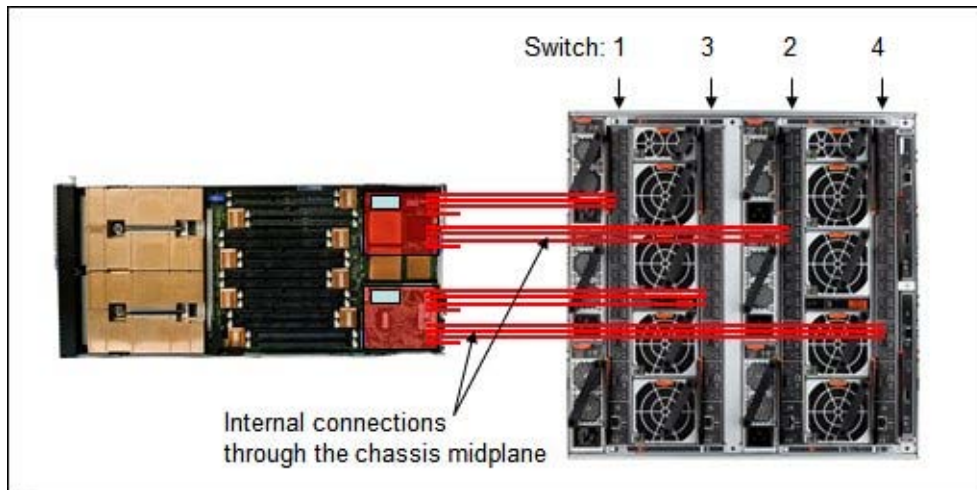

Figure 5. Example configuration

The following table lists the parts that are used in the configuration.

Table 7. Components used when connecting the adapter to the 10 GbE switches

Model / feature	Description	Quantity
7895-23X	IBM Flex System p260 Compute Node	1 to 14
EC24	IBM Flex System CN4058 8-port 10Gb Converged Adapter	2 per server
7893-92X	IBM Flex System Enterprise Chassis	1
ESW7	IBM Flex System Fabric EN4093R 10Gb Scalable Switch	4
3596	IBM Flex System Fabric EN4093 10Gb Scalable Switch (Upgrade 1)	4
3597	IBM Flex System Fabric EN4093 10Gb Scalable Switch (Upgrade 2)	4

FCoE configuration using a Brocade SAN

The CN4058 adapter can be used with the EN4093R 10Gb Scalable Switch as Data Center Bridging (DCB) switches that can transport FCoE frames using FCoE Initialization Protocol (FIP) snooping. The encapsulated FCoE packets are sent to the Brocade VDX 6730 Fibre Channel Forwarder (FCF) which is functioning as both an aggregation switch and an FCoE gateway, as shown in the following figure.
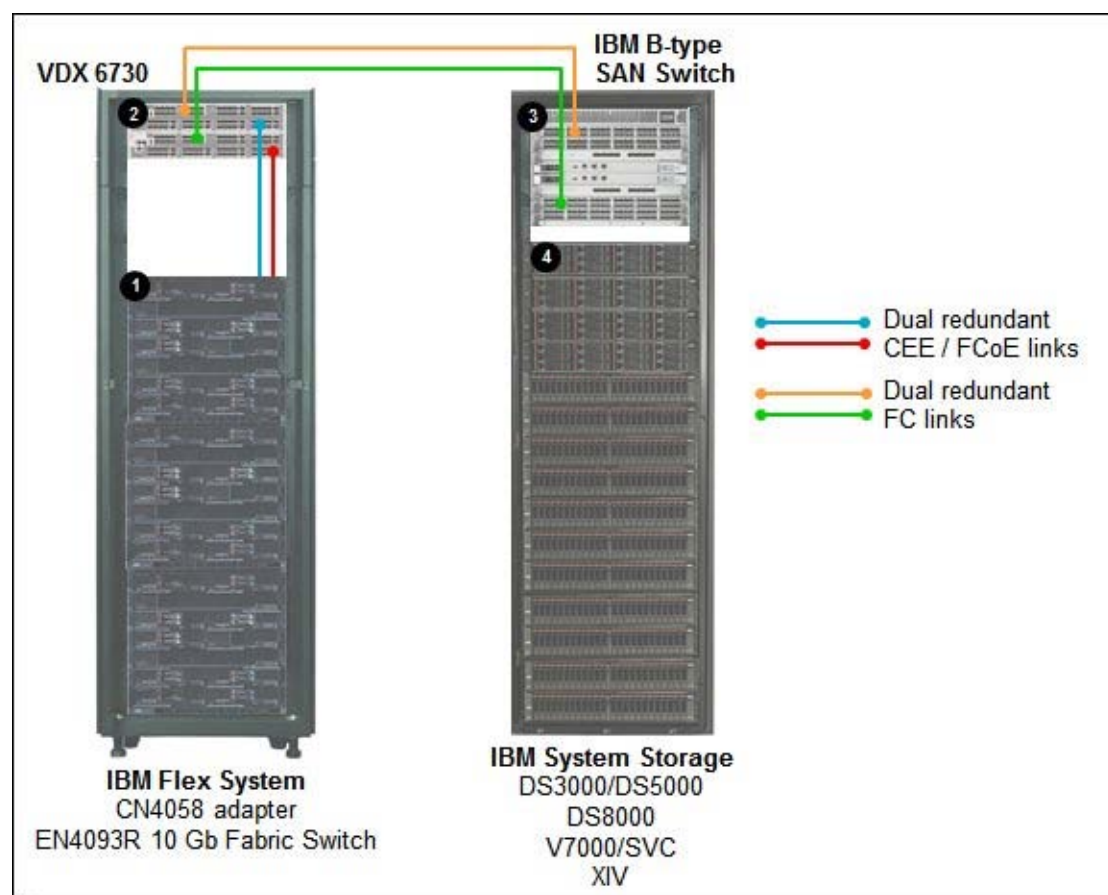

Figure 6. FCoE solution using the EN4093R as an FCoE transit switch with the Brocade VDX 6730 as an FCF

The solution components used in the scenario depicted in the figure are listed in the following table.

Table 8. FCoE solution using the EN4093R as an FCoE transit switch with the Brocade VDX 6730 as an FCF

Diagram reference	Description	Feature code	Quantity
❶	**IBM Flex System FCoE solution**		
	IBM Flex System CN4058 8-port 10Gb Converged Adapter	EC24	1 per server
	IBM Flex System Fabric EN4093R 10Gb Scalable Switch	ESW7	2 per chassis
	IBM Flex System Fabric EN4093 10Gb Scalable Switch (Upgrade 1)	3596	1 per EN4093R
	IBM Flex System Fabric EN4093 10Gb Scalable Switch (Upgrade 2)	3597	1 per EN4093R
❷	**Brocade VDX 6730 Converged Switch for IBM**		
❸	**IBM B-type or Brocade SAN fabric**		
❹	**IBM System Storage FC disk controllers**		
	IBM System Storage DS3000 / DS5000		
	IBM System Storage DS8000		
	IBM Storwize V7000 / SAN Volume Controller		
	IBM XIV		

IBM provides extensive FCoE testing to deliver network interoperability. For a full listing of IBM supported FCoE and iSCSI configurations, see the System Storage Interoperation Center (SSIC) website at: http://ibm.com/systems/support/storage/ssic

Related publications

For more information refer to the following resources:

- IBM U.S. Announcement Letter
  http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS112-182

- IBM Flex System Fabric EN4093 and EN4093R 10Gb Scalable Switch Product Guide
  http://www.redbooks.ibm.com/abstracts/tips0864.html?Open

- IBM Flex System Fabric CN4093 10Gb Converged Scalable Switch Product Guide
  http://www.redbooks.ibm.com/abstracts/tips0868.html?Open

- IBM Flex System EN4091 10Gb Ethernet Pass-thru Product Guide
  http://www.redbooks.ibm.com/abstracts/tips0865.html?Open

- IBM Flex System EN2092 1Gb Ethernet Scalable Switch Product Guide
  http://www.redbooks.ibm.com/abstracts/tips0861.html?Open

- IBM Flex System p260 and p460 Compute Node Product Guide
  http://www.redbooks.ibm.com/abstracts/tips0880.html?Open

- IBM Flex System p270 Compute Node Product Guide
  http://www.redbooks.ibm.com/abstracts/tips1018.html?Open

- IBM Flex System Information Center (User's Guides for servers and options)
  http://publib.boulder.ibm.com/infocenter/flexsys/information

- *IBM Flex System Interoperability Guide*
  http://www.redbooks.ibm.com/fsig

- IBM Redbooks® publication *IBM Flex System Products and Technology*, SG24-7984
  http://www.redbooks.ibm.com/abstracts/sg247984.html

- IBM Redbooks Product Guides for IBM Flex System servers and options
  http://www.redbooks.ibm.com/Redbooks.nsf/portals/PureSystems?Open&page=pgbycat

- IBM Configurator for e-business (e-config)
  http://ibm.com/services/econfig/

- ServerProven for IBM Flex System
  http://ibm.com/systems/info/x86servers/serverproven/compat/us/flexsystems.html

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