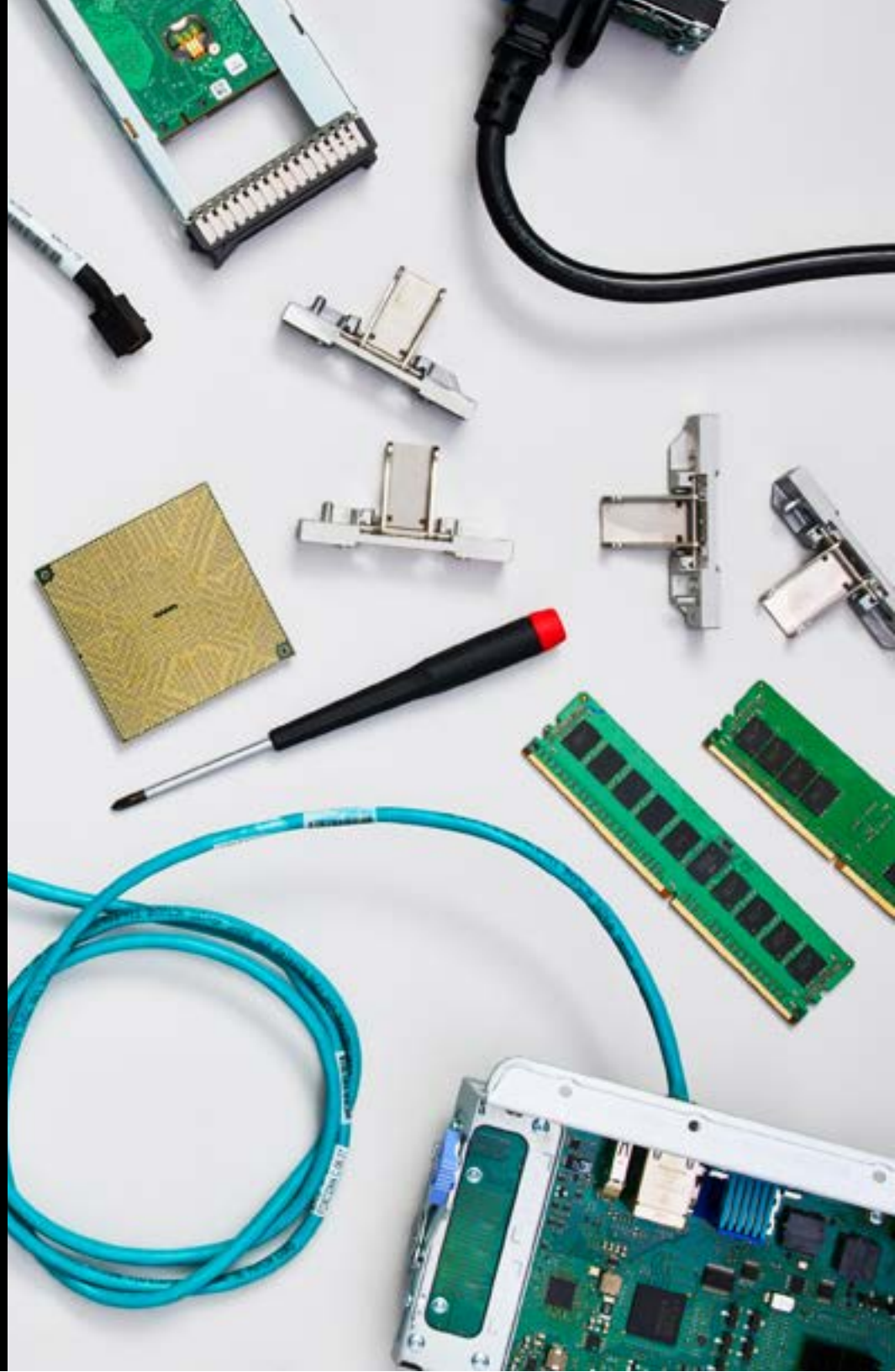
IBM Power Systems Facts & Features

Enterprise, Scale-out and Accelerated Servers with POWER9 Processor Technology



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Why Power Systems?

If anything is certain about the future, it's that there will be more complexity, more data to manage and greater pressure to deliver instantly. The hardware you buy should meet today's expectations and prepare you for whatever comes next.

Power Systems are built for the most demanding, data-intensive, computing on earth. Our cloud-ready servers help you unleash insight from your data pipeline — from managing mission-critical data, to managing your operational data stores and data lakes, to delivering the best server for cognitive computing.

With industry leading reliability and security, our infrastructure is designed to crush the most data-intensive workloads imaginable, while keeping your business protected.

Simplified multicloud
Rethink how data, applications and services move across a hybrid cloud environment. With IBM POWER9™ based Power Systems, you can dynamically scale compute and memory on demand and build a cloud designed for the most data intensive workloads.

Built-in end-to-end security
IBM Power Systems have security built in at all layers in the stack – processor, systems, firmware, OS and Hypervisor. With accelerated encryption built into the chip, your data is protected in motion and at rest. And PowerVM® is the only hypervisor amongst major competitors with no reported vulnerabilities.

Proven reliability
Today's always-on world requires resilient, mission-critical servers that deliver continuous operations. IBM servers ranked the most reliable for the 10th straight year (1) and are industry leaders for enterprise servers (1) with a maximum uptime of 99.9996% (2.1 minutes/server/annum unplanned downtime) of any non-mainframe Linux platforms.

Industry-leading value and performance
Did you know that the IBM POWER9 processor drives the world's fastest supercomputers? That is the same processor that is ready to accelerate your enterprise. Whether you're moving from an older Power server or x86, the performance gain can be significant.

Follow us @IBMpowersystems
Learn more at www.ibm.com/power

1. ITIC 2017 - 2018 Global Server Hardware, Server OS Reliability Survey

IBM Power Systems

Power LC921, Power LC922, and Power AC922

These servers provide the fastest, simplest way to deploy deep learning frameworks — with enterprise-class support — to fuel new thinking and capabilities across your organization.

	IBM Power LC921	IBM Power LC922	IBM Power AC922	IBM Power AC922
Product Line				
Machine type	9006-12P	9006-22P	8335-GTH	8335-GTX
System Packaging	19” rack drawer (1U)	19” rack drawer (2U)	19” rack drawer (2U)	19” rack drawer (2U)
Microprocessor type	64-bit POWER9	64-bit POWER9	64-bit POWER9 with NVLink	64-bit POWER9
# of processor sockets per server	1 or 2	1 or 2	2	2
GHz (cores/socket) # of cores	2.2 GHz (2) | 32 2.13 GHz (2) | 40	2.91 GHz (2) | 32 2.70 GHz (2) | 40 2.60 GHz (2) | 44	8335-3.3 GHz (2) | 16 3.0 GHz (2) | 20	3.45 GHz (2) | 16 3.10 GHz (2) | 22
		Max boost frequency is 3.8 GHz		
Level 2 (L2) cache per core	512 KB	512 KB	512 KB	512 KB
Level 3 (L3) cache per core	10 MB	10 MB	10 MB	10 MB
System Memory (minimum - maximum)	32 GB – 1024 GB	32 GB – 1024 GB	256 GB – 2048 GB	256 GB – 2048 GB
Memory Type	**2666 MHz DDR4** (with 1x RDIMM per port up to 8x RDIMM total) **2133 MHz DDR4** (with 2x RDIMM per port)		2666 MHz DDR4	2666 MHz DDR4
Transactional Memory			Y	
Acceleration	N/A	N/A	Up to 4 NVIDIA Tesla V100 GPUs with NVLink	Up to 6 NVIDIA Tesla V100 GPUs with NVLink
Water Cooling	N/A	N/A	N/A	Y
Reliability, Availability, Serviceability				
Chipkill memory	Y	Y	Y	Y
Baseboard Management Controller	Y	Y	Y	Y
Hot-swappable disk/SSD bays	Y	Y	Y (HDD/SSD only)	Y (HDD/SSD only)
Processor Instruction Retry	Y	Y	Y	Y
Redundant hot-plug power	Y	Y	Y	Y
Redundant hot-plug cooling	Redundant but not hot-plug	N/A	Y	Y

These notes apply to the description tables for the pages which follow:

Y - Standard /Supported	Optional - Optionally Available / Supported	N/A - Not Available / Supported	SOD - Statement of General Direction announced	SLES - SUSE Linux Enterprise Server	RHEL - Red Had Enterprise Linux

Power LC921, Power LC922, and Power AC922

System unit PCIe Gen4 slots a	2 PCIe x8 2 PCIe x16	4 PCIe x8 2 PCIe x16	1 PCIe x4 2 PCIe x16 1 PCIe x8/x8	1 PCIe x4 2 PCIe x16 1 PCIe x8/x8
Slimline DVD bay	4 LFF/SFF bays for four SAS/ SATA HDDs or SSDs and four available for NVMe Gen3 2x SATA DOM	12 LFF/SFF bays for twelve SAS/SATA HDDs or SSDs, and four available for NVMe Gent3 2 SFF trays in the rear for SAS/ SATA (optional) 2x SATA DOM	2 SFF-4	
Maximum TB storage in system unit	40.0 TB (with 4x 10TB disks)	120.0 TB (with 12x 10TB disks)	7.68 (with 2x 3.84TB)	

System Unit Details (Power Systems S LC/AC Class Servers)

	IBM Power LC921	IBM Power LC922	IBM Power AC922
System Unit Details			
POWER9 SCM sockets (Number of SCMs)	1 or 2	1 or 2	1 or 2
Max memory DIMM slots	16	16	16
Max peak memory bandwidth to DIMMs	170 GB/sec	170 GB/sec per socket	340 GB/sec per system
Integrated ports			
System/serial (RJ45)	0	0	0
USB-3	2 (rear)	2 (2 rear)	2 (1 front & 1 rear)
VGA	1	1	1
BMC	Part of the base / not Feature coded	Part of the base / not Feature coded	Part of the base / not Feature coded
IPMI	1	1	1
USB-1	N/A	N/A	N/A
Ethernet for general use	N/A	N/A	2 (1GB)
HMC ports	N/A	N/A	N/A
PCIe Ethernet adapter	optional	1 optional	1 required
SATA bays in system unit			
2.5-inch (SFF) only	4 - LFF/SFF SAS/SATA bays (4 bays can support NVMe)	12 - LFF/SFF SAS/SATA bays (4 bays can support NVMe)	2 SFF-4
3.5-inch (LFF) or SFF	4	12	0
Media bays			
DVD-RAM slimlin	N/A	N/A	N/A

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System Unit Details (Power Systems S LC/AC Class Servers)

	IBM Power LC921	IBM Power LC922	IBM Power AC922
HH for tape	N/A	N/A	N/A
SATA storage controllers for disk/SSD	Y	Y	Y
Base backplane	Y, integrated	Y, integrated	Y, integrated
Split backplane	N/A	N/A	N/A
RAID adapter	Y	Y	N/A
Hybrid RAID function	0/1/10/5	0/1/10/5	N/A
Optional EXP24S ports	N/A	N/A	N/A
PCIe Gen4 adapter slots	4	6	4
PCIe x4	0	0	1
PCIe x8	2	4	1
PCIe x16	2	2	2
Max PCIe bus speed (GHz)	16.0 (Gen4)	16.0 (Gen4)	16.0 (Gen4)
Max I/O bandwidth*	192 GB/sec	256 GB/sec	176 GB/sec
Service indicator LEDs	Y	Y	Y

Power S LC Class Servers Software Support

	Power LC921	Power LC922	Power AC922 GTG	Power AC922 GTX
Power Systems Software				
Software Tier	Small	Small	Small	Small
PowerVM™				
PowerVM Linux Edition	N/A	N/A	N/A	N/A
PowerVM Enterprise Editions	N/A	N/A	N/A	
AIX				
AIX	N/A	N/A	N/A	N/A

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Power S LC Class Servers Software Support

	Power LC921	Power LC922	Power AC922 GTG	Power AC922 GTX
IBM i				
IBM i	N/A	N/A	N/A	N/A
Linux				
Red Hat Enterprise Linux 6.6 (BE)	N/A	N/A	N/A	N/A
Red Hat Enterprise Linux 7.1 (BE and LE)	N/A	N/A	N/A	N/A
Red Hat Enterprise Linux 7.5 (LE)	Supported	Supported	Supported	Supported
Linux Enterprise Server 11 (BE)	N/A	N/A	N/A	N/A
SUSE Linux Enterprise Server 12 (LE)	N/A	N/A	N/A	N/A
Ubuntu 16.04 (LST)	Supported	Supported	Supported	Supported
PowerHA™				
PowerHA SystemMirror for AIX 6.1 Standard and Enterprise Editions	N/A	N/A	N/A	N/A
PowerHA SystemMirror for AIX 7 Standard Edition	N/A	N/A	N/A	N/A
PowerHA SystemMirror for IBM i Version 7.2 Standard and Enterprise Editions	N/A	N/A	N/A	N/A

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Power S914, Power S922, Power S924, and Power L922

Superior On-Premise Infrastructure for Hybrid Multicloud IT

	IBM Power S914	IBM Power S922	IBM Power S924	IBM Power L922
Product Line				
Machine type	9009-41G	9009-22G	9009-42G	9008-22L
System Packaging	19" rack drawer (4U) or tower	19" rack drawer (2U)	19" rack drawer (4U)	19" rack drawer (2U)
Microprocessor type	64-bit POWER9	64-bit POWER9	64-bit POWER9	64-bit POWER9
# of processor sockets per server	1	1 Upgradable or 2	1 Upgradable or 2	1 Upgradable or 2
GHz (cores/socket) # of cores	4C with 2.3 to 3.8 GHz (max) 6C with 2.3 to 3.8 GHz (max) 8C with 2.8 to 3.8 GHz (max)	1C with 2.8 to 3.8 GHz (max) 4C with 2.8 to 3.8 GHz (max) 8C with 3.4 to 3.9 GHz (max) 10C with 2.9 to 3.8 GHz (max) 11C with 2.8 to 3.8 GHz (max)	8C with 3.8 to 4.0 GHz (max) 10C with 3.5 to 3.9 GHz (max) 11C with 3.45 to 3.9 GHz (max) 12C with 3.4 to 3.9 GHz (max)	8C with 3.4 to 3.9 GHz (max) 10C with 2.9 to 3.8 GHz (max) 12C with 2.7 to 3.8 GHz (max)
EnergyScale	Yes	Yes	Yes	Yes
Level 2 (L2) cache per core	512 KB	512 KB	512 KB	512 KB
Level 3 (L3) cache per core	10 MB	10 MB	10 MB	10 MB
System Memory (minimum - maximum)	32 GB – 1024 GB	32 GB - 4096 GB	32 GB - 4096 GB	32 GB - 4096 GB
Reliability, Availability, Serviceability				
Chipkill memory	Yes	Yes	Yes	Yes
Service processor	Yes	Yes	Yes	Yes
Hot-swappable disks/ SSD	Yes	Yes	Yes	Yes
Dynamic Processor Deallocation	Yes	Yes	Yes	Yes
Processor Instruction Retry	Yes	Yes	Yes	Yes
Alternate Processor Recovery	Yes	Yes	Yes	Yes
Concurrent maintenance PCIe slots	Yes	Yes	Yes	Yes
Redundant hot-plug power	Yes	Yes	Yes	Yes
Redundant hot-plug cooling	Yes	Yes	Yes	Yes
Dual VIOS	Optional	Optional	Optional	Optional
Capacity and Expandability				
PowerVM Linux Edition	N/A	N/A	N/A	Yes
PowerVM Enterprise Edition	Yes	Yes	Yes	Yes
Max logical partitions/micro-partitions	160	440	480	480

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Power S914, Power S922, Power S924, and Power L922

System unit PCIe Gen4 low profile slots	5 PCIe x8 3 PCIe x16	6 PCIe x8 5 PCIe x16	6 PCIe x8 5 PCIe x16	6 PCIe x8 3 PCIe x16
Max PCIe Gen3 I/O Drawer	0.5	1.5	1.5	1.5
Max PCIe slots: system unit + PCIe I/O drawers	14 (8 in system unit + 6 in I/O drawer)	29 (11 in system unit + 18 in I/O drawer)	29 (11 in system unit + 18 in I/O drawer)	24 (6 in system unit + 18 in I/O drawer)
System unit disk/SSD bays with standard or split back-plane	12 SFF-3 or 6+6 SFF-3	12 SFF-3 or 6+6 SFF-3	8 SFF-3	8 SFF-3
System unit disk/SSD bays with expanded function back-plane and dual IOA with 7.2GB write cache	18 SFF-3 plus optional EXP24SX attachment for an additional 24 SFF-2 bays	N/A	18 SFF-3 plus optional EXP24SX attachment for an additional 24 SFF-2 bays	N/A
Maximum TB storage in system unit	32.4 TB (with 18x 1.8 TB disks)	14.4 TB (with 8x 1.8 TB disks)	32.4 TB (with 18x 1.8 TB disks)	14.4 TB (with 8x 1.8 TB disks)
Maximum EXP24SX/EXP24S/ EXP12SX storage enclo-sures	28		28	28
Maximum in EXP24SX/EXP24S	672 drives | 1209 TB w/ 1.8 TB disk	672 drives | 1209 TB w/ 1.8 TB disk	672 drives | 1209 TB w/ 1.8 TB disk	672 drives | 1209 TB w/ 1.8 TB disk
Maximum in EXP12SX	N/A	336 drives | 2593 TB w/ 7.72 TB disk	336 drives | 2593 TB w/ 7.72 TB disk	336 drives | 2593 TB w/ 7.72 TB disk
# of NVMe Enterprise Devices on PCIe Slots	Up to 7 adapters	Up to 10 adapters	Up to 10 adapters	Up to 5 adapters
# of NVMe Enterprise Devices on Front Drives Slots	Up to 4 U.2 drives	Up to 4 U.2 drives	Up to 4 U.2 drives	N/A
Max TB of NVMe Enterprise Class Storage	70.4 TB	89.6 TB	89.6 TB	32 TB

System Unit Details (Power Systems Enterprise Scale-Out Servers)

	IBM Power S914	IBM Power S922	IBM Power S924	IBM Power L922
System Unit Details				
POWER9 SCM sockets (Number of SCMs)	1	1 or 2	1 or 2	1 or 2
Max memory DIMM card slots	16	32 (with 2 SCM)	32 (with 2 SCM)	32 (with 2 SCM)

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System Unit Details (Power Systems Enterprise Scale-Out Servers)

	IBM Power S914	IBM Power S922	IBM Power S924	IBM Power L922
Max sustained memory bandwidth to L4 cache from SCM	Up to 120 MB	Up to 240 MB	Up to 240 MB	Up to 240 MB
Max peak memory bandwidth to DIMMs	170 GB/sec	340 GB/sec	340 GB/sec	340 GB/sec
Integrated ports				
System/serial (RJ45)	1	1	1	1
USB-3 ports	3 (1 front & 2 rear)	4 (2 front & 2 rear)	3 (1 front & 2 rear)	4 (2 front & 2 rear)
HMC ports (RJ45)	2	2	2	2
Ethernet adapter ports	4 x1 Gb or 1 x10 Gb	4 x1 Gb or 1 x10 Gb	4 x1 Gb or 1 x10 Gb	4 x1 Gb or 1 x10 Gb
SAS bays in system unit				
2.5-inch (disk/SSD)	18 or 12 SFF-3	8 SFF-3	18 or 12 SFF-3	8 SFF-3
1.8-inch (SSD) Media Bays	0	0	0	0
DVD-RAM slimline	1	1	1	1
HH for tape	N/A	N/A	N/A	N/A
Integrated SAS storage controllers for disk/ SSD/DVD	Yes	Yes	Yes	Yes
Base backplane SAS controllers	1 (zero write cache)	1 (zero write cache)	1 (zero write cache)	1 (zero write cache)
Split backplane SAS controllers	2 (zero write cache)	2 (zero write cache)	2 (zero write cache)	2 (zero write cache)
Expanded function backplane	Dual IOA (7.2 GB write cache)	Dual IOA (7.2 GB write cache)	Dual IOA (7.2 GB write cache)	Dual IOA (7.2 GB write cache)
Easy Tier function	N/A	Yes with expanded function backplane	N/A	Yes with expanded function backplane
Optional EXP24SX or EXP12SX ports	Yes with expanded function backplane	Yes with expanded function backplane	Yes with expanded function backplane	Yes with expanded function backplane
PCIe Gen4 back-end slots	8	11	11	5
PCIe x8	5	6	6	2
PCIe x16	3	5	5	3
PCIe Gen3 adapter slots	0	0	0	4

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System Unit Details (Power Systems Enterprise Scale-Out Servers)

Max PCIe bus speed (GHz)	16.0 (Gen4)	16.0 (Gen4)	16.0 (Gen4)	16.0 (Gen4)
Max I/O bandwidth	160 GB/sec	Up to 320 GB/sec	Up to 320 GB/sec	Up to 320 GB/sec
Service indicator LEDs	Yes	Yes	Yes	Yes

Storage backplane notes: Integrated SAS controllers are based on latest IBM patented SAS RAID adapter technology. All backplane options offer RAID 0, 1, 5, 6, 10 capabilities plus hot spare capability. Write cache is mirrored for protection and physically is two 1.8 GB DRAM caches offering up to 7.2 GB effective capacity with compression. One optional EXP24SX storage drawer attachment is to two SAS ports on rear of server which is available with the expanded function backplane. The EXP24SX is external to the system unit taking 2U rack space and attached via SAS cables and provides 24 SSF-2 SAS bays for disk or for SSD.

Power Systems Enterprise Scale-Out Servers Software Support

	Power S914	Power S922	Power S924	Power L922
Power Systems Software				
Software Tier	Small	Small	Small	Small
PowerVM™				
PowerVM Linux Edition	Supported	Supported	Supported	Supported
PowerVM Enterprise Editions	Supported	Supported	Supported	Supported
AIX				
AIX 7.1	Supported	Supported	Supported	N/A
AIX 7.2	Supported	Supported	Supported	N/A
IBM i				
IBM i Software Tier	P05/P10	P10	P20	P10
IBM i 7.2	Supported	Supported with VIOS	Supported	N/A
IBM i 7.3	Supported	Supported with VIOS	Supported	N/A
IBM i 7.4	Supported	Supported with VIOS	Supported	N/A

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IBM Power Systems

Power Systems Enterprise Scale-Out Servers Software Support

	Power S914	Power S922	Power S924	Power L922
Linux				
Red Hat Enterprise Linux 8 for Power LE, Version 8.1, or later	Supported	Supported	Supported	Supported
SUSE Linux Enterprise Server 15 SP 1, or later	Supported	Supported	Supported	Supported
PowerHA™				
PowerHA SystemMirror for AIX 6.1 Standard and Enterprise Editions	Supported	Supported	Supported	N/A
PowerHA SystemMirror for AIX 7 Standard Edition	Supported	Supported	Supported	N/A
PowerHA SystemMirror for IBM i Version 7.2 Standard and Enterprise Editions	Supported	Supported	Supported	N/A

For updated information about OS support, please check for supported versions on the OS vendor's hardware compatibility lists

IBM Power Systems

Power E950

Blazing performance, extreme agility and industry-leading reliability in a compact 4-socket system.

	IBM Power E950
Product Line	
Machine type	9040-MR9
System Packaging	19" rack drawer (4U)
Microprocessor type	64-bit POWER9
# of processor sockets per server	2 or 4
GHz (cores/socket) | max # of cores | min # of cores | min # of activations	3.6 to 3.8 GHz (8) | 32 max | 16 | 8 3.4 to 3.8 GHz (10) | 40 max | 20 | 10 3.2 to 3.8 GHz (11) | 44 max | 22 | 11 3.15 to 3.8 GHz (12) | 48 max | 24 | 12

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Power E950

	IBM Power E950
EnergyScale	Y
Level 2 (L2) cache per core	512 KB
Level 3 (L3) cache per core	10 MB
Level 4 (L4) cache per socket	Up to 128 MB
System memory: min / max / (min % active) 1600 MHz DDR4	128 GB / 16 TB / (greater of 128 GB or 50% of installed memory)
Active Memory Expansion	Optional
Reliability, availability, serviceability	
First failure data capture (FFDC)	Y
Processor Instruction Retry	Y
L2 and L3 cache error correction code (ECC) protection with cache line delete	Y
Integrated power and cooling monitor function in processor-on-chip controller	Y
Fabric bus retry with spare data lane	Y
Extended cache line delete	Y
Core contained checkstops	Y
IBM memory buffer and spare dynamic random access memory (DRAM) module capability with x4 DIMMs	Y
Selective dynamic fir ware updates	Y
Chipkill memory	Y
Memory dual in-line memory module (DIMM) support with ECC checking supporting x4 Chipkill	
Service processor	Y
Hot-swappable disks	Y
Phase redundant voltage regulators	Y
Regulator modules for processors, memory and I/O and standby voltage	Y
Hot-swappable disks	Y
Dynamic Processor Deallocation	Y
Alternate Processor Recovery	Y
Hot plug PCIe slots	Y
Active Memory Mirroring for Hypervisor	Optional

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Power E950

Redundant hot-plug power supplies	Y
Redundant, hot swappable fans for processor, memory and PCIe slots	Y
Dual VIOS	Optional
Cloud Mgmt and Deployment	
IBM Cloud PowerVC Manager	Included (separately priced)
Cloud Management Console	No charge (36 months)
IBM API Connect and WebSphere Connect	Included
Open source cloud automation and confi uration tooling for AIX	Included
Power-to-Cloud Rewards	5,000 points
Capacity and expandability	
Capacity on Demand (CoD)	Y
Power Enterprise Pools	N/A
Power Integrated facility for Linux	Optional
PowerVM Enterprise Edition	Enterprise
Max logical partitions/micropartitions	960 (20 per core)
System unit PCIe Gen4 full high slots	Up to 10 - 8 x16 slots, 2 x8 slots (two x16 slots per installed processor module)
System unit PCIe Gen3 full high slots	1
Max PCIe Gen3 I/O Drawers	4
Max PCIe Gen3 slots	51 (System unit and external I/O drawers)
Slimline DVD USB port	4
NVMe bays	4
Maximum TB storage in system unit	42.56 TB (8 x 3.72TB read intensive SAS SSD + 4 x 3.2 TB NVMe SSD)
Maximum EXP24SX/EXP12SX storage enclosures	64
Max in EXP12SX	768 drives | 6144 TB with 8 TB disk
Max in EXP24SX	1536 drives | 5713 TB with 3.72 TB disk
Performance	
AIX rPerf GHz (cores/socket): perf (# cores) (*est)	3.15 to 3.8 GHz (12): 587.8 (24) : 1,146.4 (48) 3.2 to 3.8 GHz (11): 549.6 (22) : 1,071.9 (44) 3.4 to 3.8 GHz (10): 530.2 (20) : 1,034.1 (40) 3.6 to 3.8 GHz (8): 446.3 (16) : 870.4 (32)

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System Unit Details (Power Enterprise Servers) Power E950

	With 2 Processor Modules	With 4 Processor Modules
System Unit Details		
Power9 Sockets	4 (2 fi led)	4 (4 fi led)
Number of processor modules	2	4
Memory DIMM slots	64	128
Max sustained memory bandwidth to L4 cache from SCM	230 GB/sec	230 GB/sec
Max peak memory bandwidth to DIMMs from L4 cache	820 GB/sec	1640 GB/sec
Integrated ports		
System/serial (RJ45)	1	1
USB-2 ports	2	2
USB-3 ports	4 (2 front & 2 rear)	4 (2 front & 2 rear)
HMC ports (RJ45)	2	2
Ethernet adapter ports	2-4 ports, 1Gb and/or 10Gb depending on PCIe adapter selected	2-4 ports, 1Gb and/or 10Gb depending on PCIe adapter selected
SAS bays in system unit		
2.5-inch (disk/SSD)	8 SFF-3	8 SFF-3
NVMe U.2	4 bays	4 bays
Media bays		
DVD-RAM slimline	N/A	N/A
HH for tape	N/A	N/A
Integrated SAS storage controllers for disk/SSD/DVD	Y	Y
DASD Backplane with no HDD/SDD	Dual IOA (zero write cache)	Dual IOA (zero write cache)
Base DASD backplane together	Dual IOA (7.2 GB write cache)	Dual IOA (7.2 GB write cache)
Split DASD backplane	2 (zero write cache)	2 (zero write cache)
Easy Tier function	Y with any backplane	Y with any backplane
Optional EXP24SX ports	Y	Y
PCIe Gen3 adapter slots	1	1
PCIe x8	1	1
PCIe x16	0	0
PCIe Gen4 adapter slots	6	10

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System Unit Details (Power Enterprise Servers) Power E950

PCIe x8	2	2
PCIe x16	4	8
Max PCIe bus speed (GHz)	8.0 (Gen3)	8.0 (Gen3)
Max I/O bandwidth	192 GB/sec	320 GB/sec
Service indicator LEDs	Y	Y

Storage backplane notes: Integrated SAS controllers are based on latest IBM patented SAS RAID adapter technology. All backplane options offer RAID 0, 1, 5, 6, 10 capabilities plus hot spare capability plus Easy Tier function assuming enough drives are physically installed to do so. Write cache is mirrored for protection and physically is two 1.8 GB DRAM caches offering up to 7.2 GB effective capacity with compression.

Power E980

The most powerful, reliable, secure and scalable POWER9 server designed for mission critical applications.

	IBM Power E980 (1 NODE)	IBM Power E980 (2 NODE)	IBM Power E980 (3 NODE)	IBM Power E980 (4 NODE)
Product Line				
Machine type	9080-M9S	9080-M9S	9080-M9S	9080-M9S
System Packaging	19” rack drawer (7U) One 5U system node & one 2U system control unit	19” rack drawer (12U) Two 5U system nodes & one 2U system control unit	19” rack drawer (17U) Three 5U system nodes & one 2U system control unit	19” rack drawer (22U) Four 5U system nodes& one 2U system control unit
Microprocessor type	64-bit POWER9	64-bit POWER9	64-bit POWER9	64-bit POWER9
# of processor sockets per server	4	8 (4 per system node)	12 (4 per system node)	16 (4 per system node)
Processor Options: GHz (cores/socket) # of cores	3.9 to 4.0 GHz (8) | 32 3.7 to 3.9 GHz (10) | 40 3.58 to 3.9 GHz (11) | 44 3.55 to 3.9 GHz (12) | 48	3.9 to 4.0 GHz (8) | 64 3.7 to 3.9 GHz (10) | 80 3.58 to 3.9 GHz (11) | 88 3.55 to 3.9 GHz (12) | 96	3.9 to 4.0 GHz (8) | 96 3.7 to 3.9 GHz (10) | 120 3.58 to 3.9 GHz (11) | 132 3.55 to 3.9 GHz (12) | 144	3.9 to 4.0 GHz (8) | 128 3.7 to 3.9 GHz (10) | 160 3.58 to 3.9 GHz (11) | 176 3.55 to 3.9 GHz (12) | 192
Minimum number cores active	8	8	8	8
Energy Scale	Y	Y	Y	Y
Level 2 (L2) cache per core	512 KB	512 KB	512 KB	512 KB
Level 3 (L3) cache per core	10 MB	10 MB	10 MB	10 MB
Level 4 (L4) cache per socket	Up to 128 MB	Up to 128 MB	Up to 128 MB	Up to 128 MB
System memory: min / max / (min % active) 1600 MHz DDR3 or DDR4	256 GB / 16 TB / (50%)	512 GB / 32 TB / (50%)	768 GB / 48 TB / (50%)	1024 GB / 64 TB / (50%)

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Y - Standard / Supported	Optional - Optionally Available / Supported	N/A - Not Available / Supported	SOD - Statement of General Direction announced	SLES - SUSE Linux Enterprise Server	RHEL - Red Had Enterprise Linux

Power E980

	IBM Power E980 (1 NODE)	IBM Power E980 (2 NODE)	IBM Power E980 (3 NODE)	IBM Power E980 (4 NODE)
NVMe bays	4	8	12	16
Active Memory Expansion	Optional	Optional	Optional	Optional
Reliability, availability, serviceability				
First failure data capture (FFDC)	Y	Y	Y	Y
L2 and L3 cache error correction codes (ECC) protection with cache line delete	Y	Y	Y	Y
Extended cache line delete	Y	Y	Y	Y
Core contained checkstops	Y	Y	Y	Y
Processor fabric bus retry with data lane sparing	Y	Y	Y	Y
Guided FSP and SMP cable installation	Y	Y	Y	Y
Redundant phase and spare phase for voltage regulator modules (VRMs) supply-ing processors and DIMMS	Y	Y	Y	Y
Concurrent add/repair of I/O drawers	Y	Y	Y	Y
Extended error handling on PCIe slots	Y	Y	Y	Y
Concurrent repair of op-panel	Y	Y	Y	Y
Selective dynamic fir ware updates	Y	Y	Y	Y
Chipkill memory	Y	Y	Y	Y
Service processor and clock	Redundant with failover	Redundant with failover	Redundant with failover	Redundant with failover
Hot-swappable disks	N/A	N/A	N/A	N/A
Dynamic Processor Deallocation	Y	Y	Y	Y
Processor Instruction Retry	Y	Y	Y	Y
Alternate Processor Recovery	Y	Y	Y	Y
Hot-plug PCIe slots	Y	Y	Y	Y
Blind-swap PCIe slots in system unit	Y	Y	Y	Y
Blind-swap PCIe slots in PCIe I/O drawer	Y	Y	Y	Y
Active Memory Mirroring for Hypervisor	Y	Y	Y	Y
Redundant hot-plug power	Y	Y	Y	Y
Redundant hot-plug cooling	Y	Y	Y	Y

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Power E980

	IBM Power E980 (1 NODE)	IBM Power E980 (2 NODE)	IBM Power E980 (3 NODE)	IBM Power E980 (4 NODE)
Dual VIOS	Optional	Optional	Optional	Optional
Cloud Mgmt and Deployment				
IBM Cloud PowerVC Manager	Included (separately priced)	Included (separately priced)	Included (separately priced)	Included (separately priced)
Cloud Management Console	No charge (36 months)	No charge (36 months)	No charge (for 36 months)	No charge (for 36 months)
Convert Power server resources to cloud r	Y	Y	Yes	Yes
IBM API Connect and WebSphere Connect	Included	Included	Included	Included
Open source cloud automation and configuration tooling or AIX	Included	Included	Included	Included
Power-to-Cloud Rewards	10,000 points per system	10,000 points per system	10,000 points (per system)	10,000 points (per system)
Capacity and expandability				
Capacity on Demand (CoD) functions	Y	Y	Y	Y
Power Enterprise Processor Pools	Optional	Optional	Optional	Optional
Power Integrated Facility for Linux	N/A	N/A	N/A	N/A
PowerVM Enterprise Edition	Enterprise	Enterprise	Enterprise	Enterprise
Max logical partitions/micro-partitions	960 (20 per core max)	1920 (20 per core max)	2,880 (20 per core max)	3,840 (20 per core max)
Max system node PCIe Gen4 x16 slots	8	16 (8 per system node)	24 (8 per system node)	32 (8 per system node)
Max PCIe Gen3 I/O Drawers	4	8 (4 per node)	12 (4 per node)	16 (4 per node)
Max PCIe Gen3 slots (all PCIe I/O drawers)	48	96	144	192
System Control Unit: Media USB ports: System node / System Control Unit	2 / 1	5 / 1	5 / 1	5 / 1
Max disk storage in system unit	N/A	N/A	N/A	N/A
Max EXP24SX/EXP12SX	42	84	126	168
Maximum in EXP12SX	504 drives | 5929 TB w/ 7.72TB	1008 drives | 11858 TB w 7.72TB	1,512 drives	2,016 drives
Maximum in EXP24SX/EXP24S	1008 drives | 2764 TB w/ 1.8TB	2016 drives | 5529 TB w/ 1.8TB	3,024 drives	4,032 drives

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IBM Power Systems

Power E980

Performance*				
rPerf GHz (cores/socket): perf (# cores)	3.9 to 4.0 GHz (32):910.0 3.7 to 3.9 GHz (40) : 1,098.1 3.58 to 3.9 GHz (44) : 1,181.4 3.55 to 3.9 GHz (48) : 1,270.2	(64): 1,820.0 (80) : 2,196.2 (88) : 2,362.9 (96) : 2,540.4	3.9 to 4.0 GHz (32): 910.0 3.7 to 3.9 GHz (40) : 1,098.1 3.58 to 3.9 GHz (44) : 1,181.4 3.55 to 3.9 GHz (48) : 1,270.	(64): 1,820.0 (80) : 2,196.2 (88) : 2,362.9 (96) : 2,540.4
IBM i CPW GHz (cores/socket): perf (# cores)	3.9 to 4.0 GHz (32): 508,900 3.7 to 3.9 GHz (40) : 611,300 3.58 to 3.9 GHz (44) : 639,000 3.55 to 3.9 GHz (48) : 687,500	(64): 1,012,000 (80) : 1,216,000 (88) : 1,271,000 (96) : 1,368,000	3.9 to 4.0 GHz (32): 508,900 3.7 to 3.9 GHz (40) : 611,300 3.58 to 3.9 GHz (44) : 639,000 3.55 to 3.9 GHz (48) : 687,500	(64): 1,012,000 (80) : 1,216,000 (88) : 1,271,000 (96) : 1,368,000

IBM Power Systems

System Unit Details (Power Enterprise Servers) Power E980

	Power E980 System Node	System control unit (one per system)
System Unit Details		
POWER9 SCM sockets	4	N/A
Memory CDIMM slots	32	N/A
Max peak memory bandwidth to L4 cache from SCM	230 GB/sec per socket, 920 G/sec per node	N/A
Integrated ports		
System/serial (RJ45)	N/A	N/A
USB ports	2 or 3	1
HMC ports (RJ45)	0	4
Ethernet adapter ports	N/A	N/A
SAS bays in system unit		
2.5-inch (disk/SSD)	N/A	N/A
1.8-inch (SSD)	N/A	N/A
Media bays		
DVD-RAM slimline	N/A	Attached via USB port
Integrated SAS storage controllers for disk/SSD/DVD	N/A	N/A
PCIe Gen4 adapter slots	8	N/A
PCIe x8	0	N/A
PCIe x16	8	N/A
Max I/O bandwidth (peak)	545 GB/sec	N/A

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System Unit Details (Power Enterprise Servers) Power E980

Service indicator LEDs	Y	Y
Operator panel	N/A	1

Power Enterprise Servers Software Support

	Power E950	Power E980
Power Systems Software		
Software Tier	Small	Medium
PowerVM™		
PowerVM Linux Edition	With Power IFL	With Power IFL
PowerVM Enterprise Editions	Standard	Standard
AIX		
AIX 6.1	Supported	Supported
AIX 7.1	Supported	Supported
AIX 7.2	Supported	Supported
IBM i		
IBM i Software Tier	N/A	P30
IBM i 7.2 TR9 *	N/A	Supported
IBM i 7.3 TR5*	N/A	Supported
Linux		
Red Hat Enterprise Linux 7.5 LE (p8 compatible)	Supported	Supported
Red Hat Enterprise Linux for SAP with Red Hat Enterprise Linux 7 for Power LE version 7.5	Supported	Supported
SUSE Linux Enterprise Server 12 Service Pack 3	Supported	Supported
SUSE Linux Enterprise Server for SAP with SUSE Linux Enterprise Server 12 Service Pack 3	Supported	Supported
SUSE Linux Enterprise Server for SAP with SUSE Linux Enterprise Server 11 Service Pack 4	N/A	Supported
SUSE Linux Enterprise Server 15	Supported	Supported

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IBM Power Systems

Power Enterprise Servers Software Support

	Power E950	Power E980
PowerHA™		
PowerHA SystemMirror for AIX 6.1[2] Standard and Enterprise Editions	N/A	N/A
PowerHA SystemMirror for AIX 7[2] Standard Edition	N/A	N/A
PowerHA SystemMirror for IBM i Version 7.2 Standard and Enterprise Editions	N/A	N/A

**** Or later version***

IBM Power Systems

Server PCIe I/O Drawers

	Server Attachment	PCIe Slots per Drawer	SAS Baysper Drawer	Available to Order	Drawer Footprint
Drawer					
PCIe Gen3 I/O Drawer (#EMX0)	via x16 PCIe slot	6 or 12	0	Y	19” rack 4U

IBM Power Systems

Server PCIe I/O Drawer Attachment

	Power LC921	Power LC922	Power AC922	Power S914	Power S924	Power S922
Server Drawer						
PCIe	N/A	N/A	N/A	Max 1/2	Max 1[1/2]	Max 1

	Power E950	Power E980
Server Drawer		
PCIe	Max 4	Max 16

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PCIe Gen3 I/O Expansion Drawer notes

- PCIe Gen3 I/O drawer is not supported on the LC921, LC922, AC922, or L922 models.
- Each I/O drawer holds one or two 6-slot fan-out modules. A drawer with just one fan-out module is labeled "½" in this document. Each fan-out module is attached to a x16 PCIe slot in the Scale-out system unit or in the Enterprise system node or CEC.
- The attachment card in a 4U POWER9 server or in a 5U E980 Enterprise system node uses one PCIe slot. The attachment card in a 2U Scale-out server is a double-wide card using two PCIe slots.
- Each fan-out module provides 6 PCIe Gen3 slots. Two of the six slots are x16 and four are x8.
- Up to four drawers on an E950 and up to four drawers per each system node of an E980 system
- PCIe Gen3 I/O drawers can not be shared between two servers
- For good cable management practices, a maximum of 4 PCIe Gen3 I/O drawers per rack is generally recommended for confi urations using a large number of 4-port PCIe adapters with cables attached to all the ports. If the rack has an 8-inch rear extender making it deeper and able to manage more cables, then a maximum of 6 PCIe Gen3 I/O drawer is recommended.
- Peak I/O bandwidth per fan-out module is 32 GB/sec.

For additional connectivity information, please reference the IBM Sales Manual for more information on I/O features and adapters.

Server I/O SAS Encloser Units

	Server Attachment	PCIe Slots per Drawer	SAS Bays per Drawer	Available to Order	Drawer Footprint
Drawer					
EXP12SX (#ESLL / #ELLL)	Via SAS	0	12 LFF-1 SAS	Y	19" rack 2U
EXP24SX (#ESLS / #ELLS)	Via SAS	0	24 SFF-2 SAS	Y	19" rack 2U

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Server I/O Drawer Attachment

	Power LC921	Power LC922	Power AC922	Power S914	Power S924	Power S922	Power L922
Server Drawer							
EXP12SX	N/A	N/A	N/A	Max 28	Max 28	Max 28	N/A
EXP12SX	N/A	N/A	N/A	Max 28	Max 28	Max 28	N/A

	Power E950	Power E980
Server Drawer		
EXP12SX	Max 64	Max 168
EXP24SX	Max 64	Max 168

EXP12SX/EXP24SX storage enclosure notes:

- The maximum drawer attachment is shown above per type of drawer. But it is also a “combined” server maximum. For example, if the maximum shown above is for 14 drawers, it would be combined total of EXP12SX and EXP24SX which would be 14. It would not be 14+14 for a combined total of 28.
- The EXP12SX and EXP24SX are designed for 12Gb throughput. Currently no 12Gb SAS adapters are announced.
- The EXP12SX and EXP24SX are attached to PCIe3 SAS adapters or to integrated POWER9 SAS controllers. They are not attached to older PCIe SAS adapters.
- The EXP12SX supports large capacity 3.5-inch (LFF) disk drives which are 7200 rpm. 4k byte sector drives are supported. Big data applications are its primary usage.
- The EXP12SX is not supported by IBM i.
- The EXP24SX supports 2.5-inch (SFF) SSD and 10k/15k rpm disk drives. 4k and 5xx byte sector drives are supported.
- A Power S914, S924, S922, and L922 Scale-out server has a maximum of 14 storage enclosures if only a system unit is used. The maximum of 28 requires one or more PCIe Gen3 I/O Drawer to be present.
- A Power E950 has a maximum of 16 storage enclosures if only a system unit is used. To support the maximum of 64, three or four PCIe Gen3 drawers are needed.

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Server I/O Drawer Attachment

- A single system node Power E980 with 4 PCIe drawers has a maximum of 64 storage enclosures. A two-node Power E980 with 8 PCIe drawers has a max of 128 storage enclosures. A three or four node Power E980 has a max of 168 storage enclosures. PCIe Gen3 drawers are required to attain this maximum.
- A maximum of 16 storage enclosures can be attached to one PCIe Gen3 I/O drawer due to cable management considerations.

For additional connectivity information, please reference the IBM Sales Manual for more information on I/O features and adapters.

Physical Planning Characteristics

Note: More comprehensive information may be found in the IBM Site and Hardware Planning document at http://blaze.aus.stglabs.ibm.com/kc20E-cur/ . Plus, additional summary information can be found in the IBM Sales Manual for each server at ibm.com/common/ssi .

	Power LC921	Power LC922	Power AC922 8335-GTH	Power AC922 8335-GTX
Server				
Packaging	19" rack drawer (2U)	19" rack drawer (2U)	19" rack drawer (2U)	19" rack drawer (2U)
Power supplies used	Two 1000 or 800W N + 1 standard	Two 1600 or 1000W N+1 standard	Two 2200W N+1 standard	Two 2200W N+1 standard
Voltage (AC) single phase	100 - 120 or 200 - 240	100 - 120 or 200 - 240	200 - 240	200 - 240
Maximum Altitude				
Feet	10000	10000	10000	10000
Meters	3048	3048	3048	3048

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Physical Planning Characteristics

	IBM Power S914	IBM Power S924	IBM Power S922	IBM Power L922
Server				
Packaging	19" rack drawer (2U)	19" rack drawer (2U)	19" rack drawer (4U)	Tower
Power supplies used	Four 900W tower or rack Two 900W rack N + 1 standard	Four 1400W rack N+1 standard	Two 1400W rack N+1 standard	Two 1400W rack N+1 standard

	IBM Power S914	IBM Power S924	IBM Power S922	IBM Power L922
Voltage (AC) single phase	100 - 127 or 200 - 240	200 – 240	200 - 240	200 - 240
Maximum Altitude				
Feet	10000	10000	10000	10000
Meters	3048	3048	3048	3048

	Power E950	Power E980 System node	Power E980 System control unit
Server			
Packaging	19” rack drawer 4U	19” rack drawer 5U per node	19” rack drawer (one per 980) 2U
Power supplies used	Four 2000W N + 1 standard	Four 1950W per node N + 2 standard	Zero – redundant power input from system node(s)
Voltage (AC) single phase	200 - 240	200 – 240	N/A
Maximum Altitude			
Feet	10000	10000	10000
Meters	3050	3050	3050

IBM Power Systems

Physical Planning Characteristics

To avoid any delay in service, obtain an optional lift tool (#EB2Z). One feature EB2Z lift tool can be shared among many servers and I/O drawers. The EB2Z lift tool provides a hand crank to lift and position up to 159 kg (350 lb). The EB2Z lift tool is 1.12 meters x 0.62 meters (44 in. x 24.5 in.). Note that a single system node can weigh up to 86.2 kg (190 lb).

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IBM Power Systems

Physical Planning Characteristics

	7014-S25 or #0555	7014-T00 or #0551	7014-T42 or #0553	7014-B42	7965-94Y Slim Rack
Racks					
	25U	36U	42U	42U	42U
Height					
Inches	49.0	71.0 – 75.8	79.3	79.3	78.8
Millimeters	1344	1804 – 1926	2015	2015	2002
Width (can vary depending on use of side panels)					
Inches	23.8	24.5 – 25.4	24.5 - 25.4	24.5 - 25.4	23.6
Millimeters	605	623 – 644	623 – 644	623 - 644	600
Depth (can vary depending on door options selected)					
Inches	39.4	41.0 – 45.2	41.0 - 45.2	41.0 - 55.5	43.1 – 48.2
Millimeters	1001	1042 – 1098	1043 – 1098	1042 - 1409	1095 - 1224

Power E980 are supported by IBM Manufacturing only in the 7965-94Y.

IBM Power Systems

Warranty[1] / Installation

	Power LC921	Power LC922	Power AC922	Power S914	Power S924	Power S922	Power L922
Warranty Service Levels							
24x7 with two hour service objective[2]	Optional	Optional	Optional	Optional	Optional	Optional	Optional
24x7 with four hour service objective	Optional	Optional	Optional	Optional	Optional	Optional	Optional
9x5 with four hour service objective	Optional	Optional	Optional	Optional	Optional	Optional	Optional
9x5 next-business-day	Standard [6]	Standard [3]	Standard [3]	Standard [6]	Standard [3]	Standard [3]	Standard [3]

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Warranty[1] / Installation

	Power LC921	Power LC922	Power AC922	Power S914	Power S924	Power S922	Power L922
Warranty Service Levels							
Warranty Period	3 years	3 years	3 years	3 years	3 years	3 years	3 years
Server install[4]	CSU	CSU	CSU	CSU	CSU	CSU	CSU

	Power E950	Power E980
Warranty Service Levels		
24x7 with two hour service objective[2]	Optional	Optional
24x7 with four hour service objective	Included*	Standard
9x5 with four hour service objective		
	Standard	
9x5 next-business-day		
Warranty Services Period	3 / 1 years[5]	1 year
Server installation[4]	CSU	IBI

1. These warranty terms and conditions are for the United States and may be different in other countries. Consult your local IBM representative or IBM Business Partner for country-specific in ormation.
2. Optional = Warranty Service Upgrade available.
3. Mandatory Customer Replaceable Unit (CRU) or Limited On-site service depending on the feature code. With an upgrade to a higher support service level, the mandatory CRU features become optional CRU.
4. CSU = Customer Set Up, IBI = Installation by IBM. For server hardware only. Note for IBI severs, server feature codes such as an EXP24SX I/O drawer or PCIe Gen3 I/O drawer or PCIe adapter or disk drive are installed by the IBM service representative as part of the initial installation. Optionally a client may choose to install CSU features without an IBM service representative.
5. System is provided with a one year standard warranty 9x5 NBD. For your convenience, IBM has provided an upgrade to 24x7 coverage PLUS two additional years of extended warranty services (varies by country).
6. Mandatory Customer Replaceable Unit (CRU). With an upgrade to a higher support service level, mandatory CRU becomes optional CRU.

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Performance Notes

The performance information contained herein is current as of the date of this document. All performance benchmark values and estimates are provided “AS IS” and no warranties or guarantees are expressed or implied by IBM. Buyers should consult other sources of information, including system benchmarks, to evaluate the performance of a system they are considering.

rPerf (Relative Performance) is an estimate of commercial processing performance relative to other IBM UNIX® systems. It is derived from an IBM analytical model which uses characteristics from IBM internal workloads, TPC and SPEC benchmarks. The rPerf model is not intended to represent any specific public benchmark results and should not be reasonably used in that way. The model simulates some of the system operations such as CPU, cache and memory. However, the model does not simulate disk or network I/O operations.

rPerf estimates are calculated based on systems with the latest levels of AIX and other pertinent software at the time of system announcement. Actual performance will vary based on application and confi uration specific . The IBM eServer™ pSeries® 640 is the baseline reference system and has a value of 1.0. Although rPerf may be used to approximate relative IBM UNIX commercial processing performance, actual system performance may vary and is dependent upon many factors including system hardware confi uration and software design and confi uration. Variations in incremental system performance may be observed in commercial workloads due to changes in the underlying system architecture. For additional information about rPerf, contact your local IBM offi e or an IBM authorized reseller.

Commercial Processing Workload (CPW) is a relative measure of performance of systems running the IBM i operating system. Performance in client environments may vary. The value is based on maximum confi urations. For a complete description Please refer to the “IBM Power Systems Performance Capabilities Reference - IBM i operating system” at the following Web site of CPW and the CPW rating for IBM Power Systems: www.ibm.com/systems/power/software/i/management/performance/resources.html

All performance estimates are provided “AS IS” and no warranties or guarantees are expressed or implied by IBM. Buyers should consult other sources of information including system benchmarks and application sizing guides to evaluate the performance of a system they are considering buying. Actual system performance may vary and is dependent upon many factors including system hardware confi ura tion and software design and confi uration.
IBM recommends application-oriented testing for performance predictions. Additional information about the performance benchmarks, values and systems tested is available from your IBM marketing representative or IBM Authorized Reseller or access the following on the Web:

SPEC – http://www.spec.org

TPC – http://www.tpc.org

More information

Contact your IBM sales representative or IBM Business Partner

Access the Power Systems Products and Services page on IBM’s World Wide Web server at ibm.com/systems/power and then select the appropriate hardware or software option

Product announcement letters and Sales Manual containing more details on hardware and software offerings are available at ibm.com/common/ssi

More detailed benchmark and performance information is available at ibm.com/systems/p/hardware/benchmarks , ibm.com/systems/p/hardware/system_perf.html and at ibm.com/systems/i/solutions/perfmgmt/resource.html .

IBM Systems
1 New Orchard Rd.
Armonk, New York 10504

Produced in the United States of America
July 2020

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When referring to storage capacity, total TB equals total GB divided by 1000; accessible capacity may be less.

The IBM home page on the Internet can be found at ibm.com .

This brochure provides detailed technical specifications f all IBM POWER9 processor-based Power Systems servers in a tabular, easytoscan format for easy comparison between systems. These systems are UNIX (AIX), IBM i and Linux operating system servers. Not all features listed in this document are available on all three operating systems.