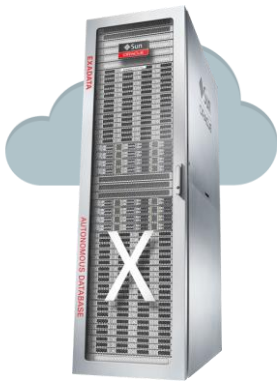


Oracle Gen 2 Exadata Cloud at Customer

Exadata Performance, with Cloud Simplicity

ORACLE®

**Exadata
Cloud at Customer**



Oracle Gen 2 Exadata Cloud at Customer delivers the world's most advanced database cloud to customers who require their databases to be located on-premises.

Exadata Cloud at Customer uniquely combines the world's #1 database technology and Exadata, the most powerful database platform, with the simplicity, agility and elasticity of a cloud-based deployment. It is identical to Oracle's Exadata Cloud Service but located in customers' own data centers and managed by Oracle Cloud experts, thus enabling a consistent Exadata cloud experience for customers – whether on-premises, or in Oracle Cloud Infrastructure data centers.

Customers that already own database and database option licenses can choose to deploy them on Exadata Cloud at Customer to minimize costs. Customers that do not have existing database licenses can choose to use Oracle Database Enterprise Edition Extreme Performance which enables every Oracle Database feature and option, ensuring highest performance, best availability, most effective security and simplest management. All Exadata features are included in both cases. Databases deployed on Exadata Cloud at Customer are 100% compatible with both existing on-premises databases and databases that are deployed in Oracle Cloud Infrastructure.

Exadata Cloud at Customer is ideal for customers desiring cloud benefits but who cannot move their databases to the public cloud due to sovereignty laws, industry regulations, corporate policies, security requirements, network latency, or organizations that find it impractical to move databases away from other tightly coupled on-premises IT infrastructure.

What's New in Gen 2

Gen 2 Exadata Cloud at Customer brings Exadata X8 hardware and the power and flexibility of the Oracle Cloud Infrastructure (OCI) control plane to Exadata Cloud at Customer. Exadata X8 hardware brings the latest CPUs and more storage to Exadata Cloud at Customer, with larger numbers of cores in the storage servers to transparently decrypt and process data. The new control plane simplifies deployment, and reduces the time it takes customers to realize the value of their system. It also provides customers using both Exadata Cloud Service and Exadata Cloud at Customer with a consistent user experience, with the same web UI, command line interface (CLI), and REST APIs in both services. Finally, Gen 2 Exadata Cloud at Customer adds support for Oracle Database 19c, the long-term supported release that most customers plan to adopt.

KEY BUSINESS BENEFITS

Exadata Cloud at Customer combines the world's #1 database with Exadata, the most powerful database platform, controlled by Oracle Cloud software, and managed on-premises by Oracle Cloud experts.

- Cloud simplicity with on-premises deployment
- Faster time-to-market with web-based database provisioning
- Subscription-based pricing, with ability to bring your own licenses (BYOL) to cloud
- Scale up and down as needed and pay only what you use
- Easily migrate existing databases with no application changes
- Reduced IT administration
- Fast local network connectivity delivers better response times than Public Clouds
- On-premises deployment to meet compliance and data sovereignty requirements
- Proven mission-critical database and platform
- Extreme performance for OLTP, Analytics, Hybrid, and Consolidation workloads
- Focus staff on improving business, not operating infrastructure

The Best Database on the Best Cloud Platform

Oracle Exadata has been the best database platform for the past 10 years. Similarly, Oracle Gen 2 Exadata Cloud at Customer is the best cloud database platform, as it can deliver extreme performance, mission critical availability and the highest security for all Online Transaction Processing (OLTP), Data Warehousing (DW), In-Memory Analytics, and Mixed/Hybrid workloads, making it the ideal database consolidation platform for the cloud.

Best Database Technology

Oracle Database is the most popular and most versatile database technology for both OLTP and Analytics. With decades of technology innovation, it has been proven at hundreds of thousands of mission-critical deployments around the world. Exadata Cloud at Customer makes this enterprise-proven, robust database technology available in a cloud-based consumption model at customers' data centers behind their firewalls.

Most Powerful Database Infrastructure and Platform

The platform that delivers Exadata Cloud is Oracle Exadata, which has been established as the highest performing, most cost effective and highest available platform for deploying Oracle databases. Exadata was designed from the beginning as a cloud architecture featuring scale-out database servers and scale-out intelligent storage servers connected by an ultra-fast InfiniBand network. Exadata delivers many smart hardware and software innovations for databases, distinguishing itself from other generic converged systems

For additional information on Exadata, please visit <http://www.oracle.com/exadata>.

Cloud Automation and Subscription Model

On top of the rock-solid Oracle Database and Exadata platform, Exadata Cloud at Customer adds the ease, simplicity, and flexibility of the software that powers Oracle Cloud Infrastructure. Organizations can now access the Oracle Database on Oracle Exadata with a simple consumption/subscription model in their own data centers behind their firewall. Oracle experts manage the Exadata infrastructure on behalf of customers, which means human resources and IT administration costs are significantly reduced, and IT can focus on improving business results. Full Oracle Database functionality with Exadata Cloud at Customer ensures that any existing

application can be quickly migrated to a cloud model without changes. Provisioning and expanding the database service deployed on the Exadata Cloud at Customer is driven through simple web interfaces, providing customers rapid elasticity to meet changing business demands.

Exadata: The Best Database Platform

EXADATA HARDWARE

- Fastest Networking
 - 40Gbps InfiniBand Networking
- Fastest Storage
 - Ultra-fast PCI NVMe flash
 - Up to 250 GB/sec Throughput
 - Up to 4.8 Million 8K I/Os per sec
 - ¼ millisecond response time
- Large Memory Capacity
 - Up to 720 GB per Database Server
- Complete Redundancy

EXADATA SOFTWARE

All Exadata Software features, such as:

- Smart Scan
- Storage Indexes
- Data Mining Offload
- Hybrid Columnar Compression
- Smart Flash Cache
- Smart Flash Logging
- In-Memory Fault Tolerance
- I/O Resource Management
- Network Resource Management
- Instant Failure Detection
- Sub-second I/O Latency Capping
- Columnar Flash Cache
- JSON/XML Smart Scan
- Direct-to-Wire OLTP protocol
- Fastest RAC Node Failure Recovery
- Fastest Data Guard Redo Apply
- Fastest Backup using Offload to Storage

Exadata Hardware

Exadata Cloud at Customer comes in different infrastructure shapes to support workloads of different sizes. The Exadata Cloud at Customer Base System provides a cost-effective Exadata entry point, while traditional quarter, half, and full rack shapes can meet nearly arbitrary CPU processing and database storage requirements. Online dynamic scaling of OCPU resources is available in every Exadata Cloud at Customer shape so that customers can pay only for the OCPUs that they use, dramatically reducing costs compared to a traditionally purchased platform.

All the Exadata Cloud at Customer shapes are built on powerful database servers, scale-out intelligent storage servers, PCI NVMe flash, and high capacity disk drives. Internal connectivity between database and storage servers is enabled by a low-latency InfiniBand fabric. External connectivity to the Exadata Cloud at Customer system is provided using standard 10 or 25 Gigabit Ethernet.

The database-optimized data tiering between RAM, flash and disk implemented in Exadata provides lower latency, higher capacity, and faster performance than other flash-based solutions. Flash-only storage arrays cannot match the throughput of Exadata's integrated and optimized architecture with full InfiniBand based scale-out, fast PCI NVMe flash, offload of data intensive operations to storage, and algorithms that are specifically optimized for databases.

Exadata Software

The technology that enables Exadata's unparalleled performance without any of the bottlenecks of traditional storage arrays is Exadata Storage Server software. This software powers the Exadata storage servers, providing an extremely efficient and database-optimized storage infrastructure. All Exadata Storage Server software features are included in Exadata Cloud at Customers.

One of the many unique features of Exadata Storage Server software is *Smart Scan* technology, which offloads data intensive SQL operations from the database servers directly into the storage servers. By pushing SQL processing to the storage servers, data filtering and processing occur immediately and in parallel across all storage servers, as data is read from disk and flash. Only the rows and columns that are directly relevant to a query are sent to the database servers. This greatly accelerates analytic queries, eliminates bottlenecks, and significantly reduces the CPU usage of the database servers.

In addition to Smart Scan, Exadata includes a vast array of software capabilities that enables its unparalleled scalability, performance and availability. Some of these Exadata software features are:

- *Storage Indexes* avoid unnecessary I/O operations by replacing them with a few in-memory lookups

- *Exafusion Direct-to-Wire Protocol* allows database processes to read and send Oracle RAC messages directly over the InfiniBand network, which considerably improves OLTP response time and scalability in Exadata
- *Smart Fusion Block Transfer* improves OLTP performance further by eliminating the impact of redo log write latency when moving blocks between nodes
- *Smart Flash Logging* accelerates OLTP by using the flash memory in Exadata Storage Servers combined with the high-speed RAM memory in the Exadata disk controllers to reduce the average latency of database commits
- *Hybrid Columnar Compression* utilizes a combination of row and columnar methods to greatly compress data, enabling tremendous cost-savings and performance improvements due to reduced storage capacity and reduced I/O, especially for analytic workloads
- *In-Memory* columnar formats in Flash Cache extend the Exadata Columnar Flash Cache by automatically transforming data into In-Memory columnar formats as it's loaded into flash cache. Smart Scans then leverage ultra-fast Single Instruction Multiple Data (SIMD) Vector instructions, thus processing multiple column values with a single instruction

Exadata is engineered to provide the highest levels of availability. Each Exadata Cloud at Customer system has completely redundant hardware components. In addition, Exadata Cloud at Customer comes pre-integrated with Oracle Maximum Availability Architecture (MAA) best practices for Database High Availability (HA) technologies such as RAC, ASM, RMAN, Flashback and Data Guard. Further, Exadata-specific HA capabilities such as *Instant Detection of Compute and Storage Server Failures* and *Exadata I/O Latency Capping*, significantly enhance the availability of Exadata.

Exadata Cloud at Customer systems can be used to deploy a large number of databases, enabling high database consolidation. To ensure consistent performance in a highly consolidated environment, Exadata provides unique end-to-end prioritization and resource management capabilities spanning database servers, network and storage.

Exadata Cloud at Customer

Exadata Cloud at Customer enables Oracle databases to run on the Exadata platform in customers' data centers, orchestrated by Oracle's cloud automation, with infrastructure managed by Oracle's cloud experts. Exadata Cloud at Customer instances come pre-configured according to best-practices that have been proven at thousands of mission critical Exadata sites around the world.

Subscription Overview

Exadata Cloud at Customer is available through a subscription offering that requires a minimum term of 4 years. Exadata Cloud at Customer has two subscription models:

- Exadata Cloud at Customer: Oracle Database Enterprise Edition Extreme Performance Included
- Exadata Cloud at Customer Bring Your Own License (BYOL)

Exadata Cloud at Customer Enterprise Edition Extreme Performance Included

This subscription model includes all the features of Oracle Database Enterprise Edition, plus all the Oracle Database Enterprise Manager Packs and all Database Enterprise Edition Options. These industry-leading capabilities include Database In-Memory, Real Application Clusters (RAC), Active Data Guard, Automatic Storage Management (ASM), Partitioning, Advanced Compression, Advanced Security,

EXADATA WORKLOADS

- Any combination or mix of OLTP, Data Warehousing, Reporting, OLAP, In-Memory Analytics, Spatial, Graph, JSON, XML, Objects, Large Objects
- Consolidate many physical databases or pluggable databases
- Deploy primary databases in Exadata Cloud at Customer with Disaster Recovery standby databases in Exadata Cloud Service
- Full ACID compliance (Atomicity, Consistency, Isolation, Durability) greatly simplifies application development and ensures data correctness

Database Vault, Real Application Testing, OLAP, Advanced Analytics and Spatial and Graph. Also included in an Exadata Cloud at Customer PaaS subscription is Oracle Multitenant, enabling high consolidation density, rapid provisioning and cloning, efficient patching and upgrades, and significantly simplified database management. This subscription model is ideal for customers without existing Oracle database licenses, or customers seeking to use Oracle database features beyond what they are currently licensed.

EXADATA PAAS FEATURES

- Oracle Database 19c, 18c, 12.2.0.1, 12.1.0.2, and 11.2.0.4
- All Oracle Database Options:
 - Active Data Guard
 - Advanced Analytics
 - Advanced Compression
 - Advanced Security
 - Database In-Memory
 - Database Vault
 - Label Security
 - Multitenant
 - On-Line Analytical Processing
 - Partitioning
 - Real Application Clusters
 - Real Application Testing
 - Spatial and Graph
- Oracle Database Enterprise Manager Packs
 - Diagnostics Pack
 - Tuning Pack
 - Database Lifecycle Management Pack
 - Data Masking and Subsetting Pack
 - Cloud Management Pack for Oracle Database

Exadata Cloud: Compatible, Scalable, Available, Secure Decades of Database Innovation Proven at Millions of Mission-Critical Deployments

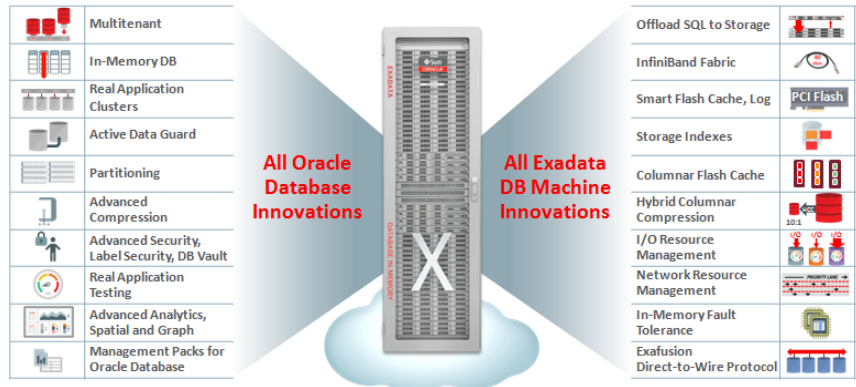


Figure 1: Exadata Cloud at Customer PaaS with all Database and Exadata features

Exadata Cloud at Customer Bring Your Own License (BYOL)

Exadata Cloud at Customer Bring Your Own License (BYOL) is designed to minimize costs when migrating to the cloud. In a BYOL model, customers can deploy their existing Oracle Enterprise Edition and Database Option licenses on Exadata Cloud at Customer. Standard Edition is not supported on any Exadata Cloud at Customer.

When a customer brings a Database Enterprise Edition license entitlement to Oracle Exadata Cloud at Customer, they are granted the rights to use Oracle Transparent Data Encryption (TDE), Diagnostics Pack, Tuning Pack, Data Masking and Subsetting Pack, and Real Application Testing without having on-premises license entitlements for those Database Options and Management Packs. The Exadata System software is also included in a BYOL subscription, so BYOL customers do not have to bring a license entitlement for the Exadata System Software.

Service Overview

Customers can choose to deploy Oracle Database 19c, Oracle Database 18c, Oracle Database 12c Release 2 (12.2.0.1), Oracle Database 12c Release 1 (12.1.0.2), Oracle Database 11g Release 2 (11.2.0.4), or a combination of these. Customers connect to databases from their applications using standard Oracle Net Services clients such as JDBC and OCI. As shown in Fig. 1, Exadata Cloud at Customer also includes all capabilities of the underlying Exadata platform.

Customers choose an Exadata configuration starting with a Base System, which has 2 database servers and 3 storage servers. Customers dynamically provision database

servers with any number compute cores (OCPUs) within the hardware limits of the chosen configuration. Pricing is based on the size of the Exadata hardware configuration and the number of enabled compute cores, and as business grows, customers can enable or disable compute cores completely online, thus paying only for the processing power that they require. All the disk/flash storage, IOPS and memory for the configuration chosen is included in the subscription price. There is no charge for network communication to the Exadata Cloud at Customer.

Customers with additional resource requirements may choose larger Exadata shapes, such as the Quarter, Half and Full Racks, enabling higher compute, network and storage capacity. Detailed specifications for each Exadata Cloud at Customer shape are provided in Table 1.

CLOUD AUTOMATION FEATURES

- Easy and rapid database provisioning in a few clicks
- Cloud automation software reduces administration
- Subscribe to only the compute cores needed by the application
- Scale up and down as needed
- 100% compatibility with on-premises and Oracle Cloud Infrastructure databases
- Comprehensive database management through Oracle Enterprise Manager, as well as Cloud-based self-service automation
- Exadata infrastructure management and monitoring by Oracle Cloud Operations

Cloud Control Plane

Customers can manage their Exadata Cloud at Customer system and perform life cycle management operations for the databases running on the platform using the Cloud Control Plane. It is a sophisticated software suite which runs in the Oracle Public Cloud. Customers can connect to the Cloud Control Plane through a secure link using a web browser, command line interface (CLI), or REST APIs. User administration, create/delete database, backup, restore, patching, auditing, and OCPU scaling are examples of operations customers can perform using the Cloud Control Plane. Another key function of the Control Plane is to track a customer's usage and bill only for what they use.

The Cloud Control Plane includes a sophisticated identity management system which allows multiple departments or groups to share an Oracle Cloud Infrastructure tenancy. Compartments enable access control across resources and provide an effective mechanism to organize and control access to resources like an Exadata Cloud at Customer within a single tenancy.

Policies can be used to grant fine grain permissions within a single database for separation of duty. For example, one administrator could be responsible for backup and another for patching.

The Cloud Control Plane used by Exadata Cloud at Customer is also used by the Exadata Cloud Service. This allows customers to work with both Exadata Cloud Service and Exadata Cloud at Customer, using the exact same UX and REST APIs. Any investments in automated scripting developed for a Cloud at Customer environment will be preserved should a customer eventually choose to migrate to the Oracle Public Cloud.

Secure Remote Access to Exadata Cloud at Customer

Control plane instructions are sent to the Exadata Cloud at Customer system through a dedicated secure tunnel between the Exadata Cloud at Customer and the Cloud Control Plane. Oracle Cloud Operations staff use the same tunnel to access the Exadata Cloud at Customer infrastructure for remote monitoring, maintenance and troubleshooting. Two Control Plane Servers installed in the Exadata Cloud at Customer rack host the secure tunnel endpoint and act as a gateway for access to the infrastructure. They also host components that orchestrate the cloud automation, aggregate and route telemetry messages from the Exadata Cloud at Customer environment to the Oracle Support Services infrastructure, and host images for database grid infrastructure and infrastructure patching.

The following diagram shows a typical configuration of Exadata Cloud at Customer.

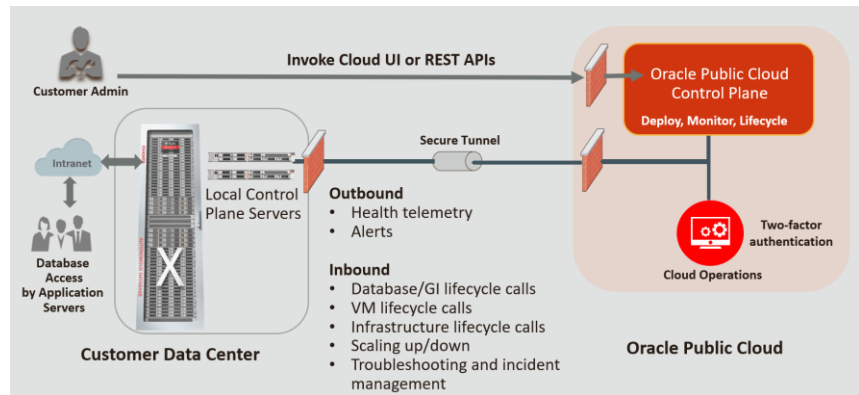


Figure 2: Typical Deployment of Exadata Cloud at Customer

Administration

Customers have complete access to all Oracle Database and OS features to ensure smooth and simple migration from on-premises Oracle deployments to Exadata Cloud at Customer. Each Exadata Cloud at Customer instance is configured such that there is a single Virtual Machine (VM), called the DomU, which is owned by the customer, in each database server of the Exadata system. Customers have root privileges for the Exadata database server DomU and DBA privileges on the Oracle databases. They can configure the Exadata database server as they like and load additional agent software on the Exadata database servers to conform to business standards or security monitoring requirements.

Customers perform familiar database administration and OS administration tasks aided by cloud automation for database provisioning, backup, patching, and upgrades. Database and OS updates are initiated by customers on their preferred schedule. Underlying infrastructure for Exadata Cloud at Customer, including Exadata InfiniBand network, storage servers, compute nodes, hypervisors and Exadata System Software, is deployed, monitored, maintained and managed by Oracle Cloud Operations. This allows customers to focus on application and business logic necessary for the core business, instead of getting bogged down with infrastructure maintenance projects. This enables customers to accelerate time to market, increase availability, and reduce business risk.

Oracle Cloud Operations

Oracle Cloud Operations monitors and maintains the infrastructure components of the Exadata Cloud at Customer service. Key components and activities include:

- Components Managed
 - Exadata Storage Servers and Database Servers (Dom0)
 - Power Distribution Units (PDUs)
 - InfiniBand Network and Switches
 - Management Switch
 - Control Plane Servers
 - Oracle VM (Hypervisor)
 - Exadata System Software and all firmware
- Monitoring Activities

- Exadata Cloud at Customer infrastructure layer incident monitoring, management, and root cause analysis
- Threshold performance analysis
- Maintenance Activities
 - Bug and security fixes inside hypervisor
 - Exadata System Software updates and upgrades
 - Firmware updates and upgrades to any of the hardware components including networking components and InfiniBand switches
 - Proactive infrastructure upgrades to make infrastructure software consistent with Oracle Public Cloud
 - Staging of operating system, database and Grid Infrastructure updates for subsequent deployment by customers

Deployment by Oracle

Exadata Cloud at Customer includes deployment by a specialized Oracle hardware engineer. The engineer will come onsite, deploy the hardware in your data center, connect the system to your network, and configure the system to communicate with the Oracle Cloud Control Plane. Before handing over the system Oracle will do an end-to-end validation of the system to ensure it is ready for deploying databases.

Backup & Recovery

Exadata Cloud at Customer provides automatic built-in database backup facilities, with weekly full backups and daily incremental backups. Customers can choose to store backups on local disk in the Fast Recovery Area (FRA) provisioned directly on the Exadata system, in the Oracle Cloud Object Storage service, or to a local Zero Data Loss Recovery Appliance or NFS Filer. Customers can also use third-party backup solutions by installing the necessary agents in the customer-managed virtual machines (DomU).

Scaling Exadata Cloud at Customer

With Exadata Cloud at Customer, customers can easily scale their business as business conditions change. This avoids the costly practice of sizing for the highest possible peak workload, which is often required for on-premises systems and with reserved cloud capacity solutions common to other cloud providers.

An example use case that leverages cloud scalability is running a standby database at a minimum level required to apply the logs, but then scaling up in the event the standby need be activated. Other common use cases are workloads that go up or down depending on time of day, week, month, quarter, or year—for example, a retailer whose workload peaks at the holidays. Capacity adjustments can be made completely online and as frequently as needed. The OCI CLI and REST APIs allow customers to create scripts that automatically scale the system up and down either on metrics or on a schedule. Customers are only billed for the peak usage within any hourly billing period.

If the Exadata Cloud at Customer system is at capacity, then customers can acquire additional Exadata Cloud at Customer subscriptions and distribute their database workload across multiple Exadata Cloud at Customer systems.

Enterprise Class Security with the Simplicity of Cloud, in Your Data Center

Exadata benefits from scrutiny by Oracle Security experts and by hundreds of industry experts around the world. Exadata Cloud at Customer delivers Exadata as an Oracle Cloud Service in the physical protection of a customer data center, and is based on comprehensive security measures deployed in the hardware infrastructure, network, Exadata platform, and Oracle database. The security features of Exadata Cloud at Customer segregate customer data access and Oracle Cloud Operations, and ensure that data that enters or leaves the Exadata Cloud at Customer is secure, data that resides on the system is secure, access to the system is secure, and the code that runs on the system is secure. Oracle cloud automation further enhances security by enforcing strong passwords and data encryption on all databases and making it fast and easy for customers to keep databases updated with the latest security patches from Oracle.

Exadata Cloud at Customer Infrastructure Security protects the physical servers and components that are the building blocks of the system. Infrastructure security features include

- Vendor signed firmware on most hardware components to ensure hardware components will only run valid code from the vendor that supplied that component
- Hardware acceleration that delivers near-native encryption and decryption speed so that encryption can always be used for all Oracle database data
- Infrastructure optimizations that uniquely move decryption processing to Exadata Storage Server infrastructure
- Virtual machines that provide secure isolation between customer domain and Oracle Cloud Operations

Customers have full control to ensure data in the Oracle database can only be accessed by users with explicit rights to access that data. Oracle Cloud Operations does not access customer data to carry out their duties of infrastructure support.

Exadata Cloud at Customer Network Security is implemented with isolated networks, and each network is equipped with additional security measures to secure critical data processing tasks. Network security features include

- Internal InfiniBand network: InfiniBand partitioning secures storage and RAC interconnect traffic
- Customer client network: Oracle Net Encryption secures application traffic to databases
- Customer backup network: Oracle Net Encryption secures traffic for high-bandwidth use cases such as backup, data loading, and disaster protection using Data Guard
- Customer controlled VLANs mapped directly to the DomU

Exadata Cloud at Customer Platform Security is based on customer-accessible virtual machines that deliver the Exadata Cloud at Customer Compute Node platform. The operating system deployment for the Exadata Cloud at Customer platform includes

- A minimal Linux distribution ensures that just the packages needed to run Oracle Database are installed and enabled
- Minimal open ports and running services that minimize attack surfaces
- Token-based SSH that provides secure access to customer virtual machines
- Comprehensive logging and auditing that tracks access and modification

Customers have full root access to the virtual machine running the Exadata Compute Node software, and they can add additional tools to implement their existing security best practices, such as installing software agents, configuring the iptables firewall, and LDAP authentication.

Exadata Cloud at Customer Database Security is based on the enterprise security features of the Oracle database. Customers have 2 deployment options:

- Exadata Cloud at Customer Enterprise Edition Extreme Performance subscription that includes all Oracle Advanced Security features, such as Transparent Data Encryption (TDE), Database Vault, Label Security, Redaction, Subsetting, and Masking
- BYOL commercial model which adds Transparent Data Encryption (TDE) and the Data Masking and Subsetting pack entitlements to any Oracle Database Enterprise Edition license they move to Exadata Cloud at Customer

TDE encryption keys are stored in a password protected Oracle wallet in the customer's Exadata Compute Node VM by default, and customers can optionally configure external key stores such as Oracle Key Vault and commercial hardware security modules (HSMs) to further separate access and duties.

Migration to Exadata Cloud at Customer

Full compatibility between on-premises databases and databases deployed on Exadata Cloud at Customer makes migration to Exadata Cloud at Customer easy and low risk. Oracle provides tools to make it easy to migrate with or without downtime, and from Linux x86 platforms, or any other supported Oracle database platform.

Conclusion: Transform IT, Unleash Business Potential

Oracle Gen 2 Exadata Cloud at Customer features the most versatile and functional database technology – Oracle Database, on the fastest, most powerful, and most available platform – Exadata, with the simplicity and cost effectiveness of Oracle Cloud software deployed in customer premises.

Enterprise-proven database capabilities are now instantly available to maximize productivity, lower risk and accelerate time-to-value. To embrace the Cloud, customers no longer have to compromise their SQL functionality, performance, availability, data models, or transactional integrity. No changes to on-premises applications are required either, enabling rapid and easy migration to the cloud, or deployment of a hybrid cloud strategy. They can bring their existing on-premises database software license to Exadata Cloud, leveraging their existing investments. Finally, with Exadata Cloud, organizations no longer have to dedicate limited IT talent to managing and maintaining infrastructure.

Exadata Cloud uniquely delivers all these benefits in the public cloud with Oracle Database Exadata Cloud Service or in the customer's own data center with Oracle Gen 2 Exadata Cloud at Customer.

Table 1. EXADATA CLOUD AT CUSTOMER X8-2: Technical Specifications

	Base System	Quarter Rack	Half Rack	Full Rack
Number of Database Servers	2	2	4	8
Maximum Number of OCPUs	48	100	200	400
Total Memory (GB)	720	1,440	2,880	5,760
Number of Storage Servers	3	3	6	12
Total Cores in Storage Servers	144	144	288	576
Total Flash Capacity (TB)	38.4	76.8	153.6	307.2
Total Usable Disk Capacity ¹ (TB)	74.8	149.7	299.4	598.7
Max DB Size – No Local backup ¹ (TB)	59.9	119.8	239.5	479.0
Max DB Size - Local Backup ¹ (TB)	29.9	59.9	119.8	239.5
Max SQL Flash Bandwidth ² (GB/s)	25	64.5	129.0	258.0
Max SQL Flash Read IOPS ³	562,500	1,194,000	2,388,000	4,776,000
Max SQL Flash Write IOPS ⁴	518,000	1,088,000	2,176,000	4,352,000
Max SQL Disk Bandwidth ² (GB/s)	2.7	5.4	10.8	21.5
Max SQL Disk IOPS ³	3,900	7,800	15,600	31,000
Max Data Load Rate ⁵ (TB/hr)	3.8	7.5	15	30
Network Connectivity	Per Database Server: <ul style="list-style-type: none"> • 2x10/25 Gb Ethernet (backup) • 2x10/25 Gb Ethernet (client) 			

1. 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 to create a database after taking into account space needed for ASM high redundancy and recovering from a drive failure, but before database compression

2. Bandwidth is peak physical scan bandwidth achieved running SQL, assuming no database compression. Effective user data bandwidth is higher when database compression is used.

3. Based on 8K I/O requests running SQL.

4. Based on 8K I/O requests running SQL. Flash write I/Os measured at the storage servers after ASM mirroring, which issues multiple storage I/Os to maintain redundancy.

5. Load rates are typically limited by database server CPU, not I/O. Rates vary based on load method, indexes, data types, compression and partitioning.

Additional Notes on Technical Specifications:

- Each rack is 42 RU (Rack Units) in height, has 2x redundant Power Distribution Units (PDUs), 2x 36-port QDR (40 Gb/s) InfiniBand switches and 1x 48-port Cisco Ethernet switch for infrastructure administration by Oracle Cloud Operations.
- Included Spare Parts Kit contains: 1 x NVMe PCI Flash card and 1 x High Capacity disk.
- Base System is the minimum Exadata Cloud at Customer configuration. Each Base System DB Server has 1x26 core CPU (24-cores available to the customer) and 6x64G DIMMs installed (360GB available).
- A Database Server in any Exadata Cloud at Customer X8 configuration has 4x1.2TB local drives

EXADATA CLOUD AT CUSTOMER X8-2 ENVIRONMENTAL SPECIFICATIONS

Metric	Full Rack		Half Rack		Quarter Rack		Base System	
Height Width Depth	<ul style="list-style-type: none"> 78.74" - 2000 mm 23.66" – 601 mm 47.13" – 1197 mm 							
Acoustic noise (operating)	9.4 B		9.1 B		8.9 B		8.9 B	
Weight	1,948.7 lbs	883.9 kg	1,304.1lbs	591.5 kg	989.8 lbs	449.0 lbs	961.1 lbs	435.9 kg
Maximum power usage	17.0 kW	17.3 kVA	9.3 kW	9.5 kVA	5.4 kW	5.5 kVA	4.5 kW	4.6 kVA
Typical power usage ¹	11.9 kW	12.1 kVA	6.5 kW	6.6 kVA	3.8 kW	3.9 kVA	3.2 kW	3.2 kVA
Cooling at maximum usage	58,013 BTU/hr		31,658 BTU/hr		18,480 BTU/hr		15,380 BTU/hr	
	61,204 kJ/hr		33,399 kJ/hr		19,497 kJ/hr		16,226 kJ/hr	
Cooling at typical usage	40,609 BTU/hr		22,160 BTU/hr		12,936 BTU/hr		10,766 BTU/hr	
	42,843 kJ/hr		23,379 kJ/hr		13,648 kJ/hr		11,358 kJ/hr	
Airflow at maximum usage ²	2,686 CFM		1,466 CFM		856 CFM		712 CFM	
Airflow at typical usage ²	1,880 CFM		1,026 CFM		599 CFM		498 CFM	

Operating temperature/humidity: 5 °C to 32 °C (41 °F to 89.6 °F), as measured by an industry grade temperature measurement device directed at the front bezel of the servers, 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

¹ Typical power usage varies by application load.

² Airflow must be front-to-back.

EXADATA DATABASE MACHINE REGULATIONS AND CERTIFICATIONS

REGULATIONS¹	SAFETY:	UL/CSA 60950-1, EN 60950-1, IEC 60950-1 CB Scheme with all country differences
	RFI/EMI:	EN55032, EN61000-3-11, EN61000-3-12
	IMMUNITY:	EN 55024
	EMISSIONS AND IMMUNITY:	EN300 386
CERTIFICATIONS¹	North America (NRTL), European Union (EU), International CB Scheme, BSMI (Taiwan), C-Tick (Australia), CCC (PRC), MSIP (Korea), CU EAC (Customs Union), VCCI (Japan)	
EUROPEAN UNION DIRECTIVES	2014/30/EU Low Voltage Directive, 2014/30/EU EMC Directive, 2011/65/EU RoHS Directive, 2012/19/EU WEEE Directive	





¹ All standards and certifications referenced are to the latest official version at the time the data sheet was written. Other country regulations/certifications may apply. In some cases, as applicable, regulatory and certification compliance were obtained at the component level.



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