



IBM POWER Linux










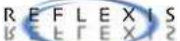




































IBM OpenPOWER – Over 260 Members

This is What a Revolution Looks Like

The image displays a large collection of logos for IBM OpenPOWER members, organized into six horizontal categories. Each category is represented by a blue bar with white text on the left, followed by a row of logos.

- Implementation / HPC / Research:** Includes logos for ASU, ASTRI, Agency for Science, Technology and Research, CAMBRIDGE CARES, Carnegie Mellon University, cfms, CINECA, Hartree Centre, intb, icm, JÜLICH, Lawrence Livermore National Laboratory, LSU, M, NUS, NANYANG TECHNICAL UNIVERSITY, OAK RIDGE, OSU, OVM.COM, rackspace, RICE, rzg, SASTRA UNIVERSITY, Sandia National Laboratories, SDSC, USC, TACC, and others.
- Software:** Includes logos for American Megatrends, FreeBSD, Google, gpub, 红旗 Linux, RedHadoop, redislabs, symon, T2i, and ubuntu.
- System / Integration:** Includes logos for ARROW ELECTRONICS, INC., AS67K, AVNET, BUL, CIARA, Cirrascale, CSPI, DRC, E4, IBM, inspur, Mark III Systems, Microway, NEC, OCF, ONE STOP SYSTEMS, PENGUIN COMPUTING, RAPTOR ENGINEERING, rikor, IIRIDS Technologies, STACK VELOCITY, TEXHOPOM, UNISOURCE, YA DR, and others.
- I/O / Storage / Acceleration:** Includes logos for ALGOL LOGIC, ALPHA DATA, AVAGO TECHNOLOGIES, BittWare, blackgraph, BLUEBEE, BROCADE, Chelsio, CONVEY, DataDirect, edico, genome, EVERSPIN, FUSION-IO, HGST, HITACHI, Inspire the Next, Inphi, Interface Masters, MAXELLER TECHNOLOGIES, Mellanox, MEMBLAZE, Micron, Microsemi, MYRICOM, Nallatech, NVIDIA, and others.
- Boards / Systems:** Includes logos for Celestica, 创和通讯, IBM, Inventec, msi, PET, TYAN, and wistron.
- Chip / SOC:** Includes logos for IBM, IDT, infineon, POWERCORE, SYNAPSE design, and VeriSilicon.

Linux Applications on POWER

HPC		Cloud	Big Data & Machine Learning	Mobile Enterprise
CHARMM	miniDFT	   	 	 
GROMACS	CTH	 	 	 
NAMD	BLAST	 	 	 
AMBER	Bowtie	 	 	 
RTM	BWA	 	 	 
GAMESS	FASTA	 	 	 
WRF	HMMER	 	 	 
HYCOM	GATK		 	
HOMME	SOAP3			
LES	STAC-A2			
MiniGhost	SHOC			
AMG2013	Graph500			
OpenFOAM	llog			

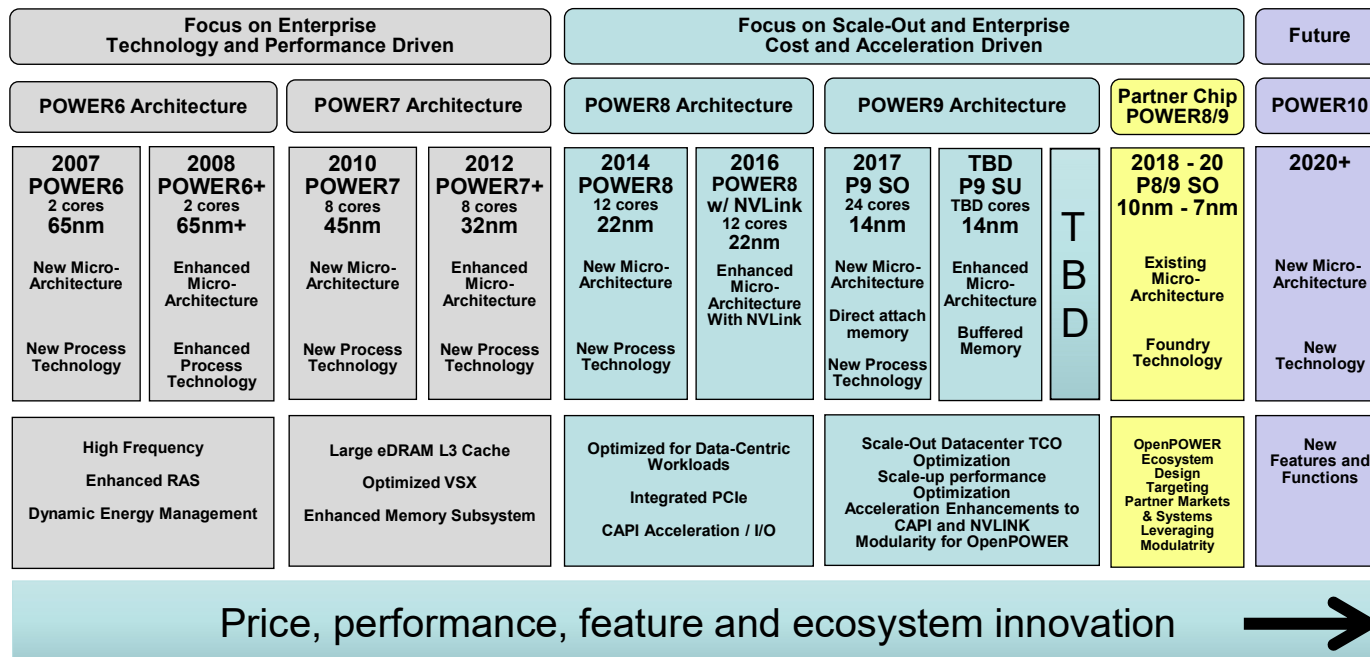
100,000+ Packages in Linux Distributions on Power

  	Major Linux Distro	  
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IBM

IBM Systems

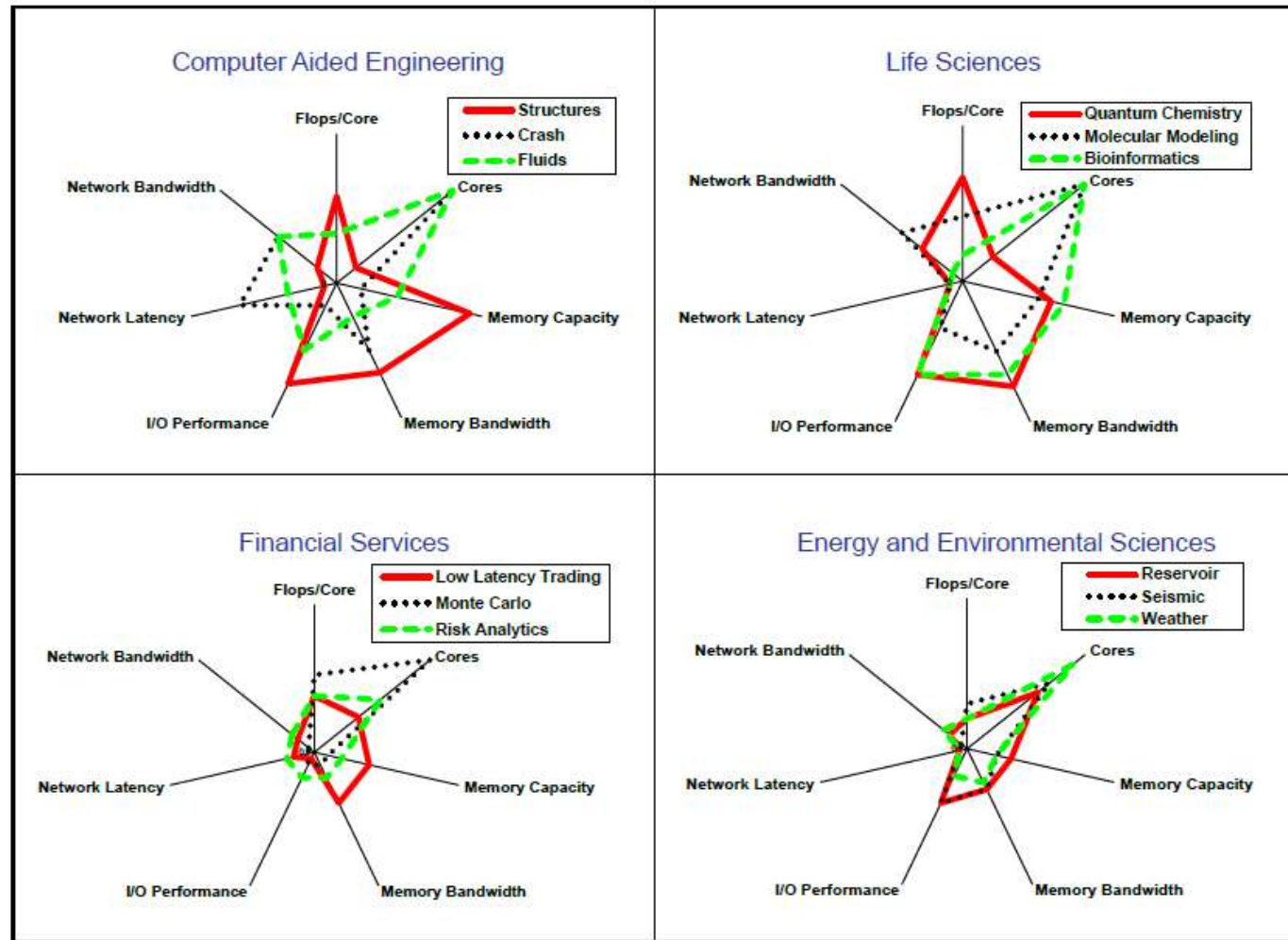
Power Processor Roadmap



Source: <http://openpowerfoundation.org/presentations/brad-mccredie-board-advisor-ibm/>

Memory
Bandwidth?
IO?
Cores?
Flops?

*What does it
Mean?
Better
Application
Performance*



IBM

Figure 4: Application Performance Characteristics Mapped to Seven Key Cluster System Features

POWER9 – Premier Acceleration Platform

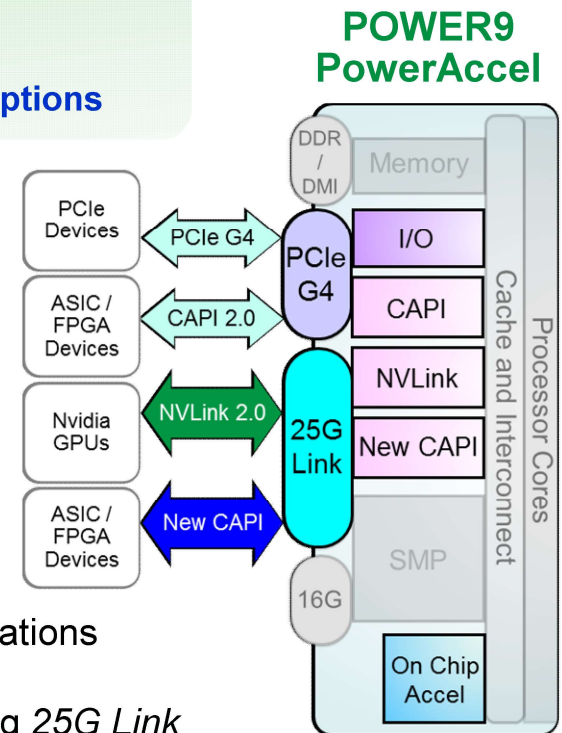
Extreme Processor / Accelerator Bandwidth and Reduced Latency
Coherent Memory and Virtual Addressing Capability for all Accelerators
OpenPOWER Community Enablement – Robust Accelerated Compute Options

State of the Art I/O and Acceleration Attachment Signaling

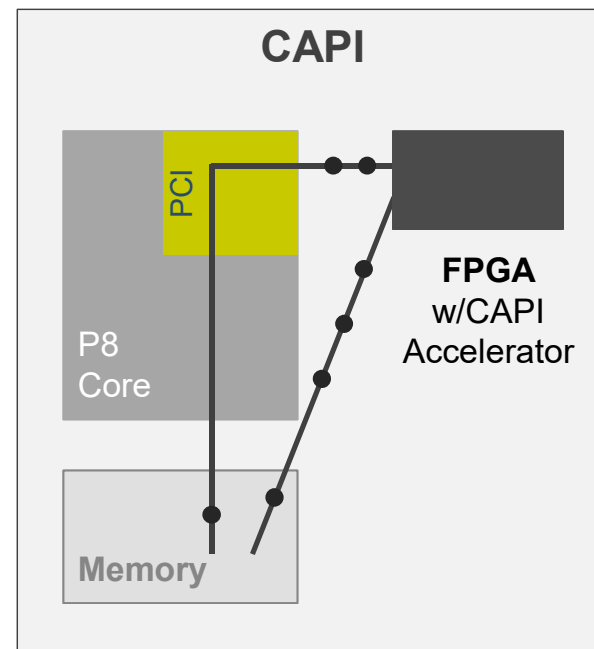
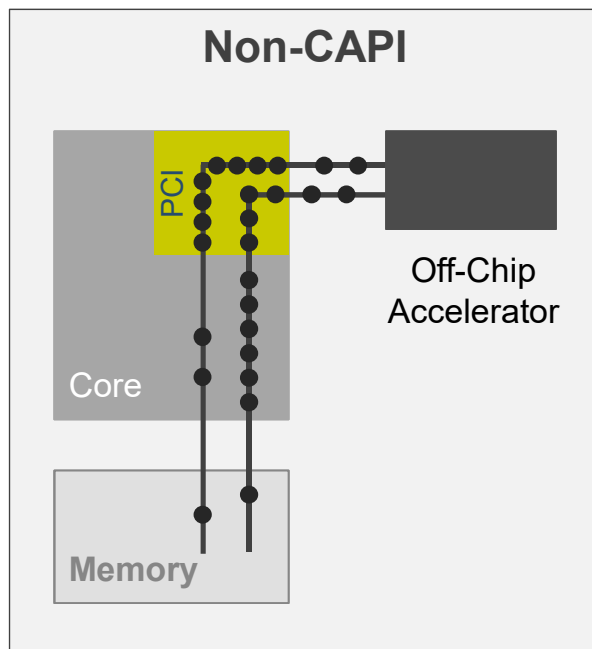
- **PCIe Gen 4** x 48 lanes – 192 GB/s duplex bandwidth
- **25G Link** x 48 lanes – 300 GB/s duplex bandwidth

Robust Accelerated Compute Options with OPEN standards

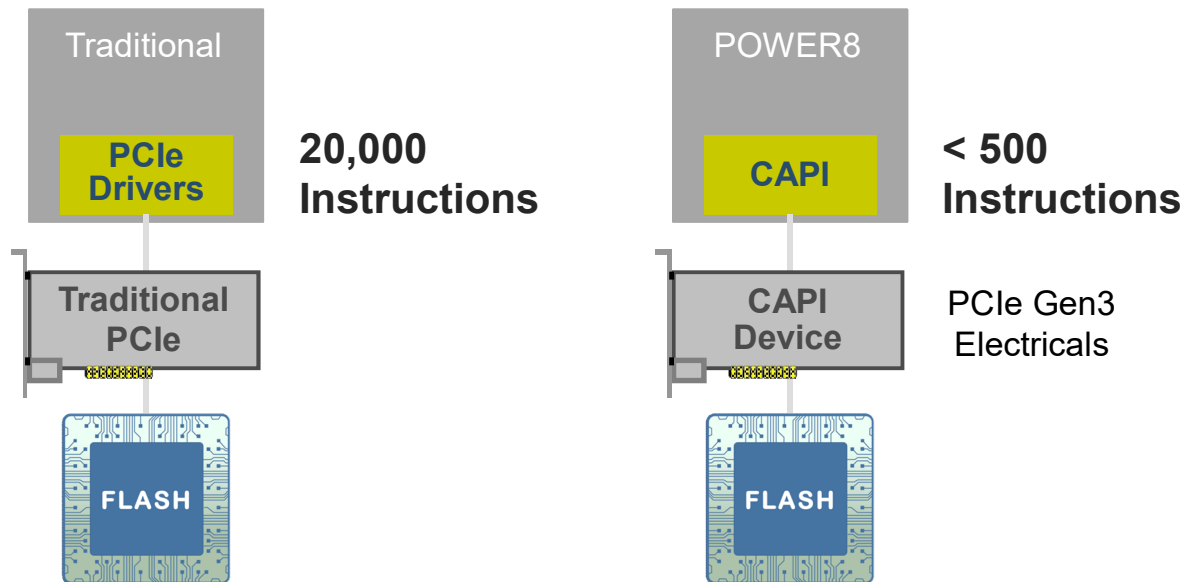
- **On-Chip Acceleration** – Gzip x1, 842 Compression x2, AES/SHA x2
- **CAPI 2.0** – 4x bandwidth of POWER8 using *PCIe Gen 4*
- **NVLink 2.0** – Next generation of GPU/CPU interconnect
 - Up to 2x bandwidth of NVLink1.0
 - Easier programming model for complex analytic & cognitive applications
 - Coherency, virtual addressing, low overhead communication
- **OpenCAPI 3.0** – High bandwidth, low latency and open interface using *25G Link*



Coherent Accelerator Processor Interface



CAPI Lowers Flash Latency
















IBM CAPI Roadmap

Feature	CAPI	CAPI 2.0	OpenCAPI 3.0	OpenCAPI 4.0
CPU Generation	POWER8	POWER9	POWER9	Post-POWER9
PSL Location	FPGA/ASIC	FPGA/ASIC	Processor	Processor
Native DMA	No	Yes	Yes	Yes
Native Atomic Ops	No	Yes	Yes	Yes
Interface	PCIe (8 Gbps)	PCIe (16 Gbps)	25 Gbps	32 Gbps
# Lanes per port	x8	x16	x 8*	x4, x8, x16, x32
BW per port	8+8 GB/s	32+32 GB/s	25+25 GB/s	Up to 128+128 GB/s
POWER Systems	All P8 models	All P9 models	Most P9 models	TBD

*Note: ports may be bonded to multiply bandwidth

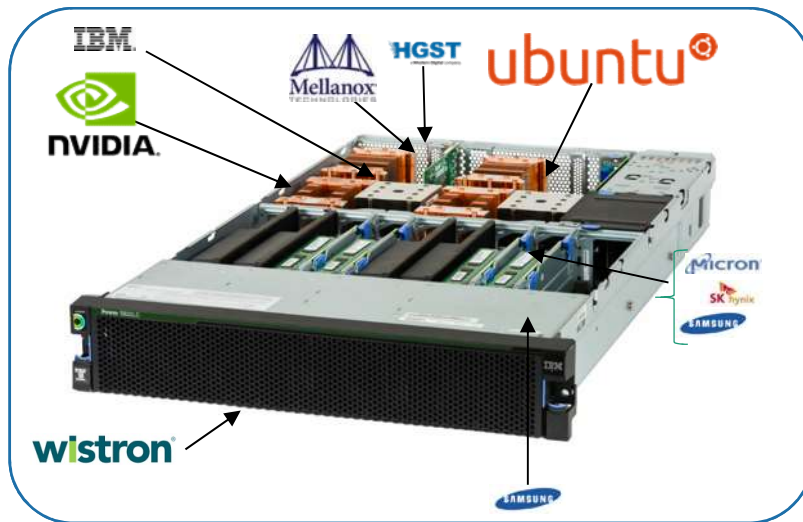


IBM Mellanox Adapter Portfolio

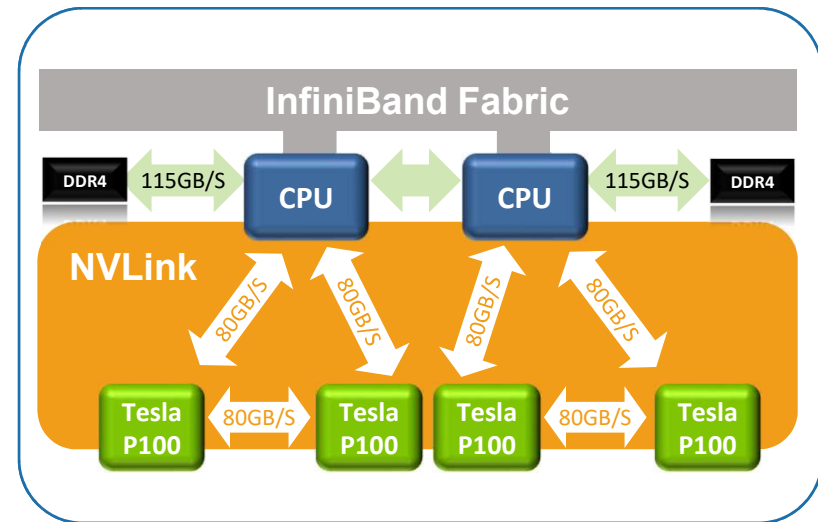
10GbE		HP Dual Port 10GbE SFP+ HP Dual Port 10GbE SR	EC38 / EL53 EC2N / EL54	x8	
		LP Dual Port 10GbE SFP+ LP Dual Port 10GbE SR	EC37 / EL3X EC2M / EL40		
10/ 25 GbE		LP Dual Port 10/25GbE SFP+	EKAU	x8	
40GbE		HP Dual Port 40GbE QSFP	EC3B	x8	
		LP Dual Port 40GbE QSFP	EC3A		
100GbE		LP Single Port 100GbE QSFP28	EKAM	x16	
		LP Dual Port 100GbE QSFP28 HP Dual Port 100GbE QSFP28	EC3L EC3M		
100GbE / EDR		LP Dual Port 100GbE / EDR QSFP28	EKAL		
FDR		HP Dual Port FDR QSFP	EC33 / EL50	x16	
		LP Dual Port FDR QSFP	EC32 / EL3D		
EDR		HP Single Port EDR QSFP28 HP Dual Port EDR QSFP28	EC3U EC3F	x16	
		LP Single Port EDR QSFP28 LP Dual Port EDR QSFP28	EC3T EC3E		

GPU & POWER

Infused with OpenPOWER Ecosystem

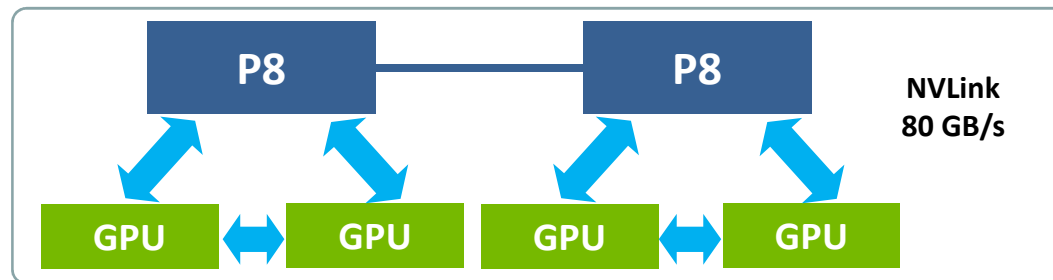


Designed for Programmability

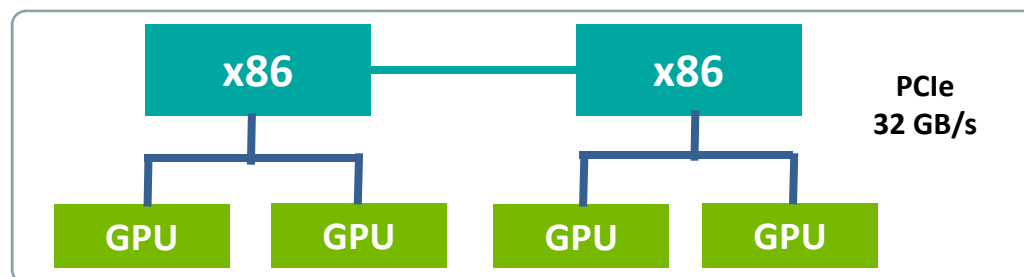


- 2.5X the CPU:GPU Interface Bandwidth
- Tight coupling: strong CPU: strong GPU performance
- Equalizing access to memory - for all kinds of programming
- Closer programming to the CPU paradigm

POWER8 NVLink Server



No NVLink between CPU & GPU
for x86 Servers: PCIe Bottleneck



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