

# ORACLE EXADATA DATABASE MACHINE X2-2

## FEATURES AND FACTS

### FEATURES

- Up to 96 CPU cores and 768 GB memory for database processing
- Up to 168 CPU cores for storage processing
- From 2 to 8 database servers
- From 3 to 14 Oracle Exadata Storage Servers
- Up to 5.3 TB of Exadata Smart Flash Cache
- QDR (40 Gb/second) InfiniBand Switches
- Uncompressed user data capacity of up to 100 TB per rack
- Uncompressed I/O bandwidth of up to 50 GB/second per rack
- Exadata Hybrid Columnar Compression often delivers 10X-15X compression ratios
- Complete redundancy for high availability

### FACTS

- Ability to perform up to 1,000,000 I/O operations per second
- Easily upgrade to meet the needs of any size application
- Scale by connecting multiple Exadata Database Machine X2-2 Full or Half Racks. Up to 8 racks can be connected without requiring additional switches. Larger configurations can be built with additional switches
- Pre-configured system optimized for all database applications

*The Oracle Exadata Database Machine X2-2 delivers extreme performance and scalability for all your database applications including Online Transaction Processing (OLTP), Data Warehousing (DW) and consolidation of mixed workloads. Built using industry-standard hardware from Sun, and intelligent database and storage software from Oracle, the Exadata Database Machine is a complete optimized package of software, servers, and storage. Simple and fast to implement, the Exadata Database Machine is ready to tackle your largest and most important database applications — and often run them 10x faster, or more.*

### Extreme Performance for Online Transaction Processing, Data Warehousing and Consolidating Mixed Workloads

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 day one much of the integration effort, cost and time of database deployment has been eliminated. Whether its OLTP, DW or mixed application workloads, a common deployment creates a tremendous opportunity for consolidation economies of scale in the data center. All this with breakthrough performance.

The unique technology driving the performance advantages of the Exadata Database Machine is the Oracle Exadata Storage Server. By pushing SQL processing to the Exadata Storage Servers all the disks can operate in parallel reducing database server CPU consumption while using much less bandwidth to move data between storage and database servers. 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. Exadata Storage Servers provide a high-bandwidth, massively parallel solution delivering up to 50 GB per second of raw I/O bandwidth and up to 1,000,000 I/O operations per second (IOPS). Much of these performance gains come from the incorporation of Exadata Smart Flash Cache in each Exadata Storage Server and the Oracle Databases' storage hierarchy. With 14 Exadata Storage Servers in a 42U



## RELATED PRODUCTS AND SERVICES

### RELATED PRODUCTS

- Oracle Exadata Database Machine X2 8
- Oracle Exadata Storage Server X2-2
- Oracle Database 11g
- Real Application Clusters
- Partitioning
- Advanced Compression
- Advanced Security
- Active Data Guard
- GoldenGate
- Real Application Testing
- OLAP
- Data Mining
- Business Intelligence
- Enterprise Manager
- Oracle Linux

### RELATED SERVICES

The following services are available from Oracle:

- Advanced Customer Services
- Consulting Services
- Oracle University courses
- Oracle Auto Service Request

Rack, 5.3 TB of Exadata Smart Flash Cache is integrated into the Exadata Database Machine Full Rack.

In addition, Exadata Database Machine is the world's most secure database system. Building on the high security capabilities in every Oracle Database, Exadata Database Machine provides the ability to query fully encrypted databases with near zero overhead at hundreds of gigabytes per second. This is done by moving decryption processing from software into the Exadata Storage Server hardware.

### Extreme Scalability

Three versions of the Exadata Database Machine X2-2 are available. From the Full Rack system with 8 database servers and 14 Exadata Storage Servers to the Quarter Rack system with 2 database servers and 3 Exadata Storage Servers, there is a configuration that fits any application. One version can be upgraded online to another ensuring a smooth upgrade path as processing requirements grow. All three versions are available with either 600 GB High Performance SAS disks or 2 TB High Capacity SAS disks.



In addition to upgrading from a small to large Exadata Database Machine, a building-block methodology is used that allows the largest Exadata Database Machine to quickly and easily scale to any size. Exadata Database Machine Full and Half Racks can be coupled (Full Rack to Full Rack, Full Rack to Half Rack or Half Rack to Half Rack) using the integrated InfiniBand fabric. As new racks of Exadata Database Machines are incrementally added to a system, the storage capacity and performance of the system grow. A system composed of two Full Rack systems is simply twice as powerful as a single rack system providing double the I/O throughput and double the storage capacity. It can be run in single system image mode or logically partitioned for consolidation of multiple databases. Scaling out is easy with Exadata Database Machine. Oracle Real Application Clusters (RAC) can dynamically add more processing power and Automatic Storage Management (ASM) can dynamically rebalance the data across Exadata Storage Servers to fully utilize all the hardware in each configuration.

### Enterprise Ready

The Exadata Database Machine X2-2 has complete redundancy built in to support the demands of mission critical applications. Each Exadata Database Machine has redundant InfiniBand connectivity, redundant Power Distribution Units (PDU), and the servers all have hot-swappable power supplies for high availability. Oracle RAC protects against database server failure and ASM provides disk mirroring to protect against disk failures. Hot swappable components ensure the database can tolerate server and disk drive failure. In addition, data is mirrored across storage servers to protect against loss of data and safeguard data accessibility.

Oracle Enterprise Manager is available to manage the software environment on the

Exadata Database Machine. Also available is a system monitoring plug-in for the Exadata Storage Server that delivers comprehensive availability, performance, and configuration information for the Exadata environment. Using Enterprise Manager, administrators can perform proactive monitoring and detailed configuration analysis of their Exadata Database Machine.

### Software from Oracle, Hardware from Sun

The Exadata Database Machine builds upon years of Oracle and Sun jointly solving customers' business and technical challenges. Integrated hardware and software technology, and related hardware support services, are provided in a unified fashion by Oracle. By combining leading, industry-standard servers and storage hardware from Sun with the intelligence built into the Oracle software, the Exadata Database Machine delivers the industry's highest levels of performance, scalability and reliability, and is backed by Oracle Support.

<b>Key Capabilities</b>		
<b>Exadata Database Machine X2-2 Full Rack with High Performance SAS Disks</b>	<b>Exadata Database Machine X2-2 Half Rack with High Performance SAS Disks</b>	<b>Exadata Database Machine X2-2 Quarter Rack with High Performance SAS Disks</b>
Up to 25 GB/second of uncompressed raw disk bandwidth	Up to 12.5 GB/second of uncompressed raw disk bandwidth	Up to 5.4 GB/second of uncompressed raw disk bandwidth
Up to 50 GB/second of uncompressed Flash data bandwidth	Up to 25 GB/second of uncompressed Flash data bandwidth	Up to 11 GB/second of uncompressed Flash data bandwidth
Up to 50,000 Disk IOPS	Up to 25,000 Disk IOPS	Up to 10,800 Disk IOPS
Up to 1,000,000 Flash IOPS	Up to 500,000 Flash IOPS	Up to 225,000 Flash IOPS
100 TB of raw disk data capacity	50 TB of raw disk data capacity	21 TB of raw disk data capacity
Up to 28 TB of uncompressed user data*	Up to 14 TB of uncompressed user data*	Up to 6 TB of uncompressed user data*
Data Load Rate: Up to 5 TB/hour	Data Load Rate: Up to 2.5 TB/hour	Data Load Rate: Up to 1 TB/hour
<b>Exadata Database Machine X2-2 Full Rack with High Capacity SAS Disks</b>	<b>Exadata Database Machine X2-2 Half Rack with High Capacity SAS Disks</b>	<b>Exadata Database Machine X2-2 Quarter Rack with High Capacity SAS Disks</b>
Up to 14 GB/second of uncompressed raw disk bandwidth	Up to 7 GB/second of uncompressed raw disk bandwidth	Up to 3 GB/second of uncompressed raw disk bandwidth
Up to 50 GB/second of uncompressed Flash data bandwidth	Up to 25 GB/second of uncompressed Flash data bandwidth	Up to 11 GB/second of uncompressed Flash data bandwidth
Up to 25,000 Disk IOPS	Up to 12,500 Disk IOPS	Up to 5,400 Disk IOPS
Up to 1,000,000 Flash IOPS	Up to 500,000 Flash IOPS	Up to 225,000 Flash IOPS
336 TB of raw disk data capacity	168 TB of raw disk data capacity	72 TB of raw disk data capacity
Up to 100 TB of uncompressed user data*	Up to 50 TB of uncompressed user data*	Up to 21 TB of uncompressed user data*
Data Load Rate: Up to 5 TB/hour	Data Load Rate: Up to 2.5 TB/hour	Data Load Rate: Up to 1 TB/hour
* User data capacity is an estimate of space available for table rows after mirroring all the disk space, allowing space to recover from disk failures, and setting aside space for database structures like logs, undo, a large TEMP space sufficient for Data Warehousing, and some indexes. This user data capacity represents uncompressed data. When using Exadata Hybrid Columnar Compression the capacity will be many times higher. Actual user data varies by application.		

Exadata Database Machine X2-2 Full Rack	Exadata Database Machine X2-2 Half Rack	Exadata Database Machine X2-2 Quarter Rack
8 x Database Servers, each with: <ul style="list-style-type: none"> <li>• 2 x Six-Core Intel® Xeon® X5670 Processors (2.93 GHz)</li> <li>• 96 GB Memory</li> <li>• Disk Controller HBA with 512MB Battery Backed Write Cache</li> <li>• 4 x 300 GB 10,000 RPM SAS Disks</li> <li>• 2 x QDR (40Gb/s) Ports</li> <li>• 2 x 10 Gb Ethernet Ports based on the Intel 82599 10GbE Controller</li> <li>• 4 x 1 Gb Ethernet Ports</li> <li>• 1 x ILOM Ethernet Port</li> <li>• 2 x Redundant Hot-Swappable Power Supplies</li> </ul>	4 x Database Servers, each with: <ul style="list-style-type: none"> <li>• 2 x Six-Core Intel® Xeon® X5670 Processors (2.93 GHz)</li> <li>• 96 GB Memory</li> <li>• Disk Controller HBA with 512MB Battery Backed Write Cache</li> <li>• 4 x 300 GB 10,000 RPM SAS Disks</li> <li>• 2 x QDR (40Gb/s) Ports</li> <li>• 2 x 10 Gb Ethernet Ports based on the Intel 82599 10GbE Controller</li> <li>• 4 x 1 Gb Ethernet Ports</li> <li>• 1 x ILOM Ethernet Port</li> <li>• 2 x Redundant Hot-Swappable Power Supplies</li> </ul>	2 x Database Servers, each with: <ul style="list-style-type: none"> <li>• 2 x Six-Core Intel® Xeon® X5670 Processors (2.93 GHz)</li> <li>• 96 GB Memory</li> <li>• Disk Controller HBA with 512MB Battery Backed Write Cache</li> <li>• 4 x 300 GB 10,000 RPM SAS Disks</li> <li>• 2 x QDR (40Gb/s) Ports</li> <li>• 2 x 10 Gb Ethernet Ports based on the Intel 82599 10GbE Controller</li> <li>• 4 x 1 Gb Ethernet Ports</li> <li>• 1 x ILOM Ethernet Port</li> <li>• 2 x Redundant Hot-Swappable Power Supplies</li> </ul>
3 x 36 port QDR (40 Gb/sec) InfiniBand Switches	3 x 36 port QDR (40 Gb/sec) InfiniBand Switches	2 x 36 port QDR (40 Gb/sec) InfiniBand Switches
14 x Exadata Storage Servers X2-2 with 12 x 600 GB 15,000 RPM High Performance SAS disks or 12 x 2 TB 7,200 RPM High Capacity SAS disks Includes 5.3 TB Exadata Smart Flash Cache	7 x Exadata Storage Servers X2-2 with 12 x 600 GB 15,000 RPM High Performance SAS disks or 12 x 2 TB 7,200 RPM High Capacity SAS disks Includes 2.6 TB Exadata Smart Flash Cache	3 x Exadata Storage Servers X2-2 with 12 x 600 GB 15,000 RPM High Performance SAS disks or 12 x 2 TB 7,200 RPM High Capacity SAS disks Includes 1.1 TB Exadata Smart Flash Cache
Additional Hardware Components Included: <ul style="list-style-type: none"> <li>• Ethernet switch for administration of the Database Machine</li> <li>• Keyboard, Video or Visual Display Unit, Mouse (KVM) hardware for local administration</li> <li>• 42U rack packaging</li> </ul> Spares Kit Included: <ul style="list-style-type: none"> <li>• 2 x 600 GB High Performance SAS disks or 2 x 2 TB High Capacity SAS</li> <li>• 2 x 96 GB Exadata Smart Flash Cache cards</li> <li>• InfiniBand cables</li> </ul>	Additional Hardware Components Included: <ul style="list-style-type: none"> <li>• Ethernet switch for administration of the Database Machine</li> <li>• Keyboard, Video or Visual Display Unit, Mouse (KVM) hardware for local administration</li> <li>• 42U rack packaging</li> </ul> Spares Kit Included: <ul style="list-style-type: none"> <li>• 1 x 600 GB High Performance SAS disk or 1 x 2 TB High Capacity SAS disk</li> <li>• 1 x 96 GB Exadata Smart Flash Cache card</li> <li>• InfiniBand cables</li> </ul>	Additional Hardware Components Included: <ul style="list-style-type: none"> <li>• Ethernet switch for administration of the Database Machine</li> <li>• Keyboard, Video or Visual Display Unit, Mouse (KVM) hardware for local administration</li> <li>• 42U rack packaging</li> </ul> Spares Kit Included: <ul style="list-style-type: none"> <li>• 1 x 600 GB High Performance SAS disks or 1 x 2 TB High Capacity SAS disk</li> <li>• 1 x 96 GB Exadata Smart Flash Cache card</li> <li>• InfiniBand cables</li> </ul>

<b>Exadata Database Machine X2-2 Support Services</b>
<ul style="list-style-type: none"> <li>• Hardware Warranty: 1 year with a 4 hour web/phone response during normal business hours (Mon-Fri 8AM-5PM), with 2 business day on-site response/Parts Exchange</li> <li>• Oracle Premier Support for Systems: Oracle Linux support and 24x7 with 2 hour on-site hardware service response (subject to proximity to service center)</li> <li>• Oracle Premier Support for Operating Systems</li> <li>• Oracle Customer Data and Device Retention</li> <li>• System Installation Services</li> <li>• Software Configuration Services</li> <li>• Oracle Auto Service Request (ASR)</li> </ul>

<b>Exadata Database Machine X2-2 Upgrades</b>		
<b>Exadata Database Machine X2-2 Rack Connection</b>	<b>Exadata Database Machine X2-2 Half Rack to Full Rack Upgrade</b>	<b>Exadata Database Machine X2-2 Quarter Rack to Half Rack Upgrade</b>
Upgradability: Connect multiple Full or Half Racks via included InfiniBand fabric	Upgradability: Field upgrade from Half Rack to Full Rack	Upgradability: Field upgrade from Quarter Rack to Half Rack
<ul style="list-style-type: none"> <li>• Full Rack to Full Rack, Full Rack to Half Rack and Half Rack to Half Rack systems can be connected</li> <li>• InfiniBand cables to connect 3 Full or Half Racks come in the Rack Spares Kit</li> <li>• Additional optical InfiniBand cables required when connecting 4 or more Full or Half Racks</li> <li>• Up to 8 racks can be connected without requiring additional InfiniBand switches</li> </ul>	<p>Additional Hardware Components Included With The Upgrade:</p> <ul style="list-style-type: none"> <li>• 4 x Database Servers</li> <li>• 7 x Exadata Storage Servers X2-2 with 12 x 600 GB 15,000 RPM High Performance SAS disks or 12 x 2 TB 7,200 RPM High Capacity SAS disks</li> <li>• InfiniBand and Ethernet cables to connect all the components</li> <li>• Upgrade to Full Rack Spares Kit</li> </ul>	<p>Additional Hardware Components Included With The Upgrade:</p> <ul style="list-style-type: none"> <li>• 2 x Database Servers</li> <li>• 4 x Exadata Storage Servers X2-2 with 12 x 600 GB 15,000 RPM High Performance SAS disks or 12 x 2 TB 7,200 RPM High Capacity SAS disks</li> <li>• 1 x 36 port QDR (40 Gb/sec) InfiniBand switch</li> <li>• InfiniBand and Ethernet cables to connect all the components</li> <li>• Upgrade to Half Rack Spares Kit</li> </ul>
<p>Upgrade Support Services:</p> <ul style="list-style-type: none"> <li>• Hardware installation and software configuration</li> </ul>	<p>Upgrade Support Services:</p> <ul style="list-style-type: none"> <li>• Hardware installation and software configuration</li> </ul>	<p>Upgrade Support Services:</p> <ul style="list-style-type: none"> <li>• Hardware installation and software configuration</li> </ul>

<b>Environmental Specifications</b>		
<b>Exadata Database Machine X2-2 Full Rack</b>	<b>Exadata Database Machine X2-2 Half Rack</b>	<b>Exadata Database Machine X2-2 Quarter Rack</b>
<ul style="list-style-type: none"> <li>• Height: 42U, 78.66" - 1998 mm</li> <li>• Width: 23.62" – 600 mm</li> <li>• Depth: 47.24" – 1200 mm</li> </ul>	<ul style="list-style-type: none"> <li>• Height: 42U, 78.66" - 1998 mm</li> <li>• Width: 23.62" – 600 mm</li> <li>• Depth: 47.24" – 1200 mm</li> </ul>	<ul style="list-style-type: none"> <li>• Height: 42U, 78.66" - 1998 mm</li> <li>• Width: 23.62" – 600 mm</li> <li>• Depth: 47.24" – 1200 mm</li> </ul>
Weight: 2,131 lbs. (966.6 kg)	Weight: 1,329 lbs. (602.8 kg)	Weight: 902 lbs. (409.1 kg)
<b>Power</b> <ul style="list-style-type: none"> <li>• Maximum power usage: 14.0 kW (14.3 kVA)</li> <li>• Typical power usage (varies by application load): 9.8 kW (10.0 kVA)</li> </ul>	<b>Power</b> <ul style="list-style-type: none"> <li>• Maximum power usage: 7.2 kW (7.3 kVA)</li> <li>• Typical power usage (varies by application load): 5.1 kW (5.2 kVA)</li> </ul>	<b>Power</b> <ul style="list-style-type: none"> <li>• Maximum power usage: 3.6 kW (3.7 kVA)</li> <li>• Typical power usage (varies by application load): 2.7 kW (2.75 kVA)</li> </ul>
<b>Cooling</b> <ul style="list-style-type: none"> <li>• At maximum usage: 47,800 BTU/hour (50,400 kJ/hour)</li> <li>• At typical usage: 33,400 BTU/hour (35,300 kJ/hour)</li> </ul>	<b>Cooling</b> <ul style="list-style-type: none"> <li>• At maximum usage: 24,600 BTU/hour (25,950 kJ/hour)</li> <li>• At typical usage: 17,400 BTU/hour (18,400 kJ/hour)</li> </ul>	<b>Cooling</b> <ul style="list-style-type: none"> <li>• At maximum usage: 12,300 BTU/hour (13,000 kJ/hour)</li> <li>• At typical usage: 9,200 BTU/hour (9,700 kJ/hour)</li> </ul>
<b>Airflow</b> <ul style="list-style-type: none"> <li>• At maximum usage: 2,200 CFM</li> <li>• At typical usage: 1,560 CFM</li> <li>• Airflow must be front-to-back</li> </ul>	<b>Airflow</b> <ul style="list-style-type: none"> <li>• At maximum usage: 1,130 CFM</li> <li>• At typical usage: 840 CFM</li> <li>• Airflow must be front-to-back</li> </ul>	<b>Airflow</b> <ul style="list-style-type: none"> <li>• At maximum usage: 550 CFM</li> <li>• At typical usage: 410 CFM</li> <li>• Airflow must be front-to-back</li> </ul>
Operating temperature/humidity: 5 °C to 32 °C (41 °F to 89.6 °F), 10% to 90% relative humidity, non-condensing Altitude Operating: Up to 3,048 m, max. ambient temperature is de-rated by 1° C per 300 m above 900 m		
<b>Regulations*</b> <ul style="list-style-type: none"> <li>• Safety: UL 60950-1 2nd Ed, EN60950-1:2006 2nd Ed, CB Scheme with all country differences</li> <li>• RFI/EMI: FCC CFR 47 Part 15 Subpart B Class A, EN 55022:2006+A1:2007 Class A, EN 61000-3-11:2000, EN 61000-3-12:2005, ETSI EN 300 386 V1.4.1 (2008)</li> <li>• Immunity: EN 55024:1998+A1:2001:+A2:2003</li> </ul>		
<b>Certifications*</b> <ul style="list-style-type: none"> <li>• Safety: UL/cUL, CE, BSMI, GOST R, S-Mark, CSA C22.2 No. 60950-1-07 2nd Ed, CCC</li> <li>• EMC: CE, FCC, VCCI, ICES, KCC, GOST R, BSMI Class A, AS/NZ 3548, CCC</li> <li>• Other: Complies with WEEE Directive (2002/96/EC) and RoHS Directive (2002/95/EC)</li> </ul>		
* In some cases, as applicable, regulatory and certification compliance were obtained at the component level.		

Oracle Database Software (sold separately)	
For database servers	Oracle Database 11g Release 2 Enterprise Edition (requires 11.2.0.2 or higher), Oracle Real Application Clusters, Oracle Partitioning, and other Oracle Database options
For storage servers	Oracle Exadata Storage Server Software
Oracle Software (included)	
For database servers	Oracle Linux 5 Update 5 Zero-loss Zero-copy Datagram Protocol (ZDP) InfiniBand protocol used to communicate between the Exadata Storage Servers and the Oracle Database which is based on the Reliable Datagram Sockets (RDS) OpenFabrics Enterprise Distribution (OFED)
Exadata Storage Software Features	
<ul style="list-style-type: none"> <li>• Smart Scan Technology</li> <li>• Storage Index Technology</li> <li>• Hybrid Columnar Compression</li> <li>• Smart Scans of Data Mining model scoring</li> </ul>	
High-Availability Features	
<ul style="list-style-type: none"> <li>• Redundant power supplies for all servers</li> <li>• Redundant InfiniBand switches</li> <li>• Redundant Power Distribution Units</li> <li>• Oracle Automatic Storage Management: All database files mirrored; disk failures do not interrupt query processing</li> <li>• Oracle Real Application Clusters: database server failures are tolerated</li> <li>• Oracle Exadata Storage Server Software: storage server failures are tolerated</li> <li>• Backup is performed using Oracle Recovery Manager</li> <li>• Point in time restores are performed using Oracle Flashback Technologies</li> <li>• Oracle Data Guard for protection against disasters</li> </ul>	
Manageability Features	
<ul style="list-style-type: none"> <li>• Oracle Embedded Integrated Lights Out Manager (ILOM)</li> <li>• Oracle Enterprise Manager Grid Control</li> <li>• Oracle Auto Service Request (ASR)</li> <li>• Oracle Quality of Service Management (requires Oracle Database 11.2.0.2)</li> </ul>	

### Contact Us

For more information about the Oracle Database Machine, please visit [oracle.com](http://oracle.com) or call +1.800.ORACLE1 to speak to an Oracle representative.



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