RISC Analysis Information Summary

IBM POWER9 Scale Out Servers

9008-22L, 9009-22A, 9009-41A, 9009-42A, 9223-22H, 9223-42H.

This document provides a brief overview of available Processors, Memory, I/O Slots, Storage Backplanes etc.

Links to IBM's Announcement and SalesManual pages are at the end of this document.

We anticipate updating RISC Analysis with Power9 information by the end of March 2018. At this time, we are still resolving some conflicting information with IBM.

General:

02/13/2018: IBM have today announced 6 New Models of POWER9 Scale-Out Servers, using 3 new Machine Types. Availability is scheduled for 03/20/2018.

MT	9008	9009	9009	9009	9223	9223
Model	22L	22A	41A	42A	22H	42H
Name	L922	S922	S914	S924	H922	H924
Form	2U	2U	4U	4U	2U	4U
Procs	2	2	1	2	2	2

With the exception of 9009-41A (S914), all Systems support 2x Processor Sockets and are 19-inch Rack Mount.

9009-41A is available for Rack or Tower and supports a single Processor Socket.

These are the first mainstream Power9 systems, after the 8335-GTG AC9222 System announced in December 2017.

The 9008-22L is a Linux Dedicated System
The 9009 Systems support Linux, AIX, IBM i, VIOS.
The 9223 Systems are SAP HANA Optimized, also supporting Linux, AIX, IBM i, VIOS.

Processors

Unlike previous CPUs, the Base Proc Speed varies based on the machine performance config. This skews the Min CPU Clock Speed.

Dynamic Processor frequencies have been around for some time, and are generally referred to as 'Turbo' (CPU Over-Clocking).

Available Cores Per System

	9008 22L	9009 22A	9009 41A	9009 42A	9223 22H	9223 42H
	L922	S922	S914	S924	H922	H924
4-Core			X			
6-Core			X			
8-Core			X			
4/8-Core		X			X	
8/16-Core	X	X		X	X	X
10/20-Core	X	X		X	X	X
12/24-Core	X			X		X

Power9 CPU and Activation FCs

	MT Model	9008 22L	9009 22A	9009 41A	9009 42A	9223 22H	9223 42H
Description	CCIN	L922	S922	S914	S924	H922	H924
2.3 ~ 3.8GHz 4-Core	5C22			EP10			
2.8 ~ 3.8GHz 4-Core	5C22		EP16			EP16	
Activation $ 0				EPZL			
Activation $			EP46	EP40		EP46	
2.3 ~ 3.8GHz 6-Core	5C23			EP11			
Activation $ 0				EPZM			
Activation $				EP41			
2.8 ~ 3.8GHz 8-Core	5C27			EP12			
3.4 ~ 3.9GHz 8-Core	5C27	ELPV	EP18			EP18	
3.8 ~ 4.0GHz 8-Core	5C28				EP1E		EPIE
Activation $		ELAV	EP48	EP42	EP4E	EP48	EP4E
2.9 ~ 3.8GHz 10-Core	5C24	ELPW	EP19			EP19	
3.5 ~ 3.9GHz 10-Core	5C25				EP1F		EP1F
Activation $		ELAW	EP49		EP4F	EP49	EP4F
2.7 ~ 3.8GHz 12-Core	5C26	ELPX					
3.4 ~ 3.9GHz 12-Core	5C29				EP1G		EP1G
Activation $		ELAX			EP4G		EP4G

All Processor Cores require Activation.

L1 Cache 64KB per Core
L2 Cache 512KB per Core
L3 Cache 120MB per CPU

P9 System Memory

The Systems use Industry Standard 2666MHz DDR4 RDIMMs (1.2V 288-Pin).

All Memory is installed in Pairs, with the exception of 8335-GTG which must be Fully Populated with 16x identical Memory DIMMs.

Actual Clock Speed varies depending upon installed System and Memory Config.
Although Peak Bandwidth is 2666MHz, the DIMMs may operate at 2133MHz or 2140MHz.

P9 Memory FCs & Configs

	9008	9009	9009	9009	9223	9223	8335	8335
	22L	22A	41A	42A	22H	42H	GTG	GTW
	L922	S922	S914	S924	H922	H924	AC922	
Slots Per Proc	16	16	16	16	16	16	8	8
Max Slots (System)	32	32	16	32	32	32	16	16
Mem Config	Pair	Pair	Pair	Pair	Pair	Pair	Full	Full
Min Mem (System GB)	32	32	32	32	32	32	256	256
Min DIMMs (System)	2	2	2	2	2	2	16	16
Max Mem 1x Proc	2TB	2TB	1TB	2TB	2TB	2TB	N/A	N/A
Max Mem 2x Proc	4TB	4TB	N/A	4TB	4TB	4TB	1TB	2TB
Max DIMM Module (GB)	128	128	64	128	128	128	64	128
#EM60 8GB DDR4 324D								
#EM61 16GB DDR4							X	X
#EM62 16GB DDR4 324E	X	X	X	X	X	X		
#EM63 32GB DDR4 324F	X	X	X	X	X	X	X	X
#EM64 64GB DDR4 325A	X	X	X	X	X	X	X	X
#EM65 128GB DDR4 324C	X	X		X	X	X		X

Note: Although P9 MT 8335 (AC922) is not a member of the Systems covered by this document, the FCs and FRUs are related, and are therefore retained in our MTMD to FC chart.

I/O Slots

2U System Slots are PCIe Low Profile, Half Length
4U System Slots are PCIe Full High, Half Length

The number of installed Processors determines available Bus Slots

PCIe Bus Slots by System Type/Installed Procs

			System Size	2U	2U	4U	4U
			Installed Procs	1x	2x	1x	2x
Gen	Lanes	Physical	CAPI				
PCIe4	(x16)	(x16)	Yes	1	3	1	3
PCIe4	(x8)	(x16)	Yes	1	2	1	2
PCIe3	(x8)	(x16)	No	2	2	2	2
PCIe3	(x8)	(x8)	No	2	2	4	4

Note: Slots with x8 Lanes, that are physically x16 Connectors will only support x16 Adapters that are designed to Auto-Negotiate the available lanes.

One of the PCIe3 x8/x8 Slots is used for the 1Gb 4-Port Ethernet Adapter

Storage Backplanes

Five Storage Backplanes FCs are announced for the initial Power9 Models.

2x Base Function (8-Bay and 12-Bay) without Write Cache
3x Expanded Function (8-, 12-, and 18-Bay) with Write Cache.

The 12-Slot Backplanes include an RDX Removable Storage Bay.

Note:

P8 RAID Internal Adapters are not supported on P9 Models.
RAID Internal Adapters for Power9 Backplanes share CCINs with previous Power8 Backplanes, but they are different physical Adapters, with different FRUs.

Power9 Storage Backplane FCs

	Base 8	Exp 8	Base 12	Exp 12	Exp 18	Split Base	SAS Ports
Backplane CCIN	2D36	2D36	2D34	6B64	2D35		
Controller CCIN	57D7	57DC	57D7	57D8	57D8	57D7	
9008-22L L922	EL66	EL67				EL68	EJ00
9009-22A S922	EJ1F	EJ1G				EJ1H	EJ00
9009-41A S914			EJ1C	EJ1M	EJ1D	EJ1E	EJ0W
9009-42A S924			EJ1C	EJ1M	EJ1D	EJ1E	EJ0W
9223-22H H922	EJ1F	EJ1G				EJ1H	EJ00
9223-42H H924			EJ1C	EJ1M	EJ1D	EJ1E	EJ0W

All Backplanes support
 SFF-3 SSDs and HDDs
 5xx and 4K Byte Sector formats (5xx & 4K can not be mixed in the same Array).
 RAID-0, 5, 6, 10

Base Storage Backplanes (8-Bay #EL66/#EJ1F and 12-Bay #EJ1C)

The Base Backplanes include a single SAS Controller (CCIN 57D7) without Write Cache.

57D7 is a 2U Card. Despite 12-Slot Bays only being supported on the 4U models, IBM confirm the card is the same for both 2U and 4U.

JBOD is supported.

Split Backplane FCs

Base Backplanes support Split Drive Bays (4+4 or 6+6) via appropriate FC, which adds a second 57D7 SAS Controller. The second SAS Controller does not include Write Cache.

#EL68 Split #EL66 to 4+4 SFF-3 Bays: Add 2nd 57D7 SAS Controller
#EJ1H Split #EJ1F to 4+4 SFF-3 Bays: Add 2nd 57D7 SAS Controller
#EJ1H Split #EJ1C to 6+6 SFF-3 Bays: Add 2nd 57D7 SAS Controller

Expanded Function Storage Backplanes (#EL67/#EJ1G, #EJ1M, #EJ1D)

These Backplanes include RAID Internal SAS Controllers with 1.8GB Physical Write Cache. With Compression, up to 7.2GB of Write Cache can be achieved.

The 8-Slot Backplanes (#EL67/#EJ1G) us a Single Controller (non-Mirrored Write Cache) CCIN 57DC.

This controller uses the second controller slot for the Back-Up Power Module Card (No FC, no known CCIN).

The 12 and 18-Slot Backplanes (#EJ1M, #EJ1D) are Dual (Paired) Controllers (with Mirrored Write Cache) CCIN 57D8.

Write Cache is based upon Flash Memory and uses Super Capacitors to remove the need for batteries.

The Controller Cards include appropriate mini SAS HD internal connector Cables.

Expanded Function Backplanes support
- RAID-5T2, 6T2, RAID-10T2
- Easy Tier Function (Auto assigns Hot Data to SSD, Cold Data to HDD)
- Active/Active Configs (with at least 2x Arrays)
- Optional External SAS Port(s) #EJ00, #EJ0W

Expanded Function Backplanes do not support Split Backplane Configs.

Optional External SAS Port(s) #EJ00, #EJ0W

Supported on the Expanded Function Backplanes.
The 8x Slot Backplanes (#EL67/#EJ1G) support the addition a single SAS Port via #EJ00
The 12x Slot and 18 Slot Backplanes (#EJ1M, #EJ1D) support dual SAS Ports via #EJ0W

The SAS Ports are used to connect to an External SAS Storage unit such as the EXP24SX via a pair of SAS-Mini HD Narrow YO Cables.
The SAS Port(s) option covers a physical PCIe (x8) Slot.

Power9 Storage Backplane Front Bezel FCs

		8x Bay		12x Bay		18x Bay	
	Form	IBM	OEM	IBM	OEM	IBM	OEM
9008-22L L922	Rack	EJUC	EJU7				
9009-22A S922	Rack	EJU6	EJU7				
9009-41A S914	Rack			EJU2	EJU4	EJUF	EJUH
9009-41A S914	Tower			EJU8	EJUA	EJU9	EJUB
9009-42A S924	Rack			EJU3	EJU4	EJUG	EJUH
9223-22H H922	Rack	EJU6	EJU7				
9223-42H H924	Rack			EJU3	EJU4	EJUG	EJUH

Additional Backplane Notes:

Some IBM documentation refers to the RAID Internal Adapter Cards by the Backplane Feature Codes. i.e.:
  PCIe3 x8 cache SAS RAID Internal Adapter 6 Gb (FC EJ1G; CCIN 57DC)

Strictly speaking, this is incorrect and could cause confusion.
The RAID Internal Cards have CCINs but not FCs. The FCs refer to the Backplane.

Power Supplies

MT-MD	Form	FC	Description	Min
9008-22L L922	Rack	EL1B	1400W 200-240V AC	2
9009-22A S922	Rack	EB2M	1400W 200-240V AC	2
9009-41A S914	Tower	EB2L	900W 127/240V AC	4
9009-41A S914	Rack	EB2M	1400W 200-240V AC	2
9009-42A S924	Rack	EB2M	1400W 200-240V AC	4
9223-22H H922	Rack	EB2M	1400W 200-240V AC	2
9223-42H H924	Rack	EB2M	1400W 200-240V AC	4

Integrated/Standard

Service Processor
Hot-Swap and Redundant Cooling/Power Supplies
2x HMC 1GbE RJ45 Ports
1x RJ45 System Port

USB Ports and Default LAN Adapter vary by Model

	9008 22L	9009 22A	9009 41A	9009 42A	9223 22H	9223 42H
	L922	S922	S914	S924	H922	H924
Front USB 3.0 Ports	2	2	1	1	2	1
Rear USB 3.0 Ports	2	2	2	2	2	2
1Gb PCIe2 4-Port LAN	EL4M	5260	5899	5899	5260	5899

Supported O/S

	9008 22L	9009 22A	9009 41A	9009 42A	9223 22H	9223 42H
	L922	S922	S914	S924	H922	H924
Linux	X	X	X	X	X	X
AIX		X	X	X	X	X
IBM i		X	X	X	X	X

Reference (links)

MT Model	Announcement Letter	IBM SalesManual
9008-22L L922	118-022	9008-_h01
9009-22A S922	118-021	9009-_h01
9009-41A S914	118-023	9009-_h03
9009-42A S924	118-020	9009-_h02
9223-22H H922	118-002	9223-_h01
9223-42H H924	118-001	9223-_h02