

## Emulex 10GbE VFA II and Emulex 10GbE VFA Advanced II for BladeCenter HS23

### Product Guide (withdrawn product)

The Emulex 10GbE Virtual Fabric Adapter II (VFA II) and Emulex 10GbE VFA Advanced II for BladeCenter® HS23 are the options available to the BladeCenter Virtual Fabric portfolio. These adapters are supported on the new HS23 blade to enable up to four uplink/downlink ports for increased I/O bandwidth and maximum performance. The combination of HS23 and Emulex options enables clients to simplify their I/O infrastructure by reducing the number of switches needed inside the chassis while supporting Ethernet and virtual NICs (vNICs) using the same hardware components.

The virtual NICs are configured to meet the client's mix of network connectivity and throughput demands for today's complex server application environments. Both physical 10 Gbps ports on the adapter can be divided into four virtual ports with bandwidth allocation in 100 Mbps increments up to the maximum of 10 Gbps per physical port. The Emulex 10GbE VFA Advanced II adds FCoE and iSCSI hardware initiator functionality to enable data center infrastructure convergence. Figure 1 shows the adapter.



Figure 1. Emulex 10GbE Virtual Fabric Adapter II for BladeCenter HS23

### Did you know?

The Emulex 10GbE VFA II routes onboard 10 Gb Ethernet ports on HS23 to the I/O bays 7 and 9 of BladeCenter H or HT chassis, and the adapter's 10 GbE ports are routed to the I/O bays 8 and 10. With four 10 Gb Ethernet ports, the solution offers the flexibility to operate as a Virtual Fabric with up to 14 vNICs or as traditional 10 Gb Ethernet NICs. The adapter enables you to configure up to 18 ports on a single blade server: eight virtual NICs with the Emulex 10 GbE VFA II, plus six vNICs with the onboard Emulex 10 GbE NICs, plus the two onboard Gigabit Ethernet NICs, plus two GbE NICs with a CIOv expansion card.

## Part number information

Table 1. Ordering part numbers and feature codes

Description	Part number	Feature code
Emulex 10GbE VFA II for BladeCenter HS23	81Y3120	A287
Emulex 10GbE VFA Advanced II for BladeCenter HS23	90Y9332*	A2ZN
Virtual Fabric Advanced FOD Upgrade for BladeCenter	90Y9350	A2ZP

\* Withdrawn from marketing

The adapter part number includes the following items:

- One Emulex 10GbE VFA II or Emulex 10GbE VFA Advanced II for HS23
- Documentation CD
- Important Notices flyer
- Warranty flyer

The standard Emulex 10GbE Virtual Fabric Adapter II for HS23 can be upgraded to the same features as the Emulex 10GbE Virtual Fabric Adapter Advanced II for HS23 with the addition of the Emulex 10GbE Virtual Fabric Advanced FOD Upgrade option, part number 90Y9350.

## Features

Emulex Virtual Fabric Adapter II for HS23 and Emulex Virtual Fabric Adapter Advanced II for HS23 have the following features:

- Two 10 Gb Ethernet ports (1 Gb and 10 Gb auto-negotiation)
- Full-duplex (FDX) capability (40 Gbps throughput)
- 10 Gb ports operating in a virtual NIC (vNIC), Unified Fabric Port (UFP), or physical NIC (pNIC) mode
  - vNIC mode: Up to eight vNICs (up to four vNICs per one 10 Gb port)
    - Virtual Fabric or Switch Independent mode of operation
    - Virtual port bandwidth allocation in 100 Mbps increments
    - Up to two vNICs can be configured as an iSCSI or FCoE vNICs (one per port) with optional Advanced Upgrade (90Y9350) or with Emulex 10GbE VFA Advanced II (90Y9332)
  - UFP mode: Up to eight virtual ports (vPorts) (up to four vPorts per one 10 Gb port)
    - Virtual port bandwidth allocation in 100 Mbps increments
    - Up to two vPorts can be configured as an iSCSI or FCoE vPorts (one per port) with optional Advanced Upgrade (90Y9350) or with Emulex 10GbE VFA Advanced II (90Y9332)
  - pNIC mode: dual-port 1/10 Gb Ethernet adapter
    - With optional Advanced Upgrade (90Y9350) or with Emulex 10GbE VFA Advanced II (90Y9332), the pNIC mode enables two LAN (10 GbE) ports and two storage ports (iSCSI or FCoE).
- IPv4/IPv6 offload
  - TCP, UDP checksum offload
  - Large send offload (LSO)
  - Large receive offload (LRO)
  - Receive side scaling (RSS)
- IPv4 TCP Chimney Offload
- IEEE 802.1Q VLAN tagging
- VLAN insertion and extraction
- Jumbo frames up to 9000 bytes
- Load balancing and failover teaming support including adapter fault tolerance (AFT), switch fault tolerance (SFT), adaptive load balancing (ALB), and IEEE 802.3ad
- Enhanced Ethernet (draft) support
  - Enhanced Transmission Selection (ETS) (P802.1Qaz)
  - Priority-based Flow Control (PFC) (P802.1Qbb)
  - Data Center Bridging eXchange Protocol (DCBX) (P802.1Qaz)
- Supports Serial over LAN (SoL) and concurrent KVM (cKVM)
- Preboot Execution Environment (PXE) support

- Wake On LAN support
- PCIe x8 Gen 2 host interface
- Message Signal Interrupt (MSI-X) support
- CFFh form factor can be combined with a CIOv expansion card on the same blade server
- BladeCenter HS23's onboard dual-port 10 GbE NIC pass-through capability

## Modes of operation

The Emulex 10GbE Virtual Fabric Adapter II for HS23 offers the following modes of operation:

- Virtual Fabric mode (also known as vNIC1) only works in conjunction with Virtual Fabric 10Gb Switch Module installed in I/O module bays 8 and 10 in the chassis. In this mode, the Emulex adapter communicates with the switch module to obtain vNIC parameters (using DCBX). Also, a special tag within each data packet is added and later removed by the NIC and switch for each vNIC group to maintain separation of the virtual channels. In vNIC mode, each physical port is divided into four virtual ports, providing a total of eight virtual NICs per adapter. The default bandwidth for each vNIC is 2.5 Gbps. Bandwidth for each vNIC can be configured at the Virtual Fabric 10Gb Switch Module from 100 Mbps to 10 Gbps, up to a total of 10 Gb per physical port. The vNICs can also be configured to have 0 bandwidth if you must allocate the available bandwidth to fewer than eight vNICs. In Virtual Fabric Mode, you can change the bandwidth allocations through the Virtual Fabric 10Gb Switch Module user interfaces without requiring a reboot of the server.

When storage protocols are enabled on the Emulex 10GbE Virtual Fabric Adapter Advanced II for HS23, six ports are Ethernet, and two ports are either iSCSI or FCoE.

- Switch Independent Mode (also known as vNIC2), where the adapter works with the following I/O modules:
  - Virtual Fabric 10Gb Switch Module
  - Cisco Nexus 4001I Switch Module
  - 10Gb Ethernet Pass-Thru Module and a top-of-rack (TOR) switch

These modules must be installed in I/O module bays 8 and 10 in the chassis. Beyond the way that the adapter communicates with the switch, Switch Independent Mode offers the same capabilities as Virtual Fabric Mode in terms of the number of vNICs and the bandwidth that each can be configured to have. Switch Independent Mode extends the existing customer VLANs to the virtual NIC interfaces. The IEEE 802.1Q VLAN tag is essential to the separation of the vNIC groups by the NIC adapter or driver and the switch. The VLAN tags are added to the packet by the applications or drivers at each end station rather than by the switch.

- Unified Fabric Port only works in conjunction with Virtual Fabric 10Gb Switch Module installed in I/O module bays 8 and 10 in the chassis. With UFP, the Emulex adapter communicates with the switch module to obtain vPort parameters. UFP has a number of modes associated with it, including:
  - Tunnel mode: Provides Q-in-Q mode, where the vPort is customer VLAN-independent (very similar to vNIC Virtual Fabric Dedicated Uplink Mode)
  - Trunk mode: Provides a traditional 802.1Q trunk mode (multi-VLAN trunk link) to the virtual NIC (vPort) interface, i.e. permits host side tagging
  - Access mode: Provides a traditional access mode (single untagged VLAN) to the virtual NIC (vPort) interface which is similar to a physical port in access mode
  - FCoE mode: Provides FCoE functionality to the vPort
  - Auto-VLAN mode: Auto VLAN creation for Qbg and VMready environments

With UFP, each physical port is divided into four virtual ports, providing a total of eight vPorts per adapter. Bandwidth for each vPort can be configured at the Virtual Fabric 10Gb Switch Module from 100 Mbps to 10 Gbps, up to a total of 10 Gb per physical port. The vPorts can also be configured to have 0 bandwidth if you must allocate the available bandwidth to fewer than eight vPorts. In UFP mode, you can change the bandwidth allocations through the Virtual Fabric 10Gb Switch Module user interfaces without requiring a reboot of the server.

When storage protocols are enabled on the Emulex 10GbE Virtual Fabric Adapter Advanced II for HS23, six ports are Ethernet, and two ports (vPort 2 on each physical port) are either iSCSI or FCoE.

- In pNIC mode, the expansion card can operate as a standard 10 Gbps or 1 Gbps 2-port Ethernet expansion card. When in pNIC mode, the expansion card functions with the following I/O modules:
  - Virtual Fabric 10Gb Switch Module
  - Cisco Nexus 4001I Switch Module
  - 10Gb Ethernet Pass-Thru Module and a TOR switch

These modules must be installed in I/O module bays 8 and 10.

In pNIC mode, the Advanced adapter or the Advanced upgrade operates in traditional Converged Network Adapter (CNA) mode with two network ports (Ethernet) and two storage ports (iSCSI or FCoE) available to the operating system.

### Supported servers

The Emulex 10GbE VFA II and Emulex 10GbE VFA Advanced II for HS23 are supported in the BladeCenter servers listed in Table 2.

Table 2. Supported servers

Part number	Description	HS22 (7870)	HS23 (7875, E5-2600)	HS23 (7875, E5-2600 v2)	HS23E (8038)	HX5 (7873)
81Y3120	Emulex 10GbE VFA II for BladeCenter HS23	N	Y	Y	N	N
90Y9332	Emulex 10GbE VFA Advanced II for BladeCenter HS23	N	Y	Y	N	N
90Y9350	Virtual Fabric Advanced FOD Upgrade for BladeCenter	N	Y	Y	N	N

Figure 2 shows where the Emulex 10GbE VFA II for HS23 card is installed in a BladeCenter server.

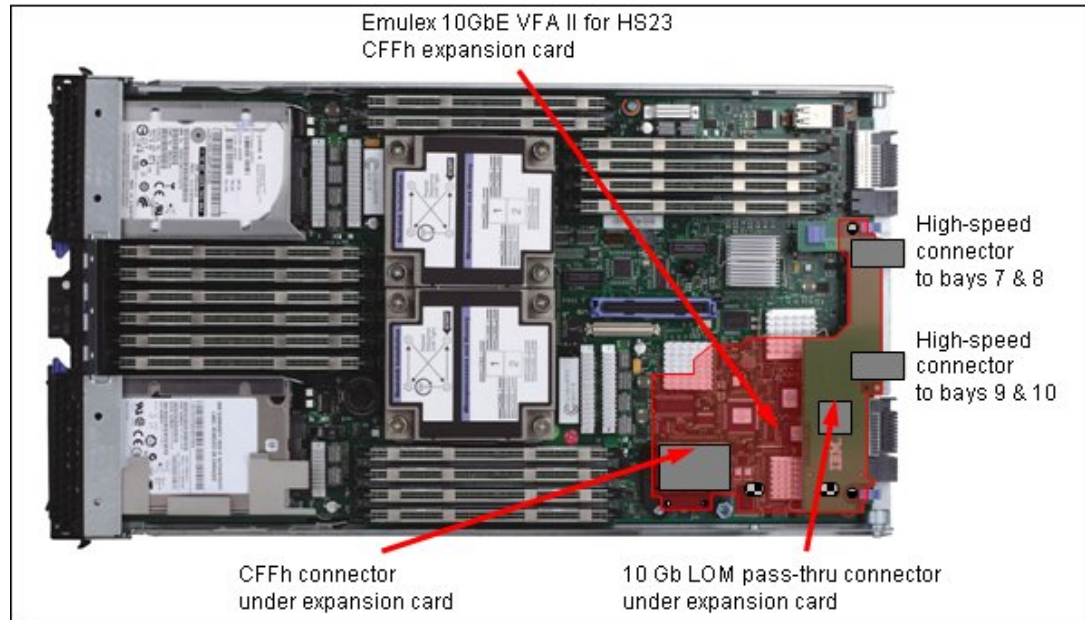


Figure 2. Location on the HS23 server planar where the Emulex 10GbE VFA II for HS23 card is installed

### Supported BladeCenter chassis and I/O modules

BladeCenter chassis support is based on the blade server type in which the expansion card is installed. Consult the ServerProven® website to see in which chassis each blade server type is supported:

<http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/>

Table 3 lists the supported chassis and I/O module combinations that the Emulex 10GbE Virtual Fabric Adapter II for HS23 supports, in either standard physical port mode (pNIC) or one of the NIC virtualization modes: Virtual Fabric, Switch Independent, or Unified Fabric Port.

Table 3. I/O modules supported with the Emulex 10GbE Virtual Fabric Adapter II for HS23

Part number	Description	BladeCenter S	BladeCenter E	BladeCenter H	BladeCenter T	BladeCenter HT	MSIM	MSIM-HT
<b>Virtual Fabric vNIC mode</b>								
46C7191	Virtual Fabric 10Gb Switch Module	N	N	Y	N	Y	N	N
39Y9267	6-port 10 Gb High Speed Switch Module	N	N	N	N	N	N	N
46M6181	10Gb Ethernet Pass-Thru Module	N	N	N	N	N	N	N
46M6071	Cisco Nexus 4001I Switch Module	N	N	N	N	N	N	N
69Y1909	Brocade Converged 10GbE Switch Module	N	N	N	N	N	N	N
<b>Switch Independent vNIC mode</b>								
46C7191	Virtual Fabric 10Gb Switch Module	N	N	Y	N	Y	N	N
39Y9267	6-port 10 Gb High Speed Switch Module	N	N	N	N	N	N	N
46M6181	10Gb Ethernet Pass-Thru Module	N	N	Y	N	Y	N	N
46M6071	Cisco Nexus 4001I Switch Module	N	N	Y	N	Y	N	N
69Y1909	Brocade Converged 10GbE Switch Module	N	N	N	N	N	N	N
<b>Unified Fabric Port</b>								
46C7191	Virtual Fabric 10Gb Switch Module	N	N	Y	N	Y	N	N
39Y9267	6-port 10 Gb High Speed Switch Module	N	N	N	N	N	N	N
46M6181	10Gb Ethernet Pass-Thru Module	N	N	N	N	N	N	N
46M6071	Cisco Nexus 4001I Switch Module	N	N	N	N	N	N	N
69Y1909	Brocade Converged 10GbE Switch Module	N	N	N	N	N	N	N
<b>pNIC mode</b>								
46C7191	Virtual Fabric 10Gb Switch Module	N	N	Y	N	Y	N	N
39Y9267	6-port 10 Gb High Speed Switch Module	N	N	N	N	N	N	N
46M6181	10Gb Ethernet Pass-Thru Module	N	N	Y	N	Y	N	N
46M6071	Cisco Nexus 4001I Switch Module	N	N	Y	N	Y	N	N
69Y1909	Brocade Converged 10GbE Switch Module	N	N	N	N	N	N	N

In BladeCenter H, the ports of Emulex VFA II for HS23 cards are routed through the midplane to I/O bays 8 and 10 (Figure 3). The BladeCenter HT is similar in that the Emulex VFA II for HS23 card ports are also routed through the midplane to I/O bays 8 and 10.

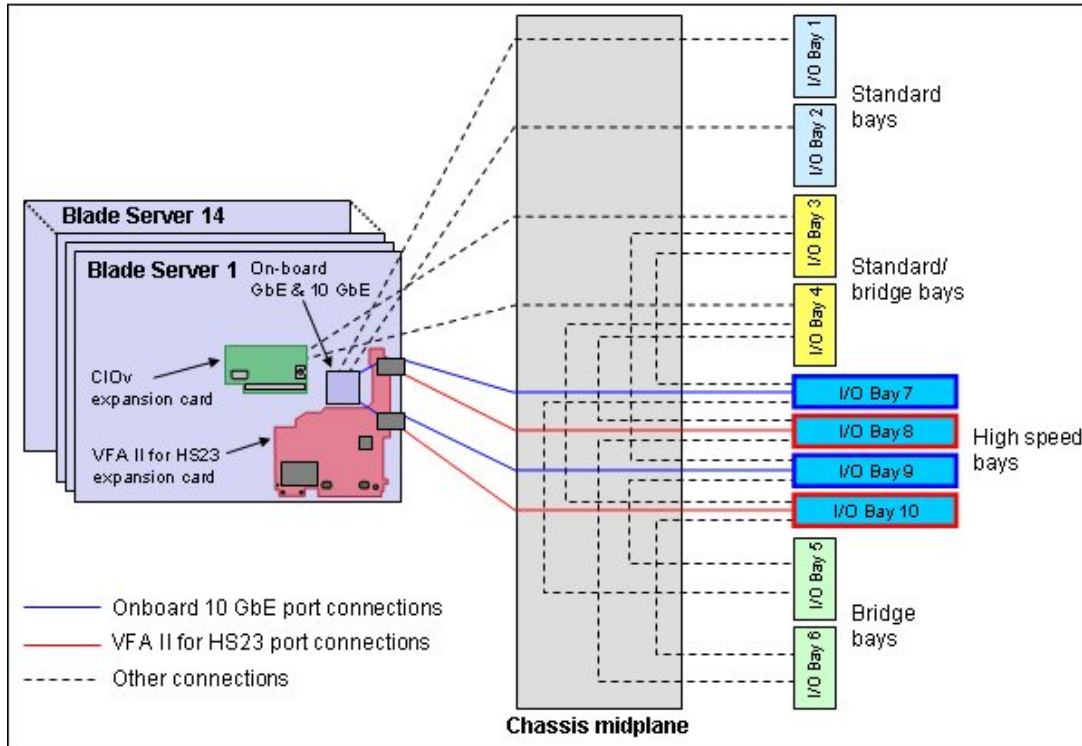


Figure 3. BladeCenter H I/O topology showing the I/O paths from onboard 10 GbE and VFA II for HS23 card

The Emulex 10GbE Virtual Fabric Adapters II for HS23 require I/O modules to be installed in bays 8 and 10 of the BladeCenter H and HT chassis (Table 4).

Table 4. Locations of I/O modules required to connect to the expansion card

Expansion card	I/O bay 7	I/O bay 8	I/O bay 9	I/O bay 10
Emulex 10GbE VFA II for HS23	Used by onboard 10 GbE	Supported I/O module	Used by onboard 10 GbE	Supported I/O module
Emulex 10GbE VFA Advanced II for HS23	Used by onboard 10 GbE	Supported I/O module	Used by onboard 10 GbE	Supported I/O module

## Typical configurations

Figure 4 shows the use of the Emulex 10GbE Virtual Fabric Adapter II for HS23 in the scalable converged Virtual Fabric solution. Blue lines represent HS23's two onboard 10 GbE physical ports that are routed to the Virtual Fabric 10Gb Switch Modules in bays 7 and 9 through Emulex 10 GbE VFA for HS23. Red lines represent two VFA ports routed to the Virtual Fabric 10Gb Switch Modules in bays 8 and 10 of the BladeCenter chassis. All connections between the controller, card, and the switch modules are internal to the chassis. No cabling is needed. Table 5 provides configuration details.

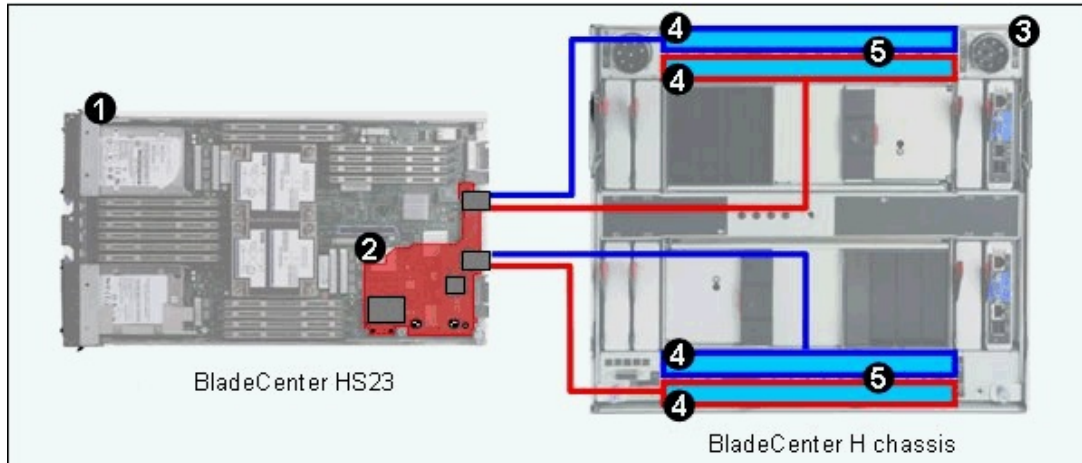


Figure 4. Configuration using the Emulex 10GbE Virtual Fabric Adapter II for HS23

Depending on how you configure the switches and 10 GbE blade ports, you can get either of these:

- Up to 14 virtual Ethernet ports in vNIC mode (six vNICs on the onboard 10 GbE controller and eight vNICs on Emulex 10GbE VFA II for HS23). Each virtual port can be configured to operate at 100 Mbps to 10 Gbps, up to a total maximum of 10 Gb per physical port. Two onboard vNICs can be designated for storage connections (either FCoE or iSCSI), with optional Virtual Fabric Advanced Software Upgrade (LOM) (90Y9310). Two vNICs on Emulex VFA II for HS23 can also be designated for storage connections with Virtual Fabric Advanced FOD Upgrade for BladeCenter (90Y9350).
- Four 10 Gb Ethernet ports (pNIC mode). With optional Advanced Upgrades (90Y9310 and 90Y9350), up to eight ports (up to four Ethernet network ports and up to four FCoE or iSCSI storage ports) are available to the operating system.

Table 5. Components used with the Emulex VFA II for HS23 Virtual Fabric solution

Diagram reference	Part number/machine type	Description	Quantity
1	7875	BladeCenter HS23	1 to 14
2	81Y3120	Emulex 10GbE Virtual Fabric Adapter II for HS23	1 per server
3	8852	BladeCenter H	1
4	46C7191	Virtual Fabric 10Gb Switch Module	4
5	46C3447	SFP+ SR Transceiver	Up to 40*

\* To communicate outside the chassis, you must have either one SFP+ transceiver or SFP+ direct-attached cable (DAC) for each external 10 Gb port on the Virtual Fabric 10Gb Switch Module that you want to enable.

## Storage connectivity

Supported FCoE configurations are shown in the following table.

Table 6. Supported FCoE configurations

Virtual Fabric adapter	FCoE upgrade	BladeCenter I/O module	FCF switch	SAN fabric	OS support	Storage targets			
<ul style="list-style-type: none"> <li>Emulex 10GbE VFA II for HS23, 81Y3120</li> <li>Emulex 10GbE VFA Advanced II for HS23, 90Y9332</li> </ul>	<ul style="list-style-type: none"> <li>90Y9350 (not needed for 90Y9332)</li> </ul>	<ul style="list-style-type: none"> <li>Virtual Fabric 10Gb Switch Module, 46C7191 (vNIC1, vNIC2, UFP, pNIC)</li> </ul>	<ul style="list-style-type: none"> <li>QLogic Virtual Fabric Extension Module, 46M6172 (Full Fabric mode)</li> </ul>	<ul style="list-style-type: none"> <li>Brocade</li> <li>Cisco MDS</li> </ul>	<ul style="list-style-type: none"> <li>RHEL 5, 6</li> <li>SLES 10, 11</li> <li>vSphere 4.1, 5.0, 5.1</li> <li>Windows Server 2008 R2, 2012, 2012 R2</li> </ul>	<ul style="list-style-type: none"> <li>DCS3700</li> <li>DS3500</li> <li>DS5000</li> <li>DS8000</li> <li>SVC</li> <li>V3500</li> <li>V3700</li> <li>V5000</li> <li>V7000</li> <li>XIV</li> <li>Tape</li> </ul>			
			<ul style="list-style-type: none"> <li>QLogic Virtual Fabric Extension Module, 46M6172 (NPV mode)</li> </ul>				<ul style="list-style-type: none"> <li>Brocade</li> </ul>		
			<ul style="list-style-type: none"> <li>Brocade VDX 6730</li> </ul>					<ul style="list-style-type: none"> <li>Cisco MDS</li> </ul>	
			<ul style="list-style-type: none"> <li>Cisco Nexus 5010</li> <li>Cisco Nexus 5020</li> <li>Cisco Nexus 5548</li> <li>Cisco Nexus 5596</li> </ul>						
		<ul style="list-style-type: none"> <li>10Gb Ethernet Pass-thru Module, 46M6181 (vNIC2, pNIC)</li> </ul>	<ul style="list-style-type: none"> <li>Brocade VDX 6730</li> </ul>	<ul style="list-style-type: none"> <li>Brocade</li> </ul>			<ul style="list-style-type: none"> <li>Brocade</li> </ul>		
								<ul style="list-style-type: none"> <li>G8264CS (NPV mode)</li> </ul>	<ul style="list-style-type: none"> <li>Brocade</li> <li>Cisco MDS</li> </ul>
								<ul style="list-style-type: none"> <li>G8264CS (Full Fabric mode)</li> </ul>	
		<ul style="list-style-type: none"> <li>Cisco Nexus 4001I Switch Module, 46M6071 (vNIC2, pNIC)</li> </ul>	<ul style="list-style-type: none"> <li>Cisco Nexus 5010</li> <li>Cisco Nexus 5020</li> <li>Cisco Nexus 5548</li> <li>Cisco Nexus 5596</li> </ul>	<ul style="list-style-type: none"> <li>Cisco MDS</li> </ul>					

Supported iSCSI configurations are shown in the following table.

**Note:** System Storage Interoperation Center normally only lists support for iSCSI storage attached using hardware iSCSI offload adapters in the servers. BladeCenter servers support any type of iSCSI (1Gb or 10Gb) storage as long as software iSCSI initiator device drivers meet the storage requirements for the operating system and device driver levels.



Table 7. Supported iSCSI configurations

Virtual Fabric adapter	iSCSI upgrade	BladeCenter I/O module	External Ethernet switch	OS support	Storage targets
<ul style="list-style-type: none"> <li>Emulex 10GbE VFA II for HS23, 81Y3120</li> <li>Emulex 10GbE VFA Advanced II for HS23, 90Y9332</li> </ul>	<ul style="list-style-type: none"> <li>90Y9350 (not needed for 90Y9332)</li> </ul>	<ul style="list-style-type: none"> <li>Virtual Fabric 10Gb Switch Module, 46C7191 (vNIC1, vNIC2, UFP, pNIC)</li> </ul>	<ul style="list-style-type: none"> <li>Any Ethernet switch</li> <li>RackSwitch G8124E</li> </ul>	<ul style="list-style-type: none"> <li>RHEL 5, 6</li> <li>SLES 10, 11</li> <li>vSphere 4.0, 5.0, 5.1</li> <li>Windows Server 2008 R2, 2012, 2012 R2</li> </ul>	<ul style="list-style-type: none"> <li>DCS3700</li> <li>DS3500</li> <li>DS5000</li> <li>SVC</li> <li>V3500</li> <li>V3700</li> <li>V5000</li> <li>V7000</li> <li>XIV</li> </ul>

**Important:** Use these tables only as a starting point. Configuration support must be verified through the IBM System Storage® Interoperation Center (SSIC) found at the following website:  
<http://www.ibm.com/systems/support/storage/ssic>

## Warranty

One-year limited warranty. When installed in a supported BladeCenter server, these cards assume your system's base warranty and any Lenovo warranty service upgrade purchased for the system.

## Physical specifications

The Emulex 10GbE Virtual Fabric Adapter II and Virtual Fabric Advanced II for HS23 have the following physical specifications:

Dimensions and weight (approximate):

- Height: 15 mm (0.6 in)
- Width: 160 mm (6.3 in)
- Depth: 125 mm (4.9 in)
- Weight: 0.13 kg (0.28 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)

## Operating environment

This adapter complies with temperature rating requirements for BladeCenter H and BladeCenter HT chassis and is supported in the following environment:

- Temperature: Operating:
  - 0 - 52 °C (32 - 125 °F) at an altitude of 0 - 914 m (0 - 3,000 ft)
  - 0 - 49 °C (32 - 120 °F) at an altitude of 0 - 3,000 m (0 - 10,000 ft)
- Temperature: Non-operating:
  - 40 - 65°C (-40 - 149° F) at an altitude of 0 - 12,000 m (0 - 39,370 ft)
- Humidity
  - Operating: 8 - 80%, noncondensing
  - Non-operating: 5 - 80%, noncondensing

## Regulatory compliance

The adapter conforms to the following 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

## Operating system support

The Emulex 10GbE Virtual Fabric Adapter II and Virtual Fabric Adapter Advanced II for HS23 support the following operating systems:

- Microsoft Windows Server 2012 R2
- Microsoft Windows Server 2012
- Microsoft Windows Server 2008 R2
- Microsoft Windows Server 2008, Datacenter x64 Edition
- Microsoft Windows Server 2008, Datacenter x86 Edition
- Microsoft Windows Server 2008, Enterprise x64 Edition
- Microsoft Windows Server 2008, Enterprise x86 Edition
- Microsoft Windows Server 2008, Standard x64 Edition
- Microsoft Windows Server 2008, Standard x86 Edition
- Microsoft Windows Server 2008, Web x64 Edition
- Microsoft Windows Server 2008, Web x86 Edition
- Red Hat Enterprise Linux 6 Server x64 Edition
- Red Hat Enterprise Linux 6 Server Edition
- Red Hat Enterprise Linux 5 Server x64 Edition
- Red Hat Enterprise Linux 5 Server with Xen x64 Edition
- Red Hat Enterprise Linux 5 Server Edition
- SUSE Linux Enterprise Server (SLES) 12
- SUSE Linux Enterprise Server 11 with Xen for AMD64/EM64T
- SUSE Linux Enterprise Server 11 for x86
- SUSE Linux Enterprise Server 11 for AMD64/EM64T
- SUSE Linux Enterprise Server 10 for x86
- SUSE Linux Enterprise Server 10 for AMD64/EM64T
- VMware vSphere 5.5 (ESXi)
- VMware vSphere 5.1 (ESXi)
- VMware vSphere 5.0 (ESXi)
- VMware ESXi 4.1
- VMware ESX 4.1

Support for operating systems is based on the combination of the expansion card and the blade server on which it is installed. See the 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/>

## Related publications

For more information refer to the following resources:

- US Announcement Letter:  
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS112-044>
- BladeCenter Interoperability Guide  
<http://lenovopress.com/bcig>
- BladeCenter Products and Technology, SG24-7523  
<http://lenovopress.com/sg247523>

## Related product families

Product families related to this document are the following:

- [Blade Network Adapters](#)

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