IBM Flex System EN2092 1Gb Ethernet Scalable Switch

IBM Redbooks Product Guide

The IBM Flex System™ EN2092 1Gb Ethernet Scalable Switch enables administrators to offer full Layer 2 and 3 switching and routing capability with combined 1 Gb and 10 Gb external ports in an IBM Flex System Enterprise Chassis. Such consolidation simplifies the data center infrastructure and helps reduce the number of discrete devices, management consoles, and management systems while leveraging the 1 Gb Ethernet infrastructure. In addition, the next-generation switch module hardware supports IPv6 Layer 3 frame forwarding protocols. This Scalable Switch delivers cost savings with flexible port mapping and Features on Demand upgrades, efficient traffic management, increased external bandwidth, and strong Ethernet switching price/performance.

Figure 1 shows the switch module.

Figure 1. IBM Flex System EN2092 1Gb Ethernet Scalable Switch

Did you know?

The base switch configuration comes standard with 24x 1 GbE port licenses that can be assigned to internal or external 1 GbE connections or even external SFP+ ports with flexible port mapping. For example, this feature allows you to trade off one external 1 GbE RJ-45 port for one internal 1 GbE port (or vice versa) or trade off ten 1 GbE ports for one 10 GbE port. You then have the flexibility of turning on more ports when you need them using IBM Features on Demand upgrade licensing capabilities that provide “pay as you grow” scalability without the need to buy additional hardware.

Delivering advanced virtualization awareness and cloud readiness helps simplify management and automates VM mobility by making the network VM aware with IBM VMready® which works with all the major hypervisors.

Part number information

The part numbers to order the switch and optional upgrades are shown in Table 1.

Table 1. Part numbers and feature codes for ordering

Description	Part number	Feature code (x-config / e-config)
Switch module		
IBM Flex System EN2092 1Gb Ethernet Scalable Switch	49Y4294	A0TF / 3598
Features on Demand upgrades		
IBM Flex System EN2092 1Gb Ethernet Scalable Switch (Upgrade 1)	90Y3562	A1QW / 3594
IBM Flex System EN2092 1Gb Ethernet Scalable Switch (10Gb Uplinks)	49Y4298	A1EN / 3599

The part number for the switch, 49Y4294, includes the following items:

- One IBM Flex System EN2092 1Gb Ethernet Scalable Switch
- Important Notices Flyer
- Warranty Flyer
- Documentation CD-ROM

The switch does not include a serial management cable. However, the optional IBM Flex System Management Serial Access Cable, 90Y9338, is supported and contains two cables, a mini-USB-to-RJ45 serial cable and a mini-USB-to-DB9 serial cable, either of which can be used to connect to the switch locally for configuration tasks and firmware updates.

The part numbers for the upgrades, 90Y3562 and 49Y4298, include the following items:

- Feature on Demand Activation Flyer
- Upgrade activation key

The base switch and upgrades are as follows:

- 49Y4294 is the part number for the base switch, and it comes with 14 internal 1 GbE ports enabled, one to each compute node and ten external 1 GbE ports enabled. All external 1 GbE ports have RJ-45 connectors.
- 90Y3562 (Upgrade 1) can be applied on the base switch to take full advantage of four-port adapter cards installed in each compute node. This upgrade enables 14 additional internal ports, for a total of 28 ports. The upgrade also enables 10 additional external 1 GbE ports for a total of twenty 1 GbE external ports. This upgrade requires the base switch.
- 49Y4298 (10Gb Uplinks) can be applied on the base switch when you need more external bandwidth. The upgrade enables four external 10 GbE ports with SFP+ connectors (SFP+ transceivers or DAC cables are not included). This upgrade requires the base switch.
- Both 90Y3562 (Upgrade 1) and 49Y4298 (10Gb Uplinks) can be applied on the switch at the same time to allow you to use 28 internal 10 GbE ports leveraging all four ports on an four-port expansion card, and to utilize all external ports on the switch.

Flexible port mapping: With IBM Networking OS version 7.8 or later clients have more flexibility in assigning ports that they have licensed on the EN2092 which can help eliminate or postpone the need to purchase upgrades. While the base model and upgrades still activate specific ports, flexible port mapping provides clients with the capability of reassigning ports as needed by moving internal and external 1 GbE ports or trading off ten 1 GbE ports for the use of an external 10 GbE port. This is very valuable when you consider the flexibility with the base license and with Upgrade 1 or 10Gb Uplinks upgrade.

With flexible port mapping, clients have licenses for a specific number of ports:

- 49Y4294 is the part number for the base switch, and it provides 24x 1 GbE port licenses that can enable any combination of internal and external 1 GbE ports and external 10 GbE ports (with the use of ten 1 GbE port licenses per one 10 GbE port).
- 90Y3562 (Upgrade 1) upgrades the base switch by activation of 14 internal 1 GbE ports and ten external 1 GbE ports which is equivalent to adding 24 more 1 GbE port licenses for a total of 48x 1 GbE port licenses. Any combination of internal and external 1 GbE ports and external 10 GbE ports (with the use of ten 1 GbE port licenses per one 10 GbE port) can be enabled with this upgrade. This upgrade requires the base switch.
- 49Y4298 (10Gb Uplinks) upgrades the base switch by activation of four external 10 GbE ports. With the use of one external 10 GbE port license for ten 1 GbE ports, any combination of internal and external 1 GbE ports and external 10 GbE ports can be enabled with this upgrade. This upgrade requires the base switch.
- Both 90Y3562 (Upgrade 1) and 49Y4298 (10Gb Uplinks) simply activate all the ports on the EN2092 which is 28 internal 1 GbE ports, 20 external 1 GbE ports, and four external 10 GbE SFP+ ports.

Note: When both Upgrade 1 and 10Gb Uplinks are activated, flexible port mapping is no longer used because all the ports on the EN2092 are enabled.

The following table lists supported port combinations on the switch and required upgrades.

Table 2. Supported port combinations (Part 1: Default port mapping)

Upgrade required / Supported port combinations	Quantity		
	Base switch, 49Y4294	Upgrade 1, 90Y3562	10Gb Uplinks, 49Y4298
• 14x internal 1 GbE ports • 10x external 1 GbE ports	1	0	0
• 28x internal 1 GbE ports • 20x external 1 GbE ports	1	1	0
• 14x internal 1 GbE ports • 10x external 1 GbE ports • 4x external 10 GbE ports	1	0	1
• 28x internal 1 GbE ports • 20x external 1 GbE ports • 4x external 10 GbE ports	1	1	1

Table 2. Supported port combinations (Part 2: Flexible port mapping*)

Supported port combinations	Quantity required		
	Base switch, 49Y4294	Upgrade 1, 90Y3562	10Gb Uplinks, 49Y4298
• 24x 1 GbE ports (internal and external); each ten 1 GbE ports can be trade off for one external 10 GbE SFP+ port.	1	0	0
• 48x 1 GbE ports (internal and external); each ten 1 GbE ports can be trade off for one external 10 GbE SFP+ port.	1	1	0
• 14x 1 GbE ports (internal and external) • 4x external 10 GbE SFP+ ports; each external 10 GbE port can be trade off for a combination of ten internal and external 1 GbE ports.	1	0	1

* Flexible port mapping is available in IBM Networking OS 7.8 or later.

Supported cables and transceivers

If the 10Gb Uplinks upgrade (49Y4298) is used used or the client uses flexible port mapping to activate an external SFP+ port, then either SFP+ transceivers or DAC cables are required to provide outside connectivity. The following table lists supported SFP/SFP+ and DAC cable options.

Table 3. Supported SFP/SFP+ transceivers and DAC cables

Description	Part number	Feature code (x-config / e-config)
Serial console cables		
IBM Flex System Management Serial Access Cable Kit	90Y9338	A2RR / None
SFP transceivers - 1 GbE		
IBM SFP RJ-45 Transceiver (does not support 10/100 Mbps)	81Y1618	3268 / EB29
IBM SFP 1000Base-T (RJ-45) Transceiver (does not support 10/100 Mbps)	00FE333	A5DL / EB29
IBM SFP SX Transceiver	81Y1622	3269 / EB2A
IBM SFP LX Transceiver	90Y9424	A1PN / ECB8
SFP+ transceivers - 10 GbE		
IBM SFP+ SR Transceiver	46C3447	5053 / EB28
IBM SFP+ LR Transceiver	90Y9412	A1PM / ECB9
10GBase-SR SFP+ (MMFiber) transceiver	44W4408	4942 / 3282
SFP+ direct-attach cables - 10 GbE		
1m IBM Passive DAC SFP+ Cable	90Y9427	A1PH / ECB4
1.5m IBM Passive DAC SFP+ Cable	00AY764	A51N / None
2m IBM Passive DAC SFP+ Cable	00AY765	A51P / None
3m IBM Passive DAC SFP+ Cable	90Y9430	A1PJ / ECB5
5m IBM Passive DAC SFP+ Cable	90Y9433	A1PK / ECB6
7m IBM Passive DAC SFP+ Cable	00D6151	A3RH / ECBH

With the flexibility of the IBM switch, clients can take advantage of the technologies that they require for multiple environments:

- For 1 GbE links, you can use RJ-45 UTP cables up to 100 m.
- For 10 GbE (supported on external SFP+ ports), you can use direct-attached copper (DAC) SFP+ cables for in-rack cabling and distances up to 7 m. These DAC cables have SFP+ connectors on each end, and they do not need separate transceivers. For longer distances the 10GBASE-SR transceiver can support distances up to 300 meters over OM3 multimode fiber or up to 400 meters over OM4 multimode fiber with LC connectors. The 10GBASE-LR transceivers can support distances up to 10 kilometers on single mode fiber with LC connectors.

Benefits

The IBM Flex System EN2092 1Gb Scalable Switch is considered particularly suited for these clients:

- Clients who want to leverage GbE in their infrastructure
- Clients who are implementing a virtualized environment and require multiple GbE ports
- Clients who require investment protection for 10 Gb external ports
- Clients who want to reduce TCO and improve performance while maintaining high levels of availability and security
- Clients who want to avoid or minimize oversubscription, which can result in congestion and loss of performance

The switch offers the following key benefits:

- Increases network performance

  With the growth of virtualization and the evolution of cloud, many of today's applications require low latency and high-bandwidth performance. The EN2092 delivers non-blocking architecture with 176 Gbps throughput and full line rate performance, making it ideal for managing dynamic workloads across the network. In addition, the switch provides a rich Layer 2 and Layer 3 feature set that is ideal for many of today's data centers, plus it offers a combined external bandwidth of 60 Gb.

- Pay as you grow investment protection and lower total cost of ownership

  The EN2092's flexible port mapping allows you to buy only the ports that you need, when you need them to lower acquisition and operational costs. The base switch configuration includes 24x 1 GbE port licenses that can be assigned to internal 1 GbE connections and 1 GbE or even 10 GbE (by using ten 1 GbE licenses per one 10 GbE port) external ports. You then have the flexibility of turning on more 1 GbE connections to the compute node and more 1 GbE or 10 GbE external ports when you need them using IBM Features on Demand licensing capabilities that provide "pay as you grow" scalability without the need to buy additional hardware.

- VM-aware networking

  Delivering advanced virtualization awareness helps simplify management and automates VM mobility by making the network VM aware with IBM VMready® which works with all the major hypervisors. For companies using VMware or Linux KVM, IBM System Networking's SDN VE offerings (sold separately) enable network administrators to simplify management by having a consistent virtual and physical networking environment. 5000V virtual and physical servers use the same configurations, policies, and management tools. Network policies migrate automatically along with virtual machines (VMs) to ensure that security, performance, and access remain intact as VMs move from compute node to compute node.

- Simplifies network infrastructure

  The EN2092 1Gb Scalable Switch simplifies deployment and growth by using its innovative scalable architecture. This architecture helps increase return on investment by reducing the qualification cycle, while providing investment protection for additional I/O bandwidth requirements in the future. The extreme flexibility of the switch comes from the ability to turn on additional ports as required, both down to the compute node and for upstream connections (including 10 GbE).

- Integrates network management

  A key challenge is the management of a discrete network environment. The EN2092 1Gb Scalable Switch is tightly integrated and managed through the IBM Flex System Manager. The switch also supports a command-line interface (CLI) for integration into existing scripting and automation. Network management can be simplified by using port profiles, topology views, and virtualization management.

  For more advanced levels of management and control, IBM offers IBM System Networking Switch Center (SNSC), which can significantly reduce deployment and day-to-day maintenance times, while providing in-depth visibility into the network performance and operations of IBM switches. Plus, when leveraging tools like VMware vCenter Server or vSphere, SNSC provides additional integration for better optimization.

Features and specifications

The EN2092 Scalable Switch has the following features and specifications:

- Internal ports
  - Twenty-eight internal full-duplex Gigabit ports
  - Two internal full-duplex 1 GbE ports connected to the chassis management module
- External ports
  - Four ports for 1 Gb or 10 Gb Ethernet SFP+ transceivers (support for 1000BASE-SX, 1000BASE-LX, 1000BASE-T, 10GBASE-SR, or 10GBASE-LR) or SFP+ direct-attach copper (DAC) cables. SFP+ modules or DAC cables are not included and must be purchased separately.
  - Twenty external 10/100/1000 1000BASE-T Gigabit Ethernet ports with RJ-45 connectors
  - One RS-232 serial port (mini-USB connector) that provides an additional means to configure the switch module

- Scalability and performance
  - Fixed-speed external 10 Gb Ethernet ports for maximum external bandwidth
  - Autosensing 10/1000/1000 external Gigabit Ethernet ports for bandwidth optimization
  - Non-blocking architecture with wire-speed forwarding of traffic
  - Media access control (MAC) address learning: automatic update, support of up to 32,000 MAC addresses
  - Up to 128 IP interfaces per switch
  - Static and LACP (IEEE 802.3ad) link aggregation, up to 60 Gb of total external bandwidth per switch, up to 64 trunk groups, up to 16 ports per group
  - Support for jumbo frames (up to 9,216 bytes)
  - Broadcast/multicast storm control
  - IGMP snooping for limit flooding of IP multicast traffic
  - IGMP filtering to control multicast traffic for hosts participating in multicast groups
  - Configurable traffic distribution schemes over trunk links based on source/destination IP or MAC addresses or both
  - Fast port forwarding and fast uplink convergence for rapid STP convergence
- Availability and redundancy
  - Virtual Router Redundancy Protocol (VRRP) for Layer 3 router redundancy
  - IEEE 802.1D STP for providing L2 redundancy
  - IEEE 802.1s Multiple STP (MSTP) for topology optimization, up to 32 STP instances supported by single switch
  - IEEE 802.1w Rapid STP (RSTP) (provides rapid STP convergence for critical delay-sensitive traffic like voice or video)
  - Per-VLAN Rapid STP (PVRST) enhancements
  - Layer 2 Trunk Failover to support active/standby configurations of network adapter teaming on compute nodes
  - Hot Links provides basic link redundancy with fast recovery for network topologies that require Spanning Tree to be turned off
- VLAN support
  - Up to 1024 VLANs supported per switch, with VLAN numbers ranging from 1 to 4095 (4095 is used for management module's connection only)
  - 802.1Q VLAN tagging support on all ports
  - Private VLANs

- Security
  - VLAN-based, MAC-based, and IP-based ACLs
  - 802.1x port-based authentication
  - Multiple user IDs and passwords
  - User access control
  - Radius, TACACS+ and LDAP authentication and authorization
  - NIST 800-131A Encryption
  - Selectable encryption protocol; SHA 256 enabled as default
  - IPv6 ACL metering
- Quality of Service (QoS)
  - Support for IEEE 802.1p, IP ToS/DSCP, and ACL-based (MAC/IP source and destination addresses, VLANs) traffic classification and processing
  - Traffic shaping and re-marking based on defined policies
  - Eight Weighted Round Robin (WRR) priority queues per port for processing qualified traffic
- IP v4 Layer 3 functions
  - Host management
  - IP forwarding
  - IP filtering with ACLs, up to 896 ACLs supported
  - VRRP for router redundancy
  - Support for up to 128 static routes
  - Routing protocol support (RIP v1, RIP v2, OSPF v2, BGP-4), up to 2048 entries in a routing table
  - Support for DHCP Relay
  - Support for IGMP snooping and IGMP relay
  - Support for Protocol Independent Multicast (PIM) in Sparse Mode (PIM-SM) and Dense Mode (PIM-DM).
- IP v6 Layer 3 functions
  - IPv6 host management (except default switch management IP address)
  - IPv6 forwarding
  - Up to 128 static routes
  - Support for OSPF v3 routing protocol
  - IPv6 filtering with ACLs

- Virtualization
  - VMready
  - Switch partitioning (SPAR)
    - SPAR forms separate virtual switching contexts by segmenting the data plane of the module. Data plane traffic is not shared between SPARs on the same switch.
    - SPAR operates as a Layer 2 broadcast network. Hosts on the same VLAN attached to a SPAR can communicate with each other and with the upstream switch. Hosts on the same VLAN but attached to different SPARs communicate through the upstream switch.
    - SPAR is implemented as a dedicated VLAN with a set of internal compute node ports and a single external port or link aggregation (LAG). Multiple external ports or LAGs are not allowed in SPAR. A port can be a member of only one SPAR.
- Manageability
  - Simple Network Management Protocol (SNMP V1, V2, and V3)
  - HTTP browser GUI
  - Telnet interface for CLI
  - SSH and SSHv2
  - Serial interface for CLI
  - Scriptable CLI
  - Firmware image update (TFTP and FTP)
  - Network Time Protocol (NTP) for switch clock synchronization
- Monitoring
  - Switch LEDs for external port status and switch module status indication
  - Remote Monitoring (RMON) agent to collect statistics and proactively monitor switch performance
  - Port mirroring for analyzing network traffic passing through the switch
  - Change tracking and remote logging with the syslog feature
  - Support for the sFLOW agent for monitoring traffic in data networks (separate sFLOW analyzer required elsewhere)
  - POST diagnostics

The following features are not supported with IPv6:

- Default switch management IP address
- SNMP trap host destination IP address
- Bootstrap Protocol (BOOTP) and DHCP
- RADIUS, TACACS+ and LDAP
- QoS metering and re-marking ACLs for out-profile traffic
- VMware Virtual Center (vCenter) for VMready
- Routing Information Protocol (RIP)
- Internet Group Management Protocol (IGMP)
- Border Gateway Protocol (BGP)
- Virtual Router Redundancy Protocol (VRRP)
- sFLOW

Standards supported

The switch supports the following IEEE standards:

- IEEE 802.1D Spanning Tree Protocol (STP)
- IEEE 802.1s Multiple STP (MSTP)
- IEEE 802.1w Rapid STP (RSTP)
- IEEE 802.1p Class of Service (CoS) prioritization
- IEEE 802.1Q Tagged VLAN (frame tagging on all ports when VLANs are enabled)
- IEEE 802.1x port-based authentication
- IEEE 802.2 Logical Link Control
- IEEE 802.3 10BASE-T Ethernet
- IEEE 802.3u 100BASE-TX Fast Ethernet
- IEEE 802.3ab 1000BASE-T copper twisted pair Gigabit Ethernet
- IEEE 802.3z 1000BASE-SX short range fiber optics Gigabit Ethernet
- IEEE 802.3z 1000BASE-LX long range fiber optics Gigabit Ethernet
- IEEE 802.3ad Link Aggregation Control Protocol
- IEEE 802.3x Full-duplex Flow Control
- IEEE 802.3ae 10GBASE-SR short range fiber optics 10 Gb Ethernet
- IEEE 802.3ae 10GBASE-LR long range fiber optics 10 Gb Ethernet
- 10GSFP+Cu SFP+ Direct Attach copper

Supported chassis and adapter cards

The switches are installed in switch bays in the rear of the IBM Flex System Enterprise Chassis, as shown in the following figure. Switches are normally installed in pairs because I/O adapter cards installed in the compute nodes route to two switch bays for redundancy and performance.

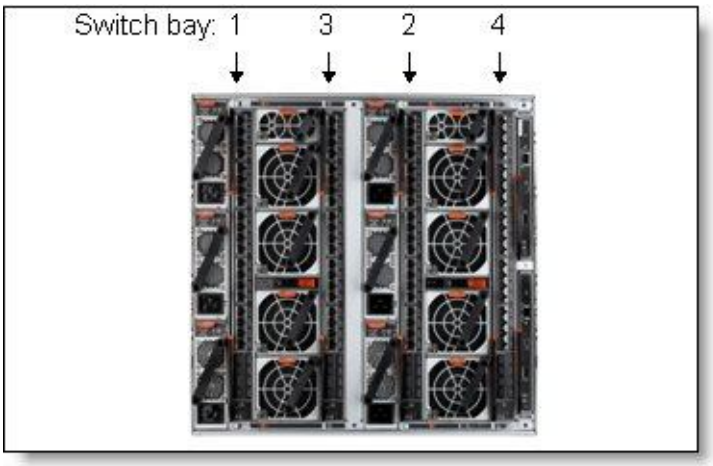

Figure 2. Location of the switch bays in the IBM Flex System Enterprise Chassis

The connections between the adapters installed in the compute nodes to the switch bays in the chassis are shown diagrammatically in the following figure. The figure shows both half-wide compute nodes, such as the x240 with two adapters, and full-wide compute nodes, such as the p460 with four adapters.

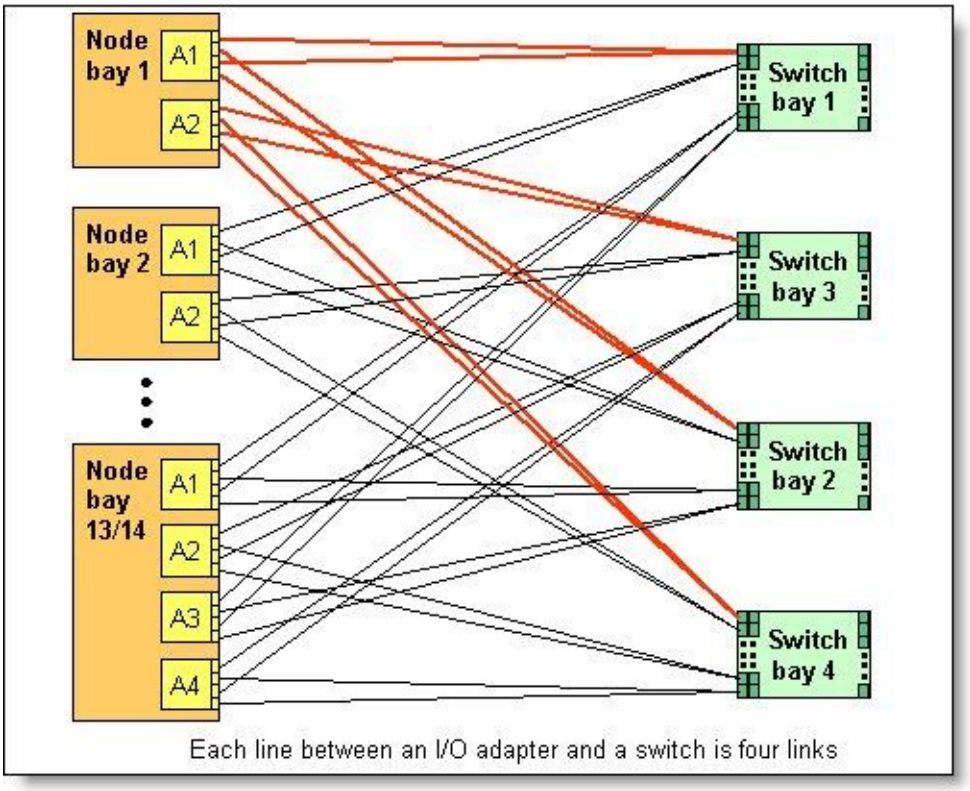

Figure 3. Logical layout of the interconnects between I/O adapters and I/O modules

The IBM Flex System EN2092 Scalable Switch can be installed in bays 1, 2, 3, and 4 of the Enterprise chassis. A supported adapter card must be installed in a corresponding slot of the compute node (slot A1 when switches are installed in bays 1 and 2 or slot A2 when switches are in bays 3 and 4).

Prior to Networking OS 7.8, with four-port adapters, an optional Upgrade 1 (90Y3562) was required for the switch to allow communications on all four ports. With IBM Networking OS 7.8 or later, there is no need to buy additional switch upgrades for 4-port adapters if the total number of port licenses on the switch does not exceed the number of external (upstream network ports) and internal (compute node network ports) connections used.

In compute nodes that have an integrated dual-port 10 GbE network interface controller (NIC), NIC's ports are routed to bays 1 and 2 with a specialized periscope connector, and the adapter card in slot A1 is not required. However, when needed, the periscope connector can be replaced with the adapter card. In such a case integrated NIC will be disabled.

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 compute nodes	Port on the adapter	Corresponding I/O module bay in the chassis
Slot 1	Port 1	Module bay 1
	Port 2	Module bay 2
	Port 3	Module bay 1
	Port 4	Module bay 2
Slot 2	Port 1	Module bay 3
	Port 2	Module bay 4
	Port 3	Module bay 3
	Port 4	Module bay 4
Slot 3 (full-wide compute nodes only)	Port 1	Module bay 1
	Port 2	Module bay 2
	Port 3	Module bay 1
	Port 4	Module bay 2
Slot 4 (full-wide compute nodes only)	Port 1	Module bay 3
	Port 2	Module bay 4
	Port 3	Module bay 3
	Port 4	Module bay 4

The following table lists compatibility information for the EN2092 1Gb Scalable Switch with I/O adapters. 10 GbE adapters operate at 1 GbE speeds when used with this switch.

Table 5. Network adapters

Description	Part number	Feature code (x-config / e-config)	Supported with EN2092
40 Gb Ethernet			
IBM Flex System EN6132 2-port 40Gb Ethernet Adapter	90Y3482	A3HK / A3HK	No
10 Gb Ethernet			
Embedded 10Gb Virtual Fabric Adapter (2-port)	None	None / None	Yes*
IBM Flex System CN4022 2-port 10Gb Converged Adapter	88Y5920	A4K3 / A4K3	No
IBM Flex System CN4054 10Gb Virtual Fabric Adapter (4-port)	90Y3554	A1R1 / None	Yes
IBM Flex System CN4054R 10Gb Virtual Fabric Adapter (4-port)	00Y3306	A4K2 / A4K2	Yes
IBM Flex System CN4058 8-port 10Gb Converged Adapter	None	None / EC24	No
IBM Flex System EN4054 4-port 10Gb Ethernet Adapter	None	None / 1762	Yes
IBM Flex System EN4132 2-port 10Gb Ethernet Adapter	90Y3466	A1QY / None	No
IBM Flex System EN4132 2-port 10Gb RoCE Adapter	None	None / EC26	No
1 Gb Ethernet			
Embedded 1 Gb Ethernet controller (2-port)**	None	None / None	Yes
IBM Flex System EN2024 4-port 1Gb Ethernet Adapter	49Y7900	A10Y / 1763	Yes

* The Embedded 10Gb Virtual Fabric Adapter is built into x222 nodes and certain models of the x240 and x440 nodes.
** The Embedded 1 Gb Ethernet controller is built into x220 nodes.

The adapters are installed in slots in each compute node. The following figure shows the locations of the slots in the x240 Compute Node. The positions of the adapters in the other supported compute nodes are similar.

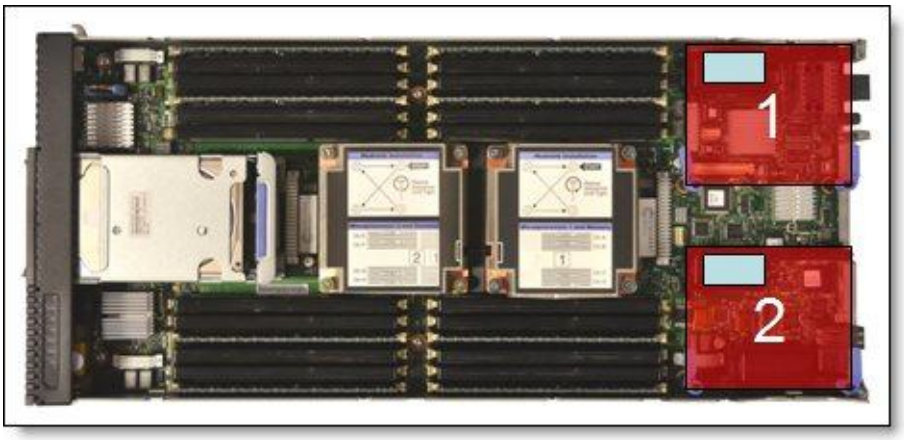

Figure 4. Location of the I/O adapter slots in the IBM Flex System x240 Compute Node

Connectors and LEDs

Figure 5 shows the front panel of the IBM Flex System EN2092 1Gb Ethernet Scalable Switch .

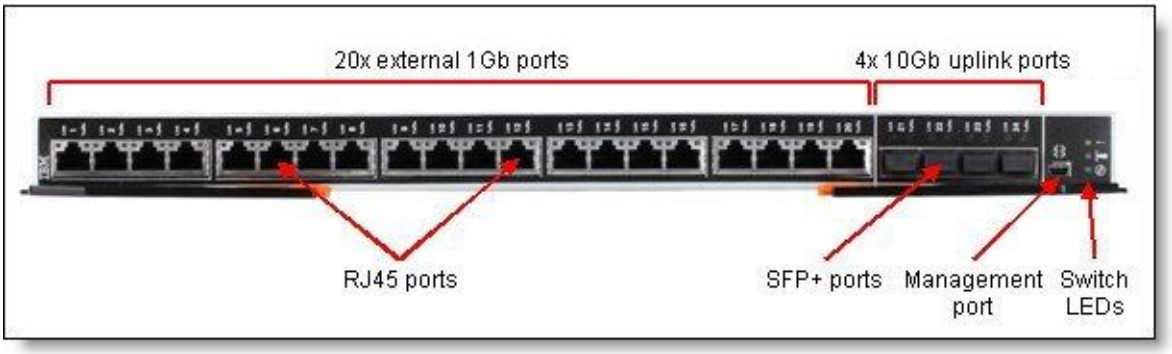

Figure 5. Front panel of the IBM Flex System EN2092 1Gb Ethernet Scalable Switch

The front panel contains the following components:

- LEDs that display the status of the switch module and the network:
  - OK LED indicates that the switch module has passed the power-on self-test (POST) with no critical faults and is operational.
  - Identify: This blue LED can be used to identify the switch physically, by illuminating via the management software.
  - Error LED (switch module error) indicates that the switch module has failed the POST or detected an operational fault.
- One mini-USB RS-232 console port that provides an additional means to configure the switch module. This mini-USB-style connector enables connection of a special serial cable. (The cable is optional and it is not included with the switch. See the "Part number information" section for details).
- Twenty external 1000BASE-T Ethernet ports for 10/100/1000 Mbps connections to external Ethernet devices.
- Four external SFP+ port connectors to attach SFP+ modules for 1 Gb or 10 Gb connections to external Ethernet devices.
- An Ethernet link OK LED and an Ethernet Tx/Rx LED for each external port on the switch module.

Network cabling requirements

The network cables that can be used with the switch are listed in the following table.

Table 6. EN2092 network cabling requirements

Transceiver	Standard	Cable	Connector
10 Gb Ethernet			
IBM SFP+ SR Transceiver (46C3447)	10GBASE-SR	850 nm OM3 multimode fiber cable (50 µ or 62.5 µ) up to 300 m or up to 400 m with OM4 multimode fiber	LC
IBM SFP+ LR Transceiver (90Y9412)	10GBASE-LR	1310 nm single-mode fiber cable up to 10 km	LC
Direct attach cable	10GSFP+Cu	SFP+ DAC cables up to 5 m (see Table 3)	SFP+
1 Gb Ethernet			
External RJ-45 ports (fixed)	1000BASE-T	UTP Category 5, 5E, and 6 up to 100 meters	RJ-45
IBM SFP RJ-45 Transceiver (81Y1618)	1000BASE-T	UTP Category 5, 5E, and 6 up to 100 meters	RJ-45
IBM SFP SX Transceiver (81Y1622)	1000BASE-SX	850 nm multimode fiber cable (50 µ or 62.5 µ) up to 550 m	LC
IBM SFP LX Transceiver (90Y9424)	1000BASE-LX	1310 nm single-mode fiber cable up to 10 km	LC
Management ports			
External 1 GbE management port	1000BASE-T	UTP Category 5, 5E, and 6 up to 100 meters	RJ-45
External RS-232 management port	RS-232	DB-9-to-mini-USB or RJ-45-to-mini-USB console cable (comes with optional Management Serial Access Cable, 90Y9338)	Mini-USB

Warranty

The switch carries a 1-year, customer-replaceable unit (CRU) limited warranty. When installed in a chassis, these switches assume your system's base warranty and any IBM ServicePac® upgrade.

Physical specifications

The approximate dimensions and weight of the switch are as follows:

- Height: 30 mm (1.2 inches)
- Width: 401 mm (15.8 inches)
- Depth: 317 mm (12.5 inches)
- Weight: 3.7 kg (8.1 lb)

Shipping dimensions and weight (approximate):

- Height: 114 mm (4.5 in)
- Width: 508 mm (20.0 in)
- Depth: 432 mm (17.0 in)
- Weight: 4.1 kg (9.1 lb)

Agency approvals

The switch conforms to the following regulations:

- United States FCC 47 CFR Part 15, Subpart B, ANSI C63.4 (2003), Class A
- IEC/EN 60950-1, Second Edition
- Canada ICES-003, issue 4, Class A
- Japan VCCI, Class A
- Australia/New Zealand AS/NZS CISPR 22:2006, Class A
- Taiwan BSMI CNS13438, Class A
- CE Mark (EN55022 Class A, EN55024, EN61000-3-2, EN61000-3-3)
- CISPR 22, Class A
- China GB 9254-1998
- Turkey Communique 2004/9; Communique 2004/22
- Saudi Arabia EMC.CVG, 28 October 2002

Typical configurations

Prior to IBM Networking OS 7.8, compute nodes with 4-port network adapters required Upgrade 1 for the EN2092 to enable connectivity on all four adapter ports despite of number of compute nodes and external connections used. With the introduction of flexible port mapping in IBM Networking OS 7.8, if the Flex System chassis is not fully populated with the compute nodes that have four network ports, there might be no need to buy Upgrade 1.

Consider the following scenario. You are planning to install ten x240 compute nodes with EN2024 adapters or ten dual-server x222 compute nodes that will be connected to two EN2092 switches installed in I/O bays 1 and 2. You are also planning to use four external 1 GbE ports on each EN2092 for the connectivity to the upstream network. In this scenario, the total number of 1 GbE ports needed per one EN2092 is 24. The base switch supplies required 24 port licenses; therefore, the solution can be implemented without the need to buy Upgrade 1.

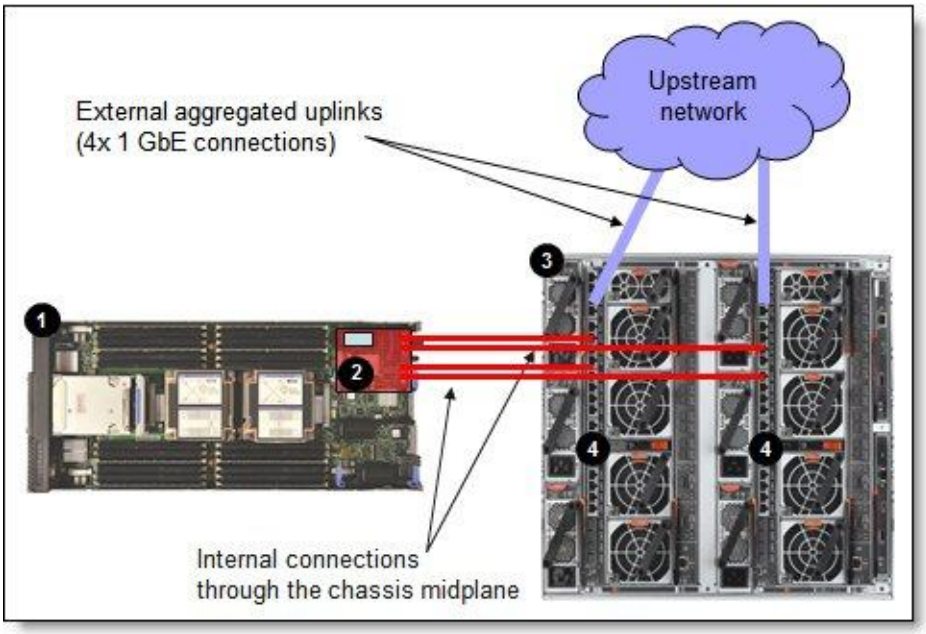

Figure 6. EN2092 flexible port mapping with EN2024 4-port adapter card

The solution components used in the scenario shown in Figure 10 are listed in Table 11.

Table 7. EN2092 flexible port mapping with EN2024 4-port adapter card

Diagram reference	Description	Part number	Quantity
1	IBM Flex System x240 Compute Node or other supported compute node	Varies	Up to 10
2	IBM Flex System EN2024 4-port 1Gb Ethernet Adapter	49Y7900	1 per compute node
3	IBM Flex System Enterprise Chassis with additional power supplies and fan modules if needed	8721A1G	1
4	IBM Flex System EN2092 1Gb Ethernet Scalable Switch	49Y4294	2 per chassis

Related publications and links

For more information see the following IBM Flex System EN2092 1Gb Ethernet Scalable Switch product publications, available from the IBM Flex System Information Center:
http://publib.boulder.ibm.com/infocenter/flexsys/information/index.jsp

- *Installation Guide*
- *Application Guide*
- *Command Reference*

Other documents:

- US Announcement Letter 112-053
  http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS112-053
- IBM Flex System Enterprise Chassis Product Guide
  http://www.redbooks.ibm.com/abstracts/tips0865.html
- *IBM Flex System Interoperability Guide*
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- IBM Redbooks Product Guides for IBM Flex System compute nodes and options
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- IBM System x Configuration and Options Guide:
  http://ibm.com/systems/xbc/cog/
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  http://ibm.com/systems/info/x86servers/serverproven/compat/us/flexsystems.html

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This document was created or updated on May 16, 2014.

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