Guide to Sustainable Computing

5 reasons why processor selection makes a difference

Intel can help you meet your sustainability goals.
Use this guide to learn how.

1

Do more with less.

Focus on doing more per watt. Instead of general-purpose cores, consider processors with integrated accelerators and software optimizations that can help improve performance per watt. Look for artificial intelligence (AI) and telemetry tools that can monitor and manage resource efficiencies.

2

Make decisions based on workloads that matter.

Select your processor based on performance measurements of workloads that reflect real-life applications, including managing data.

AI workloads use up to	Network infrastructure workloads use up to	HPC workloads use up to
96% less electricity	**51%** less electricity	**39%** less electricity

with Intel® Xeon® processor–powered servers, compared to AMD EPYC processor–powered servers.[1,2,3]

3

Lower the carbon footprint of your data center.

Processors with built-in accelerators can run workloads more efficiently. This can help reduce the electricity used, thereby reducing carbon emissions.

4

Look beyond cores.

Look beyond core count and TDP specifications. Consider a balanced architecture that uses built-in workload accelerators that can improve energy efficiency.

- Intel® Advanced Vector Extensions 512 (Intel® AVX-512)
- Intel® Deep Learning Boost (Intel® DL Boost)
- Intel® Crypto Acceleration

5

Assess total cost of ownership (TCO) across your server fleet.

Improving performance per watt can help significantly reduce TCO across a data center. For example, running the **PostgreSQL** database with **Intel® Mesh Architecture** can enable:

Up to	Up to	Up to
24% fewer servers used	**24%** lower total costs over four years	**11%** less electricity used

with Intel® Xeon® processors, compared to AMD EPYC processors.[4]

Meet your sustainability goals with Intel.

Use the Intel® Xeon® Processor Sustainability Advisor to select the best processor for more efficient data center operations.
https://xeonprocessoradvisor.intel.com/

Refer to the Intel® Xeon® Processor Advisor On-prem Workload and Sustainability module to get started.

[1] 96% less electricity claim based on Intel testing of ResNet-34 and Intel-optimized TF v2.7. All testing completed as of April 2022. Common configuration: **Configurations: Intel® processor–based configuration:** Intel® Xeon® Gold 6342 processor (24 cores, 230 W thermal design power, (TDP)) and Intel® Xeon® Platinum 8358 processor (32 cores, 250 W TDP), system: SMC220-TNR, sockets: 2, ucode: 0xd0002a0, memory: 1 TB (16 x 64 GB DDR4-3200) total, operating system (OS): Ubuntu 20.04.4 LTS, kernel: 5.4.0-120-generic, Sub-NUMA Cluster (SNC): off, Intel® Turbo Boost Technology: on, Intel® Hyper-Threading Technology (Intel® HT Technology): on, network: 1 x 10 Gb Intel® Ethernet Converged Network Adapter X540-T2, storage: 1 x Serial ATA (SATA), 1 x Intel® SSD D7-P5510 NVMe, software: SSD-RESNET 3.6, Intel® optimized TF v2.7. **AMD processor–based configuration:** AMD EPYC 7443 processor (24 cores, 200 W TDP) and AMD EPYC 7543 processor (32 cores, 225 W TDP), system: SMC AS -2124US-TNRP, sockets: 2, ucode: ia00114, memory: 1 TB (16 x 64 GB DDR4-3200) total, OS: Ubuntu 20.04.4 LTS, kernel: 5.4.0-107-generic, NUMA per socket (NPS): 1, turbo: on, AMD Simultaneous Multithreading (SMT): on, network: 1 x 10 Gb Intel® Ethernet Converged Network Adapter X540-T2, storage: 1 x SATA, 1 x Intel® SSD D7-P5510 NVMe, software: SSD-RESNET 3.6, TF_v2.7_ZenDNN_v3.2.

[2] Based on Intel testing as of May 2022. **NGINX**, running 10M CPS. **Configurations: Intel® processor–based configuration:** Intel® Xeon® Gold 6338N processor (32 cores, 185 W TDP, system: SMC X12DPG-QT6, sockets: 1, ucode: 0x8000332, memory: 128 GB (8 x 16 GB DDR4-3200) total, OS: Ubuntu 20.04.4 LTS, kernel: 5.4.0-67-generic, SNC: off, Intel® Turbo Boost Technology: off, Intel® HT Technology: on, network: 1 x 2 x 100 Gb Intel® Ethernet Network Adapter E810, storage: 1 x SATA, software: NGINX 1.20.1, OPENSSL 1.1.1f, RSA 2K, TLS Handshake. **AMD processor–based configuration:** AMD EPYC 7513 (32 cores, 200 W TDP, SMC H12Dsi-NL, sockets: 1, ucode: 0xa001143, memory: 128 GB (8 x 16 GB DDR4-3200) total, OS: Ubuntu 20.04.4 LTS, kernel: 5.4.0.67-generic, NUMA per socket (NPS): 2, turbo: off, AMD SMT: on, network: 1 x E810 2x100G, storage: 1 x SATA, software: NGINX 1.20.1, OPENSSL 1.1.1f, RSA 2K, TLS Handshake.

[3] Based on Intel testing as of February 2022. **LAMMPS**, running Proton 1K 1st. **Configurations: Intel® processor–based configuration:** Intel® Xeon® Gold 6342 processor (24 cores, 230 W TDP) and Intel® Xeon® Platinum 8358 processor (32 cores, 250 W TDP), system: SMC220-TNR, sockets: 2, ucode: 0xd0002a0, memory: 1 TB (16 x 64 GB DDR4-3200) total, OS: Red Hat Enterprise Linux 8.5, kernel: 4.18.0-348.12.2.el8_5.x86_64, SNC: on, Intel® Turbo Boost Technology: on, Intel® HT Technology: on, network: 1 x 10 Gb Intel® Ethernet Converged Network Adapter X540-T2, storage: 1 x SATA, 1 x Intel® SSD D7-P5510 NVMe, software: SSD-RESNET 3.6, TF_v2.7_ZenDNN_v3.2. **AMD processor–based configuration:** AMD EPYC 7543 processor (24 cores, 200 W TDP) and AMD EPYC 7543 processor (32 cores, 225 W TDP), system: SMC AS -2124US-TNRP, sockets: 2, ucode: ia001114, memory: 1 TB (16 x 64 GB DDR4-3200) total, OS: Red Hat Enterprise Linux 8.5, kernel: 4.18.0-348.12.2.el8_5.x86_64, NPS: 4, turbo: on, AMD SMT: on, network: 1x 10 Gb Intel® Ethernet Converged Network Adapter X540-T2, storage: 1 x SATA, 1 x Intel® SSD D7-P5510 NVMe, software: App Version: v2020-10-29; Build notes: Tools: Intel® MKL 2020u4, Intel® C Compiler 2020u4, Intel® Threading Building Blocks 2020u4, Intel® MPI 2019u8; Build knobs: -O3 -ip -xCORE-AVX512 -qopt-zmm-usage=high. **AMD processor–based configuration:** AMD EPYC 7543 processor (24 cores, 200 W TDP) and AMD EPYC 7543 processor (32 cores, 225 W TDP), system: SMC AS -2124US-TNRP, sockets: 2, ucode: ia001114, memory: 1 TB (16 x 64 GB DDR4-3200) total, OS: Red Hat Enterprise Linux 8.5, kernel: 4.18.0-348.12.2.el8_5.x86_64, NPS: 4, turbo: on, AMD SMT: on, network: 1x 10 Gb Intel® Ethernet Converged Network Adapter X540-T2, storage: 1 x SATA, 1 x Intel® SSD D7-P5510 NVMe, software: App Version: v2020-10-29; Build notes: Tools: Intel® MKL 2020u4, Intel® C Compiler 2020u4, Intel® Threading Building Blocks 2020u4, Intel® MPI 2019u8; Build knobs: -O3 -ip -xCORE-AVX512 -qopt-zmm-usage=high.

[4] Based on Intel testing as of February 2022. 100-node postgres module (NPM). **Configurations: Intel® processor–based configuration:** Intel® Xeon® Gold 6346 processor (16 cores, 205 W TDP), Intel® Xeon® Gold 6342 processors (24 cores, 230 W TDP), and Intel® Xeon® Platinum 8358 processor (32 cores, 250 W TDP), system: SMC 220U-TNR, sockets: 2, ucode: 0xd0002a0, memory: 1 TB (16 x 64 GB DDR4-3200) total, OS: Ubuntu 20.04.4 LTS, kernel: 5.4.0-120-generic, SNC: off, Intel® Turbo Boost Technology: on, Intel® HT Technology: on, network: 1 x 10 Gb Intel® Ethernet Converged Network Adapter X540-T2, storage: 1 x SATA, 2 x Intel® SSD D7-P5510 NVMe, software: HammerDB 4.3, PostgreSQL 14.1. **AMD processor–based configuration:** AMD EPYC 7343 processor (16 cores, 190 W TDP), AMD EPYC 7443 processor (24 cores, 200 W TDP), and AMD EPYC 7543 processor (32 cores, 225 W TDP), system: SMC AS -2124US-TNRP, sockets: 2, ucode: 0xa001114, memory: 1 TB (16 x 64 GB DDR4-3200) total, OS: Ubuntu 20.04.4 LTS, kernel: 5.4.0-120-generic, NPS: 1, turbo: on, AMD SMT: on, network: 1x 10 Gb Intel® Ethernet Converged Network Adapter X540-T2, storage: 1 x SATA, 1 x Intel® SSD D7-P5510 NVMe, software: HammerDB 4.3, PostgreSQL 14.1.

Performance varies by use, configuration, and other factors. Learn more at **www.Intel.com/PerformanceIndex**.

Performance results are based on testing as of dates shown in configurations and may not reflect all publicly available updates. No product or component can be absolutely secure.

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