ORACLE EXADATA STORAGE SERVER X3-2

KEY FEATURES AND BENEFITS

FEATURES

- 12 x 3.5 inch High Performance or High Capacity disks
- 1.6 TB of Exadata Smart Flash Cache
- 12 CPU cores dedicated to SQL processing in storage
- 64 GB memory
- Dual InfiniBand ports
- Redundant power supplies
- Oracle Exadata Storage Server software
- Oracle Linux or Solaris based Database Machines

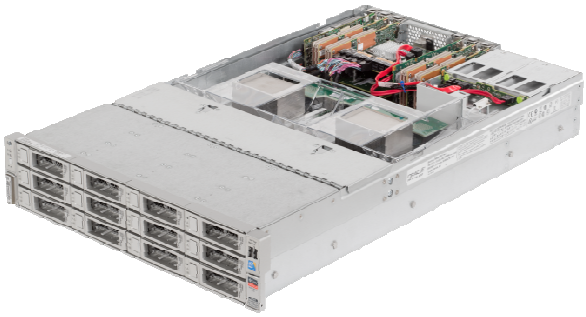
BENEFITS

- Uncompressed usable capacity of up to 3.25 TB per server when using High Performance disks
- Uncompressed usable capacity of up to 16 TB per server when using High Capacity disks
- Hybrid Columnar Compression delivers 10X-15X compression ratios
- Effective data bandwidth of up to 7.25 GB/second per server with Flash and uncompressed data
- Effective data bandwidth of up to 72.5 GB/second per server with Flash and compressed data
- Software pre-installed

The Oracle Exadata Storage Server X3-2 is the storage building block of the Oracle Exadata Database Machine, Oracle SPARC SuperCluster and Oracle Exadata Storage Expansion Rack. The Exadata Storage Server is highly optimized for use with the Oracle Database and employs a massively parallel architecture and Exadata Smart Flash Cache to dramatically accelerate Oracle Database processing and speed I/O operations. It may be attached to an Exadata Database Machine to build out the Database Machine and is ideal for Online Transaction Processing (OLTP), Data Warehousing (DW) and consolidation of mixed workloads. Simple to deploy and manage, the Oracle Exadata Storage Server provides linear I/O scalability and mission-critical reliability.

Oracle Exadata Storage Server

The Oracle Exadata Storage Server is a fast, reliable, high capacity, industry-standard storage server. Each server comes preconfigured with: 2 x six-core Intel® Xeon® E5-2630L Processors, 64 GB memory, 1.6 TB of Exadata Smart Flash Cache, 12 disks connected to a storage controller with 512MB battery-backed cache, and dual port InfiniBand connectivity. All software is preinstalled and comes complete with management interface for remote access, dual-redundant hot-swappable power supplies and takes up 2U in a 19-inch rack.



The Oracle Exadata Storage Server comes with either twelve 600 GB 15,000 RPM High Performance disks or twelve 3 TB 7,200 RPM High Capacity disks. The High Performance based Exadata Storage Servers provide up to 3.25 TB of uncompressed usable capacity, and up to 1.8 GB/second of raw data bandwidth. The High Capacity based Exadata Storage Servers provide up to 16 TB of uncompressed usable capacity, and up to 1.3 GB/second of raw data bandwidth. When stored in compressed format, the amount of user data and the amount of data bandwidth delivered by each cell increases up to 10 times.

RELATED PRODUCTS AND SERVICES

RELATED PRODUCTS

- Oracle Exadata Database Machine X3-2
- Oracle Exadata Database Machine X3-8
- Oracle Exadata Storage Expansion Rack X3-2
- Oracle SPARC SuperCluster
- Oracle Database 11g
- Real Application Clusters
- Partitioning
- Advanced Compression
- Advanced Security
- Active Data Guard
- Real Application Testing
- OLAP
- Advanced Analytics
- Business Intelligence
- Enterprise Manager
- Oracle Linux
- Oracle Solaris

RELATED SERVICES

The following services are available from Oracle:

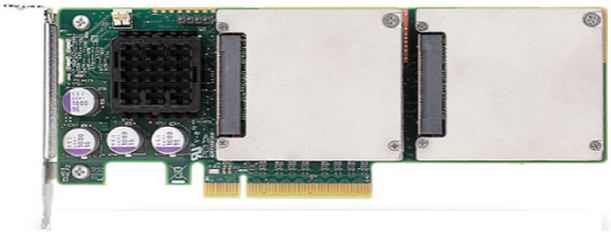
- Advanced Customer Services
- Oracle Premier Support for Systems
- Oracle Platinum Services
- Consulting Services
- Oracle University courses

Extreme Performance by Offloading Data Intensive Processing

The Oracle Database and the Exadata Storage Server Software includes a unique technology that offloads data intensive SQL operations from the database servers into the Exadata Storage Servers. By pushing SQL processing to the Exadata Storage Servers, data filtering and processing occurs immediately and in parallel across all storage servers as data is read from disk. Exadata storage offload reduces database server CPU consumption and greatly reduces the amount of data moved between storage and database servers. The CPUs in Exadata Storage Servers do not replace database CPUs. Instead they accelerate data intensive workloads similar to how graphics cards accelerate image intensive workloads.

Extreme Performance from Exadata Smart Flash Cache

Exadata systems use the latest PCI flash technology rather than flash disks. PCI flash greatly accelerates performance by placing flash directly on the high speed PCI bus rather than behind slow disk controllers and directors. Each Exadata Storage Server includes 4 PCI flash cards with a total capacity of 1.6 TB of flash memory. A Full Rack Exadata Database Machine includes 56 PCI flash cards providing 22.4 TB of flash memory.



The Exadata Smart Flash Cache automatically caches frequently accessed data in PCI flash while keeping infrequently accessed data on disk drives. This provides the performance of flash with the capacity and cost of disk. The Exadata Smart Flash Cache understands database workloads and knows when to avoid caching data that will never be reused or will not fit in the cache. The Oracle Database and Exadata storage optionally allow the user to provide directives at the database table, index and segment level to ensure that specific data is retained in flash. Tables can be retained in flash without the need to move the table to different tablespaces, files or LUNs like you would have to do with traditional storage and flash disks.

The combination of scale-out storage, InfiniBand networking, database offload, and PCI flash allows a single rack Exadata Database Machine rack to deliver up to 100 GB per second of I/O bandwidth and up to 1,500,000 random 8K I/O operations per second (IOPS) to database workloads. This performance is orders of magnitude faster than traditional storage arrays.

The Exadata Smart Flash Cache also implements unique algorithms to reduce the latency of log write I/O. The time to commit user transactions or perform critical updates is very sensitive to the latency of log writes. Smart Flash Logging takes advantage of the flash memory in Exadata storage to speed up log writes while implementing special algorithms that bypass the latency spikes that are seen in other flash solutions.

Optimizing Storage Use and I/O Through Compression

Compressing data can provide dramatic reduction in the storage consumed for large databases. The Exadata Storage Server provides a very advanced compression capability called Hybrid Columnar Compression (HCC). Hybrid Columnar Compression enables the highest levels of data compression and provides tremendous cost-savings and performance improvements due to reduced I/O. Typical storage savings range from 10x to 15x. On conventional systems, enabling high data compression has the drawback of reducing performance. Because the Exadata Database Machine is able to offload compression overhead into large numbers of processors in Exadata storage, most workloads run faster using Hybrid Columnar Compression than they do without it. Hybrid Columnar Compression combines the compression and analytic performance benefits of column storage while avoiding the dramatic slowdown that pure columnar stores experience for drilldown operations.

Intelligent Scalable Storage Grid

Oracle Exadata Storage Servers are installed in to a customer supplied 19-inch rack and is connected to an Exadata Database Machine or SPARC SuperCluster via InfiniBand. Exadata Storage Servers have dual 40 Gigabit InfiniBand links that provide connectivity many times faster than traditional storage or server networks. Further, Oracle's interconnect protocol uses direct data placement to ensure very low CPU overhead by directly moving data from the wire to database buffers with no extra data copies.

Exadata Storage Servers are architected to scale-out easily. To achieve higher performance and greater storage capacity, additional Exadata Storage Servers can be connected to an Oracle Database Machine or SPARC SuperCluster. This, combined with faster InfiniBand interconnect, Exadata Smart Flash Cache and the reduction of data transferred due to offload processing and Hybrid Columnar Compression, yields very large performance improvements. A 10x improvement in query performance compared to traditional database storage architectures is common, with much greater improvement possible.

An alternative to the purchase of individual Exadata Storage Servers with the requisite rack, InfiniBand switches, cables and other infrastructure built and configured by the customer, is the Exadata Storage Expansion Rack. The Exadata Storage Expansion Rack enables you to easily grow the Exadata storage capacity and bandwidth of any X3-2 and X3-8 Exadata Database Machine or SPARC SuperCluster. It is designed for database deployments that require very large amounts of data including: historical or archive data; backups and archives of Exadata Database Machine data; documents, images, file and XML data, LOBs and other large unstructured data. Available in Full Rack, Half Rack and Quarter Rack versions it connects to the Exadata Database Machine or SPARC SuperCluster using the integrated InfiniBand fabric to easily scale the system to any capacity. The expansion rack is extremely simple to configure as there are no LUNs or mount points to configure. Storage is configured and added to a database with a few simple commands, completed in minutes. ASM dynamically and automatically balances the

data across Exadata Storage Servers, online, evenly spreading the I/O load across the racks fully utilizing all the hardware and easily integrating the expansion rack into the configuration.

Mission Critical High Availability

The Oracle Exadata Storage Server has complete redundancy built in to support the demands of mission critical applications. Each Exadata Storage Server has dual port InfiniBand connections and dual-redundant, hot-swappable power supplies for high availability. Automatic Storage Management, a feature of the Oracle Database, provides disk mirroring. Hot swappable Exadata disks ensure the database can tolerate disk drive failures. In addition, data is mirrored across storage servers to ensure that storage server failure will not cause loss of data, or inhibit data accessibility.

Oracle Exadata Storage Server X3-2 Hardware	
The Oracle Exadata Storage Server comes preconfigured with:	
Processors	2 x Six-Core Intel® Xeon® E5-2630L (2.0 GHz) Processors
Exadata Smart Flash Cache	1.6 TB
System Memory	64 GB
Disk Controller	Disk Controller HBA with 512MB Battery Backed Write Cache
InfiniBand Connectivity	Dual-Port QDR (40Gb/s) InfiniBand Host Channel Adapter
Power Supplies	Dual-redundant, hot-swappable power supply
Disk Drives	12 x 600 GB 15,000 RPM High Performance or 12 x 3 TB 7,200 RPM High Capacity For raw disk capacity, 1 GB = 1 billion bytes. Actual formatted capacity is less.
Remote Management	Integrated Lights Out Manager (ILOM) Ethernet port

Oracle Exadata Storage Server X3-2 Key Capabilities	
High Performance disks	• Up to 1.8 GB/second of uncompressed raw disk bandwidth per cell • Up to 7.25 GB/second of uncompressed Flash data bandwidth per cell • 7.2 TB of raw disk data capacity • Up to 3.25 TB of uncompressed usable capacity per cell
High Capacity disks	• Up to 1.3 GB/second of uncompressed raw disk bandwidth per cell • Up to 6.75 GB/second of uncompressed Flash data bandwidth per cell • 36 TB of raw disk data capacity • Up to 16 TB of uncompressed usable capacity per cell

Oracle Exadata Storage Server X3-2 Environmental Specifications	
Dimensions and Weight	• Height: 3.5 in. (87.6 mm) • Width: 17.5 in. (445.0 mm) • Depth: 29.0 in. (737.0 mm) • Weight: 70 lbs. (31.8 kg)
Environment	• Operating temperature: 5 ºC to 35 ºC (41 ºF to 95 ºF) • Non-operating temperature: -40 ºC to 70 ºC (-40 ºF to 158 ºF) • Operating relative humidity 10% to 90% non-condensing • Non-operating relative humidity: up to 93%, non-condensing • Operating altitude: Up to 3,000 m, maximum ambient temperature is derated by 1° C per 300 m above 900 m • Non-operating altitude: Up to 12,000 m • Acoustic noise: 7.61 B operating
Power	• Dual-redundant, hot-swappable power supply • Maximum output power: 1000 W • Maximum AC input current at 100 V AC and 1,000 W output: 12.0 A • Specified power supply efficiency at 1,000 W (100%) load: 91%
Regulations [1]	• Safety: EN 60950-1:2006 + A11:2009, IEC 60950-1:2005, 2nd Edition (Evaluated to all CB countries), UL 60950-1, 2nd Edition, CSA C22.2 No. 60950-1-07 • RFI/EMI: EN55022:2006 + A1:2007 Class A, EN61000-3-2:2006 + A1:2009 + A2:2009, EN61000-3-3:2008, 47CFR15 Subpart B (FCC) Class A, ICES-003 Class A, AS/NZS CISPR22:2006 Class A, CISPR22:2008: Class A • Immunity: EN 55024:2010
Certifications [1]	• Safety: UL/cUL, CE, BSMI, GOST R, S-Mark, CSA C22.2 No. 60950-1-07 2nd Ed. • EMC: CCC, CE, FCC, VCCI, ICES, C-Tick, KCC, GOST R, BSMI Class A • Other: Complies with WEEE Directive (2002/96/EC) and RoHS Directive (2011/65/EC)

[1] In some cases, as applicable, regulatory and certification compliance were obtained at the component level.

Oracle Exadata Storage Server X3-2 Software
• Oracle Exadata Storage Server Software 11g Release 2 (release 11.2.3.2or later) • Oracle Linux 5 Update 8 with the Unbreakable Enterprise Kernel • Requires Oracle Database 11g Release 2 Enterprise Edition or later for the database accessing Exadata storage
High-Availability Features
• Redundant power supplies • Redundant InfiniBand ports • Hot swappable disk drives • Oracle Automatic Storage Management: All database files either double or triple mirrored; Disk failures do not abort queries or transactions • Oracle Exadata Storage Server Software: Storage server failure can be tolerated without data loss or aborting queries or transactions
Manageability Features
• Oracle Embedded Integrated Lights Out Manager (ILOM) • Oracle Enterprise Manager Cloud Control 12c
Support Services Provided By Oracle
• 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
• Oracle Premier Support for Systems: Oracle Linux and Solaris support and 24x7 with 2 hour on-site hardware service response (subject to proximity to service center)
• Oracle Premier Support for Operating Systems
• Oracle Customer Data and Device Retention
• System Installation Services
• Software Configuration Services
• Oracle Platinum Services
• Oracle Exadata Start-Up Pack
• System Upgrade Support Services including hardware installation and software configuration
• Oracle Auto Service Request (ASR)

Contact Us

For more information about the Oracle Exadata Storage Server, please visit oracle.com or call +1.800.ORACLE1 to speak to an Oracle representative.

Oracle is committed to developing practices and products that help protect the environment

ORACLE