

IBM® Power® E1050

Midrange server



Today's environment of constant, rapid change is driving greater alignment between business and IT priorities

Increase
flexibility



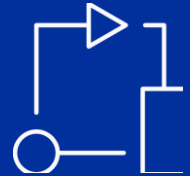
Improve security
and resiliency



Derive more value
from data



Ensure continuous
operations



A world of opportunity and uncertainty

**Deliver
new services**



**Manage
cybersecurity risk**



**Operate
efficiently**



Businesses are shifting operations with cloud, but recognize the continued value of on-premises infrastructure

56% > 64% > 85%

of CEOs said they need to aggressively pursue operational agility and flexibility – more than any other action – when asked about their priorities over the next 2-3 years¹

of organizations shifted to more cloud-based business activities in response to COVID-19.² Now, 97% are employing cloud and 78% have at least piloted AI³

agree that on-premises infrastructure is a critical part of their firms' hybrid cloud strategies⁴

1. ["The 2021 CEO Study. Find your essential: How to thrive in a post-pandemic reality."](#) IBM Institute for Business Value. February 2021

2. ["COVID-19 and the future of business: Executive epiphanies reveal post-pandemic opportunities."](#) IBM Institute for Business Value. September 2020

3. Payraudeau, Jean-Stéphane, Anthony Marshall, and Jacob Dencik. ["Extending digital acceleration: Unleashing the business value of technology investments."](#) IBM Institute for Business Value. October 2021

4. [The Key To Enterprise Hybrid Cloud Strategy: An Annual Forrester Consulting Study](#) Commissioned By IBM, January 2020

Evolving threat landscape

Cybercriminals remain adept at successfully infiltrating organizations across the globe

21%

Ransomware share of attacks

41%

Attacks exploited phishing for initial access

\$401M

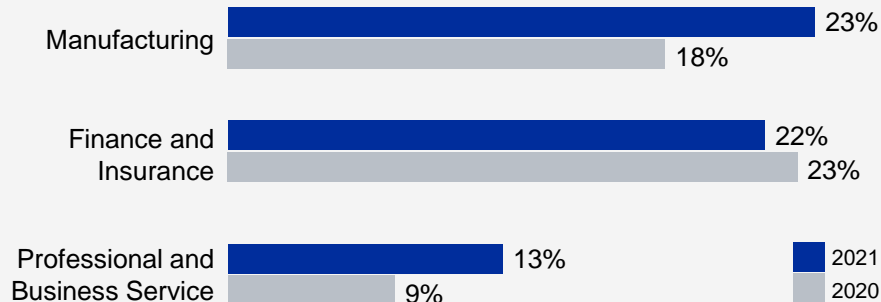
Average cost of a mega data breach (50-65M records)

2,204%

Increase in reconnaissance against OT devices

Top industries targeted

Percentage of attacks



Linux threats on the rise

146%

year-over-year increase in Linux ransomware innovation across cloud environments

Delivering flexible IT without sacrificing performance is critical

- Organizing IT around flexible technologies will help realize gains from modernization and transformation
 - Build integration capabilities to extend mission critical applications and data
 - Increase flexibility of capacity and service
 - Protect data and your infrastructure with zero trust approach
- This can free capital to invest in additional business and operational resilience for your organization



IBM Power

Create business agility with a flexible
and secure hybrid cloud infrastructure



Modernize applications to maximize value from data

Integrate new cloud-native microservices
to innovate with existing applications

Build once, deploy anywhere for
optimized workload placement

Access and analyze data faster
to accelerate time to market

Secure infrastructure to defend against attacks

Safeguard data with workload
isolation and platform integrity
from processor to the cloud

Simplify protection without
impacting performance using
transparent memory encryption

Prepare for cryptography advancements
such as Quantum-safe Cryptography
and Fully Homomorphic Encryption (FHE)

Automate operations to improve productivity

Automate, modernize, and manage
manual infrastructure tasks so teams
can focus on higher-value projects

Dynamic agility to seamlessly
adjust to changing business needs

Choose flexible consumption
options with built-in cost optimization

Why IBM Power10?

Respond faster to business demands

Set a new standard for performance with containerized cloud-native applications

Streamline insights and automation

Run inferencing models directly on the chip to bring AI closer to core enterprise data and applications

Protect data from core to cloud

Enable advanced protection with workload isolation and platform integrity to the processor as part of a zero-trust approach

Ensure uptime and reliability

Built with redundancies, substantial retry, and self-healing capabilities for class-leading infrastructure reliability



Introducing: IBM Power E1050

Built for large data and memory workloads



- Improve economics of application delivery and IT services
- Enhance resiliency and serviceability
- Enable more agile IT – rapidly adjust to demands of a changing business climate
- Delivering 8-socket performance and scale in only 4-sockets and 4U rack



AIX Linux PowerVM Red Hat OpenShift

OPTIMIZED PERFORMANCE, SCALE, AND ECONOMICS

Up to 96 Power10 cores with three processor options:
12c, 18c, and 24c

Up to 16 TB (64 Enterprise 4U DDIMMs)

11 PCIe Gen4/5 slots (8 Gen5 capable)

IBM Power E1050 highlights



- 4U Server – 19” Rack Enclosure
- **NEW!** Power10 DCM processor w/ 12, 18, or 24 cores/socket, delivers up to 96 cores
- **NEW!** 1-Hop flat CPU interconnect for maximum scalability and efficiency
- **NEW!** 64 DDIMM slots that provide up to 16TB max memory capacity* (GA: 8TB)
- **NEW!** Main Memory Encryption for added security
- Active Memory Mirroring support to reduce unplanned outages
- **NEW!** Eleven PCIe slots (8 are GEN5 capable), all slots are concurrently maintainable
- **NEW!** Up to 10 NVMe U.2 Flash Bays provides up to 64 TB of internal storage
- Secure and Trusted Boot with TPM module
- Supports external PCIe I/O Expansion Drawer
- Supports external SAS Storage Expansion Drawer
- **NEW!** Titanium power supplies to meet EU Efficiency Directives
- **NEW!** Enterprise BMC managed (eBMC)
- Flexible Consumption with Capacity on Demand and Power Enterprise Pools 2.0
- Built-in PowerVM virtualization
- Cloud Management Console
- Power Cloud Rewards
- **NEW!** Standard 3 Year Warranty with Power Expert Care

* Planned support after initial GA



Power E1050

Delivering unprecedented 4-socket performance



5

World Record
Benchmarks

Representing
industry recognized
enterprise workloads

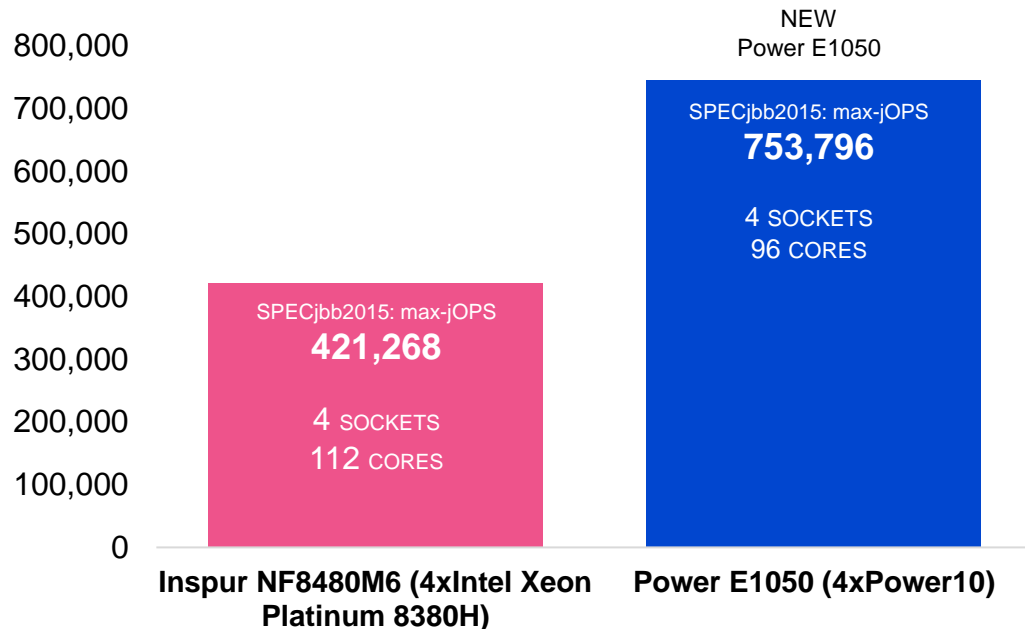
Compute - SPEC CPU 2017
- SPECrate®2017_int_base
- SPECrate®2017_int_peak

Java - SPECjbb2015-MultiJVM
- Max-jOPS
- Critical-jOPS

SAP - Two-tier SAP SD Standard Application
- Users (SAPS)

IBM Power E1050

World record 4-socket SPECjbb2015 benchmark result¹



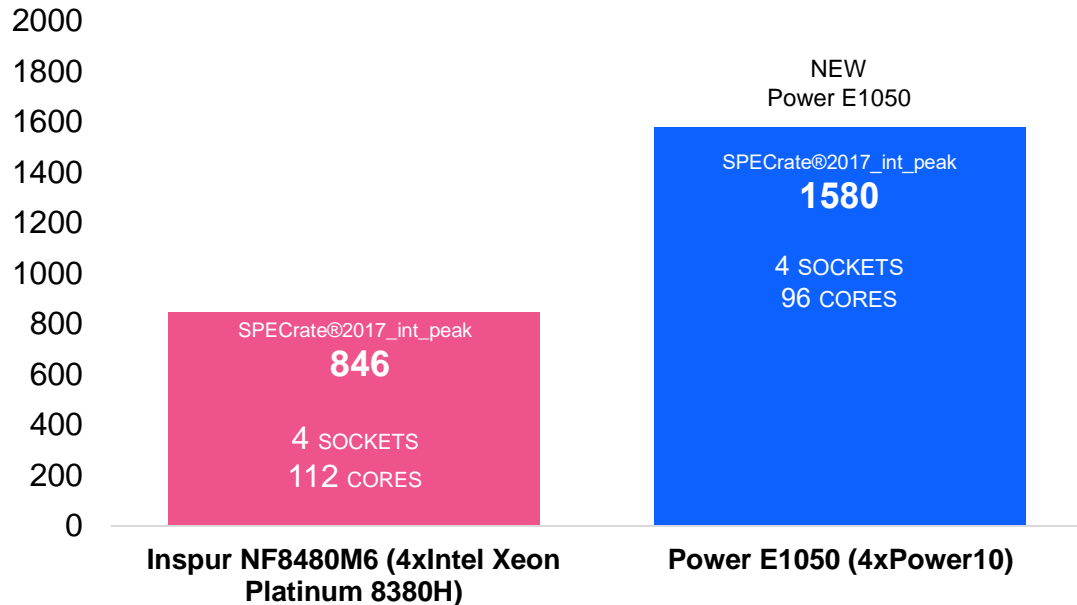
World record 4-socket performance

- max-jOPS
 - 753,796 vs 421,268
- critical-jOPS
 - 356,887 vs 208,197
- 2.1x more performance per core
- 1.8x more performance per system

1. Comparison based on best performing 4-socket systems (IBM Power E1050 3.15-3.9 GHz, 96 core, AIX and Inspur NF8480M6 2.90 GHz, Intel Xeon Platinum 8380H) using published results at <https://www.spec.org/jbb2015/results/jbb2015multiJvm.html> as of 22 June 2022. SPEC® and the benchmark SPECjbb2015-MultiJVM and SPECjbb2015 are registered trademarks of the Standard Performance Evaluation Corporation. For more information about SPECjbb®2015, see <https://www.spec.org/jbb2015/>

IBM Power E1050 – Respond faster to business demands

World record 4-socket SPEC CPU 2017 benchmark result¹

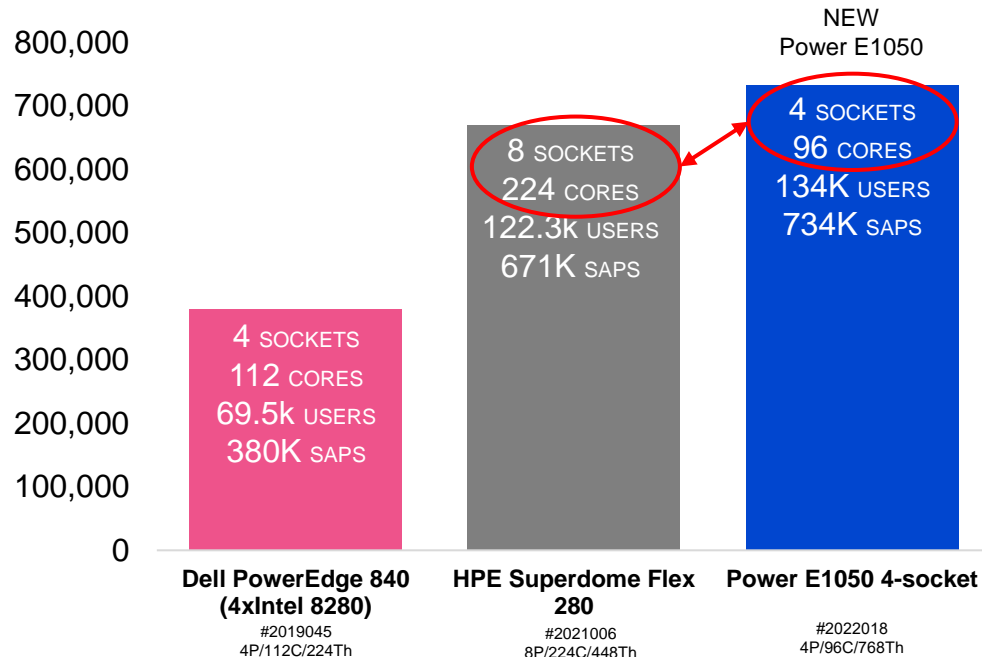


- SPECrate®2017_int_peak
 - 1580 vs. 846
- SPECrate®2017_int_base
 - 1220 vs. 814
- 2.2x more performance per core
- 1.9x more performance per system

1. Comparison based on best performing 4-socket systems (IBM Power E1050 3.15-3.9 GHz, 96 core and Inspur NF8480M6 2.90 GHz, Intel Xeon Platinum 8380H) using published results at <https://www.spec.org/cpu2017/results/rint2017.html> as of 30 June 2022. SPEC® and the benchmark names SPECrate®2017_int_base and SPECrate®2017_int_peak are registered trademarks of the Standard Performance Evaluation Corporation. For more information about SPEC CPU 2017, see [www.http://spec.org/cpu2017](http://spec.org/cpu2017)

IBM Power E1050

World Record 4-socket two-tier SAP SD standard application benchmark result¹



World record 4-socket performance

- 734,050 vs 380,280 SAPS*
- 134,000 vs 69,500 users
- More performance per core
 - 2.6x vs 8-socket Intel⁴
 - 2.3x vs 4-socket Intel³

The most flexible and reliable
SAP HANA platform⁵

*Note: 100 SAPS = 2,000 fully business processed order line items per hour

1. All results can be found at sap.com/benchmark and are valid as of July 7, 2022
2. IBM Power E1050; two-tier SAP SD standard application benchmark running SAP ERP 6.0 EHP5; Power10 2.95 GHz processor, 4,096 GB memory, 4p/96c/768t, 134,016 SD benchmark users, 736,420 SAPS, AIX 7.3, DB2 11.5, Certification # 2022018.
3. Dell EMC PowerEdge 840; two-tier SAP SD standard application benchmark running SAP ERP 6.0 EHP5; Intel Xeon Platinum 8280 2.7 GHz, 4p/112c/224t, 69,500 SD benchmark users (380,280 SAPS), SUSE Linux Enterprise Server 12 and SAP ASE 16, Certification # 2019045.
4. HPE Superdome Flex; two-tier SAP SD standard application benchmark running SAP ERP 6.0 EHP5; Intel Xeon Platinum 8380H 2.9 GHz, 8p/224c/448t, 122,300 SD benchmark users (670,830 SAPS), Windows Server 2016 and Microsoft SQL Server 2012, Certification # 2021006.
5. Ranked most reliable server in its category for 12th year by [ITIC](https://www.itic.com). Flexible: Only platform that runs AIX, IBM i, Linux OS'es while supporting the ability to run 16 SAP HANA production environment in a single server

IBM Power E1050

Scalable, sustainable compute



Same
work



Less
infrastructure



Smaller
carbon footprint

59%

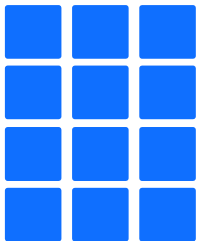
lower energy consumption for
the same workload in Power
E1050 vs Power E850C*

47%

lower energy consumption for
the same workload in Power
E1050 vs Power E950*

Reduce carbon footprint with Power10

3 x IBM Power8



3 x 3,850 = 11,550 watts

2 x IBM Power9



2 x 4,220 = 8,440 watts

IBM Power10



5,200 watts

* Power8 is 810 rPerf @ 3,850 Watts (0.210 rPerf/Watt), Power10 is 2689 rPerf @ 5,200 Watts (0.517 rPerf/Watt); $0.517 / 0.210 = 2.46$ more rPerf/Watt, delivering over 2X energy efficiency
Power9 is 1146 rPerf @ 4,220 Watts (0.272 rPerf/Watt), Power10 is 2689 rPerf @ 5,200 Watts (0.517 rPerf/Watt); $0.517 / 0.272 = 1.90$ more rPerf/Watt

Power E1050

Improved Performance = Lower TCO

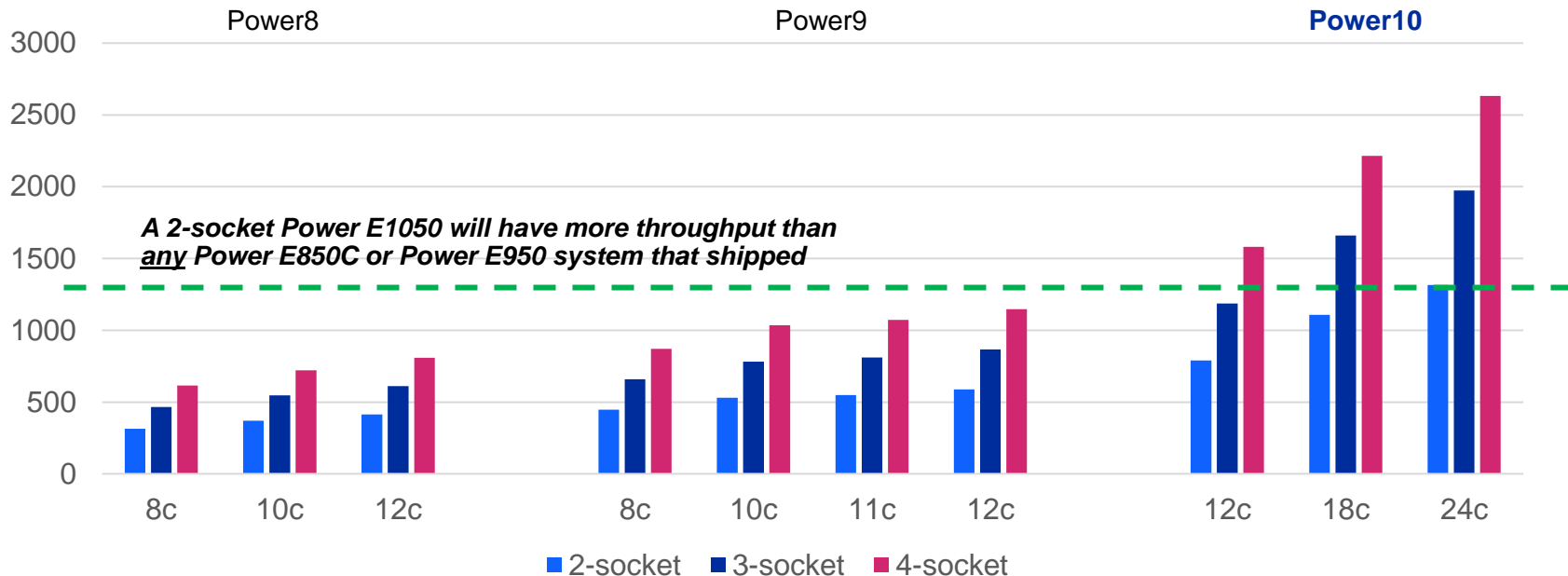


Increased core performance and increased core density

- Reduce energy and cooling costs and save floor space
- Consolidate multiple E850/E950 systems onto fewer E1050 systems

Optimize SW maintenance costs (Oracle, Db2, WAS, etc.)

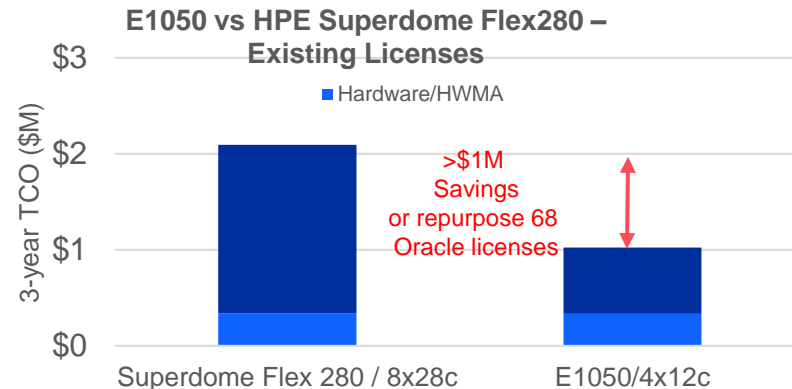
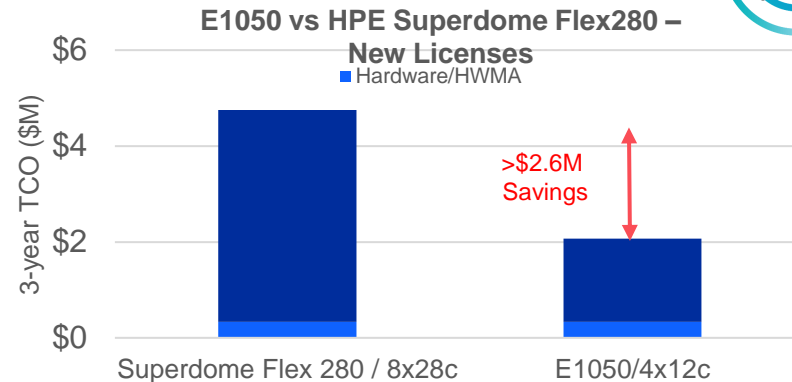
- Core performance capabilities increase 15-38% vs. E950 and up 45-95% vs. E850C
- Repurpose licenses for future growth and new applications



Oracle on Power E1050

Optimize your environment

- 5X performance per core **reduces Oracle core license requirement by ½** vs compared x86 system
- Can help **save millions** over 3 years
- Sub-capacity licensing: License only what is needed
- Growth capacity: Zero-downtime with CUoD enables seamless growth without purchasing new systems



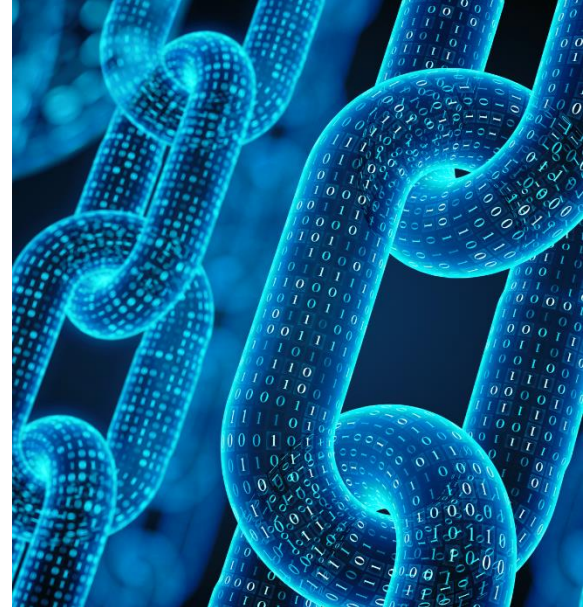
Performance is based on Quantitative Performance Index (QPI) data as of July 18, 2022, from IDC available at <https://www.idc.com/about/qpi> for IBM Power E1050 (4x12c Power10) versus HPE Superdome Flex280 (8x28-core Xeon 8280M) and utilizations of 70% for E1050 based on IBM Power Performance Utilization Guarantee and 40% for x86 based on IT Economics assessments of customer environments running a total of 13,800 x86 cores where average measured IBM peak utilization is 16%. Peak utilization of 16% is derived from a weighted average of x86 workloads in four large enterprise client IT environments using a total of the compared 13,861 x86 cores in production and test environments. For additional information on x86 workload analysis contact the IBM IT Economics team, IT.Economics@us.ibm.com

Total Cost of Ownership is defined as hardware, software, and maintenance costs over a period of three years for equivalent performance where hardware pricing is based on IBM Power system pricing at <https://www.ibm.com/products/> and extrapolated industry standard x86 and software pricing based on IBM internal industry knowledge. Actual savings will vary based upon individual client configurations and conditions.

Security that protects your data anywhere

Security is architected into Power10 servers for all types of threats: traditional, new, and emerging

- Processor
- Firmware
- Hypervisors
- Management
- Network
- Operating systems
- Containers
- Applications
- Middleware
- AI



Base platform security & integrity

Continuously protect platform integrity across main processor, service processor and peripherals

End to end hybrid cloud security

Offer platform capabilities with the highest level of security from infrastructure to cloud to containers

Workload security enablement

Provide features to secure client workloads: HW, firmware, and OS support for isolation, integrity, encryption, event monitoring

Simplified security management

Automated security management to simplify security operations and compliance: patching, integrity monitoring, health checking

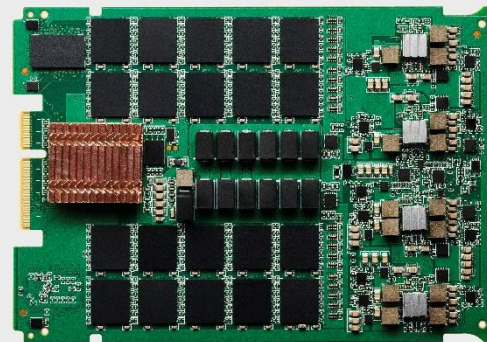
Power10 memory technologies

New Differential DIMM Technology (DDIMM)

- Moving from Industry Standard to Differential DIMMs in Power10
- 4U enterprise DIMM has enhanced buffer, N-1 voltage regulation and spare DRAM technology

New Open Memory Interface (OMI)

- Providing higher bandwidth and flexibility for future memory technologies



2x better memory RAS than industry standard DIMMs¹

2.4x higher memory bandwidth than scalable x86 processors

DDR4 running at up to 3200 Mbps data rate provides 409 GB/s peak memory bandwidth per socket

Transparent memory encryption with no additional management setup and no performance impact

Chipkill technology with advanced ECC protects from memory chip failure - plus spare

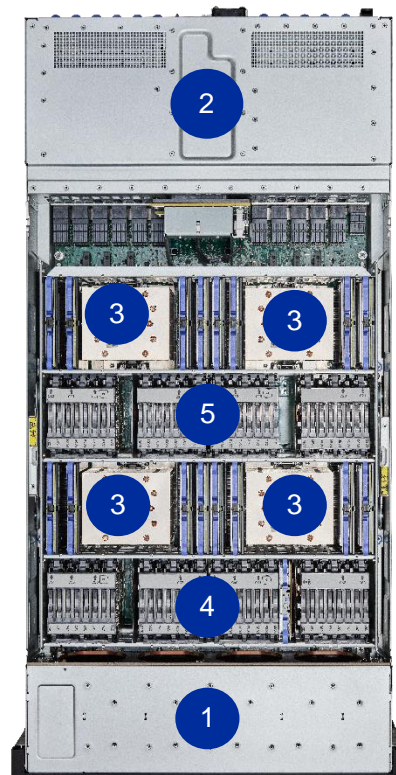
Active Memory Mirroring (AMM) feature supported - Mirrors hypervisor memory to provide resiliency from uncorrectable memory errors

¹ Based on IBM's internal analysis of the IBM product failure rate of DDIMMS vs Industry Standard-DIMMs

Power E1050 redundancy and reliability built-in



- 1 Redundant system cooling with multiple fans and concurrent maintenance
- 2 Redundant/bulk power - even if 2 power supplies fail system keeps operating on 4U systems
- 3 Processors include FFDC, instruction retry, core contained checkstops, power and cooling monitoring and multi-node SMP fabric
- 4 Chipkill technology with advanced ECC protects from memory chip failure - plus spare
- 5 Active Memory Mirroring for hypervisor feature to allow system to read from mirror if a memory read error is detected

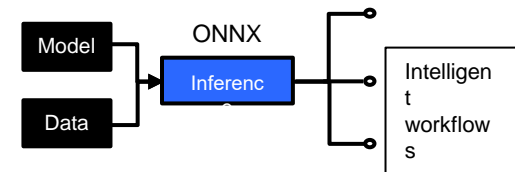


Data fabric instead of data silos

Streamline insights and automation with In-core AI inferencing and machine learning

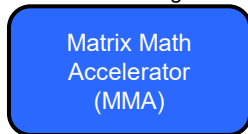


Bring your own models and run inference
where your operational data resides



AIX IBMi Linux Red Hat OpenShift

Inference Engine



Power10

4 MMA Engines
per Core

5x

Faster AI inferencing
per socket over Power E980*

- Perform in-core AI inferencing and ML where the data resides
- Train AI models anywhere, deploy on Power without changes for AI
- Support for popular libraries, AI frameworks and ONNX runtime
- Provides alternative to using separate GPU systems

* 5x improvement in per socket inferencing throughput for large size 32b floating point inferencing models from POWER9 E980 (12-core modules) to Power E1080 (15-core modules). Based on IBM testing using PyTorch, OpenBLAS on the same BERT Large with SQuAD v1.1 data set

Performance – POWER8 E850C vs. Power E1050

	POWER8	Power10	
Sockets	2, 3, 4	2, 3, 4	
Core Counts	Up to 48	Up to 96	More core that are faster and more powerful to deliver quicker business insights
Max Memory	4TB	16TB	
Memory Bandwidth	768 GB/sec	1636 GB/sec	
IO Bandwidth	315 GB/sec	756 GB/sec	Reduce time to value by rapidly moving data through the system
PCIe Slots	11 PCIe Gen 3 Slots	11 PCIe Gen 4/Gen 5 Slots	
NVMe per Drawer	N/A	10 PCIe Gen4	

+ more security

Performance – POWER9 E950 vs. Power E1050



IBM Power offers cloud flexibility to deploy where needed

From current infrastructure



to hybrid infrastructure



to consumption as a service



Power10 Servers	Power Private Cloud with Dynamic Capacity	Power in IBM Cloud
Core business apps and data	Pay for only what you use	Extend to public cloud
<ul style="list-style-type: none">▪ Performance and scale leadership▪ Class-leading availability▪ End-to-end security from the processor to virtualization and OS	<ul style="list-style-type: none">▪ Flexible consumption options with built-in cost optimization▪ Cloud-based monitoring, metering by the minute for Power and RHEL and OpenShift▪ Power10 and POWER9 can co-exist in same pool▪ By the day Elastic Capacity on Demand without monitoring	<ul style="list-style-type: none">▪ Consistent architecture to on-prem infrastructure▪ Run Linux, AIX, and IBM i▪ VM-as-a-Service for Dev/Test, HA/DR, modernization▪ Global footprint with access to IBM Cloud services

Utility capacity consumption in the Power Private Cloud

Available Capacity (always turned on)

Remaining system physical resources above Base Capacity and the Metered Capacity in use, that is always turned on and ready to be consumed by demand

Dynamic Capacity (Pay-per-use, OPEX)

Additional resource above Base Capacity, activated for use as Metered Capacity when each system is added to a Pool

Metered resource consumption is monitored by the minute at the pool level

Metered Capacity resource consumption is charged by the minute for specific resources consumed above a pool's aggregated Base Capacity

Permanent Capacity (Static/Base, CAPEX)

Purchased on each Power system within a pool but aggregated across the pool for consumption monitoring. It consists of Base Processor Activations, Base AIX and IBM i software license entitlement(s) and minimum required hardware

Note: Clients may manage potential resource consumption via PowerVM & PowerVC configuration & resource management options & policies

Modernize apps incrementally

Drive innovation and agile DevOps with modern and traditional apps co-located on IBM Power

Open and integrated approach

VMs and OpenShift containers co-reside on same server

Build once, deploy anywhere

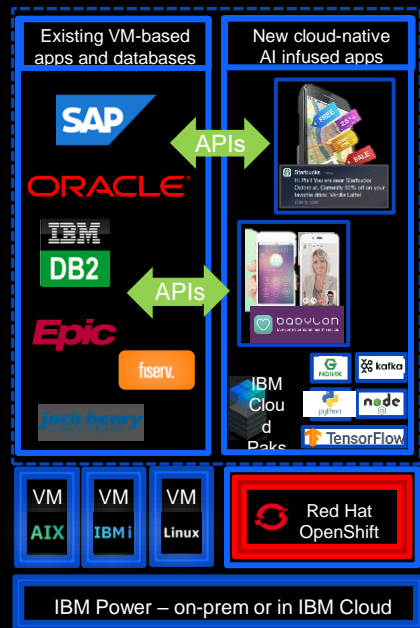
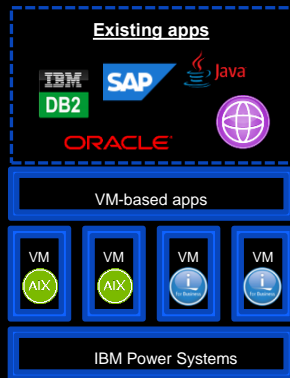
For optimized data and workload placement

Culture and skill transformation

Best practices, proven methods, and tools

1. Accelerate Digital Transformation
2. Accelerate Delivery
3. High(er) Quality
4. Deployment Flexibility for Hybrid Cloud

Incrementally
modernize in place

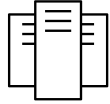


Enterprise Scale,
Agility, RAS



Delivering SAP HANA innovation and performance

From current infrastructure



to hybrid infrastructure



to consumption as a service



Power10 Servers	Power Private Cloud with Dynamic Capacity	Power in IBM Cloud	RISE with SAP, Premium Supplier Option
Core business apps and data	Pay for only what you use	Extend to public cloud	Managed as a service
<ul style="list-style-type: none">▪ Performance and scale leadership▪ Industry leading uptime for SAP HANA▪ Flexibility with multiple production VMs▪ End-to-end security from the processor to virtualization	<ul style="list-style-type: none">▪ Leadership TCO▪ Distributed private cloud, shared utility consumption and built-in cost optimization▪ Cloud-based monitoring: compute, memory and OS metered by the minute▪ Power10 and POWER9 can co-exist in same pool	<ul style="list-style-type: none">▪ Consistent architecture to on-prem infrastructure▪ Run Linux, AIX, and IBM i▪ VM-as-a-Service for Dev/Test, HA/DR, modernization▪ Global footprint with access to IBM Cloud services	<ul style="list-style-type: none">▪ Advantages of Power architecture for SAP workloads▪ Capacity configurations▪ Unified accountability, simplified engagement and contracting

