ORACLE

Oracle Cloud DBA

Lear how to stay up to date on this Dbaas era

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Nuestros Valores

- **Integridad**
- **Ética**
- **Compliance**
- **Innovación**
- **Trabajo en Equipo**
- **Respeto Mutuo**
- **Satisfacción del Cliente**
- **Justicia**
- **Calidad**
- **Comunicación**

Como empresa líder en tecnología, aceptamos la **diversidad** en todas sus formas. Realmente creemos que la **innovación** comienza con la **inclusión**. Y esto solo se puede lograr con la cooperación de nuestros **partners**. Afirmamos nuestro **compromiso** de mantener un **ambiente respetuoso** y **libre de discriminación** y esperamos esto de nuestros **socios de negocios**.

Oracle espera que sus **partners** realicen negocios de manera **justa** y **ética**, cumplan con las leyes anticorrupción en todo el mundo, cooperen con las solicitudes de información de Oracle y eviten participar en cualquier actividad que implique incluso la apariencia de ser incorrecta.

Es vital que nuestros partners se adhieran al **Código de Ética y Conducta Comercial de Oracle**, que da los lineamientos sobre los valores que son esenciales para nuestro éxito como empresa. Estos valores son la base de todo lo que hacemos y lo que debemos vivir todos los días.

Utilice el código QR para acceder al Código de Ética y Conducta Comercial de Oracle.

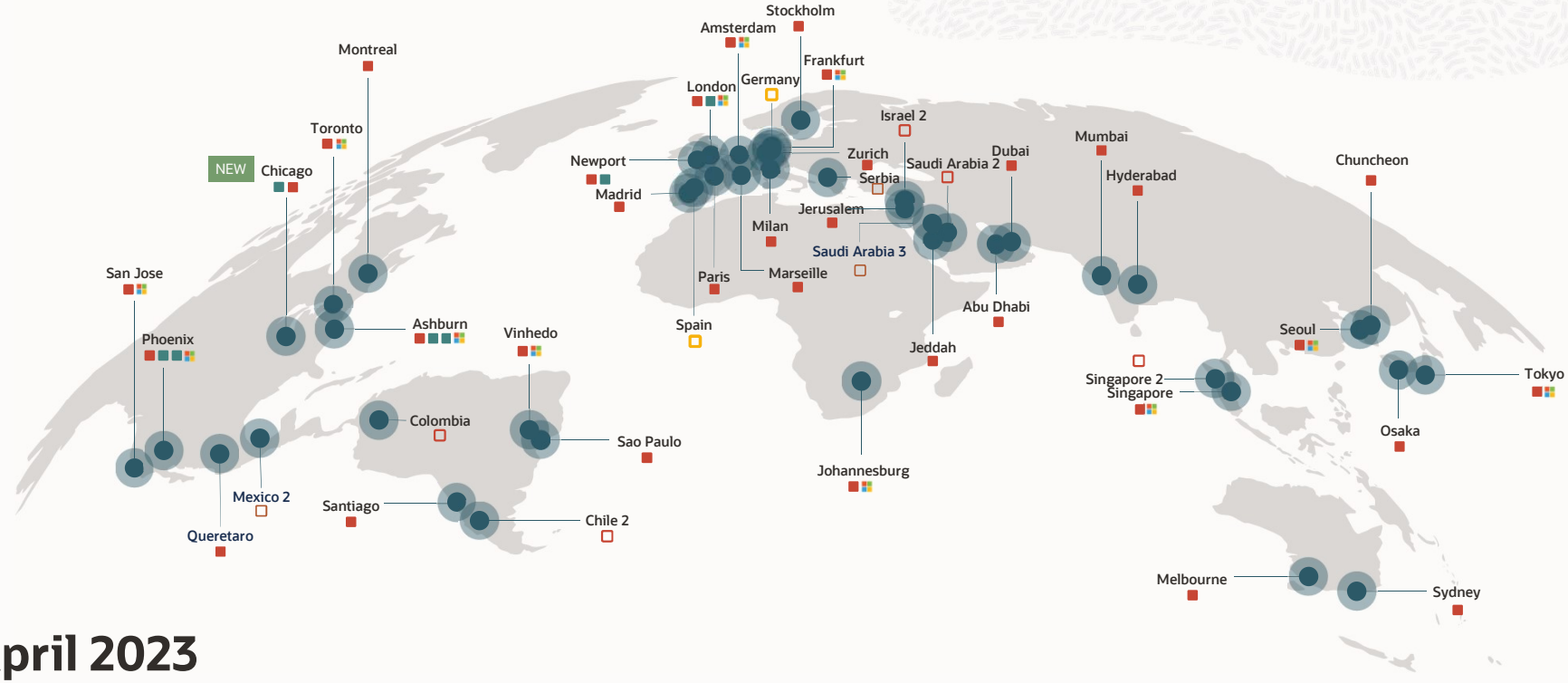
Agenda Day 1

- Oracle Exadata Cloud
- OCI Database NoSQL Service
- OCI Database Backup and Restore
- Demo – Exadata Smart Scan
- Demo – OCI Console Tour
- Demo – NoSQL Table Provisioning

OCI Cloud Region Map

Current Oracle Datacenter around the World

Oracle Cloud Infrastructure Global Locations



April 2023

41 regions; 10 more planned

12 Azure Interconnect Regions

- Commercial
- Commercial Planned
- Sovereign Planned
- Government
- Microsoft Interconnect Azure

OCI Database Services

OCI Database Services

Resilient recovery with no data loss is a foundational requirement

Mission critical Cloud database service

- Exadata, RAC, Bare Metal, VM

Complete Lifecycle Automation

- Provisioning, Patching, Backup & Restore

High Availability and Scalability

- RAC & Data Guard
- Dynamic CPU and Storage Scaling

Security

- Infrastructure (IAM, Security Lists, Audit logs)
- Database (TDE, Encrypted RMAN backup / Block volume encryption)

OCI Platform integration

- Tagging, Limits and Usage integration

Oracle Exadata Cloud

Compatible Exadata On-Premises, Hybrid Cloud and Public Cloud

On-Premises

Exadata Database Machine

Customer Data Center

Purchased

Customer Managed

Hybrid Cloud

Exadata Cloud@Customer

Customer Data Center

Cloud Subscription

Oracle Managed

Public Cloud

Exadata Cloud Infrastructure

Oracle Cloud

Cloud Subscription

Oracle Managed

Exadata Cloud | OCI Console

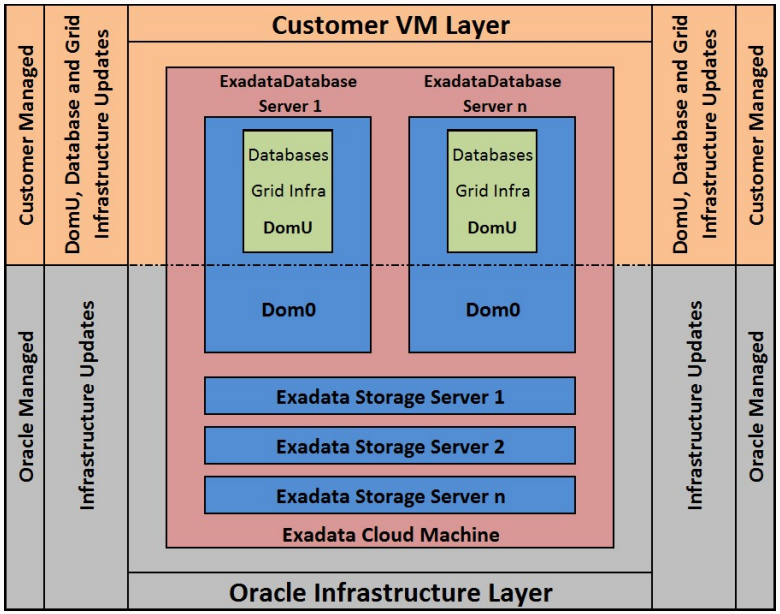
Database Cloud Service | Exadata

Understanding Oracle Exadata Cloud Service and Cloud at Customer

World's Best database machine, provisioning with GI

- As many databases as you want
- No Single Instance allowed. Just RAC!
- Start With 2 cores and Scale Up/Down OCPU's based on your requirement
- Data Guard with and across Ads
- Only Oracle Database Enterprise Editions allowed
- Exadata Cloud X9M Shapes (Base, Quarter, Ralf and Full Rack)
- Works with Autonomous Database on Dedicated Infrastructure

Exadata Cloud | Dom0 vs DomU Roles and Responsabilities



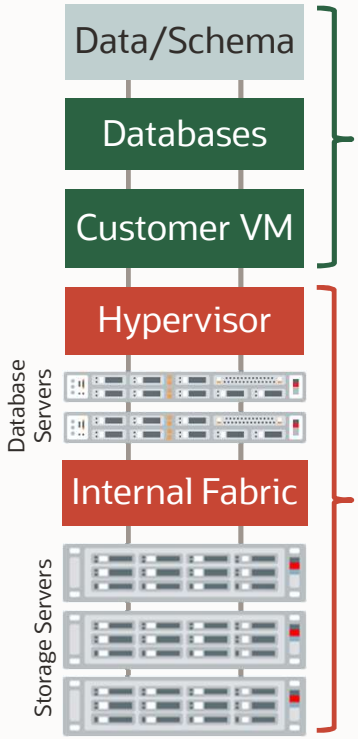
About *Dom0* Oracle Responsibilities

- Oracle Cloud Ops manage Exadata infrastructure (hardware, system software) & hypervisor (dom0);
- Oracle Support is responsible for update any version;
- For ExaCC gen1, Oracle Support open an SR and request customer formal approval;
- For Exacc Gen2, the customer is responsible for scheduling Dom0 maintenance and must provide at least 4 dates per year;

About *DomU* Customer Responsabilities

- Adjust license (BYOL or License included)
- Scale UP/Down resources
- For Exadata C@C Gen 1 DomU uses Xen for virtualiztion
- For Exadatada Cloud at Customer Gen2 DomU uses KVM
- Customer have root access to domU;
- The customer is responsible for any update or configuration change on DomU;

Simple Cloud Management Model in Public Cloud



Customer owns everything inside database

- Data, schema, encryption keys

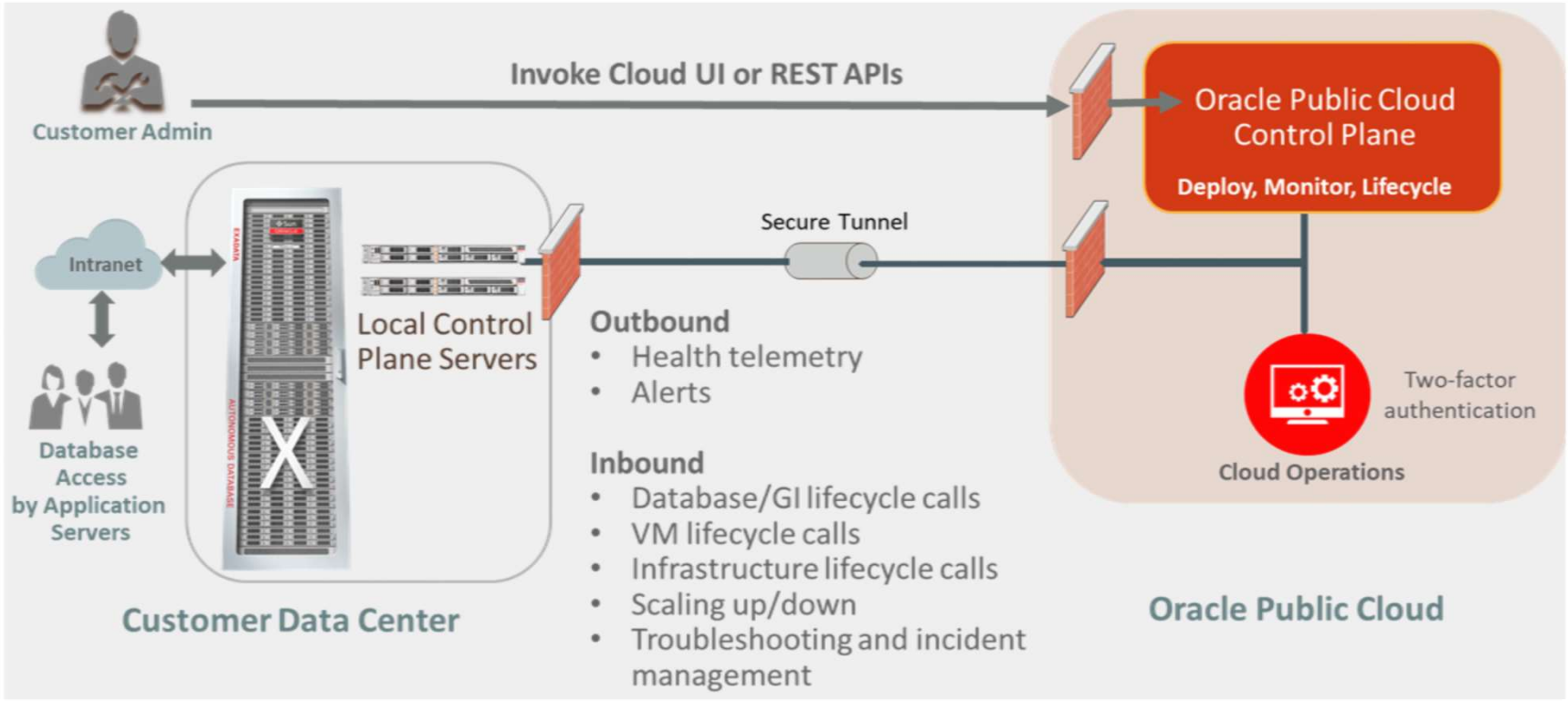
Customer subscribes to database services

- Customer manages VMs and Databases using Cloud Automation (UI / APIs)
- Automation to create, delete, patch, backup, scale up/down, etc.
- Runs all supported Oracle Database versions 12.1.0.2, 12.2.0.1, 19c
- Customer controls access to customer VM
- Customer can install and manage additional software in customer VM
- Oracle staff are not authorized to access customer VM

Oracle owns and manages infrastructure

- Hypervisor, database and storage servers, storage network
- Patching, security scans, security updates
- Monitoring and maintenance
- Customer not authorized to access Oracle infrastructure

Exadata Cloud | Control Plane Workflow



Exadata Cloud | Most Powerful Database + Plataform

Multitenant	
In-Memory DB	
Real Application Clusters	
Active Data Guard	
Partitioning	
Advanced Compression	
Advanced Security, Label Security, DB Vault	
Real Application Testing	
Advanced Analytics, Spatial and Graph	
Management Packs for Oracle Database	

All Oracle Database Innovations

All Exadata DB Machine Innovations

Offload SQL to Storage	
InfiniBand Fabric	
Smart Flash Cache, Log	
Storage Indexes	
Columnar Flash Cache	
Hybrid Columnar Compression	
I/O Resource Management	
Network Resource Management	
In-Memory Fault Tolerance	
Exafusion Direct-to-Wire Protocol	

Fastest Cloud In Memory, Smart Scan and HCC

Unique: Smart Scan (SQL Offload)

- Data-intensive processing* runs in Exadata Storage, bypassing network bottlenecks and freeing up DB CPUs

Unique: Tiered Flash Cache

- Active data is automatically cached on PCI NVMe Flash, inactive data on low cost, high-capacity disks

Unique: Storage Indexes

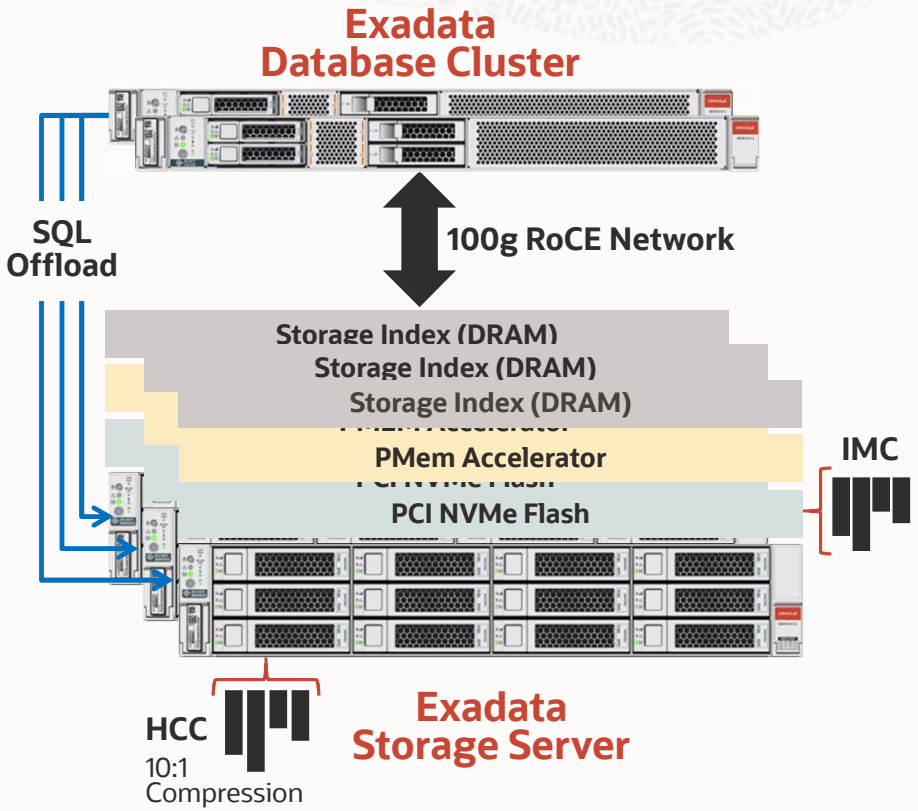
- Eliminates I/O not relevant to a particular query

Unique: Hybrid Columnar Compression (HCC)

- Compressed, columnar format in storage, saving space, reducing I/O, speeding analytic queries

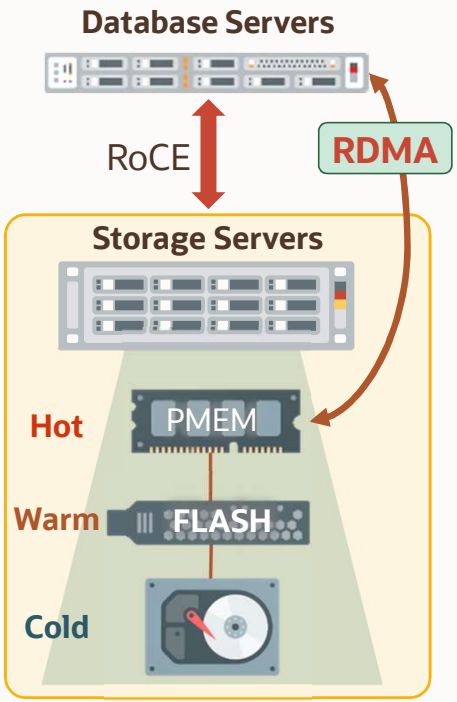
Unique: In-Memory Columnar (IMC)

- Extends In-Memory database performance to higher capacity Flash memory in storage



*Includes long-running SQL queries, backups, decryption, aggregation, data mining

Exadata Architecture – Scale out design with persistent memory



Scale-out system architecture and software

- Oracle RAC across multiple database servers for scaling and high availability
- Smart Scan offload of SQL to parallel intelligent storage servers
- Speeds up queries and scans with local access to data

Database uses RDMA instead of I/O to read PMEM in Smart Storage

- Bypasses network and I/O software, interrupts, context switches
- Hottest data transparently managed in PMEM
- Automatic redundancy across multiple storage servers
- Speeds up both database reads and commits

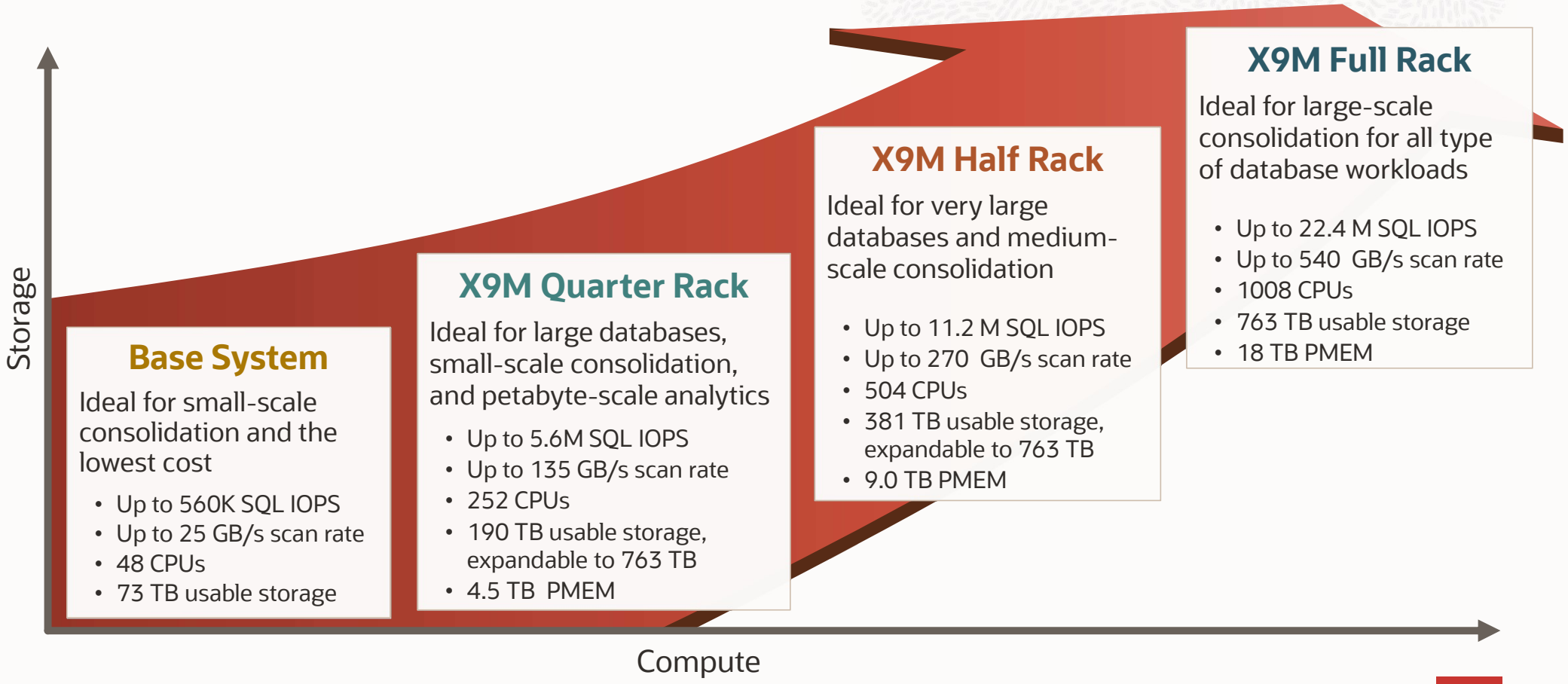
Results - 19µs IO latency from Database to PMEM in Storage

- 10X faster than flash for OLTP

World's Only Shared Persistent Memory Optimized for Database

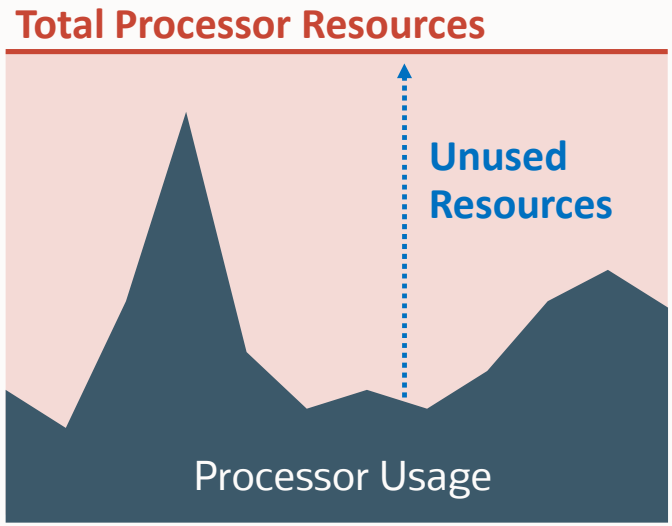
Exadata Cloud X9M Flexible Shapes

Available in high-performance, cost-effective shapes to match enterprise needs



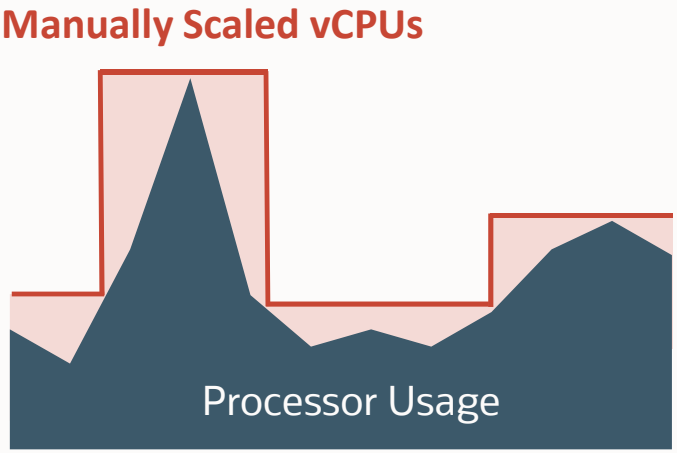
Online, Elastic Scaling with Exadata Cloud@Customer

Pay Only for What You Use



On-Premises – Static

Purchase server processors and software licenses for highest projected peak load



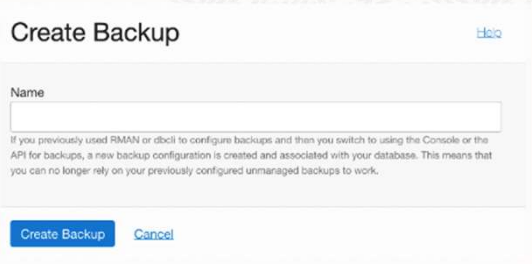
Exadata Cloud – Elastic

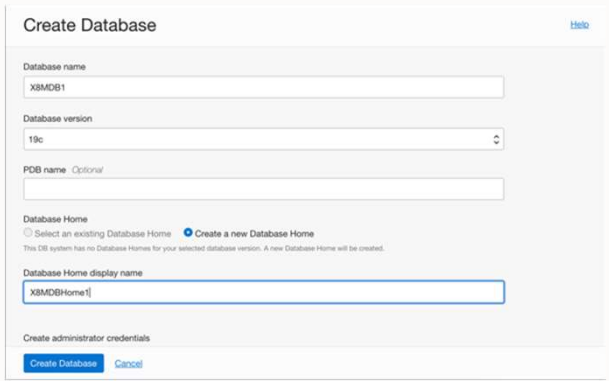
Adjust enabled vCPUs to match actual workload via APIs and web UI - vCPUs are charged per second

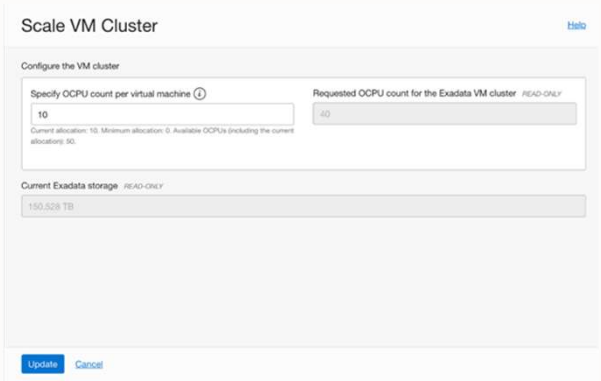
Cloud Automation for Common Lifecycle Tasks

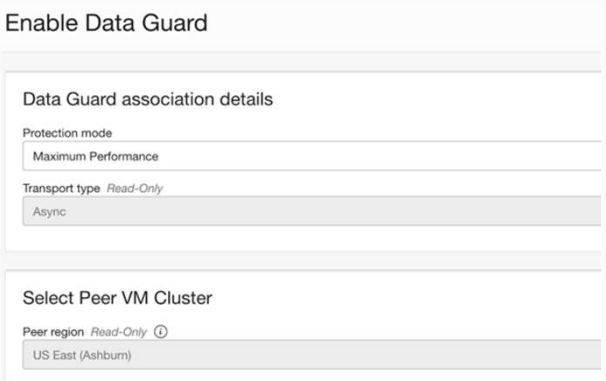
Oracle Cloud Web base UI, REST APIs, SDK, CLI, Terraform

- Scale OCPUs
- Create Database Homes and Databases
- Schedule Infrastructure Maintenance
- Update Operating System, Grid Infrastructure, and Databases
- Backup and recovery
- Enable Data Guard









Exadata Cloud Command Line Interface

What's a Exadata Cloud Dbaas tool?

```
[oracle@exacc6-vm01c02 ~]$ dbaascli database status --dbname demobkp
DBAAS CLI version 22.2.1.1.0
Executing command database status
Database Status:
Instance demobkp1 is running on node exacc6-vm01c02. Instance status: Open.
Instance demobkp2 is not running on node exacc6-vm02c02

Database name: demobkp
Oracle Database 19c EE Extreme Perf Release 19.0.0.0.0 - Production
```

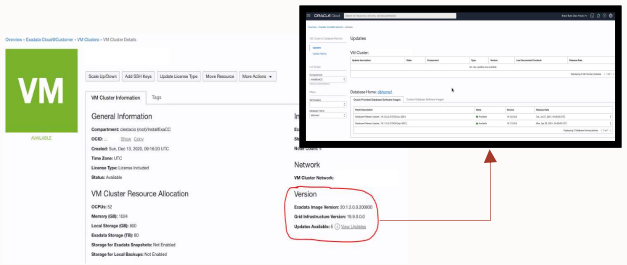

Exadata Cloud Pathing

Pathing dom0, domU, Tooling, Grid and Oracle home, how and how to do

DOMU - CUSTOMER RESPONSIBILITY

Maintaining a secure Exadata Service instance in the best working order requires you to perform the following tasks regularly:

- **Patching Grid Infrastructure.**
- **Patching Database software.**
- **Patching Exadata Software Image (SO).**
- **Patching Tooling (dbaascli).**
- **Patching other components installed on DomU.**



DOM0 - ORACLE RESPONSIBILITY

Oracle manages quarterly infrastructure maintenance updates of all other infrastructure components:

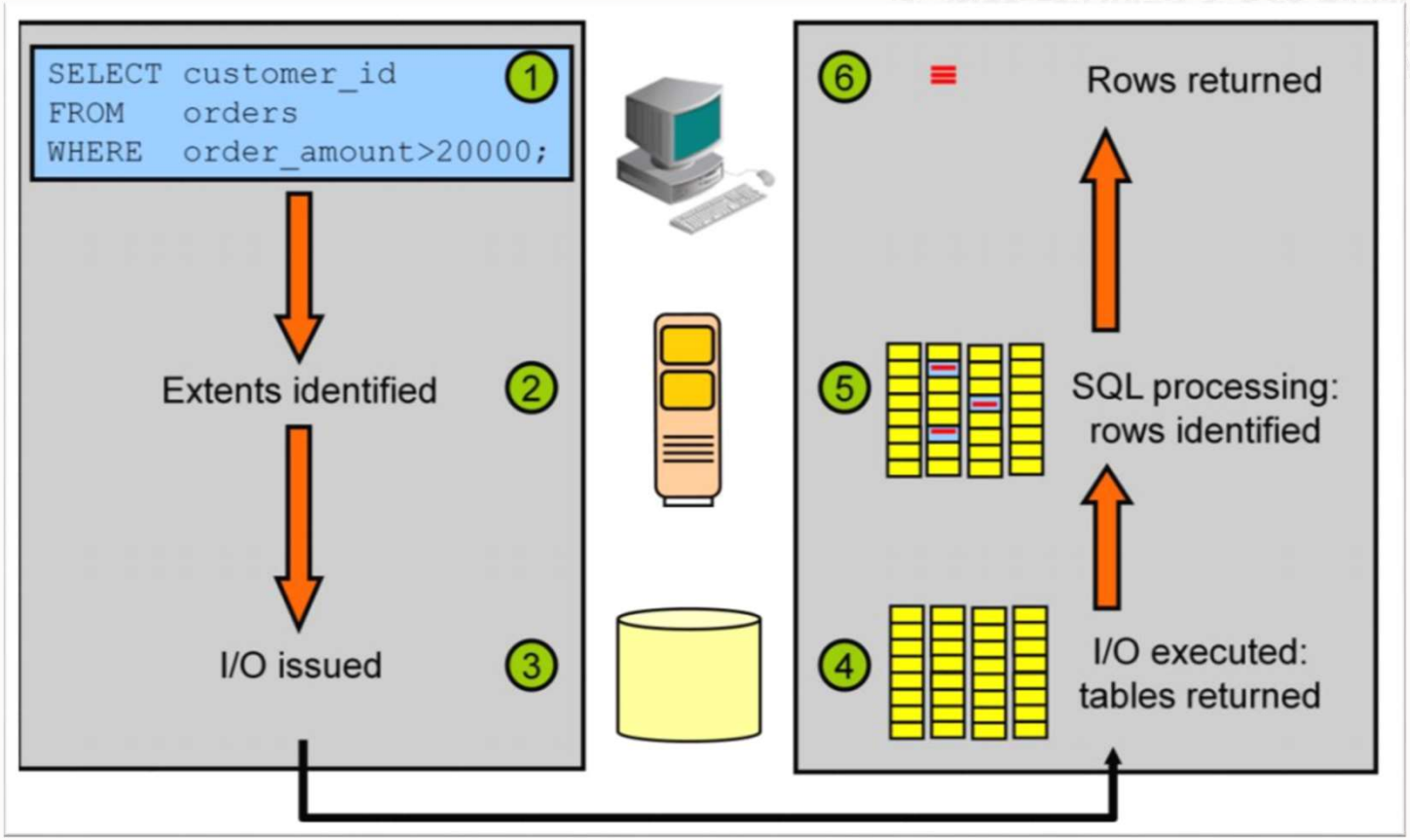
- **Patching Database Servers (Dom0).**
- **Patching Storage servers.**
- **Patching Network switches.**
- **Patching Control Planes.**

Quarterly maintenance updates may require a restart of the customer-managed guest virtual servers.

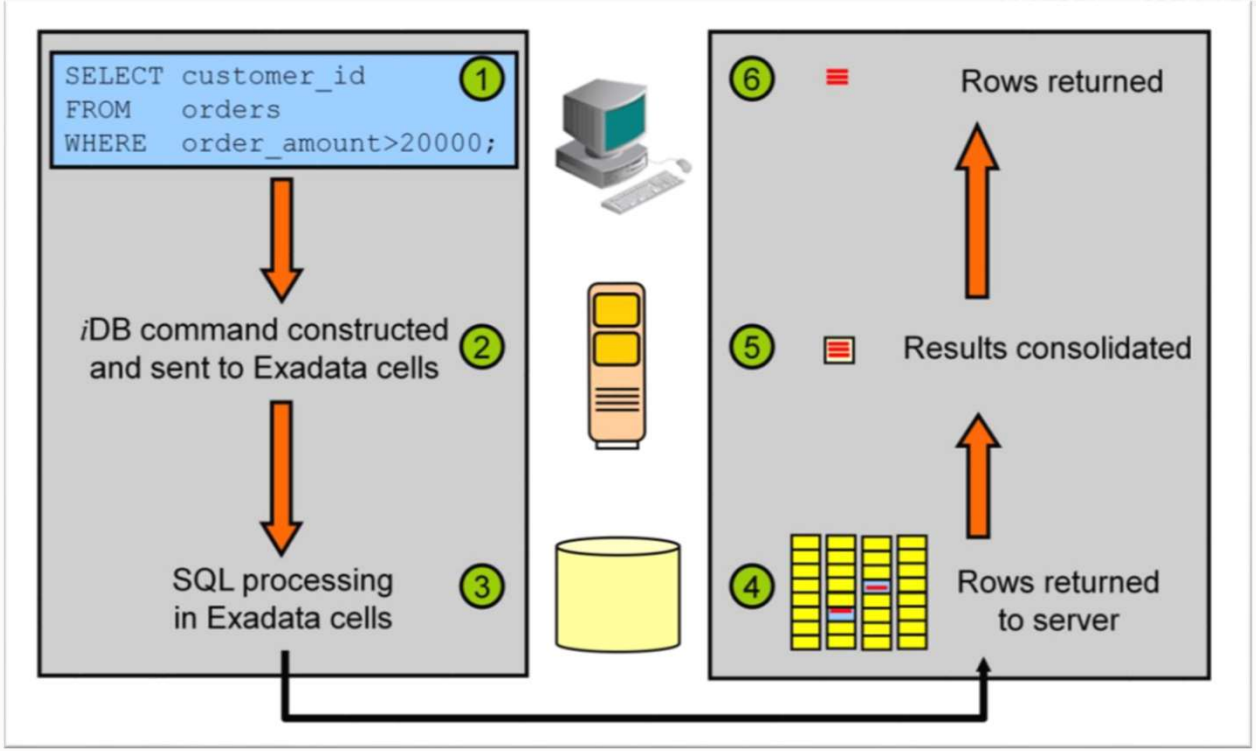
Quarter 1	Quarter 2	Quarter 3	Quarter 4
JANUARY	APRIL	JULY	OCTOBER
FEBRUARY	MAY	AUGUST	NOVEMBER
MARCH	JUNE	SEPTEMBER	DECEMBER

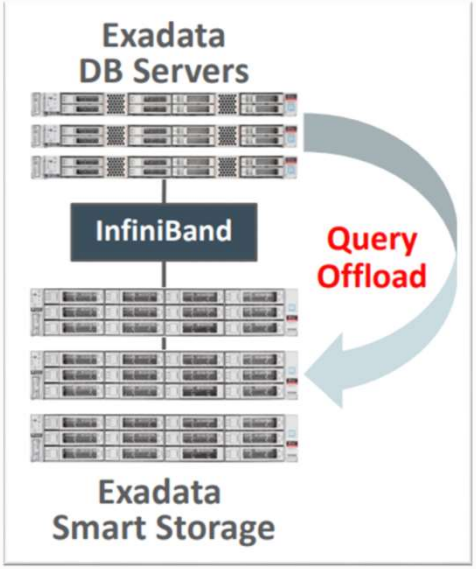
Exadata Cloud Smart Scan

Oracle Database | No Exadata System



Exadata Cloud a Smart Scan | Off Load Querying





Query Execution plan | Traditional Database Vs Exadata System

```
SQL> select * from table(dbms_xplan.display);

PLAN_TABLE_OUTPUT
--------------------------------------------------------------------------------------------------------------
--------------------------------------------------------------------------------------------------------------
Plan hash value: 970577077

-----------------------------------------------------------------------------------------------------
| Id  | Operation                           | Name            | Rows  | Bytes | Cost (%CPU)| Time     |
-----------------------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT                    |                 |   902 | 23452 |    10   (0)| 00:00:01 |
|   1 |  TABLE ACCESS BY INDEX ROWID BATCHED| CUSTOMERS       |   902 | 23452 |    10   (0)| 00:00:01 |
|*  2 |   INDEX RANGE SCAN                  | CUSTOMERS_ID_PK |   902 |       |     6   (0)| 00:00:01 |
-----------------------------------------------------------------------------------------------------

Predicate Information (identified by operation id):
---------------------------------------------------
```

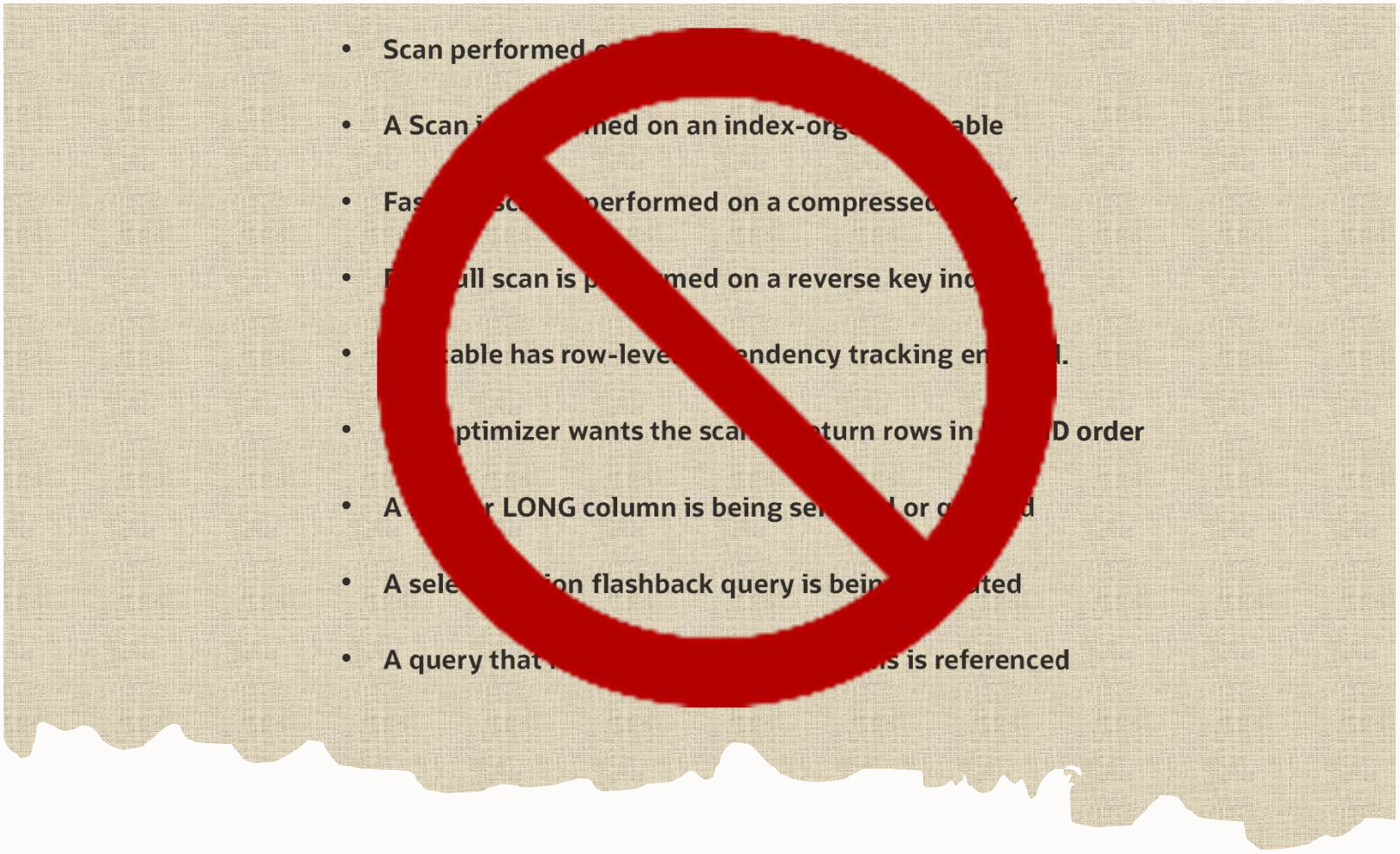

```
PLAN_TABLE_OUTPUT
--------------------------------------------------------------------------------------------------------------
--------------------------------------------------------------------------------------------------------------
Plan hash value: 2008213504

-----------------------------------------------------------------------------------------------------
| Id  | Operation                   | Name      | Rows  | Bytes | Cost (%CPU)| Time     |
-----------------------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT            |           |   902 | 23452 |   306K  (1)| 00:00:12 |
|*  1 |  TABLE ACCESS STORAGE FULL  | CUSTOMERS |   902 | 23452 |   306K  (1)| 00:00:12 |
-----------------------------------------------------------------------------------------------------

Predicate Information (identified by operation id):
---------------------------------------------------

   1 - storage("ID"<=1000 AND "ID">=100)
       filter("ID"<=1000 AND "ID">=100)
```

Exadata Smart Scan Why it's not working?



Backup Your Cloud Database

Continuous protection of Oracle Database in OCI

Ransomware is a major concern

Contar com um plano sólido de segurança é fundamental

62%

More ransomware attacks in the US in 2021 to more than 3,500 on an annual basis (source: US Treasury)

37%

Das corporações Globais foram atacadas pelo ransomware em 2022 (source: IDC)

$1.85M

Average total cost of remediating a ransomware attack (source: Sophos)

180%

More annualized losses from ransomware attacks in the US during 2021 to $1.18B on an annual basis (source: US Treasury)

One minute of data loss due to ransomware attack could impact 100s to 1000s of business transactions in enterprise databases

Data protection goals in the cloud

Minimize ransomware risk

- Reduce data loss exposure and downtime after an attack
- Protect against backup deletion or alteration during an attack
- Secure backups against unauthorized access and information disclosure

Optimize operations

- Get rid of time-consuming and resource-intensive weekly full backups on production database services
- Eliminate backup validation resource consumption on production database services
- Simplify multistep recovery processes and make recovery times predictable
- Minimize backup-driven costs

Reduce administration

- Consistently apply backup policies across an organization
- Understand backup health and recoverability
- Plan for database backup space utilization

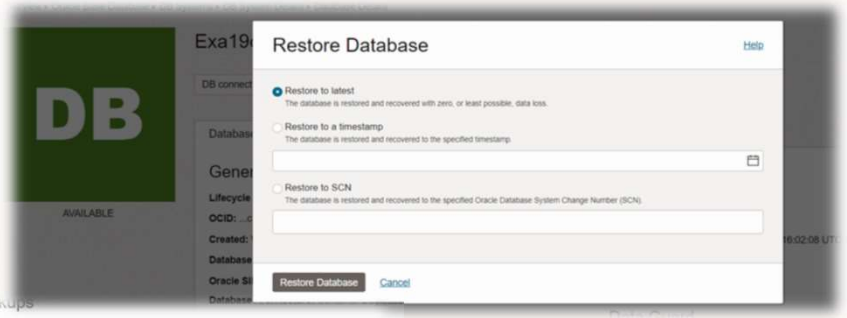
Traditional OCI | Backup and Restore

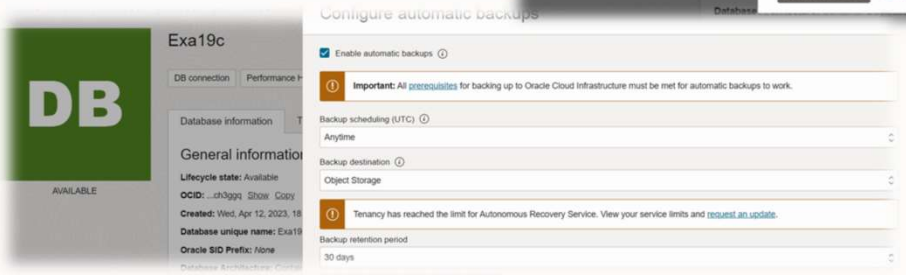
Manage backup and restore feature for VM/BM DB System

- Backup stored in Object or Local storage
- DB System in private subnets can leverage Service Gateway
- Start With 2 cores and Scale Up/Down OCPU's based on your requirement

Backup Options

- It is not possible to create a non-CDB via the console - use dbcli



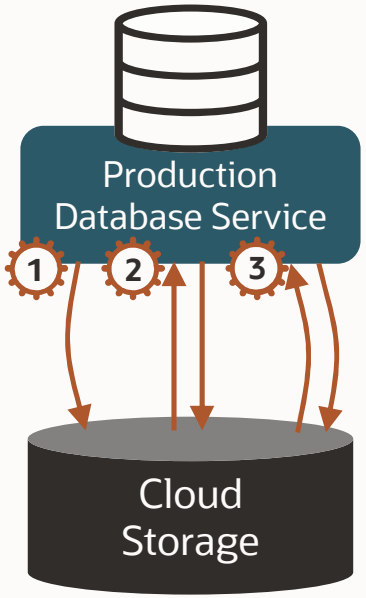


Recovery Service offloads backup validation

All backups are checked for recoverability, reducing database service overhead

Traditional cloud backup

1. Backup (full or incremental) is created on the production database service and stored in object storage
2. Production service reads the backup from object store, validates it, and fixes issues **doubling the impact on production database services**
3. Periodic revalidation **increases production database consumption**
4. Resulting in:
   a. Lower production performance if resource constrained, or
   b. Higher consumption costs if resources are unconstrained, or
   c. Decision to not validate backups or revalidate them, increasing risk



All work takes place on the production database service

Oracle Database Zero Data Loss Autonomous Recovery Service

A fully managed, automated service for continuously protecting Oracle databases in OCI

Ransomware resiliency

- Automatic and mandatory encryption to help prevent data theft
- Safeguards backups with enforced 14-day retention
- Optimizes backups in the background for fast recovery with zero data loss

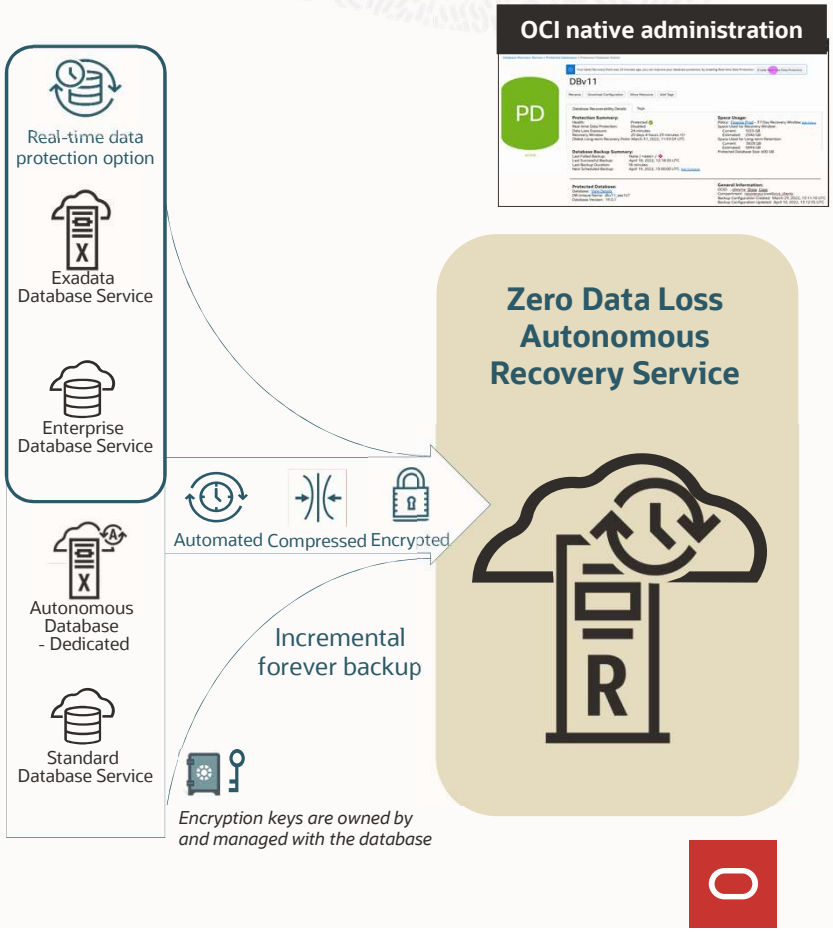
Operational efficiency

- No more weekly full backups – eliminates production database overhead
- Shorter backup windows with incremental forever strategy
- Zero-impact database recovery validation for every backup

Cloud simplicity

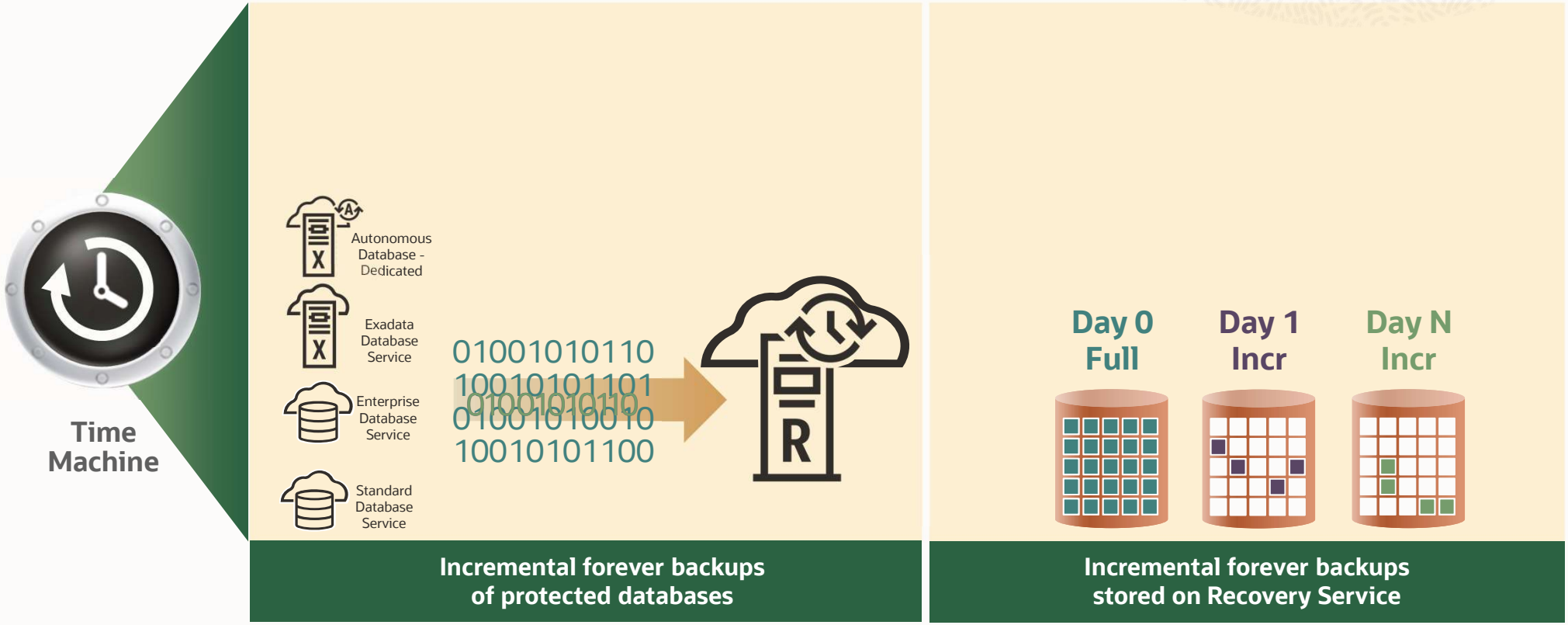
- Quickly configure database protection at scale with zero data loss
- Control costs with database-specific backup consumption metrics
- Gain deep data protection insights with granular recovery health dashboard

Using proven Recovery Appliance technology



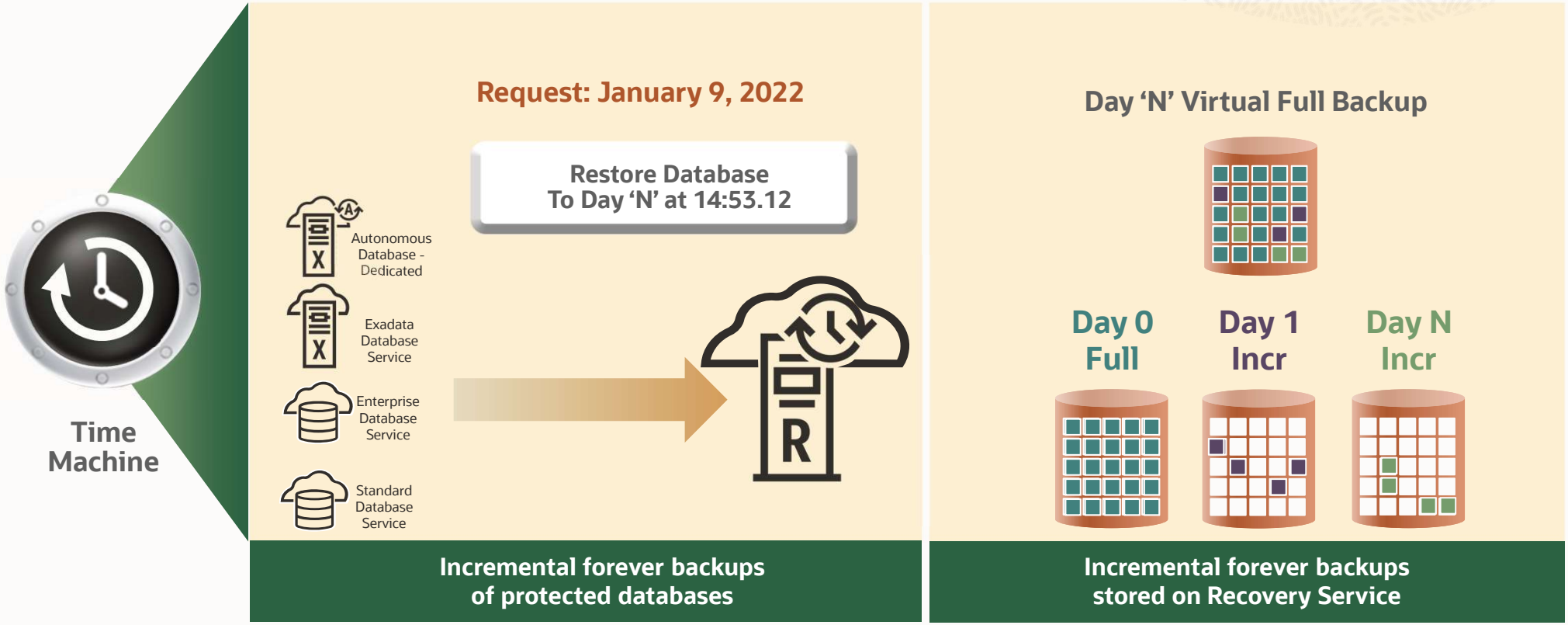
Recovery Service eliminates weekly full backups

Incremental-forever backups reduce backup overhead on production database services



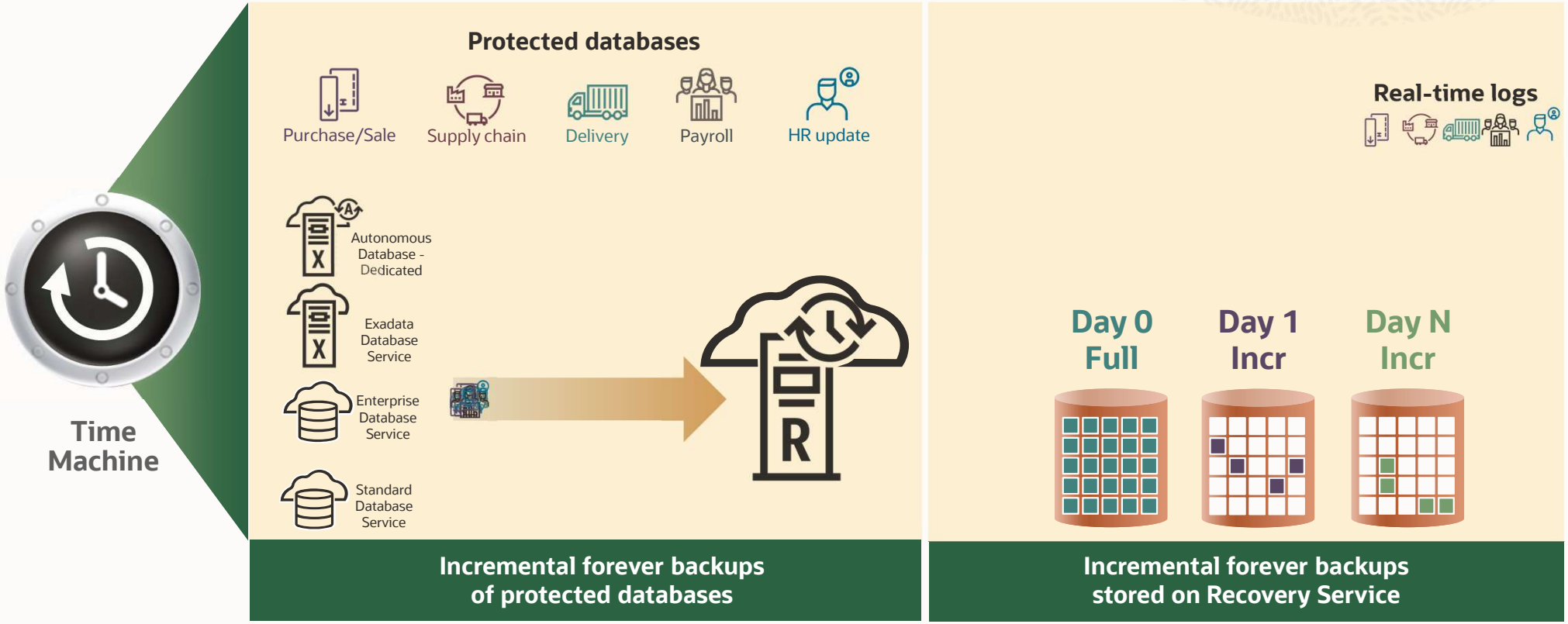
Recovery Service simplifies database restores

Creation of virtual full backups eliminates multiple incremental restore & apply cycles



Recovery Service continuously protects Oracle databases

Real-time protection of database changes increases resiliency with point-in-time recovery



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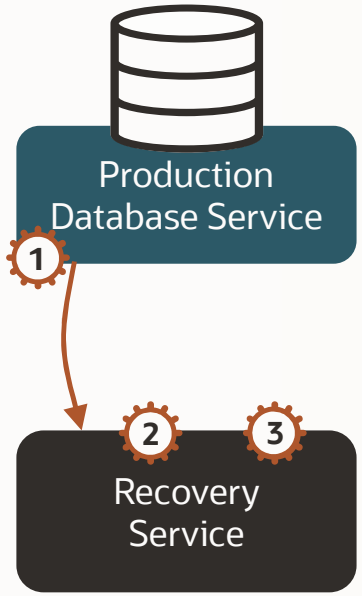


Most work takes place on the Recovery Service

Recovery Service backup

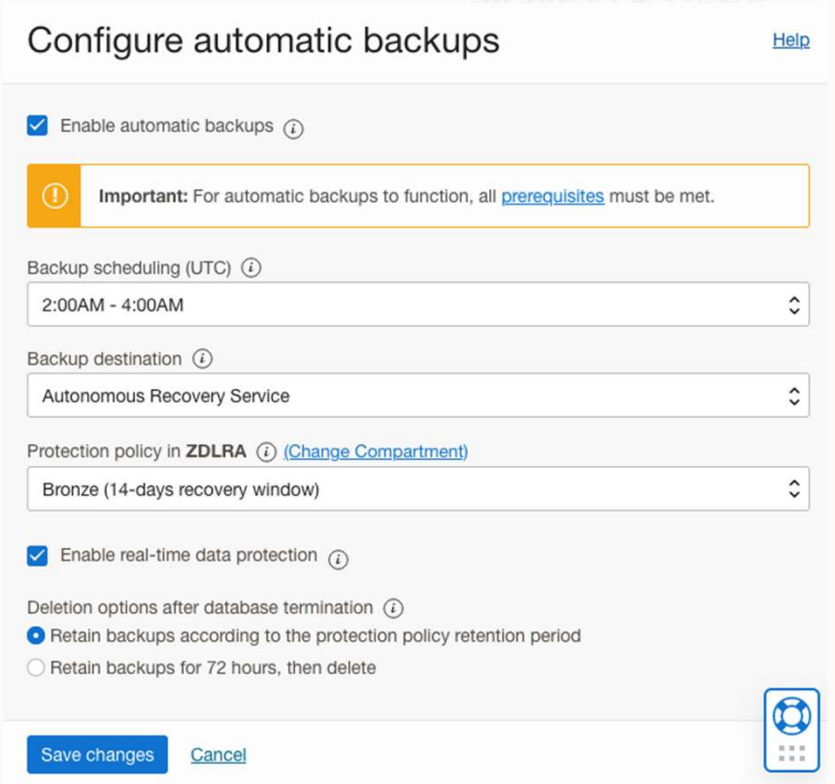
1. Incremental forever backup is created on the production database service and stored in the Recovery Service
2. The Recovery Service uses **internal Oracle Database knowledge** to check examine and fix backups when ingested, with **no impact on production databases**
3. The Recovery Service periodically revalidates backups with **no production database consumption**
4. Resulting in:
   a. **Minimal backup impact on production databases**
   b. **No additional production database service costs**
   c. **Higher recoverability & lower risk**

Recovery Service is easy to set up and use

Protect Oracle databases with less then 5 clicks in the OCI console

A fully managed OCI service with a simple UI

1. Enable automatic backups
2. Schedule daily incremental backups to meet your business schedule
3. Select Autonomous Recovery Service
4. Select protection window of 14 to 95 days
5. Enable real-time protection



Recovery Service protects against unauthorized access

Built-in security and resiliency help safeguard mission-critical data

Encryption is mandatory

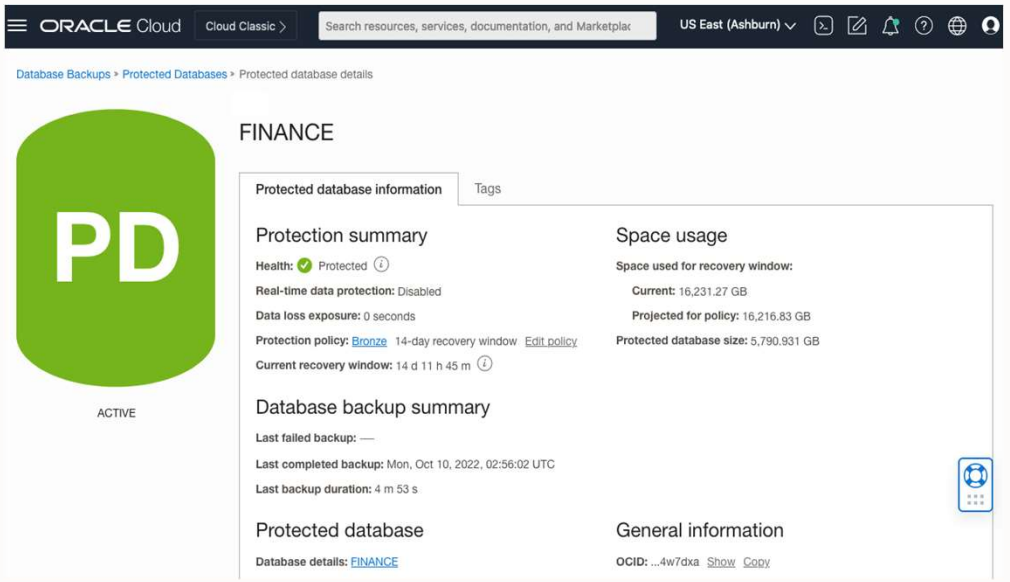
- Non-encrypted databases are rejected
- Keys are never stored in the Recovery Service

Access and management controls

- No direct user access to storage – backup only
- Access granted per protected database
- 14-day minimum retention enables recovery from human error or malicious internal actors

Resilient operations

- Fault-tolerant across all infrastructure components
- Highly available across Availability Domains and Fault Domain
- Load balanced within a region



Recovery Service provides insights into backup health and operations

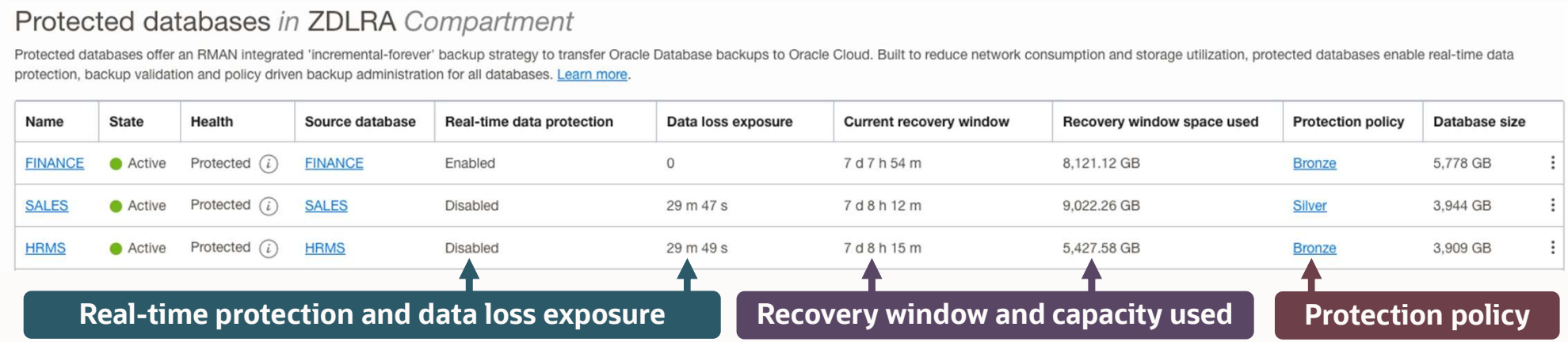
Built-in dashboards and tools simplify reporting and planning

Continuous monitoring of potential business risks

- Data loss exposure
- Recovery window

Critical data for operational planning

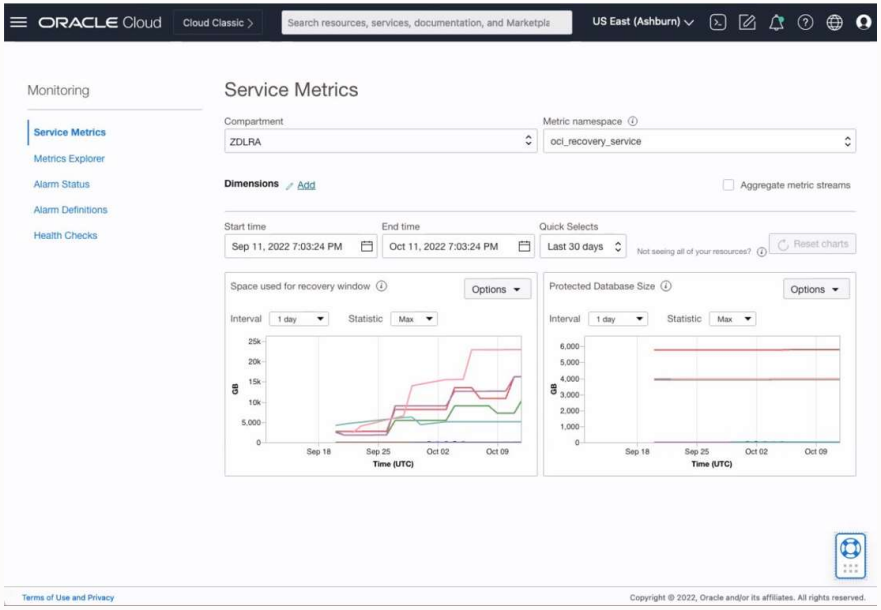
- Capacity usage
- Protection policy



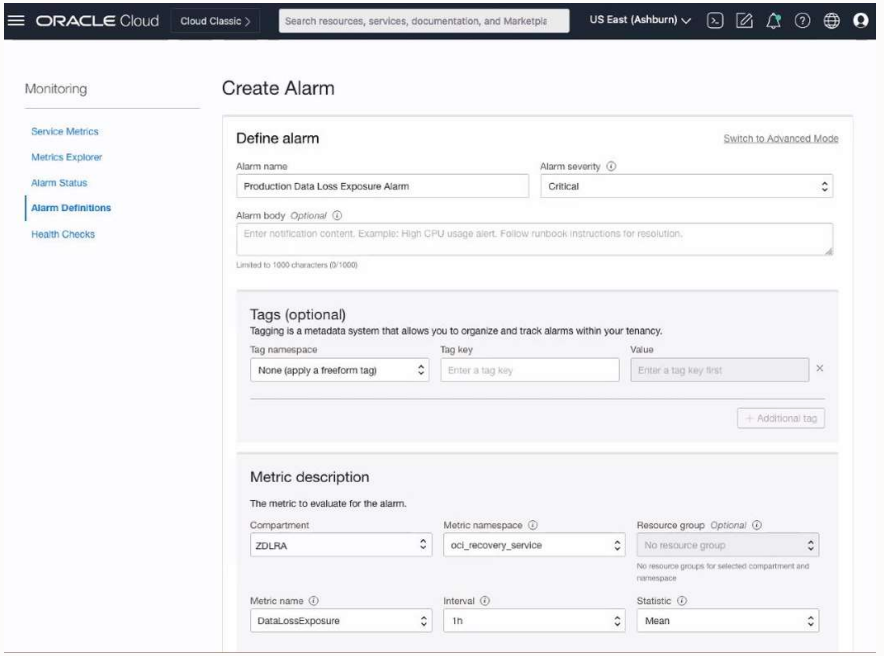
Recovery Service integrates with OCI observability and management

Comprehensive visibility across the full cloud stack

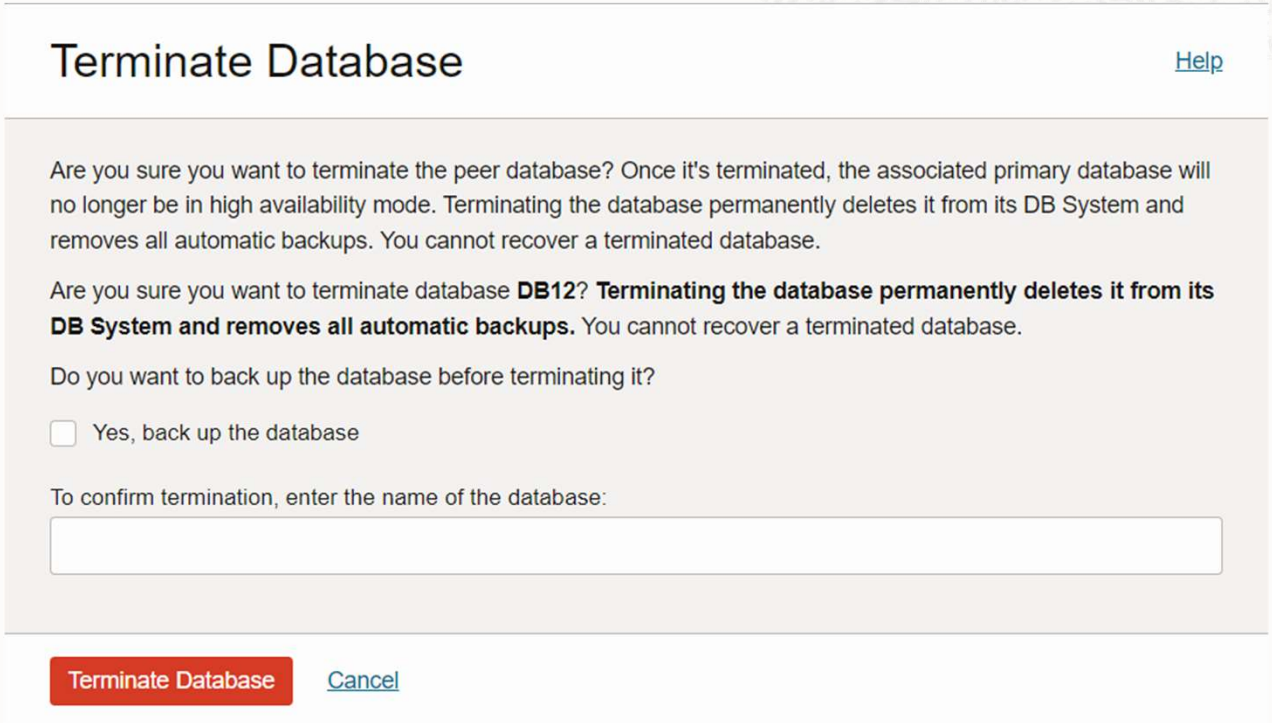
Integration with OCI Metrics Explorer provides common access to critical information



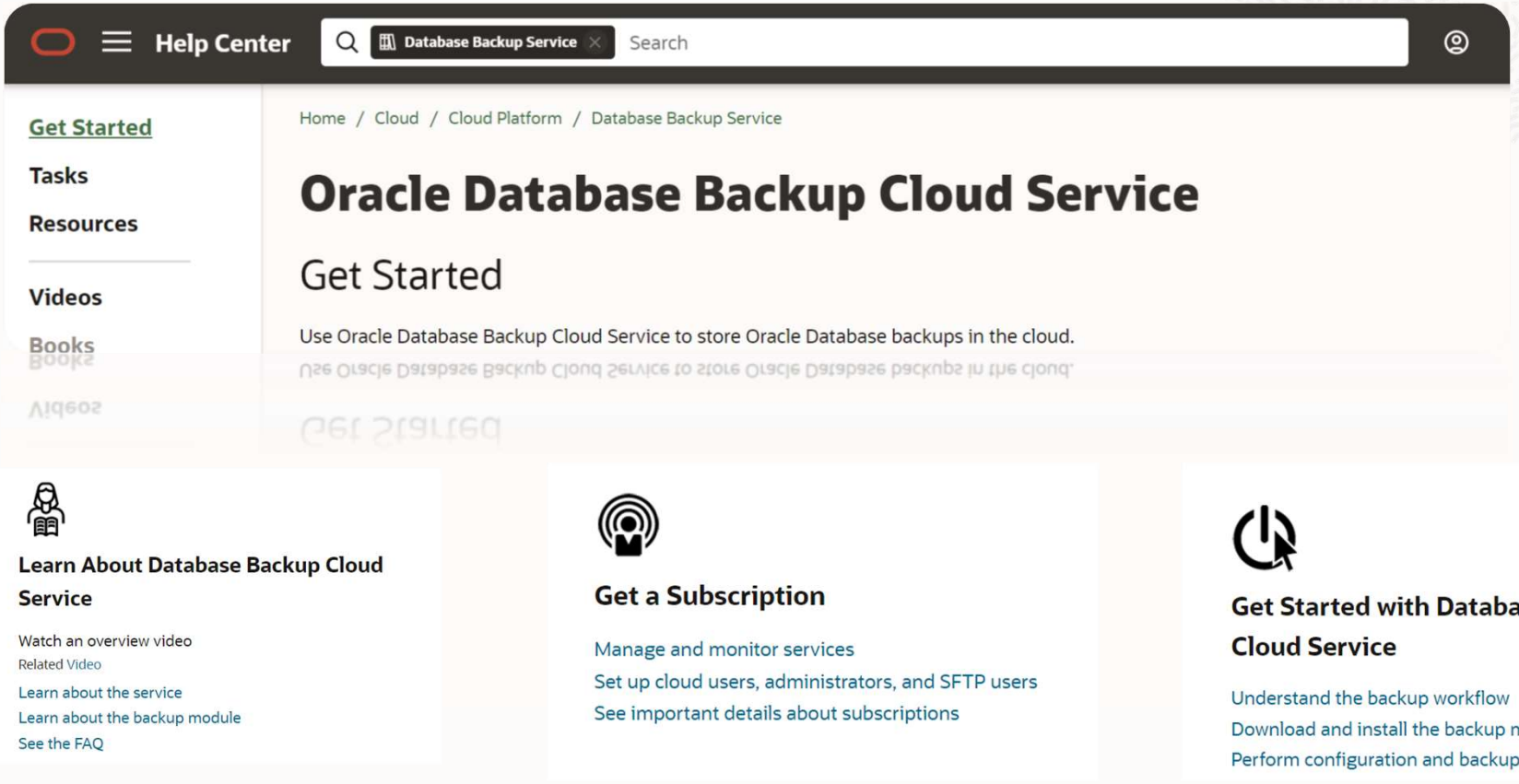
Alarms and notifications are created within OCI for consistent monitoring and management



OCI Database Backup | Take Care before delete your Database



Cloud Backup | Oracle Database Backup Cloud Service page

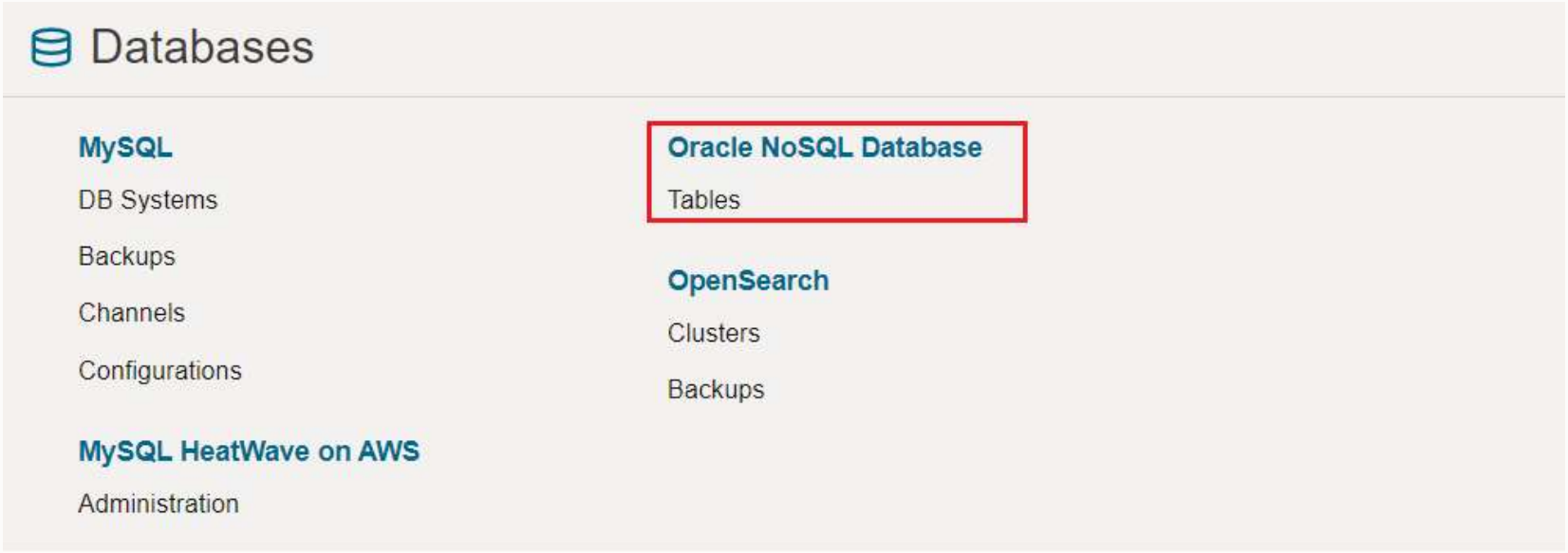


https://docs.oracle.com/en/cloud/paas/db-backup-cloud

Oracle NoSQL Cloud Service

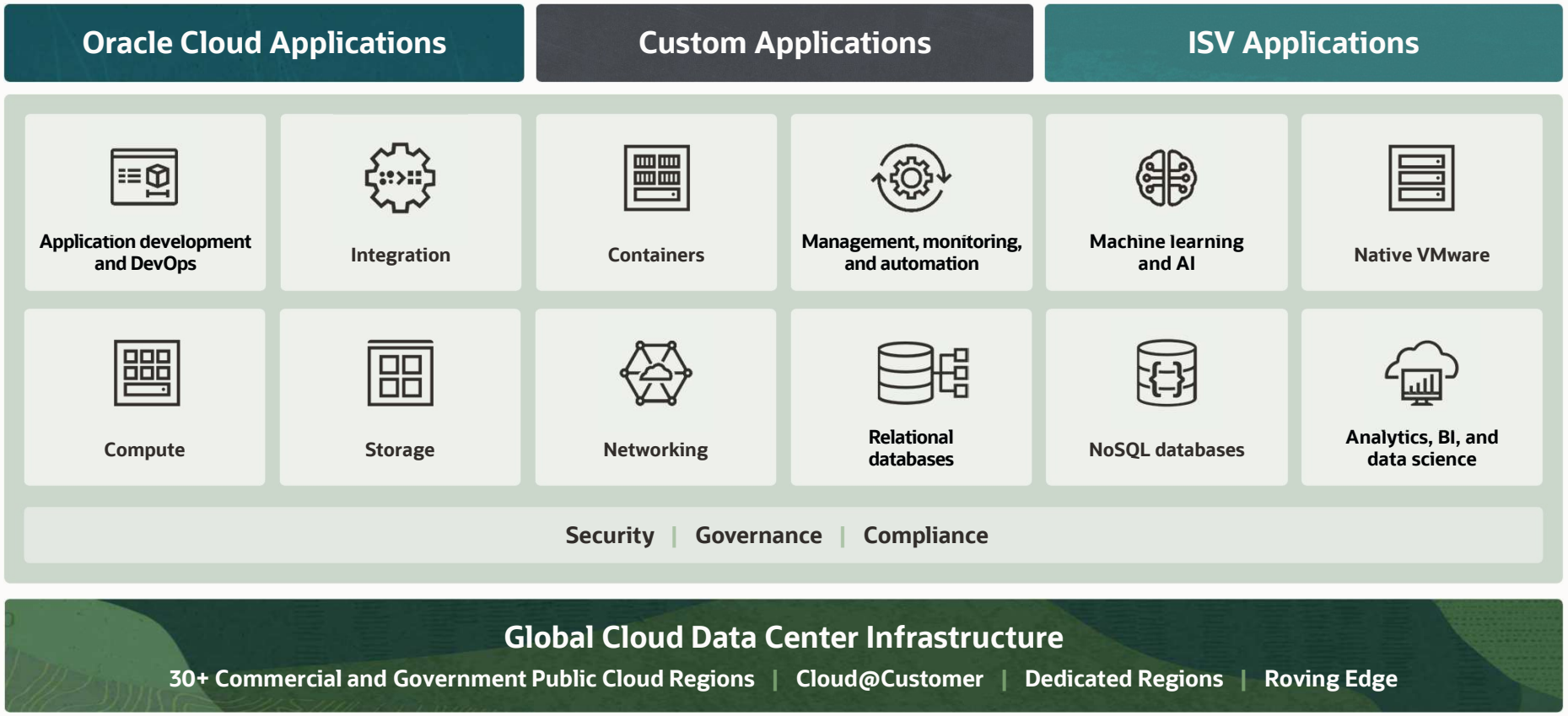
Oracle NoSQL Database Services on OCI Console

Easy provisioning and Management



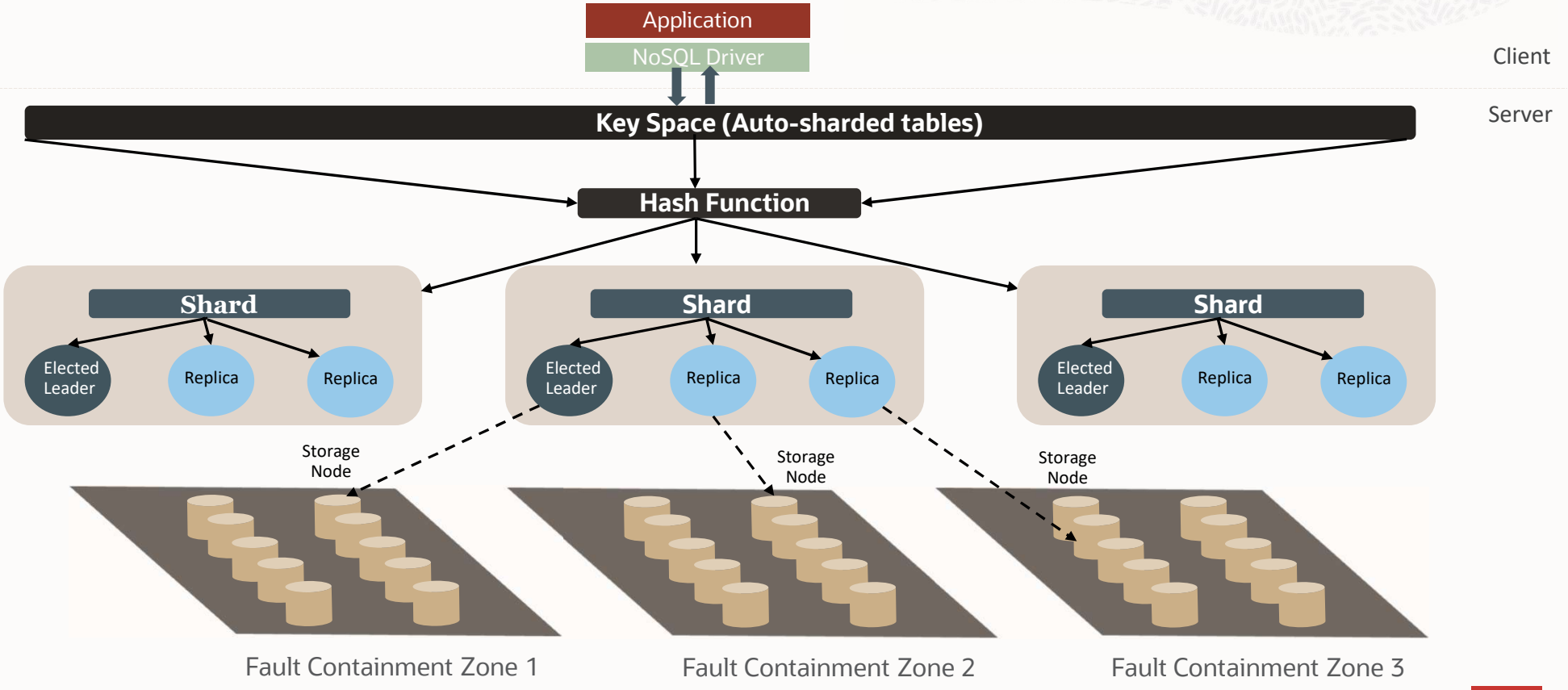
https://docs.oracle.com/en/cloud/paas/nosql-cloud

OCI: A complete cloud infrastructure platform



Oracle NoSQL Database Architecture Overview

A distributed, shared nothing key/value data store architected for HA



Oracle NoSQL Database Cloud Service

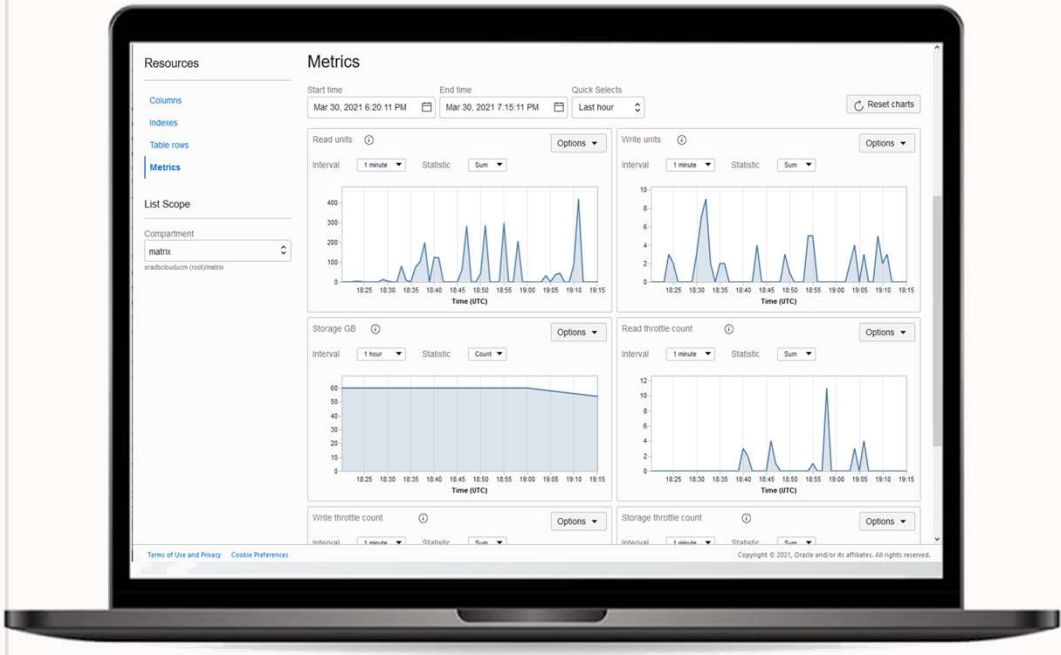
Built for extreme, dynamic workloads of today's modern applications

Fast, Flexible NoSQL Database Service at any scale

- **Fully managed**, **serverless** NoSQL database **table service**
- **Single digit millisecond** and **predictable** latency at any scale
- **Linear throughput scaling** for **extreme** workloads
- Multi-model support (document, fixed schema, key/value)
- **Built-in high availability** for business continuity
- Fully **ACID compliant** and **adjustable** read consistency
- Serverless computing through Oracle Functions
- Available in 30 OCI commercial regions worldwide (Mar 2022)

Differentiated Use Cases

- **Request level granularity** for extreme workloads, and handles **spikes** and **drops optimally**
- Fast, constant, high-volume workloads requiring **predictable low latency** for **highly responsive applications**
- Designed for business applications requiring **scale**, **performance**, and **high availability** with flexible consistency



Oracle NoSQL Database Cloud Service - Metrics

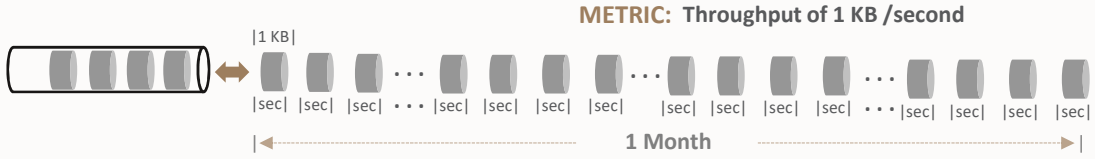
Throughput provisioning

1 Write Unit

- The throughput of up to 1 kilobyte (KB) of data per second for a write operation over a one-month period
- Approximately 2.67 million writes per month

1 Read Unit

- The throughput of up to 1 kilobyte (KB) of data per second for an eventually consistent read operation
- Approximately 2.67 million eventually consistent reads per month
- 2 Read units are needed for an absolute consistent read



Period of a month
=3600 KB/Hr*744 Hr
=2.67 million (writes/reads) KBs

Oracle NoSQL Database Cloud Service – Capacity

Provisioned capacity vs. on-demand capacity

Provisioned Capacity

- Must determine read/write units in advance
- Adjustments done via API or console
- Increasing unlimited
- Decreases limited to 4 per day
- Pay for what you provision
- Deep understanding of workload needed

On-Demand Capacity

- Automatic scaling
- No rate limiting in your application
- No workload characterization
- Simple to use
- Pay for what consumed

Oracle NoSQL Database Cloud Service – Provisioned Capacity

Provisioned throughput

- Provision reads/sec, writes/sec, GB storage at table creation time
  - Dynamically increase
  - Dynamically decrease


```
JAVA code sample:
TableRequest tableRequest = new TableRequest()
        .setStatement("create table if not exists foo (id integer,
value JSON)")
        .setTableLimits(new TableLimits(2000, 100, 500))
        .setTimeout(1000);
TableResult res = NoSQLHandle.tableRequest(tableRequest);
```

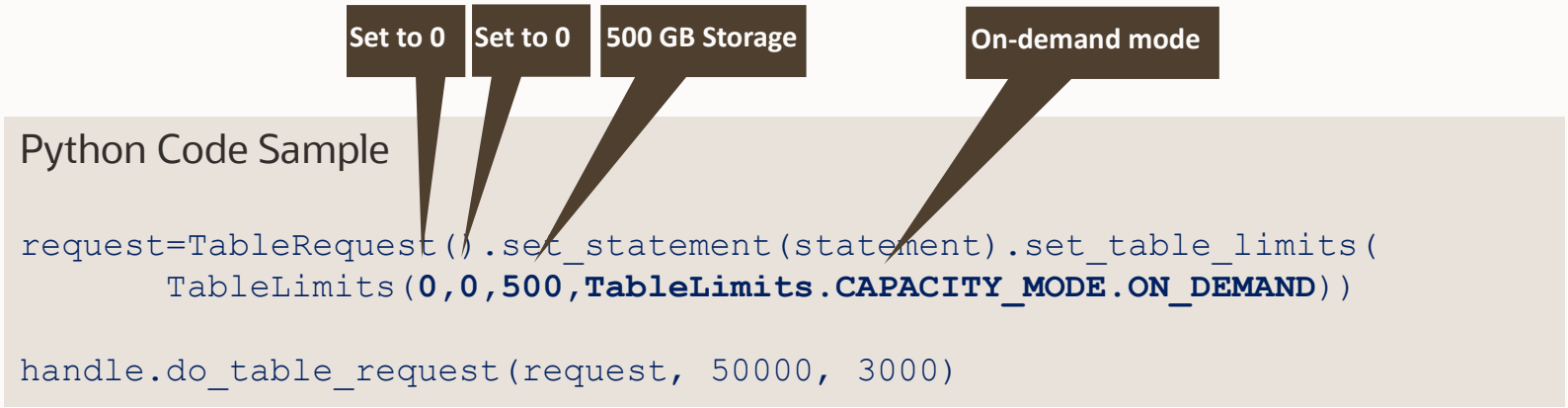
Modify the table lowering the read units to 1000

```
tableRequest.setTableLimits(new TableLimits(1000, 100, 500))
```

Note: Every TableRequest is a DDL call to the NoSQL store and may be performed 4 times within a minute.

Oracle NoSQL Database Cloud Service – On-Demand Capacity

Auto-scaling throughput



Python Code Sample

```
request=TableRequest().set_statement(statement).set_table_limits(
       TableLimits(0,0,500,TableLimits.CAPACITY_MODE.ON_DEMAND))

handle.do_table_request(request, 50000, 3000)
```

Pay-Per Use

Provisioned

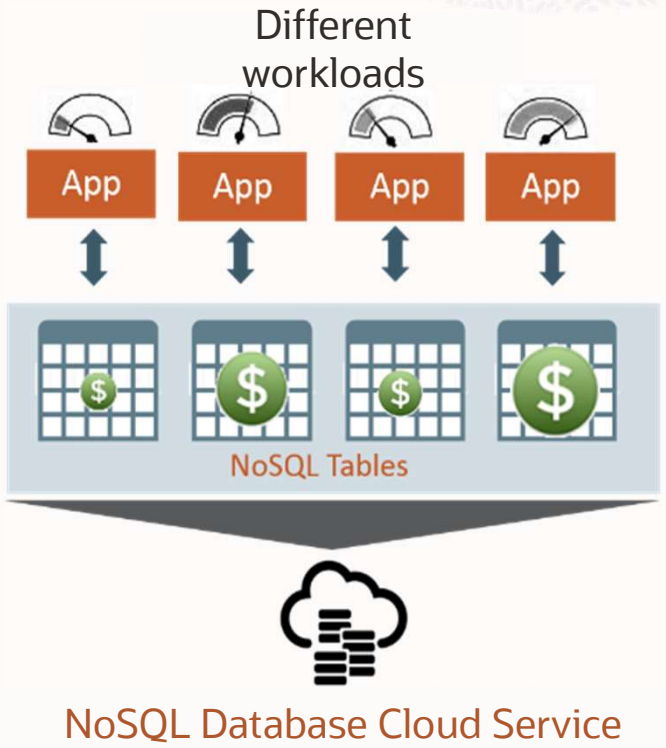
Pay per table capacity provisioned

- Different table with different capacity to serve different workloads
- Pay per throughput and storage capacity provisioned - Table level read units, write units, storage in GB

On-demand

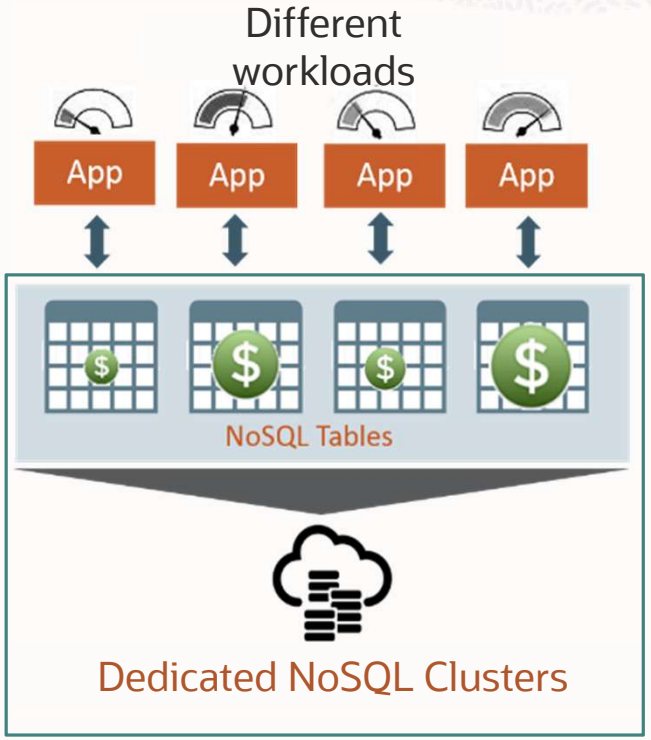
Pay based on the read/write units consumed

- Pay per throughput used - Table level read units, write units
- Pay no throughput costs when idle
- Pay for storage capacity provisioned – storage in GB
- Ideal for unpredictable, seldom used, or new workloads



Private Hosted Dedicated Environment

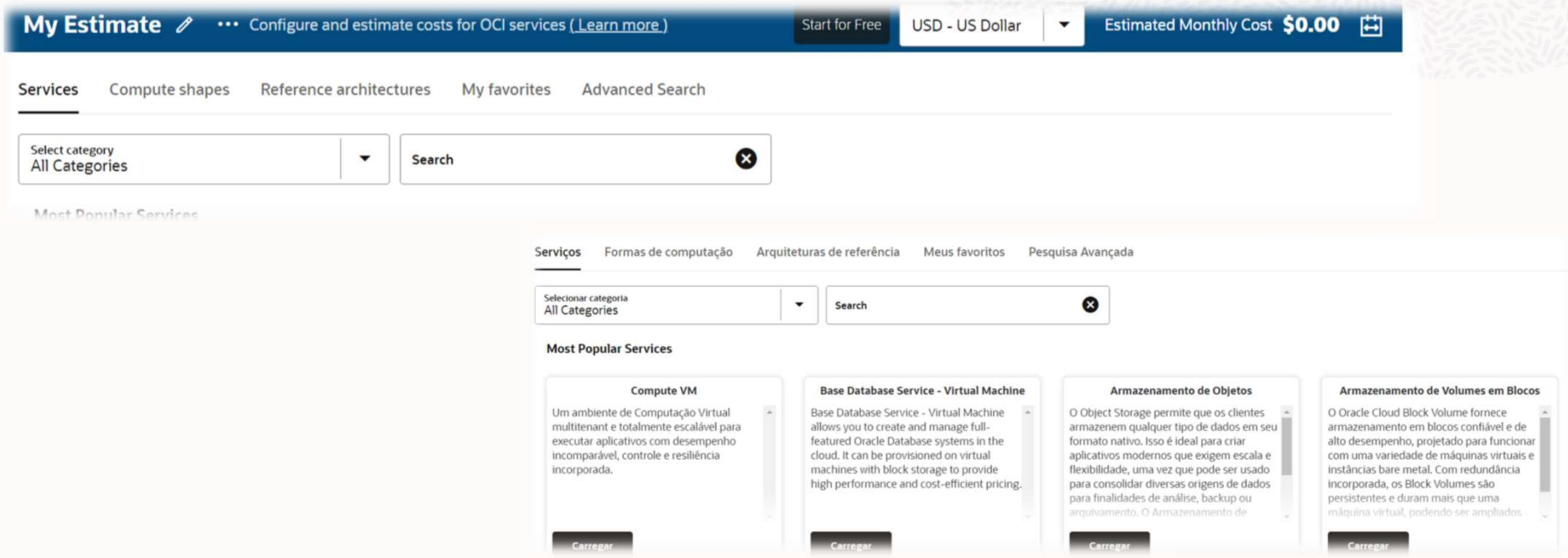
- **Dedicated**
  - Supports extremely high throughput needs of demanding applications with maximum throughput of:
    - 420,000 read units (420 MB of reads per second)
    - 280,000 write units (280 MB of writes per second)
  - Fully managed NoSQL cluster environment that is dedicated to your tenancy
  - Isolated data at rest
    - Dedicated direct attached storage of 17.5 TB of storage capacity per month
    - Low latency, reduced blast radius of failure with HA
    - No other tenants can access
- **Private**
  - Access your hosted environment via a private endpoint
  - Whitelisted tenancy access
  - No other tenant can get routed to your cluster



Studding and costs useful tools

Very good tools to test and

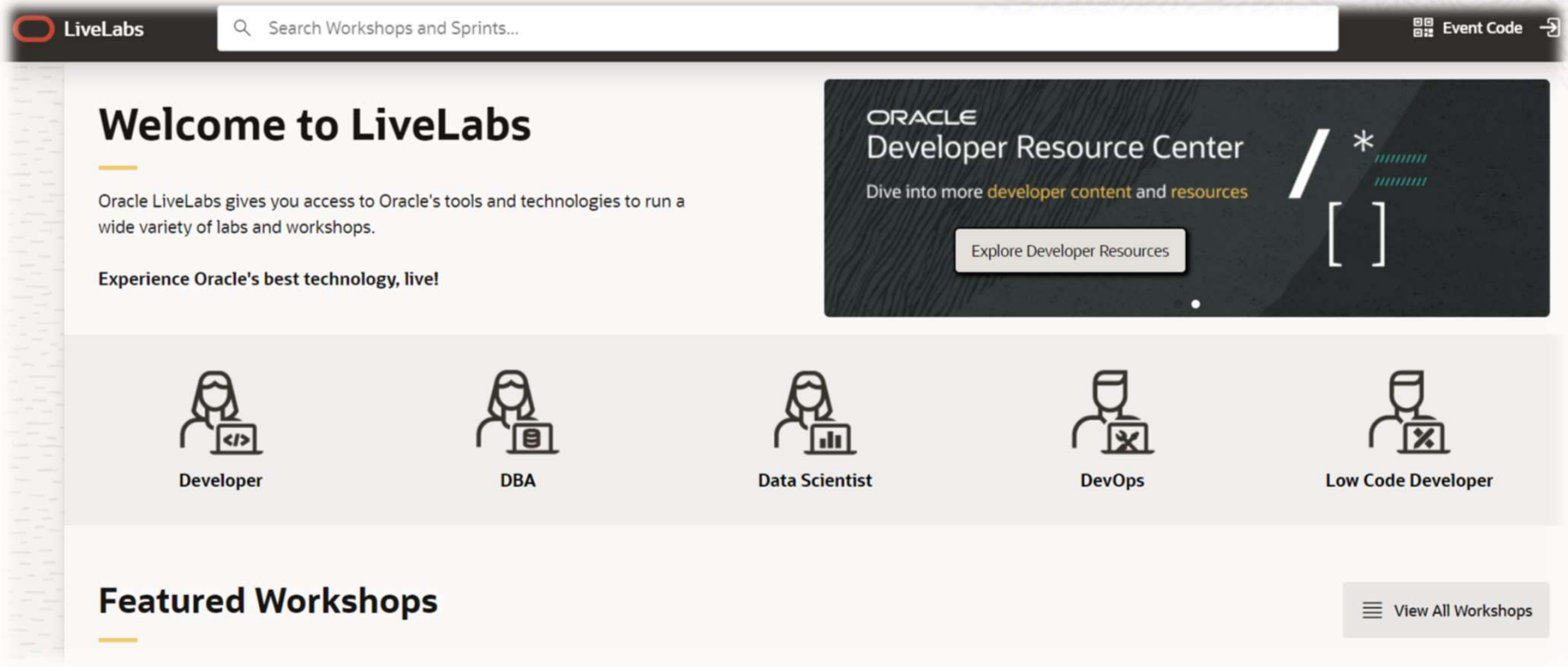
Oracle Cloud Cost Estimator



https://www.oracle.com/cloud/costestimator.html

Oracle Live Labs

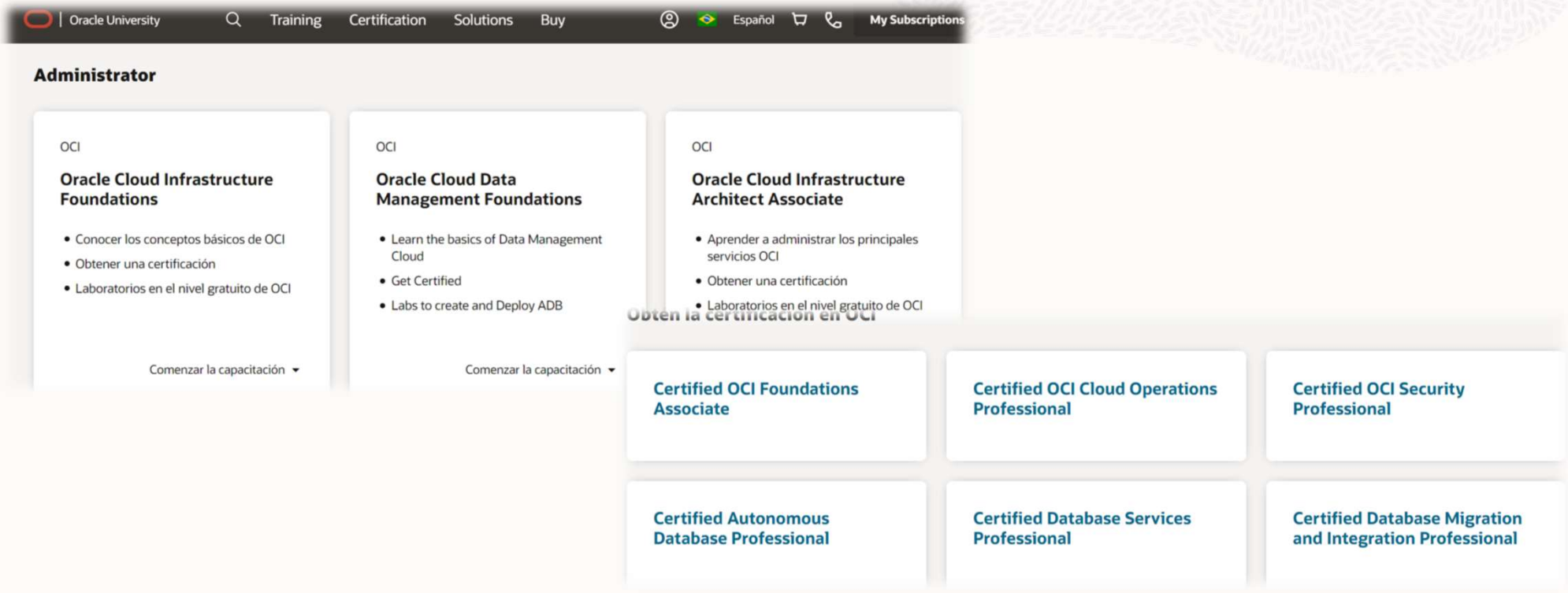
Easy to deploy our oracle solution and features



https://apexapps.oracle.com/pls/apex/r/dbpm/livelabs/home

Oracle OCI Free Courses and Certifications

Easy to deploy our oracle solution and features



https://education.oracle.com/es/learn/oracle-cloud-infrastructure/pPillar_640

Thank You ☺

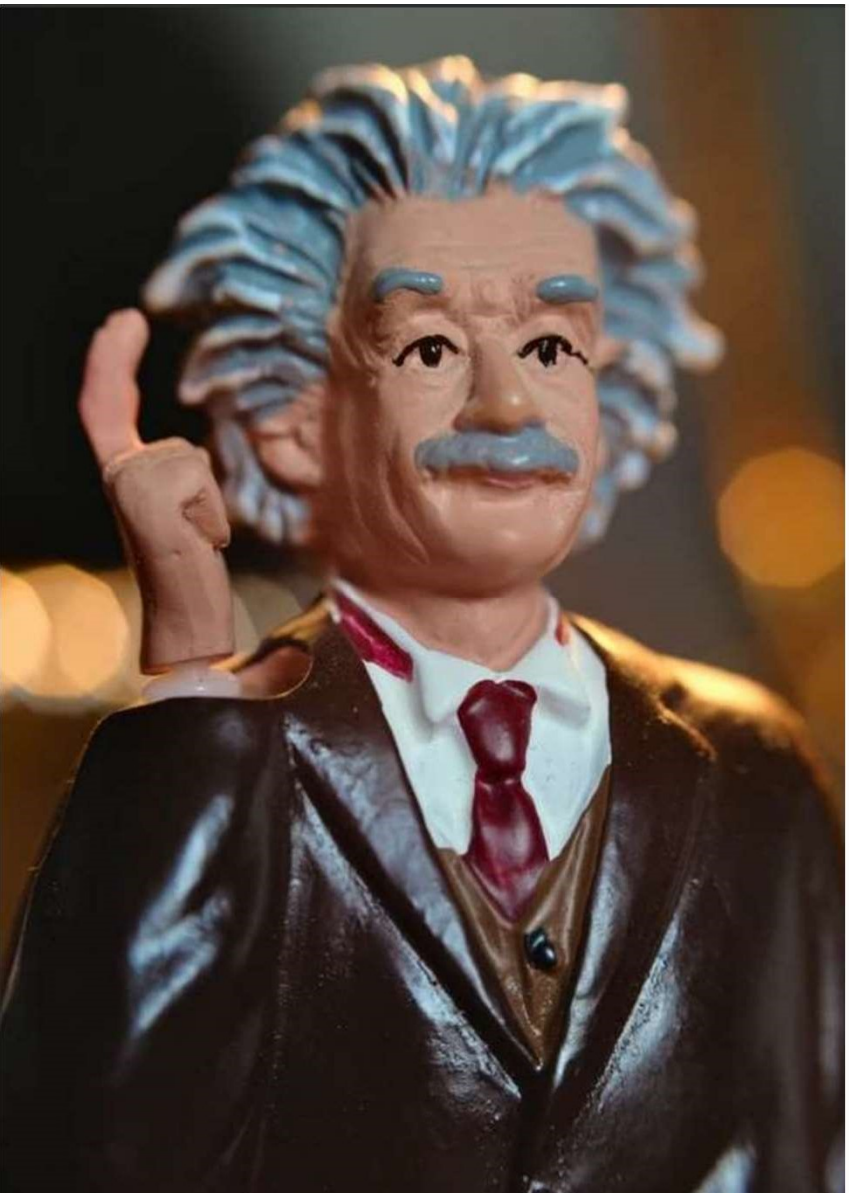
Questions / Feedback / Training Suggestions

andre.sousa@oracle.com

marcel.lamarca@oracle.com

Ask for help ☺


ORACLE



Demo 1 – OCI NoSQL Services

- NoSQL Table provisioning
- NoSQL Table Insert using OCI Console
- Exadata Cloud Shape and Versions

Demo 2 – Exadata Smart Scan

- Changing Table execution plan using Index
- Change index to invisible and enable Smart Scan

Demo 3 - OCI Console Tour

- Dom0 Patching scheduling
- Database Provisioning
- Exadata Pathing prechk on Console
- Exadata Cloud Shape and Version