IBM Power Systems

Кое-что про POWER7+

А. Перевозчиков
2012 Patent Leadership (20 years of Leadership)

**TOP 10 US Patent Grants**

- **IBM** 6,478
- **Samsung** 5,081
- **Canon** 3,174
- **Sony** 3,032
- **Panasonic** 2,769
- **Microsoft** 2,613
- **Toshiba** 2,447
- **Hon Hai Precision** 2,031
- **General Electric** 1,652
- **LG Electronics** 1,624

Source: IFI Patent Intelligence
HP Dropped to #15 with 1,394
Oracle is not in the top 50

**$6B In R&D**

- **Research**
- **Software Group**
- **Systems & Technology Group**

32 Nanometer factory
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IBM’S 10-year march to UNIX leadership

UNIX Server Rolling Four Quarter Average Revenue Share


* As reported last fiscal quarter
Processors
IBM POWER processor roadmap

New Generation ~ 3 Year Revolution
“+” Version ~ 1-2 Year Evolution

First Dual Core in Industry
- Dual Core
- Chip Multi Processing
- Distributed Switch
- Shared L2
- Dynamic LPARs (32)
- 180nm, 130nm

2001

Hardware Virtualization for Unix & Linux
- Dual Core & Quad Core Md
- Enhanced Scaling
- 2 Thread SMT
- Distributed Switch +
- Core Parallelism +
- FP Performance +
- Memory bandwidth +
- 130nm, 90nm

2004

POWER4/4 +

POWER5/5 +

POWER6/6 +

POWER7/7+

Fastest Processor In Industry
- Dual Core
- High Frequencies
- Virtualization +
- Memory Subsystem +
- Altivec
- Instruction Retry
- Dyn Energy Mgmt
- 2 Thread SMT +
- Protection Keys +
- 65nm

2007

2010

Binary Compatible & Increased Core Performance

Most POWERful & Scalable Processor in Industry
- 3, 4, 6,8 Core
- 32MB On-Chip eDRAM
- Power Optimized Cores
- Mem Subsystem +
- 4 Thread SMT++
- Reliability +
- VSM & VSX
- Protection Keys +
- 2012 Power 7+
- 32nm
- 4.42GHz
- 80MB L3 Cache
- Accelerators
POWER7+
Innovation Drives Performance

Gain by Technology Scaling  Gain by Innovation

Relative % of Improvement

IBM plans for future 22 nm technology are subject to change.
POWER7+

POWER7
45 nm

POWER7
32 nm

В 2.5 раза больше L3-кэш

Аппаратные ускорители
Benefits of eDRAM for POWER7+

With eDRAM

2.1B Transistors
567 mm²

Without eDRAM

5.4B Transistors
950 mm²

IBM’s eDRAM Benefits:
- Greater density: 1/3 the space of 6T SRAM implementation
- Less power requirements: 1/5 the standby power
- Fewer soft errors: Soft Error Rate 250x lower than SRAM
- Better Performance
## Processor Designs

<table>
<thead>
<tr>
<th>Technology</th>
<th>POWER5</th>
<th>POWER5+</th>
<th>POWER6</th>
<th>POWER7</th>
<th>POWER7+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>130nm</td>
<td>90nm</td>
<td>65nm</td>
<td>45nm</td>
<td>32nm</td>
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<tr>
<td>Transistors</td>
<td>389 mm²</td>
<td>245 mm²</td>
<td>341 mm²</td>
<td>567 mm²</td>
<td>567 mm²</td>
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<tr>
<td>Cores</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>8</td>
<td>8</td>
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<tr>
<td>Frequencies</td>
<td>1.65 GHz</td>
<td>1.9 GHz</td>
<td>4 - 5 GHz</td>
<td>3 – 4 GHz</td>
<td>3.6 – 4.4+ GHz</td>
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<tr>
<td>L2 Cache</td>
<td>1.9MB Shared</td>
<td>1.9MB Shared</td>
<td>4MB / Core</td>
<td>256 KB per Core</td>
<td>256 KB per Core</td>
</tr>
<tr>
<td>L3 Cache</td>
<td>36MB</td>
<td>36MB</td>
<td>32MB</td>
<td>4MB / Core</td>
<td>10MB / Core</td>
</tr>
<tr>
<td>Memory Cntrl</td>
<td>1</td>
<td>1</td>
<td>2 / 1</td>
<td>2 / 1</td>
<td>2 / 1</td>
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<tr>
<td>Architecture</td>
<td>Out of Order</td>
<td>Out of Order</td>
<td>In of Order</td>
<td>Out of Order</td>
<td>Out of Order</td>
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<tr>
<td>LPAR</td>
<td>10 / Core</td>
<td>10 / Core</td>
<td>10 / Core</td>
<td>10 / Core</td>
<td>20 / Core</td>
</tr>
</tbody>
</table>
POWER7+

Physical Design:
- Integrated Cache, Memory Controllers and Accelerator
- 32nm technology
- 3 / 4 / 6 / 8

Features:
- Higher Frequencies
- 80MB on chip L3 Cache
- Memory Compression Accelerator
  - Active Memory Expansion
- Hardware encryption support for AIX
- Random Number Generator
- Improved RAS features
- Enhanced Energy / Power Gating
- Enhanced GX System Buses
- Enhanced Single Precision Floating Point performance
- 20 Virtual Machine’s per core
Improved SP Floating Point performance

POWER7/7+ has four FP pipelines. Each pipeline in POWER7/7+ can do either a SP or a DP. DP width is 2x of SP. POWER7/7+ feeds two SP in each DP pipeline
  - Needed separate area for control and some status bits.
In POWER7: Two DP pipe together can execute a 2-way SIMD FPDP instruction.
In POWER7+: Same two DP pipe together now can execute a 4-way SIMD SPFP instruction.
Two 4-way SIMD SPFP instruction can be executed in POWER7+
  - Only one in POWER7.
Multiply-add counting as two, POWER7+ has 16 SP FLOP per cycle
POWER7+ Encryption Accelerator

**Technology**

- **Crypto Offload Accelerators:**
  - Provide cryptographic engines to relieve the POWER7+ processor from the performance intensive cryptographic algorithms of AES, SHA, and RSA.

- **High quality random numbers:**
  - Generated with high performance with the RNG offload feature of the POWER7+ processor.

**Client Benefits**

- Can be applied to a broader set of data creating a stronger security ecosystem.
- POWER7+ core focused on application performance.
- Two primary AIX security applications: 1) Encrypted File Systems protecting your data in storage or on backup media 2) IPsec protecting your data over the network.

- Ensures that the high demand for entropy on a heavily loaded systems always yields high quality random numbers.
- RNG offload provides entropy and security is ensured.
- Processor performance focused on your applications.
POWER7+ RAS Specific Features

New Power On Reset Engine (PORE)
- Enables a processor core to be re-initialized while system remains up and running
- Directly used to:
  - *Allow for Concurrent Firmware Updates:* In cases where a processor initialization register value needs to be changed

L3 Cache dynamic column repair
- New self-healing capability that complements cache line delete
- Uses PORE feature to substitute a failing bit-line for a spare during run-time.

New Fabric Bus Dynamic Lane Repair
- POWER7+ has spare bit lanes that can dynamically be repaired (using PORE)
  - For Busses that connect CEC drawers
  - Avoids any repair action or outage related to a single bit failure.
Dynamic Processor Fabric Bus repair

Fabric busses run between CEC drawers / use ECC protection.
Spare signals run between the drawers.
If fault occurs on one of the signals, ECC allows continued operations until we dynamically activate and start using a spare.
Activation of a spare involves temporarily stopping the clocks using a power savings mode that is new for POWER7+.
Transparent to applications since it is a very momentary pause that allows us to switch from one signal to another on the bus.
At least 2 bits can be bad and can be tolerated
  ▪ First bit can be "self-healed" without any need to take a service action.

Competition: Single bit-line error will cause an entire lane of traffic to be taken out of commission –
  ▪ Major impact to performance,
  ▪ Drive the necessity of a service action.
POWER7 / POWER7+ Module Packaging

**POWER7**

- **Power 795**
  - Single Chip Glass Ceramic

- **Power 775**
  - Quad-chip MCM

**POWER7+**

- **Power 710 / 730**
  - Single Chip Organic

- **Power 720 / 740**
  - Single Chip Organic

- **Power 750 / 760**
  - Dual Chip Organic

- **Power 770 / 780**
  - Single Chip Organic
POWER7+ DCM

Один сокет
Два процессора POWER7+
- 4 ядра
- 6 ядер

Получаем
- 8-ядерный DCM
- 12-ядерный DCM
POWER7+ Core / Cache options

POWER7+ 6 Core Chip

POWER7+ 4 Core Chip

60 MB L3 Cache

40 MB L3 Cache
Частота процессора

- Для простоты используется точность с одним знаком после запятой (например 3.6)
- Реальные частоты таковы:

<table>
<thead>
<tr>
<th>Цифры в анонсе</th>
<th>Реальные значения</th>
</tr>
</thead>
<tbody>
<tr>
<td>POWER7+ 710</td>
<td></td>
</tr>
<tr>
<td>4-core @ 3.6 GHz</td>
<td>4 Core @ 3.612 GHz</td>
</tr>
<tr>
<td>6-core @ 4.2 GHz</td>
<td>6 Core @ 4.284 GHz</td>
</tr>
<tr>
<td>8-core @ 4.2 GHz</td>
<td>8 Core @ 4.228 GHz</td>
</tr>
<tr>
<td>POWER7+ 730</td>
<td></td>
</tr>
<tr>
<td>8-core @ 4.3 GHz</td>
<td>8 Core @ 4.312 GHz</td>
</tr>
<tr>
<td>12-core @ 4.2 GHz</td>
<td>12 Core @ 4.284 GHz</td>
</tr>
<tr>
<td>16-core @ 3.6 GHz</td>
<td>16 Core @ 3.612 GHz</td>
</tr>
<tr>
<td>16-core @ 4.2 GHz</td>
<td>16 Core @ 4.228 GHz</td>
</tr>
</tbody>
</table>
Новые модели
POWER7 Portfolio

- Power 795
- Power 780+
- Power 770+
- Power 750+ / 760+
- Power 720+/740+
- Power 710+/730+
- PowerLinux 7R1 / 7R2
- IBM PureFlex System
- p460
- p260+
- p24L
- PS Blades

5 Feb POWER7+ Announcement
POWER7+ 710 Express

✓ 1 Socket: Power 710
✓ 2U Form Factor
✓ POWER7+
✓ 4, 6 or 8 cores
✓ Up to 256 GB memory
✓ 5 PCIe x8 Gen2 Slots
✓ 6th PCIe x4 Gen2 slot for Ethernet
✓ Single GX++ Slots
  ▪ Ultra SSD Drawer option
✓ 6 SFF Bays
  ▪ Optional add’l storage drawers
POWER7+ 710  8231-E1D  4 / 6 / 8 Cores

Single Socket
Processor module options:
- 4-core socket: FC #EPCE  3.6 GHz
- 6-core socket: FC #EPCG  4.2 GHz
- 8-core socket: FC #EPCJ  4.2 GHz

For 4 Core
- IBM i P05 tier (users)
- AIX small tier
- Zero Disk/SSD-only drawers
- Zero Ultra SSD drawer

For 6 / 8 Core
- Zero 12X I/O loops
- Max 256 GB memory
- Disk/SSD-only drawers
- Ultra SSD drawer
- IBM i P10 tier (users)
- AIX small tier

For 4 / 6/ 8 Core
- Zero 12X I/O loops
- Max 256 GB memory
- System unit HDD/SSD
- Fibre Channel or FCoE attached SAN attachment
POWER7+ 730 Express

✓ 2 Sockets: Power 730
✓ 2U Form Factor
✓ POWER7+
✓ 4, 6 or 8 cores per socket
✓ **Up to 512 GB Memory**
✓ 5 PCIe x8 Gen2 Slots
✓ 6th PCIe x4 Gen2 slot for Ethernet
✓ Dual GX++ Slots
  ▪ 12X PCIe Drawer option
  ▪ **Ultra SSD I/O Drawer** option
✓ 6 SFF Bays
  ▪ Optional add’l Storage drawers
POWER7+ 730  8231-E2D  8 / 12 / 16 Cores

Dual Sockets
Processor modules:

- 4 Core sockets: FC #EPCF  4.3 GHz
- 6 Core sockets: FC #EPCG  4.2 GHz
- 8 Core sockets: FC #EPCH  3.6 GHz
- 8 Core sockets: FC #EPCJ  4.2 GHz

- For 8 / 12 / 16 core
  - Max 1 12X I/O loops
  - Max 512 GB memory
  - System unit HDD/SSD
  - Disk/SD-only drawers supported
  - Ultra SSD drawer
  - Fibre Channel or FCoE attached SAN attachment
  - IBM i P20 tier  (5250)
  - AIX small tier
# PowerLinux 7R1 / Power 710 Positioning

<table>
<thead>
<tr>
<th></th>
<th>PowerLinux 7R1</th>
<th>Power 710</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8246-L1T</td>
<td>8246-L1D</td>
</tr>
<tr>
<td>Operating Systems</td>
<td>Linux</td>
<td>AIX, i for Business, Linux</td>
</tr>
<tr>
<td>POWER7+ Architecture</td>
<td>4 Core @ 3.6 GHz</td>
<td>4 Core @ 3.6 GHz</td>
</tr>
<tr>
<td>Dual Sockets</td>
<td>6 Core @ 4.2 GHz</td>
<td>6 Core @ 4.2 GHz</td>
</tr>
<tr>
<td></td>
<td>8 Core @ 4.2 GHz</td>
<td>8 Core @ 4.2 GHz</td>
</tr>
<tr>
<td>DDR3 Memory</td>
<td>4 / 8 / 16 / 32 GB DIMMs</td>
<td>4 / 8 / 16 / 32 GB DIMMs</td>
</tr>
<tr>
<td></td>
<td>32GB to 256GB</td>
<td>8GB to 256GB</td>
</tr>
<tr>
<td>12X PCIe Expansion Drawer</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>HDD/SSD storage drawers</td>
<td>Up to 4</td>
<td>N/A</td>
</tr>
<tr>
<td>EXP30 Ultra SSD Drawer</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>SAS SFF Bays</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCIe Gen2 Slots</td>
<td>General Purpose: Five x8 LP &amp; Dedicated: One x4 LP (Ethernet Adapter)</td>
<td></td>
</tr>
<tr>
<td>Integrated SAS/SATA Cntrl</td>
<td>Standard: RAID 0, 1, &amp; 10 Optional: RAID 5 &amp; 6</td>
<td></td>
</tr>
<tr>
<td>GX++ Slots</td>
<td>One</td>
<td></td>
</tr>
<tr>
<td>Integrated Ports</td>
<td>3 USB, 2 Serial, 2 HMC</td>
<td>Quad Port 10/100/1000</td>
</tr>
<tr>
<td>Ethernet in 6th PCIe slot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Media Bays</td>
<td>1 Slim-line (DVD) &amp; optionally 1 Half Height (DAT 160/320 tape or RDX)</td>
<td></td>
</tr>
<tr>
<td>Virt Management</td>
<td>IVM or HMC</td>
<td></td>
</tr>
<tr>
<td>Redundant Power &amp; Cooling</td>
<td>Standard</td>
<td></td>
</tr>
<tr>
<td>Warranty</td>
<td>3 Years</td>
<td></td>
</tr>
</tbody>
</table>

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# PowerLinux 7R2 / Power 730 Positioning

## PowerLinux 7R2

### Operating Systems
- Linux

### POWER7+ Architecture
- Dual Sockets
- 16 Cores @ 3.6 GHz
- 16 Cores @ 4.2 GHz

### DDR3 Memory
- 4 / 8 / 16 / 32 GB DIMMs
- 32GB to 512GB

### 12X PCIe Expansion Drawer
- Up to 2

### HDD/SSD storage drawers
- Up to 14

### EXP30 Ultra SSD Drawer
- Up to 1

### SAS SFF Bays
- Up to 6 HDD or SSD

### PCIe Gen2 Slots
- General Purpose: Five x8 LP
- Dedicated: One x4 LP (Ethernet Adapter)

### Integrated SAS/SATA Cntrl
- Standard: RAID 0, 1, & 10
- Optional: RAID 5 & 6

### GX++ Slots
- Two

### Integrated Ports
- 3 USB, 2 Serial, 2 HMC

### Ethernet in 6th PCIe slot
- Quad Port 10/100/1000

### Media Bays
- 1 Slim-line (DVD) & optionally Half Height (DAT 160/320 tape or RDX)

### Virt Management
- IVM or HMC

### Redundant Power & Cooling
- Standard

### Warranty
- 3 Years

## Power 730

### Operating Systems
- AIX
- Linux

### POWER7+ Architecture
- Dual Sockets
- 8 Cores @ 4.3 GHz
- 12 Core @ 4.2 GHz
- 16 Core @ 3.6 / 4.2 GHz

### DDR3 Memory
- 4 / 8 / 16 / 32 GB DIMMs
- 8GB to 512GB

### 12X PCIe Expansion Drawer
- N/A

### HDD/SSD storage drawers
- Up to 2

### EXP30 Ultra SSD Drawer
- N/A

### SAS SFF Bays
- Up to 14

### PCIe Gen2 Slots
- General Purpose: Five x8 LP
- Dedicated: One x4 LP (Ethernet Adapter)

### Integrated SAS/SATA Cntrl
- Standard: RAID 0, 1, & 10
- Optional: RAID 5 & 6

### GX++ Slots
- Two

### Integrated Ports
- 3 USB, 2 Serial, 2 HMC

### Ethernet in 6th PCIe slot
- Quad Port 10/100/1000

### Media Bays
- 1 Slim-line (DVD) & optionally Half Height (DAT 160/320 tape or RDX)

### Virt Management
- IVM or HMC

### Redundant Power & Cooling
- Standard

### Warranty
- 3 Years
IBM PowerLinux 7R2 SAP SD 2-Tier Performance

28% Better than best published Linux 16-core Sandy Bridge EP result on the latest SAP SD 2-Tier benchmark (6_EHP5) with 16-core, 4.22 GHz PowerLinux 7R2

SAP Users

- IBM PowerLinux 7R2 (4.22 GHz POWER7+, SLES 11 SP2)
- HP DL 380 G8 (2.90 GHz Xeon E5 2690, RHEL 6.2)

POWER7+
IBM PowerLinux 7R2

#1 for SAP Linux on 2-socket

SAP source: http://www.sap.com/benchmark/
As of 12/17/12.
SAP Publication number for HP results: 2012032
POWER7+ 720 Express

✓ Single Socket:
✓ 4U Form Factor
✓ POWER7+
✓ 4, 6 or 8 cores per socket
✓ **Up to 512 GB Memory**
✓ 5 + 4 PCIe x8 Gen2 Slots
✓ 6th PCIe x4 Gen2 slot for Ethernet
✓ One GX++ Slots
  ▪ 12X PCI Drawer
  ▪ **Ultra SSD I/O Drawer** option
✓ 6 SFF Bays
  ▪ Optional add’l Storage drawers
✓ Optional Split Backplane support on planar
POWER7+ 720  8202-E4D  4 / 6 / 8 Core

Single POWER7+ socket options:
- FC #EPCK  4-core @ 3.6 GHz
- FC #EPCL  6-core @ 3.6 GHz
- FC #EPCM  8-core @ 3.6 GHz

- For 4 Core Systems
  - Max 64 GB memory
  - Zero 12X I/O loops
  - Zero Ultra SSD drawer
  - IBM i P05 tier (users)
  - AIX small tier

- For 6 / 8 Core Systems
  - Max 512 GB memory
  - Max one 12X I/O loop
  - Max one Ultra SSD drawer
  - IBM i P10 tier (users)
  - AIX small tier
**520 / 720 Upgrade Paths Details**  
(same serial number)

**Notes:**
- Same-serial-number upgrades from Power 720 to a newer Power 720 (B-to-C, B-to-D, or C-to-D) are not offered
- POWER6 9408-M25 to POWER6 8203-E4A conversions remain available
POWER7+ 740 Express

✓ Single or Dual Sockets
✓ 4U Form Factor
✓ POWER7+
✓ 6 or 8 cores per socket
✓ Up to 1 TB Memory
✓ 5 + 4 PCIe x8 Gen2 Slots
✓ 6th PCIe x4 Gen2 slot for Ethernet
✓ Dual GX++ Slots
  - 12X PCI Drawer option
  - Ultra SSD I/O Drawer option
✓ 6 SFF Bays
  - Optional add’l Storage drawers
✓ Optional Split Backplane support on planar
POWER7+ 740  8205-E6D  6 / 8 / 12 / 16 Core

Single or dual sockets processor options:
- FC #EPCP  6 Core @ 4.2 GHz
- FC #EPCQ  8 Core @ 3.6 GHz
- FC #EPCR  8 Core @ 4.2 GHz

Can add 2\textsuperscript{nd} module later

- For 6 / 8 Core Single Socket
  - Max 512 GB memory
  - Max 1 12X I/O loop
  - Max 1 EXP30 Ultra SSD Drawer
  - IBM i P20 tier / 5250 Entitlements
  - AIX small tier

- For 12 / 16-core Dual Sockets
  - Max 1024 GB memory
  - Max 2 12X I/O loops
  - Max 2 EXP30 Ultra SSD Drawer
  - IBM i P20 tier / 5250 Entitlements
  - AIX small tier

* Added 4Q 2010
Merging Power 770 & Power 740 = Power 750/760

- **Quad Sockets**
- **IO Subsystem**
- **Memory Architecture**
- **RAS Features**

Enterprise System features
Express System pricing

Power 750
Power 760
Power 770
Power 740

Express System pricing
POWER7+ Power 750 / 760

New generation of Express/Enterprise Class servers
- Evolution of Power 750
- Provides more Core, more Memory, more IO bandwidth, etc.

Wide range of uses..
- Data Base
- ERP
- Server consolidation

Enterprise features
- 40GB of Internal IO bandwidth
- Split Backplane support standard
- Six full size PCIe Gen2 slots with Blind swap support
- Blind swap PCIe adapter support
- Quad Socket processor design
- Memory Density options
- CUoD support (Power 760)

Supports up to 640 / 960 LPARs
## Processor Offerings for Power 750 and Power 760

<table>
<thead>
<tr>
<th>Sockets</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<tbody>
<tr>
<td>Power 750</td>
<td>8</td>
<td>16</td>
<td>24</td>
<td>32</td>
</tr>
<tr>
<td>Power 760</td>
<td>12</td>
<td>24</td>
<td>36</td>
<td>48</td>
</tr>
</tbody>
</table>

![Power 750](image1.png)  
![Power 760](image2.png)
Power 750

✓ POWER7+
✓ 8 Cores per Socket @ 3.5 & 4.0 GHz
✓ Up to Four Sockets
✓ Up to 32 Cores
✓ Up to 1 TB of memory
✓ 6 PCIe Gen2 slots
✓ 6 SFF DASD/SSD Bays
✓ Multifunction card w/ up to 4 10GbE ports
✓ Enhanced RAS
✓ Three year maintenance coverage
## Power 750

**Up to 32 Cores**
4 Socket / 5U

Supports up to 640 LPARs

**FC # 2319**

**3 Yr Maintenance**
24 x 7

### 8408-E8D Specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>POWER7+ Arch. + Up to 4 Sockets</td>
<td>8-core DCM @ 4.0 GHz</td>
</tr>
<tr>
<td></td>
<td>8-core DCM @ 3.5 GHz</td>
</tr>
<tr>
<td>DDR3 Memory</td>
<td>Up to 1 TB</td>
</tr>
<tr>
<td>Capacity on Demand</td>
<td>N / A</td>
</tr>
<tr>
<td>SAS SFF Bays</td>
<td>Up to 6 HDD or SSD</td>
</tr>
<tr>
<td></td>
<td>Split Backplane support</td>
</tr>
<tr>
<td>IO Expansion Slots in CEC</td>
<td>PCIe x8: 6 Slots (Hot Swap)</td>
</tr>
<tr>
<td></td>
<td>Dual GX++ Bus (with 2 or more DCM)</td>
</tr>
<tr>
<td>Integrated IO Cntrl</td>
<td>SAS (Dual) plus SATA</td>
</tr>
<tr>
<td></td>
<td>Standard RAID 0, 1, &amp; 10</td>
</tr>
<tr>
<td></td>
<td>Optional RAID 5 &amp; 6</td>
</tr>
<tr>
<td>IVM / HMC Support</td>
<td>Yes / Yes (HMC optional)</td>
</tr>
<tr>
<td>Integrated Multifunction Card (IMFC)</td>
<td>4 Ethernet (Dual 10 Gb &amp; Dual 1 Gb or Quad 10Gb); 2 USB, 1 serial</td>
</tr>
<tr>
<td>Integrated Ports</td>
<td>1 USB, 2 HMC, 2 SPCN, plus IMFC</td>
</tr>
<tr>
<td>Media Bays</td>
<td>1 Slim-line for DVD</td>
</tr>
<tr>
<td>12X PCIe IO Drawers</td>
<td>Max 4 (no PCI-X drawers)</td>
</tr>
<tr>
<td>EXP30 Ultra SSD Drawer</td>
<td>Max 2</td>
</tr>
<tr>
<td>HDD/SSD-only drawer</td>
<td>Max 51</td>
</tr>
<tr>
<td>Redundant Power</td>
<td>Yes</td>
</tr>
<tr>
<td>Redundant Cool</td>
<td>Yes</td>
</tr>
<tr>
<td>EnergyScale</td>
<td>Dynamic Energy Save &amp; Capping</td>
</tr>
<tr>
<td>Redundant Power</td>
<td>Yes</td>
</tr>
<tr>
<td>Redundant Cool</td>
<td>Yes</td>
</tr>
<tr>
<td>EnergyScale</td>
<td>Dynamic Energy Save &amp; Capping</td>
</tr>
</tbody>
</table>

**FC # 2319**
Power 760

✅ POWER7+
✅ 12 Cores per Socket @ 3.1 & 3.4 GHz
✅ Up to Four Sockets
✅ Up to 48 Cores
✅ Up to 2 TB of memory
✅ 6 PCIe Gen2 slots
✅ 6 SFF DASD/SSD Bays
✅ Multifunction card w/ up to 4 10Gb E ports
✅ Capacity on Demand for Processors
  ✪ Permanent activations
  ✪ Dynamic Processor Sparing
✅ Enhanced RAS
✅ Three year maintenance coverage
IBM Power Systems

Power 760 (with 48 cores) delivers 82% more users than leading x86 results (with 40 cores) in SAP S&D 2-Tier benchmark

Power Systems result even surpasses leading x86 80 core result

25,488
SAP SD Users

Best Intel® Sandy Bridge results

(1) IBM Power 760 on the two-tier SAP SD standard application benchmark running SAP enhancement package 5 for the SAP ERP 6.0 application; certification number not available at press time and can be found at sap.com/benchmark. IBM Power System 760, 4 processors / 48 cores / 192 threads, POWER7+ 4.0 GHz, XX GB memory.

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Power 760 Capacity Upgrade on Demand

Minimum of 8 Core activations is required
Permanent activations only
- No temporary or Trial CoD
  - No Elastic (On/Off) CoD or Utility CoD
No memory CoD
- Plan ahead for memory demands
- Adding memory requires system unit to be powered down
Dynamic Processor Sparing is available

CUoD provides flexibility to have “stand by” resources available to be permanently activated

<table>
<thead>
<tr>
<th>Power 760</th>
<th>0/12-core DCM feature</th>
<th>Processor core activation feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1 GHz</td>
<td>#EPT5</td>
<td>#EPTA</td>
</tr>
<tr>
<td>3.4 GHz</td>
<td>#EPT6</td>
<td>#EPTB</td>
</tr>
</tbody>
</table>

About 70% of the list price is for activations assuming 100% of the cores are activated.

Prices shown are IBM USA suggested list prices as of Feb 2013 and are subject to change without notice; Reseller prices may vary.
## Power 760

**Up to 48 Cores**  
**4 Socket / 5U**

**Supports up to 960 LPARs**

**3 Yr Maintenance**  
**24 x 7**

### 9109-RMD

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>POWER7+ Arch.</td>
<td>12-core DCM @ 3.4 GHz</td>
</tr>
<tr>
<td>Up to 4 Sockets</td>
<td>12-core DCM @ 3.1 GHz</td>
</tr>
<tr>
<td>DDR3 Memory</td>
<td>Up to 2 TB</td>
</tr>
<tr>
<td>Capacity on Demand</td>
<td>Yes for Processors (Permanent only)</td>
</tr>
<tr>
<td>SAS SFF Bays</td>
<td>Up to 6 HDD or SSD Split Backplane support</td>
</tr>
<tr>
<td>IO Expansion Slots in CEC</td>
<td>PCIe x8: 6 Slots (Hot Swap)</td>
</tr>
<tr>
<td></td>
<td>Dual GX++ Bus (with 2 or more DCM)</td>
</tr>
<tr>
<td>Integrated IO Cntrl</td>
<td>SAS (Dual) plus SATA</td>
</tr>
<tr>
<td></td>
<td>Standard RAID 0, 1, &amp; 10</td>
</tr>
<tr>
<td></td>
<td>Optional RAID 5 &amp; 6</td>
</tr>
<tr>
<td>IVM / HMC Support</td>
<td>No / Yes (HMC required)</td>
</tr>
<tr>
<td>Integrated Multifunction Card</td>
<td>4 Ethernet (Dual 10 Gb &amp; Dual 1 Gb or Quad 10Gb)</td>
</tr>
<tr>
<td>(IMFC)</td>
<td>2 USB, 1 serial</td>
</tr>
<tr>
<td>Integrated Ports</td>
<td>1 USB, 2 HMC, 2 SPCN, plus IMFC</td>
</tr>
<tr>
<td>Media Bays</td>
<td>1 Slim-line for DVD</td>
</tr>
<tr>
<td>12X PCIe IO Drawers</td>
<td>Max 4 (no PCI-X drawers)</td>
</tr>
<tr>
<td>EXP30 Ultra SSD Drawer</td>
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<td>Max 51</td>
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<tr>
<td>Redundant Power</td>
<td>Yes</td>
</tr>
<tr>
<td>Redundant Cooling</td>
<td>Yes</td>
</tr>
<tr>
<td>EnergyScale</td>
<td>Dynamic Energy Save &amp; Capping</td>
</tr>
</tbody>
</table>

**AIX**  
**i** for Business  
**Linux**
## POWER7+ 750 / 760 Systems

<table>
<thead>
<tr>
<th>Feature</th>
<th>POWER7 750</th>
<th>POWER7+ 750</th>
<th>POWER7+ 760</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sockets</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Cores</td>
<td>32</td>
<td>32</td>
<td>48</td>
</tr>
<tr>
<td>Frequencies</td>
<td>3.2 – 3.6 GHz</td>
<td>3.5 – 4.0 GHz</td>
<td>3.1 – 3.4 GHz</td>
</tr>
<tr>
<td>Maximum Memory</td>
<td>512 GB</td>
<td>1 TB</td>
<td>2 TB</td>
</tr>
<tr>
<td>GX slots</td>
<td>1 GX++ &amp; 1 shared GX</td>
<td>2 GX++</td>
<td>2 GX++</td>
</tr>
<tr>
<td>PCI slots</td>
<td>2 PCIx &amp; 3 PCIe Gen1</td>
<td>6 PCIe Gen2</td>
<td>6 PCIe Gen2</td>
</tr>
<tr>
<td>MultiFunction Ethernet ports *</td>
<td>Four 1Gb or two 10Gb</td>
<td>Two 10Gb CNA + Two 10/1 Gb</td>
<td>Two 10Gb CNA + Two 10/1 Gb</td>
</tr>
<tr>
<td>SFF SAS bays</td>
<td>6 / 8</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Integrated split backplane</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>LPARs</td>
<td>10 per core</td>
<td>20 per core</td>
<td>20 per core</td>
</tr>
<tr>
<td>Height</td>
<td>4U</td>
<td>5U</td>
<td>5U</td>
</tr>
<tr>
<td>Installation</td>
<td>Customer Set-Up</td>
<td>Customer Set-Up</td>
<td>IBM installed</td>
</tr>
<tr>
<td>CoD</td>
<td>N / A</td>
<td>N / A</td>
<td>Processor on Demand</td>
</tr>
<tr>
<td>Software Tier</td>
<td>Small</td>
<td>Small</td>
<td>Medium</td>
</tr>
<tr>
<td>HMC</td>
<td>Optional</td>
<td>Optional</td>
<td>Required</td>
</tr>
</tbody>
</table>
Power 750 / 760 Performance Considerations

POWER7+ 750 / 760

Power 750+ / 760 systems design / topology is similar to Power 770 with 6 core sockets

- Similar workload characteristics
- Bandwidths between cores is higher than those between Sockets / Nodes
- Latency across Sockets / Nodes is higher than latencies between cores

Memory Bandwidth per core

- Power 750+ = Power 750
- Power 760 < Power 750
  - Power 760 has more cores per socket
POWER7+ 750 / 760 CPU Card
Two memory riser cards required per DCM
Front View

6 SFF DASD/SSD Bays
- Standard split Backplane 3+3
- Optional 2+2+2 split
- Optional 6 (no split) w/ RAID5/6

Batteries for Opt RAID5/6 Write Cache

Op Panel
Power 750 / 760 Rear View
Rear view of POWER7+ 750/760

Four Integrated Multifunction Card (IMFC) options

- #1768 = $ 1785
- #1769 = $ 3358
- #EN10 = $ 3013
- #EN11 = $ 4061

Every 750/760 needs one …. can change to different feature later if needed

- Power down server to replace (not hot plug)

Four Ethernet ports
  - Two SFP+ (Copper or Optical SR)
  - Two RJ45

Two USB ports

One serial port

Does not require a PCIe slot

Use VIOS to virtualize (no integrated virtualization without VIOS)

IBM i requires VIOS for Ethernet ports (native support of USB ports)

- IBM i LAN consoles must be native, not connected through VIOS

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Multifunction Cards

FC #1768 (Copper)
FC #1769 (Optical)

Dual 10 Gb Optical / 1 Gb Ethernet
Dual 10 Gb Copper / 1 Gb Ethernet

FC #EN10 (Copper)
FC #EN11 (Optical)

Dual 10 Gb Optical / 1/10 Gb Ethernet
Dual 10 Gb Copper / 1/10 Gb Ethernet
Integrated Multifunction Card #EN10 / #EN11

- Compared to #1768 / #1769 Multifunction Card
  - #EN10/EN11 have expanded Ethernet port capabilities

  - Higher function SFP+ ports ... CNA (Converged Network Adapter = NIC + FCoE) ... can reduce the number of PCIe adapters needed
  - Higher speed RJ45 ports ... 10Gb ... and lower cost cabling option to attach to 10Gb switches vs SR optical or Copper twinax

- Same USB and serial port capabilities

- Available for POWER7+ 750/760
  - SOD for 770/780 (‘C’ and ‘D’ models)

- NPIV support through VIOS for FCoE

- AIX, IBM i, Linux, VIOS support
  - Identical to POWER7+ 750 / 760 support levels
  - Note IBM i -- VIOS required. For SFP+ ports, NIC supported, FCoE not tested/supported
Power 750/760 General Information….

Physical Specifications:
- Width: 447 mm (17.6 in)
- Depth: 858 mm (33.8 in)
- Height: 217 mm (8.56 in), 5 EIA units
- Weight: 70.3 kg (155 lb)

Operating voltage: 200 to 240 V

Operating Frequency: 50/60 Hz

Power Consumption: 2400 watts (maximum)

Thermal Output: 8189 Btu/hour (maximum)

Power-source Loading
- 2.45 KVA (maximum configuration)

Noise Level and Sound
- Rack-mount drawer: 7.1 Bels operating

http://www-912.ibm.com/see/EnergyEstimation
POWER7+ Performance

rPerf ratings charted. If CPW ratings charted, the bars show the same scaling.
Power 750 / 760 Performance …

- Power 595
  - POWER5+
  - 64 Core
  - @ 2.3 GHz

- Power 570
  - POWER6
  - 16 Core
  - @ 5.0 GHz

- Power 750
  - POWER7+
  - 32 Core
  - @ 4.0 GHz

- Power 760
  - POWER7+
  - 48 Core
  - @ 3.4 GHz

rPerf ratings charted. If CPW ratings charted, the bars show the same scaling.
POWER7+ 770 / 780
POWER7+ 770

✓ POWER7+
✓ Frequencies:
  - 4C SCM @ 3.8 GHz    Max Config: 64 Cores
  - 3C SCM @ 4.2 GHz    Max Config: 48 Cores
✓ Up to 64 Cores
✓ Up to 4 TB of memory
✓ 6 PCIe Gen2 slots / CEC
✓ MultiFunction Card with 10GbE and 1GbE
✓ Capacity on Demand
✓ Enhanced RAS
  - Self-healing capability for L3 Cache functions
  - Core re-initialization (Running system)
  - Dynamic Processor Fabric Bus repair
POWER7+ 780

✓ POWER7+
✓ Frequencies:
  ▪ 8C SCM @ 3.7 GHz  Max Cores: 128 Cores
  ▪ 4C SCM @ 4.4 GHz  Max Cores: 64 Cores
✓ Up to 128 Cores
✓ Up to 4 TB of memory
✓ 6 PCIe Gen2 slots / CEC
✓ MultiFunction Card with 10GbE and 1GbE
✓ Enhanced Capacity on Demand options
✓ Enhanced RAS
  ▪ Self-healing capability for L3 Cache functions
  ▪ Core re-initialization (Running system)
  ▪ Dynamic Processor Fabric Bus repair