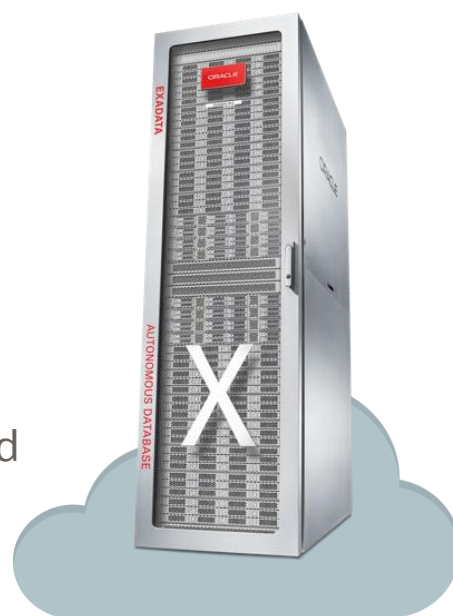




# Oracle Exadata Cloud Service X8M

Oracle Exadata Cloud Service delivers the world's most advanced database cloud by combining the world's #1 database technology and Exadata, the most powerful database platform, with the simplicity, agility and elasticity of a cloud-based deployment.

Customers can now run Oracle Database in the cloud with the same extreme performance and availability experienced by thousands of organizations deploying Exadata on-premises. Oracle Database deployed in the cloud as part of this service have access to all Oracle Database options. They are 100% compatible with databases deployed on-premises, ensuring a smooth transition to the cloud, and an efficient hybrid cloud strategy. With dedicated and elastic Exadata database and storage servers, and infrastructure managed by Oracle experts, Exadata Cloud Service enables business agility and operational flexibility with zero CapEx.



## WHAT'S NEW IN EXADATA CLOUD SERVICE X8M

Exadata Cloud Service X8M brings Exadata X8M hardware, a superior network fabric and improved virtualization to Exadata Cloud Service. Exadata X8M storage servers include persistent memory, creating an additional tier of storage, boosting overall system performance. Exadata X8M combines persistent memory with innovative RDMA algorithms that bypass the network and I/O stack, eliminating expensive CPU interrupts and context switches, reducing latency by 10x compared to previous Exadata Cloud Service generations, to as low as 19µs.

Exadata Cloud Service X8M has a new faster 100Gbps Remote Direct Memory Access over Converged Ethernet (RoCE) internal network fabric, providing 2.5x more bandwidth than previous generations and an extremely low-latency interconnect between all database and storage servers. The new platform also enables denser consolidation of databases, upgrading the hypervisor to Kernel Virtual Machine (KVM) and increasing the available memory to 1,390 GB per physical database server.

The starting Exadata Cloud Service X8M configuration consists of a Quarter Rack, two database servers and three storage servers, which can be elastically expanded by adding additional database and/or storage servers independently. Elastic configurations provide a flexible and efficient mechanism to meet any size business need.

## THE BEST DATABASE ON THE BEST CLOUD PLATFORM

Oracle Exadata has been the best database platform for over 10 years. Similarly, Oracle Exadata in the cloud 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 Service makes this enterprise-proven, robust database technology available in a cloud-based consumption model hosted in the most advanced and robust cloud infrastructure.

### Most Powerful Database Platform

The platform that delivers Exadata Cloud Service 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. With X8M, they are now connected by a faster RoCE network. Exadata delivers many smart hardware and software innovations for databases, distinguishing itself from other generic converged systems.

### Cloud Automation and Subscription Model

On top of the rock-solid Oracle Database and Exadata platform, Exadata Cloud Service adds the simplicity, flexibility, and security of the software that powers Oracle Cloud Infrastructure (OCI). Organizations can now benefit from a simple consumption/subscription model for Oracle Database on Oracle Exadata without capital investments for IT infrastructure such as data center space, power, cooling, servers, storage, networks and software. Oracle experts manage the Exadata infrastructure on behalf of customers, which means human resources

#### Key Features

- Most powerful Oracle Database service with all options, features, and Enterprise Manager Database Packs
- All Exadata capabilities ensures extreme performance, availability, and security
- Rapidly provision Exadata resources and databases in a few clicks
- Cloud automation software reduces administration
- Elastic independent scaling of database and storage servers
- Online scaling of database cores to match workload demand
- 100% compatibility with on-premises Oracle Database
- Comprehensive database management through Oracle Enterprise Manager, as well as Cloud-based self-service
- Single-click database updates, backup, and recovery
- Data Guard automation enables effortless Disaster Recovery protection
- All infrastructure management and monitoring by Oracle Cloud Operations

#### Key Business Benefits

- Cloud simplicity
- Faster time-to-market with web based Exadata and database provisioning
- Cloud economics with no capital expenses
- Subscription based pricing with the ability to bring your own licenses (BYOL) to cloud
- Lower costs with pay-per-use consumption
- Optimized infrastructure cost
- Easy migration of existing databases with no application changes
- Extreme performance for OLTP, analytics, hybrid, and consolidated workloads
- Business focus on value-added activities, not infrastructure operations

and IT administration costs are significantly reduced, and IT can focus on improving business results. Full Oracle Database functionality with Exadata Cloud Service 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 Service is driven through simple web interfaces, providing customers elasticity to meet changing business demands.

## EXADATA: THE BEST DATABASE PLATFORM

### Exadata Hardware

Exadata Cloud Service X8M is built on powerful database servers, scale-out intelligent storage servers, persistent memory, PCI NVMe flash, and high capacity disk drives. Internal connectivity between database and storage servers is enabled by a low-latency 100Gbps RoCE internal network fabric. External connectivity to the Exadata Cloud Service X8M system is provided using standard 25 Gigabit Ethernet.

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

Exadata Cloud Service X8M offers elastic infrastructure shapes to support workloads of different sizes. The shapes start with a Quarter Rack, 2 database and 3 storage servers, and allow elastic server expansion up to 32 database and 64 storage servers to meet larger CPU processing and storage requirements. The Exadata Cloud Service also offers a Base System to provide a cost-effective Exadata entry point with a fixed, non-elastic shape that is hardware generation agnostic.

### Exadata Software

The technology that enables Exadata's unparalleled performance without any of the bottlenecks of traditional storage arrays is Exadata System software. This software powers the Exadata Storage Servers, providing an extremely efficient database-optimized storage infrastructure.

One of the many unique features of Exadata System 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.

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

- *Shared Persistent Memory Data Accelerator* uses RDMA to read data from persistent memory with unprecedented low latency.
- *Persistent Memory Commit Accelerator* uses RDMA to write commit records to persistent memory providing 8x faster log writes.
- *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 RoCE network, which considerably improves OLTP response time and scalability in Exadata.

#### Elastic Compute

- Latest Generation Intel® Xeon® Processors
- Up to 1,600 Database Server Cores
- Up to 44 TB of DDR4 DRAM

#### Scalable Storage

- Up to 2.5 PB Database Size (Triple-mirrored, Without Compression)
- Up to 1.6 PB PCI NVMe Flash
- Up to 96 TB Persistent Memory
- Latest Generation Intel® Xeon® Processors
- Up to 3,072 Storage Server Cores

#### Fastest Networking

- 100 Gbps RoCE Internal Fabric
- 25 Gbps Ethernet for client connections and backup

#### Exadata Software

- Smart Scan
- Persistent Memory Data Accelerator
- Persistent Memory Commit Accelerator
- 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
- Test/Dev Snapshots
- Fastest RAC Node Failure Recovery
- Fastest Data Guard Redo Apply

- *Smart Fusion Block Transfer* improves OLTP performance further by eliminating the impact of redo log write latency when moving blocks between nodes.
- *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 system has completely redundant hardware components. In addition, Exadata Cloud Service 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 Database and Storage Server Failures and Exadata I/O Latency Capping, significantly enhance the availability of Exadata.

One single instance of Exadata Cloud Service 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.

## ORACLE CLOUD INFRASTRUCTURE

Exadata Cloud Service X8M is available in Oracle's next-generation cloud, Oracle Cloud infrastructure (OCI). Built on the foundation of the most modern datacenter, network and server technology, Oracle Cloud Infrastructure Services are architected from the ground up with a fundamentally different approach to Cloud platform deployment. The following Oracle Cloud Infrastructure features provide a set of unique benefits for Exadata Cloud Service around availability, performance and ease of cloud integration: Regions and Availability Domains, a modern network infrastructure, Virtual Cloud Network and high-performance compute infrastructure.

- Oracle Cloud Infrastructure Services are deployed in Regions and Availability Domains. A region is a localized geographic area, and an Availability Domain is one or more data centers located within a region. Availability Domains are isolated from each other, fault tolerant, and very unlikely to fail simultaneously. All the Availability Domains in a region are connected to each other by a low latency, high bandwidth network.
- Oracle Cloud Infrastructure network infrastructure is comprised of a high performance, non-oversubscribed, flat physical network which provides the latency and throughput of rack adjacency across the network within an Availability Domain.
- Oracle Cloud Infrastructure provides a secure, private software-defined Virtual Cloud Network (VCN) that allows customers to treat OCI Services as a secure and elastic extension of their on-premises network. Customers can configure their Exadata Cloud Service instance in their preferred VCN with complete flexibility that includes assigning their own private IP address space, creating subnets, creating route tables and configuring stateful firewalls. Customers can configure the VCN with an optional Internet Gateway to handle public traffic, an optional Service Gateway to privately access Oracle services or an optional IPSec VPN connection to securely extend their on-premises network.

Networking - Virtual Cloud Networks - Virtual Cloud Network Details

### ExadataCloud\_VCN

Move Resource Add Tags Terminate

VCN Information Tags

CIDR Block: 10.0.0.0/16  
 Compartment: ExaCS  
 Created: Thu, Jan 24, 2020, 03:15:32 UTC

OCID: ...tf3wa Show Copy  
 Default Route Table: Default Route Table for ExaCS  
 DNS Domain Name: exacs.oraclevcn.com

Resources

#### Subnets in ExaCS Compartment

Name	State	CIDR Block	Subnet Access	Created
ExternalClient_Subnet	Available	10.0.8.0/28	Public (Regional)	Sun, Sep 15, 2019, 20:47:02 UTC
Backup_Subnet	Available	10.0.2.0/26	Private (EWVY:EU-FRANKFURT-1-AD-3)	Thu, Jan 24, 2019, 03:18:22 UTC

Figure 1: Oracle Cloud Infrastructure Virtual Cloud Network (VCN) Details



- Oracle Cloud Infrastructure Services also offer fully dedicated bare metal and virtualized compute infrastructure instances with powerful processors, high memory, and latest generation NVMe SSDs, which provides unrivaled raw performance ideal to run CPU intensive and I/O intensive applications. These applications connect to the databases deployed on Exadata Cloud Service instances over a secure, high speed network connection, delivering unparalleled performance for any enterprise-scale application deployment.

For more information on Oracle Cloud Infrastructure, visit <https://www.oracle.com/cloud>.

## EXADATA CLOUD SERVICE OVERVIEW

Exadata Cloud Service enables full-featured Oracle databases to run on the Exadata platform in the Oracle Public Cloud. Exadata Cloud Service 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 Service is available through two flexible subscription offerings:

- License Included - Enterprise Edition Extreme Performance
- Bring Your Own License (BYOL)

### License Included – Enterprise Edition Extreme Performance

This subscription model includes all of the features of Oracle Database Enterprise Edition, plus all of 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, Database Vault, Real Application Testing, OLAP, Advanced Analytics and Spatial and Graph. Also included in an Exadata Cloud Service 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 those currently licensed.

## Exadata Cloud: Most Powerful Database + Platform

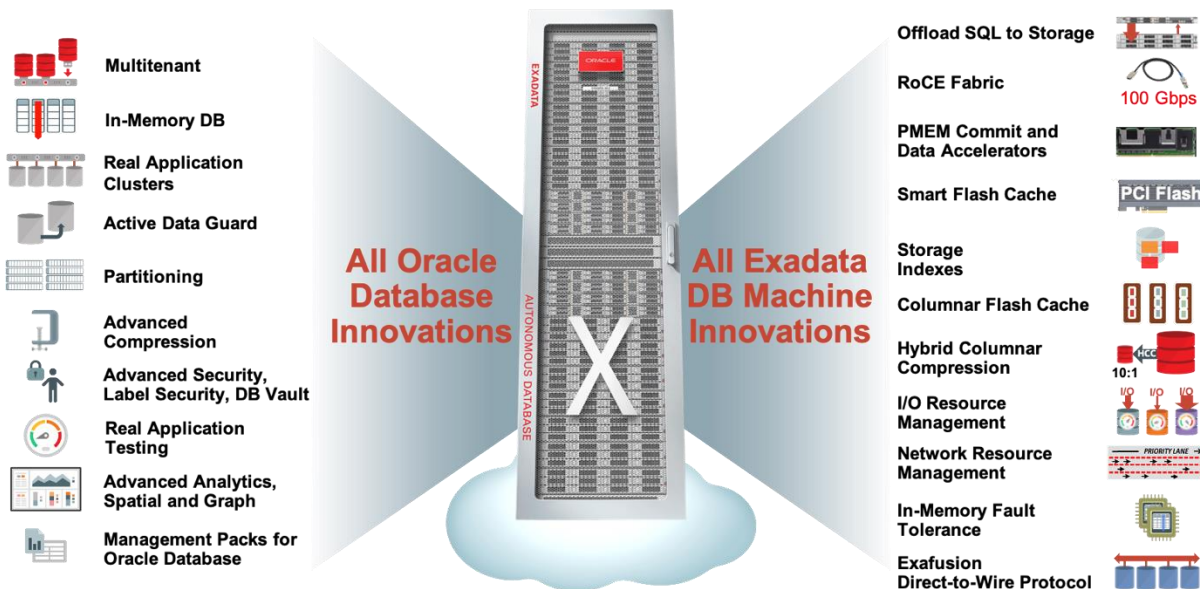


Figure 2: Exadata Database Cloud PaaS with all Database and Exadata features

### Bring Your Own License (BYOL)

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 Service. Oracle Standard Edition is not supported on any Exadata Cloud Service.

When a customer brings a Database Enterprise Edition license entitlement to Oracle Exadata Cloud Service, 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. 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 11g Release 2 (11.2.0.4), Oracle Database 12c Release 1 (12.1.0.2), Oracle Database 12c Release 2 (12.2.0.1), Oracle Database 18c, Oracle Database 19c, 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 Figure 2, Exadata Cloud Service also includes all capabilities of the underlying Exadata platform.

Customers can choose an entry level Base System which is not expandible or subscribe to the Exadata Cloud Service X8M. The X8M shapes start with a Quarter Rack and allow elastic expansion by adding additional database and storage servers to enable higher compute and storage capacity. Detailed specifications for Exadata Cloud Service configurations are provided in Table 1.

The database servers have a physical maximum number of compute cores (OCPUs) that can be enabled for the chosen configuration, and customers can specify their desired number of compute cores within these limits. Service pricing is based on the amount of infrastructure dedicated to the service and the number of enabled compute cores.

## Elastic Server Expansion and OCPU Scaling

Exadata Cloud Service features infrastructure that is dedicated to each customer, to ensure that response times and throughput are predictable for critical business processes. Exadata Cloud Service X8M allows online elastic database and storage server expansion, supporting workloads of different sizes. In addition, Exadata Cloud Service also allows OCPU scaling, enabling customers to grow, and later shrink, their individual database server OCPU resources to meet their peak or seasonal demands.

Customers who purchase universal credits pay the same low rate for the service when they elastically scale their service. This provides them with the best of both worlds; Low prices based on Oracle's universal credit pricing model, with the flexibility to adjust capacity as business conditions change.

## 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 Service. Each Exadata Cloud Service instance is a cluster of Virtual Machines (VM), which is owned by the customer, in each database server of the Exadata system. Customers have root privileges for the Exadata database server VM and DBA privileges on the Oracle databases. Customers perform familiar database administration and OS administration tasks aided by cloud automation for backup, patching, and upgrades.

All supporting infrastructure for Exadata Cloud Service is deployed, maintained and managed by Oracle, including datacenter networking, private Exadata RoCE networks, physical Exadata database and storage servers, firmware, and Exadata System software. Maintenance is performed in a rolling manner, eliminating any service downtime. Customers determine the scheduling of quarterly infrastructure maintenance, giving them authority over when maintenance may affect their systems. This gives customers complete control over their systems, while allowing them to focus on their business needs and application requirements, and not on database infrastructure monitoring and management.

## ACCESS AND SECURITY

Exadata Cloud Service provides secure high-performance access from both on-premises systems and from other Oracle Cloud Infrastructure services.

To ensure consistent high-performance and isolation, multiple separate networks are provided on each Exadata server.

- The Client and Backup Networks provide 25 Gb/sec connectivity for high-bandwidth use cases such as application connectivity, backup, data loading, and disaster protection using Data Guard
- RDMA over Converged Ethernet (RoCE) internal network fabric is used internally for ultra-high-speed compute-to-compute and compute-to-storage networking.
- A secure, separate and isolated Cloud Management network is used by Oracle Exadata Cloud Operations to manage the servers, storage and switches.

In addition to the security and isolation associated with the user defined Virtual Cloud Network (VCN), Exadata Cloud Service incorporates additional layers of security to protect the system as well as the entire lifecycle of data both at rest and in transit. Customer scheduled quarterly infrastructure maintenance updates the system and cloud automation enable customers to patch their OS and databases. At rest data protection is provided by ensuring that all databases created on Exadata Cloud Service are encrypted using the Transparent Data Encryption (TDE) capability of the Oracle Database. Data transmitted over the network may be secured between the client application and the database using Oracle Native Network Encryption. Backups are encrypted in the Object Storage Service in Oracle Cloud Infrastructure.

## Cloud Control Plane

Customers can manage their Exadata Database Service 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 Oracle Cloud Infrastructure. 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/modify/delete databases, 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 Service within a single tenancy.

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

## Provisioning

The Cloud Control Plane includes a simple easy-to-use web-based provisioning wizard through which customers can quickly provision their chosen Exadata system and subsequently their database instances.

Customers create their databases in a very simple manner through a simple web-based wizard, choosing options such as the database version, database administration security credentials, and backup & recovery parameters.

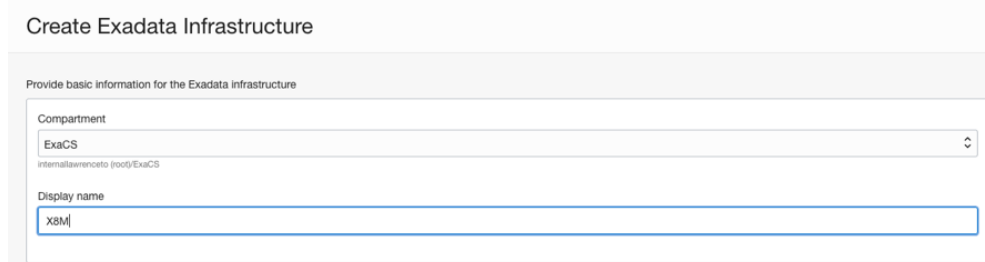


Figure 3: Oracle Cloud Infrastructure: Create Exadata Infrastructure

This automated streamlined process of deploying a dedicated Exadata system for the customer along with RAC databases ready for application access, significantly cuts down the labor-intensive procurement-to-deployment cycle that typically takes weeks to months in an enterprise IT setting. This forms the essence of the business agility and rapid time to market capabilities of Oracle Cloud.

## Backup & Recovery

Exadata Cloud Service provides built-in database backup automation, with weekly full backups and daily incremental backups to the Object Storage Service. Simply schedule automated backups and choose the retention period from the Cloud Control Plane. On-demand standalone backups can also be easily created with a single click of the mouse.

Recovery from a backup in the Cloud Control Plane is again a single click of the mouse. Databases can be created from a backup or restored to the latest backup, a timestamp, or a system change number (SCN).

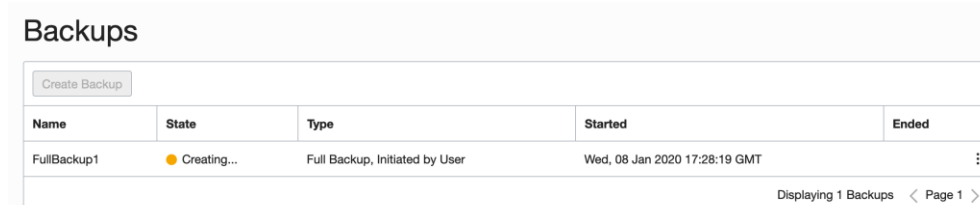


Figure 4: Oracle Cloud Infrastructure – Exadata Cloud Service: Create Backup

## Disaster Recovery

Within Exadata Cloud Service, disaster recovery automation leverages Oracle Active Data Guard across cloud regions or availability domains (ADs) via the Oracle Cloud Control Plane. Regions offer geographical isolation and can be separated by vast distances, across countries or even continents, to provide a very high level of disaster recovery protection. Availability Domains are independent and isolated data centers within a region that are very unlikely to simultaneously fail, making them resilient to disasters. Customers can use the Cloud Control Plane automation to instantiate standby databases for disaster recovery. Switchover to a standby database can be manually initiated at any time followed by the option to reinstate the primary database. Active Data Guard can be manually configured to automatically fail over to the standby database in case of an unplanned outage.

## Updating Exadata Cloud Service Databases

Updating Exadata Cloud Service databases can be performed by customers with a single mouse click. To update a database, simply move the database to a database home with a higher version in the Cloud Control Plane. The database is moved and updated one node at a time in a rolling manner, ensuring no database downtime.

The screenshot shows a web interface titled "Move Database to Another Home" with a "Help" link. Below the title is a warning: "The database will use the Oracle Database software version of the target Database Home. Make sure the target Database Home is using the software you want. Learn more about managing Database Homes." The interface is divided into two sections: "Source Database Home" and "Target Database Home".

**Source Database Home:**

- Source Database Home: dbhome20200709164424
- Source Database Version: 19.7.0.0
- Last Version Updated on: Not Applicable

**Target Database Home:**

- Select a target Database Home: OraDB19Home12
- Database Version: 19.8.0.0

Figure 5: Oracle Cloud Infrastructure – Exadata Cloud Service: Update Database

## CONCLUSION: TRANSFORM IT, UNLEASH BUSINESS POTENTIAL

Oracle Exadata Cloud Service features the most versatile and functional database technology – Oracle Database, on the most powerful platform – Exadata, with the simplicity, flexibility, and cost benefits of Oracle Cloud Infrastructure (OCI).

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. Finally, with Exadata Cloud Service, organizations no longer need to dedicate limited IT talent to managing and maintaining infrastructure. Instead they can focus on business logic and leverage the cloud innovation benefits much more expeditiously.

With a database platform uniquely engineered for extreme performance, along with fast deployment, simplified management, low operating costs and reduced risks, Oracle Exadata Cloud Service is the best public cloud database platform available.

For more information on Exadata Cloud Service X8M, visit <https://www.oracle.com/database/exadata-cloud-service.html>



Table 1: EXADATA CLOUD SERVICE: Technical Specifications

Exadata Cloud Service Typical Hardware Configurations

Service item	Base System <sup>1</sup>	X8M Quarter Rack <sup>2</sup>	X8M Half Rack <sup>2</sup>	X8M Full Rack <sup>2</sup>
Number of Database Servers	2	2	4	8
Maximum Number of OCPUs	48	100	200	400
Total Memory Available (GB)	656	2,780	5,560	11,120
Min # of Enabled OCPUs	4	4	8	16
Usable Local Storage Per DB Server (GB)	200	1,163	1,163	1,163
Number of Storage Servers	3	3	6	12
Total Persistent Memory Capacity (TB)	0	4.5	9.0	18.0
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 <sup>3</sup> (TB)	74	149	299	598
Max DB Size – No Local Backup <sup>3</sup> (TB)	59	119	239	479
Max DB Size – Local Backup <sup>3</sup> (TB)	29	59	119	239
Max SQL Flash Bandwidth <sup>4</sup> (GB/s)	25	75	150	300
Max SQL PMEM/Flash Read IOPS <sup>5,8</sup>	562,500	3,000,000	6,000,000	12,000,000
Max SQL PMEM/Flash Write IOPS <sup>6,8</sup>	518,000	1,410,000	2,820,000	5,640,000
Max SQL Disk Bandwidth <sup>4</sup> (GB/s)	2.7	5.4	10.8	21.5
Max SQL Disk IOPS <sup>5</sup>	3,900	7,800	15,600	31,000
Max Data Load Rate <sup>7</sup> (TB/hr)	3.8	7.5	15.0	30.0
Network (Client/Backup)	10 GbE	25 GbE	25 GbE	25 GbE

Exadata Cloud Service X8M: Elastic Server Expansion<sup>2</sup>

Shape Size	Database Servers and Maximum OCPUs	Storage Servers and Total Usable Disk Capacity <sup>3</sup>
X8M Quarter Rack (Starting Configuration)	2x database servers, 100 OCPUs	3x storage servers, 149 TB

Server Type	Maximum OCPUs	Total Memory Available
X8M Database Server (32 Maximum)	50	1,390 GB

Server Type	Total Cores	Persistent Memory	Total Flash Capacity	Total Usable Disk Capacity <sup>3</sup>
X8M Storage Server (64 Maximum)	48	1.5 TB	25.6 TB	49.9 TB

Exadata Cloud Service X8M: Individual Server Performance Metrics

Server Type	Maximum SQL Flash Bandwidth <sup>4</sup>	Maximum SQL Read IOPS <sup>5</sup>	Maximum SQL Write IOPS <sup>6</sup>
X8M Database Server	n/a	1,500,000	980,000
X8M Storage Server	25 GB/s	1,500,000	470,000

<sup>1</sup> Base System is hardware generation agnostic and is not expandable.

<sup>2</sup> Elastic server expansion allows adding X8M database or storage servers to a quarter rack to achieve the exact ratio of compute to storage that the application needs, or to create the typical half rack and full rack hardware configurations.

<sup>3</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 to create a database after taking into account space needed for ASM high redundancy, but before database compression.

<sup>4</sup> Bandwidth is peak physical scan bandwidth achieved running SQL, assuming no database compression. Effective user data bandwidth is higher when database compression is used.

<sup>5</sup> Based on 8K I/O requests running SQL.

<sup>6</sup> 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.

<sup>7</sup> Load rates are typically limited by database server CPU, not I/O. Rates vary based on load method, indexes, data types, compression and partitioning.

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