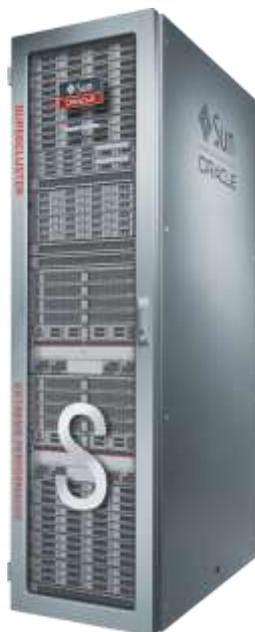


# Oracle SuperCluster T5-8

**ORACLE**  
SUPERCLUSTER

Oracle SuperCluster T5-8 is an integrated server, storage, networking, and software system that provides maximum end-to-end database and application performance and minimizes initial and ongoing support and maintenance effort and complexity at the lowest total cost of ownership. It is ideal for Oracle Database and best for Oracle applications, maximizing return on software investments and increasing IT agility, and it improves application usability and overall IT productivity. Oracle SuperCluster provides unique database, OLTP, and data warehouse performance and storage efficiency enhancements as well as unique middleware and application performance enhancements. The system, which is engineered and preintegrated for easy deployment, minimizes overhead and is backed by the most aggressive support service-level agreements (SLAs) in the industry.



## Complete: Servers, Storage, Networking, and Software. Optimized. Ready to Run.

Oracle SuperCluster is pretested with integrated Oracle servers, storage, networking and software technologies optimized together to run Oracle Database, Java, and enterprise applications unchanged. Oracle SuperCluster T5-8 accelerates Oracle Database and Java performance by up to 10x, while improving user response times and meeting service level agreements. With no single point of failure, Oracle SuperCluster T5-8 customers can achieve high application availability, which minimizes planned and unplanned downtime while providing the highest service levels for core business applications across all tiers of the data center. Oracle SuperCluster T5-8 runs both Oracle Database and enterprise applications on one system, lowering TCO through consolidation and delivering secure multitenant cloud services 5x faster than the traditional build-your-own IT approach.

## Extreme Performance

Oracle SuperCluster T5-8 is based on fast database and application servers, the fastest database storage, and Oracle's SPARC T5 microprocessor and operating system combination. Oracle Solaris 11 on SuperCluster provides a highly available, secure, and scalable operating system with zero-overhead server, storage, and network virtualization capabilities and best-in-class application performance resulting in greater consolidation ratios. Applications certified on Oracle Solaris 8, Oracle Solaris 9, Oracle Solaris 10, and Oracle Solaris 11 can run without modification simultaneously on Oracle SuperCluster. InfiniBand networking technology is the communication backbone that

## ENGINEERED SYSTEM FOR DATABASES AND APPLICATIONS

### KEY BUSINESS BENEFITS

- Complete infrastructure for databases and applications
- Single pre-integrated system, from compute and storage to virtualization, operating system and management
- Co-engineered Oracle M7 processor, Oracle Exadata Storage Server, InfiniBand, Oracle Solaris, Oracle VM, and Oracle Database delivers unbeatable performance and efficiency
- Binary compatibility to protect your investments

### KEY FEATURES

- Up to 256 compute processors and 4 TB of memory in a single rack
- Supports Oracle Solaris 11, Oracle Solaris 10, Oracle Solaris 9, and Oracle Solaris 8
- Built-in, zero-overhead virtualization using Oracle VM Server for SPARC and Oracle Solaris Zones
- Optimized for Oracle Database and Exalogic Elastic Cloud Software with unique hardware acceleration
- Highly available ZFS storage cluster for high performance, fully redundant disk storage
- InfiniBand I/O fabric that provides extremely scalable, reliable, and high-performance connectivity among all components
- Fully integrated and fully redundant compute, storage, and networking components for high availability
- Built-in, hardware encryption to provide end-to-end data security

delivers low-latency, high-performance 40 gigabits-per-second bandwidth—many times higher than traditional server or storage networks.

Integration of Oracle's Exadata Storage Server systems, Exadata Storage Server Software, and Exalogic Elastic Cloud Software provide database and Java application performance advantages on a single system. Running Exalogic Elastic Cloud Software on Oracle SuperCluster T5-8 can provide up to 10x increase in Java application performance acceleration. Exadata Storage Server provides the database storage building block of Oracle SuperCluster T5-8. It is highly optimized for use with Oracle Database because it employs a massively parallel architecture and the Exadata Smart Flash Cache feature of Oracle Exadata to dramatically accelerate Oracle Database processing and speed I/O operations. With the integration of Exadata Storage Server systems, the Oracle SuperCluster T5-8 full rack offers up to 1 million database IOPS and rapid query throughput, enabling databases and data warehouses to run 10x faster and deliver quicker results than with other platforms. Oracle SuperCluster T5-8 is capable of running 1 million secure transactions per second at the web, middleware, and database tiers, concurrently, with no performance impact.

## Optimizing Storage Use and I/O Through Compression

Oracle Exadata Storage Server X5-2 provides a very advanced compression capability called Hybrid Columnar Compression that provides dramatic reductions in storage for large databases. Hybrid Columnar Compression enables the highest levels of data compression and provides tremendous cost savings and performance improvements due to reduced I/O, especially for analytic workloads. Storage savings is data dependent and often ranges from 5x to 20x. Typical storage savings is an industry leading 10x. On conventional systems, enabling high data compression has the drawback of reducing performance. Because Oracle SuperCluster is able to offload decompression overhead into large numbers of processors in Oracle Exadata storage, most analytics workloads run faster using Hybrid Columnar Compression than they do without it. Hybrid Columnar Compression delivers the compression and analytic performance benefits of column storage while avoiding the dramatic slowdown that pure columnar stores experience for drilldown operations (single row access).

Two modes of Hybrid Columnar Compression are available. **Query-optimized compression** mode is suitable for read-intensive workloads such as data warehouses and provides large storage savings while providing enhanced analytic performance. **Archive compression** mode provides the highest degree of compression and is targeted at seldom-accessed data that is kept online.

On OLTP systems, Hybrid Columnar Compression can be used to compress older, less active data while new, more active and update-intensive data can be compressed using advanced row compression. Oracle Database 12c provides the ability to change the type of compression used by individual table partitions online (even if there are global indexes on the table), to ensure seamless tiering across different compression types as data ages and becomes less active.

## Record-Breaking I/O Performance from Extreme Flash Storage Server

**RELATED PRODUCTS**

- Oracle SuperCluster M7
- Oracle SuperCluster M6-32
- Oracle Solaris
- Oracle Exadata
- Oracle's Exadata Storage Expansion Racks
- Oracle ZFS Storage Appliance
- Oracle's Sun Datacenter InfiniBand Switch 36
- Oracle Database 11g
- Oracle Real Application Clusters (Oracle RAC)
- Oracle's Exalogic Elastic Cloud Software
- Oracle Enterprise Manager Ops Center
- Oracle Solaris Cluster
- Oracle Optimized Solutions

**RELATED SERVICES**

- Oracle Advanced Customer Support services
- Oracle Premier Support for Systems
- Oracle Infrastructure as a Service On-Premise
- Oracle Platinum Services
- Oracle PlatinumPlus Services
- Consulting services
- Oracle University courses

Exadata Storage Server X5-2 introduces NVMe (nonvolatile memory express)-based **Extreme Flash Storage Servers**. Each Extreme Flash server consists of eight 1.6 TB state-of-the-art NVMe PCI Flash drives. PCI flash delivers ultra-high performance by placing flash memory directly on the high-speed PCI bus rather than behind slow disk controllers and directors.

The Extreme Flash Storage Server replaces the previous High Performance disk configuration of Exadata Storage Server and is backward compatible with all supported Oracle SuperCluster systems. Extreme Flash Storage Servers also can be combined with High Capacity Storage Servers within the same rack.

Flash performance is often limited and bottlenecked by traditional storage architectures. In contrast, Oracle SuperCluster uses a combination of scale-out storage, InfiniBand networking, database offload, and PCI flash to deliver extremely high-performance rates from flash. This performance is orders of magnitude faster than traditional database architectures.

### Extreme Performance from Exadata Smart Flash Cache

Flash is also included in the Exadata Storage Server X5-2 **High Capacity Storage Server**, in the form of four of Oracle's Sun Flash Accelerator F160 PCIe Card (NVME) with a total raw capacity of 6.4 TB of flash memory. High Capacity Storage Servers use flash as a cache in conjunction with 96 TB of disk storage. Flash in a High Capacity Storage Server can be used directly as flash disks, but it is almost always configured as a flash cache (**Exadata Smart Flash Cache**) in front of disk since caching provides flash-level performance for much more data than fits directly into flash.

Exadata Smart Flash Cache automatically caches frequently accessed data while keeping infrequently accessed data on disk drives. This provides the performance of flash with the capacity and low cost of disk. Exadata Smart Flash Cache understands database workloads and knows when to avoid caching data that the database rarely accesses or is too big to fit in the cache. In addition to automatic caching, administrators can optionally provide SQL directives to ensure that specific tables, indexes, or partitions are always retained in flash. Tables can be retained in flash without the need to move the table to different tablespaces, files, or LUNs as is often required with traditional storage.

Exadata Smart Flash Cache is designed to deliver flash-level I/O rates and response times for data that is many times larger than the physical flash capacity in the machine. It automatically moves active data that is experiencing heavy I/O activity into flash, while leaving cold data that sees infrequent I/O activity on disk. It is common for hit rates in Exadata Smart Flash Cache to be more than 90 percent, or even 98 percent in real-world database workloads even though flash capacity is more than 10x smaller than disk capacity. Such high flash cache hit rates mean that Exadata Smart Flash Cache provides an **effective flash capacity** that is often 10x larger than the physical flash cache.

Exadata Smart Flash Cache also caches database block writes. Write caching eliminates disk bottlenecks in large scale OLTP and batch workloads. The Exadata Smart Flash Cache write cache is transparent, persistent, and fully redundant. The I/O

performance of Exadata Smart Flash Cache is comparable to dozens of enterprise disk arrays with thousands of disk drives.

To further accelerate OLTP workloads, Exadata Smart Flash Cache also implements a special algorithm to reduce the latency of log write I/Os called Exadata Smart Flash Logging, a feature of Oracle Exadata. The time to commit user transactions or perform critical updates is very sensitive to the latency of log writes. Exadata Smart Flash Logging takes advantage of the flash memory in Oracle Exadata storage combined with the high-speed RAM memory in the Oracle Exadata disk controllers to greatly reduce the latency of log writes and avoid the latency spikes that frequently occur in other flash solutions.

Exadata Smart Flash Cache also implements a unique algorithm called **Exadata Columnar Flash Cache** to accelerate reporting and analytical queries. Exadata Columnar Flash Caching implements a dual format architecture in flash by automatically transforming frequently scanned data compressed by Hybrid Columnar Compression into a pure columnar format as it is loaded into the flash cache. Smart scans on pure columnar data in flash run faster because they read only the selected columns, reducing flash I/Os and storage server CPU consumption. This accelerates reporting and analytic queries while maintaining excellent performance for OLTP style single-row lookups.

## No Single Point of Failure

Oracle SuperCluster T5-8 has no single point of failure due to built-in full component redundancy, and it provides a highly available framework offering automatic application failover and recovery to support the demands of mission-critical applications. Oracle SuperCluster T5-8 enables the high database and application availability to minimize planned and unplanned downtime, which provides the highest service level for core applications across all tiers of the data center. Oracle Clusterware drastically improves database availability while Oracle Solaris Cluster provides industry-leading application uptime.

Oracle Enterprise Manager Ops Center 12c provides end-to-end monitoring of all components and simplified management of virtual infrastructure for easy application consolidation along with network and storage provisioning. With Oracle Platinum Services support, Oracle SuperCluster T5-8 features real-time fault notification and resolution, and risk-free, simplified integrated stack patching with no service interruption—ensuring reduced risk and expedited updates. Oracle SuperCluster T5-8 offers significant reductions in time for patching and minimizes downtime, ensuring maximum service levels for all applications.

Oracle SuperCluster T5-8 features a dynamic self-tuning tool for highest availability. This tool acts as a virtual tuning expert. It constantly monitors and applies recommended best practices as required and detects potential risk scenarios. Further, it automatically takes corrective action and applies performance optimizations automatically to enhance availability and performance while reducing risk.

## Highest Efficiency

Compared to the build-it-yourself IT approach, Oracle SuperCluster T5-8 helps users achieve high efficiency in the data center. Since Oracle's hardware and software are

coengineered, Oracle SuperCluster T5-8 speeds time to production and deployment of secure multitenant cloud services 5x faster than build-it-yourself deployments. Running Oracle Database and enterprise applications together on Oracle SuperCluster T5-8 offers significant price performance advantage over comparable build-it-yourself IT deployments. Upgrading an existing data center with Oracle SuperCluster T5-8 also can dramatically lower TCO, reducing data center footprint, power, and cooling costs. Additionally, Oracle SuperCluster T5-8 can lower operation and maintenance costs by 3x.

Oracle Solaris 11 is the world's most powerful cloud operating system, featuring zero-overhead virtualization. Oracle's virtualization technology, Oracle VM Server for SPARC, enables provisioning of databases and applications, across a range of performance, capacity, and availability attributes to cost effectively manage SLAs.

Hybrid Columnar Compression on Oracle SuperCluster T5-8 enables the highest levels of data compression due to reduced I/O. Hybrid Columnar Compression is optimized to use both database and storage capabilities on Oracle SuperCluster T5-8 to deliver up to 10x more data compression. This reduces or eliminates the need to add more expansive SAN-based storage.

Oracle Optimized Solutions dramatically reduce deployment time, effort, and risk while maximizing performance using tested and documented best practices. Customers can deliver cloud services "out of the box" using Oracle Optimized Solutions offerings such as a database-as-a-service cloud. For example, on Oracle SuperCluster T5-8, database provisioning can be accelerated by 32x and database deployment can be simplified with 12x fewer steps. Oracle Optimized Solutions provide a template that customers can leverage to reduce operating costs on aging assets while delivering a more flexible service environment to internal application users. Customers can quickly deploy enterprise cloud services with 24/7 availability, secure multitenancy, and a radically simplified management, patching, and support model. The result is an agile database environment that is better able to support business needs by enabling higher end user productivity, increased utilization, and reduced IT costs.

## Seamless Integration and Support

By combining its industry-standard high-performance servers and storage with the intelligence built into its best-in-class software, Oracle SuperCluster T5-8 delivers the industry's highest levels of performance, scalability, and reliability—all backed by Oracle support. Only Oracle offers a single point of accountability and complete, integrated support for the entire Oracle technology stack—applications to disk—with 24/7 hardware service, expert technical support, proactive tools, and software updates. To help accelerate deployment and ensure operational readiness of system, Oracle also offers lifecycle services to help with planning and guidance, installation, configuration, production readiness, and patch deployment services. To further support the performance and high availability of customers' systems, Oracle Premier Support customers who are running certified configurations on Oracle SuperCluster can qualify to receive Oracle Platinum Services—the industry's highest level of support—which provides remote fault monitoring with fast response times and patch deployment at no additional cost.

Oracle SuperCluster Specifications	Half Rack	Full Rack
Oracle's SPARC T5-8 Compute Nodes	2	2
Each compute node configured with:	<ul style="list-style-type: none"> <li>4 x sixteen-core SPARC T5 processors (3.6 GHz)</li> <li>64 x 16 GB of memory</li> <li>8 x 1.2 TB 10,000 RPM disks</li> <li>4 x dual-port QDR InfiniBand adapter</li> <li>4 x dual-port 10 GbE</li> </ul>	<ul style="list-style-type: none"> <li>8 x sixteen-core SPARC T5 processors (3.6 GHz)</li> <li>128 x 16 GB of memory</li> <li>8 x 1.2 TB 10,000 RPM disks</li> <li>8 x dual-port QDR InfiniBand adapter</li> <li>8 x dual-port 10 GbE</li> </ul>
	128 CPU cores and 2 TB of memory for database and application processing (64 CPU cores and 1 TB of memory per compute node)	256 CPU cores and 4 TB of memory for database and application processing (128 CPU cores and 2 TB of memory per compute node)
Exadata Storage Server	4	8
Each Exadata Storage Server X5-2 is configured with:		
<ul style="list-style-type: none"> <li>2 x eight-core Intel® Xeon® processor E5-2630 v2 for SQL processing</li> <li>12 x 8 TB 7,200 RPM high-capacity disks and 4 x 1.6 TB Exadata Smart Flash Cache, or</li> <li>8 x 1.6TB NVMe PCI flash drives</li> </ul>		
Extreme Flash	<p><b>Flash Metrics</b></p> <ul style="list-style-type: none"> <li>51.2 TB data capacity (raw)</li> </ul> <p><b>Disk Metrics</b></p> <ul style="list-style-type: none"> <li>51 TB raw data disk capacity<sup>3</sup></li> </ul> <p><b>Combined Metrics</b></p> <ul style="list-style-type: none"> <li>22 TB data capacity (usable)<sup>4</sup></li> </ul>	<p><b>Flash Metrics</b></p> <ul style="list-style-type: none"> <li>102.4 TB data capacity (raw)</li> </ul> <p><b>Disk Metrics</b></p> <ul style="list-style-type: none"> <li>102 TB raw data disk capacity<sup>3</sup></li> </ul> <p><b>Combined Metrics</b></p> <ul style="list-style-type: none"> <li>44 TB data capacity (usable)<sup>4</sup></li> </ul>
High Capacity	<p><b>Flash Metrics</b></p> <ul style="list-style-type: none"> <li>25.6 TB data capacity (raw)<sup>3</sup></li> <li>Up to 384 TB effective flash capacity<sup>4</sup></li> </ul> <p><b>Disk Metrics</b></p> <ul style="list-style-type: none"> <li>7.2 GB/sec SQL disk bandwidth<sup>1</sup></li> <li>10,400 database disk IOPS<sup>2</sup></li> <li>384 TB data capacity (raw)<sup>3</sup></li> </ul> <p><b>Combined Metrics</b></p> <ul style="list-style-type: none"> <li>216 TB data capacity (usable)<sup>5</sup></li> </ul>	<p><b>Flash Metrics</b></p> <ul style="list-style-type: none"> <li>51.2 TB data capacity (raw)<sup>3</sup></li> <li>Up to 768 TB effective flash capacity<sup>4</sup></li> </ul> <p><b>Disk Metrics</b></p> <ul style="list-style-type: none"> <li>14.4 GB/sec SQL disk bandwidth<sup>1</sup></li> <li>20,800 database disk IOPS<sup>2</sup></li> <li>768 TB data capacity (raw)<sup>3</sup></li> </ul> <p><b>Combined Metrics</b></p> <ul style="list-style-type: none"> <li>432 TB data capacity (usable)<sup>5</sup></li> </ul>
<p><sup>1</sup> Bandwidth is peak physical scan bandwidth achieved running SQL, assuming no data compression. Effective data bandwidth is higher when compression is used.</p> <p><sup>2</sup> Based on 8 K I/O requests running SQL. Note that the I/O size greatly affects flash IOPS. Others quote IOPS based on smaller I/O operations that are not relevant for databases.</p> <p><sup>3</sup> Raw capacity is measured in standard disk drive terminology with 1 GB = 1 billion bytes.</p> <p><sup>4</sup> Effective flash capacity is larger than the physical flash capacity and takes into account the high flash hit ratios due to Oracle Exadata's intelligent flash caching algorithms, as well as the size of the underlying disk storage. It is the size of the data files that can often be stored in Oracle Exadata and be accessed at the speed of flash memory. Usable capacity is measured using normal powers of 2 space terminology with 1 TB = 1024 * 1024 * 1024 * 1024 bytes.</p> <p><sup>5</sup> Usable capacity is measured using normal powers of 2 space terminology with 1 TB = 1024 * 1024 * 1024 * 1024 bytes. It is the actual space available for a database after taking into account Oracle Automatic Storage Management redundancy and preserving adequate space to recover from a drive failure. Space needed for the DBFS disk group as well as space needed to host the OS and image binaries have been removed.</p>		
Shared Storage Subsystem	1	1
Oracle ZFS Storage ZS3-ES dual controller, each with:		
<ul style="list-style-type: none"> <li>2 x eight-core 2.1 GHz Intel® Xeon® processor E5-2658 processors</li> <li>16 x 16 GB of memory</li> <li>1 x dual-port InfiniBand HCA</li> <li>2 x 900 GB SATA disks</li> <li>2 x 1.6 TB read optimized solid-state disk (SSD)</li> </ul>		
Disk shelf:		
<ul style="list-style-type: none"> <li>20 x 8 TB high-capacity 7,200 RPM disks</li> <li>4 x 200 GB write-optimized SSD</li> </ul>		
InfiniBand Switches	3	3

- 36-port QDR (40 Gb/sec) InfiniBand switches

**Additional Hardware Components**

Additional hardware components included:

- Ethernet management switch
- 42U rack packaging
- 2 x redundant power distributions units (PDUs)
- InfiniBand and Ethernet cables

Spares included:

- 1 x 8 TB high-capacity disk and 1 x 1.6 TB Exadata Smart Flash Cache card, or
- 1 x 1.6 TB NVMe PCI flash drive
- InfiniBand cables

**Key Applications**

<ul style="list-style-type: none"> <li>• Data center consolidation</li> <li>• Multitier enterprise applications</li> <li>• Large to small databases and data warehouses</li> <li>• Private clouds</li> </ul>	<ul style="list-style-type: none"> <li>• Securely virtualize and consolidate applications to increase operating efficiency, reduce server count, and conserve data center space and energy.</li> <li>• Consolidate up to 100 legacy servers with one full rack of integrated server, storage, and networking hardware, and systems software technology.</li> <li>• Run existing Oracle, independent software vendor (ISV), and custom applications without modification.</li> <li>• Deploy high-performance web, database, middleware, and application tiers on a single system.</li> <li>• Leverage built-in database acceleration to deliver unsurpassed performance, scalability, and data protection.</li> <li>• Minimize time to value and risk and maximize performance with Oracle Optimized Solutions.</li> <li>• Rapidly deploy self-service cloud services using the most efficient virtualization and automated systems management.</li> </ul>
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**Software**

<ul style="list-style-type: none"> <li>• Operating system</li> </ul>	<ul style="list-style-type: none"> <li>• Oracle Solaris 11.1 for Oracle Database 11g, Exalogic Elastic Cloud Software and general purpose applications</li> <li>• Oracle Solaris 10 1/13 for general purpose applications</li> </ul>
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**Virtualization**

Built-in, low overhead, Oracle VM Server for SPARC and Oracle Solaris Zones provide the flexibility to power virtual systems and thousands of zones at no additional cost.

**Oracle SuperCluster Services and Support**

<p><b>Hardware Warranty</b></p>	<p>One year with four-hour web/phone response during normal business hours (Monday to Friday 8 a.m. to 5 p.m.), with two-business day onsite response/parts exchange</p>
<p><b>Oracle Support</b></p>	<ul style="list-style-type: none"> <li>• Oracle Platinum Services                             <ul style="list-style-type: none"> <li>• Remote fault monitoring with faster response times and patch deployment services to qualified Oracle Premier Support customers at no additional cost</li> </ul> </li> <li>• Oracle Premier Support for Systems                             <ul style="list-style-type: none"> <li>• Essential support services including 24/7 support with two-hour onsite hardware service response (subject to proximity to service center), proactive tools, and online resources</li> </ul> </li> <li>• Oracle Customer Data and Device Retention</li> <li>• Oracle Auto Service Request</li> </ul>
<p><b>Oracle SuperCluster Start-Up Pack</b></p>	<ul style="list-style-type: none"> <li>• Oracle SuperCluster Start-Up Advisory Service</li> <li>• Oracle SuperCluster Installation Service</li> <li>• Oracle SuperCluster Configuration Service</li> <li>• Oracle SuperCluster Production Support Readiness Service</li> <li>• Oracle SuperCluster Quarterly Patch Deployment Service</li> </ul>
<p><b>Services from Oracle Advanced Customer Support services</b></p>	<ul style="list-style-type: none"> <li>• Oracle Standard System Installation</li> <li>• Oracle Standard Software Configuration</li> <li>• Oracle Exalogic Configuration Service</li> <li>• Oracle Advanced Monitoring and Resolution</li> <li>• Oracle Solution Support Center</li> <li>• Oracle Business Critical Assistance</li> <li>• Oracle Advanced Support Assistance</li> <li>• Oracle Priority Service</li> <li>• Quarterly Patch Deployment</li> <li>• Oracle Business Critical Service for Systems Support</li> <li>• Oracle Advanced Support Engineer for Engineered Systems</li> </ul>
<p><b>Services from Oracle Consulting</b></p>	<ul style="list-style-type: none"> <li>• Oracle Migration Factory</li> <li>• Consolidation services</li> <li>• Architecture services</li> </ul>

Oracle SuperCluster T5-8 Environmental Specifications	Full Rack	Half Rack
<b>Dimensions</b>	<ul style="list-style-type: none"> <li>Height: 78.66 inches—1,998 mm</li> <li>Width: 23.62 inches—600 mm</li> <li>Depth: 47.24 inches—1,200 mm</li> </ul>	
	Weight: 1,916 lb.	Weight: 1,556 lb.
<b>Power:</b>	Maximum: 15.1 kW (15.9 kVA) Typical: 12.6 kW (13.3 kVA)	Maximum: 8.6 kW (9.0 kVA) Typical: 7.1 kW (7.5 kVA)
<b>Cooling:</b>	Maximum: 54,505 BTU/hour (57.4 kJ/hour) Typical: 45,422 BTU/hour (47.8 kJ/hour)	Maximum: 31,013 BTU/hour (32.6 kJ/hour) Typical: 25,591 BTU/hour (26.97 kJ/hour)
<b>Airflow:</b>	Maximum: 2,523 CFM Typical: 2,103 CFM	Maximum: 1,436 CFM Typical: 1,185 CFM
<b>Operating Temperature/Humidity:</b>	5 °C to 32 °C (41 °F to 89.6 °F), 10% to 90% relative humidity, noncondensing	
<b>Altitude Operation:</b>	Up to 9,840 feet (3,048 m) <sup>2</sup> , maximum ambient temperature is de-rated by 1° C per 300 m above 900 m	
<b>Regulations<sup>1</sup>:</b>	<ul style="list-style-type: none"> <li>Safety: UL 60950-1 2nd Ed, EN60950-1:2006+A11:2009+A12:2011, CB Scheme with all country differences</li> <li>RF/EMI (Class A): FCC CFR 47 Part 15 Subpart B, EN 55022:2010, ETSI EN 300 386 V1.6.1 (2012-09)</li> </ul> Immunity: EN 55024:2010; ETSI EN 300 386 V1.6.1 (2012-09)	
<b>Certifications<sup>1</sup>:</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> </ul>	
<b>Other:</b>	Complies with WEEE Directive (2002/96/EC) and RoHS Directive (2011/65/EU)	

<sup>1</sup> In some cases, as applicable, regulatory and certification compliance were obtained at the component level.

<sup>2</sup> Except in China where regulations may limit installations to a maximum altitude of 6,560 feet (2,000 m).

### Oracle SuperCluster Upgrades

Oracle SuperCluster T5-8 Half Rack to Full Rack upgrade, hardware components include:

- 8 x sixteen-core SPARC T5 processors (3.6 GHz)
- 64 x 16 GB of memory
- 4 x Exadata Storage Server X5-2 with 8 x 1.6 TB NVMe PCI flash drives or 12 x 8 TB 7,200 RPM high-capacity disks
- 8 x dual-port QDR InfiniBand adapter
- 8 x dual-port 10 GbE
- InfiniBand and Ethernet cables to connect all the components

Expand existing storage capacity by adding additional instances of Exadata Storage Server in-rack or connecting to Oracle's Exadata Storage Expansion Racks.

Multirack connection:

- Connect any combination of Oracle SuperCluster, Oracle Exadata, Exadata Storage Expansion Racks, or Oracle Exalogic via the included InfiniBand fabric.
- Up to 18 racks can be connected without requiring additional InfiniBand switches.
- InfiniBand cables to connect three racks are included in the rack spares kit.
- Additional optical InfiniBand cables are required when connecting four or more racks.

Add Fibre Channel cards to compute nodes to connect to existing SAN infrastructure.

### Oracle Software (Included)

- Oracle Solaris 11.1
- Oracle Solaris 10 1/13
- Oracle VM Server for SPARC
- Oracle Solaris Zones
- Oracle Enterprise Manager Ops Center 12c
- Oracle ZFS Storage Appliance Replication feature; Oracle ZFS Storage Appliance Cloning feature

### Oracle Software (Sold Separately)

- Oracle Database 11g Release 2; Oracle Database 12c
- Exadata Storage Server Software
- Exalogic Elastic Cloud Software

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- Oracle Solaris Cluster 4.1 (Oracle Solaris 11.1); Oracle Solaris Cluster 3.3 3/13 (Oracle Solaris 10)
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#### CONTACT US

For more information about Oracle SuperCluster T5-8, visit [oracle.com](http://oracle.com) or call +1.800.ORACLE1 to speak to an Oracle representative.

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#### Integrated Cloud Applications & Platform Services

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