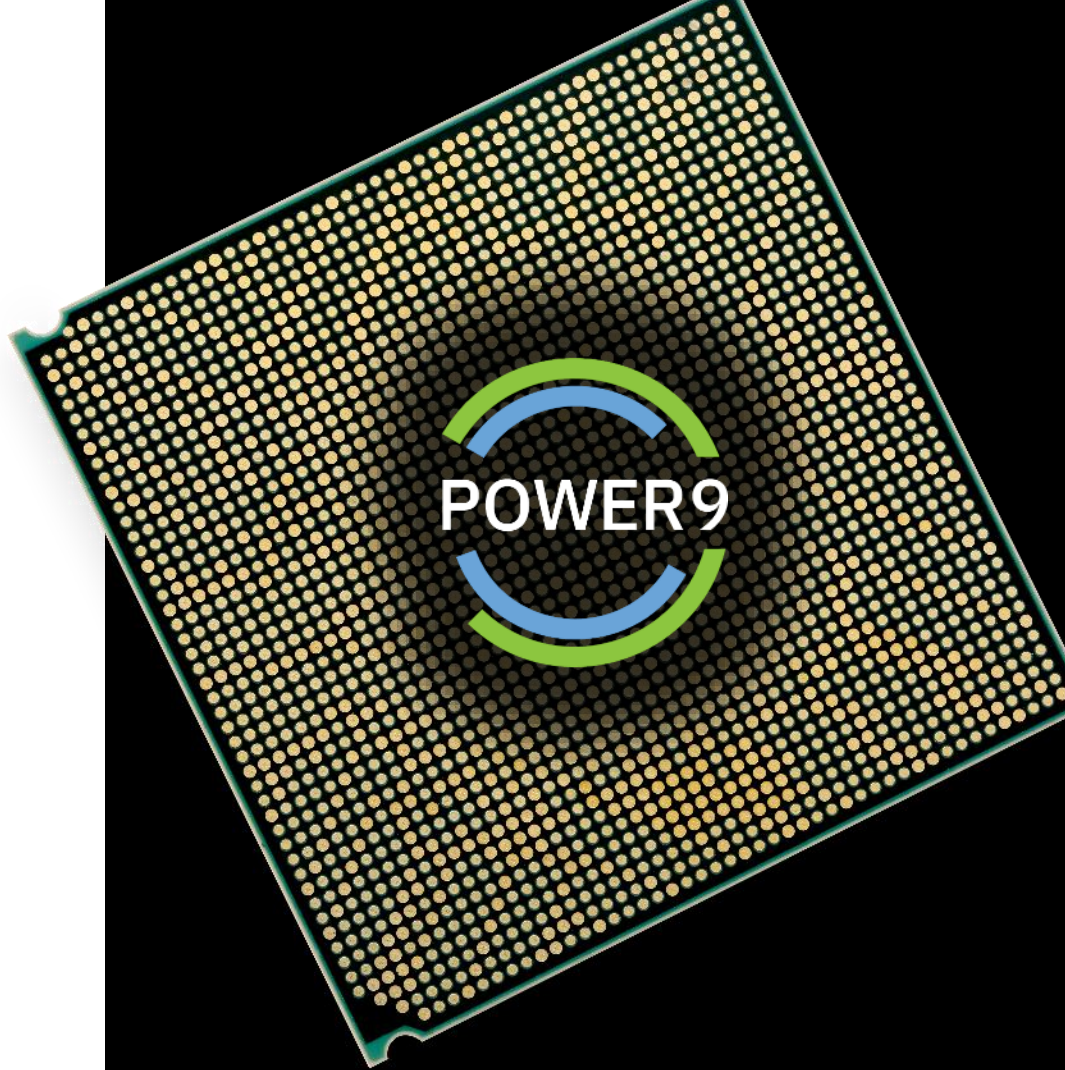


IBM POWER9 Family

*When data-intensive workloads
are the bottom line*

—

Chris Eaton (ceaton@ca.ibm.com)
James Allen (jdallen@us.ibm.com)



When data intensive workloads are the bottom line

Built-in PowerVM virtualization, IBM POWER9-based Power Systems are cloud-ready, enabling you to deploy the right cloud environment to meet your needs.

Enterprise cloud-ready



Power Systems easily integrate into your organization's private or hybrid cloud strategy to handle flexible consumption models and changing customer needs.

Number 1 in reliability



Ranked #1 in every major reliability category by ITIC, IBM Power Systems deliver the most reliable on-premises infrastructure to meet around-the-clock customer demands.

Industry-leading value and performance



With Power Systems, clients can take advantage of superior core performance and memory bandwidth to deliver both performance and price-performance advantages.

Enterprise Cloud Ready: IBM Cloud Private

- Secure, enterprise-grade services and operations
- Large and growing ecosystem of application runtimes, software, data and other value-added services
- Supports Power, Z, x86 heterogeneous clusters



- Faster insights for cognitive applications
- Better performance at lower cost
- Seamless modernization for AIX and IBM i apps
- Easiest heterogeneous cloud to install and operate

Enterprise grade. **Open** by design. **Accelerated by Power.**

Modernization To Private Cloud with IBM Cloud Private and Power Systems

Simplifies Cloud Application Deployment

Over **50% faster** to deploy applications
versus traditional infrastructure ¹

And is **27% less** expensive than the
public cloud to run a typical workload mix ²

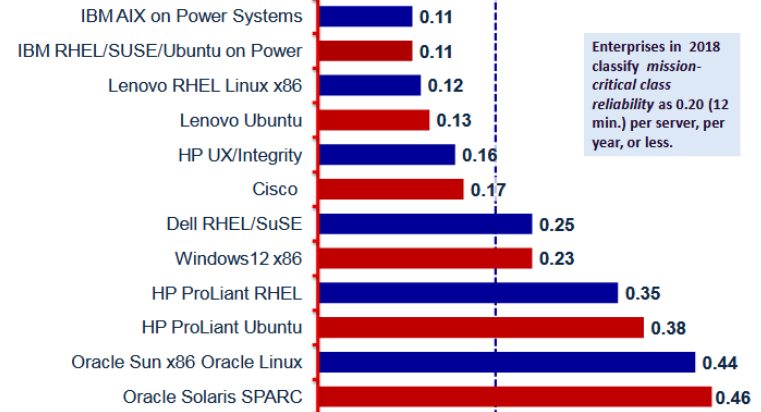
With **88% more** containers
per core supported on
Power versus x86 ³





Ranked Number 1 in every major reliability category by ITIC

Unplanned Downtime in 2017 - 2018 (Hours per Year)



“IBM POWER8-based processor systems and the latest POWER9 servers provide several key feature/function advantages that advance reliability and enable customers to lower Total Cost of Ownership (TCO) and achieve near-immediate ROI.”

Superior performance and value for data intensive and AI workloads

POWER9 S924 for Transaction Systems ¹

47% higher performance on less than half the cores

2.4X better price performance vs x86

POWER9 L922 for Data Warehousing ²

6% higher performance on less than half the cores

2.4X better price performance vs. x86

POWER9 AC922 for Machine Learning ³

46x faster model training with 8 POWER9 CPUs vs. 89 machines running TensorFlow in Google Cloud



POWER9 LC922 running MongoDB ⁴

47% higher performance on less than half the cores

2X better price performance vs x86

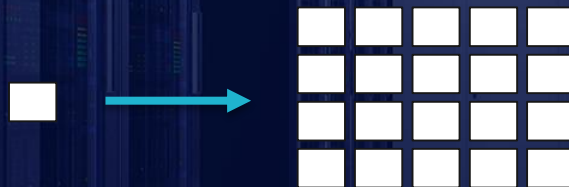


Homogenous was yesterday's approach

The AI era requires a new one

Legacy Approach

ONE SIZE FITS ALL - Approach all application requirements with a single non-optimized building block



Modern Approach

Leverage optimized servers designed for the AI era and the vastly different requirements



Systems designed to crush Big Data and AI workloads

Deep Learning



Data Intensive
Workloads



Big Data Workloads



Enterprise Private
Clouds



IBM and Business Partner
Internal Use Only – Until
Announce



AI

MACHINE
LEARNING

DEEP
LEARNING

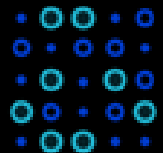
IBM POWER SYSTEMS for AI

AC922



An Acceleration Superhighway

Unleash state of the art IO and accelerated computing potential in the post “CPU-only” era



Designed for the AI Era

Architected for the modern analytics and AI workloads that fuel insights



Delivering Enterprise-Class AI

Flatten the time to AI value curve by accelerating the journey to build, train, and infer deep neural networks



Acceleration Super Highway

5.6x more data throughput vs. PCIe Gen3

with NVIDIA NVLink optimization to the core

2x bandwidth

with PCIe Gen4 vs. PCIe Gen3

Access up to 2TB of system memory

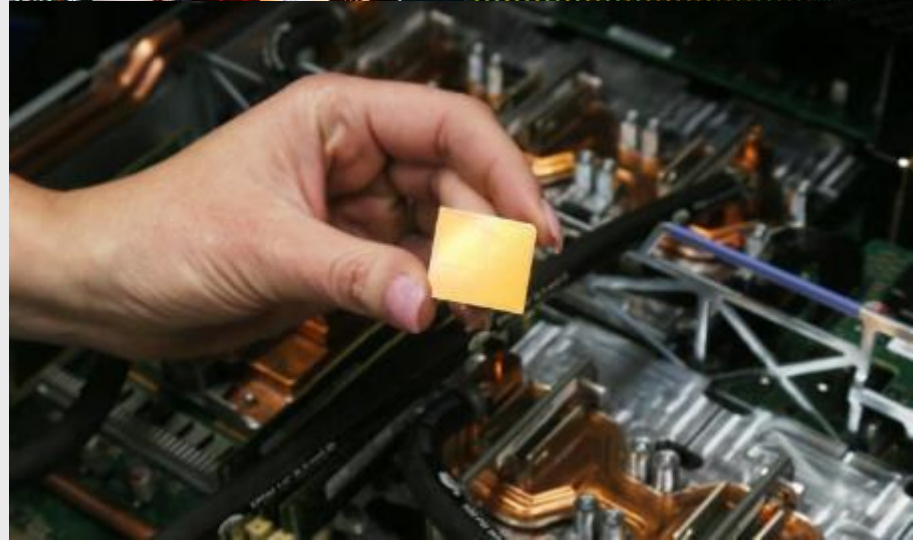
delivered with coherence ... only on POWER!

Superior data transfer to multiple devices

25G Links to OpenCAPI GPU devices

GPU \leftrightarrow CPU and GPU \leftrightarrow GPU speed-up

not just GPU \leftrightarrow GPU





DATA INTENSIVE APPLICATIONS

Industry leading 2-socket vs x86. Designed to meet highest performance and security needs, within a dense form factor, and a memory footprint up to 4TB.



S914

- 1-socket, 4U / Tower
- 4, 6 and 8 cores/ socket
- 1TB memory

- AIX, IBM i, & Linux
- PowerVM



L922

- 1,2-socket, 2U
- 8,10, and 12 cores per socket
- 4TB memory

- Linux only
- PowerVM



S922

- 1,2-socket, 2U
- 4, 6 8, and 10 cores per socket
- 4TB memory

- AIX, IBM i, & Linux
- PowerVM

S924

- 2-socket, 4U
- 8, 10, and 12 cores per socket
- 4TB memory

- AIX, IBM i, & Linux
- PowerVM



Optimized for SAP HANA in-memory database workloads

Up to 2-socket, 12 cores per socket with 4TB memory for SAP HANA workloads

Highly flexible systems with best in class virtualization

Consolidate workloads to reduce data center footprint

H922

- 1,2-socket, 2U
- 4, 8, and 10 cores per socket
- 4TB memory
- Linux
- Max. 25% of cores for AIX or IBM i

H924

- 2-socket, 4U
- 8, 10, and 12 cores per socket
- 4TB memory
- Linux
- Max. 25% of cores for AIX or IBM i



1.3x more memory capacity than x86 Xeon SP (Skylake) 2-socket platform

Only 2-socket Scale-out SAP HANA system (TDI5 or Appliance) with 4TB of memory



BIG DATA

Business Strategy
Marketing
Product
Sales
Finance
Operations
Human Resources

23:35:60
Business Strategy
Marketing
Product
Sales
Finance
Operations
Human Resources

Eliminate Big Data Bottlenecks IBM Power Systems LC922 & LC921

The Big Data Crushers!

The IBM Power Systems LC922 enhances the LC product line's open heritage while delivering superior performance in a cost optimized design needed in today's AI Era.

2x

Price performance advantage for data intensive applications such as MongoDB

59%

Improved Spark price-performance for efficiency across the AI data leveraging the P9 thread density for large amounts of concurrent Spark queries

2X

more data scientists on a single server at **FASTER RESPONSE TIMES** with Data Science Experience (DSX)

4 x POWER9 LC922



4 x Intel Xeon SP Gold 6140



1.59x better price performance

18% lower price



30% more performance

POWER9 LC922



Intel Xeon SP Gold 6150





ENTERPRISE
PRIVATE
CLOUDS

E950

H950

E980

H980



HYBRID CLOUD



Simplified Enterprise Cloud

Instantly cloud enable any workload with IBM POWER9 based Power Systems and build a cloud designed for the most data intensive workloads.

Proven Reliability

IBM Power Systems ranks #1 in every major reliability category by ITIC and is an industry leader of Mid Range and High End Servers.

Delivered Secure

IBM Power Systems have security built in at all layers, from Chip to the OS, and IBM tests all permutations of entire stack to deliver end to end security.

Scales Performance Affordably

IBM POWER9 drives the worlds largest super computers and is ready to accelerate your enterprise.

Where Mission Critical and Cloud come together



E950 and H950

4U, 2 or 4 sockets

12, 11, 10 or 8 cores per socket

Up to 16TB total memory

4TB per processor

E980 and H980

Up to four 5U CEC drawers + 2U Control Unit

Up to 192 processor cores

12, 11, 10 or 8 cores per socket

Up to 64TB total memory

16TB per drawer



POWER9

Software solutions that grow with you



IBM AIX

Scalable and robust enterprise open standards-based UNIX operating system for the Power Systems architecture. AIX has a history of consistently delivering a high-performance secure environment.

IBM i

An integrated platform enabling flexibility and dependability with robust architecture, exceptional security and business resilience.

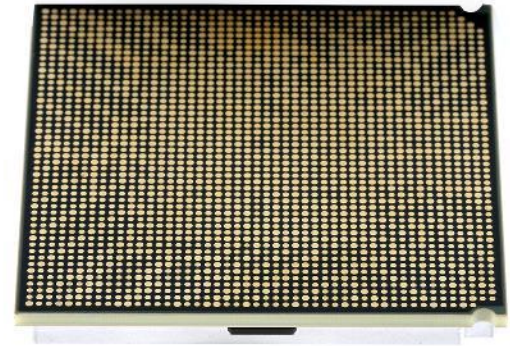
Linux

An open operating system built by the open source community, resulting in faster processing speed, bandwidth and inherent security.

POWER9 processor

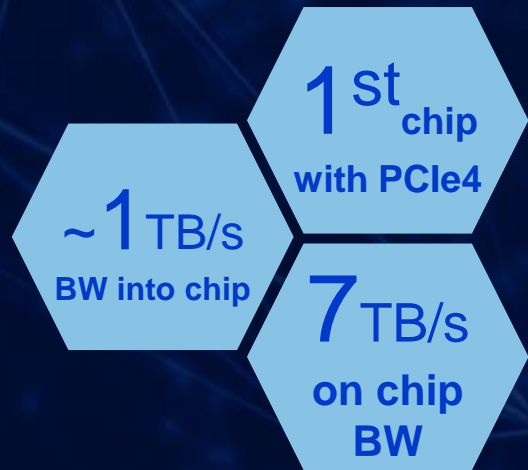
~1 TB/s
BW into chip

7 TB/s
on chip
BW



The entire US Library Of Congress
can be processed on a POWER9
core chip in just over 1 second.

POWER9 processor



Others

PCIe Gen3

POWER9

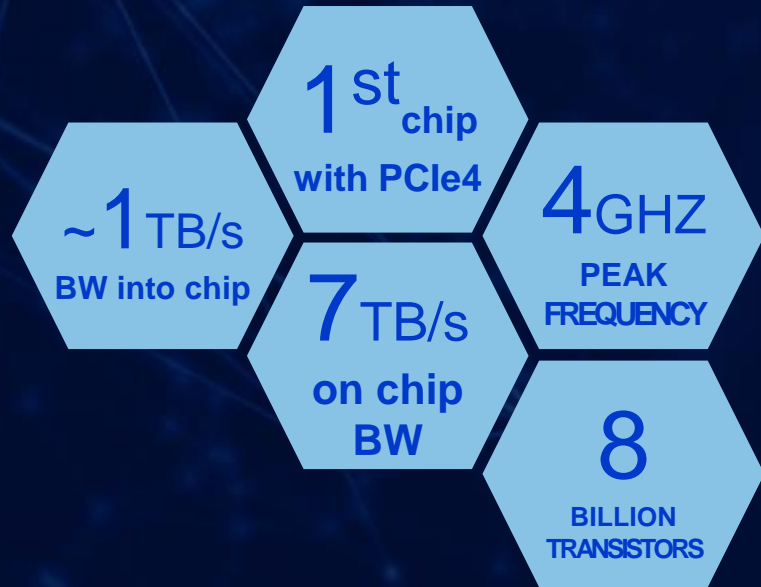
2x faster

PCIe Gen4

**State of the Art I/O
and Acceleration
Attachment Signaling**

PCIe Gen 4 x 48 lanes
192 GB/s duplex bandwidth

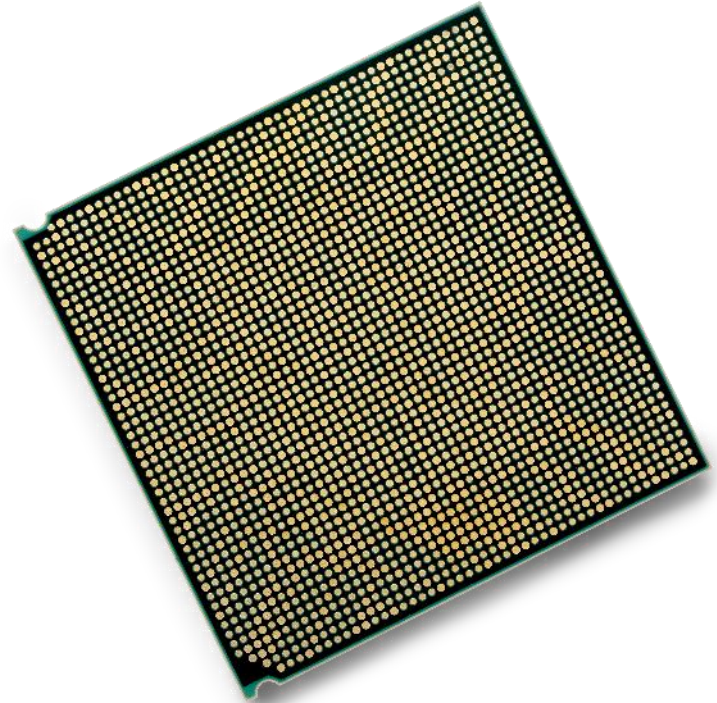
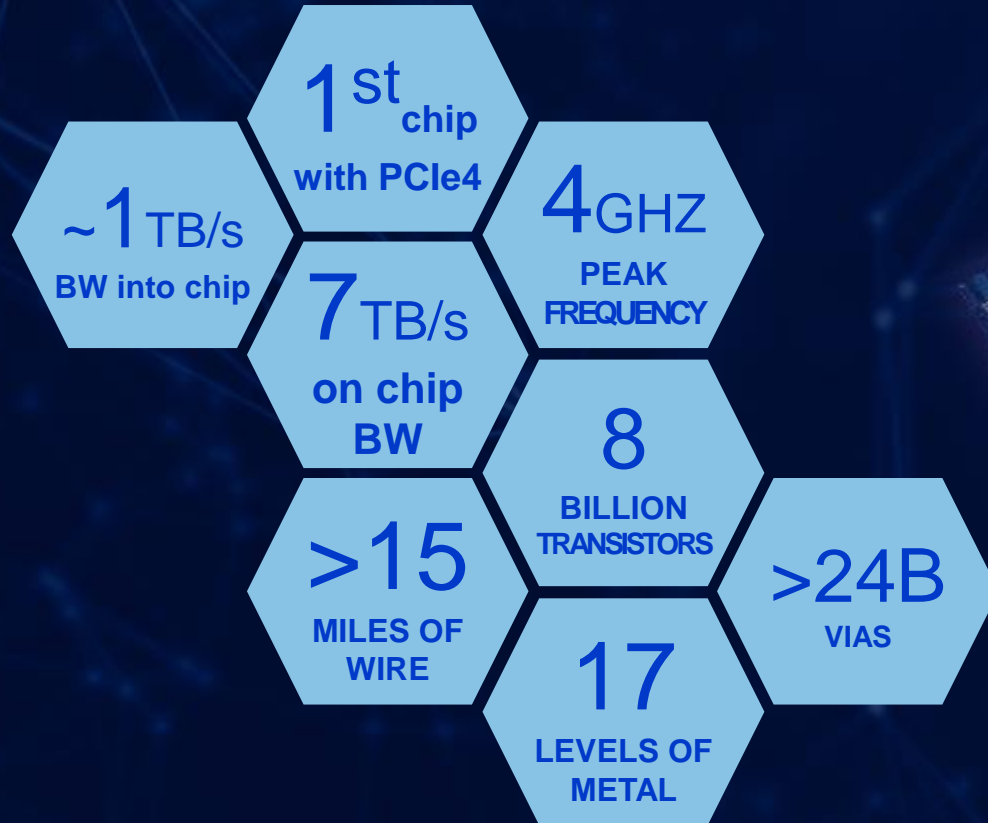
POWER9 processor



More than one
transistor for every
person on the planet

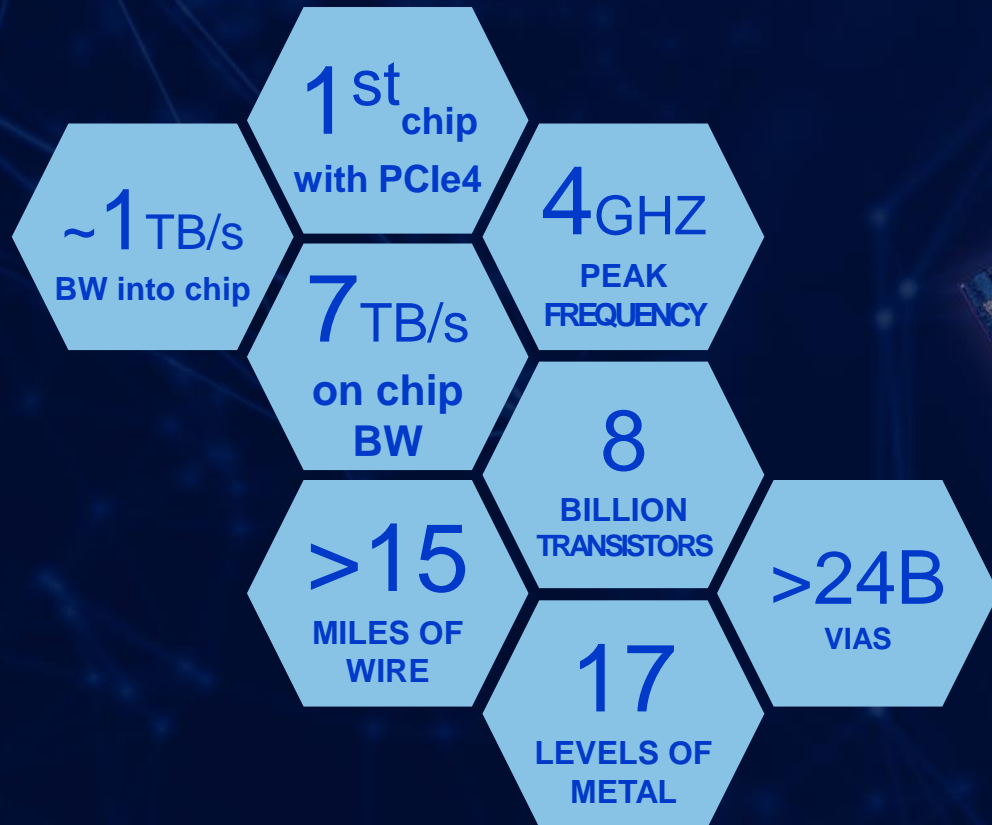


POWER9 processor



Innovation that makes a difference for mission critical applications

POWER9 processor



POWER9 vs.
x86 Xeon SP (Skylake)

2x¹ performance per core

2.6x² more RAM per socket

1.8x³ memory bandwidth per socket

POWER9 with NVLink
vs. x86 Xeon

9.5x⁴ CPU to accelerator bandwidth

IBM POWER9 Family

When data-intensive workloads are the bottom line



Mission Critical Data Intensive Workloads for Private Clouds

Entry

Midsize

Enterprise

Big Data Workloads

Enterprise AI Workloads

S922/S914/S924
H922/H924/L922

E950/H950

E980/H980

LC922/LC921

AC922

IBM and Business Partner Internal Use Only – Until Announce