IBM PowerLinux 7R2 is optimized for Linux to help deliver new solutions and services faster, with higher quality

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At a glance

The PowerLinux™ 7R2 is fueled by the outstanding performance and energy efficiency of the IBM® POWER7® processor, optimized for the Linux™ operating system running on the IBM Power® platform:

- Powerful 64-bit 8-core POWER7 processor modules
  - Two 16-core configurations at 3.3 GHz and 3.55 GHz
- Up to 256 GB of memory with optional memory riser cards
- Rich I/O options in the system unit:
  - Five PCIe Gen2 Low Profile slots
  - PCIe LP 2-Port 1GbE TX adapter (#EL2M for SUSE Linux Enterprise Server (SLES) 10 operating system) or PCIe2 LP 4-port 1GbE Adapter (#EL11 for SLES 11 and Red Hat Enterprise Linux (RHEL) operating systems)
  - Six disk or solid-state drive (SSD) SAS small form-factor (SFF) bays -- up to 3.6 TB
  - Slimline DVD-RAM
  - Bay for tape or removable drive (with #EJ0E)
  - Integrated SAS/SATA controller with RAID 0, 1, and 10 support for disk and SSD; also supports tape and DVD
- EnergyScale™ technology

Overview

The IBM PowerLinux™ 7R2 server delivers the outstanding performance of the IBM POWER7 processor in a dense, highly efficient 2U rack-optimized form factor for Linux customers. It is ideal for running multiple Linux infrastructure and application workloads, virtualized with PowerVM®, more economically than traditional Linux servers. Take advantage of the scalability and capacity of the PowerLinux 7R2 by leveraging IBM's feature-rich PowerVM virtualization technology to fully utilize the server's capacity and deploy virtual partitions faster as well as move workloads as needed across PowerLinux and IBM Power Systems™ servers with Live Partition Mobility.

The PowerLinux 7R2 server is a Linux only 2U rack-mount server with two sockets offering 16-core 3.3 GHz and 3.55 GHz configurations. The new PowerLinux 7R2 (8246-L2C) server also provides expanded I/O capabilities using the high-performance Gen2 PCIe interfaces.
The PowerLinux 7R2 server supports a maximum of 16 DDR3 DIMM slots, with four DIMM slots included in the base configuration and 12 DIMM slots available with three optional memory riser cards, allowing for a maximum system memory of 256 GB.

Memory features (two memory DIMMs per feature) supported are 8 GB, 16 GB, and 32 GB and run at speeds of 1066 MHz.

The IBM PowerLinux 7R2 server offers three storage backplane options. The first supports three SFF SAS HDDs or SSDs, an SATA DVD, and a half-high tape drive. The second supports six SFF SAS HDDs or SSDs and an SATA DVD. These two choices both provide an integrated SAS controller, offering RAID 0, 1, and 10 support. The third supports six SFF SAS HDDs or SSDs, an SATA DVD, and adds support for Dual Write Cache RAID 5, RAID 6, and an external SAS port. HDDs and SSDs are hot-swap and front accessible with each of the three alternatives.

Other integrated features include:

- Five PCIe x8 Gen2 Low Profile expansion slots.
- PCIe LP 2-Port 1GbE TX adapter (#EL2M for SLES 10 operating system) or PCIe2 LP 4-port 1GbE Adapter (#EL11 for SLES 11 and RHEL operating systems).
- Service Processor.
- Integrated SAS/SATA controller for HDD, SSD, tape, and DVD in the system unit, supporting RAID 0, 1, and 10. RAID 5 and RAID 6 are available.
- EnergyScale technology.
- Two system ports, three USB ports, and two HMC ports.
- Redundant and hot-swap power.
- Redundant and hot-swap cooling.

Knowledge gained from IBM Watson™, architected on 90 scale-out POWER7-based systems running Linux, has been built into the PowerLinux 7R2 server. The PowerLinux system is specifically designed for emerging workloads that are proven ideal for a virtualized, scale-out Linux server environment. The PowerLinux 7R2 server benefits from POWER7 performance, Intelligent Threads technology, and high memory and I/O bandwidth. Like Watson, these workloads will realize more performance, more efficient virtualization, unique workload optimizing features, and industry-leading reliability, availability, and scalability at prices comparable with traditional Linux servers.

IBM is investing in new technologies to further advance the value of the PowerLinux 7R2 server for the following emerging and traditional workloads:

**Big Data analytics**

Companies want to deliver actionable insights faster with optimized solutions that process structured and unstructured data on a massive scale. IBM PowerLinux Big Data Analytics solutions offer breakthrough solutions for big data analytics. The IBM PowerLinux Big Data Edition for InfoSphere® BigInsights™ enables organizations to mine data-at-rest, and the IBM PowerLinux Big Data Edition for InfoSphere Streams analyzes data-in-motion. IBM PowerLinux big data solutions are optimized for both types of data to help businesses deliver analytics services faster by taking advantage of the workload-optimizing features of the POWER7 architecture that specifically apply to big data:

- Run thousands of tasks in parallel with:
  - Eight higher-frequency cores per socket
  - Four intelligent threads per core
  - Larger on-chip cache (eDRAM)
- Achieve massive scale-out flexibility with:
  - Choice of dense rack or compute nodes
  - High speed, low latency interconnect
- Similar pricing to x86 rack/compute node
- Exploit extreme memory bandwidth:
  - Higher memory bandwidth of other commercially available systems

The IBM InfoSphere BigInsights based PowerLinux solution uses the open source Apache Hadoop framework and other open source and IBM value-added technologies for distributed processing of large data sets across clusters of computers. This big data solution can help companies analyze social media sites for the latest buzz about their products, for example, and take action to boost sales.

The IBM InfoSphere Streams based solution analyzes data-in-motion. Designed to manage stream flows and apply various analytics against streaming data, companies can store less, analyze more, and make better decisions, faster. By extracting insight from data as it is streaming into your organization, you can react to events as they are happening to change business outcomes. For example, financial institutions can inspect real-time credit card usage to detect and prevent fraudulent transactions.

The IBM PowerLinux Big Data Edition for InfoSphere Streams performs complex real-time analytics on data-in-motion. Enterprises can seamlessly extend existing applications with data mining capabilities and scale to any size PowerLinux cluster. PowerLinux Big Data Edition for InfoSphere Streams also leverages GPFS™, IBM’s industry-leading cluster file system.

**Industry application solutions**

More companies are relying on Linux for business applications that are designed for their industry and tuned for specific business needs. PowerLinux provides a highly secure, resilient, and fully optimized stack for industry applications, enabling faster time-to-delivery for new, differentiating services with less downtime. Optimized systems tuned with PowerLinux offer a lower cost per workload for high-quality business services compared to x86 commodity servers. Solutions for government, banking, manufacturing, and others are available in several local markets.

PowerLinux Solution Edition for SAP Applications delivers a single system SAP environment for midsize businesses, supporting up to 500 SAP users on the competitively priced PowerLinux 7R2 server with IBM PowerVM and IBM DB2®. The PowerLinux 7R2 server provides the ideal platform to consolidate multiple x86 server workloads onto a single server. SAP production, development, test, and database environments can run on a single high-performing, efficient, and reliable server. Consolidation of the SAP and database environments simplifies administration and maintenance for SAP Applications and lowers IT costs for midsize businesses.

PowerLinux Solution Edition for SAP Applications leverages PowerVM for PowerLinux that is optimized for the Linux operating system and is offered exclusively on the PowerLinux servers. PowerVM for PowerLinux incorporates all the features of PowerVM Enterprise Edition and provides unique advanced capabilities for Linux environments, including the ability to dynamically remove memory from running virtual machines (VMs) and reallocate it to other VMs and the ability to enhance performance by automatically reacting to anticipated and unanticipated spikes in server demand.

IBM PowerVM for IBM PowerLinux offers new pricing for cost-effective virtualized workload environments. With lower virtualization costs, you receive IT savings through the total cost of acquisition (TCA) and the total cost of ownership (TCO).

PowerLinux Solution Edition for SAP Applications supports SAP’s POWER7 certified products like SAP Business Suite and SAP Solution Manager with IBM DB2 V9.7. SAP products are available for order from SAP or SAP Business Partners.

**Open source infrastructure services**

Linux is the low-cost deployment platform of choice for vital applications like web, email, and social media collaboration. Companies are replacing more expensive infrastructure applications with robust open source offerings running on Linux, and running them in virtualized environments. With the IBM PowerLinux Linux

IBM is a registered trademark of International Business Machines Corporation
Application Services Edition, you can run key infrastructure workloads with industry standards-based Linux on competitively priced PowerLinux servers. Open source applications for PowerLinux are included with commercial Linux distributions from Red Hat and SUSE, and supported by Red Hat, SUSE, or IBM. Open source applications like email, file, and print, and web and network infrastructure can be installed and configured in the PowerLinux Linux Application Services Edition using the IBM Installation Toolkit. The Installation Toolkit simplifies the setup of your workloads by stepping you through their configuration.

PowerLinux Linux Application Services Edition leverages PowerVM for PowerLinux for efficient server virtualization. PowerLinux Linux Application Services Edition PowerVM technology is designed to help Power Systems servers deliver higher server utilization rates than VMware on x86. Running open source application workloads on a single server reduces costly IT administration, energy consumption, data center space, and other expenses associated with the deployment and maintenance of numerous servers. IBM can offer a superior economic model for workload consolidation on POWER7 servers with PowerVM software, a key driver behind recent migrations from Oracle (Sun) and HP to Power Systems technology.

PowerVM for PowerLinux offers advanced virtualization functionality and is offered exclusively on the PowerLinux servers. The PowerVM for PowerLinux pricing structure delivers cost-effective virtualized workload environments. PowerVM technology is designed to provide secure and scalable virtualization and to control server and virtual image sprawl.

**ISV industry and cross-industry solutions**

IBM is working with worldwide ISVs like SAP along with regional ISVs to optimize and exploit integrated PowerVM virtualization functionality and superior performance of the PowerLinux 7R2 with their business application suites. In addition, a growing portfolio of thousands of applications is available from global and regional ISVs for the PowerLinux 7R2 server. To search for ISV applications available for the new PowerLinux 7R2 server along with the associated Linux distributions, see the IBM Global Solutions Directory


To see the full list of available applications that will be compatible to run on the PowerLinux 7R2 server, use the following in your search criteria:

- Choose the following hardware platforms:
  - IBM Power Systems, IBM System p® (pSeries®), and IBM BladeCenter® JSxx and PSxx (POWER® processor-based)
- Choose from the following operating systems:
  - Red Hat Enterprise Linux: RHEL 5, RHEL 6
  - SUSE Linux Enterprise Server: SLES 10, SLES 11
  - Other Linux distribution

**IBM Software**

In addition, IBM Software provides a growing portfolio of solution stacks and services optimized for PowerLinux, including:

- Web Infrastructure with optional database and enterprise integration
- Data Management and Analytics for structured and unstructured data
- Web Portals
- Storage Management

**Key prerequisites**

Refer to the Hardware requirements section and Software requirements section.
Planned availability date

November 16, 2012

Description

**IBM PowerLinux 7R2**

Summary of standard features:

- Rack-mount (2U) configuration
- 8-core processor modules, offering the following configurations
  - 16-core 3.3 GHz and 3.55 GHz
- 8 GB, 16 GB, or 32 GB of 1066 MHz DDR3 ECC memory (error checking and correcting) minimum 32 GB expandable to 256 GB
  - A minimum 32 GB of memory is required with 3.55 GHz configuration (#ELB5). A system must be ordered with a minimum/maximum of 4 x #EL15, 2 x #EL16, or 1 x #EL17, and a minimum 32 GB. Maximum memory is 256 GB.
  - A minimum 64 GB or memory is required with 3.3 GHz configuration (#ELB4). A system must be ordered with a minimum/maximum of 4 x #EL15, or 2 x #EL16, or 1 x #EL17 and 32 GB of additional low-priced memory from memory features EL1F, EL1G, and EL1H. Maximum memory is 256 GB.
- Three storage backplane options:
  - Three SFF SAS HDDs/SSDs, SATA DVD bay, tape drive bay
  - Six SFF SAS HDDs/SSDs, SATA DVD bay
  - Six SFF SAS HDDs/SSDs, SATA DVD bay, Dual Write Cache SAS RAID, external SAS port
- Five PCIe x8 Gen2 and one PCIe x4 Gen2 Low Profile slots
- Two GX++ slots
- Integrated:
  - Service Processor
  - EnergyScale technology
  - Hot-swap and redundant cooling
  - Three USB ports, two system ports, and two HMC ports
- Two 1725 Watt AC, Hot-swap power supplies

Certain configurations of the PowerLinux 7R2 are ENERGY STAR qualified. Refer to:

http://www-03.ibm.com/systems/hardware/energy_star/index.html

The PowerLinux 7R2 is ordered using either feature number ELB4 for a configuration with two POWER7 3.3 GHz processor modules or feature number ELB5 for a configuration with two POWER7 3.55 GHz processor modules.

In addition to the two processor modules, the minimum PowerLinux 7R2 initial order must include 16 processor activations, 32 GB of memory with ELB5 and 64 GB of memory with ELB4, two HDD/SDDs, an Ethernet adapter, a storage backplane, two power supplies and two power cords, an operating system indicator, PowerVM for PowerLinux or GPFS, and a Language Group Specify.
The minimum defined initial order configuration, if no choice is made, is as follows:

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<th>Feature number</th>
<th>Description</th>
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| ELB4           | Package indicator which includes:  
2 x EPL4        | 0/8 core 3.3 GHz POWER7 Processor Module (with ELB4)  
16 x EPL9       | 16 Processor Activations (Zero-priced)  
2 x EL16        | 32 GB Memory (Zero-priced)  
1 x EL1H        | 32 GB Memory  
2 x EL03        | 146.8 GB 15k SFF HDD |

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| ELB5           | Package indicator which includes:  
2 x EPL5        | 0/8 core 3.55 GHz POWER7 Processor Module (with ELB5)  
16 x EPLA       | 16 Processor Activation (Zero-priced)  
2 x EL16        | 32 GB Memory (Zero-priced)  
2 x EL03        | 146.8 GB 15k SFF HDD |

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<th>Feature number</th>
<th>Description</th>
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<tr>
<td>EL0T</td>
<td>Storage Backplane for 2.5-inch Drives/SATA DVD/Tape (Zero-priced)</td>
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<th>Feature number</th>
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| EL11           | PCIe2 LP 4-port 1GbE Adapter ($0)  
or  
EL2M*          | 2-Port 10/100/1000 Base-TX Ethernet PCI Express Adapter  
2 x 5603       | Power Supply, 1725 watt AC  
9300/97xx      | Language Group Specify  
2147           | Primary Operating System Indicator - Linux (#2147)  
16 x #EC22     | PowerVM for PowerLinux (1 per core)  
or  
5765-G66       | GPFS  
2 x 6xxx       | Two Power Cords |

* Feature EL2M is required with SUSE Linux Enterprise Server 10. Feature EL11 is required with all other Linux editions.

- The first two memory features chosen on an initial order are installed in the nonfeaturized memory riser card. When 4 x #EL15 are chosen to meet the minimum memory requirements, 1 x #EL0A must be ordered. Feature EL0A is not allowed with feature EL16 or EL17.
- Alternative configuration options are available on a special bid basis from your IBM representative or Business Partner.
- No internal HDD/SSD is required if feature 0837 (Boot from SAN) is selected. A Fibre Channel or Fibre Channel over Ethernet adapter must be ordered if feature 0837 is selected.

**Dynamic logical partitioning**

The dynamic logical partitioning (LPAR) function provides enhanced resource management for the PowerLinux 7R2 server. Dynamic LPAR allows available system resources to be quickly and easily configured across multiple logical partitions to meet the rapidly changing needs of your business.

Dynamic LPAR also allows you to add new system resources such as new HDDs or SSDs into your system's configuration without requiring a reboot. If the IBM PowerVM for PowerLinux (#EC22) feature is installed in the system, a maximum of 10 dynamic LPARs for each physical processor can be defined, with a PowerLinux 7R2 system maximum of 160 dynamic LPARs.

**Notes for IBM Systems Director and VMControl**

- If implementing dynamic logical partitioning:
– An HMC or IVM is required to manage POWER7 processor-based servers implementing partitioning. Multiple POWER7 processor-based servers can be supported by a single HMC.

– If an HMC is used to manage any POWER7 processor-based server, the HMC must be a CR3, or later, model rack-mount HMC or C05, or later, deskside HMC.

– When IBM Systems Director is used to manage an HMC or if the HMC manages more than 254 partitions, the HMC should have 3 GB of RAM minimum and be a CR3 model, or later, rack-mount or a C06, or later, deskside. SDMC cannot be managed by Systems Director at this time.

• If you are installing IBM Systems Director:

• If installing IBM Systems Director VMControl\textsuperscript{TM}:
  – IBM Systems Director VMControl V2.4, or later, is required.
  – VMControl is included in IBM Systems Director Express\textsuperscript{®} Edition.
  – IBM PowerVM is required to run VMControl.
  – VMControl Enterprise Edition requires IBM Systems Director V6.3, or later. If the product is installed on an older version of IBM Systems Director, you will be prompted to perform an upgrade before accessing full functionality.

**IBM PowerVM for IBM PowerLinux (#EC22)**

Either IBM PowerVM for PowerLinux or GPFS is required on the PowerLinux 7R2.

IBM PowerVM for IBM PowerLinux allows customers to create partitions in units of less than 1 CPU (sub-CPU LPARs) and allow the same system I/O to be virtually added to these partitions. The feature also includes a software component that provides cross-partition workload management.

IBM PowerVM for IBM PowerLinux offers:

• Micro-Partitioning\textsuperscript{®} (up to 10 partitions per processor core, 160 per PowerLinux 7R2 system)
• Virtualized disk and optical devices (VIOS)
• Automated CPU reconfiguration
• Real-time partition configuration and load statistics
• Support for dedicated and shared processor LPAR groups
• Support for manual provisioning of resources

At initial order entry, selecting feature number EC22 will result in Micro-Partitioning to be enabled during manufacture and the enabling software media and publications to be shipped to the customer. When ordering feature number EC22 as an MES, an activation key will be posted on an IBM website, and the customer must retrieve it and install it on the system.

The IBM website is

http://www-912.ibm.com/pod/pod

Notes for PowerVM Editions:

• If implementing IBM PowerVM:
  – IBM PowerVM V2.2, or later, is required
• Virtual machines, or logical partitions (LPARs), are managed using built-in Integrated Virtualization Manager (IVM) software or optionally through use of the Hardware Management Console (HMC).

• If any processors in a system have the Virtualization feature, all active processors must have it.
• Once the Virtualization feature is installed in a system, it cannot be removed.
• IBM PowerVM V2.2, or later, and a supported Linux operating system level are minimum requirements for performing Live Partition Mobility functions on POWER7. Refer to the **Software requirements** section for more information on minimum Linux operating system levels.

Other features of PowerVM for PowerLinux:

• If any processors in a system have the Virtualization feature, all active processors must have it.
• Once the Virtualization feature is installed in a system, it cannot be removed.
• Virtual Ethernet and Virtual Storage are part of PowerVM Editions.

PowerVM for PowerLinux also includes Live Partition Mobility, which allows for the movement of a logical partition from one POWER6® or POWER7 server to another with no application downtime.

**Note:** PowerVM V2.1.2.11 with Fix Pack 22.1 and Service Pack 1, or later, and a supported Linux operating system level are minimum requirements for performing Live Partition Mobility functions on POWER7. Refer to the **Software requirements** section for more information on minimum Linux operating system levels.

### 19-inch racks

The PowerLinux 7R2 (8246-L2C) is designed to mount in the 36U 7014-T00 (#0551) or the 42U 7014-T42 (#0553) rack. These racks are built to the 19-inch EIA standard. When you order a new 8246 system, you can also order the appropriate 7014 rack model with the system hardware on the same initial order. IBM is making the racks available as features of the 8246-L2C when you order additional I/O drawer hardware for an existing system (MES order). The rack feature number should be used if you want IBM to integrate the newly ordered I/O drawer in a 19-inch rack before shipping the MES order.

**1.8-Meter Rack (#0551)**

The 1.8-Meter Rack (#0551) is a 36 EIA unit rack. The rack that is delivered as feature 0551 is the same rack delivered when you order the 7014-T00 rack; the included features may be different. Some features that are delivered as part of the 7014-T00 must be ordered separately with feature 0551. Order feature 0551 only when required to support rack integration of MES orders prior to shipment from IBM.

**2.0-Meter Rack (#0553)**

The 2.0-Meter Rack (#0553) is a 42 EIA unit tall rack. The rack that is delivered as feature 0553 is the same rack delivered when you order the 7014-T42 rack; the included features may be different. Some features that are delivered as part of the 7014-T42 must be ordered separately with the feature 0553. Order the feature 0553 only when required to support rack integration of MES orders prior to shipment from IBM.

### IBM Power Systems Deployment-ready Services

IBM offers a portfolio of integration, configuration, and customization services for IBM Power Systems. These Deployment-ready Services are designed to accelerate customer solution deployment and reduce related resources and cost. Offerings include:

• Integration
  - Component integration
  - Rack integration
  - Operating system preinstallation
  - Unit personalization
- Third-party hardware/software installation
- Customer-specified placement
- Asset tagging: Standard tagging Radio Frequency Item Device (RFID)
- Special packaging: Box consolidation
- System customization: Remote access partitioning customized operating system/firmware

For more information on Deployment-ready Services, refer to

http://www.ibm.com/power/deploymentreadyservices/

Reliability, availability, and serviceability (RAS) features

Reliability, fault tolerance, and data correction

The reliability of systems starts with components, devices, and subsystems that are designed to be highly reliable. The POWER7 processor SCM uses lower-voltage technology, improving reliability with stacked latches to reduce soft error (SER) susceptibility. During the design and development process, subsystems go through rigorous verification and integration testing processes. During system manufacturing, systems go through a thorough testing process to help ensure the highest level of product quality.

The system cache and memory offer ECC (error checking and correcting) fault-tolerant features. ECC is designed to correct environmentally induced, single-bit, intermittent memory failures and single-bit hard failures. With ECC, the likelihood of memory failures will be reduced. ECC also provides double-bit memory error detection that helps protect data in the event of a double-bit memory failure.

The Linux operating system supports disk drive mirroring (RAID 1) through software, while other RAID protection schemes are provided through hardware RAID adapters.

Memory error correction extensions

The memory has single-bit-error correction and double-bit-error detection ECC circuitry. The ECC code is also designed so that the failure of any one specific memory module within an ECC word by itself can be corrected absent any other fault.

Memory protection features include scrubbing to detect errors, a means to call for the deallocation of memory pages for a pattern of correctable errors detected, and signaling deallocation of a logical memory block when an error occurs that cannot be corrected by the ECC code.

Fault monitoring functions

- When a POWER7 processor-based system is initially powered on, BIST (built-in self-test) and POST (power-on self-test) check processor, cache, memory, and associated hardware required for proper booting of the operating system. If a noncritical error is detected or if the errors occur in resources that can be removed from the system configuration, the restarting process is designed to proceed to completion. The errors are logged in the system nonvolatile RAM (NVRAM).
- Disk drive fault tracking is designed to alert the system administrator of an impending disk drive failure before it impacts customer operation.

Mutual surveillance

The Service Processor monitors the operation of the firmware during the boot process and also monitors the hypervisor for termination. The hypervisor monitors the Service Processor and will perform a reset/reload if it detects the loss of the Service Processor. If the reset/reload does not correct the problem with the Service
Processor, the hypervisor will notify the operating system and the operating system can take appropriate action, including calling for service.

**Environmental monitoring functions**

POWER7 based servers include a range of environmental monitoring functions:

- Temperature monitoring warns the system administrator of potential environmental-related problems by monitoring the air inlet temperature. When the inlet temperature rises above a warning threshold, the system initiates an orderly shutdown. When the temperature exceeds the critical level or if the temperature remains above the warning level for too long, the system will shut down immediately.
- Fan speed is controlled by monitoring actual temperatures on critical components and adjusting accordingly. If internal component temperatures reach critical levels, the system will shut down immediately, regardless of fan speed. When a redundant fan fails, the system calls out the failing fan and continues running. When a nonredundant fan fails, the system shuts down immediately.

**Availability enhancement functions**

The POWER7 family of systems continues to offer and introduce significant enhancements designed to increase system availability.

**POWER7 processor functions**

As in POWER6, the POWER7 processor has the ability to do processor instruction retry and alternate processor recovery for a number of core-related faults. This significantly reduces exposure to both hard (logic) and soft (transient) errors in the processor core. Soft failures in the processor core are transient (intermittent) errors, often due to cosmic rays or other sources of radiation, and generally are not repeatable. When an error is encountered in the core, the POWER7 processor will first automatically retry the instruction. If the source of the error was truly transient, the instruction will succeed and the system will continue as before. On IBM systems prior to POWER6, this error would have caused a checkstop.

Hard failures are more difficult, being true logical errors that will be replicated each time the instruction is repeated. Retrying the instruction will not help in this situation. As in POWER6, POWER7 processors have the ability to extract the failing instruction from the faulty core and retry it elsewhere in the system for a number of faults, after which the failing core is dynamically deconfigured and called out for replacement. These systems are designed to avoid a full system outage.

**POWER7 single processor checkstopping**

As in POWER6, POWER7 provides single processor checkstopping. This significantly reduces the probability of a fault in any one processor affecting total system availability.

**Partition availability priority**

Also available is the ability to assign availability priorities to partitions. If an alternate processor recovery event requires spare processor resources in order to protect a workload, when no other means of obtaining the spare resources is available, the system will determine which partition has the lowest priority and attempt to claim the needed resource. On a properly configured POWER7 processor-based server, this allows that capacity to be first obtained from, for example, a test partition instead of a financial accounting system.

**POWER7 cache availability**

The POWER processor-based line of servers continues to be at the forefront of cache availability enhancements. The L3 cache is now integrated on the POWER7 processor. The POWER7 processor provides both L2 and L3 cache line delete functions.
Special uncorrectable error handling

Special uncorrectable error (SUE) handling was an IBM innovation introduced for POWER5 processors, where an uncorrectable error in memory or cache does not immediately cause the system to terminate. Rather, the system tags the data and determines whether it will ever be used again. If the error is irrelevant, it will not force a checkstop.

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, allow 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.

Predictive failure and dynamic component deallocation

Servers with POWER processors have long had the capability to perform predictive failure analysis on certain critical components such as processors and memory. When these components exhibit certain symptoms that may indicate a failure is imminent, the system can dynamically deallocate and call home, when enabled, about the failing part before the error is propagated system-wide. In many cases, the system will first attempt to reallocate resources in such a way that will avoid unplanned outages. In the event that insufficient resources exist to maintain full system availability, these servers will attempt to maintain partition availability by user-defined priority.

Uncorrectable error recovery

When the auto-restart option is enabled, the system can automatically restart following an unrecoverable software error, hardware failure, or environmentally induced (ac power) failure.

Serviceability

The purpose of serviceability is to repair the system while attempting to minimize or eliminate service cost (within budget objectives), while maintaining high customer satisfaction. Serviceability includes system installation, MES (system upgrades/downgrades), and system maintenance/repair. Depending upon the system and warranty contract, service may be performed by the customer, an IBM representative, or an authorized warranty service provider.

The serviceability features delivered in this system provide a highly efficient service environment by incorporating the following attributes:

- Design for Customer Set Up (CSU), Customer Installed Features (CIF), and Customer Replaceable Units (CRU)
- Error detection and Fault Isolation (ED/FI)
- First Failure Data Capture (FFDC)
- Converged service approach across multiple IBM server platforms

Service environments

The HMC is a dedicated server that provides functions for configuring and managing servers for either partitioned or full-system partition using a GUI or command-line interface (CLI). An HMC attached to the system allows support personnel (with client authorization) to remotely log in to review error logs and perform remote maintenance if required.

The POWER7 processor-based platforms support two main service environments:
• Attachment to one or more HMCs is a supported option by the system. This is the default configuration for servers supporting logical partitions with dedicated or virtual I/O. In this case, all servers have at least one logical partition.

• No HMC. There are two service strategies for non-HMC systems.
  – Full system partition: A single partition owns all the server resources, and only one operating system may be installed.
  – Partitioned system: In this configuration, the system can have more than one partition and can be running more than one operating system. In this environment, partitions are managed by the Integrated Virtualization Manager (IVM), which provides some of the functions provided by the HMC.

Service Interface

The Service Interface allows support personnel to communicate with the service support applications in a server using a console, interface, or terminal. Delivering a clear, concise view of available service applications, the Service Interface allows the support team to manage system resources and service information in an efficient and effective way. Applications available through the Service Interface are carefully configured and placed to give service providers access to important service functions.

Different service interfaces are used, depending on the state of the system and its operating environment. The primary service interfaces are:

• LEDs
• Operator Panel
• Service Processor menu
• Operating system service menu
• Service Focal Point™ on the HMC
• Service Focal Point Lite on IVM

In the light path LED implementation, the system can clearly identify components for replacement by using specific component-level LEDs, and can also guide the servicer directly to the component by signaling (turning on solid) the amber system fault LED, enclosure fault LED, and the component FRU fault LED. The servicer can also use the identify function to blink the FRU-level LED. When this function is activated, a roll-up to the blue enclosure locate and system locate LEDs will occur. These LEDs will turn on solid and can be used to follow the light path from the system to the enclosure and down to the specific FRU.

First Failure Data Capture and Error Data Analysis

First Failure Data Capture (FFDC) is a technique that helps ensure that when a fault is detected in a system, the root cause of the fault will be captured without the need to re-create the problem or run any sort of extending tracing or diagnostics program. For the vast majority of faults, a good FFDC design means that the root cause can also be detected automatically without servicer intervention.

First Failure Data Capture FFDC information, error data analysis, and fault isolation are necessary to implement the advanced serviceability techniques that enable efficient service of the systems and to help determine the failing items.

In the rare absence of FFDC and Error Data Analysis, diagnostics are required to re-create the failure and determine the failing items.

Diagnostics

General diagnostic objectives are to detect and identify problems so that they can be resolved quickly. Elements of IBM's diagnostics strategy include:

• Provide a common error code format equivalent to a system reference code, system reference number, checkpoint, or firmware error code.
• Provide fault detection and problem isolation procedures. Support remote connection ability to be used by the IBM Remote Support Center or IBM Designated Service.
• Provide interactive intelligence within the diagnostics with detailed online failure information while connected to IBM’s back-end system.

**Automatic diagnostics**

Because of the FFDC technology designed into IBM servers, it is not necessary to perform re-create diagnostics for failures or require user intervention. Solid and intermittent errors are designed to be correctly detected and isolated at the time the failure occurs. Runtime and boottime diagnostics fall into this category.

**Stand-alone diagnostics**

As the name implies, stand-alone or user-initiated diagnostics require user intervention. The user must perform manual steps, including:

• Compact disk-based diagnostics
• Keying in commands
• Interactively selecting steps from a list of choices

**Concurrent maintenance**

The system will continue to support concurrent maintenance of power, cooling, HDD or SSD, DVD, and firmware updates (when possible). The determination of whether a firmware release can be updated concurrently is identified in the readme information file released with the firmware.

**Service labels**

Service providers use these labels to assist them in performing maintenance actions. Service labels are found in various formats and positions, and are intended to transmit readily available information to the servicer during the repair process. Following are some of these service labels and their purpose:

• Location diagrams: Location diagrams are located on the system hardware, relating information regarding the placement of hardware components. Location diagrams may include location codes, drawings of physical locations, concurrent maintenance status, or other data pertinent to a repair. Location diagrams are especially useful when multiple components are installed such as DIMMs, CPUs, processor books, fans, adapter cards, LEDs, and power supplies.
• Remove/replace procedures: Service labels that contain remove/replace procedures are often found on a cover of the system or in other spots accessible to the servicer. These labels provide systematic procedures, including diagrams, detailing how to remove/replace certain serviceable hardware components.
• Arrows: Numbered arrows are used to indicate the order of operation and serviceability direction of components. Some serviceable parts such as latches, levers, and touch points need to be pulled or pushed in a certain direction and certain order for the mechanical mechanisms to engage or disengage. Arrows generally improve the ease of serviceability.

**Packaging for service**

The following service enhancements are included in the physical packaging of the systems to facilitate service:

• Color coding (touch points): Terracotta-colored touch points indicate that a component (FRU/CRU) can be concurrently maintained. Blue-colored touch points delineate components that are not concurrently maintained -- those that require the system to be turned off for removal or repair.
• Tool-less design: Selected IBM systems support tool-less or simple tool designs. These designs require no tools or simple tools such as flathead screw drivers to service the hardware components.
Positive retention: Positive retention mechanisms help to assure proper connections between hardware components such as cables to connectors, and between two cards that attach to each other. Without positive retention, hardware components run the risk of becoming loose during shipping or installation, preventing a good electrical connection. Positive retention mechanisms like latches, levers, thumb-screws, pop Nylatches (U-clips), and cables are included to help prevent loose connections and aid in installing (seating) parts correctly. These positive retention items do not require tools.

**Error handling and reporting**

In the event of system hardware or environmentally induced failure, the system runtime error capture capability systematically analyzes the hardware error signature to determine the cause of failure. The analysis result will be stored in system NVRAM. When the system can be successfully restarted either manually or automatically, the error will be reported to the operating system. Error Log Analysis (ELA) can be used to display the failure cause and the physical location of the failing hardware.

With the integrated Service Processor, the system has the ability to automatically send out an alert through phone line to a pager or call for service in the event of a critical system failure. A hardware fault will also turn on the amber system fault LED located on the system unit to alert the user of an internal hardware problem. The indicator may also be set to blink by the operator as a tool to allow system identification. For identification, the blue locate LED on the enclosure and at the system level will turn on solid. The amber system fault LED will be on solid when an error condition occurs.

On POWER7 processor-based servers, hardware and software failures are recorded in the system log. When an HMC is attached, an ELA routine analyzes the error, forwards the event to the Service Focal Point (SFP) application running on the HMC, and notifies the system administrator that it has isolated a likely cause of the system problem. The Service Processor event log also records unrecoverable checkstop conditions, forwards them to the SFP application, and notifies the system administrator. Once the information is logged in the SFP application, if the system is properly configured, a call home service request will be initiated and the pertinent failure data with service parts information and part locations will be sent to an IBM service organization. Customer contact information and specific system-related data such as the machine type, model, and serial number, along with error log data related to the failure are sent to IBM Service.

**Service Processor**

The Service Processor provides the capability to diagnose, check the status of, and sense the operational conditions of a system. It runs on its own power boundary and does not require resources from a system processor to be operational to perform its tasks.

The Service Processor supports surveillance of the connection to the HMC and to the system firmware (hypervisor). It also provides several remote power control options, environmental monitoring, reset, restart, remote maintenance, and diagnostic functions, including console mirroring. The Service Processors menus (ASMI) can be accessed concurrently with system operation, allowing nondisruptive abilities to change system default parameters.

**IBM Electronics Services**

Electronic Service Agent™ and the IBM Electronic Services web portal comprise the IBM Electronic Services solution -- dedicated to providing fast, exceptional support to IBM customers. IBM Electronic Service Agent is a no-charge tool that proactively monitors and reports hardware events such as system errors, performance issues, and inventory. Electronic Service Agent can help focus on the customer's company business initiatives, save time, and spend less effort managing day-to-day IT maintenance issues.
Integrated in the operating system in addition to the HMC, Electronic Service Agent is designed to automatically and electronically report system failures and customer-perceived issues to IBM, which can result in faster problem resolution and increased availability. System configuration and inventory information collected by Electronic Service Agent also can be viewed on the secure Electronic Services web portal and used to improve problem determination and resolution between the customer and the IBM support team. As part of an increased focus to provide even better service to IBM customers, Electronic Service Agent tool configuration and activation comes standard with the system. In support of this effort, a new HMC External Connectivity security whitepaper has been published, which describes data exchanges between the HMC and the IBM Service Delivery Center (SDC) and the methods and protocols for this exchange. To read the whitepaper and prepare for Electronic Service Agent installation, go to the "Reference Guide" section at http://www.ibm.com/support/electronic

Select your country.

Click on "IBM Electronic Service Agent Connectivity Guide."

**Benefits**

**Increased uptime:**

Electronic Service Agent is designed to enhance the warranty and maintenance service by providing faster hardware error reporting and uploading system information to IBM Support. This can optimize the time monitoring the symptoms, diagnosing the error, and manually calling IBM Support to open a problem record. And 24 x 7 monitoring and reporting means no more dependency on human intervention or off-hours customer personnel when errors are encountered in the middle of the night.

**Security:**

Electronic Service Agent is secure in monitoring, reporting, and storing the data at IBM. Electronic Service Agent securely transmits through the Internet (HTTPS or VPN) and can be configured to communicate securely through gateways to provide customers a single point of exit from their site. Communication between the customer and IBM only flows one way; activating Service Agent does not enable IBM to call into a customer's system. System inventory information is stored in a secure database, which is protected behind IBM firewalls. The customer's business applications or business data is never transmitted to IBM.

**More accurate reporting:**

Because system information and error logs are automatically uploaded to the IBM Support Center in conjunction with the service request, customers are not required to find and send system information, decreasing the risk of misreported or misdiagnosed errors. Once inside IBM, problem error data is run through a data knowledge management system and knowledge articles are appended to the problem record.

**Customized support:**

Using the IBM ID entered during activation, customers can view system and support information in the "My Systems" and "Premium Search" sections of the Electronic Services website.

The Electronic Services web portal is a single Internet entry point that replaces the multiple entry points traditionally used to access IBM Internet services and support. This web portal enables you to gain easier access to IBM resources for assistance in resolving technical problems. The newly improved My Systems and Premium Search functions make it even easier for Electronic Service Agent-enabled customers to track system inventory and find pertinent fixes.
My Systems provides valuable reports of installed hardware and software using information collected from the systems by IBM Electronic Service Agent. Reports are available for any system associated with the customer’s IBM ID. Premium Search combines the function of search and the value of Electronic Service Agent information, providing advanced search of the technical support knowledgebase. Using Premium Search and the Service Agent information that has been collected from the system, customers are able to see search results that apply specifically to their systems.

For more information on how to utilize the power of IBM Electronic Services, visit the following website or contact an IBM Systems Services Representative:

http://www.ibm.com/support/electronic

Accessibility by people with disabilities

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


Reference information

Refer to Software Announcement ZP12-0016, dated April 24, 2012 (IBM PowerVM for IBM PowerLinux).

Refer to Software Announcement ZP12-0026, dated April 24, 2012 (Red Hat Enterprise Linux for IBM POWER).

Refer to Hardware Announcement ZG12-0108, dated April 24, 2012 (PowerLinux 7R2 with EX24S Drawer Support).

Refer to Software Announcement ZG12-0101, dated April 24, 2012 (PowerLinux 7R2).

Product number

The following are newly announced features on the specific models of the IBM Power Systems 8246 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>EMEA Bulk MES Indicator</td>
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<td>System port/UPS Conversion Cable</td>
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<td>PCIe2 LP 4-Port 10GbE&amp;1GbE SFP+ Copper&amp;RJ45</td>
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<td>PCIe2 LP 2-port 10GbE SR Adapter</td>
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<td>PCIe2 LP 2-Port 10GbE SFP+ Copper Adapter</td>
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<td>4.3m (14-Ft) 3PH/32A Pwr Cd-Australia</td>
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<td>Storage Backplane -- 6 SFF Drives/SATA DVD</td>
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<td>Storage Backplane -- 6 SFF Drives/SATA DVD</td>
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The following are features already announced for the IBM Power Systems 8246 machine type:

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<td>19 inch, 1.8 meter high rack</td>
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<tr>
<td>19 inch, 2.0 meter high rack</td>
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<td>Rack Filler Panel Kit</td>
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<td>SAN Load Source Specify</td>
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<td>177GB SFF-1 SSD w/ eMLC (AIX/Linux)</td>
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<td>177GB SSD Module with eMLC (AIX/Linux)</td>
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<td>PCIe LP RAID &amp; SSD SAS Adapter 3Gb</td>
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<td>2M LC-SC 50 Micron Fiber Converter Cable</td>
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| 1.8 M (6-ft) Extender Cable for Displays (15-pin
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<td>Rack Integration Services: BP only</td>
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<td>Rack Integration Services</td>
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Full Width Keyboard -- USB, US English Euro, #103P
Opt Front Door for 1.8m Rack 8246 L2C 5983
Opt Front Door for 2.0m Rack 8246 L2C 6069
1.8m Rack Acoustic Doors 8246 L2C 6248
2.0m Rack Acoustic Doors 8246 L2C 6249
1.8m Rack Trim Kit 8246 L2C 6263
2.0m Rack Trim Kit 8246 L2C 6272
Power Cable 4.3m (14-ft), Drawer to IBM PDU, (250V/10A) 8246 L2C 6458
Power Cord 4.3m (14-ft), Drawer To OEM PDU (125V, 15A) 8246 L2C 6460
Power Cord 4.3m (14-ft), Drawer to Wall/OEM PDU, (250V, 15A), U. S. 8246 L2C 6469
Power Cord 1.8m(6-ft), To Wall (125V, 15A) 8246 L2C 6470
Power Cord 2.7m (9-ft), To Wall/OEM PDU, (125V, 15A) 8246 L2C 6471
Power Cord 2.7m (9-ft), To Wall/OEM PDU, (250V, 16A) 8246 L2C 6472
Power Cord 2.7m (9-ft), To Wall/OEM PDU, (250V, 10A) 8246 L2C 6473
Power Cord 2.7m (9-ft), To Wall/OEM PDU, (250V, 13A) 8246 L2C 6474
Power Cord 2.7m (9-ft), To Wall/OEM PDU, (250V, 16A) 8246 L2C 6475
Power Cord 2.7m (9-ft), To Wall/OEM PDU, (250V, 10A) 8246 L2C 6476
Power Cord 2.7m (9-ft), To Wall/OEM PDU, (250V, 16A) 8246 L2C 6477
Power Cord 2.7 M(9-foot), To Wall/OEM PDU, (250V, 16A) 8246 L2C 6478
Power Cord 2.7m (9-ft), To Wall/OEM PDU, (125V, 15A or 250V, 10A) 8246 L2C 6488
4.3m (14-Ft) 3PH/24A Power Cord 8246 L2C 6489
4.3m (14-Ft) 1PH/48A Pwr Cord 8246 L2C 6491
4.3m (14-Ft) 1PH/48-60A Pwr Cord 8246 L2C 6492
Power Cord 2.7m (9-ft), To Wall/OEM PDU, (250V, 10A) 8246 L2C 6493
Power Cord 2.7m (9-ft), To Wall/OEM PDU, (250V, 10A) 8246 L2C 6494
Power Cord 2.7m (9-ft), To Wall/OEM PDU, (250V, 10A) 8246 L2C 6496
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Power Cord 2.7m (9-foot), To Wall/OEM PDU, (125V, 15A) 8246 L2C 6587
Power Cord 2.7m (9 FOOT), To Wall/OEM PDU, (125V, 15A) 8246 L2C 6588
Power Cord 2.7m (9-foot), To Wall/OEM PDU, (125V, 15A) 8246 L2C 6589
Power Cord 2.7m (9-foot), To Wall/OEM PDU, (125V, 15A) 8246 L2C 6590
Power Cord 2.7m (9-foot), To Wall/OEM PDU, (250V, 15A) 8246 L2C 6591
Power Cord 2.7m (9-foot), To Wall/OEM PDU, (250V, 15A) 8246 L2C 6592
Power Cord 2.7m (9-foot), To Wall/OEM PDU, (250V, 15A) 8246 L2C 6593
Power Cord 2.7m (9-foot), To Wall/OEM PDU, (250V, 15A) 8246 L2C 6594
Power Cord 2.7m (9-foot), To Wall/OEM PDU, (250V, 15A) 8246 L2C 6595
Power Cord 2.7m (9-foot), To Wall/OEM PDU, (250V, 15A) 8246 L2C 6596
Power Cord 2.7m (9-foot), To Wall/OEM PDU, (250V, 15A) 8246 L2C 6597
Power Cord 2.7m (9-foot), To Wall/OEM PDU, (250V, 15A) 8246 L2C 6598
Power Cord 2.7m (9-foot), To Wall/OEM PDU, (250V, 15A) 8246 L2C 6599
Power Cord 4.3m (14-ft), Drawer to OEM PDU (125V, 15A) 8246 L2C 6600
Power Cord 3m (10-ft), Drawer to IBM PDU, (250V/10A) 8246 L2C 6601
Power Cord 4.3m (14-Foot), Drawer to OEM PDU, (250V, 15A) 8246 L2C 6602
Power Cord 2.7m (9-foot), Drawer to IBM PDU, (250V/10A) 8246 L2C 6603
Power Cord 1.5m (5-foot), Drawer to IBM PDU, (250V/10A) 8246 L2C 6604
Power Cord 2.7m (9-foot), To Wall/OEM PDU, (250V, 10A) 8246 L2C 6605
Power Cord 4.3m (14-ft), Drawer to OEM PDU (125V, 15A) 8246 L2C 6606
Power Cord 4.3m (14-ft), Drawer to Wall/OEM PDU, (250V, 15A) 8246 L2C 6607
Power Cord 2.7m (9-foot), Drawer to IBM PDU, (250V/10A) 8246 L2C 6608
Power Cord 1.5m (5-foot), Drawer to IBM PDU, (250V/10A) 8246 L2C 6609
Power Cord 2.7m (9-foot), To Wall/OEM PDU, (250V, 10A) 8246 L2C 6610
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Power Cord 4.3m (14-ft), Drawer to Wall/OEM PDU, (250V, 15A) 8246 L2C 6612
Power Cord 2.7m (9-foot), Drawer to IBM PDU, (250V/10A) 8246 L2C 6613
Power Cord 1.5m (5-foot), Drawer to IBM PDU, (250V/10A) 8246 L2C 6614
Power Cord 2.7m (9-foot), To Wall/OEM PDU, (250V, 10A) 8246 L2C 6615
Intelligent PDU+, 1 EIA Unit, Universal UTG0247 Connector 8246 L2C 7109
Environmental Monitoring Probe 8246 L2C 7118
Power Distribution Unit 8246 L2C 7188
Ethernet Cable, 15m, Hardware Management Console to System unit 8246 L2C 7802
Linux Software Preinstall 8246 L2C 8143
Publications

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

System Overview
Planning for the system
Installing and configuring the system
Working with consoles, terminals, and interfaces
Managing system resources
Working with operating systems and software applications
Troubleshooting, service, and support
You can access the product documentation at

http://publib.boulder.ibm.com/infocenter/powersys/v3r1m5/index.jsp

Product documentation is also available on DVD (5K5T-7087).

The following information is shipped with the 8246-L2C:

- Power Hardware Information DVD (SK5T-7087)
- Installing the 8246-L2C
- Safety Information

Hardware documentation such as installation instructions, user’s information, and service information is available to download or view at

http://www.ibm.com/systems/support

Visit the IBM System Support Site, which contains the documentation for the hardware

http://www.ibm.com/systems/support

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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

**Physical specifications**
- Width: 440 mm (19.0 in)
- Depth: 706 mm (27.8 in)
- Height: 89 mm (3.5 in)
- Weight (Maximum configurator): 29.5 kg (65 lb)

**Operating environment**
- Temperature: (nonoperating) 5° to 45°C (41° to 113°F); recommended temperature (operating) 18° to 27°C (64° to 80°F); allowable operating temperature 5° to 35°C (41° to 95°F)
- Relative humidity: Nonoperating 8% to 80%; recommended 5.5°C (42°F) dew point to 60% RH and 15°C (59°F) dew point
- Maximum dew point: 28°C (84°F) (operating)
- Operating voltage: 200 to 240 V ac
- Operating frequency: 47/63 Hz
- Maximum measured power consumption:
  - 1260 watts (maximum)
- Power factor: 0.98
- Thermal output:
  - 4,300 Btu/hour (maximum)
- Power-source loading
  - 1.286 kVa (maximum configuration)
  - Maximum altitude: 3,050 m (10,000 ft)

**Note:** The maximum measured value is the worst case power consumption expected from a fully populated server under an intensive workload. The maximum measured value also accounts for component tolerance and non-ideal operating conditions. Power consumption and heat load vary greatly by server configuration and utilization. The IBM Systems Energy Estimator should be used to obtain a heat output estimate based on a specific configuration.

http://www-912.ibm.com/see/EnergyEstimator

**Noise level and sound power (Preliminary data)**

6.6 bels (Operating and idling)

**EMC conformance classification:** This equipment is subject to FCC rules and shall comply with the appropriate FCC rules before final delivery to the buyer or centers of distribution.

- US: FCC Class A
- Europe: CISPR 22 Class A
- Japan: VCCI-A
- Korea: Korean Requirement Class A
- China: People's Republic of China commodity inspection law Class A

**Homologation -- Telecom environmental testing (Safety and EMC):**
Homologation approval for specific countries has been initiated with the IBM Homologation and Type Approval (HT&A) organization in LaGaude, France. This
Power Systems model and applicable features meet the environmental testing requirements of the country telecom and have been designed and tested in compliance with the Full Quality Assurance Approval (FQAA) process as delivered by the British Approval Board for Telecom (BABT), the UK Telecom regulatory authority.

This product is not certified for 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.

**Product safety/Country testing/Certification:**

- UL 60950 Underwriters Laboratory, Safety Information
- CSA C22.2 No. 60950-00, Canadian Standards Association
- EN60950 European Norm
- IEC 60950, Edition 1, International Electrotechnical Commission, Safety Information
- Nordic deviations to IEC 60950-1 1st Edition

**General requirements:**

The product is in compliance with IBM Corporate Bulletin C-B 0-2594-000 Statement of Conformity of IBM Product to External Standard (Suppliers Declaration).

**Systems**

- Product category: C
- Power consumption in active mode: 398 watts
- Base processor configuration Composite Theoretical Performance (CTP): 134,064 MTOPs (4-core 3.0 GHz processor)
- WT:
  - 0.1267 16-core POWER7 3.3 GHz
  - 0.1365 16-core POWER7 3.55 GHz

WT is Weighted Teraflops, which is based on the number of floating point operations the processor can perform in a cycle.

**Hardware requirements**

**PowerLinux 7R2 minimum system configuration**

The PowerLinux 7R2 offers 16-core configurations with two processor modules. The PowerLinux 7R2 can contain up to 256 GB of system memory (64 GB maximum per memory riser card).

The PowerLinux 7R2 offers five PCIe x8 Gen2 slots and one PCIe x4 Gen2 Low Profile slots, and three or six SFF HDDs/SDDs and one or two media devices, depending on the storage back-plane selected.

PowerLinux 7R2 initial order must include a minimum of the following items:

- Choose package from:
  - Feature ELB4 indicates a package that includes two 3.3 GHz processor modules (2 x #EPL4) and 16 processor activations (16 x #EPL9).
  - Feature ELB5 indicates a package that includes two 3.55 GHz processor modules (2 x #EPL5) and 16 processor activations (16 x #EPLA).
- A minimum of 64 GB of memory is required with ELB4. A minimum of 32 GB of memory is required with ELB5. Both are expandable to 256 GB.
  - Choose 32 GB minimum memory for ELB5 and first 32 GB memory for ELB4 from:
- 4 x 8 GB (2 x 4 GB) Memory DIMMs, 1066 MHz, DDR3 (#EL15)
- 2 x 16 GB (2 x 8 GB) Memory DIMMs, 1066 MHz, DDR3 (#EL16)
- 1 x 32 GB (2 x 16 GB) Memory DIMMs, 1066 MHz, DDR3 (#EL17)

Choose additional 32 GB of memory for ELB4 from:
- 8 GB (2 x 4 GB) Memory DIMMs, 1066 MHz, DDR3 (#EL1F)
- 16 GB (2 x 8 GB) Memory DIMMs, 1066 MHz, DDR3 (#EL1G)
- 32 GB (2 x 16 GB) Memory DIMMs, 1066 MHz, DDR3 (#EL1H)

**Note:** The first 2 memory features chosen on an initial order are installed in the nonfeaturized memory riser card. When 4 x #EL15 are chosen to meet the minimum memory requirements, 1 x #EL0A must be ordered. #EL0A is not allowed with #EL16 or #EL17.

- Choose Storage Backplane from:
  - 3 x SFF/SATA DVD bay/Tape bay (#EL0R)
  - 6 x SFF/SATA DVD bay (#EL0T)
  - 6 x SFF/SATA DVD bay with Dual Write Cache RAID, and an external SAS port (#EL0V)
- One PCIe2 LP 4-port 1GbE Adapter (#EL11) with SUSE Linux Enterprise Server 11 and Red Hat Enterprise Linux or one PCIe LP 2-Port 1GbE TX Adapter (#EL2M) with SUSE Linux Enterprise Server 10
- Choose minimum of one HDD or SSD from:
  - 177 GB SAS SFF SSD (#1775)
  - 387 GB SAS SFF SSD (#ES0A)
  - 600 GB SAS SFF HDD 10,000 RPM (#EL0P)
  - 300 GB SAS SFF HDD 15,000 RPM (#EL0Z)
  - 146.8 GB SAS SFF HDD 15,000 RPM (#EL03)
  - 300 GB SAS SFF HDD 15,000 RPM (#EL02)
  - 177 GB SAS 1.8” Solid-State Drive (#1995)
  -- Feature 1995 requires feature 2053.
  -- No internal HDD or SSD is required if feature 0837 (Boot from SAN) is selected. In this case, a Fibre Channel or Fibre Channel over Ethernet adapter must also be ordered.
- Two 1725 watt AC Power Supplies (2 x #5603) and two power cords (2 x #6xxx)
- Linux Primary Operating System Indicator (#2147)
- Choose:
  - PowerVM for PowerLinux (16 x #EC22)
  - GPFS (5765-G66)
- One Language Group, Specify (#9300 or #97xx)

**Note:** The following features are initial order only and are part of packages ELB4 and ELB5:

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<thead>
<tr>
<th>Feature</th>
<th>Description</th>
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<tr>
<td>EL15</td>
<td>8 GB (2x4 GB) Memory DIMMS, 1066 MHz, 2Gb DDR3 DRAM (Zero-priced)</td>
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<tr>
<td>EL16</td>
<td>16 GB (2x8 GB) Memory DIMMS, 1066 MHz, 2Gb DDR3 DRAM (Zero-priced)</td>
</tr>
<tr>
<td>EL17</td>
<td>32 GB (2x16 GB) Memory DIMMS, 1066 MHz, 2Gb DDR3 DRAM (Zero-priced)</td>
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<td>EL0R</td>
<td>Storage Backplane -- 3 SFF Drives/SATA DVD/HH Tape (Zero-priced)</td>
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<tr>
<td>EL0T</td>
<td>Storage Backplane -- 6 SFF Drives/SATA DVD (Zero-priced)</td>
</tr>
<tr>
<td>EL0V</td>
<td>Storage Backplane -- 6 SFF Drives/SATA (Zero-priced)</td>
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</tbody>
</table>
DVD/RAID/External SAS Port (Zero-priced)
EL0A Memory Riser Card (Zero-priced)
EPL4 8-core 3.3 GHz POWER7 Processor Module (Zero-priced)
EPL5 8-core 3.55 GHz POWER7 Processor Module (Zero-priced)
EPL9 Processor Activation for #EPL4 (Zero-priced)
EPLA Processor Activation for #EPL5 (Zero-priced)

Note: One nonfeaturized memory riser card is included in the base system. Additional memory riser card features (#EL0K) can be ordered on the PowerLinux 7R2.

RAID

There are multiple protection options for HDD/SSD drives in the SAS SFF bays in PowerLinux 7R2 system units or drives in disk-only I/O drawers. Although protecting drives is always recommended, Linux users may choose to leave some or all drives unprotected at their own risk and IBM supports these configurations.

This HDD/SSD drive protection can be provided by Linux software or by the HDD or SSD hardware controllers. Mirroring of drives is provided by Linux software. In addition, Linux supports controllers providing RAID 0, 1, 5, 6, or 10. To further augment HDD/SSD protection, hot spare capability can be used for protected drives. Specific hot spare prerequisites apply.

An integrated SAS HDD/SSD controller is provided in the PowerLinux 7R2 system unit and provides support for JBOD and RAID 0, 1, and 10 for Linux. It is optionally augmented by RAID 5 and RAID 6 capability when storage backplane feature number EL0V is added to the configuration. Other disk/SSD controllers are provided as PCIe SAS adapters are supported. PCI Controllers with and without write cache are supported. RAID 5 and RAID 6 on controllers with write cache are supported.

Linux can use disk drives formatted with 512 byte blocks when being mirrored by the operating system. These disk drives must be reformatted to 528 byte sectors when used in RAID arrays. Although a small percentage of the drive’s capacity is lost, additional data protection such as ECC and bad block detection is gained in this reformating. For example, a 300 GB disk drive when reformatted provides around 283 GB. IBM Power SSDs are formatted to 528 bytes.

Software requirements

- SUSE Linux Enterprise Server 11 Service Pack 1, or later, with current maintenance updates available from SUSE to enable all planned functionality
- SUSE Linux Enterprise Server 10 Service Pack 4, with current maintenance updates available from SUSE to enable all planned functionality
- Red Hat Enterprise Linux 6.2 for POWER, or later
- Red Hat Enterprise Linux 5.8 for POWER, or later

Users should also update their systems with the latest Linux for Power service and productivity tools available at


Refer to the IBM Prerequisite website for software requirements for each feature number

https://www-912.ibm.com/e_dir/eServerPrereq.nsf

The requirement that a Linux operating system support agreement be in place with the purchase or renewal of a RHEL license can be met in the following ways:

- Clients who want Red Hat support should select one of the RHEL combined Subscription and Support features that IBM offers.

Every RHEL subscription only offering includes IBM Support access to Red Hat technical resources in the event that IBM needs Red Hat’s assistance in problem determination and resolution. In order to assure that Red Hat resources are available to assist IBM throughout the hours of support, IBM is providing clients with the appropriate subscription only offering. If clients are purchasing IBM Support with
IBM support coverage 24 hours a day, 7 days a week, they must purchase a RHEL Premium Subscription offering. Clients who are purchasing IBM Support without 24 hour access to IBM may purchase a RHEL Standard Subscription offering.

**Limitations**

**System**

- Integrated system ports are not supported under Linux when the HMC ports are connected to an HMC. Either the HMC ports or the integrated system ports can be used, but not both.
- The integrated system ports are supported for modem and async terminal connections by Linux. Any other application using serial ports requires a serial port adapter to be installed in a PCI slot. The integrated system ports do not support HACMP™ configurations.

**Hardware Management Console (HMC) machine code**

Notes for IBM Systems Director and VMControl:

- If implementing dynamic logical partitioning:
  - An HMC or IVM is required to manage POWER7 processor-based servers implementing partitioning. Multiple POWER7 processor-based servers can be supported by a single HMC.
  - If an HMC is used to manage any POWER7 processor-based server, the HMC must be a CR3, or later, model rack-mount HMC or C05, or later, deskside HMC.
  - When IBM Systems Director is used to manage an HMC or if the HMC manages more than 254 partitions, the HMC should have 3 GB of RAM minimum and be a CR3 model, or later, rack-mount or a C06, or later, deskside. SDMC cannot be managed by Systems Director at this time.
- If installing IBM Systems Director:
  - IBM Systems Director Editions for Power Systems V6.3, or later
- If installing IBM Systems Director VMControl:
  - IBM Systems Director VMControl 2.4, or later, is required.
  - VMControl is included in IBM Systems Director Express Edition.
  - IBM PowerVM is required to run VMControl.
  - VMControl Enterprise Edition requires IBM Systems Director V6.3, or later. If the product is installed on an older version of IBM Systems Director, you will be prompted to perform an upgrade before accessing full functionality.

If attaching an HMC to a new server or adding function to an existing server that requires a firmware update, the HMC machine code may need to be updated.

To determine the HMC machine code level required for the firmware level on any server, go to the following web page to access the Fix Level Recommendation Tool (FLRT) on or after the planned availability date for this product. FLRT will identify the correct HMC machine code for the selected system firmware level


If a single HMC is attached to multiple servers, the HMC machine code level must be updated to the server with the most recent firmware level. All prior levels of server firmware are supported with the latest HMC machine code level.

**Boot requirements**

- Selection of feature 0837 will indicate boot from SAN.
Processor modules

- Two processor modules are required on an order with four, six, or eight processor cores on each processor module. A minimum/maximum of two processor modules are required on a PowerLinux 7R2 order.
- All processors must be activated.
  - A PowerLinux 7R2 with two 8-core 3.3 GHz processor modules (2 x #EPL4) requires that 16 processor activation codes (16 x #EPL9) be ordered.
  - PowerLinux 7R2 with two 8-core 3.55 GHz processor modules (2 x #EPL5) requires that 16 processor activation codes (16 x #EPLA) be ordered.

Power supply

- Two 1725 watt ac power supplies (2 x #5603) are required.

Redundant fans

- Redundant fans standard

Power cords

Two power cords are required. The PowerLinux 7R2 supports 200-240 V ac power cords.

System memory

A minimum 32 GB of memory is required with 3.55 GHz configuration (#ELB5). A system must be ordered with a minimum/maximum of 4 x #EL15, 2 x #EL16, or 1 x #EL17. Maximum memory is 256 GB.

A minimum 64 GB of memory is required with 3.3 GHz configuration (#ELB4). A system must be ordered with a minimum/maximum of 4 x #EL15, or 2 x #EL16, or 1 x #EL17 and 32 GB of additional low-priced memory from memory features EL1F, EL1G, and EL1H. Maximum memory is 256 GB.

- The base machine contains one nonfeaturized memory riser card with four DIMM sockets. Memory features consume two memory DIMM sockets.
  - The PowerLinux 7R2 offers three optional memory riser card features (3 x #ELOA on initial orders; 3 x #EL0K on MES orders) with an additional four DIMM sockets per feature. Maximum system memory is 64 GB without feature ELOA/EL0K and 256 GB with 3 x feature ELOA/EL0K.
- A system can be ordered with a single memory feature EL17 for configuration ELB5. The second memory feature ordered on the same memory riser card does not have to match the first memory feature. Memory features can be mixed on either memory riser card.
- A minimum of one memory feature must be plugged into each memory riser card. Empty memory riser cards are not allowed.
- There is a performance benefit when all DIMMs on a memory riser card are of the same capacity.
- It is generally recommended that memory be installed evenly across all memory riser cards in the system. Balancing memory across the installed memory riser cards allows memory access in a consistent manner and typically results in the best possible performance for your configuration. However, balancing memory fairly evenly across multiple memory riser cards, compared to balancing memory exactly evenly typically has a very small performance difference.

Plans for future memory upgrades should be taken into account when deciding which memory feature size to use at the time of initial system order.
Figure 1. Memory features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Feature number</th>
<th>Minimum quantity</th>
<th>Maximum quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 GB 1066 MHz (2 x 4 GB RDIMMs) (Zero priced)</td>
<td>EL15</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>16 GB 1066 MHz (2 x 8 GB RDIMMs) (Zero priced)</td>
<td>EL16</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>32 GB 1066 MHz (2 x 8 GB RDIMMs) (Zero priced)</td>
<td>EL17</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>8 GB 1066 MHz (2 x 4 GB RDIMMs) (Reduced price)</td>
<td>EL1F</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>16 GB 1066 MHz (2 x 8 GB RDIMMs) (Reduced price)</td>
<td>EL1G</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>32 GB 1066 MHz (2 x 8 GB RDIMMs) (Reduced price)</td>
<td>EL1H</td>
<td>0</td>
<td>8</td>
</tr>
</tbody>
</table>

PCI card slots

The PowerLinux 7R2 contains five x8 Gen2 slots and one x4 Gen2 PCIe Low Profile slot, which is restricted to the standard Ethernet adapter.

Graphics adapters

- A graphics adapter, keyboard, and mouse are not required in the minimum configuration.
- The maximum number of graphics adapters supported in the PowerLinux 7R2 CEC is four.

I/O adapters

- Feature number EL11 or EL2M is required in the 8246-L2C minimum configuration and occupies the x4 slot. Feature EL2M is required with SUSE Linux Enterprise Server 10. Feature EL11 is required with SUSE Linux Enterprise Server 11 and Red Hat Enterprise Linux.
- Two GX++ slots are available on the PowerLinux 7R2. The GX++ slot 1 does not share space with the CEC PCIe Low Profile adapter slots. The GX++ slot 2 shares space with the PCIe x4 slot. If a GX++ adapter is plugged into the x4 slot, then the feature EL2M required LAN adapter must occupy one of the five x8 slots, leaving four x8 slots available for other adapters.
- No GX++ adapters are supported.
- Refer to Figure 2 for additional I/O adapter information.
Figure 2. I/O adapter features

<table>
<thead>
<tr>
<th>I/O adapter</th>
<th>Orderable feature number</th>
<th>Supported feature number</th>
<th>CEC Max qty</th>
<th>Sys Max qty</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCIe LP RAID &amp; SSD SAS A</td>
<td>2053</td>
<td></td>
<td>2</td>
<td>2</td>
<td>LP</td>
</tr>
<tr>
<td>PCIe2 LP 4-port 1GbE Adapter</td>
<td>5260</td>
<td></td>
<td>5</td>
<td>5</td>
<td>LP</td>
</tr>
<tr>
<td>PCIe LP POWER GTX145 Graphics Acc</td>
<td>5269</td>
<td></td>
<td>4</td>
<td>4</td>
<td>LP</td>
</tr>
<tr>
<td>PCIe LP 10Gb FC/FCoE 2-port Adapter</td>
<td>5270</td>
<td></td>
<td>5</td>
<td>5</td>
<td>LP</td>
</tr>
<tr>
<td>PCIe LP 4-Port 10/100/1000 Base-T</td>
<td>5271</td>
<td></td>
<td>5</td>
<td>5</td>
<td>LP</td>
</tr>
<tr>
<td>PCIe LP 10GbE CX4 1-port Adapter</td>
<td>5272</td>
<td></td>
<td>5</td>
<td>5</td>
<td>LP</td>
</tr>
<tr>
<td>PCIe LP 8Gb 2-Port Fibre Channel</td>
<td>5273</td>
<td></td>
<td>5</td>
<td>5</td>
<td>LP</td>
</tr>
<tr>
<td>PCIe LP 2-Port 1GbE SX Adapter</td>
<td>5274</td>
<td></td>
<td>5</td>
<td>5</td>
<td>LP</td>
</tr>
<tr>
<td>PCIe LP 10GbE SR 1-port Adapter</td>
<td>5275</td>
<td></td>
<td>5</td>
<td>5</td>
<td>LP</td>
</tr>
<tr>
<td>PCIe LP 4-Port Async EIA-232 Adapter</td>
<td>5277</td>
<td></td>
<td>5</td>
<td>5</td>
<td>LP</td>
</tr>
<tr>
<td>PCIe2 LP 4-port 1/10GbE SFP+</td>
<td>5279</td>
<td></td>
<td>5</td>
<td>5</td>
<td>LP</td>
</tr>
<tr>
<td>PCIe2 LP 4-port 1/10GbE SR</td>
<td>5280</td>
<td></td>
<td>5</td>
<td>5</td>
<td>LP</td>
</tr>
<tr>
<td>PCIe LP 2-port 1GbE TX</td>
<td>5281</td>
<td></td>
<td>5</td>
<td>5</td>
<td>LP</td>
</tr>
<tr>
<td>PCIe2 LP PCIe2 2-port 4x 1x 1x QDR</td>
<td>5283</td>
<td></td>
<td>5</td>
<td>5</td>
<td>LP</td>
</tr>
<tr>
<td>PCIe2 LP PCIe2 2-port 10GbE SR</td>
<td>5284</td>
<td></td>
<td>5</td>
<td>5</td>
<td>LP</td>
</tr>
<tr>
<td>PCIe2 LP PCIe2 2-Port 10GbE SFP</td>
<td>5286</td>
<td></td>
<td>5</td>
<td>5</td>
<td>LP</td>
</tr>
<tr>
<td>PCIe LP 2-Port Async EIA 232</td>
<td>5290</td>
<td></td>
<td>2</td>
<td>2</td>
<td>LP</td>
</tr>
<tr>
<td>PCIe LP 2-Port 1GbE TX</td>
<td>EL2M</td>
<td></td>
<td>1</td>
<td>1</td>
<td>LP</td>
</tr>
<tr>
<td>PCIe LP 4 Gb 2-Port Fibre Channel</td>
<td>EL09</td>
<td></td>
<td>5</td>
<td>5</td>
<td>LP</td>
</tr>
<tr>
<td>PCIe LP 2-x4-port SAS Adapter 3Gb</td>
<td>EL10</td>
<td></td>
<td>5</td>
<td>5</td>
<td>LP</td>
</tr>
<tr>
<td>PCIe2 LP 4-port 1GbE Adapter ($0)</td>
<td>EL11</td>
<td></td>
<td>1</td>
<td>1</td>
<td>LP</td>
</tr>
<tr>
<td>PCIe2 LP 8Gb 4-port Fibre Channel EN0Y</td>
<td>EL01</td>
<td></td>
<td>5</td>
<td>5</td>
<td>LP</td>
</tr>
</tbody>
</table>

Storage devices/Bays

- The PowerLinux 7R2 has a slim media bay that can contain an optional DVD-RAM (#5762 or follow-on) and a tape bay (only available with #EL0T/#EL0X) that can contain a tape drive or removable disk drive.
- Either feature number EL0R, EL0T, or EL0V must be selected.
  - Feature number EL0T/EL0X supports three small form-factor (SFF) disk units, either HDD or SSD, an SATA DVD, and a tape. No split backplane supported. No RAID 5 or 6 support.
  - Feature number EL0R/EL0W supports six SFF disk units, either HDD or SSD, and an SATA DVD. No split backplane supported. No RAID 5 or 6 support.
  - Feature number EL0V/EL0Y supports six SFF disk units, either HDD or SSD, and an SATA DVD External SAS port. No split backplane supported. RAID 5 and 6 is supported.
  - A valid orderable HDD or SSD is required in a minimum configuration. No HDDs or SSDs are required in the CEC if feature number 0837 is selected.
  - A feature EL01 DAT160 80/160 GB tape feature and a feature 1123 USB Internal Docking Station for Removable RDX Disk Drive are mutually exclusive. One or the other can be on the system but not both. A minimum of one x feature 1106 or feature 1107 or feature EU01 must be ordered with each feature 1123 ordered.
- SAS-bay-based 1775/ES0A support restrictions:
  - SFF features 1775 and ES0A are supported in the PowerLinux 7R2 CEC.
  - SSDs and disk drives (HDDs) are not allowed to mirror each other.

Figure 3. Storage device features

<table>
<thead>
<tr>
<th>Device</th>
<th>Maximum quantity</th>
<th>Bay</th>
<th>Orderable feature number</th>
</tr>
</thead>
<tbody>
<tr>
<td>DVD-RAM (SATA)</td>
<td>1</td>
<td>Slim</td>
<td>5762</td>
</tr>
<tr>
<td>DAT160 80/160 GB Tape</td>
<td>1</td>
<td>Tape</td>
<td>EL01</td>
</tr>
<tr>
<td>USB Internal Docking Station for Removable RDX Disk Drive</td>
<td>1</td>
<td>Tape</td>
<td>1123</td>
</tr>
<tr>
<td>Device</td>
<td>Maximum quantity</td>
<td>Bay</td>
<td>Orderable feature number</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>-------------------</td>
<td>---------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>177 GB SAS, SFF, Solid-state</td>
<td>6</td>
<td>SFF 1-6</td>
<td>1775</td>
</tr>
<tr>
<td>387 GB SAS, SFF, Solid-state</td>
<td>6</td>
<td>SFF 1-6</td>
<td>ES0A</td>
</tr>
<tr>
<td>300 GB 10K, SAS, SFF</td>
<td>6</td>
<td>SFF 1-6</td>
<td>EL02</td>
</tr>
<tr>
<td>146.8 GB 15K, SAS, SFF</td>
<td>6</td>
<td>SFF 1-6</td>
<td>EL03</td>
</tr>
<tr>
<td>600 GB 10K, SAS, SFF</td>
<td>6</td>
<td>SFF 1-6</td>
<td>EL0P</td>
</tr>
<tr>
<td>300 GB 15K, SAS, SFF</td>
<td>6</td>
<td>SFF 1-6</td>
<td>EL0Z</td>
</tr>
<tr>
<td>177 GB 1.8&quot;, Solid-state, for #2053</td>
<td>4</td>
<td>2 per</td>
<td>1995</td>
</tr>
<tr>
<td></td>
<td></td>
<td>#2053</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Six disks or solid-state drives maximum can be installed internally.

**Planning information**

**Cable orders**

No cables required.

**Security, auditability, and control**

This product uses the security and auditability features of host software 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.

**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.

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http://www.ibm.com/support/electronic

Terms and conditions

Volume orders: Contact your IBM representative.

Warranty period

Three years.

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.

Warranty service

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 via an IBM website. You must follow the problem determination and resolution procedures that IBM specifies. Scheduling of service will depend the time of your call and is subject to parts availability. If applicable to your product, parts considered Customer Replaceable Units (CRUs) will be provided as part of the machine's standard warranty service.

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.

CRU Service

IBM provides replacement CRUs to you for you to install. CRU information and replacement instructions are shipped with your machine and are available from IBM upon your request. CRUs are designated as being either a Tier 1 (mandatory) or a Tier 2 (optional) CRU.

Tier 1 (mandatory) CRU

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.

Tier 2 (optional) CRU

You may install a Tier 2 CRU yourself or request IBM to install it, at no additional charge.
Based upon availability, CRUs 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. 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.

The following parts have been designated as Tier 1 CRUs:

- DASD drive
- DASD Media Backplane
- DVD drive
- Fan Air Baffle
- Fan
- All PCI Adapters
- Memory Riser Card
- Power Supply
- Line/power cord
- Keyboard
- Mouse
- External cables
- Display
- Operator Panel
- TOD battery
- Memory DIMMs
- Processor VRM
- SAS Conduit Cable
- SAS Tape Drive Cables
- USB and SAS Tape Drive
- USB Tape Drive Signal Cable
- Storage Interposer
- SPCN Cable
- Interlock Switch
- RAID Battery
- RAID Package Card
- RAID Battery Card

**On-site Service:**

At IBM's discretion, you will receive specified 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.

Service level is:

- 9 hours per day, Monday through Friday, excluding public or national holidays, next business day response. Calls must be received by 15:00 local time in order to qualify for next-business-day response.

**Additional reference for Europe**

For additional information, refer to the Europe HW Operations Guide and Service Level Description Table available at

http://www-5.ibm.com/services/europe/maintenance/
Non-IBM parts service

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. A warranty service upgrade must be purchased during the warranty period and is for a fixed term (duration). It is not refundable or transferable and may not be prorated. If required, IBM will provide the warranty service upgrade enhanced level of on-site Service acquired by the customer. 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.

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.

The Service levels is:

- IBM On-site Repair, Same-Business-Day, On-site Response Time, Latest Call Registration 12:00, 9 hours per day, Monday through Friday, excluding public or national holidays.
- IBM On-site Repair, Same-Business-Day, On-site Response Time, Latest Call Registration 18:00, 18 hours per day, Monday through Saturday, excluding public or national holidays.
- IBM On-site Repair, Same-Business-Day, 6 hours average On-site Response Time, 24 hours per day, Monday through Sunday, 365 days a year.

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. 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.

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 Service levels is:

- IBM On-site Repair Limited, Next-Business-Day, On-site Response Time, Latest Call Registration 15:00, 9 hours per day, Monday through Friday, excluding public or national holidays.
- IBM On-site Repair, Next-Business-Day, On-site Response Time, Latest Call Registration 15:00, 9 hours per day, Monday through Friday, excluding public or national holidays.
- IBM On-site Repair, Same-Business-Day, Latest Call Registration 12:00, On-site Response Time, 9 hours per day, Monday through Friday, excluding public or national holidays.
- IBM On-site Repair, Same-Business-Day, 6 hours average, On-site Response Time, 24 hours per day, Monday through Sunday, 365 days a year.
- ESA and SSU customers: 2-hour coverage extension at no additional charge.

**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 being either a Tier 1 (mandatory) or a Tier 2 (optional) 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.

**Tier 2 (optional) CRUs:** You may install a Tier 2 CRU yourself or request IBM to install it, at no additional charge.

The following parts and feature(s) have been designated as Tier 1 CRUs:

- DASD drive
- DASD Media Backplane
- DASD drive
- DVD drive
- Fan Air Baffle
- Fan
- All PCI Adapters
- Memory Riser Card
- Power Supply
- Line/power cord
- Keyboard
- Mouse
- External cables
- Display
- Operator panel
• TOD Battery
• Memory DIMMs
• Processor VRM
• SAS Conduit Cable
• SAS Tape Drive Signal Cable
• Storage Interposer
• SPCN Cable
• Interlock Switch
• RAID Battery
• RAID Package Card
• RAID Battery Card

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

8246-L2C Type/Model
8246-L2C Feature Number 0551
8246-L2C Feature Number 0553
8246-L2C Feature Number 1775
8246-L2C Feature Number 1995
8246-L2C Feature Number EL01
8246-L2C Feature Number EPL4
8246-L2C Feature Number EPL5
8246-L2C Feature Number ESDA

Non-IBM parts service

Under certain conditions, IBM provides services for selected non-IBM parts at no additional charge for machines that are covered under warranty service upgrades or maintenance services.

This service includes hardware problem determination (PD) on the non-IBM parts (for example, adapter cards, PCMCIA cards, disk drives, memory) installed within IBM machines and provides the labor to replace the failing parts at no additional charge.

If IBM has a Technical Service Agreement with the manufacturer of the failing part, or if the failing part is an accommodations part (a part with an IBM FRU label), IBM may also source and replace the failing part at no additional charge. For all other non-IBM parts, customers are responsible for sourcing the parts. Installation labor is provided at no additional charge, if the machine is covered under a warranty service upgrade or a maintenance service.

Warranty service upgrades

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 the IBM ServiceSuite®, the IBM Enterprise Service Agreement (ESA) or under the IBM Maintenance Agreement. Consult your IBM representative for details.
**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**
Yes. The applicable processor tier is: Small

**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 visiting


Machine using LMC Type Model 8246-L2C

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.

**Prices**

For all local charges, contact your IBM representative.

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- Tajikistan
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- Ukraine
- Uzbekistan

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