IBM Power System S822LC for Big Data simplifies and optimizes your data center for Linux workloads ranging from the cloud to business-critical applications

At a glance

IBM(R) Power(R) System S822LC for Big Data (8001-22C) server is a storage-rich, powerful 1-socket or 2-socket server that offers 8, 10, 16, or 20 fully activated cores and I/O configuration flexibility to meet today's growth and tomorrow's processing needs. The server features are designed for big data workloads and business-critical applications.

The new Power System S822LC for Big Data model offers:

- Powerful IBM POWER8(R) Server Connectivity Module (SCM) processors that offer 3.32 GHz (3.857 GHz turbo) or 2.92 GHz (3.492 GHz turbo) performance with 8, 10, 16, or 20 fully activated cores
- Up to 512 GB of memory
- Five PCIe slots and four CAPI enabled (a maximum of two CAPI devices can be used concurrently)
- Two Nvidia K80 GPU capable
- Twelve 2.5-inch or 3.5-inch SATA/SAS drives for a maximum of 96 TB hard disk drive (HDD) storage or 45.6 TB of solid-state drive (SSD) storage
- Four 2.5-inch NVMe-enabled drive bays
- Two 64 GB or 128 GB SATA DOM flash modules (local, captive boot devices)
- DDR4 DRAM
- Two hot-swap, redundant power supplies
- 19-inch rack-mount hardware (2U)

Overview

The Power System S822LC for Big Data server is designed to deliver superior performance and throughput for high-value Linux(TM) workloads such as big data, MySQL, NoSQL, PHP, and key open source workloads. It is the server of choice for clients that want the advantages of running their big data, Java(TM), open source, and industry applications on a platform designed and optimized for cloud, data, and Linux. Additionally, the server is simple to order and can scale from single racks to large clusters with a simple deployment.

The Power S822LC for Big Data server supports up to two processor sockets, offering 16-core 3.32 GHz (3.857 GHz turbo) or 20-core 2.92 GHz (3.492 GHz...
turbo) POWER8 configurations in a 19-inch rack-mount, 2U (EIA units) drawer configuration. All the cores are activated.

The Power S822LC for Big Data server provides eight, twelve, or sixteen DIMM memory slots. Supported memory features are 4 GB (#EKM0), 8 GB (#EKM1), 16 GB (#EKM2), and 32 GB (#EKM3).

The Power S822LC for Big Data server also offers:

- Superior throughput and performance for high-value Linux workloads
- Low acquisition cost through system optimization (industry standard memory, limited configurations, limited I/O and expansion, and industry standard warranty)
- Rich I/O options in the system unit, including:
  - Two PCIe x16 G3 FH slots, CAPI enabled
  - Two PCIe x8 G3 FH slots, CAPI enabled
  - One PCIe x8 G3 LP slot
- Twelve LFF/SFF bays for twelve HDDs or twelve SSDs and four available for NVMe
- Integrated SATA RAID controller with RAID 0, 1, and 10 support
- Two rear USB 3.0 ports
- Two hot-swap, redundant 200 - 240 V AC power supplies
- 19-inch rack-mount 2U configuration
- Two Nvidia K80 GPU capable
- Operating systems:
  - Ubuntu Server 14.04.5 LTS
  - Ubuntu Server 16.04.1 LTS
  - Red Hat Enterprise Linux (RHEL) 7.2 little endian, for Power, or later, with i40e driver update available from RHN

Key prerequisites

One of the following operating systems is required:

- Ubuntu Server 14.04.5 LTS
- Ubuntu Server 16.04.1 LTS
- RHEL 7.2 little endian, for Power, or later, with i40e driver update available from RHN

Planned availability date

September 8, 2016

Description

Summary of standard features for the Power S822LC for Big Data server:

- Power Systems™ server built with POWER8 processor modules
  - 8-core, 3.32 GHz (3.857 GHz turbo)
  - 10-core, 2.92 GHz (3.492 GHz turbo)
- High-performance DDR4 memory
  - 4 GB (#EKM0), 8 GB (#EKM1), 16 GB (#EKM2), and 32 GB (#EKM3) memory features
- Up to 512 GB memory
- Storage bays
  - Twelve LFF/SFF bays for twelve HDDs or twelve SSDs
  - Twelve LFF SATA disk drives of 2 TB (#EKDA), 4 TB (#EKDB), 6 TB (#EKDC), or 8 TB (#EKDD)
  - Twelve 960 GB SATA SSDs (#EKS3)
- PCIe Gen3 slots
  - Two PCIe x16 G3 FH slots, CAPI enabled
  - Two PCIe x8 G3 FH slots, CAPI enabled
  - One PCIe x8 G3 LP slot
- Integrated:
  - Two rear USB 3.0 ports
- Two hot-swap redundant power supplies
- 19-inch rack-mount hardware (2U)

**Power 8001-22C system configuration**

The minimum Power 8001-22C initial order must include one processor module, eight 4 GB memory adapters, one LAN adapter, two power supplies, two line cords, rack-mounting hardware, a system software indicator, a rack integrator specify, and a Language Group Specify.

Linux is the operating system. The minimum defined initial order configuration is as follows:

<table>
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<tr>
<th>Feature number</th>
<th>Description</th>
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<tr>
<td>EKP4 x 1</td>
<td>8-core 3.32 GHz (3.857 GHz turbo) POWER8 Processor Module</td>
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<td>EKP5 x 1</td>
<td>10-core 2.92 GHz (3.492 GHz turbo) POWER8 Processor Module</td>
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<td>EKM0 x 8</td>
<td>4 GB DIMMs, 1600 MHz, 4Gb DDR4 DRAM</td>
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<td>4650 x 1</td>
<td>Rack Indicator -- Not Factory Integrated</td>
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<td>EKB1 x 1</td>
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<td>or</td>
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<td>EKB5 x 1</td>
<td>2S LFF Assembly</td>
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<td>2147 x 1</td>
<td>Primary OS Linux</td>
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<td>9xxx x 1</td>
<td>Language Group Specify (select one from announced features)</td>
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</table>

**Note:** If a rack is wanted, it must be ordered as an MTM rack on initial system orders. If the rack is included on the same system order, it will be shipped at the same time in the same shipment, but in separate packing material. IBM does not offer IBM Manufacturing rack integration of the server into the rack before shipping at this time.

**Processor modules**

A minimum of one processor module is required with up to eight feature EKP4 processor cores or ten feature EKP5 processor cores allowed. All processor cores are activate. The system assembly that is selected, either 1S or 2S, determines which processor is required.

No processor activation features are used or orderable on the 8001-22C. All processor cores/"n-ways" are always fully activated.

**Note:** The mixing of different processor features on the same system is not allowed.

**System memory**

With the 1S assembly, the server has eight memory slots. With the 2S assembly, the server has 16 memory slots. Each memory slot can hold one memory feature. A
minimum of eight memory features is required. With 4 GB DIMMs, 32 GB of memory is required. With 8 GB DIMMs, 64 GB of memory is required. With 16 GB DIMMs, 128 GB is required. With 32 GB DIMMs, 256 GB is required.

Memory must be plugged in quads; populating in quads maximizes memory bandwidth.

**Note:** The mixing of memory features is not allowed.

Plans for future memory upgrades should be taken into account when deciding which memory feature size to use at the time of the initial system order.

### DIMM memory features

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<tr>
<th>Feature name</th>
<th>Feature number</th>
<th>Maximum quantity</th>
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<td>8 GB 1600 MHz</td>
<td>EKM1</td>
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<td>16 GB 1600 MHz</td>
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<tr>
<td>32 GB 1600 MHz</td>
<td>EKM3</td>
<td>16</td>
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</tbody>
</table>

### I/O adapters

The system contains the following adapter slots:

- Two PCIe x16 G3 FH slots, CAPI enabled
- Two PCIe x8 G3 FH slots, CAPI enabled
- One PCIe x8 G3 LP slot

Only LP adapters can be placed in LP slots. An x8 adapter can be placed in an x16 slot, but an x16 adapter cannot be placed in an x8 slot.

One LP slot must be used for a required Ethernet adapter (#EKC0).

### Power supply

- Two supplies: 1600 Watt 200 - 240 V AC (included in base)

### Power cords

- Two identical power cords (included in base).

### Reliability, Availability, and Serviceability

#### Reliability, fault tolerance, and data correction

The S822LC server brings POWER8 processor and memory RAS functionality into a highly competitive cloud data center with Open Source Linux technology as the operating system and virtualization. The Open Power Abstraction Layer (OPAL) firmware provides a hypervisor and operating system-independent layer, exploiting the robust error detection and self-healing functions built into the POWER8 processor and memory buffer modules.

The processor address-paths and data-paths are protected with parity or Error Correcting Codes (ECC). The control logic, state machines, and computational units have sophisticated error detection. The processor core soft errors or intermittent errors are recovered with processor instruction retry. Unrecoverable errors are reported as machine check. Errors that affect the integrity of data lead to system check-stop.

The Level 1 (L1) data and instruction caches in each processor core are parity protected and data are stored through to L2 immediately. L1 caches have a retry capability for intermittent errors and a cache set delete mechanism for handling solid failures. The L2 and L3 caches in the POWER8 processor and L4 cache in the memory buffer chip are protected with double-bit detect, single-bit ECC. In addition, a threshold of correctable errors detected on cache lines can result in the data in the cache lines being purged and the cache lines removed from further access without requiring a reboot. An uncorrectable error detected in these caches can also trigger
a purge and delete of cache lines. This does not impact the current operation if the cache lines contained data unmodified from what was stored in system memory.

The memory subsystem has proactive memory scrubbing to help prevent accumulation of multiple single-bit errors. The ECC scheme can correct the complete failure of any one memory module within an ECC word. After marking the module as unusable, the ECC logic can still correct single symbol (two adjacent bit) errors. An uncorrectable error of data of any layer of cache up to the main memory is marked to prevent usage of fault data. The processor's memory controller and the memory buffer have retry capabilities for certain fetch and store faults.

**Special Uncorrectable Error handling**

Special Uncorrectable Error (SUE) handling is designed to prevent an uncorrectable error in memory or cache from immediately causing a machine check with uncorrectable error. The system marks the data such that if the data would ever be read again, it would generate a machine check with uncorrectable error. Termination may be limited to the program or partition or hypervisor owning the data. If the data is referenced by an I/O adapter, it would freeze if data were transferred to an I/O device.

**Thermal management, current/voltage monitoring**

The On Chip Controller (OCC) monitors various temperature sensors in the processor module, memory modules, and environmental temperature sensors and steers the throttling of processor cores and memory channels should the temperature rise over thresholds defined by the design. The power supplies have their own independent thermal sensors and monitoring.

Power supplies and voltage regulator modules monitor over-voltage, under-voltage, and over-current conditions. They report into a power good tree that is monitored by the Service Processor.

**PCI extended error handling**

PCI extended error handling (EEH)-enabled adapters respond to a special data packet generated from the affected PCI slot hardware by calling system firmware, which will examine the affected bus, enable the device driver to reset it, and continue without a system reboot. For Linux, EEH support extends to the majority of frequently used devices, although some third-party PCI devices may not provide native EEH support.

**Chassis policy after input power loss and auto restart after system-check-stop**

The boot parameter "chassis policy" controls whether the server returns to the previous state or powers up axiomatically after an input power loss. The system automatically reboots after a system-check-stop, and it is up to the system management software to decide on whether to use the server with potentially fewer resources.

**Serviceability**

The server is designed for system install and setup, feature install and remove, proactive maintenance, and corrective repair performed by the client:

- Customer Install and Setup (CSU)
- Customer Feature Install (CFI)
- Customer Repairable Units (CRU)

Warranty Service Upgrades are offered for an On Site Repair (OSR) by an IBM System Services Representative (SSR) or by an authorized warranty service provider.
IBM Knowledge Center provides up-to-date documentation to effectively service the system with:

- Quick Install Guide
- User’s Guide
- Troubleshooting Guide
- Boot Configuration Guide

The documentation can be downloaded in PDF format or used online with an internet connection.

**Service processor**

The service processor supports the Intelligent Platform Management Interface (IPMI 2.0) and Data Center Management Interface (DCMI 1.5) and Simple Network Management Protocol (SNMP V2 and V3) for system monitoring and management. The service processor provides platform system functions such as power on/off, power sequencing, power fault monitoring, power reporting, fan/thermal control, fault monitoring, VPD inventory collection, Serial over LAN (SOL), Service Indicator LED management, code update, and event reporting through system event logs (SEL). All SELs can be retrieved either directly from the service processor or from the host operating system (Linux). The service processor monitors the operation of the firmware during the boot process and also monitors the hypervisor for termination. The firmware code update is supported through the service processor and IPMI interface. The firmware image can be updated or flashed, regardless of its current state.

**Service interface**

The service interface enables the client and the support personnel to communicate with the service support applications in a server by connecting directly or remotely through a web browser or command-line interface. It provides access to various service applications and available actions. The service interface enables client and support personnel to manage system resources, inventory, and service information in an efficient and effective way.

Different service interfaces are used, depending on the state of the system and the task that is being accomplished. The primary service interfaces are:

- Service processor: Ethernet Service Network with IPMI version 2.0, systems management GUI via web browser
- Service indicator LEDs: System attention and system identification (front and back)
- Host operating system: Command-line interface

The primary service applications are:

- System event logs (SEL)
- Operating system event logs
- Sensor status GUI
- LEDs for problem determination (PD) when next to the system, locally

**Concurrent maintenance**

The following components can be replaced without powering off the server:

- Drives in the front bay
- Power supplies

**Error handling and reporting**
In the event of a system hardware failure or environmentally induced failure, the system error capture capability systematically analyzes the hardware error signature to help determine the cause of the failure. The processor and memory recoverable errors are handled through Processor Runtime Diagnostics (PRD) in the OPAL layer and generate a SEL. An extended SEL (eSEL) is associated with each SEL. It contains additional First Failure Data Capture (FFDC).

For system check-stop errors, the OCC collects Failure Information Register (FIR) data and saves it in nonvolatile memory. PRD analyzes the data upon reboot and creates a SEL and eSEL. The host Linux operating system can monitor the SELs on the service processor with the IPMI tool. Hardware and firmware failures are recorded in the SELs and can be retrieved through IPMI interface. The system has the ability to report errors associated with PCIe adapters/devices through the host operating system.

**Warranty and spare parts**

The system comes with a three-year warranty on parts. The replacement parts can be ordered through the Advanced Part Exchange Warranty Service.

**Accessibility by people with disabilities**

A US Section 508 Voluntary Product Accessibility Template (VPAT) containing details on accessibility compliance can be found on the Product accessibility information website.

**Product positioning**

IBM Power server solutions and services, designed for midsized businesses, help your business capitalize on new opportunities, manage business risk while meeting high service levels, and keep within tight budget constraints.

**Mobile**

Worklight™ on Power provides a mobile application platform to speed development and ongoing management of mobile applications, enabling clients to extend their business to mobile devices. It includes a comprehensive development environment, mobile-optimized runtime middleware, a private enterprise application store, and an integrated management and analytics console. Worklight on Power enables clients to:

- Simplify operations and reduce complexity by co-locating applications on a more scalable and reliable server
- Streamline access to data and applications with secure, high-performance virtual networking
- Grow seamlessly and accelerate deployment of new applications and services
- Reduce overhead by using existing production and disaster recovery infrastructure

**Cloud**

The IBM Power Systems™ Solution Edition for Scale-Out Cloud is a low-cost platform for cloud delivery built on the unique compute-intensive and memory bandwidth advantages of POWER8 technology with the flexibility of open source hypervisor and virtualization management tools. The Solution Edition for Scale-Out cloud includes:

- Cloud PowerVC Manager, for open and simplified virtualization and cloud delivery
- OpenStack-based tools for community-driven innovation and flexibility
- Self-service interface, process automation, and metering
- Choice of configuration customized for the skills and work at hand: 1-socket Linux server with 8-core or 10-core POWER8 processor modules, a choice of
IBM or client-provided storage, and a choice of Linux operating environments, including RHEL, SUSE Linux Enterprise Server (SLES), or Ubuntu Server

**Hadoop**

Power Systems Edition is a storage-dense integrated big data platform optimized to simplify and accelerate big data analytics. It provides a robust infrastructure that is optimized for time-critical big data workloads that accelerate ROI by being easy to procure, deploy, use, and manage. It provides higher ingest rates, delivers faster insights than competitive Hadoop solutions, and delivers better reliability and resiliency with fewer outages and fewer performance problems. Included in the solution are:

- Compute and storage: Linux-only based Power Systems plus SAS-attached DCS3700
- Management software and installation scripts: IBM Platform Cluster Manager, automated installation scripts
- Choice of application software optimized for Linux on Power: IBM InfoSphere\(^{R}\), BigInsights\(^{R}\), IBM Platform Symphony\(^{R}\), Advanced Edition (accelerated MapReduce), and IBM GPFS\(^{TM}\)

**Reference information**

Refer to the following European documents:

- European Announcement Letter ZS03-0150 for IBM Customer Agreement (ICA)
- European Announcement Letter ZS04-0135 for Enterprise Agreement Contract
- European Announcement Letter ZS98-0118 for ServiceSuite Contract
- European HW Operations Guide and Service Level Description Table website

**Product number**

The following are newly announced features on the specific models of the IBM Power Systems 8001 machine type.

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<th>Description</th>
<th>Machine type</th>
<th>Model</th>
<th>Feature number</th>
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<td>8001</td>
<td>22C</td>
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<td>One CSC Billing Unit</td>
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- **Open Power Abstraction Layer (OPAL)**
- **CAPI Activation**
- **Digital Marketplace Order Indicator**
- **Custom Service Specify, Mexico**
- **Custom Service Specify, Poughkeepsie, USA**

- **PCIe3 2-port 10GbE BaseT RJ45 Adapter, based on Intel X550-A**
- **PCIe3 4-port 10GbE SFP+ Adapter, based on Broadcom BCM57840**
- **PCIe3 2-port 10GbE SFP+ Adapter, based on Intel XL710**
- **PCIe2 2-port 1GbE Adapter, based on Intel 82575EB**
- **NVIDIA Tesla K80 24GB GPU Accelerator**
- **PCIe3 2-port 100GbE QSFP28 x16, based on Mellanox ConnectX-4**
- **PCIe3 1-port 100GbE QSFP28 x16, based on Mellanox ConnectX-4**
- **PCIe 2-port 8Gb Fibre Channel, based on QLogic QLE2562**
- **PCIe 2-port 16Gb Fibre Channel, based on QLogic QLE2692SR**
- **PCIe3 CAPI adapter, based on Alpha-Data ADM-PCIE-KU3**
- **PCIe3 2-port 10/25GbE (NIC&RoCE) Adapter, based on Mellanox ConnectX-4 Lx**
- **1-Socket Fab Assembly with Direct Attach Backplane**
- **2-Socket Fab Assembly with Direct Attach Backplane**
- **1-Socket Fab Assembly with NVMe Backplane**
- **2-Socket Fab Assembly with NVMe Backplane**
- **3m 10Gb SFP+ SR Cable, Fiber AOC**
- **3m 10Gb SFP+, Copper Passive**
- **10/1Gb SFP+ SR Optical Transceiver**
- **2M QSFP-to-QSFP Cable for QDR IB or 40Gb EN**
- **2 TB 3.5” SAS HDD**
- **4 TB 3.5” SAS HDD**
- **6 TB 3.5” SAS HDD**
- **8 TB 3.5” SAS HDD**
- **2 TB 3.5” SATA HDD**
- **4 TB 3.5” SATA HDD**
- **8 TB 3.5” SATA HDD**
- **PCIe3 SAS RAID Controller w/cable for 2U server, based on LSI MegaRAID 9361-8I**
- **PCIe3 SAS RAID Controller w/cable for 2U server, based on LSI 3008L**
- **PCIe3 2-port NVMe HBA w/cable for 2U server, based on PLX PEX8718**

- **1.8m (6-ft) Power Cord, 100-127V/15A, C13, PT#4 (NEMA 5-15)**
- **1.8m (6-ft) Power Cord, 200-240V/10A, C13, PT#18 (CEE 7 VII)**
- **2.5m (8-ft) Power Cord, 200-240V/10A, C13, PT#32 (SII 32-1971)**
- **1.8m (6-ft) Power Cord, 100-127V/15A, C13, PT#24 (SEV 24507)**
- **2.5m (8-ft) Power Cord, 200-240V/10A, C13, PT#22 (SABS 164)**
- **1.8m (6-ft) Power Cord, 200-240V/10A, C13, #25 (CEI 23-16)**
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**Publications**

IBM Power Systems hardware documentation provides clients with the following topical information:

- Licenses, notices, safety, and warranty information
- Planning for the system
- Installing and configuring the system
- Troubleshooting, service, and support
- Installing, configuring, and managing consoles, terminals, and interfaces
- Installing operating systems
- Creating a virtual computing environment
- Enclosures and expansion units
- Glossary

You can access the product documentation at IBM Knowledge Center.

Product documentation is also available on DVD (SKST-7087).

The following information is shipped with the 8001-22C:

- Power Hardware Information DVD (SKST-7087)
- Installing the IBM Power System S822LC for Big Data
- Important Notices
- Warranty Information
- License Agreement for Machine Code
You can access documentation about Linux on IBM systems at [IBM Knowledge Center](https://www.ibm.com/ibm-knowledgecenter).

To access the IBM Publications Center Portal, go to the [IBM Publications Center](https://www.ibm.com/publications) website.

The Publications Center is a worldwide central repository for IBM product publications and marketing material with a catalog of 70,000 items. Extensive search facilities are provided. A large number of publications are available online in various file formats, which can currently be downloaded.

**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 go to the [IBM Global Technology Services](https://www.ibm.com/services) website.

For details on available IBM Business Continuity and Recovery Services, contact your IBM representative or go to the [Resiliency Services](https://www.ibm.com/services/resiliencyservices) website.

Details on education offerings related to specific products can be found on the [IBM authorized training](https://www.ibm.com/training) website.

**Technical information**

**Specified operating environment**

**Physical specifications**

- Width: 441.5 mm (17.4 in.)
- Depth: 822 mm (32.4 in.)
- Height: 86 mm (3.4 in.)
- Weight: 25 kg (56 lb)

To assure installability and serviceability in non-IBM industry-standard racks, review the installation planning information for any product-specific installation requirements.

**Operating environment**

For some standards and guidelines about the operating environment, see the [ASHRAE-A2](https://www.ashrae.org) website.

**Homologation**

The Power System S822LC for Big Data server is not certified for direct connection by any means whatsoever to interfaces of public telecommunications networks. Certification may be required by law prior to making any such connection. Contact an IBM representative or reseller for any questions.

**Hardware requirements**
The Power S822LC for Big Data server offers 16-core and 20-core configurations with two processor modules. The system can contain up to 512 GB of system memory and up to five adapter cards. Two 1600 Watt 200 - 240 V AC power supplies are required in the system. This flexibility is made available through the optional features for the Power S822LC for Big Data server.

The server consists of one system central electronics complex (CEC) enclosure with the following items:

- Choose a processor module from:
  - Two 8-core, 3.32 GHz (3.857 GHz turbo) POWER8 Processor Modules (#EKP4)
  - Two 10-core, 2.92 GHz (3.492 GHz turbo) POWER8 Processor Modules (#EKP5)

  **Note:** All the cores are activated.
- Choose 32 GB minimum memory from:
  - 4 GB DIMM, 1600 MHz, 4 Gb DDR4 DRAM (#EKM0)
  - 8 GB DIMM, 1600 MHz, 4 Gb DDR4 DRAM (#EKM1)
  - 16 GB DIMM, 1600 MHz, 4 Gb DDR4 DRAM (#EKM2)
  - 32 GB DIMM, 1600 MHz, 4 Gb DDR4 DRAM (#EKM3)

  **Note:** A minimum of eight memory features must be ordered.
- Ethernet adapter
- One Language Group, Specify (#9300)
  - This may be changed to any other #9xxx language group feature listed in this IBM Power Systems announcement.
- Two hot-swap redundant power supplies: 1600 Watt 200 - 240 V AC
- Two power cords
- Rack Indicator - Not factory integrated

**Software requirements**

One of the following operating systems is required:

- Ubuntu Server 14.04.5 LTS
- Ubuntu Server 16.04.1 LTS
- RHEL 7.2 little endian, for Power, or later, with i40e driver update available from RHN

**Limitations**

- The VGA port does not support cable lengths that exceed 3 meters.
- With two Nvidia K80 GPUs and up to eight LFF HDDs installed, the ambient temperature is limited to 25°C (77°F) and processor power can go up to 240 W (0UL866). Specifically, no drives can be populated in the top two rows.
- With two Nvidia K80 GPUs plugged in, cannot plug in a CAPI card because it only has a 2 inch one PCIe x16 slot.
- With 12 LFF HDDs and no GPUs installed, the ambient temperature is limited to 35°C (95°F), and processor power can go up to 204 W (0UL866) and 234W (0UL864).
- Base processor frequency is doable within the ASHRAE A2 Envelope, but turbo performance may be degraded.
- Ubuntu KVM
  - No Qlogic FC, Mellanox, or NVMe virtualization support
  - No Migration or hot-plug support
  - No PCI Passthru support

**Planning information**
**Cable orders**
No cables are required.

**Installability**
Not applicable.

**Security, auditability, and control**
This product uses the security and auditability features of host hardware and application software.

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.

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**IBM Electronic Services**

IBM has transformed its delivery of hardware and software support services to help you achieve higher system availability. Electronic Services is a web-enabled solution that offers an exclusive, no-additional-charge enhancement to the service and support available for IBM servers. These services are designed to provide the opportunity for greater system availability with faster problem resolution and preemptive monitoring. Electronic Services comprises two separate, but complementary, elements: Electronic Services news page and Electronic Services Agent.

The Electronic Services news page is a single internet entry point that replaces the multiple entry points traditionally used to access IBM Internet services and support. The news page enables you to gain easier access to IBM resources for assistance in resolving technical problems.

The Electronic Service Agent™ is no-additional-charge software that resides on your server. It monitors events and transmits system inventory information to IBM on a periodic, client-defined timetable. The Electronic Service Agent automatically reports hardware problems to IBM. Early knowledge about potential problems enables IBM to deliver proactive service that may result in higher system availability and performance. In addition, information collected through the Service Agent is made available to IBM service support representatives when they help answer your questions or diagnose problems. Installation and use of IBM Electronic Service Agent for problem reporting enables IBM to provide better support and service for your IBM server.

To learn how Electronic Services can work for you, go to the IBM Support Portal website.

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**Terms and conditions**

**Volume orders**

Contact your IBM representative.

**Products - terms and conditions**
Warranty period

To obtain copies of the IBM Statement of Limited Warranty, contact your reseller or IBM.

Three years

An IBM part or feature installed during the initial installation of an IBM machine is subject to the full warranty period specified by IBM. 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. 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.

Solid-state disk drives, NVMe, and Flash Adapters have a maximum number of write cycles. Devices that reach this limit may fail to operate according to specifications and must be replaced at the client’s expense. Individual service life may vary and can be monitored using an operating system command.

The following have been designated as consumables or supply items and are, therefore, not covered by this warranty:

- Time and Date Battery

Warranty services

If required, IBM provides repair or exchange service depending on the types of warranty service specified for the machine. IBM will attempt to resolve your problem over the telephone, or electronically through an IBM website. Certain machines contain remote support capabilities for direct problem reporting, remote problem determination, and resolution with IBM. You must follow the problem determination and resolution procedures that IBM specifies. Following problem determination, if IBM determines On-site Service is required, scheduling of service will depend upon the time of your call, machine technology and redundancy, and availability of parts. Service levels are response-time objectives and are not guaranteed. The specified level of warranty service may not be available in all worldwide locations. Additional charges may apply outside IBM’s normal service area. Contact your local IBM representative or your reseller for country-specific and location-specific information.

The type of service is Customer Replaceable Unit or Parts Only Service.

Customer Replaceable Unit (CRU) Service

IBM provides a replacement CRU to you for you to install. CRU information and replacement instructions are shipped with your machine and are available from IBM at any time on your request. Based upon availability, a CRU will be shipped for next-business-day (NBD) delivery. IBM specifies in the materials shipped with a replacement CRU whether a defective CRU must be returned to IBM. When return is required, return instructions and a container are shipped with the replacement CRU, and you may be charged for the replacement CRU if IBM does not receive the defective CRU within 15 days of your receipt of the replacement.

Advanced Part Exchange Warranty Service

Advanced Part Exchange warranty service allows you to order and track replacement parts directly under Customer Replaceable Unit or Parts Only Service following procedures that are provided by IBM. Replacement parts are shipped to your location for you to install. IBM will use commercially reasonable delivery methods to ship the replacement part for NBD delivery. Advanced Part Exchange warranty service is not available in all countries. You must be approved and registered to use this service. Contact your IBM representative or your reseller for further information.

International Warranty Service
International Warranty Service allows you to relocate any machine that is eligible for International Warranty Service and receive continued warranty service in any country where the IBM machine is serviced. If you move your machine to a different country, you are required to report the machine information to your Business Partner or IBM representative.

The warranty service type and the service level provided in the servicing country may be different from that provided in the country in which the machine was purchased. Warranty service will be provided with the prevailing warranty service type and service level available for the eligible machine type in the servicing country, and the warranty period observed will be that of the country in which the machine was purchased.

The following types of information can be found on the International Warranty Service website:

- Machine warranty entitlement and eligibility
- Directory of contacts by country with technical support contact information
- Announcement letters

Service level is:

- 9 hours per day, Monday through Friday, excluding holidays, next-business-day response. Calls must be received by 5:00 PM local time in order to qualify for next-business-day response with 100% CRU.

**Warranty services**

IBM is now shipping machines with selected non-IBM parts that contain an IBM field replaceable unit (FRU) part number label. These parts are to be serviced during the IBM machine warranty period. IBM is covering the service on these selected non-IBM parts as an accommodation to their customers, and normal warranty service procedures for the IBM machine apply.

**Warranty service upgrades**

During the warranty period, warranty service upgrades provide an enhanced level of On-site Service for an additional charge. Service levels are response-time objectives and are not guaranteed. See the Warranty services section above for additional details.

IBM will attempt to resolve your problem over the telephone or electronically by access to an IBM website. Certain machines contain remote support capabilities for direct problem reporting, remote problem determination, and resolution with IBM. You must follow the problem determination and resolution procedures that IBM specifies. Following problem determination, if IBM determines on-site service is required, scheduling of service will depend upon the time of your call, machine technology and redundancy, and availability of parts.

**Maintenance service options**

**CRU and On-site Service**

At IBM's discretion you will receive CRU service or IBM will repair the failing machine at your location and verify its operation. You must provide a suitable working area to allow disassembly and reassembly of the IBM machine. The area must be clean, well-lit, and suitable for the purpose. The following on-site response-time objectives are available as warranty service upgrades for your machine. Available offerings are:

- 9 hours per day, Monday through Friday, excluding holidays, next-business-day response
- 24 hours per day, 7 days a week, 4-hour average response, same day
Customer Replaceable Units (CRUs) may be provided as part of the machine's standard warranty CRU Service except that you may install a CRU yourself or request IBM installation, at no additional charge, under the specified above. For additional information on the CRU Service, see the warranty information.

Maintenance services
If required, IBM provides repair or exchange service depending on the types of maintenance service specified for the machine. IBM will attempt to resolve your problem over the telephone or electronically, via an IBM website. Certain machines contain remote support capabilities for direct problem reporting, remote problem determination, and resolution with IBM. You must follow the problem determination and resolution procedures that IBM specifies. Following problem determination, if IBM determines on-site service is required, scheduling of service will depend upon the time of your call, machine technology and redundancy, and availability of parts. Service levels are response-time objectives and are not guaranteed. The specified level of maintenance service may not be available in all worldwide locations. Additional charges may apply outside IBM's normal service area. Contact your local IBM representative or your reseller for country-specific and location-specific information. The following service selections are available as maintenance options for your machine type.

On-site Service
IBM will repair the failing machine at your location and verify its operation. You must provide a suitable working area to allow disassembly and reassembly of the IBM machine. The area must be clean, well-lit, and suitable for the purpose.

Service levels are:

- 9 hours per day, Monday through Friday, excluding holidays, next-business-day response
- 24 hours per day, 7 days a week, 4-hour average response, same day

Customer Replaceable Unit (CRU) Service
If your problem can be resolved with a CRU (for example, keyboard, mouse, speaker, memory, or hard disk drive), and depending upon the maintenance service offerings in your geography, IBM will ship the replacement CRU to you for you to install. CRU information and replacement instructions are shipped with your machine and are available from IBM upon your request.

Based upon availability, CRUs will be shipped for next-business-day delivery. IBM specifies, in the materials shipped with a replacement CRU, whether a defective CRU must be returned to IBM. When return is required, 1) return instructions and a container are shipped with the replacement CRU, and 2) you may be charged for the replacement CRU if IBM does not receive the defective CRU within 15 days of your receipt of the replacement.

CRUs are designated as Tier 1 (mandatory) CRU.

Tier 1 (mandatory) CRUs: Installation of Tier 1 CRUs, as specified in this announcement, is your responsibility. If IBM installs a Tier 1 CRU at your request, you will be charged for the installation.

For machines with On-site Same-day Response Service, IBM will replace a Tier 1 CRU part at your request, at no additional charge.

All CRUs in S822LC are considered Tier 1 CRUs, including but not limited to the following:

- DASD Drive
- Fan
- Fan Cage
- All PCI Adapters
To service a Linux system end to end, Linux service and productivity tools must be installed from the Service and productivity tools web page.

The tools are automatically loaded if IBM Manufacturing installs the Linux image or IBM Installation Toolkit.

PowerPack is the best way to install required service packages from the website.

The Linux call home feature is also supported in a stand-alone system configuration to report serviceable events.

Feature numbers or models for which there is a maintenance charge:

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**Usage plan machine**

No

**IBM hourly service rate classification**

Three

When a type of service involves the exchange of a machine part, the replacement may not be new, but will be in good working order.

**Maintenance service offerings**

This machine is eligible under terms and conditions of IBM ServiceElite, the IBM Enterprise Service Agreement (ESA), or the IBM Maintenance Agreement. Consult your IBM representative for details.

**General terms and conditions**

**Field-installable features**

Yes
Model conversions
No

Machine installation
Customer setup. Customers are responsible for installation according to the instructions IBM provides with the machine.

Graduated program license charges apply
No

Licensed Machine Code
IBM Machine Code is licensed for use by a customer on the IBM machine for which it was provided by IBM under the terms and conditions of the IBM License Agreement for Machine Code, to enable the machine to function in accordance with its specifications, and only for the capacity authorized by IBM and acquired by the customer. You can obtain the agreement by contacting your IBM representative or it can also be found on the License Agreement for Machine Code and Licensed Internal Code.

Access to Machine Code updates is conditioned on entitlement and license validation in accordance with IBM policy and practice. IBM may verify entitlement through customer number, serial number, electronic restrictions, or any other means or methods employed by IBM in its discretion.

If the machine does not function as warranted and your problem can be resolved through your application of downloadable Machine Code, you are responsible for downloading and installing these designated Machine Code changes as IBM specifies. If you would prefer, you may request IBM to install downloadable Machine Code changes; however, you may be charged for that service.

Machine Code License Acceptance Requirement
B.) Acceptance-By-Use Machine: No, the Machine Code license requires signed acceptance by the machine's end user directly with IBM, applicable to orders for a new machine, machine type conversion MES, and to machines transferred to another user.

Prices
For all local charges, contact your IBM representative.

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Corrections

(Corrected on December 5, 2016)
Revised Product number section to revise description of feature EKEE.

(Corrected on November 8, 2016)
Revised Description section.

(Corrected on November 7, 2016)
Revised the product descriptions for features EKAM and EKAL in the Product number section.

(Corrected on October 26, 2016)
Revised the Physical specifications section.