HPC and AI with Intel® Xeon® 6 Processors

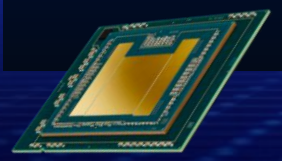
Addressing Tomorrow's Computing Needs

Across Data Center, Network & Edge

Intel Xeon 6 Processors

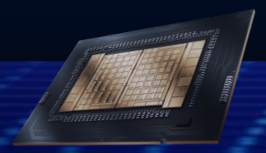
Maximum Efficiency with E-cores

Performance-per-watt for high-density compute and scale-out workloads



Peak Performance with P-cores

Per-core-performance for compute-intensive workloads



Built for Networking and Edge

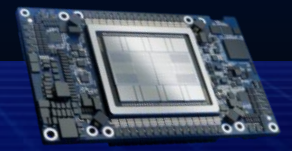
Power-efficient, servers with Intel® vRAN Boost and media acceleration, with networking built in

Performance Boost for Small Business

Affordable performance for business-critical services

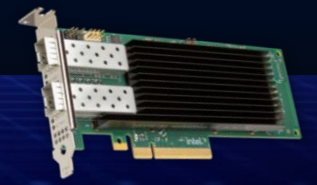
Intel AI and HPC Accelerators

Scalable and efficient performance that brings choice to Generative AI



Intel Ethernet Adapters

Standards-based, high-performance networking



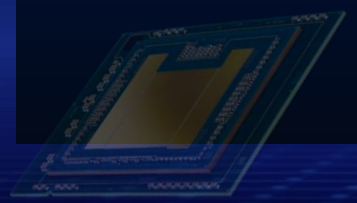
intel XEON

Addressing Tomorrow's Computing Needs

Across Datacenter, Network & Edge

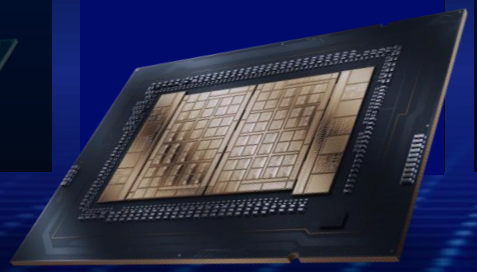
Intel
Xeon 6
processor (E-Core)

Performance-per-watt for high-density compute and scale-out workloads



Intel
Xeon 6
processor (P-Core)

Per-core-performance for compute-intensive workloads



Intel
Xeon 6
SoC (P-Core)

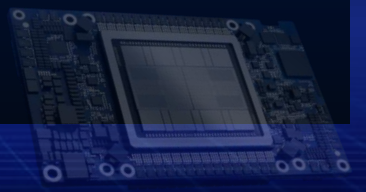
Power-efficient, servers with Intel® vRAN Boost and media acceleration, with networking built in

Intel
Xeon 6300
Entry Server

Affordable performance for business-critical services

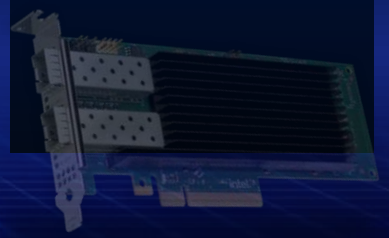
Intel
Gaudi 3
AI Accelerators

Scalable and efficient performance that brings choice to Generative AI



Intel
Ethernet
Adapters

Standards-based, high-performance networking



intel XEON

Intel Xeon 6 Processors

Addressing the broadest set of enterprise workloads with our ecosystem

Exceptional Performance
with more cores & higher memory bandwidth

Efficient Compute
with improved perf/watt, built-in acceleration & 1S-8S scalability

Trusted & Secure
most comprehensive confidential compute portfolio

Foundation for AI
best CPU for AI with Intel® AMX & most deployed CPU in AI accelerated systems

intel XEON

Intel® Xeon® 6 Processors with P-cores

Unmatched Performance

Up to

50%

higher AI performance with 1/3 less cores

vs. AMD EPYC 9005

Broadest Range of Workloads

Up to

40%

average higher performance

vs 5th Gen Intel® Xeon® processors

Optimizing Data Centers

Up to

50%

lower TCO and better performance

vs. AMD EPYC 9005

See [7A220 (ResNet50), 7G20, 7T221 (Vision Transformer)] intel.com/processorclaims: Intel Xeon 6. Results may vary

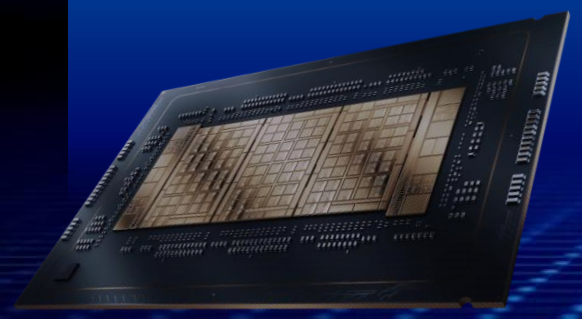
intel XEON

Intel Xeon 6 P-core Die Packages

UCC

Up to 128 P-cores

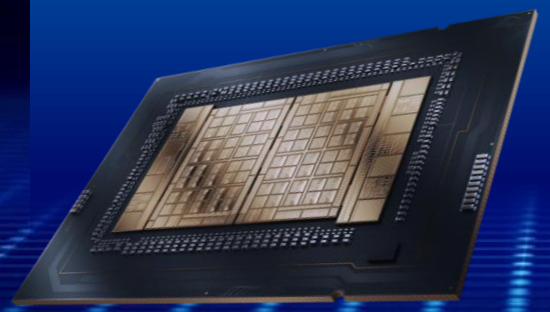
Triple Compute Tile, Intel 3
Dual I/O Tile, Intel 7



XCC

Up to 86 P-cores

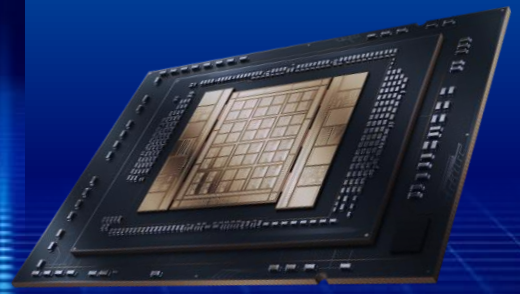
Dual Compute Tile
Dual I/O Tile



HCC

Up to 48 P-cores

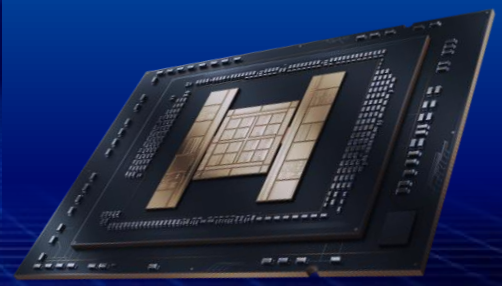
Single Compute Tile
Dual I/O Tile



LCC

Up to 16 P-cores

Single Compute Tile
Dual I/O Tile



intel XEON

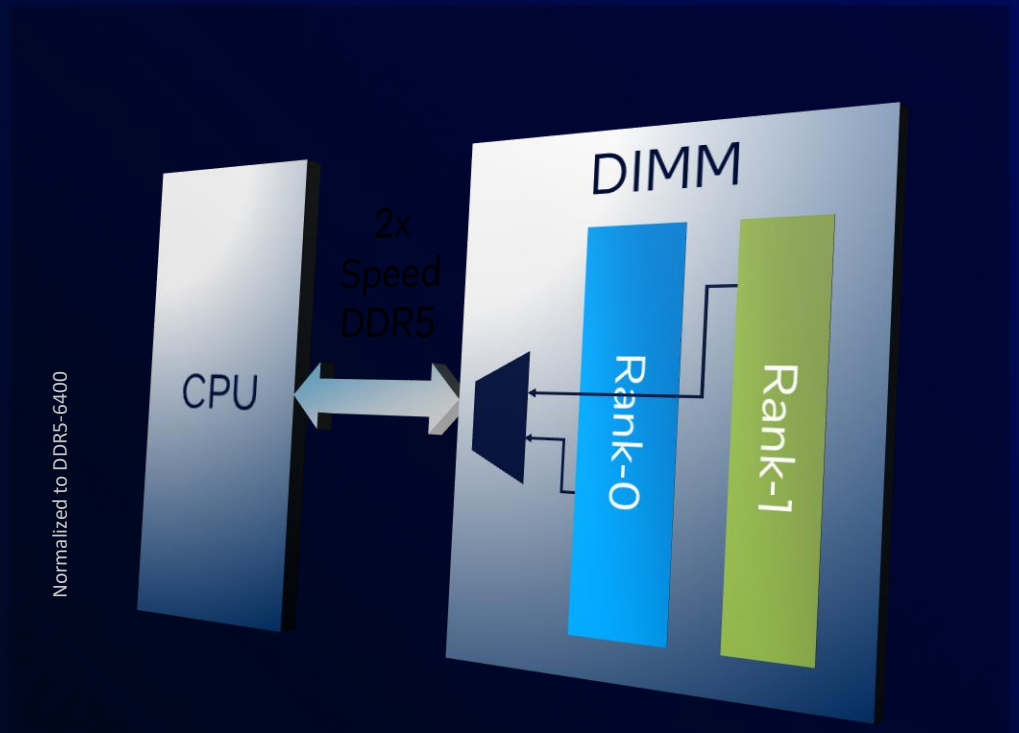
Intel Xeon 6 Processors

	Intel Xeon 6700 /6500 with P- cores	Intel Xeon 6900 with P-cores	Intel Xeon 6 with E-cores
Cores	up to **86 cores**	up to **128 cores**	up to **144 cores** (6700 series) | **288 cores** (6900 series)
Sockets	1S, 2S, 4S, 8S	1S, 2S	1S, 2S
Max TDP	150 to 350W	400 to 500W	205 to 500W
Memory	up to **8 channels DDR5** | MRDIMM	up to **12 channels DDR5** | MRDIMM	up to **12 channels DDR5**
Max Memory Speed	6400 (1 DPC) | 5200 (2 DPC) | **8000 MRDIMM (1 DPC)**	6400 (1 DPC) | 8800 MRDIMM (1 DPC)	6400 (1 DPC) | 5200 (2 DPC)
Intel® UPI	up to **4 UPI 2.0** at up to 24 GT/s per lane	up to **6 UPI 2.0** at up to 24 GT/s per lane	up to **6 UPI 2.0** at up to 24 GT/s per lane
PCI Express 5.0	up to **88 lanes** up to **136 lanes** for single socket designs	up to **96 lanes**	up to **96 lanes**
Compute Express Link	up to **64 lanes CXL 2.0**	up to **64 lanes CXL 2.0**	up to **64 lanes CXL 2.0**
Physical/Virtual Address Bits	52/57	52/57	52/48
AI Acceleration Intel® Deep Learning Boost	**Intel AMX** (INT8, BF16, FP16) + **Intel AVX 512** (VNNI/INT8)	**Intel AMX** (INT8, BF16, FP16) + **Intel AVX 512** (VNNI/INT8)	**Intel AVX 2** (VNNI/INT8)
Security	Intel Software Guard Extensions, Intel Trusted Domain Extensions		
Crypto	Vector AES, SHA2-256 extensions, VPMADD52		
Integrated Accelerators	Intel QuickAssist Technology, Intel Dynamic Load Balancer, Intel Data Streaming Accelerator, Intel In-memory Analytics Accelerator		

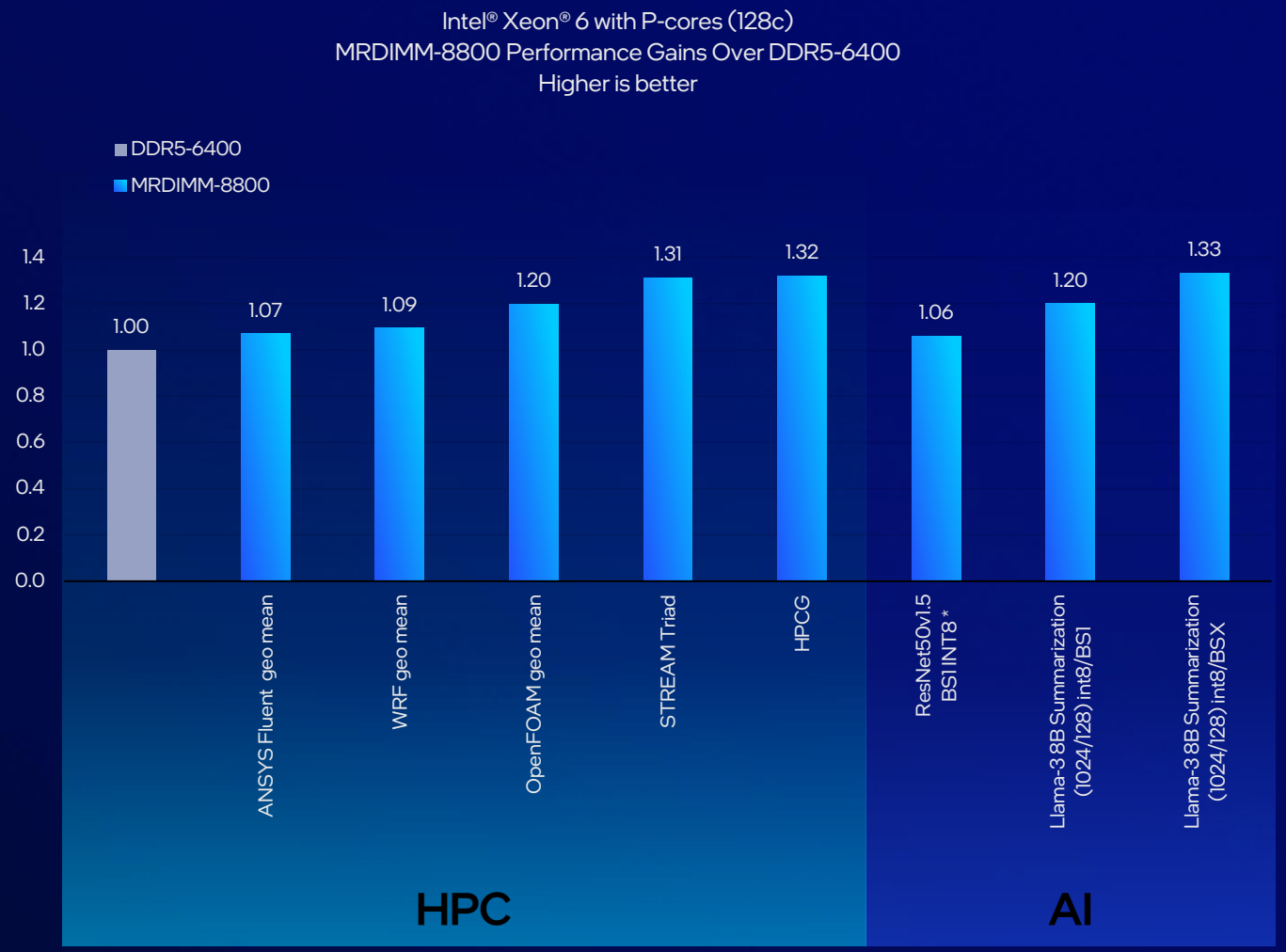
intel XEON

Multiplexed Rank DIMMs

First to market on Intel Xeon 6 processors with P-core



MRDIMMs deliver up to **8800 MT/s** data rate on Intel Xeon 6 with P-cores



See intel.com/processorclaims: Intel Xeon 6. Results may vary. * 6972P (96c) used.
This offering is not approved or endorsed by OpenCFD Limited, producer and distributor of the OpenFOAM software via www.openfoam.com, and owner of the OPENFOAM® and OpenCFD® trademark

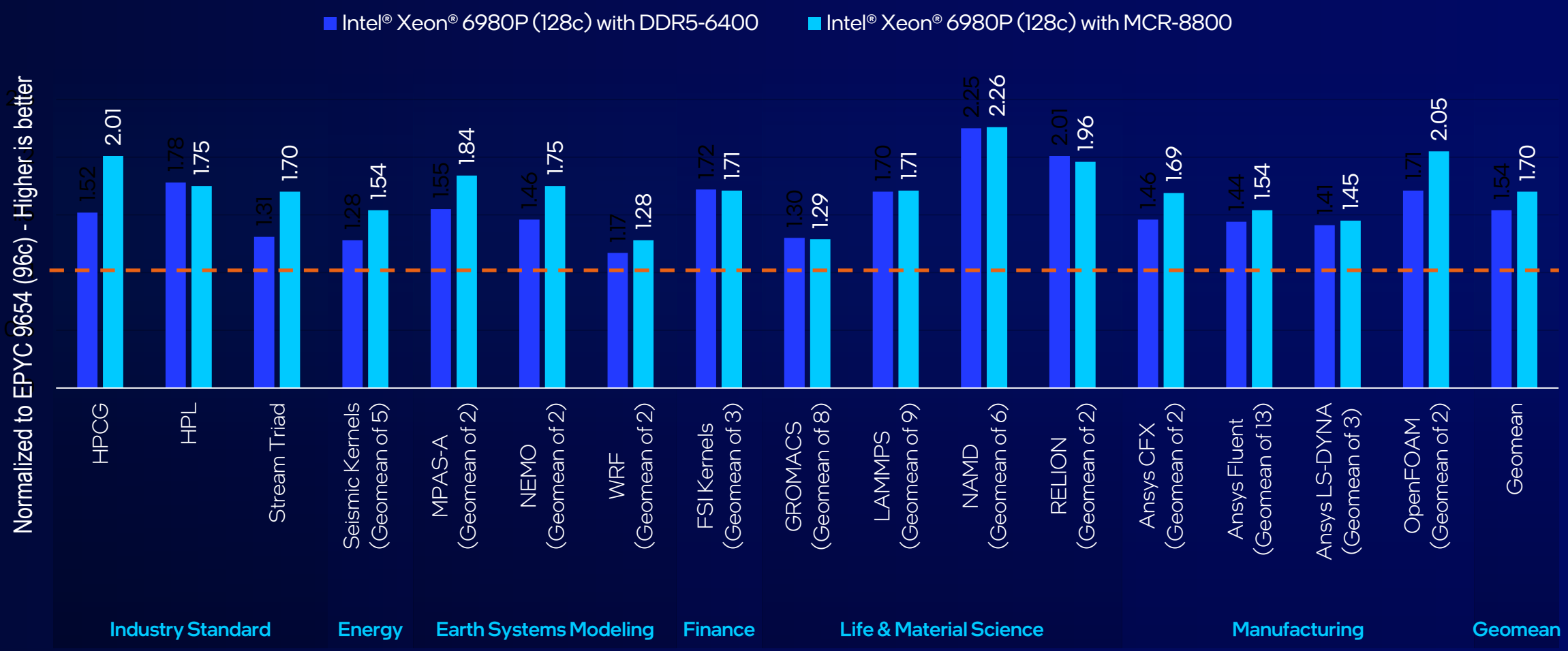
Higher Performance Efficiency Across Server Utilization

Intel Xeon 6 with P-cores delivers significant advantages in performance per watt at typical 40% server utilization

*CPU socket power used
See intel.com/processorclaims: Intel Xeon 6. Results may vary.

Performance Leadership on HPC Workloads

Higer core counts, higher bandwidth memory



intel

See intel.com/processorclaims: Intel Xeon 6. Results may vary.

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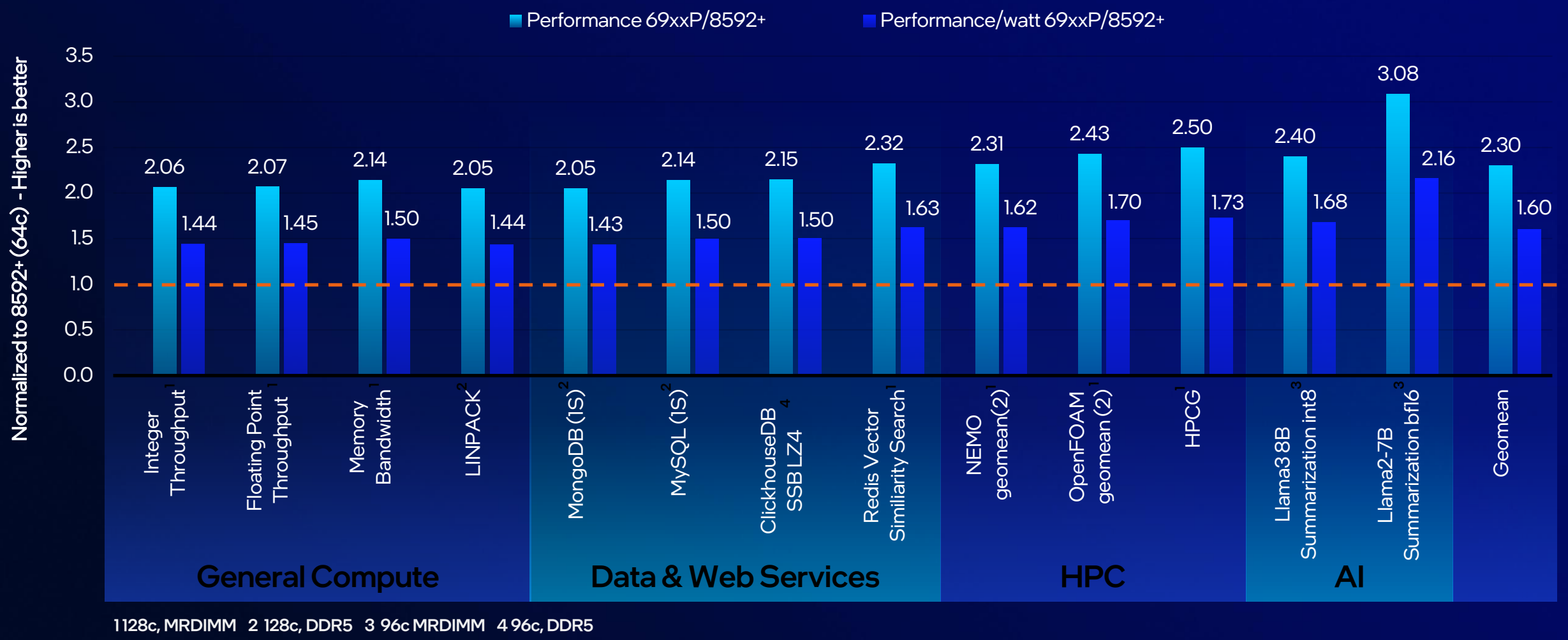
Significant Gains Across Broad Workloads

Intel Xeon 6 with P-cores vs. 5th Gen Intel Xeon Processors



1 128c, MRDIMM 2 128c, DDR5 3 96c MRDIMM 4 96c, DDR5

See intel.com/processorclaims: Intel Xeon 6. Results may vary. Performance/Watt based on CPU TDP.

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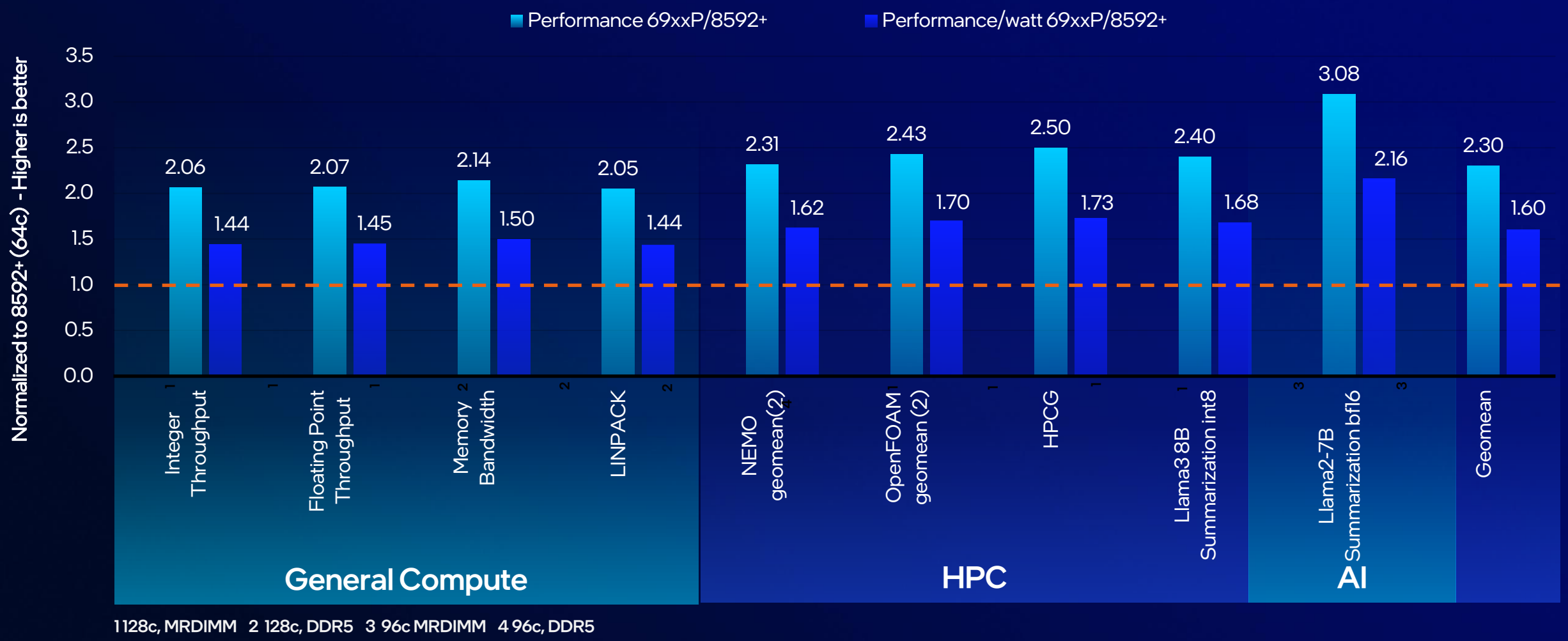
Significant Gains Across Broad Workloads

Intel Xeon 6 with P-cores vs. 5th Gen Intel Xeon Processors



1 128c, MRDIMM 2 128c, DDR5 3 96c MRDIMM 4 96c, DDR5

Intel® Xeon® 6 Delivers Performance Advantage

Across Diverse Data Center Workloads

Intel Xeon 6900P vs AMD EPYC 9005

General Compute

1.3x	Stream Triad
1.13x	Floating Point Throughput
1.06x	Linpack
0.94x	Integer Throughput

Data & Webservices

1.62x	NGINX TLS 1.3
1.17x	Mongo DB
1.14x	Redis Memtier
1.10x	Redis Vector Similarity Search

HPC

1.52x	HPCG
1.43x	OpenFOAM
1.23x	LAMMPS
1.15x	WRF

AI

2.17x	ResNet-50
1.87x	DLRM
1.85x	BERT large
1.76x	Vision Transformer

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See backup for workloads and configurations. Results may vary.
Performance at ~similar core counts.

Save Power and Money on New Server Purchases

Performance advantage and TCO savings with Xeon servers vs AMD EPYC 9005 servers

Image Construction
Stable Diffusion

1.3x Perf / Server

Computational Fluid Dynamics
OpenFOAM

1.43x Perf / Server

Language Processing
BERT-Large

1.85x Perf / Server

Recommendation System
DLRM

1.87x Perf / Server

intel XEON

*Estimated over 4 years. See backup for workloads and configurations. Results may vary.
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Xeon 6980P vs AMD 9755

A More Cost-Efficient Server Architecture

Realize TCO savings with Xeon servers vs AMD EPYC servers (Xeon 676xP vs AMD 9535)

Data Services
Redis Memtier (1S) on 6760P

1.10x Perf / Server

Image Construction
Stable Diffusion on 6767P

1.53x Perf / Server

Web Services
NGINX TLS (1S) on 6760P

1.55x Perf / Server

Image Construction
Vision Transformer on 6760P

2.09 Perf / Server

X

intel XEON

*Estimated over 4 years. See backup for workloads and configurations. Results may vary.


AI with
Intel® Xeon® 6
Processors

The growing spectrum of AI workloads

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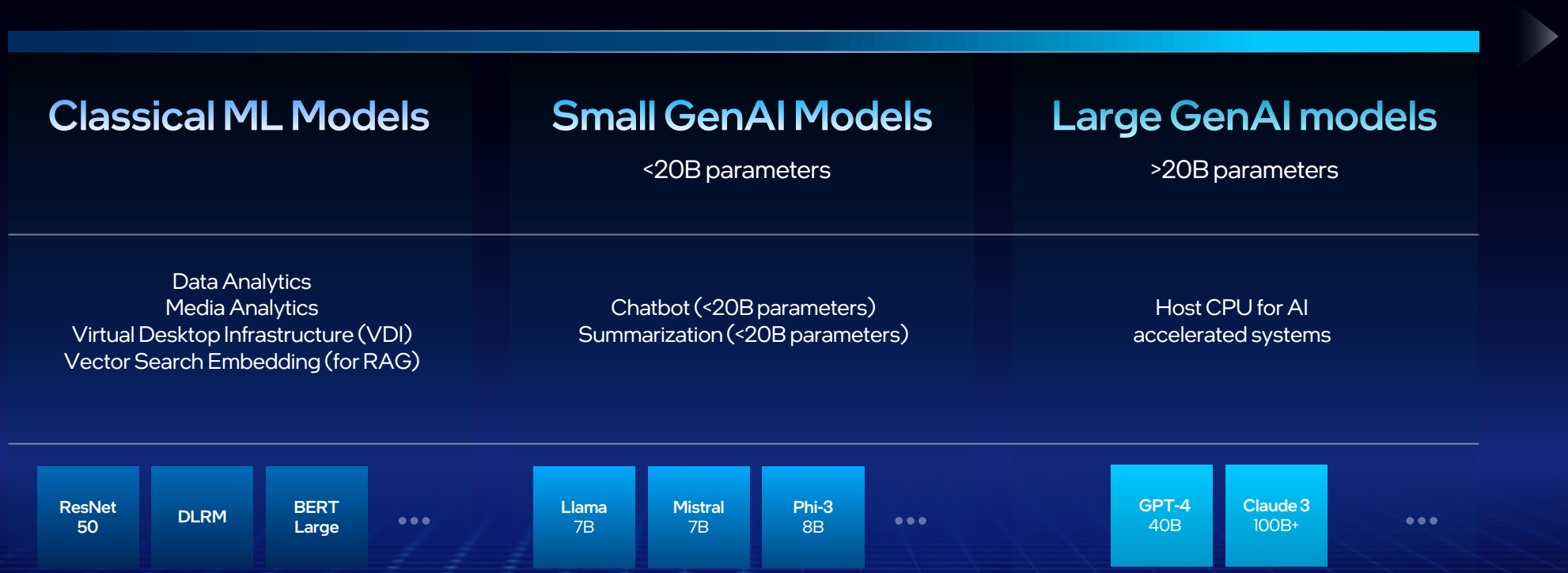
IDC's WW AI and Generative AI Spending Guide, V1 2024 (August)

Intel® Xeon® CPUs Along the AI Spectrum

Offering openness and flexibility to adapt to new trends



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Intel® Xeon® 6 Processors for AI

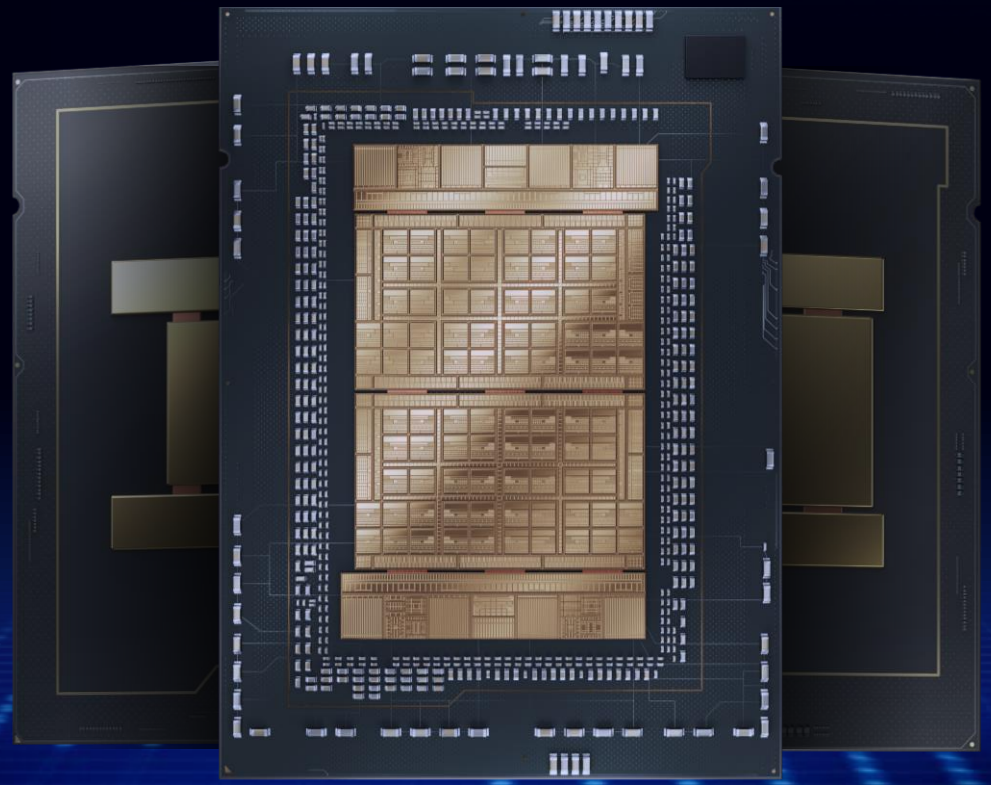
World's Best CPU for AI

Up to 128 P-cores
on 6900-series
up to 86 P-cores on 6700/6500 -series

More bandwidth & cache
MRDIMM memory support
Up to 504MB low latency LLC

AI accelerators built-in
Intel® AMX, Intel® AVX-512,
and Intel® AVX-2

Comprehensive SW suite
AI development across
classical ML and small GenAI
models



The Most Deployed Host CPU

Superior I/O performance
up to 192 PCIe 5.0 lanes

High Single Threaded Performance
With Intel's latest generation P-core

Top Tier Memory Support
30% higher memory B/W with MRDIMMs
Expandability with CXL 2.0

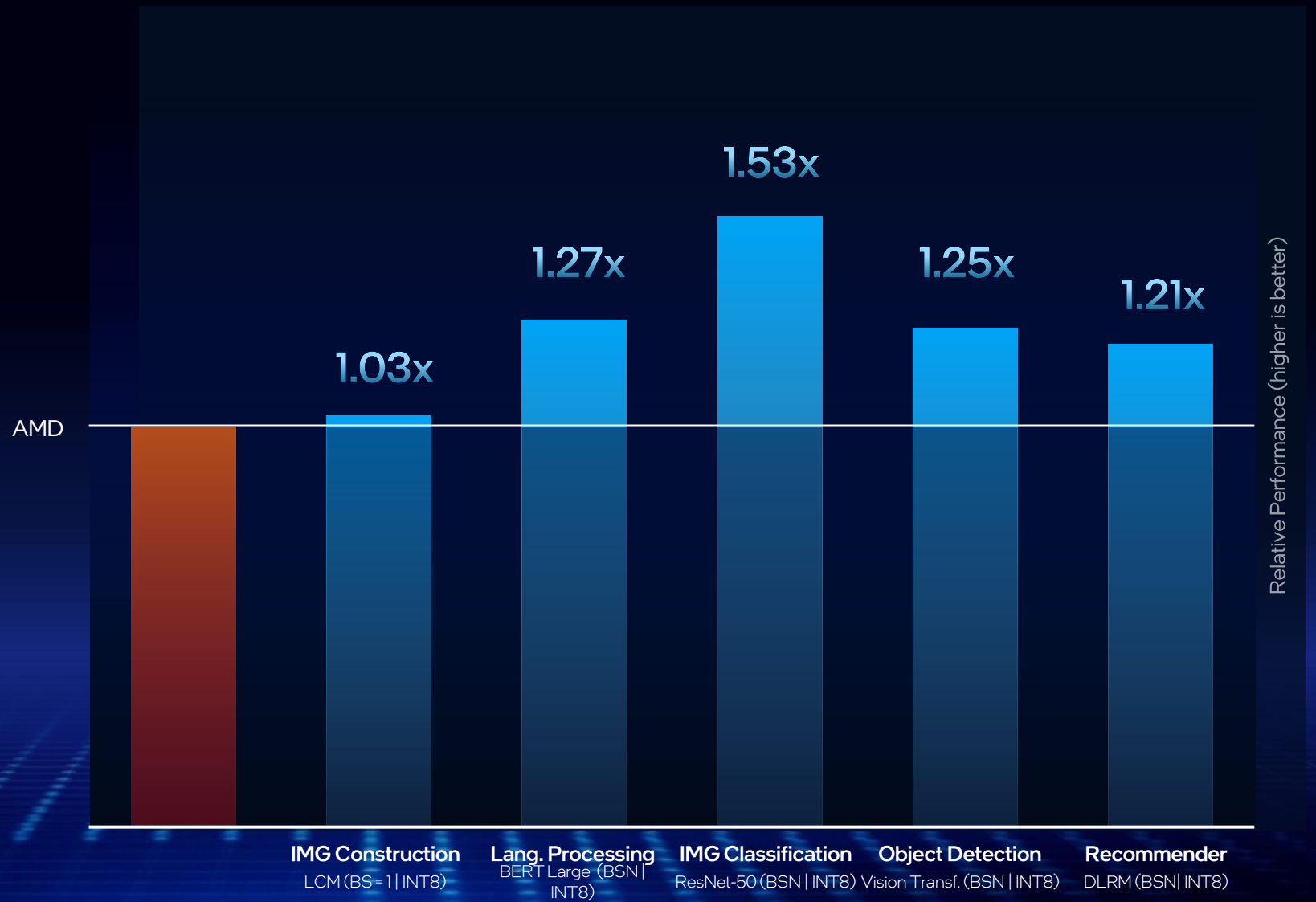
Ready for Deployment
NVIDIA® DC-MHS & NVIDIA MGX™
form factors supported

intel XEON

Source: IDC Server Tracker report, based on 1H'24 system volume
*NVIDIA logo and MGX are trademarks of NVIDIA and/or its subsidiaries

Delivering Amazing AI Performance

With 33% less cores than competition



2S AMD EPYC 9965 (128 cores)

2S Intel Xeon 6787P (86 cores)

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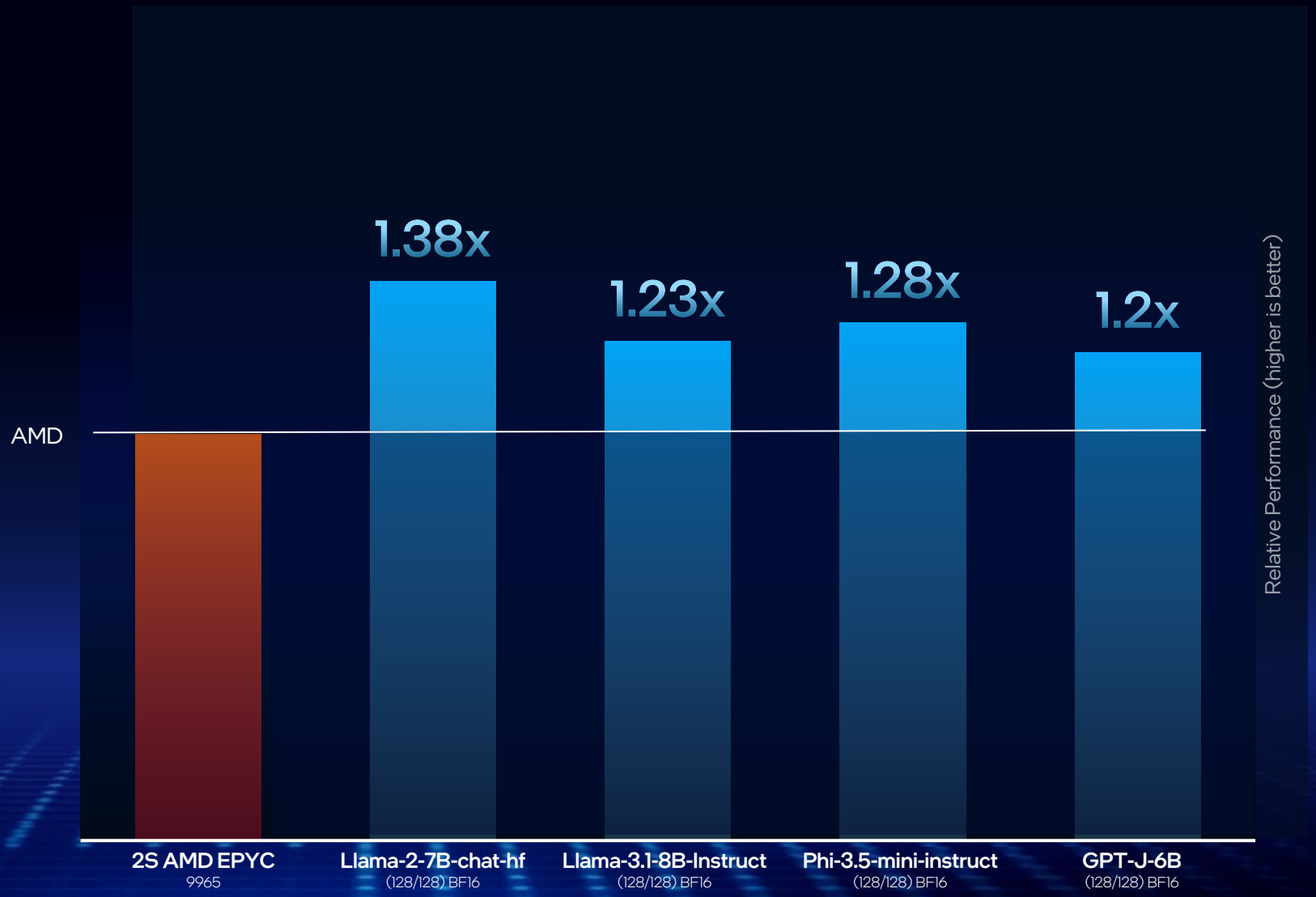
See backup for workloads and configurations. Results may vary.

Leadership in Small Model Performance

Intel Xeon 6900P series with fewer cores outperforms the best AMD EPYC 9005



2S AMD EPYC 9965 (192 cores)

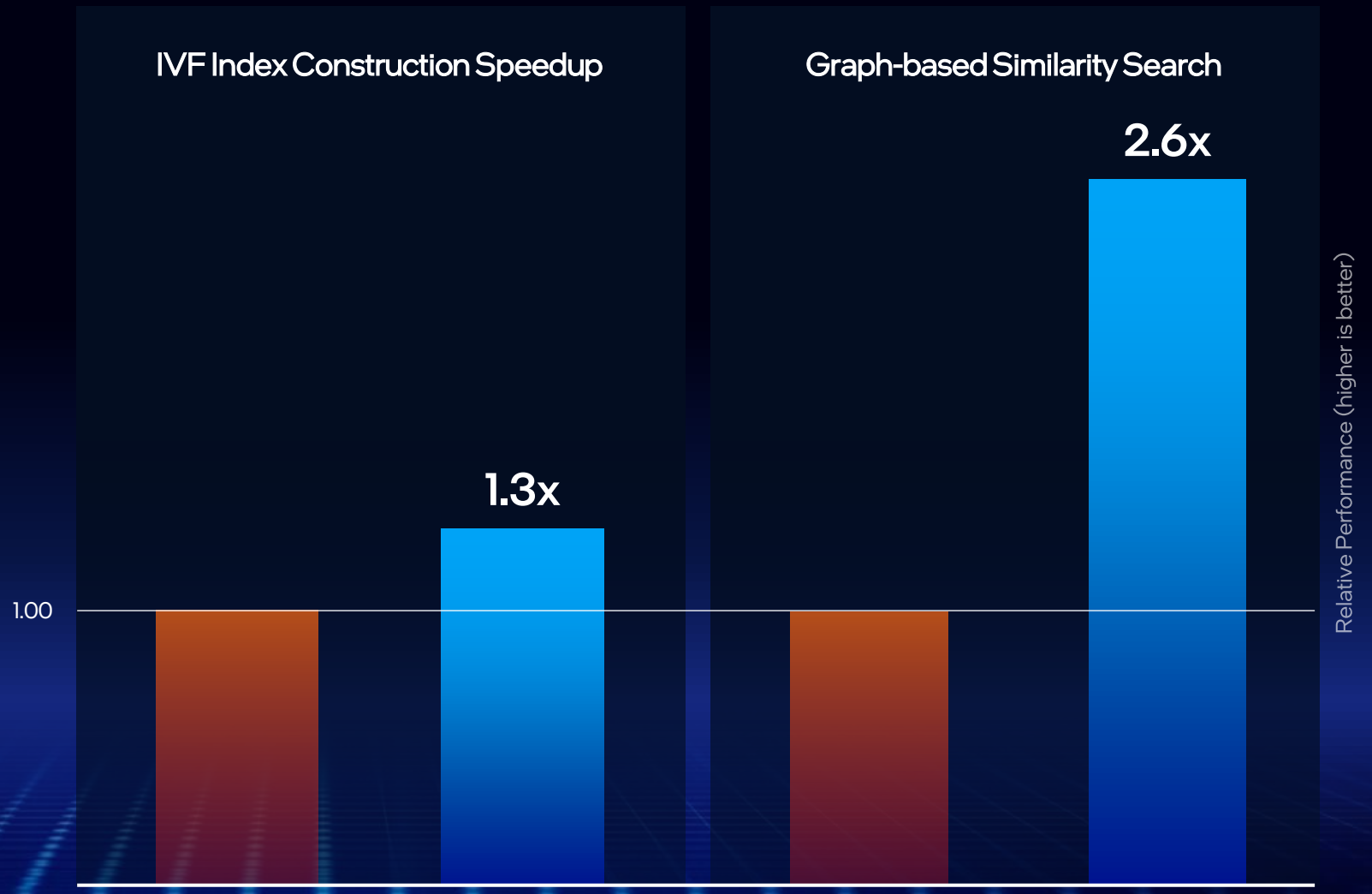
2S Intel Xeon 6980P (128 cores)

intel XEON

See backup for workloads and configurations. Results may vary.

Intel® SVS Vector Optimizations for Vector Databases

Xeon (64c) vs.
AMD EPYC (64c)
on Wiki-45M (1S)



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Intel Xeon 6981E: 1-node, 1x Intel(R) Xeon(R) 6981E, 288 cores, HT N/A, Turbo On, NUMA 2, Total Memory 768GB (12x64GB DDR5 6400 MT/s [6400 MT/s]), BIOS BHSDCRB1.IPC.3544.P24.2411192152, microcode 0x13000330, 2x Ethernet Controller 10-Gigabit X540-AT2, 2x Ethernet Controller E810-C for QSFP, 1x 1.7T Micron_7450_MTFDKCC1T9TFR, Ubuntu 24.04.1 LTS, 6.8.0-51-generic, QEMU emulator version 8.2.2libvirt 10.0.0, VM setup:8 x 8vcpu DUT + 24x 8vcpu noisy neighbor at 50% utilization. Test by Intel as of 01/10/25.

Configurations

Integer Throughput : SPECCpu2017 , icc2024:v24.42.2

Floating Point Throughput: SPECCpu2017 , icc2024:v24.42.2

NGINX: OPENSSL_VERSION="openssl-3.0.15", QAT_ENGINE_VERSION="v1.8.1"

Server-Side Java: JDK Version 17.0.1

MYSQL:MySQL 8.0.33 , HammerDB 4.7

OCI Ampere A2(Arm-based standard compute): 1-instance, 8vcpu OCI VM.Standard.A2.Flex , 32 GB total memory, bios: , microcode:, Ubuntu 24.04.1 LTS, 6.8.0-1013-oracle , test by Intel on 2/2025

Integer Throughput : SPECCpu2017 , gcc13.2 , - -Ofast-mtune

FP Throughput: SPECCpu2017, gcc13.2,

NGINX: OPENSSL_VERSION="openssl-3.1.3", NGINX version 1.22.1

Server-Side Java: JDK Version 17.0.1

MYSQL:MySQL 8.0.33 , HammerDB 4.7

Xeon is the Most Deployed Host CPU for **AI Accelerated Systems**

The role of a host CPU in maximizing the performance of an AI accelerated system:

- Data preprocessing to prepare data for training models
- Data transmission to GPU for parallel processing
- Manages check-pointing to system memory
- Inherent flexibility to process mixed workloads running on same infrastructure

Host CPU Technical Requirements	Intel Xeon 6 Winning Features
Superior I/O performance	20% more lanes with up to 192 PCIe 5.0 lanes resulting in higher i/o bandwidth[1]
High single threaded performance	High per core performance and max turbo frequency
High memory bandwidth and capacity	30% higher bandwidth w/ MRDIMMs[2] Mem capacity expansion with CXL
RAS for large scale systems	Advanced RAS support (ex: PCIe enhanced Downstream Port Containment - eDPC)
Flexible form factor support	Both DC-MHS and NVIDIA® MGX™ supported

intel XEON

* Source: IDC Server Tracker report, based on Q1'24 system volume

[1] 2S system as compared to 5th Gen Intel Xeon processor

[2] compared to DDR5 6400 RDIMM

*NVIDIA logo, MGX and HGX are trademarks of NVIDIA and/or its subsidiaries

Recommended Intel Xeon 6 Processors as Host CPUs

Jointly identified by Intel and NVIDIA for AI use cases in the data center

"We're collaborating with Intel to bring to market NVIDIA MGX reference architectures that support Intel Xeon 6 processors to handle a wide range of applications, including AI and data analytics. Using NVIDIA MGX reduces development time and ensures consistency in design and performance to help meet next-generation computing needs."

- Kaustubh Sanghani, vice president of GPU product management at NVIDIA

Intel Xeon 6 SKUs Qualified for NVIDIA® MGX™ and NVIDIA HGX™ Systems

Systems (per system config)	**Intel Xeon 6** Processors
MGX (1 CPU, 4 GPUs, 3 NICs)	Xeon 6761P[1] (64C)
MGX (2 CPUs, 4 GPUs, 3 NICs)	Xeon 6737P (32C) **Xeon 6960P[2] (48C)**
MGX (2 CPUs, 8 GPUs, 5 NICs)	Xeon 6767P (64C) **Xeon 6960P[2] (72C)**
MGX (2 CPUs, 16 GPUs, 1 NIC)	Xeon 6767P (64C) **Xeon 6960P[2] (72C)**
HGX[3] (2 CPUs, 8 GPUs, x NICs)	**Xeon 6767P (64C)** Xeon 6960P[2] (72C)

Other Xeon 6 SKUs can be used in AI Accelerated systems including Xeon 6 with E-cores for high density infrastructure requirements.

[1] Xeon 6761P SKU is only for single socket systems
[2] Xeon 6960P SKU can be configured 72C→48C for higher frequencies
[3] Three different topologies supported; for additional topologies and configuration details, please contact your Intel representative

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Intel Xeon 6 is **Ecosystem Ready**

Building efficiency and ease of use with a common software stack

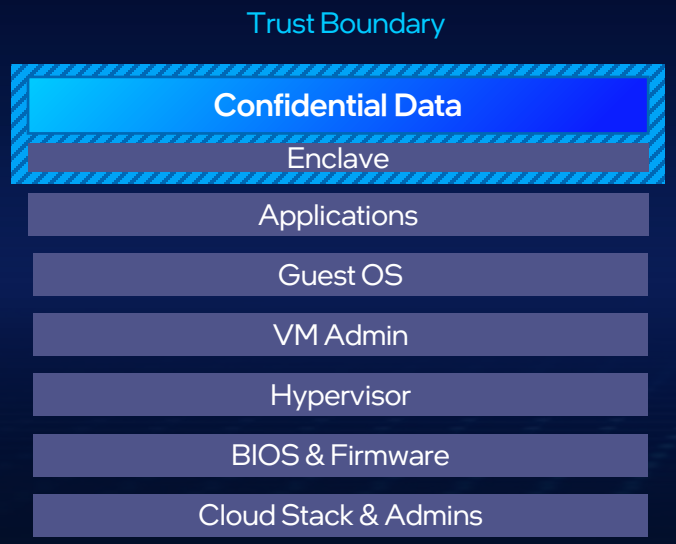
Category	Software Stack Component - Examples
Optimized Math and AI Libraries	oneDNN
	oneMKL
	MLAS
	oneCCL
OS and Hypervisor	Linux kernel and commercial Linux
	Windows
	VMware ESXi
Applications and Libraries	Database incl. common libraries (ex. ZStd)
	Network & media incl. common libraries (ex. DPDK)
	General compute & storage incl. libraries (ex. SPDK)
	Parallel compute libraries (ex. oneDPL and oneTBB)
	Scalable Vector Search (SVS)
AI Frameworks	PyTorch
	vLLM
	Hugging Face
	Tensorflow

The Most Comprehensive Portfolio

for Confidential Computing

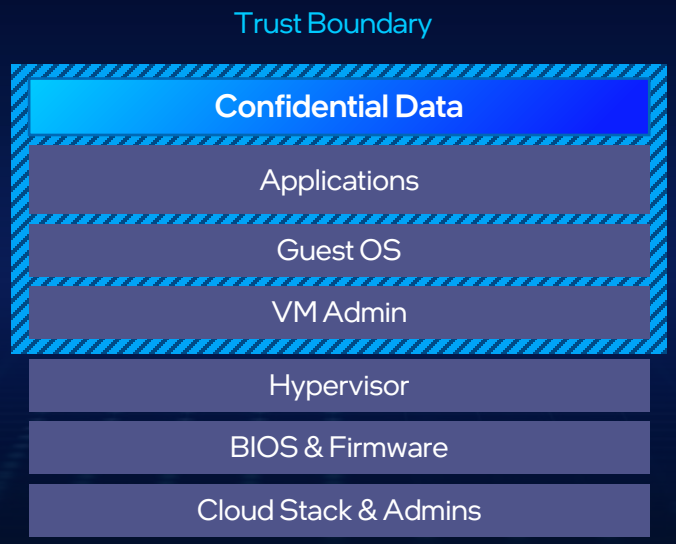
App Isolation
Intel® SGX

Smallest trust boundary for greatest data protection & code integrity



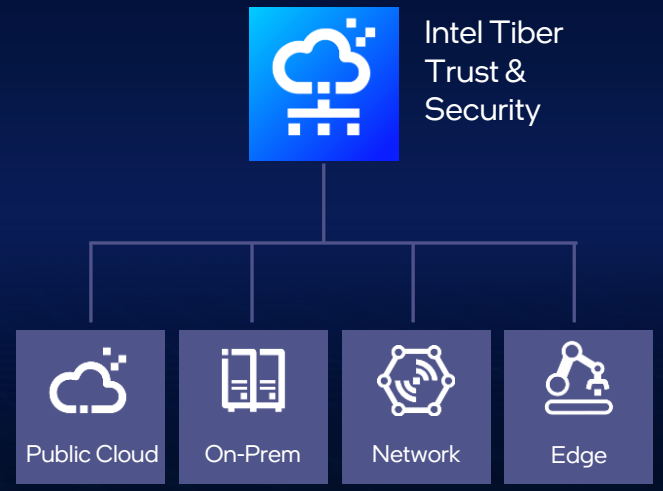
VM Isolation
Intel® TDX

Most straightforward path to greater security, compliance & control for legacy apps



Trust Services
Intel® Tiber Trust Authority

Uniform, independent attestation of trustworthy environments



intel XEON

The Next Milestone in Confidential AI with **Intel® TDX Connect**

Provides a high-performance encrypted connection between the CPU and PCIe devices with direct memory access and lower overhead

intel XEON

*Activating TDX Connect will require Intel Xeon 6 with P-cores, TDX Module updates, an enabled OS, and an enabled device

Compute Express Link 2.0 (CXL 2.0)

CXL Memory is a cost efficient, flexible, first-class solution

Support for all (Type 1, Type 2 and Type 3) devices
and backward compatible with CXL 1.1

Supports Link bifurcation
for multiple devices per host port

Supports Enhanced CXL memory (Type 3) tiering
for capacity & bandwidth expansion

Supports Managed hot plug
for device addition/removal

Enhanced Support

for CXL memory Type 3 devices, including Flat Memory Mode only available on Intel Xeon 6 CPUs

Flat Memory Mode

H/W-controlled tiering mode that is completely independent of O/S version & data-tiering capabilities

Configurations

Configurations

[7A220] Up to 50% higher AI Performance with 1/3 less cores vs EPYC 9005
6787P:1-node, 2x Intel(R) Xeon(R) 6787P, 86 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB MRDIMM 8800 MT/s [8000 MT/s]), BIOS 3A08.QCT001, microcode 0x11000311, 2x BCM57416 NetXtreme-E Dual-Media 10G RDMA Ethernet Controller, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 24.04.1 LTS, 6.8.0-47-generic. Test by Intel as of November 2024.
9755:1-node, 2x AMD EPYC 9755 128-Core Processor, 128 cores, 500W TDP, SMT On, Boost On, Total Memory 1536GB (24x64GB DDR5 6400 MT/s [6000 MT/s]), BIOS 1.1, microcode 0xb002116, 2x Ethernet Controller X550, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 24.04.1 LTS, 6.8.0-47-generic., Ubuntu 24.04.1 LTS, 6.8.0-47-generic. Test by Intel as of January 2025.
Software:ResNet50 v1.5 inference, OpenVino 2024.4.0-16554-9c9778aba39-luocheng/mha_fusion_bhls, ww45 container, Python 3.8.20, BSX INT8, multi-instance, batched

[7G20] Up to 40% higher average performance vs. 5th Gen Xeon: [Geomean of Integer Throughput, Floating Point Throughput, Stream Triad, LINPACK, MongoDB(1S), MySQL(1S), Redis Memtier(1S), LAMMPS, WRF, BlackScholes, OpenFOAM, HPCG, BERT-Large, GPT-J 6B, Next Gen Firewall(1S) comparing 6787P vs. 8592+]
a) General Compute : Integer throughput and Floating-point throughput
6787P: 1-node, 2x Intel(R) Xeon(R) 6787P, 86 cores, 350W TDP, HT On Turbo On, Total Memory 1024GB (16x64GB MRDIMM 8800 MT/s [8000 MT/s]), microcode 0x1000311, 1x 1.7T 9660-16i, Ubuntu 24.04 LTS, 6.8.0-51-generic. Test by Intel as of January 2025.
6767P: 1-node, 2x Intel(R) Xeon(R) 6767P, 64 cores, 350W TDP, On [Off Linpack, Stream], Turbo On, Total Memory 1024GB (16x64GB MRDIMM 8800 MT/s [8000 MT/s]), microcode 0x1000311, 1x 1.7T 9660-16i, Ubuntu 24.04 LTS, 6.8.0-51-generic. Test by Intel as of January 2025.
8592+: 1-node, 2x INTEL(R) XEON(R) PLATINUM 8592+, 64 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB DDR5 5600 MT/s [5600 MT/s]), BIOS 3B08.TEL3P1, microcode 0x21000283, 2x Ethernet Controller X710 for 10GBASE-T, 1x 3.6T INTEL SSDPE2KX040T7, Ubuntu 24.04.1 LTS, 6.8.0-51-generic. Test by Intel as of Jan 2025.
Software: SPECcpu2017 (est): gcc14.2;

b) Stream :
6787P : 1-node, 2x Intel(R) Xeon(R) 6787P, 86 cores, 350W TDP, HT On, Turbo On, Total Memory 512GB (16x32GB MRDIMM 8800 MT/s [8800 MT/s]), BIOS 3A08.QCT001, microcode 0x11000311, 2x Ethernet Controller X550, 1.7T SAMSUNG MZ7L31T9, Ubuntu 24.04.1 LTS, 6.8.0-51-generic. Test by Intel as of December 2024.
6767P: 1-node, 2x Intel(R) Xeon(R) 6767P, 64 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB MRDIMM 8800 MT/s [8000 MT/s]), BHSDCRB1.IPC.3544.P22.2411120403, microcode 0x1000341, 2x BCM57416 NetXtreme-E Dual-Media 10G RDMA Ethernet Controller, 1x 1.7T Micron_7450_MTFDKCC1T9TFR, Ubuntu 24.04.1 LTS, 6.8.0-31-generic. Test by Intel as of November 2024..
8592+1-node, 2x INTEL(R) XEON(R) PLATINUM 8592+, 64 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB DDR5 5600 MT/s [5600 MT/s]), BIOS 2.3, microcode 0x21000240, 2x Ethernet Controller 10-Gigabit X540-AT2, 1x 1.7T SAMSUNG MZ1L21T9HCLS-00A07, Ubuntu 24.04.1 LTS, 6.8.0-47-generic. Test by Intel as of November 2024.
STREAM: App Version: v5.10, Triad, icx:2025.0, running on physical cores

c) Linpack :
6787P: 1-node, 2x Intel(R) Xeon(R) 6787P, 86 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB DDR5 6400 MT/s [6400 MT/s]), BIOS: BHSDREL1.IPC.3544.P15.2410300111, microcode: 0x81000341, 2x Ethernet Controller X550, 476.9G INTEL SSDPEKNW512G8, Ubuntu 24.04.1 LTS, 6.8.0-38-generic. Test by Intel as of December 2024.
6767P: 1-node, 2x Intel(R) Xeon(R) 6767P, 64 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB DDR5 6400 MT/s [6400 MT/s]), BHSDCRB1.IPC.3544.P22.2411120403, microcode 0x1000341, 2x BCM57416 NetXtreme-E Dual-Media 10G RDMA Ethernet Controller, 1x 1.7T Micron_7450_MTFDKCC1T9TFR, Ubuntu 24.04.1 LTS, 6.8.0-31-generic. Test by Intel as of November 2024..
8592+: 1-node, 2x INTEL(R) XEON(R) PLATINUM 8592+, 64 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB DDR5 5600 MT/s [5600 MT/s]), BIOS 2.3, microcode 0x21000240, 2x Ethernet Controller 10-Gigabit X540-AT2, 1x 1.7T SAMSUNG MZ1L21T9HCLS-00A07, Ubuntu 24.04.1 LTS, 6.8.0-47-generic. Test by Intel as of November 2024.
HPL: App Version: Intel_Optimized_MKL_v2024.1, running on physical cores.

Configurations

d) MongoDB:
6787P: 1-node, 2x (1 used) Intel(R) Xeon(R) 6787P, 86 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB DDR5 6400 MT/s [6400 MT/s]), BIOS 3A08.QCT001, microcode 0x11000311, 2x Ethernet Controller E830-CC for QSFP, 2x BCM57416 NetXtreme-E Dual-Media 10G RDMA Ethernet Controller, 4x 3.5T KIOXIA KCD8XPUG3T84, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 22.04.5 LTS, 6.5.0-21-generic. Test by Intel as of December 2024.
6760P: 1-node, 2x (1 used) Intel(R) Xeon(R) 6760P, 64 cores, 330W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB DDR5 6400 MT/s [6400 MT/s]), BIOS 3A08.QCT001, microcode 0x11000311, 2x Ethernet Controller E830-CC for QSFP, 2x BCM57416 NetXtreme-E Dual-Media 10G RDMA Ethernet Controller, 4x 3.5T KIOXIA KCD8XPUG3T84, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 22.04.5 LTS, 6.5.0-21-generic. Test by Intel December 2024.
8592+:1-node, 2x (1 used) INTEL(R) XEON(R) PLATINUM 8592+, 64 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB DDR5 5600 MT/s [5600 MT/s]), BIOS 2.3, microcode 0x21000240, 2x Ethernet Controller X710 for 10GBASE-T, 2x Ethernet Controller E810-C for QSFP, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, 4x 3.5T KIOXIA KCD8XPUG3T84, Ubuntu 22.04.5 LTS, 6.5.0-21-generic. Test by Intel as of December 2024.
MongoDB: MongoDB 6.0.4 ycsb-0.17.0

e) MySQL HammerDB:
6787P: 1-node, 2x (1 used) Intel(R) Xeon(R) 6787P, 86 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB DDR5 6400 MT/s [6400 MT/s]), BIOS 3A08.QCT001, microcode 0x11000311, 2x Ethernet Controller E830-CC for QSFP, 2x BCM57416 NetXtreme-E Dual-Media 10G RDMA Ethernet Controller, 4x 3.5T KIOXIA KCD8XPUG3T84, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 22.04.5 LTS, 6.5.0-21-generic. Test by Intel as of December 2024.
6760P : 1-node, 2x (1 used) Intel(R) Xeon(R) 6760P, 64 cores, 330W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB DDR5 6400 MT/s [6400 MT/s]), BIOS 3A08.QCT001, microcode 0x11000311, 2x Ethernet Controller E830-CC for QSFP, 2x BCM57416 NetXtreme-E Dual-Media 10G RDMA Ethernet Controller, 4x 3.5T KIOXIA KCD8XPUG3T84, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 22.04.5 LTS, 6.5.0-21-generic. Test by Intel December 2024.
8592+:1-node, 2x (1 used) INTEL(R) XEON(R) PLATINUM 8592+, 64 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB DDR5 5600 MT/s [5600 MT/s]), BIOS 2.3, microcode 0x21000240, 2x Ethernet Controller X710 for 10GBASE-T, 2x Ethernet Controller E810-C for QSFP, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, 4x 3.5T KIOXIA KCD8XPUG3T84, Ubuntu 22.04.5 LTS, 6.5.0-21-generic. Test by Intel as of December 2024.
MsqlSQL : HammerDB 4.7, TPROC-C, on MySQL 8.0.33, multi-instance

f) Redis Memtier:
6787P:1-node, 2x (1 used) Intel(R) Xeon(R) 6787P, 86 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB MRDIMM 8800 MT/s [8000 MT/s]), BIOS 3A08.QCT001, microcode 0x11000311, 2x Ethernet Controller E830-CC for QSFP, 2x BCM57416 NetXtreme-E Dual-Media 10G RDMA Ethernet Controller, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 22.04.5 LTS, 6.5.0-21-generic. Test by Intel as of December 2024.
6767P: 1-node, 2x (1 used) Intel(R) Xeon(R) 6767P, 64 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB MRDIMM 8800 MT/s [8000 MT/s]), BIOS 3A08.QCT001, microcode 0x11000311, 2x Ethernet Controller E830-CC for QSFP, 2x BCM57416 NetXtreme-E Dual-Media 10G RDMA Ethernet Controller, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 22.04.5 LTS, 6.5.0-21-generic. Test by Intel as of December 2024.
8592+: 1-node, 2x (1 used) INTEL(R) XEON(R) PLATINUM 8592+, 64 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB DDR5 5600 MT/s [5600 MT/s]), BIOS 2.3, microcode 0x21000240, 2x Ethernet Controller X710 for 10GBASE-T, 2x Ethernet Controller E810-C for QSFP, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 22.04.5 LTS, 6.5.0-21-generic. Test by Intel as of December 2024.
Redis Memtier: Redis: 7.0.5 Memtier: 1.4.0, multi-instance, 1 instance per core

Configurations

g) WRF:
6787P: 1-node, 2x Intel(R) Xeon(R) 6787P, 86 cores, 350W TDP, HT On, Turbo On, Total Memory 512GB (16x32GB MRDIMM 8800 MT/s [8000 MT/s]), BIOS 3A08.QCT001, microcode 0x11000311, 2x Ethernet Controller X550, 1.7T SAMSUNG MZ7L31T9, Ubuntu 24.04.1 LTS, 6.8.0-51-generic. Test by Intel as of December 2024.
6767P: 1-node, 2x Intel(R) Xeon(R) 6767P, 64 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB MRDIMM 8800 MT/s [8000 MT/s]), BHSDCRB1.IPC.3544.P22.2411120403, microcode 0x1000341, 2x BCM57416 NetXtreme-E Dual-Media 10G RDMA Ethernet Controller, 1x 1.7T Micron_7450_MTFDKCC1T9TFR, Ubuntu 24.04.1 LTS, 6.8.0-31-generic. Test by Intel as of November 2024.
8592+: 1-node, 2x INTEL(R) XEON(R) PLATINUM 8592+, 64 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB DDR5 5600 MT/s [5600 MT/s]), BIOS 2.3, microcode 0x21000240, 2x Ethernet Controller 10-Gigabit X540-AT2, 1x 1.7T SAMSUNG MZ1L21T9HCLS-00A07, Ubuntu 24.04.1 LTS, 6.8.0-47-generic. Test by Intel as of November 2024.
WRF: App Version: v4.5.2, conus2.5km, ifx:2025.0 impi:2021.14

h) LAMMPS:
6787P: 1-node, 2x Intel(R) Xeon(R) 6787P, 86 cores, 350W TDP, HT On, Turbo On, Total Memory 512GB (16x32GB MRDIMM 8800 MT/s [8000 MT/s]), BIOS 3A08.QCT001, microcode 0x11000311, 2x Ethernet Controller X550, 1.7T SAMSUNG MZ7L31T9, Ubuntu 24.04.1 LTS, 6.8.0-51-generic. Test by Intel as of December 2024.
6767P: 1-node, 2x Intel(R) Xeon(R) 6767P, 64 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB MRDIMM 8800 MT/s [8000 MT/s]), BHSDCRB1.IPC.3544.P22.2411120403, microcode 0x1000341, 2x BCM57416 NetXtreme-E Dual-Media 10G RDMA Ethernet Controller, 1x 1.7T Micron_7450_MTFDKCC1T9TFR, Ubuntu 24.04.1 LTS, 6.8.0-31-generic. Test by Intel as of November 2024.
8592+: 1-node, 2x INTEL(R) XEON(R) PLATINUM 8592+, 64 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB DDR5 5600 MT/s [5600 MT/s]), BIOS 2.3, microcode 0x21000240, 2x Ethernet Controller 10-Gigabit X540-AT2, 1x 1.7T SAMSUNG MZ1L21T9HCLS-00A07, Ubuntu 24.04.1 LTS, 6.8.0-47-generic. Test by Intel as of November 2024.
LAMMPS: App Version: v2024-03-07_dev, cmkl:2025.0, icx:2025.0, impi:2021.14, tbb:2022.0, geomean of Atomic Fluid, Copper, DPD, Liquid_crystal, Polyethylene, Protein, Stillinger-Weber, Tersoff, Water

i) HPCG:
6787P: 1-node, 2x Intel(R) Xeon(R) 6787P, 86 cores, 350W TDP, HT On, Turbo On, Total Memory 512GB (16x32GB MRDIMM 8800 MT/s [8000 MT/s]), BIOS 3A08.QCT001, microcode 0x11000311, 2x Ethernet Controller X550, 1.7T SAMSUNG MZ7L31T9, Ubuntu 24.04.1 LTS, 6.8.0-51-generic. Test by Intel as of December 2024.
6767P: 1-node, 2x Intel(R) Xeon(R) 6767P, 64 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB MRDIMM 8800 MT/s [8000 MT/s]), BHSDCRB1.IPC.3544.P22.2411120403, microcode 0x1000341, 2x BCM57416 NetXtreme-E Dual-Media 10G RDMA Ethernet Controller, 1x 1.7T Micron_7450_MTFDKCC1T9TFR, Ubuntu 24.04.1 LTS, 6.8.0-31-generic. Test by Intel as of November 2024.
8592+: 1-node, 2x INTEL(R) XEON(R) PLATINUM 8592+, 64 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB DDR5 5600 MT/s [5600 MT/s]), BIOS 2.3, microcode 0x21000240, 2x Ethernet Controller 10-Gigabit X540-AT2, 1x 1.7T SAMSUNG MZ1L21T9HCLS-00A07, Ubuntu 24.04.1 LTS, 6.8.0-47-generic. Test by Intel as of November 2024.
HPCG: App Version: Intel_Optimized_MKL_v2024.1, icx:2025.0, impi:2021.14, running on physical cores.

j) OpenFOAM:
6787P: 1-node, 2x Intel(R) Xeon(R) 6787P, 86 cores, 350W TDP, HT On, Turbo On, Total Memory 512GB (16x32GB MRDIMM 8800 MT/s [8000 MT/s]), BIOS 3A08.QCT001, microcode 0x11000311, 2x Ethernet Controller X550, 1.7T SAMSUNG MZ7L31T9, Ubuntu 24.04.1 LTS, 6.8.0-51-generic. Test by Intel as of December 2024.
6767P: 1-node, 2x Intel(R) Xeon(R) 6767P, 64 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB MRDIMM 8800 MT/s [8000 MT/s]), BHSDCRB1.IPC.3544.P22.2411120403, microcode 0x1000341, 2x BCM57416 NetXtreme-E Dual-Media 10G RDMA Ethernet Controller, 1x 1.7T Micron_7450_MTFDKCC1T9TFR, Ubuntu 24.04.1 LTS, 6.8.0-31-generic. Test by Intel as of November 2024.
8592+: 1-node, 2x INTEL(R) XEON(R) PLATINUM 8592+, 64 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB DDR5 5600 MT/s [5600 MT/s]), BIOS 2.3, microcode 0x21000240, 2x Ethernet Controller 10-Gigabit X540-AT2, 1x 1.7T SAMSUNG MZ1L21T9HCLS-00A07, Ubuntu 24.04.1 LTS, 6.8.0-47-generic. Test by Intel as of November 2024.
OpenFOAM: App Version: v2312, icx:2025.0 impi:2021.14, geomean of motorbike-20m, motorbike-42m, running on physical cores.

k) BlackScholes :
6787P: 1-node, 2x Intel(R) Xeon(R) 6787P, 86 cores, 350W TDP, HT On, Turbo On, Total Memory 512GB (16x32GB MRDIMM 8800 MT/s [8000 MT/s]), BIOS 3A08.QCT001, microcode 0x11000311, 2x Ethernet Controller X550, 1.7T SAMSUNG MZ7L31T9, Ubuntu 24.04.1 LTS, 6.8.0-51-generic. Test by Intel as of December 2024.
6767P: 1-node, 2x Intel(R) Xeon(R) 6767P, 64 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB MRDIMM 8800 MT/s [8000 MT/s]), BHSDCRB1.IPC.3544.P22.2411120403, microcode 0x1000341, 2x BCM57416 NetXtreme-E Dual-Media 10G RDMA Ethernet Controller, 1x 1.7T Micron_7450_MTFDKCC1T9TFR, Ubuntu 24.04.1 LTS, 6.8.0-31-generic. Test by Intel as of November 2024.
8592+: 1-node, 2x INTEL(R) XEON(R) PLATINUM 8592+, 64 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB DDR5 5600 MT/s [5600 MT/s]), BIOS 2.3, microcode 0x21000240, 2x Ethernet Controller 10-Gigabit X540-AT2, 1x 1.7T SAMSUNG MZ1L21T9HCLS-00A07, Ubuntu 24.04.1 LTS, 6.8.0-47-generic. Test by Intel as of November 2024.
Black Scholes: App Version: v1.4, icx:2025.0, tbb:2022.0

Configurations

l) Bert Large:
6787P: 1-node, 2x Intel(R) Xeon(R) 6787P, 86 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB MRDIMM 8800 MT/s [8000 MT/s]), BIOS 3A08.QCT001, microcode 0x11000311, 2x BCM57416 NetXtreme-E Dual-Media 10G RDMA Ethernet Controller, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 24.04.1 LTS, 6.8.0-47-generic. Test by Intel as of November 2024.
6767P: 1-node, 2x Intel(R) Xeon(R) 6767P, 64 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB MRDIMM 8800 MT/s [8000 MT/s]), BIOS 3A08.QCT001, microcode 0x11000311, 2x BCM57416 NetXtreme-E Dual-Media 10G RDMA Ethernet Controller, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 24.04.1 LTS, 6.8.0-47-generic. Test by Intel as of December 2024.
8592+: 1-node, 2x INTEL(R) XEON(R) PLATINUM 8592+, 64 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB DDR5 5600 MT/s [5600 MT/s]), BIOS 2.3, microcode 0x21000240, 2x Ethernet Controller 10-Gigabit X540-AT2, 1x 1.7T SAMSUNG MZ1L21T9HCLS-00A07, Ubuntu 24.04.1 LTS, 6.8.0-47-generic. Test by Intel as of October 2024.
Software: BERT-Large inference, ww42 dlboost container, Python 3.10.14, Pytorch 2.5.0.dev20240903+cpu, IPEX 2.5.0+gitf5417a3, INT8, multi-instance, batched

m) GPT-J 6B
6787P: 1-node, 2x Intel(R) Xeon(R) 6787P, 86 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB DDR5 8800 MT/s [8000 MT/s]), BIOS 3A08.QCT001, microcode 0x11000311, 2x BCM57416 NetXtreme-E Dual-Media 10G RDMA Ethernet Controller, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 24.04.1 LTS, 6.8.0-47-generic. Test by Intel as of November 2024.
6767P: 1-node, 2x Intel(R) Xeon(R) 6767P, 64 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB DDR5 8800 MT/s [8000 MT/s]), BIOS 3A08.QCT001, microcode 0x11000311, 2x BCM57416 NetXtreme-E Dual-Media 10G RDMA Ethernet Controller, 1x 1.7T Micron_7450_MTFDKCC1T9TFR, Ubuntu 24.04.1 LTS, 6.8.0-47-generic. Test by Intel as of November 2024.8592+:1-node, 2x INTEL(R) XEON(R) PLATINUM 8592+, 64 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB DDR5 5600 MT/s [5600 MT/s]), BIOS 2.3, microcode 0x21000240, 2x Ethernet Controller 10-Gigabit X540-AT2, 1x 1.7T SAMSUNG MZ1L21T9HCLS-00A07, Ubuntu 24.04.1 LTS, 6.8.0-47-generic. Test by Intel as of October 2024.GPT-J 6B: Intel Model Zoo Optimized Benchmark, Docker 24.0.7; Pytorch/IPEX 2.6.0.dev20241016+cpu, Python 3.10.15. 1 instance per NUMA node; 2nd token P90 latency < 100ms, Chatbot: input token 128, output token 128. Summarization: input token 1024, output token 128.BSX, INT8
m) NGFW
6787P: 1-node, 2x (1 socket used), Intel(R) Xeon(R) 6787P, 86 cores, 350W TDP, HT On, Turbo Off, Total Memory 512GB (16x32GB DDR5 6400 MT/s [6400 MT/s]), BIOS BHSDCRB1.IPC.3544.P22.2411122234, microcode 0x81000360, 1x I210 Gigabit Network Connection, 2x Ethernet Controller E810-C for QSFP, 1x 223.6G INTEL SSDSC2KB240G8, 1x 120M Disk, Ubuntu 22.04 LTS, 5.15.0-27-generic. NGFW 2403, gcc 11.3, Snort 3.1.36 .Test by Intel as of 12/30/24.
8592+: 1-node, 2x (1 socket used), INTEL(R) XEON(R) PLATINUM 8592+, 64 cores, HT On, Turbo Off, NUMA 2, Total Memory 512GB (16x32GB DDR5 5600 MT/s [5600 MT/s]), BIOS EGSDCRB1.SYS.0113.D55.240625, microcode 0x21000291, 1x Ethernet interface, 1x Ethernet Controller I225-LM, 1x 223.6G INTEL SSDSC2KB240G8, 1x 120M Disk, Ubuntu 22.04 LTS, 5.15.0-27-generic, NGFW 24.03, gcc 11.3, Snort 3.1.36, Test by Intel as of 12/31/24.
Performance measured on 1S . NGFW :Test run with Turbo Off, NGFW 24.03 / Snort 3.1.36/Hyperscan 5.4, HTTP 64K Packets / LightSpd Rules.

n) NGINX
6787P: 1-node, 2x (1 socket used), Intel(R) Xeon(R) 6787P 86 cores, HT On, Turbo Off, Total Memory 512GB (16x32GB DDR5 6400 MT/s [6400 MT/s]), BIOS BHSDCRB1.IPC.3544.P07.2410011105, microcode 0x81000314, 10x Ethernet Controller E810-C for QSFP, 1x I210 Gigabit Network Connection, 1x 223.6G KINGSTON SA400S37240G, 1x 240M Disk, Ubuntu 22.04 LTS, 5.15.0-27-generic, Test by Intel as of 01/09/25.
8592+:1-node, 2x (1 socket used), INTEL(R) XEON(R) PLATINUM 8592+ (1 socket used), 64 cores, HT On, Turbo Off, Total Memory 512GB (16x32GB DDR5 5600 MT/s [5600 MT/s]), BIOS EGSDCRB1.SYS.0113.D55.2408280625, microcode 0x21000291, 1x Ethernet Controller I225-LM, 8x Ethernet Controller E810-C for QSFP, 1x 223.6G KINGSTON SUV400S37240G, 1x 240M Disk, Ubuntu 22.04 LTS, 5.15.0-27-generic, Test by Intel as of 12/29/24.
Software: NGINx v0.5.3, gcc 11.2.0, Openssl 3.3.2, ECDHE-X25519-RSA2K.

Configurations: Intel® Xeon® 6 with P-cores TCO Advantages, 128C: Xeon 6980P vs AMD 9755

[9T220] Intel® Xeon® 6 with P-cores delivers up to 24% lower total cost of ownership (TCO) than AMD EPYC 9755 based servers running a Stable Diffusion BS1 INT8 workload. Use 10 racks (100 servers) of Intel® Xeon® 6980P based servers running Stable Diffusion BS1 INT8 instead of 13 racks (130 servers) of AMD EPYC 9755 based servers and save 2618 MWh of energy, reduce carbon footprint by 1110 metric tons CO2, and save $1651K in total cost of ownership over 4-years. Intel Xeon 6980P delivers 1.3x higher performance and 1.34x higher performance/watt per server vs Intel Xeon AMD EPYC 9755 on Stable Diffusion BS1 INT8.
6980P:1-node, 2x Intel(R) Xeon(R) 6980P, 128 cores, 500W TDP, HT On, Turbo On, Total Memory 1536GB (24x64GB MRDIMM 8800 MT/s [8800 MT/s]), BIOS 1.1, microcode 0x1000314, 2x Ethernet Controller X550, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 24.04.1 LTS, 6.8.0-47-generic. Test by Intel as of December 2024. 9755:1-node, 2x AMD EPYC 9755 128-Core Processor, 128 cores, 500W TDP, SMT On, Boost On, Total Memory 1536GB (24x64GB DDR5 6400 MT/s [6000 MT/s]), BIOS 1.1, microcode 0xb002116, 2x Ethernet Controller X550, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 24.04.1 LTS, 6.8.0-47-generic., Ubuntu 24.04.1 LTS, 6.8.0-47-generic. Test by Intel as of January 2025. Software: Stable Diffusion inference, ww45 dlboost container, Python 3.10.14, 2.6.0.dev20241016+cpu, 2.6.0+git81c0d36, INT8, multi-instance, BS1
Assumptions: 1x 42U, 15KW Rack, supporting up to 20x 2U rack servers, 1x TOR switch, 1.6 PUE, kWh to kg CO2 factor 0.42394.
For 13 racks of AMD EPYC 9755 based servers over 4-years, estimated as of Feb 2025: CapEx costs: $3947k, OpEx costs (4 year, includes power and cooling utility costs, infrastructure and hardware maintenance costs): $2715k, Energy use: 10545MWh, CO2 emissions: 4470 metric tons.
For 10 rack of Intel Xeon 6980P based servers over 4-years, estimated as of Feb 2025: CapEx costs: $2947k, OpEx costs (4 year, includes power and cooling utility costs, infrastructure and hardware maintenance costs): $2064k: Energy use: 7926MWh, CO2 emissions: 3360 metric tons.
Costs based on Intel estimates, system pricing from major OEM, and information from thinkmate.com as of Feb 2025. Results may vary.

[9T221] Intel® Xeon® 6 with P-cores delivers up to 44% lower total cost of ownership (TCO) than AMD EPYC 9755 based servers running a Language Processing BERT-large workload. Use 10 racks (90 servers) of Intel® Xeon® 6980P based servers running Language Processing BERT-large instead of 15 racks (165 servers) of AMD EPYC 9755 based servers and save 4124 MWh of energy, reduce carbon footprint by 1748 metric tons CO2, and save $3670K in total cost of ownership over 4-years. Intel Xeon 6980P delivers 1.85x higher performance and 1.51x higher performance/watt per server vs Intel Xeon AMD EPYC 9755 on Language Processing BERT-large.
6980P:1-node, 2x Intel(R) Xeon(R) 6980P, 128 cores, 500W TDP, HT On, Turbo On, Total Memory 1536GB (24x64GB MRDIMM 8800 MT/s [8800 MT/s]), BIOS 1.1, microcode 0x1000314, 2x Ethernet Controller X550, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 24.04.1 LTS, 6.8.0-47-generic. Test by Intel as of December 2024. 9755:1-node, 2x AMD EPYC 9755 128-Core Processor, 128 cores, 500W TDP, SMT On, Boost On, Total Memory 1536GB (24x64GB DDR5 6400 MT/s [6000 MT/s]), BIOS 1.1, microcode 0xb002116, 2x Ethernet Controller X550, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 24.04.1 LTS, 6.8.0-47-generic., Ubuntu 24.04.1 LTS, 6.8.0-47-generic. Test by Intel as of January 2025. Software: BertLarge inference, ww42 dlboost container, Python 3.10.14, Pytorch 2.5.0.dev20240903+cpu, IPEX 2.5.0+gitf5417a3, BSX INT8, multi-instance, batched
Assumptions: 1x 42U, 15KW Rack, supporting up to 20x 2U rack servers, 1x TOR switch, 1.6 PUE, kWh to kg CO2 factor 0.42394.
For 15 racks of AMD EPYC 9755 based servers over 4-years, estimated as of Feb 2025: CapEx costs: $5010k, OpEx costs (4 year, includes power and cooling utility costs, infrastructure and hardware maintenance costs): $3319k, Energy use: 12409MWh, CO2 emissions: 5261 metric tons.
For 10 rack of Intel Xeon 6980P based servers over 4-years, estimated as of Feb 2025: CapEx costs: $2652k, OpEx costs (4 year, includes power and cooling utility costs, infrastructure and hardware maintenance costs): $2007k: Energy use: 8285MWh, CO2 emissions: 3512 metric tons.
Costs based on Intel estimates, system pricing from major OEM, and information from thinkmate.com as of Feb 2025. Results may vary.

intel.

Configurations: Intel® Xeon® 6 with P-cores TCO Advantages, 128C: Xeon 6980P vs AMD 9755

[9T222] Intel® Xeon® 6 with P-cores delivers up to 46% lower total cost of ownership (TCO) than AMD EPYC 9755 based servers running a Recommendation System DLRM workload. Use 10 racks (90 servers) of Intel® Xeon® 6980P based servers running Recommendation System DLRM instead of 17 racks (170 servers) of AMD EPYC 9755 based servers and save 5497 MWh of energy, reduce carbon footprint by 2330 metric tons CO2, and save $4052K in total cost of ownership over 4-years. Intel Xeon 6980P delivers 1.87x higher performance and 1.65x higher performance/watt per server vs Intel Xeon AMD EPYC 9755 on Recommendation System DLRM.
6980P:1-node, 2x Intel(R) Xeon(R) 6980P, 128 cores, 500W TDP, HT On, Turbo On, Total Memory 1536GB (24x64GB MRDIMM 8800 MT/s [8800 MT/s]), BIOS 1.1, microcode 0x1000314, 2x Ethernet Controller X550, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 24.04.1 LTS, 6.8.0-47-generic. Test by Intel as of December 2024. 9755:1-node, 2x AMD EPYC 9755 128-Core Processor, 128 cores, 500W TDP, SMT On, Boost On, Total Memory 1536GB (24x64GB DDR5 6400 MT/s [6000 MT/s]), BIOS 1.1, microcode 0xb002116, 2x Ethernet Controller X550, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 24.04.1 LTS, 6.8.0-47-generic., Ubuntu 24.04.1 LTS, 6.8.0-47-generic. Test by Intel as of January 2025. Software:DLRM v2 inference, ww42 dlboost container, Python 3.10.14, Pytorch 2.5.0.dev20240903+cpu, IPEX 2.5.0+gitf5417a3, BSX INT8, multi-instance, batched
Assumptions: 1x 42U, 15KW Rack, supporting up to 20x 2U rack servers, 1x TOR switch, 1.6 PUE, kWh to kg CO2 factor 0.42394.
For 17 racks of AMD EPYC 9755 based servers over 4-years, estimated as of Feb 2025: CapEx costs: $5162k, OpEx costs (4 year, includes power and cooling utility costs, infrastructure and hardware maintenance costs): $3549k, Energy use: 13782MWh, CO2 emissions: 5843 metric tons.
For 10 rack of Intel Xeon 6980P based servers over 4-years, estimated as of Feb 2025: CapEx costs: $2652k, OpEx costs (4 year, includes power and cooling utility costs, infrastructure and hardware maintenance costs): $2007k: Energy use: 8285MWh, CO2 emissions: 3512 metric tons.
Costs based on Intel estimates, system pricing from major OEM, and information from thinkmate.com as of Feb 2025. Results may vary.

[9T223] Intel® Xeon® 6787P delivers up to 28% lower total cost of ownership (TCO) than AMD EPYC 9755 based servers running a OpenFOAM geomean (2) workload. Use 10 racks (90 servers) of Intel® Xeon® 6980P based servers running OpenFOAM geomean (2) instead of 14 racks (126 servers) of AMD EPYC 9755 based servers and save 2623 MWh of energy, reduce carbon footprint by 1112 metric tons CO2, and save $1887K in total cost of ownership over 4-years. Intel Xeon 6980P delivers 1.43x higher performance and 1.34x higher performance/watt per server vs Intel Xeon AMD EPYC 9755 on OpenFOAM geomean (2).
6980P with MRDIMM: 1-node, 2x Intel(R) Xeon(R) 6980P, 128 cores, 500W TDP, HT On, Turbo On, Total Memory 1536GB (24x64GB MRDIMM 8800 MT/s [8800 MT/s]), BIOS BHSDCRB1.IPC.3544.P15.2410232346, microcode 0x1000341, 2x Ethernet Controller X710 for 10GBASE-T, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 22.04.5 LTS, 6.5.0-21-generic. Test by Intel as of December 2024. 9755: 1-node, 2x AMD EPYC 9755 128-Core Processor, 128 cores, 500W TDP, SMT On, Boost On, Total Memory 1536GB (24x64GB DDR5 6400 MT/s [6000 MT/s]), BIOS 1.1, microcode 0xb002116, 2x Ethernet Controller X710 for 10GBASE-T, 1x 3.5T Micron_7450_MTFDKCB3T8TFR, Ubuntu 24.04.1 LTS, 6.8.0-48-generic. Test by Intel as of January 2025. OpenFOAM (Geomean of motorbike-20m, motorbike-42m) - Intel: App Version: v2312, icx:2025.0 impi:2021.14. AMD: App Version: v2312, https://www.amd.com/en/developer/zen-software-studio/applications/spack/hpc-applications-openfoam.html
Assumptions: 1x 42U, 15KW Rack, supporting up to 20x 2U rack servers, 1x TOR switch, 1.6 PUE, kWh to kg CO2 factor 0.42394.
For 14 racks of AMD EPYC 9755 based servers over 4-years, estimated as of Feb 2025: CapEx costs: $3826k, OpEx costs (4 year, includes power and cooling utility costs, infrastructure and hardware maintenance costs): $2726k, Energy use: 10949MWh, CO2 emissions: 4642 metric tons.
For 10 rack of Intel Xeon 6980P based servers over 4-years, estimated as of Feb 2025: CapEx costs: $2652k, OpEx costs (4 year, includes power and cooling utility costs, infrastructure and hardware maintenance costs): $2013k: Energy use: 8326MWh, CO2 emissions: 3530 metric tons.
Costs based on Intel estimates, system pricing from major OEM, and information from thinkmate.com as of Feb 2025. Results may vary.

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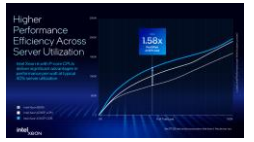
Configurations: Intel® Xeon® 6 with P-cores
TCO Advantages, 128C: Xeon 6980P vs AMD 9755

Claim: Intel® Xeon® 6 with P-cores delivers up to 30% lower total cost of ownership (TCO) than AMD EPYC 9755 based servers running a HPCG workload.

Use 10 racks (90 servers) of Intel® Xeon® 6980P based servers running HPCG instead of 12 racks (132 servers) of AMD EPYC 9755 based servers and save 1665 MWh of energy, reduce carbon footprint by 706 metric tons CO2, and save $2007K in total cost of ownership over 4-years. Intel Xeon 6980P delivers 1.47x higher performance and 1.21x higher performance/watt per server vs Intel Xeon AMD EPYC 9755 on HPCG.
6980P: 1-node, 2x Intel(R) Xeon(R) 6980P, 128 cores, 500W TDP, HT On, Turbo On, Total Memory 1536GB (24x64GB MRDIMM 8800 MT/s [8800 MT/s]), BIOS BHSDCRB1.IPC.3544.P15.2410232346, microcode 0x1000341, 2x Ethernet Controller X710 for 10GBASE-T, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 22.04.5 LTS, 6.5.0-21-generic. Test by Intel as December 2024.
9755: 1-node, 2x AMD EPYC 9755 128-Core Processor, 128 cores, 500W TDP, SMT On, Boost On, Total Memory 1536GB (24x64GB DDR5 6400 MT/s [6000 MT/s]), BIOS 1.1, microcode 0xb002116, 2x Ethernet Controller X710 for 10GBASE-T, 1x 3.5T Micron_7450_MTFDKCB3T8TFR, Ubuntu 24.04.1 LTS, 6.8.0-48-generic. Test by Intel as of January 2025.
Intel software:HPCG: App Version: Intel_Optimized_MKL_v2024.1, icx:2025.0, impi:2021.14, running on physical cores.
AMD software: HPCG: App Version: 2024_10_07, https://www.amd.com/en/developer/zen-software-studio/applications/spack/hpcg-benchmark.html, running on physical cores
Assumptions: 1x 42U, 15KW Rack, supporting up to 20x 2U rack servers, 1x TOR switch, 1.6 PUE, kWh to kg CO2 factor 0.42394.
For 12 racks of AMD EPYC 9755 based servers over 4-years, estimated as of Feb 2025: CapEx costs: $4008k, OpEx costs (4 year, includes power and cooling utility costs, infrastructure and hardware maintenance costs): $2663k, Energy use: 9991MWh, CO2 emissions: 4235 metric tons.
For 10 rack of Intel Xeon 6980P based servers over 4-years, estimated as of Feb 2025: CapEx costs: $2652k, OpEx costs (4 year, includes power and cooling utility costs, infrastructure and hardware maintenance costs): $2013k: Energy use: 8326MWh, CO2 emissions: 3530 metric tons.
Costs based on Intel estimates, system pricing from major OEM, and information from thinkmate.com as of Feb 2025.
Results may vary.

Configurations



[7T20] Up to 1.58x higher Performance per Watt with Intel Xeon 6760P processor vs. Intel Xeon 8592+ at a typical 40% server utilization point
6760P: 1-node, 2x Intel(R) Xeon(R) 6760P, 64 cores, 330W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB DDR5 6400 MT/s [6400 MT/s]), BIOS 1.0b, microcode 0x1000380, 2x Ethernet Controller X710 for 10GBASE-T, 1x 1.7T SAMSUNG MZQL21T9HCJR-00A07, CentOS Stream 9, 5.14.0-529.el9.x86_64. Test by Intel as of January 2025.
8592+: 1-node, 2x INTEL(R) XEON(R) PLATINUM 8592+, 64 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB DDR5 5600 MT/s [5600 MT/s]), BIOS 2.3, microcode 0x21000240, 2x Ethernet Controller 10-Gigabit X540-AT2, 1x 1.7T SAMSUNG MZQL21T9HCJR-00A07, CentOS Stream 9, 5.14.0-529.el9.x86_64. Test by Intel as of January 2025.
Software Config: Power Efficiency workload

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Configurations: Consolidate and Save with Intel® Xeon® 6 with P-cores, 86C Xeon 6787P vs 28C Xeon 8280

[7T21] Intel® Xeon® 6 with P-cores delivers up to 68% lower total cost of ownership (TCO) than 8280 based servers running a ResNet50 workload. Use 10 racks (100 servers) of Intel® Xeon® 6787P based servers running ResNet50 instead of 50 racks (1000 servers) of Intel® Xeon® 8280 based servers and save 30044 MWh of energy, reduce carbon footprint by 12737 metric tons CO2, and save $10392K in total cost of ownership over 4-years. Intel Xeon 6787P delivers 9.98x higher performance and 4.79x higher performance/watt per server vs Intel Xeon 8280 on ResNet50.
6787P: 1-node, 2x Intel(R) Xeon(R) 6787P, 86 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB MRDIMM 8800 MT/s [8000 MT/s]), BIOS 3A08.QCT001, microcode 0x11000311, 2x BCM57416 NetXtreme-E Dual-Media 10G RDMA Ethernet Controller, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 24.04.1 LTS, 6.8.0-47-generic. Test by Intel as of November 2024. 8280: 1-node, 2x Intel(R) Xeon(R) Platinum 8280M CPU @ 2.70GHz, 28 cores, 205W TDP, HT On, Turbo On, Total Memory 768GB (24x32GB DDR4 3200 MT/s [2666 MT/s]), BIOS Intel(R) Xeon(R) Platinum 8280M CPU @ 2.70GHz, microcode 0x4003605, 2x Ethernet Connection X722 for 10GBASE-T, 1x 1.4T INTEL SSDPE21K015TA, , Ubuntu 24.04.1 LTS, 6.8.0-48-generic. Test by Intel as of December 2024. ResNet50 v1.5 inference, OpenVino 2024.4.0-16554-9c9778aba39-luocheng/mha_fusion_bhls, ww45 container, Python 3.8.20, INT8, multi-instance, batched
Assumptions: 1x 42U, 15KW Rack, supporting up to 20x 2U rack servers, 1x TOR switch, 1.6 PUE, kWh to kg CO2 factor 0.42394.
For 50 racks of 8280 based servers over 4-years, estimated as of Feb 2025: CapEx costs: $0k, OpEx costs (4 year, includes power and cooling utility costs, infrastructure and hardware maintenance costs): $15272k, Energy use: 37967MWh, CO2 emissions: 16096 metric tons.
For 10 rack of Intel Xeon 6787P based servers over 4-years, estimated as of Feb 2025: CapEx costs: $2817k, OpEx costs (4 year, includes power and cooling utility costs, infrastructure and hardware maintenance costs): $2063k: Energy use: 7922MWh, CO2 emissions: 3358 metric tons.
Costs based on Intel estimates, system pricing from major OEM, and information from thinkmate.com as of Feb 2025. Results may vary.

[7T22] : Intel® Xeon® 6 with P-cores delivers up to 22% lower total cost of ownership (TCO) than 8280 based servers running a HPCG workload. Use 10 racks (120 servers) of Intel® Xeon® 6787P based servers running HPCG instead of 24 racks (480 servers) of Intel® Xeon® 8280 based servers and save 9889 MWh of energy, reduce carbon footprint by 4193 metric tons CO2, and save $1627K in total cost of ownership over 4-years. Intel Xeon 6787P delivers 3.95x higher performance and 2.15x higher performance/watt per server vs Intel Xeon 8280 on HPCG.
6787P: 1-node, 2x Intel(R) Xeon(R) 6787P, 86 cores, 350W TDP, HT On, Turbo On, Total Memory 512GB (16x32GB MRDIMM 8800 MT/s [8800 MT/s]), BIOS 3A08.QCT001, microcode 0x11000311, 2x Ethernet Controller X550, 1.7T SAMSUNG MZ7L31T9, Ubuntu 24.04.1 LTS, 6.8.0-51-generic. Test by Intel as of December 2024. HPCG: App Version: Intel_Optimized_MKL_v2024.1, icx:2025.0, impi:2021.14, running on physical cores. 8280: HPCG :Intel Xeon 8280L: Test by Intel as of April 2024, 1 node, 2x Intel Xeon 8280L, HT On, Turbo On, 384 GB DDR3-2933, ucode=0x5003605, Ubuntu 23.10, Kernel 6.5.0, BIOS SE5C620.86B.02.01.0017.110620230543. HPCG from MKL_v2022.1.0. running on physical cores.
Assumptions: 1x 42U, 15KW Rack, supporting up to 20x 2U rack servers, 1x TOR switch, 1.6 PUE, kWh to kg CO2 factor 0.42394.
For 24 racks of 8280 based servers over 4-years, estimated as of Feb 2025: CapEx costs: $0k, OpEx costs (4 year, includes power and cooling utility costs, infrastructure and hardware maintenance costs): $7340k, Energy use: 18299MWh, CO2 emissions: 7758 metric tons.
For 10 rack of Intel Xeon 6787P based servers over 4-years, estimated as of Feb 2025: CapEx costs: $3380k, OpEx costs (4 year, includes power and cooling utility costs, infrastructure and hardware maintenance costs): $2334k: Energy use: 8410MWh, CO2 emissions: 3565 metric tons.
Costs based on Intel estimates, system pricing from major OEM, and information from thinkmate.com as of Feb 2025. Results may vary.

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Configurations: Consolidate and Save with Intel® Xeon® 6 with P-cores, 86C Xeon 6787P vs 28C Xeon 8280

[7T23] Intel® Xeon® 6 with P-cores delivers up to 26% lower total cost of ownership (TCO) than 8280 based servers running a Server Side Java Throughput workload. Use 10 racks (100 servers) of Intel® Xeon® 6787P based servers running bbbb2015 - max jOPS instead of 21 racks (420 servers) of Intel® Xeon® 8280 based servers and save 7551 MWh of energy, reduce carbon footprint by 3202 metric tons CO2, and save $1673K in total cost of ownership over 4-years. Intel Xeon 6787P delivers 4.09x higher performance and 1.9x higher performance/watt per server vs Intel Xeon 8280 on Server Side Java Throughput.
6787P: 1-node, 2x Intel(R) Xeon(R) 6787P, 86 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB DDR5 6400 MT/s [6400 MT/s]), BIOS 3A08.QCT001, microcode 0x11000311, 2x BCM57416 NetXtreme-E Dual-Media 10G RDMA Ethernet Controller, 1x 1.7T SAMSUNG MZWLJ1T9HBJR-00007, CentOS Stream 9, 5.14.0-467.el9.x86_64. Test by Intel as of January 2025. 8280:1-node, 2x Intel(R) Xeon(R) Platinum 8280L CPU @ 2.70GHz, 28 cores, 205W TDP, HT On, Turbo On, Total Memory 768GB (24x32GB DDR4 3200 MT/s [2666 MT/s]), BIOS Intel(R) Xeon(R) Platinum 8280L CPU @ 2.70GHz, microcode 0x4003604, 2x Ethernet Connection X722 for 10GBASE-T, 2x Ethernet Controller E810-C for QSFP, 1x 1.4T INTEL SSDPE21K015TA, 1x 1.5T INTEL SSDPE2KE016T7, CentOS Stream 9, 5.14.0-333.el9.x86_64. Test by Intel as of December 2024. Server-side-java workload, JDK 23.0.2
Assumptions: 1x 42U, 15KW Rack, supporting up to 20x 2U rack servers, 1x TOR switch, 1.6 PUE, kWh to kg CO2 factor 0.42394.
For 21 racks of 8280 based servers over 4-years, estimated as of Feb 2025: CapEx costs: $0k, OpEx costs (4 year, includes power and cooling utility costs, infrastructure and hardware maintenance costs): $6361k, Energy use: 15541MWh, CO2 emissions: 6588 metric tons.
For 10 rack of Intel Xeon 6787P based servers over 4-years, estimated as of Feb 2025: CapEx costs: $2617k, OpEx costs (4 year, includes power and cooling utility costs, infrastructure and hardware maintenance costs): $2072k: Energy use: 7989MWh, CO2 emissions: 3387 metric tons.
Costs based on Intel estimates, system pricing from major OEM, and information from thinkmate.com as of Feb 2025. Results may vary.

[7T24] Intel® Xeon® 6 with P-cores delivers up to 29% lower total cost of ownership (TCO) than 8280 based servers running a MySQL OLTP (1S MySQL HammerDB) workload. Use 10 racks (180 servers) of Intel® Xeon® 6787P based servers running MySQL OLTP (1S HammerDB) instead of 39 racks (780 servers) of Intel® Xeon® 8280 based servers and save 14735 MWh of energy, reduce carbon footprint by 6247 metric tons CO2, and save $3284K in total cost of ownership over 4-years. Intel Xeon 6787P delivers 4.29x higher performance and 2.73x higher performance/watt per server vs Intel Xeon 8280 on MySQL OLTP (1S HammerDB).
6787P: 1-node, 2x (1 used) Intel(R) Xeon(R) 6787P, 86 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB DDR5 6400 MT/s [6400 MT/s]), BIOS 3A08.QCT001, microcode 0x11000311, 2x Ethernet Controller E830-CC for QSFP, 2x BCM57416 NetXtreme-E Dual-Media 10G RDMA Ethernet Controller, 4x 3.5T KIOXIA KCD8XPUG3T84, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 22.04.5 LTS, 6.5.0-21-generic. Test by Intel as of December 2024. 8280: 1-node, 2x (1 used) Intel(R) Xeon(R) Platinum 8280M CPU @ 2.70GHz, 28 cores, 205W TDP, HT On, Turbo On, Total Memory 768GB (24x32GB DDR4 3200 MT/s [2666 MT/s]), BIOS Intel(R) Xeon(R) Platinum 8280M CPU @ 2.70GHz, microcode 0x4003605, 2x Ethernet Controller E810-C for QSFP, 2x Ethernet Connection X722 for 10GBASE-T, 1x 1.4T INTEL SSDPE21K015TA, 4x 3.5T INTEL SSDPF2KX038TZ, Ubuntu 22.04.5 LTS, 6.5.0-21-generic. Test by Intel as of December 2024. HammerDB 4.7, TPROC-C, on MySQL 8.0.33, multi-instance
Assumptions: 1x 42U, 15KW Rack, supporting up to 20x 2U rack servers, 1x TOR switch, 1.6 PUE, kWh to kg CO2 factor 0.42394.
For 39 racks of 8280 based servers over 4-years, estimated as of Feb 2025: CapEx costs: $0k, OpEx costs (4 year, includes power and cooling utility costs, infrastructure and hardware maintenance costs): $11068k, Energy use: 23120MWh, CO2 emissions: 9802 metric tons.
For 10 rack of Intel Xeon 6787P based servers over 4-years, estimated as of Feb 2025: CapEx costs: $4833k, OpEx costs (4 year, includes power and cooling utility costs, infrastructure and hardware maintenance costs): $2950k: Energy use: 8385MWh, CO2 emissions: 3555 metric tons.
Costs based on Intel estimates, system pricing from major OEM, and information from thinkmate.com as of Feb 2025. Results may vary.

intel.

Configurations: Consolidate and Save with Intel® Xeon® 6 with P-cores, 86C Xeon 6787P vs 28C Xeon 8280

[7T25] Intel® Xeon® 6 with P-cores delivers up to 44% lower total cost of ownership (TCO) than 8280 based servers running a MongoDB (1S) workload. Use 10 racks (200 servers) of Intel® Xeon® 6787P based servers running MongoDB (1S) instead of 54 racks (1080 servers) of Intel® Xeon® 8280 based servers and save 23036 MWh of energy, reduce carbon footprint by 9766 metric tons CO2, and save $6720K in total cost of ownership over 4-years. Intel Xeon 6787P delivers 5.42x higher performance and 3.75x higher performance/watt per server vs Intel Xeon 8280 on MongoDB (1S).
6787P: 1-node, 2x (1 used) Intel(R) Xeon(R) 6787P, 86 cores, 350W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB DDR5 6400 MT/s [6400 MT/s]), BIOS 3A08.QCT001, microcode 0x11000311, 2x BCM57416 NetXtreme-E Dual-Media 10G RDMA Ethernet Controller, 2x Ethernet Controller E830-CC for QSFP, 4x 3.5T KIOXIA KCD8XPUG3T84, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 22.04.5 LTS, 6.5.0-21-generic. Test by Intel as of December 2024. 8280:1-node, 2x (1 used) Intel(R) Xeon(R) Platinum 8280M CPU @ 2.70GHz, 28 cores, 205W TDP, HT On, Turbo On, Total Memory 768GB (24x32GB DDR4 3200 MT/s [2666 MT/s]), BIOS Intel(R) Xeon(R) Platinum 8280M CPU @ 2.70GHz, microcode 0x4003605, 2x Ethernet Controller E810-C for QSFP, 2x Ethernet Connection X722 for 10GBASE-T, 1x 1.4T INTEL SSDPE21K015TA, 4x 3.5T INTEL SSDPF2KX038TZ, Ubuntu 22.04.5 LTS, 6.5.0-21-generic. Test by Intel as of December 2024. YCSB, MongoDB 6.0.4, muti-instance
Assumptions: 1x 42U, 15KW Rack, supporting up to 20x 2U rack servers, 1x TOR switch, 1.6 PUE, kWh to kg CO2 factor 0.42394.
For 54 racks of 8280 based servers over 4-years, estimated as of Feb 2025: CapEx costs: $0k, OpEx costs (4 year, includes power and cooling utility costs, infrastructure and hardware maintenance costs): $15250k, Energy use: 31437MWh, CO2 emissions: 13327 metric tons.
For 10 rack of Intel Xeon 6787P based servers over 4-years, estimated as of Feb 2025: CapEx costs: $5370k, OpEx costs (4 year, includes power and cooling utility costs, infrastructure and hardware maintenance costs): $3159k: Energy use: 8400MWh, CO2 emissions: 3561 metric tons.
Costs based on Intel estimates, system pricing from major OEM, and information from thinkmate.com as of Feb 2025. Results may vary.

[7T26] Intel® Xeon® 6 with P-cores delivers up to 67% lower total cost of ownership (TCO) than 8280 based servers running a NGINX TLS (1S) workload. Use 10 racks (200 servers) of Intel® Xeon® 6787P based servers running NGINX TLS (1S) instead of 97 racks (1940 servers) of Intel® Xeon® 8280 based servers and save 35107 MWh of energy, reduce carbon footprint by 14883 metric tons CO2, and save $17178K in total cost of ownership over 4-years. Intel Xeon 6787P delivers 9.71x higher performance and 5.81x higher performance/watt per server vs Intel Xeon 8280 on NGINX TLS (1S).
6787P: 1-node, 2x (1 used) Intel(R) Xeon(R) 6787P, 86 cores, 350W TDP, HT On, Turbo Off, Total Memory 1024GB (16x64GB DDR5 6400 MT/s [6400 MT/s]), BIOS 3A08.QCT001, microcode 0x11000311, 2x Ethernet Controller E830-CC for QSFP, 2x BCM57416 NetXtreme-E Dual-Media 10G RDMA Ethernet Controller, 1x 1.7T Micron_7450_MTFDKCC1T9TFR, Ubuntu 24.04.1 LTS, 6.8.0-48-generic. NGINX Webserver TLS1.3 ECDHE-X25519-RSA2K, NGINX Async v0.5.1, OpenSSL 3.1.3, IPP Crypto 2021.8, IPsec MB v 1.4, QAT Driver QAT20.L.1.2.30-00020, QAT_Engine v 1.6.1; Test by Intel as of December 2024. 8280: 1-node, 2x Intel® Xeon® Platinum 8280M CPU @ 2.70GHz, 28 cores, HT On, Total Memory 768GB (12x64GB DDR4 3200 MT/s [2934 MT/s]), BIOS SE5C620.86B.02.01.0017.110620230543, microcode 0x4003605, 2x Ethernet Controller E810-C for QSFP, 2x Ethernet Connection X722 for 10GBASE-T, 1x 1.7T SAMSUNG MZWLR1T9HBJR-00007, Ubuntu 22.04.4 LTS, 6.5.0-25-generic, Software NGINX,NGINX Async v0.5.1, OpenSSL 3.1.3,IPP Crypto 2021.8,IPsec MB v 1.4; Test by Intel as of Aug-2024.
Assumptions: 1x 42U, 15KW Rack, supporting up to 20x 2U rack servers, 1x TOR switch, 1.6 PUE, kWh to kg CO2 factor 0.42394.
For 97 racks of 8280 based servers over 4-years, estimated as of Feb 2025: CapEx costs: $0k, OpEx costs (4 year, includes power and cooling utility costs, infrastructure and hardware maintenance costs): $25566k, Energy use: 42418MWh, CO2 emissions: 17983 metric tons.
For 10 rack of Intel Xeon 6787P based servers over 4-years, estimated as of Feb 2025: CapEx costs: $5370k, OpEx costs (4 year, includes power and cooling utility costs, infrastructure and hardware maintenance costs): $3018k: Energy use: 7311MWh, CO2 emissions: 3099 metric tons.
Costs based on Intel estimates, system pricing from major OEM, and information from thinkmate.com as of Feb 2025. Results may vary.

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Intel® Xeon® 6 Delivers Performance Advantage

Across Diverse Data Center Workloads

Intel Xeon 6900P vs AMD EPYC 9005

General Compute

1.3x	Stream Triad
1.13x	Floating Point Throughput
1.06x	Linpack
0.94x	Integer Throughput

Data & Webservices

1.62x	NGINX TLS 1.3
1.17x	Mongo DB
1.14x	Redis Memtier
1.10x	Redis Vector Similarity Search

HPC

1.52x	HPCG
1.43x	OpenFOAM
1.23x	LAMMPS
1.15x	WRF

AI

2.17x	ResNet-50
1.87x	DLRM
1.85x	BERT large
1.76x	Vision Transformer

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See backup for workloads and configurations. Results may vary.
Performance at ~similar core counts.

Configurations

[9G220] Integer/Floating Point Throughput:
6972P: 1-node, 2x Intel(R) Xeon(R) 6972P, 96 cores, 500W TDP, HT On, Turbo On, Total Memory 1536GB (24x64GB MRDIMM 8800 MT/s [8800 MT/s]), BIOS 1.1, microcode 0x1000314, 2x Ethernet Controller E830-CC for QSFP, 2x Ethernet Controller 10-Gigabit X540-AT2, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 22.04.5 LTS, 6.5.0-21-generic. Test by Intel as of December 2024
9655: 1-node, 2x AMD EPYC 9655 96-Core Processor, 96 cores, 400W TDP, SMT On, Boost On, Total Memory 1536GB (24x64GB DDR5 6400 MT/s [6000 MT/s]), BIOS 1.1, microcode 0xb002116, 1x Ethernet Controller E810-C for QSFP, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, 4x 3.5T KIOXIA KCD8XPUG3T84, Ubuntu 22.04.5 LTS, 6.5.0-21-generic. Test by Intel as of January 2025.
Software: SPEC CPU 2017 Integer/Floating Point Rate v1.1.9 (est), GCC 14.2.0

[9G221] Memory Bandwidth
6972P: 1-node, 2x Intel(R) Xeon(R) 6972P, 96 cores, 500W TDP, HT Off, Turbo On, Total Memory 1536GB (24x64GB MRDIMM 8800 MT/s [8800 MT/s]), BIOS 1.1, microcode 0x1000314, 2x Ethernet Controller E830-CC for QSFP, 2x Ethernet Controller 10-Gigabit X540-AT2, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 22.04.5 LTS, 6.5.0-21-generic. Test by Intel as of December 2024
Software: STREAM v5.10, Triad, oneAPI 2024.2.0
9655: 1-node, 2x AMD EPYC 9655 96-Core Processor, 96 cores, 400W TDP, SMT Off, Boost On, Total Memory 1536GB (24x64GB DDR5 6400 MT/s [6000 MT/s]), BIOS 1.1, microcode 0xb002116, 1x Ethernet Controller E810-C for QSFP, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, 4x 3.5T KIOXIA KCD8XPUG3T84, Ubuntu 22.04.5 LTS, 6.5.0-21-generic. Test by Intel as of January 2025.
Software: STREAM v5.10, Triad, https://www.amd.com/en/developer/zen-software-studio/applications/spack/stream-benchmark.html, running on physical cores.

[9G222] LINPACK:
6972P: 1-node, 2x Intel(R) Xeon(R) 6972P, 96 cores, 500W TDP, HT Off, Turbo On, Total Memory 1536GB (24x64GB MRDIMM 8800 MT/s [8800 MT/s]), BIOS 1.1, microcode 0x1000314, 2x Ethernet Controller E830-CC for QSFP, 2x Ethernet Controller 10-Gigabit X540-AT2, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 22.04.5 LTS, 6.5.0-21-generic. Test by Intel as of December 2024
Software: Intel_Optimized_MKL_v2024.1, running on physical cores
9655: 1-node, 2x AMD EPYC 9655 96-Core Processor, 96 cores, 400W TDP, SMT Off, Boost On, Total Memory 1536GB (24x64GB DDR5 6400 MT/s [6000 MT/s]), BIOS 1.1, microcode 0xb002116, 1x Ethernet Controller E810-C for QSFP, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, 4x 3.5T KIOXIA KCD8XPUG3T84, Ubuntu 22.04.5 LTS, 6.5.0-21-generic. Test by Intel as of January 2025.
Software: HPL: App Version: 2024_10_08, https://www.amd.com/en/developer/zen-software-studio/applications/spack/hpl-benchmark.html, running on physical cores

[9D220] MongoDB (1S):
6980P: 1-node, 2x (1 used) Intel(R) Xeon(R) 6980P, 128 cores, 500W TDP, HT On, Turbo On, Total Memory 1536GB (24x64GB DDR5 6400 MT/s [6400 MT/s]), BIOS 1.1, microcode 0x1000314, 2x Ethernet Controller E830-CC for QSFP, 4x 3.5T KIOXIA KCD8XPUG3T84, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 22.04.5 LTS, 6.5.0-21-generic. Test by Intel as of January 2025.
9755: 1-node, 2x (1 used) AMD EPYC 9755 128-Core Processor, 128 cores, 500W TDP, SMT On, Boost On, Total Memory 1536GB (24x64GB DDR5 6400 MT/s [6000 MT/s]), BIOS 1.1, microcode 0xb002116, 1x Ethernet Controller E810-C for QSFP, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, 4x 3.5T KIOXIA KCD8XPUG3T84, Ubuntu 22.04.5 LTS, 6.5.0-21-generic. Test by Intel as of January 2025.
Software: MongoDB 6.0.4 ycsb-0.17.0

Configuration: Intel Xeon 6900P Delivers Compelling Performance vs AMD EPYC 9005 Across Diverse Data Center Workloads

[9D221]
Redis Memtier (1S):
6980P:1-node, 2x (1 used) Intel(R) Xeon(R) 6980P, 128 cores, 500W TDP, HT On, Turbo On, Total Memory 1536GB (24x64GB MRDIMM 8800 MT/s [8800 MT/s]), BIOS 1.1, microcode 0x1000314, 2x Ethernet Controller E830-CC for QSFP, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 22.04.5 LTS, 6.5.0-21-generic. Test by Intel as of January 2025.
9755: 1-node, 2x (1 used) AMD EPYC 9755 128-Core Processor, 128 cores, 500W TDP, SMT On, Boost On, Total Memory 1536GB (24x64GB DDR5 6400 MT/s [6000 MT/s]), BIOS 1.1, microcode 0xb002116, 1x Ethernet Controller E810-C for QSFP, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, 4x 3.5T KIOXIA KCD8XPUG3T84, Ubuntu 22.04.5 LTS, 6.5.0-21-generic. Test by Intel as of January 2025.
Software: 7.0.5 Memtier: 1.4.0, multi-instance, 1 instance per core

Redis Vector Similarity Search
6960P, Psst: 1-node, 2x Intel(R) Xeon(R) 6960P, 66 cores, 450W TDP, HT On, Turbo On, Total Memory 1536GB (24x64GB MRDIMM 8800 MT/s [8800 MT/s]), BIOS 1.0, microcode 0x11000311, 2x Ethernet Controller X710 for 10GBASE-T, 2x Ethernet Controller E830-CC for QSFP, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 22.04.5 LTS, 6.5.0-21-generic. Test by Intel as of November 2024.
9655: 1-node, 2x AMD EPYC 9655 96-Core Processor, 96 cores, 400W TDP, SMT On, Boost On, Total Memory 1536GB (24x64GB DDR5 6400 MT/s [6000 MT/s]), BIOS 1.1, microcode 0xb002116, 2x I350 Gigabit Network Connection, 2x Ethernet Controller E810-C for QSFP, 1x 5.8T INTEL SSDPE2KE064T8, 1x 1.5T INTEL SSDPF21Q016TB, Ubuntu 22.04.5 LTS, 6.5.0-21-generic. Test by Intel as of January 2025.
Software: Redis 8.0-m02, Redisearch 8, vectordb update.redisearch(1dcb421556448a285aaf84022302183749c459b7), Redis-scripts redisearch_november(46f4d94eebab1efbfc1836eafa30d2928a1ed4b3),1 instance per core

NGINX TLS:
6972P: 1-node, 2x Intel(R) Xeon(R) 6972P, 96 cores, 500W TDP, HT On, Turbo Off, Total Memory 1536GB (24x64GB DDR5 6400 MT/s [6400 MT/s]), BIOS 1.1, microcode 0x1000314, 2x Ethernet Controller E830-CC for QSFP, 1x 1.7T SAMSUNG MZWLJ1T9HBJR-00007, Ubuntu 24.04 LTS, 6.8.0-49-generic. Test by Intel as of December 2024.
Software: NGINX Async v0.5.1, OpenSSL 3.1.3, IPP Crypto 2021.8, IPsec MB v 1.4
9655: 1-node, 2x AMD EPYC 9655 96-Core Processor, 96 cores, 400W TDP, SMT On, Boost Off, Total Memory 1536GB (24x64GB DDR5 6400 MT/s [6000 MT/s]), BIOS 1.1, microcode 0xb002116, 1x Ethernet Controller E810-C for QSFP, 1x 1.7T Micron_7450_MTFDKCC1T9TFR, Ubuntu 24.04 LTS, 6.8.0-47-generic. Test by Intel as of January 2025.
Software: NGINX Async v0.5.1, OpenSSL 3.1.3

Configuration: Intel Xeon 6900P Delivers Compelling Performance vs AMD EPYC 9005 Across Diverse Data Center Workloads

HPC:
6980P with MRDIMM: 1-node, 2x Intel(R) Xeon(R) 6980P, 128 cores, 500W TDP, HT On, Turbo On, Total Memory 1536GB (24x64GB MRDIMM 8800 MT/s [8800 MT/s]), BIOS BHSDCRB1.IPC.3544.P15.2410232346, microcode 0x1000341, 2x Ethernet Controller X710 for 10GBASE-T, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 22.04.5 LTS, 6.5.0-21-generic. Test by Intel as of December 2024.
6972P with MRDIMM: 1-node, 2x Intel(R) Xeon(R) 6972P, 96 cores, 500W TDP, HT On, Turbo On, Total Memory 1536GB (24x64GB MRDIMM 8800 MT/s [8800 MT/s]), BIOS BHSDCRB1.IPC.3544.P15.2410232346, microcode 0x1000341, 2x Ethernet Controller X710 for 10GBASE-T, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 22.04.5 LTS, 6.5.0-21-generic. Test by Intel as of December 2024.
6980P with DDR5: 1-node, 2x Intel(R) Xeon(R) 6980P, 128 cores, 500W TDP, HT On, Turbo On, Total Memory 1536GB (24x64GB DDR5 6400 MT/s [6400 MT/s]), BIOS BHSDCRB1.IPC.3544.P15.2410232346, microcode 0x1000341, 2x Ethernet Controller X710 for 10GBASE-T, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 22.04.5 LTS, 6.5.0-21-generic. Test by Intel as of December 2024.
9755: 1-node, 2x AMD EPYC 9755 128-Core Processor, 128 cores, 500W TDP, SMT On, Boost On, Total Memory 1536GB (24x64GB DDR5 6400 MT/s [6000 MT/s]), BIOS 1.1, microcode 0xb002116, 2x Ethernet Controller X710 for 10GBASE-T, 1x 3.5T Micron_7450_MTFDKCB3T8TFR, Ubuntu 24.04.1 LTS, 6.8.0-48-generic. Test by Intel as of January 2025.
9655: 1-node, 2x AMD EPYC 9655 96-Core Processor, 96 cores, 500W TDP, SMT On, Boost On, Total Memory 1536GB (24x64GB DDR5 6400 MT/s [6000 MT/s]), BIOS 1.1, microcode 0xb002116, 2x Ethernet Controller X710 for 10GBASE-T, 1x 3.5T Micron_7450_MTFDKCB3T8TFR, Ubuntu 24.04.1 LTS, 6.8.0-48-generic. Test by Intel as of January 2025.

Software:
WRF (CONUS-2.5km):
Intel: App Version: v4.5.2, conus2.5km, ifx:2025.0 impi:2021.14
AMD: App Version: v4.5.2, conus2.5km, https://www.amd.com/en/developer/zen-software-studio/applications/spack/hpc-applications-wrf.html
LAMMPS (Geomean of Atomic Fluid, Copper, DPD, Liquid Crystal, Polyethylene, Protein, Stillinger-Weber, Tersoff, Water):
Intel: App Version: v2024-03-07_dev, cmkl:2025.0, icx:2025.0, impi:2021.14, tbb:2022.0
AMD: App Version: v2024-03-07_dev, cmkl:2025.0, icx:2025.0, impi:2021.14, tbb:2022.0
HPCG:
Intel: App Version: Intel_Optimized_MKL_v2024.1, icx:2025.0, impi:2021.14, running on physical cores.
AMD: App Version: 2024_10_07, https://www.amd.com/en/developer/zen-software-studio/applications/spack/hpcg-benchmark.html
OpenFOAM (Geomean of motorbike-20m, motorbike-42m):
Intel: App Version: v2312, icx:2025.0 impi:2021.14
AMD : App Version: v2312, https://www.amd.com/en/developer/zen-software-studio/applications/spack/hpc-applications-openfoam.html

Configuration: Intel Xeon 6900P Delivers Compelling Performance vs AMD EPYC 9005 Across Diverse Data Center Workloads

Vision Transformer:
6980P: 1-node, 2x (1 used) Intel(R) Xeon(R) 6980P, 128 cores, 500W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB MRDIMM 8800 MT/s [8000 MT/s]), BIOS 3A08.QCT001, microcode 0x11000311, 2x BCM57416 NetXtreme-E Dual-Media 10G RDMA Ethernet Controller, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 24.04.1 LTS, 6.8.0-47-generic. Test by Intel as of November 2024.
9755:1-node, 2x AMD EPYC 9755 128-Core Processor, 128 cores, 500W TDP, SMT On, Boost On, Total Memory 1536GB (24x64GB DDR5 6400 MT/s [6000 MT/s]), BIOS 1.1, microcode 0xb002116, 2x Ethernet Controller X550, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 24.04.1 LTS, 6.8.0-47-generic., Ubuntu 24.04.1 LTS, 6.8.0-47-generic. Test by Intel as of January 2025.
Software : Vision Transformer inference, ww45 dlboost container, Python 3.10.14, 2.6.0.dev20241016+cpu, 2.6.0+git81c0d36, INT8, multi-instance, batched
BertLarge:
6980P: 1-node, 2x (1 used) Intel(R) Xeon(R) 6980P, 128 cores, 500W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB MRDIMM 8800 MT/s [8000 MT/s]), BIOS 3A08.QCT001, microcode 0x11000311, 2x BCM57416 NetXtreme-E Dual-Media 10G RDMA Ethernet Controller, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 24.04.1 LTS, 6.8.0-47-generic. Test by Intel as of November 2024.
9755:1-node, 2x AMD EPYC 9755 128-Core Processor, 128 cores, 500W TDP, SMT On, Boost On, Total Memory 1536GB (24x64GB DDR5 6400 MT/s [6000 MT/s]), BIOS 1.1, microcode 0xb002116, 2x Ethernet Controller X550, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 24.04.1 LTS, 6.8.0-47-generic., Ubuntu 24.04.1 LTS, 6.8.0-47-generic. Test by Intel as of January 2025.
Software: BertLarge inference, ww42 dlboost container, Python 3.10.14, Pytorch 2.5.0.dev20240903+cpu, IPEX 2.5.0+gitf5417a3, BSX INT8, multi-instance, batched
DLRM:
6980P: 1-node, 2x (1 used) Intel(R) Xeon(R) 6980P, 128 cores, 500W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB MRDIMM 8800 MT/s [8000 MT/s]), BIOS 3A08.QCT001, microcode 0x11000311, 2x BCM57416 NetXtreme-E Dual-Media 10G RDMA Ethernet Controller, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 24.04.1 LTS, 6.8.0-47-generic. Test by Intel as of November 2024.
9755:1-node, 2x AMD EPYC 9755 128-Core Processor, 128 cores, 500W TDP, SMT On, Boost On, Total Memory 1536GB (24x64GB DDR5 6400 MT/s [6000 MT/s]), BIOS 1.1, microcode 0xb002116, 2x Ethernet Controller X550, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 24.04.1 LTS, 6.8.0-47-generic., Ubuntu 24.04.1 LTS, 6.8.0-47-generic. Test by Intel as of January 2025.
Software:DLRM v2 inference, ww42 dlboost container, Python 3.10.14, Pytorch 2.5.0.dev20240903+cpu, IPEX 2.5.0+gitf5417a3, BSX INT8, multi-instance, batched
ResNet50:
6980P: 1-node, 2x (1 used) Intel(R) Xeon(R) 6980P, 128 cores, 500W TDP, HT On, Turbo On, Total Memory 1024GB (16x64GB MRDIMM 8800 MT/s [8000 MT/s]), BIOS 3A08.QCT001, microcode 0x11000311, 2x BCM57416 NetXtreme-E Dual-Media 10G RDMA Ethernet Controller, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 24.04.1 LTS, 6.8.0-47-generic. Test by Intel as of November 2024.
9755:1-node, 2x AMD EPYC 9755 128-Core Processor, 128 cores, 500W TDP, SMT On, Boost On, Total Memory 1536GB (24x64GB DDR5 6400 MT/s [6000 MT/s]), BIOS 1.1, microcode 0xb002116, 2x Ethernet Controller X550, 1x 3.5T SAMSUNG MZWLJ3T8HBLS-00007, Ubuntu 24.04.1 LTS, 6.8.0-47-generic., Ubuntu 24.04.1 LTS, 6.8.0-47-generic. Test by Intel as of January 2025.
Software:ResNet50 v1.5 inference, OpenVino 2024.4.0-16554-9c9778aba39-luocheng/mha_fusion_bhls, ww45 container, Python 3.8.20, BSX INT8, multi-instance, batched

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