Power Systems
POWER9 Scale Out Servers

MTM 9009-42A (S924)
MTM 9009-41A (S914)
MTM 9009-22A (S922)
MTM 9008-22L (L922)
MTM 9223-42H (H924)
MTM 9223-22H (H922)

John Bizon – jbizon@us.ibm.com
Power Client Technical Specialist

Credits to:
• Ron Arroyo
• Simon Porstendorfer
• Ruby Zgabay
• Michael Fisher
• Nigel Griffiths
• Joe Armstrong
<table>
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<tr>
<th></th>
<th>Announce</th>
<th>Performance</th>
<th>Launch</th>
<th>GA</th>
</tr>
</thead>
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<tr>
<td>Date</td>
<td>2/13</td>
<td>2/27</td>
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<td>3/20</td>
</tr>
</tbody>
</table>
Introducing the LC Portfolio of OpenPOWER servers

IBM Power Systems LC Portfolio

Systems designed to take Data Rich and High Performance Computing (HPC) Linux workloads to the next level
POWER9 Processor

New Core Microarchitecture
- Stronger thread performance
- Efficient agile pipeline
- POWER ISA v3.0

Enhanced Cache Hierarchy
- 120MB NUCA L3 architecture
- 12 x 20-way associative regions
- Advanced replacement policies
- Fed by 7 TB/s on-chip bandwidth

Cloud + Virtualization Innovation
- Quality of service assists
- New interrupt architecture
- Workload optimized frequency
- Hardware enforced trusted execution

14nm finFET Semiconductor Process
- Improved device performance and reduced energy
- 17 layer metal stack and eDRAM
- 8.0 billion transistors

Leadership Hardware Acceleration Platform
- Enhanced on-chip acceleration
- Nvidia NVLink 2.0: High bandwidth, advanced new features (25G Link)
- CAPI 2.0: Coherent accelerator and storage attach (PCIe G4)
- OpenCAPI: Improved latency and bandwidth, open interface (25G Link)

State of the Art I/O Subsystem
- PCIe Gen4 – 48 lanes

High Bandwidth Signaling Technology
- 16 Gb/s interface – Local SMP
- 25 Gb/s interface
  - Accelerator, remote SMP
POWER Generation
Transistor Count (in billions)

POWER4 2001
POWER5 2004
POWER6 2007
POWER7 2010
POWER8 2014
POWER9 2017

0.2 0.3 0.8 1.2 4.2 8.0
POWER Generation by CPU lithography in nm

- POWER4: 180 nm (2001)
- POWER5: 130 nm (2004)
- POWER7: 45 nm (2010)
- POWER8: 22 nm (2014)
- POWER9: 14 nm (2017)
POWER9 Processor Family

Core Count / Size

SMP scalability / Memory subsystem

Scale-Out – 2 Socket Optimized
- Robust 2 socket SMP system
- Direct Memory Attach
  - Up to 8 DDR4 ports
  - Commodity packaging form factor

Scale-Up – Multi-Socket Optimized
- Scalable System Topology / Capacity
  - Large multi-socket
  - Buffered Memory Attach
  - 8 Buffered channels

SMT4 Core
- 24 SMT4 Cores / Chip
- Linux Ecosystem Optimized

SMT8 Core
- 12 SMT8 Cores / Chip
- PowerVM Ecosystem Continuity
POWER9 Processor

Redesigned Core Provides Improved Efficiency and Workload Alignment

- Increased execution bandwidth efficiency for a range of workloads including commercial, cognitive and analytics
- Sophisticated instruction scheduling and branch prediction for unoptimized applications and interpretive languages
- Adaptive features for improved efficiency and performance especially in lower memory bandwidth systems
Each of the four CPU core threads gets at least a slice
POWER9 fast core

Each of the eight CPU core threads gets at least a slice & up to 8 slices
POWER9 Scale-Out faster Architecture

POWER8
- 2 Sockets each with 2 POWER8 chips
- Four islands of L3 cache

POWER9
- 2 Sockets each with 1 POWER9 chip
- Two islands of larger L3 cache
- No comms within the socket = FASTER

Numbers are max number of cores
POWER9 Memory Subsystems

Two Memory Architectures

**Scale Out**
Direct Attach Memory

- 8 Direct DDR4 Ports
- Up to 170 GB/s of peak bandwidth
- Low latency access
- Commodity packaging form factor
- Adaptive 64B / 128B reads
- Simplified Design Point

**Max 2-Socket Systems**

**Scale Up**
Buffered Memory

- 8 Buffered Channels
- Up to 230 GB/s of memory bandwidth
- Extreme capacity – up to 8TB / socket
- Superior RAS with chip kill and lane sparing
- Compatible with POWER8 system memory
- Agnostic interface for alternate memory innovations

**4 to 16 Socket Systems**
POWER9 PCIe GEN4

POWER7/7+
- Proprietary GX Attach
- Utilizes Bridge Chip
- Directly Integrates PCI
- Improves latency/bandwidth
- CAPI 1.0 Support
- 40 GB/s Peak Bandwidth

POWER8
- Directly Integrates PCI
- Leadership Lane Count
- Full Cache Integration
- Very Early Adoption
- CAPI 2.0 Support
- 96 GB/s Peak Bandwidth

POWER9
- Directly Integrates PCI
- Leadership Lane Count
- Full Cache Integration
- Very Early Adoption
- CAPI 2.0 Support
- 192 GB/s Peak Bandwidth
POWER9 High Speed I/O

Utilize Best-of-Breed 25 Gb/s Optical-Style Signaling Technology

Flexible & Modular Packaging Infrastructure

Multi-Drawer SMP Interconnect

NVLINK 2 GPU Accelerator Attach

OpenCAPI Accelerator Attach
Workload Optimized Frequency Provides max performance

- Enables higher dynamic operational frequencies
  - For lighter workloads that do not fully utilize the core
  - For cases when all cores are not active
  - For systems in nominal operating conditions

- Modes of Operation
  - Power Save Mode – Static frequency operation
  - Nominal Mode – Static frequency operation
  - Nominal Dynamic Performance Mode – (WOF on)
    - CPU managed to Nominal power draw
    - Max Workload/Max Cores will run at least Nom Freq
    - Lighter workloads/Less cores will run at higher Freq
  - Maximum Dynamic Performance Mode – (WOF on)
    - Same as Favor Perf Mode but with WOF enabled
    - Higher acoustics – CPU managed to Higher power draw
    - Max Workload/Max Cores runs at least Turbo Freq
    - Lighter workloads/Less cores will run at higher Freq

It does not take a reboot to change modes
POWER9 M.2 NVMe support - S922 & S924

S922/S924 has two internal direct attached storage connectors

Connector support either:
- NVMe carrier card & attaches two 400 GB M.2 NVMe drives
- SAS controller requiring DASD backplane (like POWER8)
- You can mix an NVMe card and a SAS card
- Not socket dependent

M.2 NVMe on POWER9 on S922/S924
- A maximum of four x M.2 NVMe drives
- Will be higher performance than SAS DASD in backplane
- Will not support concurrent maintenance (unlike SAS drives)
- Will have a write endurance of 1 drive write per day
- Intended primarily to store and boot OS (AIX / VIOS / Linux) images
- IBM i cannot use natively, but through VIOS
- Each NVMe device → separate PCIe endpoint assign to different LPARs
- NVMe drives may be assigned to the VIOS and virtualized to client OS
This should not be surprising 22year old Tech!

1. DVD read 16x ~ 20MB/s and only 9 GB in size
2. DVD is likely to be a very low RAS item
   a) Cheaply made
   b) Mechanical
   c) Hot laser inside
   d) Regular user interaction (sticky fingers)

Alternative is a USB Memory Key
1. Faster: USB 3.0 reads at 90 MB/s
2. Larger + cheaper: 32 GB USB Memory Key is ~$20

Can add external USB DVD or DVD-RAM

• AIX and VIOS support the option of downloading a single volume install image from IBM entitled system support website and copying that image to USB flash memory stick to be used as installation media.
• Once copied to a USB flash memory stick, this media can be used on Power 8 and Power 9 systems in all the same ways as supported by DVD install media.
IBM i D-mode IPL Simplification for POWER9

Install IPLs & Disaster Recovery

When not using HMC, DVD is no longer required to IPL to DST and continue with another device.

Instead, load source uses integrated USB adapter in the POWER9 system unit:
  - Use any USB IPL hardware type (e.g., DVD, RDX, USB Flash drive) for entire install operation.
  - For genesis install from IBM distribution (ESS):
    • Use .IMG images for RDX & USB Flash drive.
    • Use .UDF images for DVD drive (external USB).
POWER9
the Servers
## POWER9 Scale Out family

<table>
<thead>
<tr>
<th>Model</th>
<th>SKU</th>
<th>Tech Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>L922</td>
<td>9008-22L</td>
<td>1,2-socket, 2U, 8,10,12 cores/socket, 32 IS RDIMM slots, 4TB memory, 4 CAPI 2.0 Slots</td>
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<td>S922</td>
<td>9009-22A</td>
<td>1,2-socket, 2U, 4, 8,10 cores/socket, 32 IS RDIMM slots, 4TB memory, 4 CAPI 2.0 Slots</td>
</tr>
<tr>
<td>S914</td>
<td>9009-41A</td>
<td>1-socket, 4U &amp; Tower, 4,6,8 cores/socket, 16 IS RDIMM slots, 1TB memory, 2 CAPI 2.0 Slots, Internal RDX Media</td>
</tr>
<tr>
<td>S924</td>
<td>9009-42A</td>
<td>2-socket, 4U, 8,10,12 cores/socket, 32 IS RDIMM slots, 4TB memory, 4 CAPI 2.0 slots, Internal RDX Media</td>
</tr>
<tr>
<td>H922</td>
<td>9223-22H</td>
<td>1,2-socket, 2U, 4, 8,10 cores/socket, 32 IS RDIMM slots, 4TB memory, 4 CAPI 2.0 Slots</td>
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### Technology Leadership
- Cloud enabled - Embedded virtualization capabilities with PowerVM
- Up to 4TB in 2 socket - DDR4 Industry Standard memory RDIMMs
- High Speed 25Gb/s external ports – one per socket
- 2 Internal NVMe Flash boot adapters
- Embedded Analytics and Algorithms on the chip help run POWER9 at an always optimized frequency
AC922 - POWER9 with increased GPU and IO bandwidth for differentiation

Realize unprecedented performance and application gains with POWER9 and NVLink 2.0
- 2 POWER9 CPUs and up to 4 “Volta” NVLink 2.0 GPUs in a versatile 2U Linux server
- PCIe Gen4 bus has double I/O Bandwidth vs. PCIe Gen3
- CPU (Turbo)/GPU (Boost) enabled for improved data center efficiency and performance to be maintained at high levels

High level System Overview
- 2-Socket, 2U Packaging
- 40 P9 Processor cores
- 4 NVIDIA Volta 2.0 GPUs
- 1 TB Memory (16x - 64GB DIMMs)
- 4 PCIe Gen4 Slots
- 2x SFF (HDD/SSD), SATA, Up to 7.7 TB storage
- Supports 1.6TB and 3.2TB NVMe Adapters
- Redundant Hot Swap Power Supplies and Fans
- Default 3 year 9x5 warranty, 100% CRU
A New Processor Delivers The POWERAccel Difference

Current CPU to GPU PCIe Attachment

- DDR4
- 32 GB/s PCIe
- System Bottleneck
- Graphics Memory
- GPU

New POWER8 with NVLink Processor Technology

- DDR4
- 115 GB/s NVLink
- New POWER 8 CPU
- 80 GB/s NVLink
- Graphics Memory
- GPU
- P100 Tesla GPU
- P100 Tesla GPU

POWER8 with NVLink delivers 2.8X the bandwidth

THE system for applications utilizing CPU-GPU bandwidth!
GPU Accelerator comparison

POWER8 with NVLink 1.0 Pascal Technology

POWER9 with NVLink 2.0 Volta Technology

POWER9 with NVLink 2.0 delivers 87.5% increased bandwidth over POWER8
S924 / H924 Scale Out Server

- 4U server - 19” Rack enclosure
- POWER9 Scale-Out SMT8 processor (12-core, 10-core, 8-core)
- Up to 4TB Memory Capacity
  - Industry Standard DDR4 RDIMMs @ up to 2666 Mhz operation
- 11 PCIe Gen3/Gen4 slots
  - Five PCIe Gen4 slots (4 CAPI enabled)
  - Six PCIe Gen3 slots (1 reserved for Ethernet adapter)
- 4 High Speed 25Gb/s ports for future OpenCAPI Acceleration
- 12 or 18 SFF (2.5”) SAS bay options
- Two internal storage controller slots
  - Single or Split backplane or Dual RAID Write Cache support
  - 2 Internal NVMe Flash boot adapters (two M.2 devices per card)
- Internal RDX Media bay (DVD external)
- I/O Expansion Drawer support
- Supports AIX, IBM i and Linux (H924 limits AIX and IBM i to 25% core activations)
S924 / H924 Scale Out Server

- 2 Internal Storage slots
- 5 PCIe Gen4 slots
- 6 PCIe Gen3 slots
- 2 Processor modules
- 16 DDR4 RDIMM’s per processor
  32 DDR4 RDIMM’s total
- 12 SFF bays & 1 RDX bay, or 18 SFF bays
- 6 Blowers
- LCD Display
- USB 3.0
We like the operator panel at the top left, no optional LCD panel on this Server.
Optional LCD goes here
Default for eConfig but can be removed, if you have a HMC
Under the hood
Nicely thought out with a clear Perspex cover
Clear is good, as you can see the LEDs & DIMMs
S924 / H924 System Topology (dual socket)

- 16 DDR4 RDIMMs 2133-2666 MHz
- X Bus 4B
- 25 Gb/s
- PCIe Gen3 x8
- USB 3.0
- Storage Controller Slot
- CAPI 2.0
- PCIe Gen4 x16
- PCIe Gen4 x8 (x16 Conn)
- C9
- PCIe Gen4 x8 (x16 Conn)
- C8
- PCIe Gen3 x8
- C5
- PCIe Gen3 x8 (x16 Conn)
- C6
- PCIe Gen3 x8
- C7
- PCIe Gen3 x8
- C10
- PCIe Gen3 x8
- C11
- PCIe Gen3 x8 (x16 Conn)
- C12
- PCIe Gen4 x16
- C4
- PCIe Gen4 x16
- C3
- PCIe Gen4 x16 (x16 Conn)
- C2
- C?? Indicates PCIe Slot Number

Ports T5, T6
OpenCAPI

Ports T7, T8
OpenCAPI

16 DDR4 RDIMMs 2133-2666 MHz
PCIe Expansion Drawer

Rear system node

Active Optical Cable Pair

Fan-out Modules

PCIe Optical Interface to system node, 2 CXP ports
S924 / H924 System Topology (single socket)

16 DDR4 RDIMMs
2133-2666 MHz

25 Gb/s

Ports T5, T6
OpenCAPI

PCIe Gen4 x16

CAPI 2.0

PCIe Gen4 x8 (x16 Conn)

C9

PCI Gen3 x8

C8

CAPI 2.0

PCI Gen3 x8

C5

PCI Gen3 x8 (x16 Conn)

C6

PCI Gen3 x8

C7

PCI Gen3 x8

C10

PCI Gen3 x8 (x16 Conn)

C11

PCI Gen3 x8

C12

Storage Controller Slot

USB 3.0

Gen3 Switch

C?? Indicates PCIe Slot Number
**S924/ H924 PCIe Slots**

**Internal PCIe Slot Summary**

<table>
<thead>
<tr>
<th>Slot</th>
<th>Attributes</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>Service Processor Card</td>
<td></td>
</tr>
<tr>
<td>C2</td>
<td>PCIe Gen4 x8 (x16 Conn)</td>
<td></td>
</tr>
<tr>
<td>C3</td>
<td>PCIe Gen4 x16 (EJ08 slot)</td>
<td>2nd</td>
</tr>
<tr>
<td>C4</td>
<td>PCIe Gen4 x16 (EJ08 slot)</td>
<td>POWER9</td>
</tr>
<tr>
<td>C5</td>
<td>PCIe Gen3 x8</td>
<td></td>
</tr>
<tr>
<td>C6</td>
<td>PCIe Gen3 x8 (x16 Conn)</td>
<td></td>
</tr>
<tr>
<td>C7</td>
<td>PCIe Gen3 x8</td>
<td></td>
</tr>
<tr>
<td>C8</td>
<td>PCIe Gen4 x8 (x16 Conn)</td>
<td></td>
</tr>
<tr>
<td>C9</td>
<td>PCIe Gen4 x16 (EJ08 slot)</td>
<td>1st</td>
</tr>
<tr>
<td>C10</td>
<td>PCIe Gen3 x8</td>
<td></td>
</tr>
<tr>
<td>C11</td>
<td>PCIe Gen3 x8</td>
<td></td>
</tr>
<tr>
<td>C12</td>
<td>PCIe Gen3 x8 (x16 Conn)</td>
<td></td>
</tr>
</tbody>
</table>

PCle Slots are Concurrently Maintainable
Full Height, Half Length PCIe form factor

**External PCIe Expansion Summary**

<table>
<thead>
<tr>
<th>Num of CPUs</th>
<th>Max num of I/O Exp Drawers (EMX0)</th>
<th>Max num of I/O Fanout Modules (EMXF)</th>
<th>Total PCIe Slots</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>3</td>
<td>26</td>
</tr>
</tbody>
</table>

PCIe Slots are Concurrently Maintainable
Full Height, Half Length PCIe form factor
S924 / H924 Processor Highlights

✓ SCM Design – Single Chip Module
✓ Three processor offerings available (SMT8 cores)
  ▪ 12-core processor (maximum throughput)
  ▪ 10-core processor
  ▪ 8-core processor (maximum core performance)

<table>
<thead>
<tr>
<th>Feature Code</th>
<th>Processor SMT8 Cores</th>
<th>Typical Frequency Range</th>
<th>IBM i P Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>EP1G</td>
<td>12 cores</td>
<td>3.4 to 3.9 Ghz (max)</td>
<td>P20</td>
</tr>
<tr>
<td>EP1F</td>
<td>10 cores</td>
<td>3.5 to 3.9 GHz (max)</td>
<td>P20</td>
</tr>
<tr>
<td>EP1E</td>
<td>8 cores</td>
<td>3.8 to 4.0 GHz (max)</td>
<td>P20</td>
</tr>
</tbody>
</table>

✓ Single processor config supported for 8 and 10-core processor offerings
✓ Processor frequencies dynamic by default: Set to Max Performance Mode
✓ Increased processor to processor fabric interconnect
  ▪ Two 16Gb/s X-Bus fabric connect between CPUs
S924 / H924 Memory

- Low latency direct attach memory architecture
- Up to 170 GB/s peak memory bandwidth per socket
- Industry standard DDR4 memory RDIMMs
- 16 DIMM slots per socket, 32 DIMM slots total
- Maximum memory capacity 4TB
- Minimum config is 2x 16GB DIMM’s per processor socket
- Supported DIMM sizes and frequencies shown in table below
- DIMM plug rules per socket
  - DIMM’s installed: 2, 4, 6, 8, 12, 16
  - DIMM’s in the same Quad as shown must be the same size

<table>
<thead>
<tr>
<th>Feature Code</th>
<th>DIMM Size</th>
<th>2-8 DIMMs per socket</th>
<th>10-16 DIMMs per socket</th>
</tr>
</thead>
<tbody>
<tr>
<td>EM62</td>
<td>16GB DIMM</td>
<td>2666 MHz</td>
<td>2133 MHz</td>
</tr>
<tr>
<td>EM63</td>
<td>32GB DIMM</td>
<td>2400 MHz</td>
<td>2133 MHz</td>
</tr>
<tr>
<td>EM64</td>
<td>64GB DIMM</td>
<td>2400 MHz</td>
<td>2133 MHz</td>
</tr>
<tr>
<td>EM65</td>
<td>128GB DIMM</td>
<td>2400 MHz</td>
<td>2133 MHz</td>
</tr>
</tbody>
</table>
S924/ H924 Storage Options

Internal Storage Options

<table>
<thead>
<tr>
<th>FC</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC59</td>
<td>NVMe Card with two M.2 connectors</td>
</tr>
<tr>
<td>EJ1C</td>
<td>Single RAID 0,10,5,6 12 SFF bays (Gen3-Carrier), 1 RDX bay</td>
</tr>
<tr>
<td>EJ1E</td>
<td>Split Backplane RAID 0,10,5,6 6+6 SFF bays (Gen3-Carrier), 1 RDX bay</td>
</tr>
<tr>
<td>EJ1M</td>
<td>Dual Write Cache RAID 0,10,5,6,5T2,6T2 12 SFF bays (Gen3-Carrier), 1 RDX bay</td>
</tr>
<tr>
<td>EJ1D</td>
<td>Dual Write Cache RAID 0,10,5,6,5T2,6T2 18 SFF bays (Gen3-Carrier)</td>
</tr>
<tr>
<td>EU00</td>
<td>RDX Docking Station</td>
</tr>
</tbody>
</table>

External Storage Options

<table>
<thead>
<tr>
<th>FC</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESSL</td>
<td>19” Disk Expansion Drawer 12 LFF Gen2-Carrier Bays (Slider12)</td>
</tr>
<tr>
<td>ESLS</td>
<td>19” Disk Expansion Drawer 24 SFF Gen2-Carrier Bays (Slider24)</td>
</tr>
<tr>
<td>5887</td>
<td>19” Disk Expansion Drawer 24 SFF Gen2-Carrier Bays (EXP24S) Migrate</td>
</tr>
</tbody>
</table>

Supported Media Overview

- NVMe M.2 Flash devices
  - 400GB (ES14)
- SFF HDDs
  - 600GB, 1200GB, 1800GB - 10K RPM
  - 300GB, 600GB - 15K RPM
- SFF SSDs
  - 387GB, 775GB, 1551GB – 10 DWPD
  - 931GB, 1860GB, 3720GB – 1 DWPD
- RDX Disk Cartridge
  - 1TB Disk Cartridge (EU01)
  - 2TB Disk Cartridge (EU2T)
S914 Scale Out Server

✓ 4U server - 19” Rack enclosure or Tower
✓ POWER9 Scale-Out SMT8 processor (8-core, 6-core, **4-core**)
✓ Up to **1TB Memory Capacity**
  ▪ Industry Standard DDR4 RDIMMs @ up to 2666 Mhz operation
✓ 8 PCIe Gen3/Gen4 slots
  ▪ Two PCIe Gen4 slots (2 CAPI enabled)
  ▪ Six PCIe Gen3 slots (1 reserved for Ethernet adapter)
✓ 2 High Speed 25Gb/s ports for future OpenCAPI Acceleration
✓ 12 or 18 SFF (2.5") SAS bay options
✓ Two internal storage controller slots
  ▪ Single or Split backplane or Dual RAID Write Cache support
  ▪ 2 Internal NVMe Flash boot adapters (two M.2 devices per card)
✓ Internal RDX Media Bay (DVD External)
✓ I/O Expansion Drawer support for 8-core and 6-core feature only
✓ **110 VAC support on the tower model**
✓ Supports AIX, IBM i and Linux
S914 Scale Out Server

- 2 PCIe Gen4 slots
- 6 PCIe Gen3 slots
- 16 DDR4 RDIMM's
- 1 Processor module
- 2 Internal Storage slots
- 12 SFF bays & 1 RDX bay, or 18 SFF bays
- 4 Blowers
- LCD Display
- USB 3.0
S914 System Topology

- 16 DDR4 RDIMMs
  - 2133-2666 MHz

- PCIe Gen4 x16
- PCIe Gen4 x8 (x16 Conn)
- PCIe Gen3 x8
  - (x16 Conn)
- PCIe Gen3 x8
  - (x16 Conn)
- PCIe Gen3 x8
- PCIe Gen3 x8
  - (x16 Conn)
- PCIe Gen3 x8
- PCIe Gen3 x8
  - (x16 Conn)
- PCIe Gen3 x8
- PCIe Gen3 x8
  - (x16 Conn)

- 25 Gb/s

- USB 3.0

- Storage Controller Slot

- Gen3 Switch
- Gen3 Switch

- C9, C8, C5, C6, C7, C10, C11, C12

- CAPI 2.0

- C?? Indicates PCIe Slot Number
S914 Processor Highlights

- SCM Design – Single Chip Module
- Three processor offerings available (SMT8 cores)
  - 8-core processor (maximum throughput)
  - 6-core processor
  - 4-core processor (minimum entry price)

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<td>EP12</td>
<td>8 cores</td>
<td>2.8 to 3.8 GHz (max)</td>
<td>P10</td>
</tr>
<tr>
<td>EP11</td>
<td>6 cores</td>
<td>2.3 to 3.8 GHz (max)</td>
<td>P10</td>
</tr>
<tr>
<td>EP10</td>
<td>4 cores</td>
<td>2.3 to 3.8 GHz (max)</td>
<td>P05</td>
</tr>
</tbody>
</table>

- Processor frequencies dynamic by default: Set to Dynamic Performance Mode
S914 Memory Subsystem

- Low latency direct attach memory architecture
- Up to 170 GB/s peak memory bandwidth per socket
- Industry Standard DDR4 RDIMMs
- 16 DIMM slots total
- Maximum memory capacity 1TB (4-Core feature limited to 64GB)
- Minimum config is 2x 16GB DIMM’s
- Supported DIMM sizes and frequencies shown in table below
- DIMM plug rules per socket
  - DIMM’s installed: 2, 4, 6, 8, 12, 16
  - DIMM’s in the same Quad as shown must be the same size

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<th>DIMM Size</th>
<th>2-8 DIMMs per socket</th>
<th>10-16 DIMMs per socket</th>
</tr>
</thead>
<tbody>
<tr>
<td>EM62</td>
<td>16GB DIMM</td>
<td>2666 MHz</td>
<td>2133 MHz</td>
</tr>
<tr>
<td>EM63</td>
<td>32GB DIMM</td>
<td>2400 MHz</td>
<td>2133 MHz</td>
</tr>
<tr>
<td>EM64</td>
<td>64GB DIMM</td>
<td>2400 MHz</td>
<td>2133 MHz</td>
</tr>
</tbody>
</table>
S914 Storage Options

Internal Storage Options

<table>
<thead>
<tr>
<th>FC</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC59</td>
<td>NVMe Card with two M.2 connectors</td>
</tr>
<tr>
<td>EJ1C</td>
<td>Single RAID 0,10,5,6 12 SFF bays (Gen3-Carrier), 1 RDX bay</td>
</tr>
<tr>
<td>EJ1E</td>
<td>Split Backplane RAID 0,10,5,6 6+6 SFF bays (Gen3-Carrier), 1 RDX bay</td>
</tr>
<tr>
<td>EJ1M</td>
<td>Dual Write Cache RAID 0,10,5,6,5T2,6T2 12 SFF bays (Gen3-Carrier), 1 RDX bay</td>
</tr>
<tr>
<td>EJ1D</td>
<td>Dual Write Cache RAID 0,10,5,6,5T2,6T2 18 SFF bays (Gen3-Carrier)</td>
</tr>
<tr>
<td>EU00</td>
<td>RDX Docking Station</td>
</tr>
</tbody>
</table>

External Storage Options (not available with 4-core option)

<table>
<thead>
<tr>
<th>FC</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESSL</td>
<td>19” Disk Expansion Drawer 12 LFF Gen2-Carrier Bays (Slider12)</td>
</tr>
<tr>
<td>ESSL</td>
<td>19” Disk Expansion Drawer 24 SFF Gen2-Carrier Bays (Slider24)</td>
</tr>
<tr>
<td>5887</td>
<td>19” Disk Expansion Drawer 24 SFF Gen2-Carrier Bays (EXP24S) Migrate</td>
</tr>
</tbody>
</table>

Supported Media Overview

- NVMe M.2 Flash devices
  - 400GB (ES14)
- SFF HDDs
  - 600GB, 1200GB, 1800GB - 10K RPM
  - 300GB, 600GB - 15K RPM
- SFF SSDs
  - 387GB, 775GB, 1551GB – 10 DWPD
  - 931GB, 1860GB, 3720GB – 1 DWPD
- RDX Disk Cartridge
  - 1TB Disk Cartridge (EU01)
  - 2TB Disk Cartridge (EU2T)
**S914 PCIe Slots**

### Internal PCIe Slot Summary

<table>
<thead>
<tr>
<th>Slot</th>
<th>Attributes</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>Service Processor Card</td>
<td></td>
</tr>
<tr>
<td>C5</td>
<td>PCIe Gen3 x8</td>
<td></td>
</tr>
<tr>
<td>C6</td>
<td>PCIe Gen3 x8 (x16 Conn)</td>
<td></td>
</tr>
<tr>
<td>C7</td>
<td>PCIe Gen3 x8</td>
<td></td>
</tr>
<tr>
<td>C8</td>
<td>PCIe Gen4 x8 (x16 Conn)</td>
<td></td>
</tr>
<tr>
<td>C9</td>
<td>PCIe Gen4 x16 (EJ08 slot)</td>
<td>1st POWER9 socket</td>
</tr>
<tr>
<td>C10</td>
<td>PCIe Gen3 x8</td>
<td></td>
</tr>
<tr>
<td>C11</td>
<td>PCIe Gen3 x8</td>
<td></td>
</tr>
<tr>
<td>C12</td>
<td>PCIe Gen3 x8 (x16 Conn)</td>
<td></td>
</tr>
</tbody>
</table>

**PCle Slots are Concurrently Maintainable**

Full Height, Half Length PCIe form factor

### External PCIe Expansion Summary

<table>
<thead>
<tr>
<th>Num of CPUs</th>
<th>Max num of I/O Exp Drawers (EMX0)</th>
<th>Max num of I/O Fanout Modules (EMXF)</th>
<th>Total PCIe Slots</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>13</td>
</tr>
</tbody>
</table>

**No PCIe Expansion on 4-core option**
S922 / H922 / L922 Scale Out Server

- 2U server - 19" Rack enclosure
- POWER9 Scale-Out SMT8 processor (12-core, 10-core, 8-core, 4-core offerings)
- Up to 4TB Memory Capacity
  - Industry Standard DDR4 RDIMMs @ up to 2666 Mhz operation
- 9 PCIe Gen3/Gen4 slots
  - Five PCIe Gen4 slots (4 CAPI enabled)
  - Four PCIe Gen3 slots (1 reserved for Ethernet adapter)
- 4 High Speed 25Gb/s ports for future OpenCAPI Acceleration
- 8 SFF (2.5’’) SAS bay option
- 2 internal storage controller slots
  - Single or Split backplane support
  - 2 Internal NVMe Flash boot adapters (two M.2 devices per card)
- I/O Expansion Drawer support
- S922 / H922 supports AIX, IBM i and Linux (H922 limits AIX and IBM i to 25% core activations)
  - No IBM i support for the 4-core S922
  - Maximum of 4 IBM i cores per partition
- L922 supports Linux only (First GA is PowerVM only, future support for bare metal and KVM)
S922 /H922 / L922 Scale Out Server

- 47 PCIe Gen4 slots
- 5 PCIe Gen3 slots
- 16 DDR4 RDIMM’s per processor
- 32 DDR4 RDIMM’s total
- 2 Processor modules
- 2 Internal Storage Controller slots
- 6 Front SFF bays
- 2 Internal SFF bays
- 4 Blowers
- LCD Display
- USB 3.0
S922 / H922 / L922 System Topology

**Ports T5, T6**
- OpenCAPI

**Ports T7, T8**
- OpenCAPI

**16 DDR4 RDIMMs**
- 2133-2666 MHz

**X Bus 4B**
- 25 Gb/s

**PCIe Gen4 x16**
- C9
- CAPI 2.0

**PCIe Gen4 x8**
- C8
- (x16 Conn)
- CAPI 2.0

**Gen3 Switch**
- C6
- PCIe Gen3 x8
- (x16 Conn)

**Gen3 Switch**
- C7
- PCIe Gen3 x8

**Eth**
- C11
- PCIe Gen3 x8

**USB 3.0**
- x1

**Storage Controller Slot**
- x8

**PCIe Gen4 x16**
- C4
- CAPI 2.0

**PCIe Gen4 x16**
- C3
- CAPI 2.0

**PCIe Gen4 x8**
- C2
- (x16 Conn)

**Ports T7, T8**
- 25 Gb/s

**Storage Controller Slot**
- x8

**16 DDR4 RDIMMs**
- 2133-2666 MHz

**Indicates PCIe Slot Number**
**S922 / H922 Processor Offering**

- SCM Design – Single Chip Module
- Three processor offerings available (SMT8 cores)
  - 10-core processor (maximum throughput)
  - 8-core processor (maximum core performance)
  - 4-core processor (minimum entry price)

<table>
<thead>
<tr>
<th>Feature Code</th>
<th>Processor SMT8 Cores</th>
<th>Typical Frequency Range</th>
<th>IBM i P Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>EP19</td>
<td>10 cores</td>
<td>2.9 to 3.8 GHz (max)</td>
<td>P10**</td>
</tr>
<tr>
<td>EP18</td>
<td>8 cores</td>
<td>3.4 to 3.9 GHz (max)</td>
<td>P10**</td>
</tr>
<tr>
<td>EP16</td>
<td>4 cores</td>
<td>2.8 to 3.8 GHz (max)</td>
<td>Not Supported</td>
</tr>
</tbody>
</table>

- Single processor configs supported
- EP16 4-Core feature limited to single socket config only
- EP16 4-Core feature does not support External I/O Expansion or External Disk Expansion
- Processor frequencies dynamic by default, set to Maximum Performance Mode

**P10 group limits IBM i partitions to a max of 4 cores per partition**
L922 Processor Offering

✓ SCM Design – Single Chip Module
✓ Three processor offerings available (SMT8 cores)
  ▪ 12-core processor (maximum throughput)
  ▪ 10-core processor
  ▪ 8-core processor (maximum core performance)

<table>
<thead>
<tr>
<th>Feature Code</th>
<th>Processor SMT8 Cores</th>
<th>Typical Frequency Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELPX</td>
<td>12 cores</td>
<td>2.7 to 3.8 GHz (max)</td>
</tr>
<tr>
<td>EPPW</td>
<td>10 cores</td>
<td>2.9 to 3.8 GHz (max)</td>
</tr>
<tr>
<td>ELPV</td>
<td>8 cores</td>
<td>3.4 to 3.9 GHz (max)</td>
</tr>
</tbody>
</table>

✓ Single processor config supported for 8 and 10-core processor offerings
✓ Both sockets must be populated for the 12-core offering
✓ Processor frequencies dynamic by default, set to Maximum Performance Mode
S922 / H922 / L922 Memory

- Low latency direct attach memory architecture
- Up to 170 GB/s peak memory bandwidth per socket
- Industry standard DDR4 memory RDIMMs
- 16 DIMM slots per socket, 32 DIMM slots total
- Maximum memory capacity 4TB
- Minimum config is 2x 16GB DIMM’s per processor socket
- Supported DIMM sizes and frequencies shown in table below
- DIMM plug rules per socket
  - DIMM’s installed: 2, 4, 6, 8, 12, 16
  - DIMM’s in the same Quad as shown must be the same size

<table>
<thead>
<tr>
<th>Feature Code</th>
<th>DIMM Size</th>
<th>2-8 DIMMs per socket</th>
<th>10-16 DIMMs per socket</th>
</tr>
</thead>
<tbody>
<tr>
<td>EM62</td>
<td>16GB DIMM</td>
<td>2666 MHz</td>
<td>2133 MHz</td>
</tr>
<tr>
<td>EM63</td>
<td>32GB DIMM</td>
<td>2400 MHz</td>
<td>2133 MHz</td>
</tr>
<tr>
<td>EM64</td>
<td>64GB DIMM</td>
<td>2400 MHz</td>
<td>2133 MHz</td>
</tr>
<tr>
<td>EM65</td>
<td>128GB DIMM</td>
<td>2400 MHz</td>
<td>2133 MHz</td>
</tr>
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</table>
## S922 / H922 / L922 Storage Options

### Internal Storage Options

<table>
<thead>
<tr>
<th>FC</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC59</td>
<td>NVMe Card with two M.2 Connectors</td>
</tr>
<tr>
<td>EJ1G</td>
<td>Single RAID 0,10,5,6 8 SFF Bays (Gen3 Carrier)</td>
</tr>
<tr>
<td>EJ1H</td>
<td>Split Backplane RAID 0,10,5,6 4+4 SFF Bays (Gen3 Carrier)</td>
</tr>
</tbody>
</table>

### Supported Media Overview

- NVMe M.2 Flash devices
  - 400GB (ES14)
- SFF HDDs
  - 600GB, 1200GB, 1800GB - 10K RPM
  - 300GB, 600GB - 15K RPM
- SFF SSDs
  - 387GB, 775GB, 1551GB – 10 DWPD
  - 931GB, 1860GB, 3720GB – 1 DWPD

### External Storage Options

<table>
<thead>
<tr>
<th>System</th>
<th>FC</th>
<th>Description</th>
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<tbody>
<tr>
<td>S922</td>
<td>ESLL</td>
<td>19” Disk Expansion Drawer 12 LFF Gen2-Carrier Bays (Slider12)</td>
</tr>
<tr>
<td>H922</td>
<td>ESLS</td>
<td>19” Disk Expansion Drawer 24 SFF Gen2-Carrier Bays (Slider24)</td>
</tr>
<tr>
<td></td>
<td>5887</td>
<td>19” Disk Expansion Drawer 24 SFF Gen2-Carrier Bays (EXP24S) migrate</td>
</tr>
<tr>
<td>L922</td>
<td>ELLL</td>
<td>19” Disk Expansion Drawer 12 LFF Gen2-Carrier Bays (Slider12)</td>
</tr>
<tr>
<td></td>
<td>ELLS</td>
<td>19” Disk Expansion Drawer 24 SFF Gen2-Carrier Bays (Slider24)</td>
</tr>
<tr>
<td></td>
<td>EL1S</td>
<td>19” Disk Expansion Drawer 24 SFF Gen2-Carrier Bays (EXP24S) migrate</td>
</tr>
</tbody>
</table>
## Internal PCIe Slot Summary

<table>
<thead>
<tr>
<th>Slot</th>
<th>Attributes</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>FSP Service Processor Card</td>
<td></td>
</tr>
<tr>
<td>C2</td>
<td>PCIe Gen4 x8 (x16 Conn)</td>
<td></td>
</tr>
<tr>
<td>C3</td>
<td>PCIe Gen4 x16 (EJ05 slot)</td>
<td>with 2\textsuperscript{nd} POWER9 module populated</td>
</tr>
<tr>
<td>C4</td>
<td>PCIe Gen4 x16 (EJ05 slot)</td>
<td></td>
</tr>
<tr>
<td>C6</td>
<td>PCIe Gen3 x8 (x16 Conn)</td>
<td>with 1\textsuperscript{st} POWER9 module populated</td>
</tr>
<tr>
<td>C7</td>
<td>PCIe Gen3 x8</td>
<td></td>
</tr>
<tr>
<td>C8</td>
<td>PCIe Gen4 x8 (x16 Conn)</td>
<td></td>
</tr>
<tr>
<td>C9</td>
<td>PCIe Gen4 x16 (EJ05 slot)</td>
<td></td>
</tr>
<tr>
<td>C11</td>
<td>PCIe Gen3 x8</td>
<td></td>
</tr>
<tr>
<td>C12</td>
<td>PCIe Gen3 x8 (x16 Conn)</td>
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</tr>
</tbody>
</table>

**PCIe Slots are Concurrently Maintainable**  
**Low Profile PCIe form factor**

---

## External PCIe Expansion Features S922/H922

<table>
<thead>
<tr>
<th>Num of CPUs</th>
<th>Max num of I/O Exp Drawers (EMX0)</th>
<th>Max num of I/O Fanout Modules (EMXF)</th>
<th>Max PCIe Slots</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>3</td>
<td>24</td>
</tr>
</tbody>
</table>

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## External PCIe Expansion Features L922

<table>
<thead>
<tr>
<th>Num of CPUs</th>
<th>Max num of I/O Exp Drawers (ELMX)</th>
<th>Max num of I/O Fanout Modules (ELMF)</th>
<th>Total PCIe Slots</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>3</td>
<td>24</td>
</tr>
</tbody>
</table>
POWER9 I/O Items
Adapters and more

Note: there are two phases GA1 and GA2
Additional New storage and networking I/O on Power 9 Scale out systems

2 New PCIe3 Network Adapters:

2-Port 10Gb NIC & RoCE SR/Cu Adapter
2-Port 25/10Gb NIC & RoCE SR/Cu Adapter

- Both adapters use Mellanox ConnectX-4 Lx Network controller
- Both adapters support NIC SR-IOV
- Additionally NIC SR-IOV support is extended to existing PCIe3 2-port 100GB NIC & RoCE QSFP28 adapter (feature codes #EC3M & #EC3L)

2 New PCIe3 Fibre Channel Adapters:

16Gb 4-port Fibre Channel Adapter
32Gb 2-port Fibre Channel Adapter

- Both adapters use Broadcom (Emulex) Fibre Channel controller
## Scale-out GA1 supported I/O items 1-25

<table>
<thead>
<tr>
<th>No.</th>
<th>Type</th>
<th>Description</th>
<th>Code Name</th>
<th>FC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ROCE</td>
<td>2-Port 10Gb NIC&amp;ROCE SR/Cu PCIe 3.0 Adapter</td>
<td>Everglades EN LP</td>
<td>EC2R</td>
</tr>
<tr>
<td>2</td>
<td>ROCE</td>
<td>2-Port 10Gb NIC&amp;ROCE SR/Cu PCIe 3.0 Adapter</td>
<td>Everglades EN</td>
<td>EC2S</td>
</tr>
<tr>
<td>3</td>
<td>ROCE</td>
<td>2-Port 25/10 Gb NIC&amp;ROCE SR/Cu PCIe 3.0 Adapter</td>
<td>Everglades EN LP</td>
<td>EC2T</td>
</tr>
<tr>
<td>4</td>
<td>ROCE</td>
<td>2-Port 25/10 Gb NIC&amp;ROCE SR/Cu PCIe 3.0 Adapter</td>
<td>Everglades EN</td>
<td>EC2U</td>
</tr>
<tr>
<td>5</td>
<td>ROCE</td>
<td>PCIe3 100GbE RoCE Dual Port x16 CX4</td>
<td>Glacier Park-EN - LP</td>
<td>EC3L</td>
</tr>
<tr>
<td>6</td>
<td>ROCE</td>
<td>PCIe3 100GbE RoCE Dual Port x16 CX4</td>
<td>Glacier Park-EN - HP</td>
<td>EC3M</td>
</tr>
<tr>
<td>7</td>
<td>LAN</td>
<td>PCIe2 LP 4-port 1GbE Adapter</td>
<td>Austin - LP</td>
<td>S260</td>
</tr>
<tr>
<td>8</td>
<td>LAN</td>
<td>PCIe2 4-port 1GbE Adapter</td>
<td>Austin - HP</td>
<td>S899</td>
</tr>
<tr>
<td>9</td>
<td>LAN</td>
<td>PCIe2 4-Port (10Gb+1GbE) SR+RJ45 Adapter</td>
<td>Shiner-S - HP</td>
<td>EN0S</td>
</tr>
<tr>
<td>10</td>
<td>LAN</td>
<td>PCIe2 LP 4-Port (10Gb+1GbE) SR+RJ45 Adapter</td>
<td>Shiner-S - LP</td>
<td>EN0T</td>
</tr>
<tr>
<td>11</td>
<td>LAN</td>
<td>PCIe2 4-port (10Gb+1GbE) Copper SFP+RJ45 Adapter</td>
<td>Shiner-S Twinax - HP</td>
<td>EN0U</td>
</tr>
<tr>
<td>12</td>
<td>LAN</td>
<td>PCIe2 LP 4-port (10Gb+1GbE) Copper SFP+RJ45 Adapter</td>
<td>Shiner-S Twinax - LP</td>
<td>EN0V</td>
</tr>
<tr>
<td>13</td>
<td>LAN</td>
<td>PCIe2 2-port 10/1GbE BaseT RJ45 Adapter</td>
<td>Shiner-T - HP</td>
<td>EN0W</td>
</tr>
<tr>
<td>14</td>
<td>LAN</td>
<td>PCIe2 LP 2-port 10/1GbE BaseT RJ45 Adapter</td>
<td>Shiner-T - LP</td>
<td>EN0X</td>
</tr>
<tr>
<td>15</td>
<td>LAN</td>
<td>PCIe G3 x8 4x10 4-Port Ethernet SR Optical HP</td>
<td>Slate SR - HP</td>
<td>EN15</td>
</tr>
<tr>
<td>16</td>
<td>CNA</td>
<td>PCIe2 4-port (10Gb FCoE &amp; 1GbE) SR&amp;RJ4 - SR</td>
<td>Houston SR - HP</td>
<td>EN0H</td>
</tr>
<tr>
<td>17</td>
<td>CNA</td>
<td>PCIe2 LP 4-port (10Gb FCoE &amp; 1GbE) SR&amp;RJ4 SR</td>
<td>Houston SR - LP</td>
<td>EN0J</td>
</tr>
<tr>
<td>18</td>
<td>CNA</td>
<td>PCIe2 4-port (10Gb FCoE &amp; 1GbE) SFP+Copper&amp;RJ4</td>
<td>Houston Cu - HP</td>
<td>EN0K</td>
</tr>
<tr>
<td>19</td>
<td>CNA</td>
<td>PCIe2 LP 4-port (10Gb FCoE &amp; 1GbE) SFP+Copper&amp;RJ4</td>
<td>Houston Cu - LP</td>
<td>EN0L</td>
</tr>
<tr>
<td>20</td>
<td>Stg_ctrl</td>
<td>B Gigabit PCI Express Dual Port Fibre Channel Adapter</td>
<td>COHO-2port - HP</td>
<td>S735</td>
</tr>
<tr>
<td>21</td>
<td>Stg_ctrl</td>
<td>PCIe LP 8Gb 2-Port Fibre Channel Adapter</td>
<td>COHO-2port - LP</td>
<td>S273</td>
</tr>
<tr>
<td>22</td>
<td>Stg_ctrl</td>
<td>PCIe2 16Gb 2-port Fibre Channel Adapter</td>
<td>Bluefin - HP</td>
<td>EN0A</td>
</tr>
<tr>
<td>23</td>
<td>Stg_ctrl</td>
<td>PCIe2 LP 16Gb 2-port Fibre Channel Adapter</td>
<td>Bluefin - LP</td>
<td>EN0B</td>
</tr>
<tr>
<td>24</td>
<td>Stg_ctrl</td>
<td>PCIe3 16Gb 4-port Fibre Channel Adapter</td>
<td>Bluefish - FH</td>
<td>EN1C</td>
</tr>
<tr>
<td>25</td>
<td>Stg_ctrl</td>
<td>PCIe3 16Gb 4-port Fibre Channel Adapter</td>
<td>Bluefish - LP</td>
<td>EN1D</td>
</tr>
</tbody>
</table>
## Scale-out GA1 supported I/O items 25 - 50

<table>
<thead>
<tr>
<th>No.</th>
<th>Type</th>
<th>Description</th>
<th>Code Name</th>
<th>FC</th>
</tr>
</thead>
<tbody>
<tr>
<td>26</td>
<td>Stg_ctrl</td>
<td>PCIe3 32Gb 2-port Fibre Channel Adapter</td>
<td>Redfish - FH</td>
<td>EN1A</td>
</tr>
<tr>
<td>27</td>
<td>Stg_ctrl</td>
<td>PCIe3 32Gb 2-port Fibre Channel Adapter</td>
<td>Redfish - LP</td>
<td>EN1B</td>
</tr>
<tr>
<td>28</td>
<td>Stg_ctrl</td>
<td>PCIe2 8Gb 4-port Fibre Channel Adapter</td>
<td>Spookfish - HP</td>
<td>5729</td>
</tr>
<tr>
<td>29</td>
<td>Stg_ctrl</td>
<td>PCIe2 LP 8Gb 4-port Fibre Channel Adapter</td>
<td>Sailfish - LP</td>
<td>EN0Y</td>
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<td>30</td>
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<td>PCIe3 RAID SAS quad-port 6 Gb LP Adapter</td>
<td>GTO - LP</td>
<td>EJ0M</td>
</tr>
<tr>
<td>31</td>
<td>Stg_ctrl</td>
<td>PCIe3 RAID SAS Adapter Quad-port 6Gb</td>
<td>GTO - LP</td>
<td>EJ0J</td>
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<tr>
<td>32</td>
<td>Stg_ctrl</td>
<td>PCIe3 LP 4 x8 SAS Port Adapter (Tape/DVD)</td>
<td>GTO Media - LP</td>
<td>EJ11</td>
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<tr>
<td>33</td>
<td>Stg_ctrl</td>
<td>PCIe3 4 x8 SAS Port Adapter (Tape/DVD)</td>
<td>GTO Media - HP</td>
<td>EJ10</td>
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<tr>
<td>34</td>
<td>Stg_ctrl</td>
<td>PCIe3 12GB CACHE RAID SAS 4 ADAPTER QUAD PORT 6Gb W/ ADV FEATURES</td>
<td>Z06 - HP</td>
<td>EJ14</td>
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<tr>
<td>35</td>
<td>WAN</td>
<td>4 Port Async ELA-232 PCIe Adapter</td>
<td>BELL - HP</td>
<td>5785</td>
</tr>
<tr>
<td>36</td>
<td>WAN</td>
<td>PCIe 1-port Bisync Adapter</td>
<td>QUARTZ Bisync</td>
<td>EN13</td>
</tr>
<tr>
<td>37</td>
<td>Graphics</td>
<td>PCIe LP POWER GTX145 Graphics Accelerator</td>
<td>Cortina - LP</td>
<td>5269</td>
</tr>
<tr>
<td>38</td>
<td>Graphics</td>
<td>PCIe LP POWER GTX145 Graphics Acceleritor</td>
<td>Cortina - HP</td>
<td>5748</td>
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<tr>
<td>39</td>
<td>IB</td>
<td>1-PORT EDR 100Gb IB CONNECTX-5 GEN4 PCIe x16 CAPI CAPABLE LP ADAPTER</td>
<td>LASSEN IB LP</td>
<td>EC62</td>
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<td>40</td>
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<tr>
<td>41</td>
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<tr>
<td>43</td>
<td>Encryption</td>
<td>PCIe3 Crpto Coprocessor BSC-Gen3 4767</td>
<td>Sentry - BSC</td>
<td>EJ33</td>
</tr>
<tr>
<td>44</td>
<td>Bus Exp</td>
<td>Bearpaw to attach MEX</td>
<td>Bearpaw - LP</td>
<td>EJ05</td>
</tr>
<tr>
<td>45</td>
<td>Bus Exp</td>
<td>BearMountain to attach MEX</td>
<td>BearMountain - HP</td>
<td>EJ07</td>
</tr>
<tr>
<td>46</td>
<td>Drawer</td>
<td>EXP245 SFF Gen2-bay Drawer (19” SAS 6Gbs 24 GEN2-S DISK BAYS)</td>
<td>HomeRun</td>
<td>5887</td>
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<tr>
<td>47</td>
<td>Drawer</td>
<td>PCIe Gen3 I/O Expansion Drawer (19” PCIe G3 4U I/O Expansion Drawer)</td>
<td>MEX Drawer</td>
<td>EMX0</td>
</tr>
<tr>
<td>48</td>
<td>Drawer</td>
<td>PCIe3 6-Slot Fanout Module for PCIe3 Expansion Drawer (Fan Out Module)</td>
<td>MEX (Fan Out)</td>
<td>EMXF</td>
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<tr>
<td>49</td>
<td>Drawer</td>
<td>EXP12SX SAS Storage Enclosure</td>
<td>SLIDER24</td>
<td>ESLS</td>
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<tr>
<td>50</td>
<td>Drawer</td>
<td>EXP245X SAS Storage Enclosure</td>
<td>SLIDER24</td>
<td>ESLS</td>
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</table>
## Scale-out GA2 supported I/O items 1 - 15

<table>
<thead>
<tr>
<th>No.</th>
<th>Type</th>
<th>Description</th>
<th>Code Name</th>
<th>FC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ROCE</td>
<td>PCIe3 LP 2-port 10GbE NIC&amp;RoCE SR Adapter</td>
<td>Baby Blue Tip w/Optics - LP</td>
<td>EC2M</td>
</tr>
<tr>
<td>2</td>
<td>ROCE</td>
<td>PCIe3 2-port 10GbE NIC&amp;RoCE SR Adapter</td>
<td>Baby Blue Tip w/Optics - HP</td>
<td>EC2N</td>
</tr>
<tr>
<td>3</td>
<td>ROCE</td>
<td>PCIe3 LP 2-port 10GbE NIC&amp;RoCE SFP+ Copper Adapter</td>
<td>Baby Blue Tip - LP</td>
<td>EC37</td>
</tr>
<tr>
<td>4</td>
<td>ROCE</td>
<td>PCIe3 2-port 10GbE NIC&amp;RoCE SFP+ Copper Adapter</td>
<td>Baby Blue Tip - HP</td>
<td>EC38</td>
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<tr>
<td>5</td>
<td>ROCE</td>
<td>PCIe3 LP 2-Port 40 GbE NIC RoCE QSFP+ Adapter</td>
<td>Travis-3EN - LP</td>
<td>EC3A</td>
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<td>6</td>
<td>ROCE</td>
<td>PCIe3 2-Port 40 GbE NIC RoCE QSFP+ Adapter</td>
<td>Travis-3EN - HP</td>
<td>EC3B</td>
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<td>7</td>
<td>LAN</td>
<td>PCIe G3 x8 4x10 4-Port Ethernet SFP+ HP</td>
<td>Slate - HP</td>
<td>EN17</td>
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<td>8</td>
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<td>PCIe LP 2-Port 1GbE SX Adapter</td>
<td>EL PASO-E-F SX - LP</td>
<td>5274</td>
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<td>9</td>
<td>LAN</td>
<td>2-Port Gigabit Ethernet-SX PCI Express Adapter</td>
<td>EL PASO-E-F SX - HP</td>
<td>5768</td>
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<tr>
<td>10</td>
<td>CNA</td>
<td>PCIe2 4-port (10Gb FCoE &amp; 1GbE) LR&amp;RJ45 Adapter</td>
<td>Houston LR - HP</td>
<td>EN0M</td>
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<td>11</td>
<td>CNA</td>
<td>PCIe2 LP 4-port (10Gb FCoE &amp; 1GbE) LR&amp;RJ45 Adapter</td>
<td>Houston LR - LP</td>
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<td>12</td>
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<td>PCIe2 8Gb 4-port Fibre Channel Adapter</td>
<td>Sailfish - HP</td>
<td>EN12</td>
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<tr>
<td>13</td>
<td>Stg_ctrl</td>
<td>PCIe2 8Gb 2-port Fibre Channel Adapter</td>
<td>HalfSail - FH</td>
<td>EN0G</td>
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<td>14</td>
<td>Stg_ctrl</td>
<td>PCIe2 8Gb 2-port Fibre Channel Adapter</td>
<td>HalfSail - LP</td>
<td>EN0F</td>
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<td>15</td>
<td>Stg_ctrl</td>
<td>PCIe3 12GB Cache RAID SAS Adapter Quad-port 6Gb</td>
<td>ZR1 - HP (dual only)</td>
<td>EJ0L</td>
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## Scale-out GA2 supported I/O items 15 - 30

<table>
<thead>
<tr>
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<th>Code</th>
<th>Name</th>
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<td>PCI-E 8x SAS Storage Controller - Low Profile Capable Tape/DVD</td>
<td></td>
<td>Cadet E - HP/ Tape &amp; DVD only</td>
<td>EJ1P</td>
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<tr>
<td>17</td>
<td>Stg_ctrl</td>
<td>PCI-E 8x SAS Storage Controller - Low Profile Capable Tape/DVD</td>
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<td>Cadet E - LP/ Tape &amp; DVD only</td>
<td>EJ1N</td>
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<tr>
<td>18</td>
<td>Stg_ctrl + SSD</td>
<td>NON-VOLATILE MEMORY PCIe3 x8 1.6TB LOW PROFILE CAPABLE NVMe ADAPTER</td>
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<td>Bolt</td>
<td>ECSA</td>
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<tr>
<td>19</td>
<td>Stg_ctrl + SSD</td>
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<td>ECSC</td>
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<tr>
<td>20</td>
<td>Stg_ctrl + SSD</td>
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<td>21</td>
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<td>PCIe LP 4-Port Async EIA-232 Adapter</td>
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<td>BELL - LP</td>
<td>S277</td>
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<tr>
<td>22</td>
<td>WAN</td>
<td>PCIe 2-Line WAN w/Modem</td>
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<td>23</td>
<td>Graphics</td>
<td>PCIe2 LP 3D Graphics Adapter x1</td>
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<td>EC51</td>
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<td>26</td>
<td>IB</td>
<td>2-port 100Gb EDR IB Adapter x16</td>
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<td>Glacier Park PCIe - LP</td>
<td>EC3E</td>
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<tr>
<td>27</td>
<td>IB</td>
<td>1-port 100Gb EDR IB Adapter x16</td>
<td></td>
<td>Glacier Park PCIe - LP</td>
<td>EC3T</td>
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<tr>
<td>28</td>
<td>USB</td>
<td>PCIe2 4-Port USB 3.0 Adapter</td>
<td></td>
<td>LILAC - HP</td>
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<td>29</td>
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<td>LILAC - LP</td>
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<td>30</td>
<td>Encryption</td>
<td>PCIe Crypto Coprocessor No BSC 4765-001</td>
<td></td>
<td>Y4-CRYPTO</td>
<td>EJ28</td>
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</table>
POWER9 Operating Systems
## Compatible Mode Architecture

### Hardware Features

<table>
<thead>
<tr>
<th>P7 MODE</th>
<th>P8 MODE</th>
<th>P9 BASE MODE</th>
<th>P9 MODE</th>
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<tbody>
<tr>
<td>4-Thread SMT</td>
<td>8-Thread SMT</td>
<td>8-Thread SMT, fused core optimization</td>
<td>8-Thread SMT, fused core optimization</td>
</tr>
<tr>
<td>VSX (Vector Scalar Extension)</td>
<td>VSX2, In-Core Encryption Acceleration</td>
<td>VSX3, In-Core Encryption Acceleration, string, video encode, quad floating point</td>
<td>VSX3, In-Core Encryption Acceleration, string, video encode, quad floating point</td>
</tr>
<tr>
<td>P7+ : AME compression acceleration and Encryption acceleration</td>
<td>AME compression acceleration and Encryption acceleration</td>
<td>AME compression acceleration and Encryption acceleration</td>
<td>AME compression acceleration and Encryption acceleration, direct user-mode Gzip acceleration</td>
</tr>
<tr>
<td>MMU Support</td>
<td>Software Effective to Virtual address translation</td>
<td>Hardware Effective to Virtual address translation (in memory segment tables)</td>
<td>Hardware Effective to Virtual address translation (in memory segment tables)</td>
</tr>
<tr>
<td>Hypervisor Interrupt Virtualization</td>
<td>Hypervisor Interrupt Virtualization</td>
<td>Hypervisor Interrupt Virtualization</td>
<td>External Interrupt Virtualization Engine (OS/Hypervisor bypass)</td>
</tr>
</tbody>
</table>

### Live LPAR Mobility

- **P7**: AME compression acceleration and Encryption acceleration
- **P8**: In-Core Encryption Acceleration, string, video encode, quad floating point
- **P9**: In-Core Encryption Acceleration, string, video encode, quad floating point

---

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Total Cost of Ownership: Competitive Comparison

IBM i: 60+% Lower Total Cost of Ownership

SOURCE: Quark + Lepton, IBM i on Power Systems for Midsize Businesses, May 2017
# IBM i System Support

<table>
<thead>
<tr>
<th>Systems</th>
<th>IBM i 7.2</th>
<th>IBM i 7.3</th>
</tr>
</thead>
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<tr>
<td><strong>POWER9</strong></td>
<td>![checkmark]</td>
<td>![checkmark]</td>
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<tr>
<td><strong>POWER8</strong></td>
<td>![checkmark]</td>
<td>![checkmark]</td>
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<td>S812, S814, S822 (VIOS only), S824, E870, E870C, E880, E880C</td>
<td>![checkmark]</td>
<td>![checkmark]</td>
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<tr>
<td><strong>POWER7/7+ Servers</strong></td>
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<td>![checkmark]</td>
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<tr>
<td>Power 710, 720, 730, 740, 750, 760, 770, 780, 795</td>
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<td>![checkmark]</td>
</tr>
<tr>
<td><strong>POWER7/7+ Blades and Compute Nodes</strong></td>
<td>![checkmark]</td>
<td></td>
</tr>
<tr>
<td>PS700/701/702/730/704, PureFlex p260/460</td>
<td>![checkmark]</td>
<td></td>
</tr>
<tr>
<td><strong>POWER6+</strong></td>
<td>![checkmark]</td>
<td></td>
</tr>
<tr>
<td>520, 550, 560, JS23/43</td>
<td>![checkmark]</td>
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<tr>
<td><strong>POWER6</strong></td>
<td>![checkmark]</td>
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<tr>
<td>520, 550, 570, 595, JS12/22</td>
<td>![checkmark]</td>
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</table>

Note 1 – no IOP or HSL support

Software Stack Support

- Firmware level FW910
- HMC code level V9R1.910
- VIOS 2.2.4, 2.2.5, 2.2.6
- AIX 7.2 TL2
- AIX 7.2 TL0, TL1 (P8 Compatibility Mode)
- AIX 7.1 TL4, TL5 (P8 Compatibility Mode)
- AIX 6.1 TL9 (P7 Compatibility Mode)
- IBM i 7.3 TR4
- IBM i 7.2 TR8
- Ubuntu 16.04.4 LTS (P8 Compatibility Mode)
- RedHat RHEL 7.4 LE (P8 Compatibility Mode)
- SuSE SLES 11 SP4 (P8 Compatibility Mode)
- SuSE SLES 12 SP3
IBM i Roadmap

2010  2014  2016

7.1  7.2  7.3  iNext  iNext + 1

Technology Refreshes

IBM i 7.3 TR4 & IBM i 7.2 TR8

** All statements regarding IBM’s future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives only.
## IBM i OS Support Dates

<table>
<thead>
<tr>
<th>Version</th>
<th>Product #</th>
<th>Availability</th>
<th>End Date: Support Extension</th>
<th>Latest Technology Refresh</th>
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</thead>
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<tr>
<td>IBM i 5.4</td>
<td>5722-SS1</td>
<td>02/14/2006</td>
<td>09/30/2013 09/30/2017</td>
<td>TR11 11/20/2015</td>
</tr>
<tr>
<td>IBM i 6.1</td>
<td>5761-SS1</td>
<td>03/21/2008</td>
<td>09/30/2015 09/30/2018</td>
<td>TR8 03/16/2018</td>
</tr>
<tr>
<td>IBM i 7.1</td>
<td>5770-SS1</td>
<td>04/23/2010 Support Extension annn 11/16/2017</td>
<td>04/30/2018</td>
<td>TR4 03/16/2018</td>
</tr>
<tr>
<td>IBM i 7.2</td>
<td>5770-SS1</td>
<td>05/02/2014</td>
<td>TBD</td>
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</tr>
</tbody>
</table>
IBM i 7.3 TR 4 and IBM i 7.2 TR8 Highlights*

Support for POWER9 Scale-Out Servers
• Support for native and VIOS configurations for new IBM S914 and IBM S924 servers with POWER9 technology
• Support for native and VIOS configurations for new IBM H924 server with POWER9 technology
• Support for VIOS configurations for new IBM S922 server with POWER9 technology
• Support for VIOS configurations for new IBM H922 server with POWER9 technology

Install Options Expanded
• Extensions to the new installation process for LIC using USB 3.0 media

Expanding the Secure-ability of IBM i
• IBM i Integrated Web Services adds advanced features to help administrators and programmers leverage APIs in a more secure environment

Increasing Productivity of Developers & Administrators
• CL commands can be stored in the IFS with full edit and compile capability
• New RPG IV Operation (DATA-INTO) allows programmers to parse structured data in most formats into an RPG variable.
• IBM i Access Client Solutions continues to be enhanced to meet the needs of our IBM i user community

IBM Software Currency
• IBM Notes/Domino 901 Feature pack 10 (including IBM Traveler) providing security enhancements delivered for IBM i


* Some selected functions are also available in IBM i 7.2 TR8
New Installation Process for IBM i

Current installation process using USB (introduced Oct 2017):
- ESS has LIC media image (I_BASE_01.IMG) for use with POWER8 USB 3.0 adapter and USB Removable Mass Storage
- Also has IBM-supplied program which can be downloaded to a PC
  - Use it to copy bootable LIC media image to USB Flash Drive
  - On a managed system, point to USB adapter and do D-mode IPL to use USB Flash drive to install LIC
  - On an unmanaged system, use DVD image to D-mode IPL to DST, then use “Define alternate installation device” option to select the USB device to install LIC
    - Note: The D-mode device and alternate install device must have the same LIC version/modification level when installing Licensed Internal Code.
  - Can also stack OS and any desired LPPs that fit on the USB Flash Drive

IBM i 7.2 TR8 & IBM i 7.3 TR4
- Can copy image to RDX media, stack OS and desired LPPs, and use it for D-mode IPL
- IBM-supplied program for copying image will have a GUI

https://www.ibm.com/developerworks/community/wikis/home?lang=en#!/wiki/IBM%20i%20Technology%20Updates/page/New%20installation%20process%20for%20LIC%20using%20USB%203.0%20media
<table>
<thead>
<tr>
<th>Model</th>
<th>Cores/Ghz</th>
<th>CPW</th>
</tr>
</thead>
</table>
| S914  | 4-core 2.3 – 3.8  
       | 6-core 2.3 – 3.8  
       | 8-core 2.8-3.8   | 52500       
       | 78500       
       | 122500     |
| S924  | 8-core 3.8 – 4.0  
       | 16-core 3.8-4.0   
       | 10-core 3.5-3.9  
       | 20-core 3.5-3.9  
       | 24-core 3.4-3.9 | 145500     
       | 268500     
       | 174500     
       | 318000     
       | 370700     |
| S812  | 1-core 3.02   | 9360      |
| S814  | 4-core 3.02   
       | 6-core 3.02    
       | 8-core 3.72    | 37400       
       | 56400       
       | 81050      |
| S824  | 6-core 3.89   
       | 12-core 3.89   
       | 8-core 4.15    
       | 16-core 4.15   
       | 24-core 3.52  | 68250       
       | 123400     
       | 89580      
       | 164700     
       | 218510     |

Performance results (in this section) published before 2/27/2018 do not include firmware and operating system security updates to mitigate Common Vulnerabilities and Exposures issue numbers CVE-2017-5715, CVE-2017-5753 and CVE-2017-5754 known as Spectre and Meltdown.

https://www-01.ibm.com/common/ssi/cgi-bin/ssialias?infotype=PM&subtype=RG&appname=STGE_PO_PO_USEN&htmlfid=POO03017USEN&attachment=POO03017USEN.PDF
RPG IV - A Modern Business Language

- Interoperability
  - XML
  - SQL
  - JSON

- Readability
  - Free form
  - No 8-80 restriction

- Functionality
  - New Built In Functions
  - Integrates with GIT
  - Source in IFS

- Modern Tools
  - RD i, RTC, ARCAD Power Pack

```rpg
ctl-opt bnddir('ACCRCV');
dcl-f custfile usage(*update);
dcl-ds custDs likerec(custRec);
dcl-f report printer;

read custfile custDs;
dow not %eof;
  if dueDate > %date(); // overdue?
    sendOverdueNotice();
    write reportFmt;
    exec sql insert :name, :duedate into
      mylib/myfile;
    endif;
  read custfile custDs;
endo;
*inlr = '1';

dcl-proc sendOverdueNotice;
  sendInvoice (custDs : %date());
end-proc;
```
Parsing Data – Before

RPG
• XML-INTO
  • Take an XML document and parse it into an RPG Variable

Database
• XML_Table
  • Take a XML document and parse it into a relational DB table
• JSON_Table
  • Take a JSON document and parse it into a relational DB Table
Parsing Data – Today

RPG
• XML-INTO
  • Take an XML document and parse it into an RPG Variable
• Data-INTO
  • Parse a ‘Data document’ into an RPG Variable
    • JSON
    • Property file
    • CSV, Others ??

Database
• XML_Table
  • Take a XML document and parse it into a relational DB table
• JSON_Table
  • Take a JSON document and parse it into a relational DB Table
Tools for Program Understanding

ARCAD – Observer

Time to start understanding your code

ARCAD Observer V1.1.0 is now included in ESS

ARCAD Observer for i - 5733-A01

• Plugs into RDi
  • Requires RDi 9.6
• Multi-job compile
• Many updates, fixes and enhancements

IBM Advanced Function Printing (AFP) Utilities for i (5770-AF1) – Adjusted Plan

- Advanced Function Printing Utilities for i (5770-AF1) 7.1 and 7.2 were withdrawn from marketing (effective July 11, 2016) and withdrawn from service (effective September 30, 2017). 5770-AF1 was not announced with IBM i 7.3.

- For clients who need 5770-AF1 on IBM i 7.2 and/or 7.3 and are not yet able to migrate to a third party product, 5770-AF1 7.2 is available on an unsupported, non-warranted basis for IBM i 7.2 and 7.3. 5770-AF1 7.2 installs on either IBM i 7.2 or 7.3.

- IBM delivered 5770-AF1 7.2 PTF SI66476 to turn off the license/key checking for 5770-AF1 7.2. Install PTF on IBM i 7.2 or 7.3.

- How to acquire 5770-AF1 7.2:
  - Download from the Entitled Systems Support (ESS) web site (http://www.ibm.com/servers/eserver/ess) under the menu “IBM i evaluation and NLV download”: 5770-AF1 is located under IBM i 5770-SS1 7.2 on the image B_GROUPx_04. (5770-AF1 7.2 is not available to download under IBM i 7.3, only under IBM i 7.2.)
  - Clients with physical media for IBM i 7.2 will still find 5770-AF1 on the 5770-SS1 keyed stamped media set B_GROUPx_04.
Db2 Web Query Version 2.2.1

Steps beyond traditional Business Intelligence into Data Discovery
- New data driven Visualization empowers:
  → Users, Analysts, and Data scientists
- Data layers (e.g., demographics) for geographic maps
  → What is the average income in this zip code?

Consolidate, Prepare, and Transform Data with DataMigrator ETL
- Even augment existing data with data from Watson

Install or upgrade in 15 minutes with the “EZ-Install” Package
→ Includes 100’s of sample reports, for the business and I/T

Video Demonstrations at ibm.biz/db2wq-221-videos & db2webqueryi.blogspot.com

GA 12/08/2017
No Charge Upgrade from previous versions**

* QRY/400 owners entitled to Web Query Express w/ limited # of user licenses for no charge
** Assumes currency on SW Maintenance
Enhanced “In-Document Analytics”

Think “Active Reports” for current Db2 Web Query users
- New default donut charts
- Tree map providing visual information
  - Size and color of box represent different measurements
    - Ex: Sanyo (green) has high gross profit% but lower revenue (smaller box)
- Automate bursting of the report to mobile device users
  - Based on some key field like REGION_ID
New Visualizations

Build with new InfoAssist+
– Empower End Users
  • Visualize Data
  • Interact with the Data
– Marquis filtering across associated views
  • Simplified focus of interest
– Can work as Run Time user or InfoAssist+ User

New Sample Reports with “how-to” demo videos
Db2 Web Query Installation and Setup
With the 2.2.1 EZ-Install Package

Up and Running in 15 Minutes
100’s of Sample Reports
Ready to Learn with Guided Tutorials
Query/400 Discovery Tool
70 Day Trial

Request by sending email to QU2@us.ibm.com Include name, company name, and server s/n
To Learn More

Db2 Web Query for i Website
– Ibmbiz/db2webqueryi
Db2 Web Query for i Wiki
– Ibmc/db2wqwiki
Db2 Web Query Getting Started Enablement:
– https://ibmbiz/db2wqconsulting
Db2 Web Query Version 2.2.1
– http://ibmbiz/db2wqv221blog
EZ-Install
– http://ibmbiz/db2wqezinstall-info

Follow Db2 Web Query guy Doug Mack on twitter at @mckdmoly or check out his blog at http://db2webqueryi.blogspot.com/ for the latest info
Access Client Solutions (ACS) Core offering (platform independent)

- 5250 display and printer emulator
- Data transfer
- Printer Output
- Console consolidation
- Other misc features

Windows Application Package (Available at G.A.)

- Windows Installer MSI Package
- Data drivers (ODBC, OLEDB, .Net)
- Printer drivers
- Does not support Windows 10

Linux Application Package (Available at G.A.)

- RPM and Debian Install Packages
- ODBC driver
IBM I ACS – Platform Independent

• Runs anywhere that has Java™
  • Java 1.6 or later
    • Java 1.8 Recommended

• This includes:
  • Windows
  • Mac
  • Linux
  • AIX
  • IBM i
Access Client Solutions
Product Page

http://www-03.ibm.com/systems/power/software/i/access/solutions.html

IBM i Access

Overview | Client Solutions | Windows | Linux | Web | Mobile

IBM i Access Client Solutions is the newest member of the IBM i Access family. It provides a Java-based, platform-independent interface that runs on most operating systems that support Java, including Linux, Mac, and Windows.

IBM i Access Client Solutions consolidates the most commonly used tasks for managing your IBM i into one simplified location. The latest version of IBM i Access Client Solutions is available to customers with an IBM i software maintenance contract.

Download IBM i Access Client Solutions base package.

No ESS!! Download direct from the Web site!!!
Access Client Solutions - Details

Supported connecting to IBM i 7.3, 7.2, 7.1 and 6.1

IBM i OS supports IBM i Access Client Solutions exactly the same as IBM i Access for Windows

– Checks out the same 57xxXW1 Licenses for 5250 and Data Transfer
– Connects to the same IBM i Access Host Servers on the same ports in the same way
  o Exit programs will continue to have the same impact
  o Application Administration local policies will still be applied
AIX Support for Power System Generations

<table>
<thead>
<tr>
<th>Power Platform</th>
<th>AIX 5.3</th>
<th>AIX 6.1</th>
<th>AIX 7.1</th>
<th>AIX 7.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>POWER4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>POWER5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>POWER6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>POWER7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>POWER8</td>
<td>(1, 2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>POWER9</td>
<td>(2)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. AIX 5.3 requires full I/O virtualization on POWER8
2. 7.1 Versioned WPARs are an option to run AIX 5.2 and AIX 5.3 environments on POWER8/POWER9
AIX & VIOS Support – native I/O

POWER9 at GA – supported any I/O configuration at GA
– AIX Version 7.2 7200-02-02 ++
– AIX Version 7.1 7100-05-02 ++
– AIX Version 6.1 6100-09-11 ++ → requires AIX 6.1 service extension
– VIOS 2.2.6.21*

POWER9 post GA (May 4, 2018) further support
– AIX Version 7.2 7200-00-06 ++
– AIX Version 7.2 7200-01-04 ++
– AIX Version 7.1 7100-04-06 ++

– VIOS 2.2.5.40**
– VIOS 2.2.4.60**

Note: * means new in 2018
Note: ** means new update in 2018
Note: ++ means “or later”
### AIX & VIOS Support – Virtual I/O & **LPM**

<table>
<thead>
<tr>
<th>POWER9 at GA</th>
<th>YYWW</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIX Version 7.2 7200-02-01 ++</td>
<td>1732</td>
</tr>
<tr>
<td>AIX Version 7.2 7200-01-01 ++</td>
<td>1642</td>
</tr>
<tr>
<td>AIX Version 7.2 7200-00-01 ++</td>
<td>1543</td>
</tr>
<tr>
<td>AIX Version 7.1 7100-05-01 ++</td>
<td>1731</td>
</tr>
<tr>
<td>AIX Version 7.1 7100-04-01 ++</td>
<td>1543</td>
</tr>
<tr>
<td>AIX Version 6.1 6100-09-06 ++</td>
<td>1543</td>
</tr>
</tbody>
</table>

- **Note:** These AIX releases are already available
# AIX feature support on POWER9

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
<th>Exploited by:</th>
<th>7.2 TL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Security</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Random number generator</td>
<td>User-mode accessible random number generator</td>
<td>Modified Apps; Java; TL2</td>
<td></td>
</tr>
<tr>
<td><strong>Performance Optimization</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power 3.0B ISA extensions</td>
<td>VSX3, string, video encode, quad floating point, pc relative addressing, 32-bit overflow, Memory Atomics</td>
<td>Compilers; Base AIX; Modified Apps; Java</td>
<td>TL2</td>
</tr>
<tr>
<td>1536-thread single LPAR</td>
<td>192-core/SMT8 single system image support</td>
<td>AIX, Oracle</td>
<td>TL3</td>
</tr>
<tr>
<td><strong>Acceleration</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GZIP acceleration</td>
<td>AIX zlib with transparent POWER9 on-chip deflate/inflate exploitation</td>
<td>Unmodified applications with zlib, Java, DB2</td>
<td>TL3</td>
</tr>
<tr>
<td><strong>Virtualization</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interrupt Virtualization Engine</td>
<td>AIX updates to directly exploit POWER9 interrupt controller. Hardware interrupt routing in a micro-partitioned environment. Bypass hypervisor call overhead.</td>
<td>AIX, VIOS</td>
<td>TL3</td>
</tr>
</tbody>
</table>
Linux on Power Systems

Linux is designed to function in multiple modes
Depending on the Power System, supported modes can be:
– Bare-metal (non-virtualized)
– KVM hosting and KVM guests
– PowerVM LPARs and VIOS

S922/S924 systems are all PowerVM only
S922/S924 systems will not support bare-metal or KVM

Different from POWER8

L922 PowerVM only (for now)
Linux support at GA

As usual: all latest updates are mandatory for support

Supported / should work:

- **Ubuntu 16.04.03**  P8compat mode
- **Ubuntu 16.04.04**  P8compat mode available ~mid-Feb 2018
- **Ubuntu 16.04.xx**  always be P8compat mode only
  → Actually has POWER9 kernel features but NOT tested or supported
- **SLES 11 SP4 BE**  P8compat mode only
- **SLES 12 SP3 LE**  Limited basic POWER9 mode
  → Boots to POWER9, sets the mode & allows P9 instructions in apps
- **RHEL 7.4 BE for P8**  NOT supported on POWER9 at all
- **RHEL 7.4 LE for P8**  P8compat mode only

- **CentOS 7.4 LE for P8** should work P8compat mode only
  – but is not tested or supported by IBM
SAP HANA non-Production support at GA

SUSE Linux Enterprise Server
– SLES 12 Service Pack 3, or later

Red Hat Enterprise Linux
– RHEL 7 for Power LE, version 7.4, or later (Power8-mode)

Ask SAP when they fully support POWER9 (and not IBM)
Hardware Management Console
HMC Requirements

HMC code level V9R1.910

CR7   7042-CR7
CR8   7042-CR8
CR9   7042-CR9
CR1   7063-CR1

No longer sold
HMC Hardware update Q3 2017

POWER8 HW Appliance – like the Intel HMC HW Appliance
• But 6 POWER8 CPU cores, 32 GB RAM & two disks
• POWER8 faster than Intel + SMT=8 for massive concurrency
• Model: POWER8 7063-CR1 [Older Intel: 7042-CR9]

POWER8 virtual HMC – like the Intel vHMC
• Runs in a PowerVM LPAR on a POWER8 server
• Obviously, you can’t manage the server its actually running on!
• Note: not KVM, XEN, Vmware as these are Intel only
• Use a vHMC to test new HMC versions on temporary basis
• Bottom line: minimum of one/two real physical HMCs is still normal
HMC Software Releases

HMC 860 “old”
Runs on Intel
Manages POWER6, POWER7, POWER8
Classic GUI & Enhanced+ GUI
Support till Q4 2018

HMC 870 Q4 2017
Runs on Intel
Manages POWER6, POWER7, POWER8
Enhanced+ GUI Only
Support at least 2019
Some “missing” features get added here like System Plans
CLI no change

HMC 9xx – Q1 2018
Runs on Intel
Manages POWER6, POWER7, POWER8
Enhanced+ GUI Only
Supported for years
Buying POWER9?
A good time to move up to a POWER8 HMC

= Most current releases
POWER9 Miscellaneous
PowerVM offer

- Migrate from previous IBM Power Systems servers with Live Partition Mobility capabilities.
- Every new Power S922/S924 server can be ordered with a temporary (60 day) IBM PowerVM license for your old server to support a seamless move to IBM POWER9 servers.
- Feature Code ELPM (one for each legacy server)
- POWER7 & POWER8 only
## New 19” Rack 7965-S42

<table>
<thead>
<tr>
<th>Feature</th>
<th>S42</th>
<th>T42</th>
<th>94Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>42U</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>600mm Wide (datacenter floor tile)</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Ship Loaded from Factory</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Flat surface for mounting H2O Manifolds and Strip PDUs</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>1200mm Depth (rack w/ covers)</td>
<td>1070+130cvrs</td>
<td>1016+cvrs</td>
<td>1040 + cvrs</td>
</tr>
<tr>
<td>Rear door heat exchanger</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td># Vertical, 1U Pockets</td>
<td>4</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Height Reduction – fit standard doorways</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Back cable depth (mm)</td>
<td>280</td>
<td>246</td>
<td>261</td>
</tr>
<tr>
<td>Earthquake certified</td>
<td>Yes – 45lbs / EIA</td>
<td>Yes – 35 lbs/ EIA</td>
<td>No</td>
</tr>
</tbody>
</table>

- **GA 4Q17**
- **POWER8 & POWER9**

![New 19” Rack 7965-S42 Image]
Scale-Out POWER8 to POWER9 Migration

Server upgrades = not possible
But some parts could be moved:

- CPU=impossible
- Motherboard=impossible
- RAM=Centaur memory card to DDR4 (impossible)
- Power Supplies = no
- Adapters=PCIe Gen3 to Gen4 (possible)
  - Gen3 should work in Gen4 slots + S922/S924 has Gen3 slots too
  - Check adapter support list below
- Disks=same chassis & disk support (possible)
  - S922/S924 Internal disks are 4K SFF-3 only
- Possible Drawer migrate, if drawer is up to date
Power Supplies

Concurrent maintenance & redundant power
Rating
• 1400 W 200- 240 VAC → POWER8 was 900W
• S924 redundancy 2+2 → if cabled correctly
• S914 redundancy 1+1
• S922 redundancy 1+1
• S914 Tower 2+2 [900W 100-127 VAC or 200-240VAC]

Energy Efficiency
• 80+ Platinum Power Supply Compliant
• EPA Energy Star Compliant
• Built-in Advanced Thermal & Power Management
Announcement Links

**POWER9 S924**

**POWER9 S922**

**POWER9 L922**

**POWER9 S914**
- a cut-down S914 (internally) for smaller workloads and memory limits & no Remote I/O drawers

**POWER9 H922**
- identical to S922 physically but for SAP-HANA on top of Linux but with a 25% AIX/IBMi allowed

**POWER9 H924**
- identical to S924 physically but for SAP-HANA on top of Linux but with a 25% AIX/IBMi allowed
Video Links

AIX / Power Systems Virtual User Group
POWER9 Jeffrey Stuecheli – Power Hardware Architect 90 minutes

POWER9 Servers: What to expect by Nigel Griffiths 2 minutes
https://www.youtube.com/watch?v=UI0A2ge_TeU

Bill Starke: IBM POWER Ecosystem and POWER9 Strategic Outlook
https://www.youtube.com/watch?v=Pu05IF_-mzo

Wikipedia on POWER9