The Flex System PCIe Expansion Node increases the capability of a standard width Flex System Compute Node with additional dedicated PCIe and mezzanine expansion

Table of contents
1 Overview 5 Publications
2 Key prerequisites 6 Technical information
2 Planned availability date 8 Terms and conditions
2 Description 9 Prices
4 Product positioning 9 Announcement countries
4 Product number

At a glance

IBM Flex System™ is a new category of computing that integrates multiple server architectures, networking, storage, and system management capability into a single system.

Offerings in this announcement include:

• IBM Flex System Enterprise Chassis
• IBM Flex System Manager
• IBM Flex System Compute Nodes
• IBM Flex System Scalable Network and Storage Switches

The IBM Flex System PCIe Expansion Node (PEN) provides the ability to attach additional PCIe express cards, fabric mezzanine cards, and next-generation graphics processing units (GPU) to an IBM Flex System compute node, expanding the compute node's capability.

Overview

The IBM Flex System PCIe Expansion Node (PEN) provides the ability to attach additional PCI express cards, fabric mezzanine cards, and next-generation graphics processing units (GPU) to an IBM Flex System compute node, expanding the compute node's capability.

• Fits into one standard width Flex System Enterprise chassis node.
• Supports two full-length, full-height x16 and two low-profile x8 Gen 2 PCI Express® slots.
• Can support up to two full-high cards.
• Can support up to four low-profile cards.
• Can support up to one full-length, full-height double-wide adapter.
• Supports 75W PCIe cards and greater, using standard PCIe auxiliary power connectors. Contact your IBM® representative for additional information on other high-wattage graphics adapters that can be supported.
• Provides dedicated attachment of select standard PCIe Adapters (such as GPUs) and select standard High IOPS PCIe expansion adapters.
• Allows for expansion up to two additional Flex System PCIe Mezzanine cards.

For a list of supported Flex System Compute nodes, adapters, and operating systems, refer to the ServerProven® web page

http://www-03.ibm.com/systems/info/x86servers/serverproven/compat/us/flex.html

The IBM Flex System PCIe Expansion Node is ideal for variety of applications environments, such as:

• Specific telecommunications network environments that require standard PCIe adapter connectivity to a Flex System Compute node.
• Applications environments written to take advantage of acceleration and visualization performance leveraging GPUs connected to Flex System Compute nodes.

The most forward thinking companies will completely rethink the way they deploy and manage their IT environments by evolving to a more open, agile, and integrated computing system that is dynamically managed from a single vantage point to simultaneously maximize efficiency and innovation.

By doing this, companies can:

• Improve efficiency and utilization through integration
• Optimize heterogeneous environments, providing the right architecture for the right workload
• Increase speed and dexterity at the enterprise level
• Improve control through simplicity, automation, compliance, and security
• Improve economics with faster time-to-value through real-time scalability
• Deliver insights faster to gain a competitive advantage

IBM Flex System can help enterprises achieve faster time to value of their IT assets, increase control of their environment, and minimize the complexity inherent in a highly virtualized environment.

Key prerequisites

• IBM Flex System Enterprise Chassis
• IBM network switch
• Appropriate PDUs and main power distribution
• Monitor, keyboard, and mouse for setup

Planned availability date

August 24, 2012

Description

**IBM Flex System PCI Expansion Node**

The PCI Expansion Node (PEN) is a PCIe expansion module designed for installation in the Flex System Enterprise Chassis. It is designed to provide PCIe expansion to compute nodes. It is a PCIe Generation 2-compliant enclosure. The design for the PEN is a captive mode where the resources are dedicated to a single compute node.

The PEN attaches to compute nodes through the captive interposer connector.
The compute node is on the left side, and is always installed in the left side of the chassis and the PEN is on the right side, and is always installed on the right side of the chassis. The compute node and PEN are installed as a single enclosure although individually they are standard width nodes, and installed and operate as a double-wide node.

The PEN adds two additional mezzanine cards to the compute node along with up to four PCIe stand-up adapters. The PCIe stand-up adapters are connected to the riser cards which are installed in the PEN. The adapters can be a combination of full-high full-length, full-high half-length, or low profile adapters.

The MEZ0 connector on the compute node provides the x16 PCIe bus, the management interface, and sideband control signaling for PEN. PEN does not directly interface with the Chassis Management Module (CMM) or Flex System Manager Node (FSM) and does not connect to any management interfaces in the midplane.

PEN has two 16x slots and two 8x slots for PCIe cards, and two 16x MEZ connectors for fabric mezzanine cards.

The PEN connects to a single compute node using the interposer cable. This is the only upstream port in the configuration. All other ports are considered downstream. The upstream port connects from the interposer connector to a single PCIe switch which, expands the PCIe bus to six downstream ports. These downstream ports may further be bifurcated depending on the types and number of devices that are connected to the system. The PCIe bus of the PEN across the interposer cable connector is limited by the PCIe bus width and speed of the compute node to the connected cable. The bifurcation of the upstream port is controlled by either the compute node attaching to PEN or directly through sideband signaling on the interposer connector. When connected to two 8x PCIe buses, PEN splits the switch into two virtual switches splitting the downstream ports between the two virtual switches.

Support for adapters:

- Standard height cards, 4.20 in (106.7 mm)
- Low profile cards, 2.536 in (64.4 mm)
- Half length cards, 6.6 in (167.65 mm)
- Full length cards, 12.283 in (312 mm)
- Support up to four PCIe cards
- Up for up to four low-profile cards
- Up for up to two full-height cards
- Up for up to one full-height double-wide card
- Support for PCIe Standards 1.0 and 2.0
- Support for PCIe x16 Graphics 150W ATX Specification 1.0
- Support for PCIe 225W/300W High Power CEM Specification 1.0 (only 225W adapters supported)
- Support for 75W PCIe cards and greater using two PCIe 2x3 75W auxiliary power connectors

IBM is planning support for the following list of adapter cards. Although the PEN design is to allow for a much greater set of standard PCIe adapter cards, this list is to document the specific cards that will be available for release 1 ship support.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>81Y4519</td>
<td>640 GB High IOPS MLC Duo Adapter for IBM System x</td>
</tr>
<tr>
<td>81Y4527</td>
<td>1.28 TB HIGH IOPS MLC DUO ADAPTER FOR IBM SYSTEM x</td>
</tr>
<tr>
<td>90Y4377</td>
<td>IBM 1.2 TB High IOPS MLC Mono Adapter</td>
</tr>
<tr>
<td>90Y4397</td>
<td>IBM 2.4 TB High IOPS MLC Duo Adapter</td>
</tr>
<tr>
<td>94Y5960</td>
<td>NVIDIA Tesla M2090</td>
</tr>
<tr>
<td>49Y7900</td>
<td>IBM Flex System EN2024 4-port 1Gb Ethernet Adapter</td>
</tr>
<tr>
<td>90Y3466</td>
<td>IBM Flex System EN4132 2-port 10Gb Ethernet Adapter</td>
</tr>
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</table>
The front facing bezel of the PEN is inset from the normal face of the compute nodes. This is to allow for the use of cables connected to PCIe adapter cards that support external IO. PEN provides up to 80 mm of space in the front of the PCIe adapter cards to allow for the bend radius of these cables.

**PEN performance**

The following information describes compute node performance when the PCIe Bus is used with GPU-based and Fusion-based IO cards.

Flex System x240 and x220 Compute Nodes both support a PCIe Gen 3 (8.0 GT/s) with x16 maximum bus width interposer connection. The PEN provides a Gen 2 (5.0 GT/s) x16 interposer connection. The compute nodes will link train to the PEN Gen 2 link speed for compatibility.

**Accessibility by people with disabilities**

A US Section 508 Voluntary Product Accessibility Template (VPAT) containing details on accessibility compliance can be requested at


**Product positioning**

IBM Flex System suits multiple delivery models, from highly customizable hardware platforms to a fully integrated and optimized system.

- IBM Flex System hardware 'building blocks' are made up of individual components that can be mixed and matched, and are fully customizable with optional management.
- IBM Flex System solutions are made up of a chassis with an integrated management appliance, IBM networking, and storage standard.
- IBM Flex System optimized offerings are made up of preconfigured, highly customized systems - focused on selected workloads or single-purpose such as PureFlex™ or Cloudburst.

**Product number**

**Options**

<table>
<thead>
<tr>
<th>Option part number</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>81y8983</td>
<td>IBM Flex System PCIe Expansion Node</td>
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<tr>
<td>00y3324</td>
<td>IBM Flex System FC5022 24-port 16Gb SAN Scalable Switch</td>
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</table>
**Pseudo part numbers**

**Note:** The following Pseudo part numbers cannot be ordered as stand-alone parts and can only be ordered via configurator.

<table>
<thead>
<tr>
<th>Pseudo Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>94Y6734</td>
<td>IBM Flex System Compute Node WW packaging - Standard+Expansion</td>
</tr>
<tr>
<td>81Y5239</td>
<td>IBM Flex System PCIe Expansion Node</td>
</tr>
<tr>
<td>00W1950</td>
<td>Full Height Smart Baffle</td>
</tr>
<tr>
<td>00W1951</td>
<td>Low Profile Smart Baffle</td>
</tr>
<tr>
<td>00W1952</td>
<td>IBM Flex System Compute Node WW packaging - Standard+Expansion</td>
</tr>
</tbody>
</table>

**Publications**


https://www-304.ibm.com/systems/support/

Under "Product Support", select " System x® ", and under "Choose your page" select "Documentation."

IBM Systems Information Center provide you with a single site where you can access product documentation for IBM systems hardware, operating systems, and server software. Through a consistent framework, you can efficiently find information and personalize your access. The IBM Systems information Centers are at


Multilingual support is provided for many of the IBM Flex System PCIe Expansion Node components in the following languages:

- Brazilian Portuguese
- Chinese (Simplified and Traditional)
- English (US and UK)
- French
- German
- Italian
- Japanese
- Korean
- Spanish

The multilingual support includes national language keyboard support, multilingual nomenclature, and translated documentation as required by the individual countries.

**Services**

**Global Technology Services**

IBM services include business consulting, outsourcing, hosting services, applications, and other technology management.

These services help you learn about, plan, install, manage, or optimize your IT infrastructure to be an on-demand business. They can help you integrate your high-speed networks, storage systems, application servers, wireless protocols, and an
array of platforms, middleware, and communications software for IBM and many non-IBM offerings. IBM is your one-stop shop for IT support needs.

For details on available services, contact your IBM representative or visit

http://www.ibm.com/services/

For details on available IBM Business Continuity and Recovery Services, contact your IBM representative or visit

http://www.ibm.com/services/continuity

For details on education offerings related to specific products, visit


Select your country, and then select the product as the category.

### Technical information

#### Specified operating environment

**Dimensions - IBM Flex System PCIe Expansion Node**

- Height: 55.5 mm (2.19 in)
- Depth: 489 mm (19.25 in)
- Width: 217 mm (8.54 in)
- Maximum weight: 5.41 kg (11.9 lb)

**Electrical**

IBM Flex System PCIe Expansion Node: 12.2 (nominal) V dc

**Note:** All weights and measurements are approximate.

#### Standards

**Equipment approvals and safety**

- IEC 60950-1, GOST R 51318.22, GOST R 51318.249, GOST R 51317.3.2, GOST R 51317.3.3
- IEC 60950-1 (CB Certificate and CB Test Report)
- CE Mark (EN55022 Class A, EN55024, EN61000-3-2, EN61000-3-3)
- CISPR 22, Class A

**Operating environment**

The IBM Flex System PCIe Expansion Node complies with ASHRAE Class A3 specifications.

- Power on:
  - Temperature: 5°C to 40°C (41°F to 104°F)
  - Humidity, noncondensing: -12°C dew point (10.4°F) and 8% - 85% relative humidity
  - Maximum dew point: 24°C (75°F)
  - Maximum altitude: 3,048 m (10,000 ft)
  - Maximum rate of temperature change: 5°C/hr (41°F/hr)
- Power off:
  - Temperature: 5°C to 45°C (41°F to 113°F)
  - Relative humidity: 8% - 85%
- Maximum dew point: 27°C (80.6°F)

- Storage (nonoperating):
  - Temperature: 1°C to 60°C (33.8°F to 140°F)
  - Altitude: 3,050 m (10,006 ft)
  - Relative humidity: 5% - 80%
  - Maximum dew point: 29°C (84.2°F)

- Shipment (nonoperating):
  - Temperature: -40°C to 60°C (-40°F to 140°F)
  - Altitude: 10,700 m (35,105 ft)
  - Relative humidity: 5% - 100%
  - Maximum dew point: 29°C (84.2°F)
  - Particulate contamination

**Note:** Government regulations (such as those prescribed by OSHA or European Community Directives) may govern noise level exposure in the workplace and may apply to you and your server installation. This IBM system is available with an optional acoustical door feature that can help reduce the sound emitted from this system. The actual sound pressure levels in your installation depend upon a variety of factors, including the number of racks in the installation; the size, materials, and configuration of the room; the noise levels from other equipment; the room ambient temperature, and employees' location in relation to the equipment. Further, compliance with such government regulations also depends upon a variety of additional factors, including the duration of employees' exposure and whether employees wear hearing protection. IBM recommends that you consult with qualified experts in this field to determine whether you are in compliance with the applicable regulations.

**Compatibility**

Contact your IBM representative or IBM Business Partner, or refer to the *IBM Sales Manual* for information on the compatibility of hardware and software for System x servers. The *Sales Manual* is updated periodically as new features and options are announced that support these servers.

**Limitations**

- Compute Nodes x220 and x240 require two installed CPUs when connecting a PCIe Expansion Node (PEN).

- One or two mezzanine expansion cards may be installed on the Flex System PCIe Expansion Node (PEN).

- Mezzanine expansion cards installed in the Flex System PCIe Expansion Node (PEN) require a switch module in the Flex System Enterprise Chassis of the same connectivity type.

- Regarding the used of solid-state disk drives, solid-state memory cells have an intrinsic, finite number of write cycles that each cell can incur. As a result, each solid-state device has a maximum amount of write cycles to which it can be subjected, documented as TBW (Total Bytes Written). IBM is not responsible for replacement of hardware that has reached the maximum guaranteed number of write cycles. This limit may be revealed as the device failing to respond to system-generated commands or become incapable of being written to. Additional information is available at http://www-03.ibm.com/systems/x/options/storage/solidstate/index.html

**Planning information**

**Customer responsibilities**

The IBM Flex System PCIe Expansion Node server is designated as customer setup. Customer setup instructions are shipped with each system.
**Cable orders**

All cables are supplied with the IBM Flex System PCIe Expansion Node. Depending on the applications, the cables may be fully installed, partially installed (plugged at one end and packaged for shipping), or included as part of a shipment group.

**Packaging**

**Ship group**

The system carton contains the system unit and a ship-group kit containing the following documents and CDs:

- Important Notices booklet
- IBM Warranty Information booklet
- Product Documentation CD that includes the following documents:
  - Installation and Service Guide
  - IBM Safety Information
  - Product machine code license and other licenses and notices
- Environmental Notice and User Guide Documentation CD

The *Installation and Service Guide* on the Product Documentation CD contains the installation, use, and troubleshooting information necessary to use and service the product.

**Supplies**

None

**Security, auditability, and control**

The customer is responsible for evaluation, selection, and implementation of security features, administrative procedures, and appropriate controls in application systems and communications facilities.

**Global Technology Services**

Contact your IBM representative for the list of selected services available in your country, either as standard or customized offerings, for the efficient installation, implementation, and/or integration of this product.

**Terms and conditions**

**Field installable feature**

Yes

**Warranty period**

One year.

An IBM part or feature installed during the initial installation of an IBM machine is subject to a full warranty effective on the date of installation of the machine. An IBM part or feature that replaces a previously installed part or feature assumes the remainder of the warranty period for the replaced part or feature. An IBM part or feature added to a machine without replacing a previously installed part or feature is subject to a full warranty effective on its date of installation. Unless specified otherwise, the warranty period, type of warranty service, and service level of a part or feature are the same as those for the machine in which it is installed.
The following has been designated as consumables or supply items and is, therefore, not covered by this warranty:

- None

The following part has been designated as a Tier 1 CRU:

- PEN

**Customer setup**
Yes

**Machine code**
No. Same license terms and conditions as base machine.

All other terms and conditions are the same as those applicable to the IBM machine type in which the feature is installed.

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**Prices**

For all local charges, contact your IBM representative.

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**Announcement countries**

All European, Middle Eastern, and African countries.

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