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# Oracle Exadata\* on Intel® Xeon® Processors: Extreme Performance for Enterprise Computing



Deploy scalable performance, reliable security, and high energy efficiency right out of the box with the Oracle Exadata\* Database Machine based on the Intel® Xeon® processor 7500 and 5600 series. High optimization puts your business ahead of the curve for mission-critical online transaction processing (OLTP), data warehousing, and consolidation of mixed workloads.

## EXADATA\* EXCEEDS EXPECTATIONS

*"What became clear from the start, and was reinforced by numerous customer panels as well as one-on-one interviews with users, was that Oracle's claims regarding Exadata's speed, efficiency, and scalability were not hype; if anything, they proved modest when compared with actual experience."*

Carl W. Olofson  
Research Vice President, IDC<sup>1</sup>

The Oracle Exadata Database Machine puts the power of Intel Xeon processors to work to meet your most demanding mission-critical workloads. Extreme performance and an intelligent storage system allow you to adapt to changes in short-term business demands and address requirements for longer-term business growth. Advanced reliability and security features help maintain data integrity, accelerate encrypted transactions, and maximize the availability of mission-critical applications, while automated energy efficiency helps decrease operating expense.

Oracle is offering a fully integrated platform for hosting all your database applications. The Exadata Database Machine is an easy-to-deploy, out-of-the-box solution for hosting the Oracle Database. Ready to go from day one, much of the integration effort, cost, and time associated with database deployment has been eliminated. Whether you are supporting OLTP, data warehousing, or mixed application workloads, a common deployment creates a tremendous opportunity for consolidation and economies of scale in the data center. And all this comes with breakthrough performance.

The unique technology driving the performance advantages of the Exadata Database Machine is the Oracle Exadata Storage Server. As data volumes continue to grow exponentially, conventional storage arrays struggle to efficiently process terabytes of data and push that data through storage networks to achieve the performance necessary for demanding database applications. By pushing SQL processing to the Exadata Storage Server, all the disks can operate in parallel, reducing the load of the database server processor while minimizing bandwidth requirements to move data between storage and database servers.

The Oracle Exadata Database Machine is engineered to allow existing Oracle-based applications to run unchanged, and the overall solution can be ready in just days. It is a complete package of servers, storage, networking, and software that is massively scalable, secure, and redundant. Multiple Exadata systems may be linked together, providing massive scalability:

- **Oracle Exadata Database Machine X2-8** includes two eight-socket database servers based on the Intel Xeon processor 7500 series, 14 Oracle Exadata Storage Servers based on the Intel Xeon processor 5600 series, and InfiniBand\* switches. It offers an excellent consolidation platform for very large OLTP and data warehousing applications.
- **Oracle Exadata Database Machine X2-2** (formerly known as V2) includes eight two-socket database servers and 14 Oracle Exadata Storage Servers, all based on the Intel Xeon processor 5600 series, plus InfiniBand switches. It is available in a choice of configurations that scale from a quarter rack to multiple full racks.

## STRATEGIC SUCCESS AT THE U.S. DEPARTMENT OF HOMELAND SECURITY<sup>2</sup>

Customs and Border Protection is the Department of Homeland Security agency responsible for securing the borders of the United States while simultaneously facilitating the flow of legitimate trade and travel.

The agency's IT infrastructure must handle a massive data load that remains available on a 24x7 basis, and it relies in part on a very large-scale Oracle Exadata\* implementation based on Intel® Xeon® processors to meet those requirements.

This mission-critical implementation delivers outstanding results, including the following:

- **Robust, secure, and flexible performance** that supports service-level agreements
- **Cost-effectiveness**, in terms of both capital and operational expenses
- **High compatibility** with other systems, for ease of integration

In addition to day-to-day success, the standardization provided by the environment helps support long-term goals related to automation, service-oriented architecture, and cloud computing. Read more in the Department of Homeland Security presentation, "[Transforming Information Technology Services: Reducing Cost and Improving Availability.](#)"<sup>3</sup>

Oracle Exadata draws from a collaborative engineering relationship between Oracle and Intel that stretches back decades. Oracle develops its products with upcoming generations of pre-release Intel-based servers in the lab,

and by the time customers deploy the solutions in their own environments, they get a fine-tuned solution stack built of components that were born to work together, taking full advantage of the Intel Xeon processors under the hood:

- **The Intel Xeon processor 7500 series** delivers scalable performance on servers with four or more sockets, with advanced reliability that protects your most data-demanding applications. Intelligent performance automatically adapts to the changing needs of Exadata environments.
- **The Intel Xeon processor 5600 series** provides efficient performance on two-socket servers. The next generation of intelligent server processors automatically regulates power consumption to combine industry-leading energy efficiency with intelligent performance that adapts to your workload.

## Intelligent Performance to Drive Demanding Exadata Workloads

The world's most demanding businesses are now deploying the next generation of Oracle Exadata solutions with Intel Xeon processors, and the performance benefits are being felt across industries. World-record processor performance enables more transactions per server for scalable, data-demanding enterprise applications.

The Oracle Exadata Database Machine is available with either the Intel Xeon processor 7500 or 5600 series. As a complete solution stack of servers, storage, networking, and software, Oracle Exadata is an excellent means of consolidating onto grids or private clouds.

Members of the Oracle Exadata product team at Oracle are in constant contact with their colleagues at Intel, providing each other with the engineering assistance and insight that drive early co-validation of emerging solutions. Customers reap the rewards of that relationship through performance innovations delivered with the Oracle Exadata Database Machine:

- **Extreme performance for data warehouses.** Exadata Smart Scan improves query performance by offloading resource-intensive query processing and data mining scoring to scalable, intelligent storage servers.
- **Extreme performance for OLTP applications.** Exadata Smart Flash Cache transparently caches data to fast solid-state storage, improving query response times and throughput.
- **Extreme performance for consolidated workloads.** Exadata's massively parallel grid is ideally suited for consolidating data warehousing and OLTP applications, and Exadata quality-of-service resource management capabilities help ensure fast response times.

Intel® Intelligent Performance Features	Real-World Benefits to Oracle Exadata* Customers
<p><b>Hardware-based parallelism</b> offers up to eight execution cores on the Intel® Xeon® processor 7500 series and six on the Intel® Xeon® processor 5600 series, plus Intel® Hyper-Threading Technology.</p>	<p>Each Oracle Exadata node can support very large workloads with transaction levels, decreasing both capital and operational expenses in the data center.</p>
<p><b>Intel® QuickPath Interconnect</b> delivers CPU-to-CPU and CPU-to-I/O bandwidth of up to 6.4 gigatransfers per second (GT/s).</p>	<p>Low latency helps the Oracle Exadata Database Machine handle memory-intensive workloads, preserving high responsiveness without bogging down.</p>
<p><b>Intel® Turbo Boost Technology</b> increases operating frequency when the processor is below power and thermal capacities.</p>	<p>Oracle Exadata infrastructure can respond as needed to large usage peaks, protecting business-critical results when demand is at its highest.</p>
<p><b>Integrated memory controllers</b> connect distributed shared memory locally to each processor, providing very low memory latency.</p>	<p>The system can deliver results rapidly for the computationally-intense Oracle Exadata workloads that drive business profitability.</p>

- **Reliability** provided by advanced support for error detection, correction, and containment protects across all major components and communication pathways.
- **Availability** supported by multiple levels of redundancy and error-recovery mechanisms helps dramatically reduce the business impact of a wide variety of hardware and software errors.
- **Serviceability** enabled by predictive failure analysis helps maintenance organizations identify problematic system components so they can be replaced before they fail.

Intel® Reliability and Security Features	Real-World Benefits to Oracle Exadata* Customers
<p><b>Machine Check Architecture Recovery (Intel® Xeon® processor 7500 series)</b> works with the OS to recover from otherwise-unrecoverable memory errors.</p>	<p>Oracle Exadata solutions deliver the high availability customers demand, helping protect against expensive business interruptions.</p>
<p><b>Predictive Failure Analysis (Intel Xeon processor 7500 series)</b> detects signs of memory failure before they actually arise and helps minimize the impact of those failures.</p>	<p>Oracle Exadata solutions deliver robust protection against business interruptions that would otherwise result from hardware component failures.</p>
<p><b>Intel® AES New Instructions (Intel® Xeon® processor 5600 series)</b> increase security by significantly reducing the performance penalties often associated with pervasive encryption.</p>	<p>Strong data encryption and decryption are highly efficient, protecting data in fast-paced business environments without sacrificing performance.</p>

## Reliability and Security to Protect Mission-Critical Applications

Protect your business-critical data assets with the world-class reliability and security features built into the Oracle Exadata Database Machine that automatically manage hardware errors and guard against malicious software attacks. Smart companies across the full range of business verticals rely on the Intel Xeon processor to automatically manage hardware errors and guard against malicious software attacks.

Cost-effective, standards-based server platforms based on the Xeon processor are a perfect fit for the Oracle Exadata Database Machine to drive profitability in your enterprise. The Intel Xeon processor 7500 series provides a level of reliability, availability, and serviceability (RAS) that was previously associated only with more expensive, proprietary architectures:

Exadata solutions are engineered to take excellent advantage of security features built into the hardware, so in addition to keeping systems up and running, data is protected from being lost or compromised. The Oracle Exadata Database Machine is built with redundancy in InfiniBand connectivity, power distribution units, and hot-swappable power supplies to support the needs of mission-critical deployments. Oracle Real Application Clusters (RAC) helps protect against database failure, and the system also provides disk mirroring to help guard data.

The combination of Oracle software and Intel hardware is extremely resilient, providing multi-level protection for the data and processes that drive your business.

## Energy Efficiency to Control Everyday Operating Expenses

Decrease operating costs and effectively meet green computing goals with the Oracle Exadata Database Machine. The solution stack dynamically puts processor and memory resources into the lowest available power state suitable to meet the demands of the workload. Intel® Intelligent Power Technology reduces overall energy consumption, improving ROI.

The high level of optimization for Intel Xeon processors built into Oracle Exadata means it runs frugally, taking as much advantage as possible of the hardware's energy efficiency. As a result, customers get an integrated approach to addressing the increasingly severe energy-cost challenges they face.

Co-engineering between Oracle and Intel helps to ensure that Oracle Exadata takes maximum advantage of platform energy efficiency, including innovative features such as those described above. Customers realize both strategic and tactical advantages that will carry through well into the future:

- **Higher efficiency** decreases power consumption and cooling requirements.
- **Return on investment** is accelerated by handling large workloads while lowering operating costs.
- **Low power requirements** help organizations meet green computing goals.

Intel Energy Efficiency Features	Real-World Benefits to Oracle Exadata* Customers
<b>Automated low-power states</b> allow the platform to change automatically among operating power states with very low latency.	The Oracle Exadata Database Machine can change individual system components frequently, helping business applications minimize overall energy usage.
<b>Integrated power gates</b> allow processor cores to power down individually and consume nearly zero power when idle.	Power usage for Oracle Exadata workloads that vary significantly in resource demands over time can be tailored as workloads fluctuate.
<b>Power-efficient memory subsystem</b> includes support for low-power memory and the option for new low-voltage memory buffers.	The large amounts of physical memory provisioned in Oracle Exadata Database Machines operate with a high degree of energy efficiency.

## Take the Next Step

The Oracle Exadata Database Machine takes advantage of servers based on the Intel Xeon processor 7500 and 5600 series to deliver a future-defining foundation for business computing.

Learn more about Intel® Xeon® processors:  
[www.intel.com/xeon](http://www.intel.com/xeon)

Learn more about the Oracle Exadata Database Machine:  
[www.oracle.com/exadata](http://www.oracle.com/exadata)

<sup>1</sup> Olofson, Carl W., "Messages from Oracle OpenWorld 2010: Exadata Exceeds Expectation and MySQL Thrives," IDC (2010). <http://www.oracle.com/us/corporate/analystreports/infrastructure/idc-225293-178262.pdf> (PDF).

<sup>2</sup> Neither the U.S. Department of Homeland Security nor the Agency of Customs and Border Protection endorses Exadata\* or Exalogic.

<sup>3</sup> Ritchhart, Kenneth M., "Transforming Information Technology Services: Reducing Cost and Improving Availability," Customs & Border Protection, Department of Homeland Security (2011). <http://www.act.gov.org/knowledgebank/documentsandpresentations/Documents/Program%20Events/Executive%20Session%20featuring%20Ken%20Ritchhart,%20CBP%201-12-11.pdf> (PDF).

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