IBM POWER Linux

IBM OpenPOWER – Over 260 Members

Linux Applications on POWER

HPC

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	Ilog

Cloud

openstack, TOMCAT, Apache, Chef, STORIX, REFLEXIS, DIASOFT, OneView Commerce, POWERSENSE, IFS, KANA, FIS, YUCHENG, sky solutions, betasystems, EXIGEN, ProjectWare, ALPHINAT

Big Data & Machine Learning

hadoop, PostgreSQL, MariaDB, redislabs, SUGARCRM, kinetica, Datameer, Spark, neo4j, EDB, AsiaINFO, INTERSYSTEMS, CROSSVIEW, ZAO, POLARIS, Valogix

Mobile Enterprise

zend, 亿阳信通 BOCO Inter-Telecom, php, CSC, RabbitMQ, Kingdee 金蝶, SYBASE, FIS, NARI 南瑞集团公司, FINEOS, ALPHINAT, comptel, Corent, TEMENOS, KUTIR

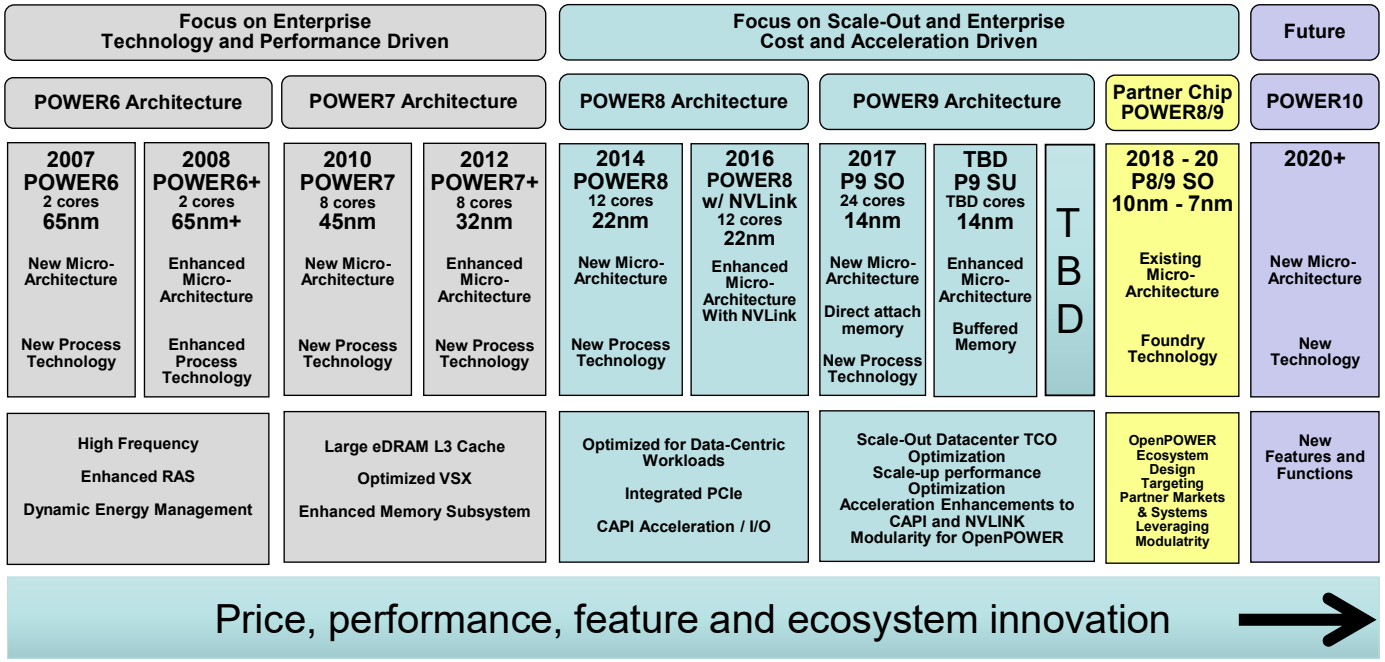
100,000+ Packages in Linux Distributions on Power

ubuntu, suse, redhat

Major Linux Distros

FreeBSD, Linux, POWER8, PowerVM

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

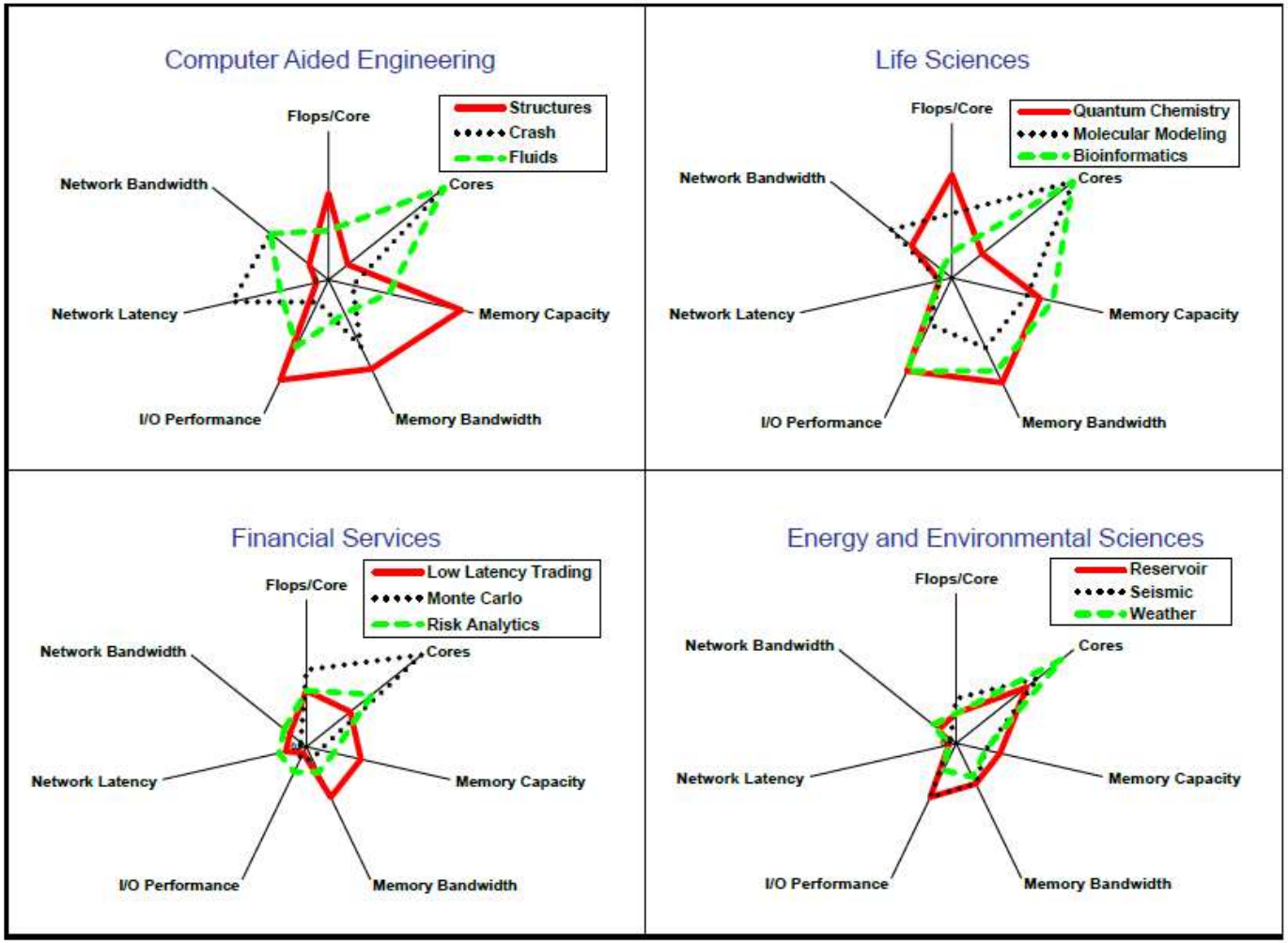
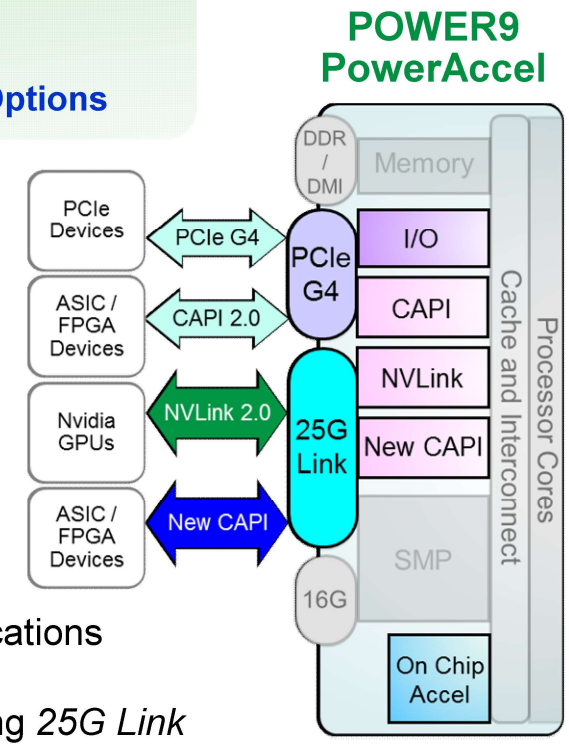


Figure 4: Application Performance Characteristics Mapped to Seven Key Cluster System Features

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



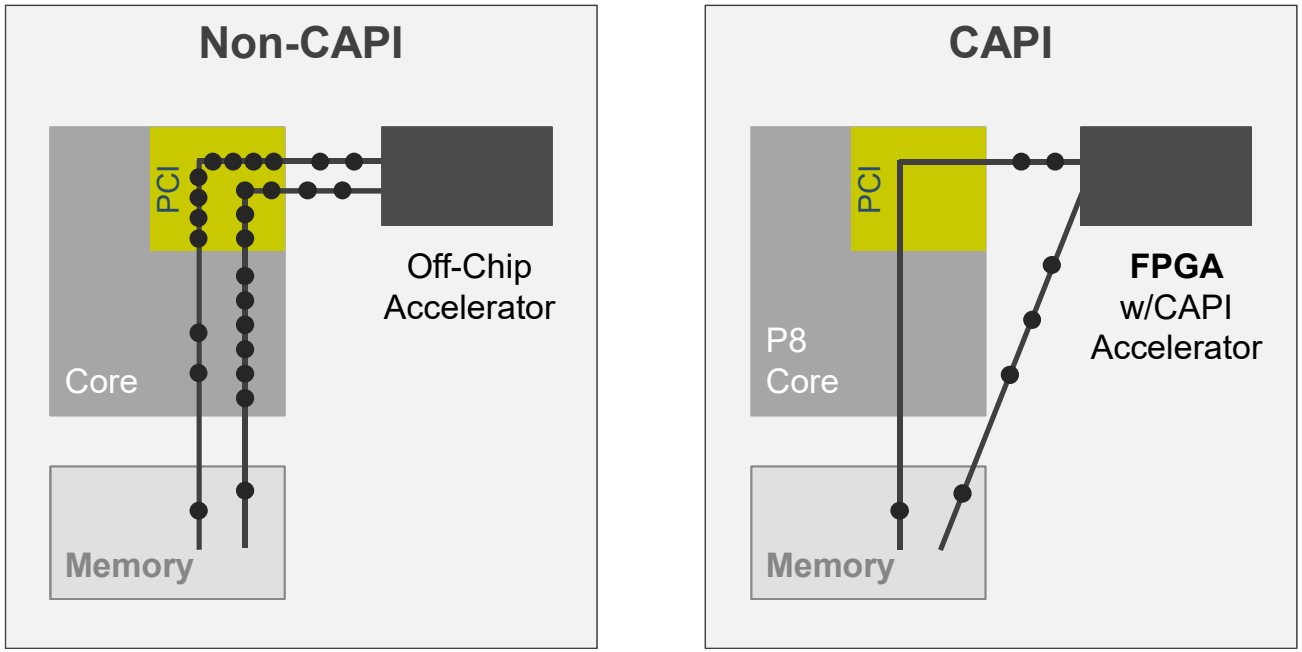
State of the Art I/O and Acceleration Attachment Signaling

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

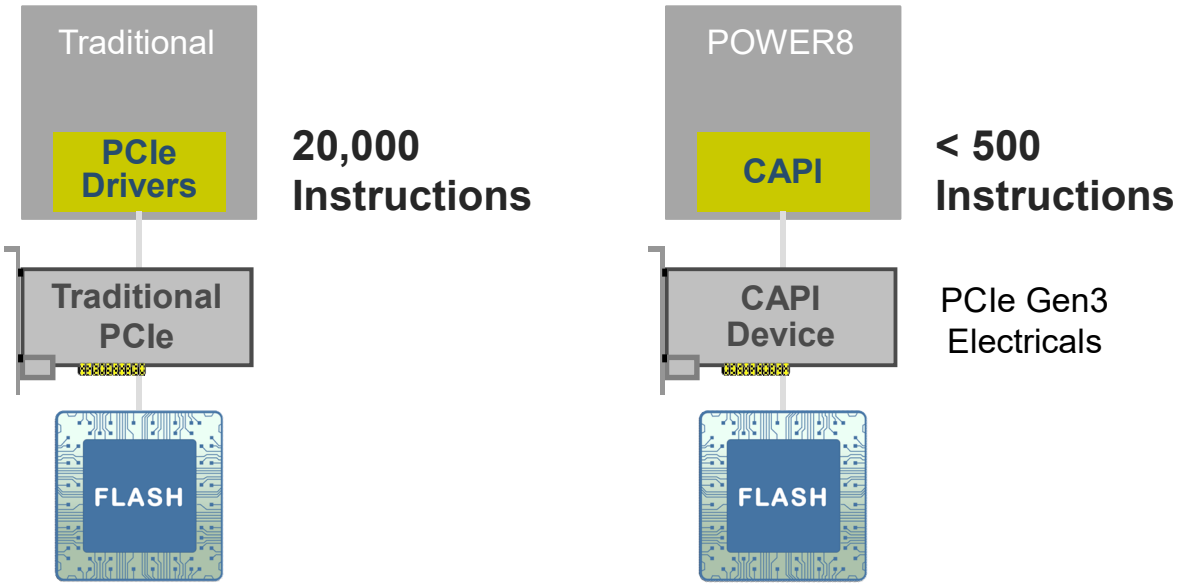
Robust Accelerated Compute Options with OPEN standards

- **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

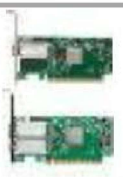
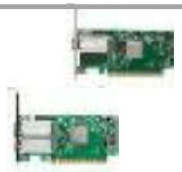


IBM CAPI Roadmap

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

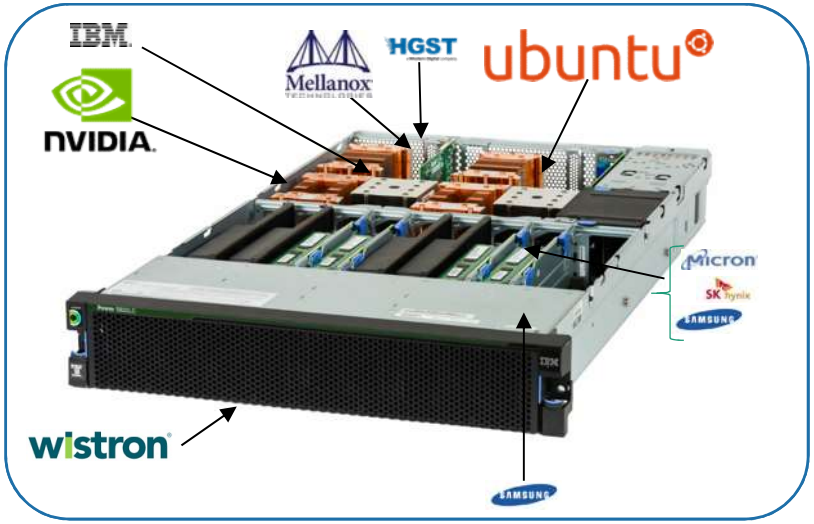
*Note: ports may be bonded to multiply bandwidth

IBM Mellanox Adapter Portfolio

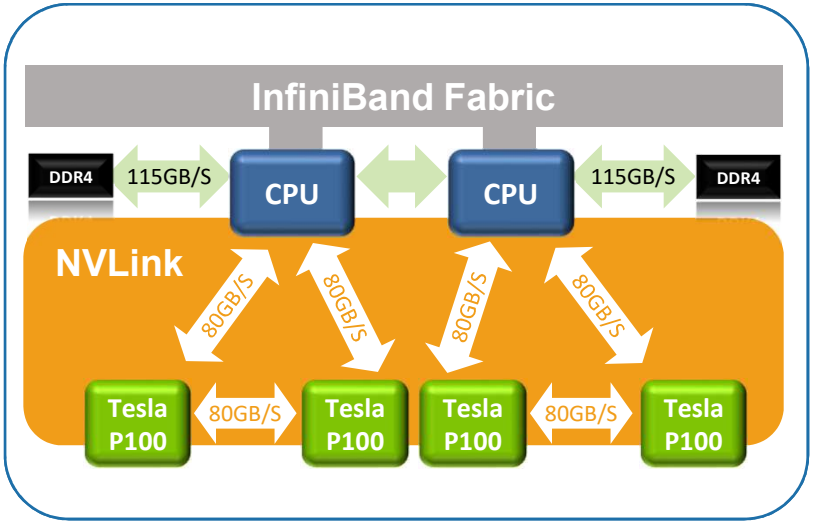
10GbE 	HP Dual Port 10GbE SFP+ HP Dual Port 10GbE SR	**EC38** / **EL53** **EC2N** / **EL54**	x8	ConnectX-3
	LP Dual Port 10GbE SFP+ LP Dual Port 10GbE SR	**EC37** / **EL3X** **EC2M** / **EL40**		
10/ 25 GbE 	LP Dual Port 10/25GbE SFP+	**EKAU**	x8	ConnectX-4 Lx
40GbE 	HP Dual Port 40GbE QSFP	EC3B	x8	ConnectX-3
	LP Dual Port 40GbE QSFP	EC3A		
100GbE 	LP Single Port 100GbE QSFP28	**EKAM**	x16	ConnectX-4
	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	ConnectIB
	LP Dual Port FDR QSFP	**EC32** / **EL3D**		
EDR 	HP Single Port EDR QSFP28 HP Dual Port EDR QSFP28	**EC3U** **EC3F**	x16	ConnectX-4
	LP Single Port EDR QSFP28 LP Dual Port EDR QSFP28	**EC3T** **EC3E**		

GPU & POWER

Infused with OpenPOWER Ecosystem

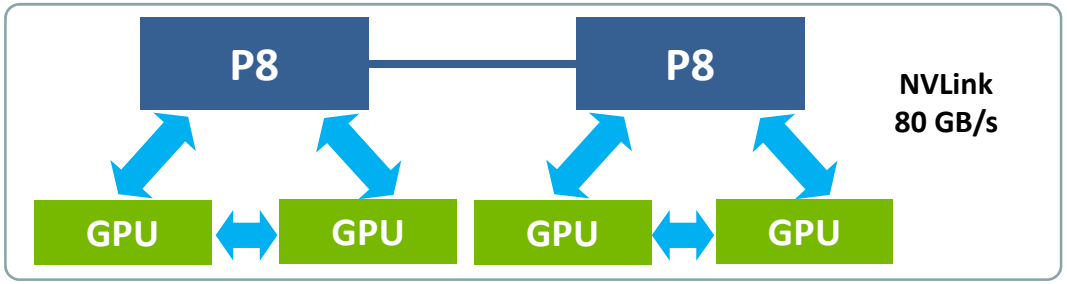


Designed for Programmabilty

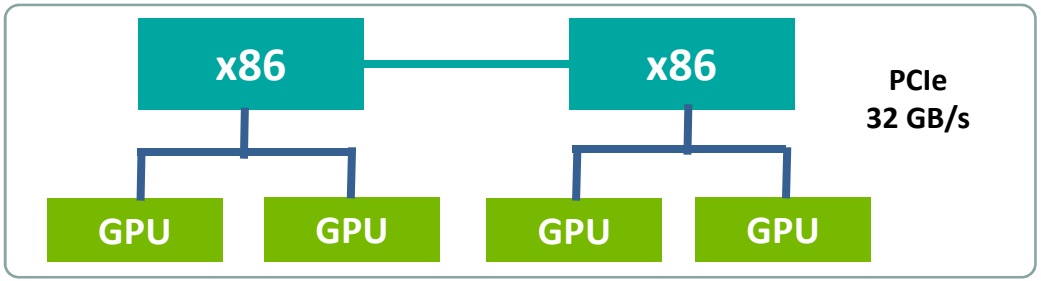


- 2.5X the CPU:GPU Interface Bandwidth
- Tight coupling: strong CPU: strong GPU performance
- Equalizing access to memory - for all kinds of programming
- Closer programming to the CPU paradigm

POWER8 NVLink Server



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



?