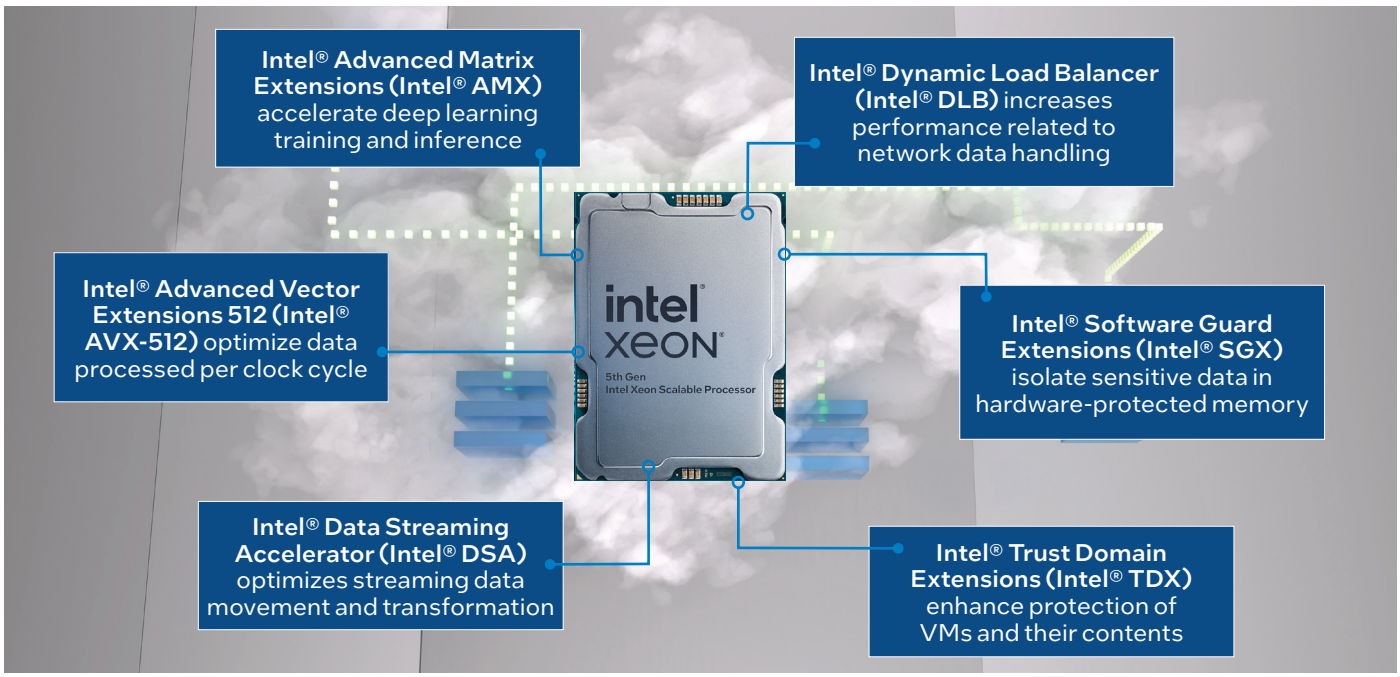
Performance. Efficiency. Security. Across All Your Clouds.

Moving workloads to a cloud operating model — or developing them there from the start — may deliver significant cost, agility and scalability advantages. At the same time, those benefits are not automatic or guaranteed. IT pros face growing complexity in the cloud services marketplace, and it is easy to make errors such as choosing the wrong instances or over-provisioning resources. As a result, many organizations find that moving to the cloud actually *costs* them money instead of delivering savings.

75% of tech leaders **BUILD IN THE CLOUD**[1]

87% of organizations **EMBRACE MULTIPLE CLOUDS**[2]

51% of IT spend **TO PUBLIC CLOUD BY 2025**[3]



intel
XEON

Your business objective: Grow revenue and innovate

To support revenue growth, successful IT organizations must be able to achieve performance, efficiency and secure access for key workloads at the most favorable price point possible, regardless of where the workload is deployed.

To expand revenues, companies must offer the type of excellent, seamless user experience — every time and at every scale — that attracts and retains customers. High-performance cloud infrastructure is critical for the responsive, intelligent services that differentiate today's businesses.

How Intel can help

By delivering more performance per core with built-in accelerators, 5th Gen Intel® Xeon® processors help you meet requirements for the most demanding workloads – so you can exceed the demands of your customers.

PERFORMANCE PROOFPOINT

UP TO **2.93x** HIGHER PERFORMANCE ON CLOUD-NATIVE BENCHMARK[4]

CloudXPRT Web Microservices with 5th gen Intel Xeon Platinum 8592+ processor vs. 5-year-old platform

- **Improved customer experiences**. Web server capacity and performance deliver web experiences that keep visitors engaged. Speed up data movement through and within cloud platforms to improve throughput on search, social, e-commerce, media and other digital services while addressing key challenges, such as quality of service, infrastructure overhead and observability.
- **Higher throughput for faster storage**. Be prepared for the massive data that comes with growth. Scale storage requirements smoothly to speed throughput while offloading from CPU cores, requiring fewer cores for the workload.
- **More performance from data center and cloud resources**. Accelerated encryption, data compression and data movement between nodes promote more efficient use of your CPU and power resources while delivering the performance needed to support growth.

Benefit *your* business

Increased ability to generate revenue are on full display in Google Cloud-based rendering operations by Gunpowder, a provider of film visual effects. The company credits reduced compute instance time for helping it be more competitive in an industry where price wars can be fierce, landing new business and building a stronger brand.

Ready to modernize.

There is a lot of pressure for organizations to hit efficiency, TCO, security and sustainability goals, even as they drive IT innovation in areas such as cloud infrastructure and AI. Microsoft Server 2016 and 2019 End of Life and End of Support is also creating pressure to upgrade. Simply put, systems from four years ago do not meet today's demands.

A refresh strategy based on Intel® Xeon® processors enables you to look holistically at investments across software, hardware and infrastructure, with updated elements optimized to bring out the best of each other.

PERFORMANCE PROOFPOINT

UP TO **62%** REDUCED TCO THAT CAN BE REINVESTED FOR GROWTH[5]

WITH **3:1** SERVER CONSOLIDATION FOR A SMALLER DATACENTER FOOTPRINT AND LOWER COSTS[5]

Your business objective: Cost Reduction

Organizations are being challenged to reduce their capital and operating expenses — hardware purchases, software licenses, power consumption and cloud costs — even while keeping up with increasing workload demands. Significant cost reductions can result from improving operational efficiency through optimized performance and refreshing old technology.

Energy efficiency is a growing concern for organizations of all kinds, especially as they work to advance their sustainability initiatives. Many organizations are considering how to reduce power consumption in their technology infrastructure and cloud purchases. In the context of public cloud infrastructure, reducing compute time is a proxy for reducing on-prem resource consumption, with similarly direct ties to cost-per-compute operation.

How Intel can help

Lower your TCO by upgrading to 5th Gen Intel Xeon processors with built-in accelerators to improve performance per watt and features for managing power efficiency. 5th Gen Intel Xeon processors also deliver fine-grained control over frequency and power consumption in runtime environments, without any workload changes.

Optimization tools

Intel's cloud optimization tools help businesses make wise choices about provisioning, maintaining and tuning cloud infrastructure. Intel Cloud Development Tools help developers cost-effectively build cloud solutions that are optimized for Intel hardware, including support for tuning cost and performance results across the solution lifecycle:

- **Choose the right migration path:** Dr. Migrate is an automated approach to cloud migrations driven by machine learning. It learns how your applications interconnect and identifies which applications to migrate first and which out-of-date apps you should remove.
- **Improve your deployment**: Densify measures production workloads to recommend cloud instance migrations for efficiency and performance gains.
- **Optimize real-time performance**: Granulate, an Intel company, automatically and continuously optimizes cloud software for performance, without code changes.

Get more details in "How to Get the Most Out of Your Cloud Without the Expense."

Key metrics analysis

With Intel Inspector (previously known as Intel Thread Checker), you can get answers to critical questions like:

- Which applications are using your memory?
- Do you have a lot of resource contention in your cache?
- Do you have a properly hyper-threaded application that's being well distributed, or is it only using one core?
- How much power are you using and where?

Benefit *your* business

In need of a fast path to increased compute cost efficiency while rebuilding the infrastructure to expand its communications platform, Nylas implemented autonomous, continuous optimization based on Granulate, enabling the company to improve cloud performance and reduce costs.

Further cost-per-compute advantages may be possible by combining the Intel Xeon platform with Intel Gaudi deep learning accelerators. Mobileye, an Intel company, successfully achieved a 40% improvement in price-performance on its cloud infrastructure using Amazon EC2 DL1 instances based on Intel Gaudi accelerators.

Your business objective: Risk Mitigation

Traditional encryption can't protect data while it is in use because applications must generally access it in unencrypted form. Confidential computing provides trusted execution environments (TEEs) where that interaction occurs in an isolated trust domain, protected from untrusted access.

Controlling data in the cloud is critical, particularly because of the privacy, regulatory and intellectual property concerns associated with sensitive data. By extending protections to data while it is in use by applications, confidential computing enables a range of business benefits, including the ability to access large training sets for AI models.

PERFORMANCE PROOFPOINT

UP TO **1.73x** HIGHER VIRTUALIZATION PERFORMANCE[6]

5th Gen Intel Xeon Platinum 8592+ processor vs. 3-year REFRESH platform

How Intel can help

5th Gen Intel Xeon processors improve dramatically on the confidential computing technologies of predecessors with the general availability of VM-level in addition to application-level isolation. This range of choice allows you to match a solution to your specific business and regulatory needs.

- **Application-level isolation**. Intel Software Guard Extensions (Intel SGX) is the most researched, updated and deployed confidential computing technology in data centers on the market today. For customers that need the least amount of code to access confidential data, Intel SGX provides the smallest trust boundary of any confidential computing technology in the data center today.
- **VM-level isolation**. Intel Trust Domain Extensions (Intel TDX) offers isolation and confidentiality at the virtual machine (VM) level. Within an Intel TDX confidential VM, the guest OS and VM applications are isolated from access by the cloud host, hypervisor and other VMs on the platform. Unlike Intel SGX, Intel TDX does not require application code changes, offering a simpler migration path for existing VMs to move to a TEE.
- **Independent attestation**. Intel provides independent attestation services in a public/private multi-cloud environment with Intel Trust Authority. Designed to remotely verify and assert trustworthiness of compute assets such as TEEs, devices and roots of trust, the service provides independent verification from the cloud infrastructure provider hosting the workload for additional assurance.

Benefit *your* business

Confidential computing lets Equideum Health engage in multi-party analysis collaborations using protected, sensitive data such as full-sequence human genomes and other biometrics. Drawing on Fortanix software technology and Intel SGX, Equideum has opened the door to innovations in personalized precision medicine.

Innovate freely with open technology

Intel is committed to an open software strategy, designed with developers in mind so that the investments you make in Intel technologies continue to add value in future generations.

Optimizations for Intel Xeon processors are already integrated into the mainstream distributions of popular deep learning frameworks, including TensorFlow and PyTorch. Intel is a top contributor to major open source projects such as Linux and Kubernetes, a commitment that extends to open source AI innovation as well. In fact, 90% of developers are using software developed or optimized by Intel.[7]

Intel oneAPI and AI tools help developers take full advantage of processor performance with an open, standards-based programming model that avoids proprietary lock-in.

- **Intel Cloud Development Tools** help you build innovative cloud solutions with resources for optimization and open source platforms tuned for Intel hardware and cloud accelerators.
- **Intel oneAPI Deep Neural Network Library (oneDNN)** is a performance library of basic deep-learning building blocks, a modular toolkit to accelerate the creation of optimized AI solutions.
- **Intel AI Analytics Toolkit (AI Kit)** accelerates machine learning and data science pipelines end-to-end with optimized deep learning frameworks and high-performing Python.
- **Intel Distribution of OpenVINO™ Toolkit** enables teams to rapidly deploy high-performance inference applications across platforms, from edge to cloud.
- **Intel oneAPI Rendering Toolkit (Render Kit)** accelerates visual compute to deliver high-performance, high-fidelity visualization applications using advanced libraries.

Find recipes, benchmarks and other resources on how to optimize key workloads using specific built-in accelerators and other hardware features at the Intel Optimization Hub. Try the capabilities of new built-in accelerators on the Intel Developer Cloud, which offers easy access to the latest Intel technologies without downloads and hardware setup.

Reimagine what's possible

Forward-looking decision makers must capture the full potential of cloud computing to grow revenue, innovate, reduce costs and reduce risk. Intel uniquely provides the comprehensive hardware, software, tools and design patterns to realize that vision. 5th Gen Intel Xeon processors deliver more performance per core and per watt than predecessors, to meet emerging demands while delivering on key business metrics.

Reimagine what's possible. It starts with Intel.

Learn More

www.intel.com/xeon

www.intel.com/cloud

developer.intel.com/cloud

[1] G2, April 16, 2023. "160+ Fascinating Cloud Computing Statistics for 2023." https://www.g2.com/articles/cloud-computing-statistics.

[2] Flexera. "2023 State of the Cloud Report." https://info.flexera.com/CM-REPORT-State-of-the-Cloud.

[3] Gartner, February 9, 2022. "Gartner Says More Than Half of Enterprise IT Spending in Key Market Segments Will Shift to the Cloud by 2025." https://www.gartner.com/en/newsroom/press-releases/2022-02-09-gartner-says-more-than-half-of-enterprise-it-spending.

[4] See [W4] at intel.com/processorclaims: 5th Gen Intel Xeon processors. Results may vary.

[5] Claims based on 4th Gen Intel Xeon processors. Intel, June 29 2023. "Minimize Total Cost of Ownership with a Server Refresh." https://www.intel.com/content/www/us/en/content-details/783070/minimize-total-cost-of-ownership-with-a-server-refresh.html.

[6] See [W9] at intel.com/processorclaims: 5th Gen Intel Xeon processors. Results may vary.

[7] Global Development Survey conducted by Evans Data Corp., 2021.

Performance varies by use, configuration and other factors. Learn more on the Performance Index site.

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

Your costs and results may vary.

Intel does not control or audit third-party data. You should consult other sources to evaluate accuracy.

Intel technologies may require enabled hardware, software or service activation.

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