The Advantages of 4-Socket Servers

Based on the Intel® Xeon® Processor E5-4600 Product Family

Increase Performance and Reduce Total Cost of Ownership
A new generation of processors provides clear benefits for moving up to 4-socket servers

With the recent release of the Intel® Xeon® processor E5-4600 product family, it’s time to take a new look at 4-socket servers. This new Intel Xeon processor line provides up to 1.88x greater performance¹ and an up to 52 percent four-year Total Cost of Ownership (TCO) estimated advantage² compared to the 2-socket servers based on the Intel® Xeon® processor E5-2600 product family. The performance gains provided by the Intel Xeon processor E5-4600 product family are even more dramatic when compared to the previous generation 2-socket Intel® Xeon® processor 5600 series, delivering up to 3.8x greater performance.³ Data centers looking for ways to improve performance, reduce costs, and make maximum use of floor space now have a clear and compelling choice for new server purchases and refreshes.

Time to Rethink 2-Socket Solutions
The standard thinking on 2-socket servers has been that, as long as they can handle the workload, 2-socket servers scaled out have provided historic price/performance, energy efficiency, and density advantages. In many cases, these designs, particularly with the latest Intel Xeon processors do perform well for smaller workloads. Before making any purchase though, organizations operating in today’s challenging economic climate and business environment should evaluate the latest 4-socket server platforms based on the Intel Xeon processor E5-4600 product family. This new processor family enables platforms and capabilities that reduce operational costs and increase capacity for innovation.

With the Intel Xeon processor E5-4600 product family, data centers now have a cost-effective way to manage server sprawl by consolidating workloads, improving energy efficiency, increasing performance, and providing dynamic capacity to handle larger workloads. The benefits of these processors, particularly with respect to performance and memory, provide organizations with a great way to avoid mid-cycle refreshes and having to deploy more physical servers.

One Solution, Multiple Advantages
Based on a new Intel® microarchitecture and Intel’s leading-edge 32nm process technology, the Intel Xeon processor E5-4600 product family provides a density- and cost-optimized 4-socket processor solution to extend the value of the Intel Xeon processor E5 family to 4-socket
servers. These processors provide up to eight cores, up to 20 MB of last level (L3) cache, and up to 1.5 TB maximum memory capacity, along with bigger, faster communication pathways to move data more quickly. Intel® Turbo Boost Technology 2.0® automatically increases processor frequencies to take advantage of power and thermal headroom for faster performance for peak workloads. Intel® Advanced Vector Extensions (Intel® AVX) provides new instructions that can deliver significant performance gains for applications that rely on floating point operations. Intel® Integrated I/O delivers better bandwidth by integrating PCI Express® 3.0 (PCIe® 3.0) on the processor die to reduce latency.

These processors also provide advanced security features, including Intel® Advanced Encryption Standard New Instructions (Intel® AES-NI) to accelerate and strengthen encryption for faster and more secure online transactions and improved data protection. Intel® Trusted Execution Technology (Intel® TXT) provides hardware-based resistance to software attacks that occur before the virtual machine boots.

Excellent Performance Scaling

Compared to the Intel Xeon processor E5-2600 product family, the Intel Xeon processor E5-4600 product family doubles the processors, memory (48 DIMMs supporting up to 1.5 TB), and I/O (160 lanes of PCIe 3.0 based on 40 lanes per socket) for maximum capacity. This extra capacity delivers substantial performance gains to better handle large workloads and dynamically respond to unpredictable demand spikes. Being able to do more with fewer servers also provides density and consolidation advantages, which translates into better TCO.

For high performance computing (HPC) applications, the Intel Xeon processor E5-2600 product family can generate up to 2x the floating-point operations per second (FLOPS) for compute-intensive technical applications compared to the previous generation Intel Xeon processor 5600 series. Stepping up to an Intel Xeon processor E5-4600 product family delivers up to another 1.7x improvement. This makes the Intel Xeon processor E5-4600 product family the obvious choice for HPC applications (such as seismic modeling, digital content creation, financial and design analysis, fluid dynamics, and life sciences) where the primary purchase decision criteria is pure floating point performance.

Performance scaling varies throughout the processor lineup. Comparing a 2-socket server based on the 130W Thermal Design Power (TDP) Intel® Xeon® processor E5-2680 with a 4-socket server based on the 130W TDP Intel® Xeon® processor E5-4650 shows an advantage up to 1.88x for the 4-socket server (see Figure 1). An even greater performance advantage can be seen lower in the processor lineup where the Intel® Xeon® processor E5-4607 delivers up to 3.1x the performance of the Intel® Xeon® processor E5-2609 on a general purpose integer, compute-intensive industry-standard benchmark.

Figure 1. The Intel® Xeon® processor E5-4600 product family provides excellent performance scaling advantages in moving up from the Intel® Xeon® processor E5-2600 product family (performance comparison based on SPECint*_rate_base2006 or server-side Java* benchmark estimates).
Achieve the Right Balance of Performance and Price

For organizations whose purchase decision is based on a balance of performance and price, the Intel Xeon processor E5-4600 product family provides cost-optimized solutions that allow customers to more easily move from 2-socket to 4-socket platforms. Figure 2, for example, shows a four-year TCO comparison with 2-socket servers based on the Intel Xeon processor E5-2600 product family and the previous generation Intel Xeon processor 5600 series.

By using fewer servers to deliver equivalent performance, the Intel Xeon processor E5-4600 product family provides the following TCO advantages:

- Less server hardware to buy
- Reduced infrastructure and utilities costs. Factors reducing these costs include:
  - Fewer servers to power and cool
  - Excellent energy efficient performance
  - Up to 75 percent better density at rack level,\(^{1,10}\) which saves valuable rack/floor space
  - Potential for less cabling and network equipment
- Fewer servers to maintain, which translates into lower maintenance costs
- Fewer operating system (OS) licenses to purchase and maintain

Superior Foundation for Virtualization

For organizations moving toward end-to-end virtualization to drive down costs, and cloud computing to improve efficiencies, agility, and service levels, 4-socket servers based on the Intel Xeon processor E5-4600 product family handle larger virtual machines (VMs) and provide better VM consolidation than the 2-socket options. With their larger memory capacities and 4-socket design, servers based on these new processors enable more VMs per watt and scale more consistently when unexpected workload spikes occur. This makes them an ideal solution for data centers constrained by power and cooling costs.

Selecting the Best Server for the Workload and Data Center

Making the right choice between 4-socket and 2-socket server platforms for particular workloads within a data center can provide financial savings now and over the useful life of the server. Maximum IT value is achieved by balancing critical purchase criteria such as performance, cost, power consumption, density, and flexibility to application requirements and the desired deployment model.

For many common workloads, 4-socket servers based on the Intel Xeon processor E5-4600 product family can provide an excellent way to reduce server sprawl, improve energy efficiency, and decrease TCO. The price/performance and memory capacity of servers with these processors provide a cost-effective refresh path for data centers using servers based on the Intel Xeon processor 5600 series or older generation 2-socket Intel Xeon processors, and in some cases, a clear performance and TCO advantage over new 2-socket servers based on the Intel Xeon processor E5-2600 product family.

For HPC and technical computing applications, where performance is of utmost importance, the Intel Xeon processor E5-4600 product family is a great answer. It provides twice the memory and I/O lanes of the Intel Xeon processor E5-2600 product family-based platforms, along with excellent floating point performance, density, and energy efficiency to solve some of the key challenges facing the HPC market.

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**Figure 2.** Four-year TCO comparison showing the estimated advantage of 4-socket servers based on the Intel® Xeon® processor E5-4607 compared to 2-socket servers based on the Intel® Xeon® processor E5-2609 (up to 52%) and the previous generation 2-socket servers based on the Intel® Xeon® processor E5606 (up to 70%).\(^{11}\)
To learn more about Intel® Xeon® processor-based servers, go to www.intel.com/xeon or speak to your local Intel reseller.