



# Intel® Xeon® Processor-based Server Selection Guide

Finding the Right Servers for Your Data Center



Every IT organization has to satisfy a unique mix of server purchase requirements (high performance, reliability, technology headroom, etc.) while working within data center constraints such as budget, floor space, power/thermal capacity and more. Your servers need to fit the application's requirements as well as your data center deployment strategy (scale up vs. scale out). Additionally proven IT usage models such as virtualization/consolidation, dense computing and technical computing are influencing the way you choose servers.

Whatever your data center requirements may be, IT decision makers can take comfort in knowing that Intel, the world leader in server technology, has server platforms based on advanced, proven technology to help your IT department deliver more efficient, dependable and responsive solutions for business. This guide helps you select from the broad range of Intel® Xeon® processor-based servers.





Intel Xeon processors are designed to meet a variety of business application and data center requirements

## The Intel® Xeon® Processor Family

The breakthrough performance, energy efficiency, and reliability of Intel Xeon processor-based server systems make them the ideal choice for all of your data demanding and standard enterprise infrastructure applications, virtualization and consolidation projects or high-density data center deployments. The Intel Xeon processor family features:

### **Powerful, Flexible 64-bit Performance**

Since 2004, Intel Xeon processor-based servers have provided leading 64-bit performance with the broadest 32-bit application support. Intel® 64 Technology\* future proofs IT investments by providing a seamless migration path from existing 32-bit application environments to newer 64-bit environments.

### **Energy-efficient Multi-core Computing**

Dual-Core Intel Xeon processors deliver a quantum leap in processing capacity without a comparable increase in power consumption, enabling businesses to grow their computing solutions more efficiently while helping keep data centers cool. And now the first Quad-Core Intel Xeon processor-based servers are available, taking your data center to a new level of performance within the same power envelope.

### **Stable and Reliable**

Intel Xeon processor-based systems are built with more server reliability and advanced performance features than competitive offerings, giving IT the headroom, reliability and compatibility you need to keep pace with the changing business environment.

## Intel® Xeon® Processors at a Glance

	<b>Dual-Core Intel® Xeon® Processor 5100 Series</b> Maximum price/performance for standard, general-purpose applications where cost is key priority	<b>Quad-Core Intel® Xeon® Processor 5300 Series</b> Maximize performance/density and performance/watt with the highest performance performance available for 2-way servers running high-performing infrastructure applications	<b>Dual-Core Intel® Xeon® Processor 7100 Series</b> Maximum performance, reliability and scalability available for standard computing on data demanding applications
<b>Advantages over previous Intel-based servers</b>	Up to 3X more performance and more than 3X power efficiency over previous single-core Intel Xeon processor-based servers. <sup>1</sup>	Best available performance/watt for a server: Get up to 50% more performance than Intel Xeon 5100 series processor in the same power envelope. <sup>1</sup>	2.5x the performance and nearly 3 times more performance per watt than the previous Dual-Core Intel Xeon processor 7000 series, supporting more users and data transactions within a cooler data center. <sup>1</sup>
<b>Advantages over AMD Opteron®-based servers</b>	Leading performance on 20+ standard 2-way benchmark applications.  Up to 48% more performance/chassis <sup>2</sup> and as much as 33% lower cost than competing blades. <sup>2</sup>  Lowers power consumption up to 15% versus AMD Opteron® dual-core processor-based servers. <sup>2</sup>	Industry's first quad-core technology further extends Xeon's performance/server and and performance/watt advantage over competing servers at mainstream pricing.  Stable and reliable: Common technology platform that scales from dual-core to quad-core featuring more server reliability and advanced technology features than competitive offerings.	Up to 1.5x better performance than the competition with the help of the 16 MB shared L3 cache. <sup>3</sup>  More cache memory and threads per processor than dual or competing multi-core processors are ideal for demanding applications in virtualized environments.  Up to 4x the system scalability enables better performance for applications requiring reliable, large-scale computing solutions. <sup>3</sup>
<b>IT Benefits</b>	Proactive data protection and improved security through advanced redundancy and error checking features.	Outstanding IT value with twice the cores to enhance virtualization capacity and provide higher data center density, at pricing similar to dual-core platforms.  Most virtualization headroom in a 2-way platform: Quad-Core Intel® Xeon® processor-based servers effectively double the virtualization capacity available in a dual-processor footprint, providing more density and headroom for server virtualization than any other 2-way standard high-volume server platform.	Advanced redundancy and error checking features such as memory mirroring and and sparing help proactively protect data and improve security. Intel® Cache Safe Technology allows continued operation in the event of rare L3 cache errors.  Scalability, hardware-assisted virtualization, and the broadest industry virtualization software support combine to help optimize data-center effectiveness.
<b>Features</b>			
<b>Large On-die cache</b>	4 MB L2	8 MB L2	16 MB L3
<b>CPUs</b>	2	2	4-32
<b>Cores/Threads</b>	4/4	8/8	8-64/16-128
<b>Memory Capacity</b>	Up to 64 GB	Up to 64 GB	Up to 512 GB
<b>I/O Capacity</b>	3-4 slots PCIe*	3-4 slots PCIe*	7 slots (4P) PCIe* scalable to 48 slots <sup>2</sup>
<b>Reliability</b>	ECC, Memory RAS	ECC, Memory RAS	RAS PLUS Memory Hot Swap, Intel® Cache Safe Technology

<sup>1</sup> Based on measured SPECint\_rate\_base2000 results. Configuration details: Published/measured results as of Sept 21, 2006.

<sup>2</sup> Dual-Core Intel Xeon Processor 5160-based platform details: Dell PowerEdge® 2950 Server platform with two Dual-Core Intel Xeon Processor 5160, 3.00 GHz with 4M L2 Cache, 1333 MHz system bus, 8 GB (8x1 GB) FB-DIMM memory, Microsoft Windows Server® 2003 Enterprise Edition. SPEC binaries built with Intel C/C++ Compiler 9.1. Referenced as published at 123. For more information see <http://www.spec.org/cpu2000/results/res2006q2/cpu2000-20060501-05940.html>

<sup>3</sup> Quad-Core Intel Xeon Processor-based platform details: Intel Server pre-production platform with two Quad-Core Intel Xeon Processor E5345, 2.33 GHz with 2x4M L2 Cache, 1333 MHz system bus, 8 GB (8x1 GB) FB-DIMM memory, Microsoft Windows® 2003 Enterprise Edition. SPEC, binaries built with Intel C/C++ Compiler 9.1.

<sup>4</sup> Data Source: Intel Internal measurement September 21, 2006. Performance chart compares an internal server side Java application benchmark measuring business operations completed per hour on pre-production platform with two Dual-Core Intel Xeon Processors 5160, 3.00 GHz (4M L2 Cache, 1333 MHz FSB, 8GB (8x1 GB FB-DIMM memory) vs. two Quad-Core Intel Xeon Processors 53xx, 2.67 GHz with 2x4M L2 Cache, 1333 MHz system bus, 8 GB (8x1 GB) FB-DIMM memory.

<sup>5</sup> Data Source: Intel Internal estimates or measurements as of September 21, 2006. Actual Results may vary. Buyers should consult other sources of information to evaluate the performance of systems or components they are considering purchasing. For more information on performance tests and on the performance of Intel products, visit <http://www.intel.com/performance/resources/limits.htm> or call (U.S.) 1-800-628-8686 or 1-916-356-3104.



### More Server Choices from Intel

## Basic Small Business Server

The Dual-Core Intel® Xeon® processor 3000<sup>^</sup> series is ideal for first time small business server computing needs. Intel's newest dual-core processor for single-processor servers, delivers a new level of energy-efficient performance from the innovative Intel® Core™ microarchitecture, optimized for low-power, dual-core, 64-bit computing.

Combined with the Intel® S3000 chipset family and ECC DDR2 memory technology, the new Dual-Core Intel Xeon processor 3000 series-based platforms are expected to deliver up to 3 times the performance and 3.5 times the performance/watt of the Intel® Pentium® D processor 950.<sup>4</sup>

Platforms based on the Intel Xeon processor 3000 series make it simple for small businesses to get the reliability, availability and serviceability needed for server environments at an economical cost.

## Standard and Dense Infrastructure: 2-Processor Systems

The most widely deployed server architecture, Intel Xeon processor-based servers are proven capable of fulfilling the broadest range of business needs across the data center, including e-mail, departmental applications, Java application servers, financial and more. Servers based on Dual-Core or Quad-Core Intel Xeon processor 5000<sup>^</sup> sequence offer IT investment protection and deliver IT ultimate flexibility to adapt to changing business needs through support for four generations of processors on a single compatible technology platform. Featuring the power-efficient Intel® Core™ microarchitecture with large on-die cache, these processors offer powerful cost-effective computing solutions while helping to keep the data center cool.

### Quad-Core Intel® Xeon® Processor 5300<sup>^</sup> Series

The industry's first quad-core processor,<sup>1</sup> the Intel® Xeon® processor 5300 series provides breakthrough performance and capabilities per watt for the ultimate in powerful, dense and energy-efficient general-purpose servers.

### Dual-Core Intel® Xeon® Processor 5100<sup>^</sup> Series

The Dual-Core Intel Xeon 5100 series processor offers industry-leading dual-core server performance for cost-effective implementation on a wide range of enterprise infrastructure applications.



## Data Demanding: 4-Processor to 32-Processor Systems

Intel® Xeon® processor 7000<sup>A</sup> sequence is your ideal choice for demanding enterprise applications and consolidation, where maximum performance, scalability and reliability are critical deployment considerations. Servers built on the Dual-Core Intel Xeon processor 7000 sequence platform help your business become more agile while helping to control data center costs.

### Dual-Core Intel® Xeon® Processor 7100<sup>A</sup> Series

Servers built on the Dual-Core Intel Xeon processor 7100<sup>A</sup> series designed specifically for multi-processor server platforms, deliver scalable performance, hardware-assisted virtualization, and reliable uptime for demanding enterprise workloads and business operations. Dual-core 64-bit technology, added headroom plus Intel® Virtualization Technology<sup>5</sup> (Intel® VT), and advanced reliability features make this the server of choice when you need the power to do more.

To learn more about Intel® Xeon®  
processor-based servers go to  
[www.intel.com/products/processor/xeon](http://www.intel.com/products/processor/xeon)  
or speak to your local Intel reseller.

### More Server Choices from Intel

## Mainframe-Class Computing

New Dual-Core Intel® Itanium® 2 processor 9000<sup>A</sup> series-based servers provide unmatched levels of flexibility and scalability with demonstrated mainframe-class reliability, proven performance, for cost-effective computing compared to RISC for your most critical business computing needs.

The new Dual-Core Intel Itanium 2 processor 9000 series delivers double the performance of yesterday's processor, Intel® Cache Safe Technology and Enhanced Machine Check Architecture for increased availability and reliability, hardware-assisted Intel Virtualization Technology, Intel® Hyper-Threading Technology,<sup>6</sup> and 20 percent lower power consumption.<sup>7</sup>

# Matching the Server to the Job and the Data Center

Selecting the right architecture and server platform for your data center pays dividends today, as well as over time. Maximum IT value is achieved by balancing critical purchase criteria such as performance, cost, reliability, and power to best fit your required applications and desired deployment model.


















## Step 1: What Do Your Applications Demand of Your Servers?

IT applications and the users who rely on them vary in their requirements for compute technology. Infrastructure applications such as e-mail, networking, and office databases demand cost-effective capacity, while enterprise applications such as analytics and ERP require higher performance and data bandwidth in the server. The first step in server selection is to select the most cost-effective server that meets the needs of the application. The table below shows which Intel Xeon processor sequence offers the best value for infrastructure and enterprise applications.

Requirement	Applications	Best Value
<b>Data Demanding</b> Compute power and headroom for data and transaction-intensive applications	<ul style="list-style-type: none"> <li>Enterprise databases</li> <li>Decision support</li> <li>Transaction-intensive applications such as e-Commerce</li> <li>Business Intelligence (BI)</li> <li>ERP</li> <li>SCM</li> <li>CRM</li> </ul>	Powerful enterprise Intel® Xeon® processor 7000 sequence-based servers
<b>Standard Infrastructure</b> Cost-effective, easy-to-manage performance and capacity for standard business applications	<ul style="list-style-type: none"> <li>Mail and web</li> <li>Office or department databases</li> <li>Line-of-business applications</li> <li>Rendering farms</li> <li>Scale-out of financial service and Java applications</li> <li>File/print</li> <li>Networking</li> <li>Application servers</li> <li>Technical computing</li> </ul>	Versatile Intel® Xeon® processor 5000 sequence-based servers

## Step 2: Optimize Data Center Value

Servers need to fit your data center deployment model and budget, as well as the applications that they host. The following table matches Intel Xeon processor-based servers to data center needs:

Data Center Requirement	Dual-Core Intel® Xeon® Processor 5100	Quad-Core Intel® Xeon® Processor 5300	Dual-Core Intel® Xeon® Processor 7100
<b>Standardization</b>	 Standardize on Intel® Xeon® processors for the best mix of solutions across your standard infrastructure and data-demanding applications		
<b>Price/Performance</b>	 Best performance for standard, high-volume server usage where cost is key priority	 Quad-core delivers the highest performing dual-processor servers	 Maximum data demanding application performance and highest system scalability
<b>Performance/Watt</b>	 Intel® Core™ microarchitecture is high-performance and easy to cool	 Quad-core processors built on Intel® Core™ microarchitecture further boost power efficiency in compatible thermal envelope	 Significant gains over prior generation and competitive performance/watt for high-end server processing
<b>Reliability</b>	 Genuine Intel architecture built with more unique reliability features than competitive offerings		 Genuine Intel architecture with the most reliability, availability and serviceability (RAS) features for standard compute environments
<b>Deployment Model</b>	 <b>Scale Out</b> Standard infrastructure applications and dense computing environments		 <b>Scale Up</b> Data demanding applications and highly scalable computing environments
<b>Dense Computing</b>	 Highly dense, low-cost blade and rack solutions	 Quad-core delivers maximum performance/ square foot for racks and blades	 High-performance, scalable rack servers
<b>Virtualization and Consolidation</b>	 Consolidating standard web, e-mail and other infrastructure applications to boost utilization	 2x cores and threads for infrastructure consolidation	 Maximum consolidation when peak application performance, reliability and memory capacity are critical

 Good

 Better

 Best



#### More Server Choices from Intel

### High-Performance Computing (HPC) and Technical Computing

High-performance computing and technical computing applications vary widely in their response to different server architectures.

#### **Intel Itanium 2 processor 9000 sequence:**

Scalable performance featuring massive 64-bit execution resources that are ideal for bio simulation, climate research and other life sciences applications. Providing support for largest physical memory (up to 1 Petabyte), memory bandwidth with proven scalability up to 2,048-processor symmetric multi-processor (SMP) systems.

#### **Intel Xeon processor 5000 sequence:**

When high performance and performance/watt for integer-intensive workloads are key considerations, powerful 64-bit dual-core and quad-core processor solutions meet the need. Supporting both 32 and 64-bit applications these servers are ideal for most technical computing solutions including seismic modeling, digital content, financial or design analysis, fluid dynamics, life sciences and more.

#### **Intel Xeon processor 3000 sequence:**

For applications and deployments seeking ultimate price/performance, best density and competitive absolute performance. Small form factor one-processor servers offer cost sensitive buyers great performance for 64-bit applications such as web farms and financial analysis and for extending HPC into existing density-challenged corporate structures.



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### Continued from page 8.

<sup>1</sup> Source (AMD 940, AMD Opteron\* 285 and Intel Xeon Processor 5100): Published or submitted results as of May 23, 2006. See <http://www.intel.com/performance> as of September 21, 2006. AMD Opteron\* socket F 2000 series publications as of September 20, 2006. Actual results may vary. Buyers should consult other sources of information to evaluate the performance of systems or components they are considering purchasing. For more information on performance tests and on the performance of Intel products, visit <http://www.intel.com/performance/resources/limits.htm> or call (U.S.) 1-800-628-8585 or 1-916-356-3104.

<sup>2</sup> Source (AMD 940, AMD Opteron\* 285 and Intel Xeon Processor 5100): Published or submitted results as of May 23, 2006. See <http://www.intel.com/performance> as of September 21, 2006. AMD Opteron\* socket F 2000 series publications as of September 20, 2006. Actual results may vary.

<sup>3</sup> Measured by Principle Technologies\* as of May 23, 2006. For configuration detail, go to <http://principletechnologies.com/clients/reports/Intel/>

<sup>4</sup> Performance measured using Intel internal TPC-C\* SQL\* 2005, SAP\* SD, and SPECjbb\* 2005 benchmarks. Intel internal, early platform measurements (17 July 2006) comparing system configurations of 4x Intel® Xeon® Processor 7140M Platform, 3.40 GHz w/ 16M L3/ Intel® E8501 Chipset / 800 MHz FSB to 4x Dual-Core Intel® Xeon® processors 3.00 GHz w/ 2x2M L2 / Intel® E8501 Chipset / 800 MHz FSB.

<sup>5</sup> Scalable to 32P dual-core versus 8P for Opteron\* Model 8000.

For power reduction, TDP specification listed is compared between the prior generation and current generation Dual-Core Intel Xeon processor 7000 Sequence (7120M 95W vs. 7041 165W)[F][2].

Performance tests and ratings are measured using specific computer systems and/or components and reflect the approximate performance of Intel products as measured by those tests. Any difference in system hardware or software design or configuration may affect actual performance. For further information see: [http://www.intel.com/performance/server/xeon\\_mp/index.htm](http://www.intel.com/performance/server/xeon_mp/index.htm).

<sup>1</sup> Of standard, high-volume server processors.

<sup>2</sup> Source 8-18-06 [www.ibm.com](http://www.ibm.com). IBM eServer\* Series x\*460 configuration available through this website.

<sup>3</sup> Principled Technologies June 2006. For configuration detail, go to <http://principletechnologies.com/clients/reports/Intel/>

<sup>4</sup> Performance measured using SPECjbb\* 2005 benchmark comparing to the Intel Pentium D processor 950 as of September 8, 2006. Performance per watt measured using WebBench\* 5 benchmark comparing to the Intel Pentium D processor 950 as of September 8, 2006

<sup>5</sup> 64-bit Intel® Xeon® processors with Intel® 64 architecture require a computer system with a processor, chipset, BIOS, OS, device drivers and applications enabled for Intel 64 architecture. Processor will not operate (including 32-bit operation) without an Intel 64 architecture-enabled BIOS. Performance will vary depending on your hardware and software configurations. Intel 64 architecture-enabled OS, BIOS, device drivers and applications may not be available. Check with your vendor for more information.

<sup>6</sup> Intel processor numbers are not a measure of performance. Processor numbers differentiate features within each processor family, not across different processor families. See [www.intel.com/products/processor\\_number/](http://www.intel.com/products/processor_number/) for details.

<sup>7</sup> Intel Virtualization Technology requires a computer system with a processor, chipset, BIOS, virtual machine monitor (VMM) and applications enabled for virtualization technology. Functionality, performance or other virtualization technology benefits will vary depending on hardware and software configurations. Virtualization technology-enabled BIOS and VMM applications are currently in development.

<sup>8</sup> Hyper-Threading Technology requires a computer system with an Intel® processor supporting HT Technology and a HT Technology enabled chipset, BIOS and operating system. Performance will vary depending on the specific hardware and software you use. See [www.intel.com/homepage/land/hyperthreading\\_more.htm](http://www.intel.com/homepage/land/hyperthreading_more.htm) for additional information.

<sup>9</sup> Other names and brands may be claimed as the property of others.

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