Find the Right Intel® Xeon® Processor-Based Server to Match Your Workload

To select the right server platform for your IT organization, you need to balance complex technical demands with constraints such as budget and floor space. Because different platforms offer unique benefits and capabilities, it is critical to understand how platforms based on Intel® Xeon® processors can address the particular needs of your environment.

This guide will help you identify and distinguish among the benefits of the Intel® Xeon® processor E7 and E5 families for common high-performance computing (HPC), database, and virtualization workloads.

**Match Your Workload to the Best Processor**

To select the right processor for your environment, an essential first step is to identify and prioritize your workload requirements. Factors to consider include:

- Processor frequency and cores
- Memory capacity and bandwidth
- Energy efficiency and density
- I/O speed and capacity
- Reliability, availability, and serviceability

As shown in the figures that follow, prioritizing these requirements will help you determine which Intel Xeon processor-based server will be best for your specific workload.

In addition to considering the requirements shown in the figures, make sure you consider the total cost of ownership, your need for scalability (including scaling cores, memory per core, and performance per core), and adaptability of the platform.

The latest Intel® Xeon® processors usher in a new era of intelligent performance that takes compute density to new heights, while delivering best-in-class support for virtualization, consolidation, and cloud computing. Servers based on these processors can help you create a standardized, reliable IT infrastructure that helps you drive down data center space, power, cooling, and management costs, while providing exceptional performance and reliability, even for your most data-demanding applications.
Workload #1: HPC

HPC includes a broad array of applications that have different requirements. To select the right platform, it’s helpful to first distinguish between two general categories of HPC: scale-out and scale-up.

Scale-out HPC

For scale-out HPC applications such as seismic modeling, digital content creation, and crash simulation, a balance of performance and energy efficiency is ideal. Your choice of a two- or four-socket system will largely depend on the compute, memory, and I/O requirements of your environment.

The Intel Xeon processor E5-2600 and E5-4600 product families support two- and four-socket systems, respectively, that provide strong solutions for these applications. Both processor families feature Intel® Advanced Vector Extensions (Intel® AVX),1,2 which boost floating point performance for CPU-bound workloads and support up to 12 DIMMs per socket for workloads that need to balance performance with memory. Node-to-node latency for highly clustered solutions is reduced with up to 40 lanes of integrated PCIe* 3.0 per socket.

Scale-out systems also need to maximize the compute per square foot and thus can benefit from the improved density and energy efficiency of the Intel Xeon processor E5 family.

Scale-up HPC

System uptime and data integrity are the critical factors for data-demanding, transaction-intensive, technical computing workloads such as financial services portfolio analysis and cosmology research. The same is true for clustered systems based on large-memory, high-core-count supernodes.

Because of the unique requirements for scale-up HPC, your server selection priorities will typically be different for these applications than for scale-out HPC applications. Reliability and memory capacity will likely rank as your highest priorities, followed by performance and other factors.

The Intel Xeon processor E7 family provides the advanced reliability features and large memory capacity necessary to seamlessly handle the massive amounts of data required by scale-up workloads. Additionally, the processors are able to scale from two to eight sockets gluelessly and support up to 16 DIMMs per socket, which provides a large-memory, high-core-count supernode solution. Solve even higher degrees of freedom problems with node-controller-based platforms that support up to 256 total sockets per system image.
Workload #2: Database

Organizations and companies of all sizes depend on databases for their operations. Because of this, databases come in many shapes and sizes, cutting across multiple application types. Selecting the right platform requires differentiating between the many categories of databases, three of which are discussed below: infrastructure, back-end, and in-memory.

Infrastructure databases

Infrastructure databases are typically small- to medium-size databases accessed on a departmental level. They contain the application programming for web, file and print sharing, and other applications that depend on a robust connection to the client environment.

In both scale-out and scale-up environments, these workloads require systems such as those powered by the Intel Xeon processor E5-2600 and E5-4600 product families, which are able to balance compute performance, reduce I/O and network access latency, and increase throughput. Solid-state disk (SSD) drives and 10 Gb Ethernet should also be considered to enable faster access to data in the system.

Back-end databases

Back-end databases such as On-Line Transaction Processing (OLTP), business processes (enterprise resource planning, customer relationship management, etc.), and decision support (data mining/analysis) require high reliability and availability, as well as higher-performing threads and increased memory capacity to support the larger amount and criticality of data.

Servers based on the Intel Xeon processor E7 family can support the large-dataset processing required for these challenging workloads. The servers can support up to 16 DIMMs per socket (up to 2TB of memory in a four-socket configuration). They also include processor-based advanced reliability features such as Machine Check Architecture Recovery, which helps maximize system availability and data integrity. Servers for these deployments are typically built with redundant configurations or as clusters for reliability and performance, so they greatly benefit from the addition of fast networks, such as 10 Gb Ethernet, and scale-out storage based on Intel Xeon processors and Intel SSDs to improve storage efficiencies and data management.

In-memory databases

In-memory databases are typically used for fast analysis of data to return near-instant results for decision support. These databases require large memory capacity to decrease data processing and analysis time, as well as high reliability to ensure system uptime and data integrity.

The Intel Xeon processor E7 family can provide the consistent uptime and data locality needed for these workloads. For clustered or mid-tier scalability, both the Intel Xeon processor E7 and E5 families provide the processing and connectivity needed. In-memory database systems in these types of environments would also benefit greatly from the fast I/O performance of SSDs and the faster network connectivity of 10 Gb Ethernet.

The Rise of 10 Gb Ethernet

What’s Driving Demand for 10 Gb Ethernet?

Data volumes and network bandwidth consumed by data centers are doubling every 18 months and the number of devices accessing networks doubles every 2.5 years.


Workload #3: Virtualization

To increase overall data center performance without exceeding physical capacity, you may need to virtualize many of your workloads. Platform selection for your virtualization efforts should be based on the type of workload, the required performance, and the virtual machine (VM) sizing.

Mainstream virtualization

Mainstream virtualization of non-mission-critical workloads is a great way to consolidate a company’s infrastructure applications. For these departmental and experimental workloads, the Intel Xeon processor E5-2600 and E5-4600 product families provide the right combination of price performance, energy efficiency, and ease of deployment that IT demands.

Did You Know?

More than 30 million networked sensor nodes are now present in the transportation, automotive, industrial, utilities, and retail sectors.

Containing the latest innovations in Intel® Virtualization Technology, the Intel Xeon processor E5-2600 and E5-4600 product families support an array of processor and I/O virtualization capabilities that enable the maximum use of system resources to deliver the high performance necessary for demanding IT workloads.

**High-density, high-capability virtualization**

With highly demanding workloads, increased need for higher consolidation, or virtualization of business-critical workloads, you need systems with maximum reliability and greater performance and headroom.

For example, when VM density (VMs per server) increases to more than 30 VMs, or VM capability (virtual CPUs, memory, or I/O per VM) increases to more than the currently accepted 8 GB per VM, it can make sense to move to the Intel Xeon processor E7 family.

Huge generational improvements in overall compute capacity and I/O throughput in the Intel Xeon processor E7 family mean more consolidation to reduce your data center operational costs. By consolidating demanding workloads on a single system with a virtual network connecting the applications, your data center can reclaim significant performance increases and cost savings over traditional multi-system deployments.

Intel® Virtualization Technologies have been a boon to the IT environment since their introduction in 2004. At that time, average server utilization was in the low single-digit percentages, causing data centers to be filled with under-utilized server and storage capacity while using significant amounts of power.

The introduction of virtualization technologies, and their enabling in key software infrastructure—such as VMware ESX,* Microsoft Hyper-V,* and open-source virtualization projects (Xen hypervisors,* KVM hypervisors,* etc.)—enabled IT to right-size data center space and utilize systems and power more efficiently. These types of improvements also became the early implementation of “as-a-service” deployments that have resulted in the move to cloud computing in the corporate environment.

The evolution of virtualization technologies is one of many examples of how Intel® processor and system technologies have resulted in TCO reductions in the IT environment and innovations in how IT returns value to the business.