



Backup and Disaster Recovery Solutions on Oracle Cloud Infrastructure

Speakers



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Safe harbor statement

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What is the **Impact** of **Downtime** on Your **Business?**





Is this a disaster?



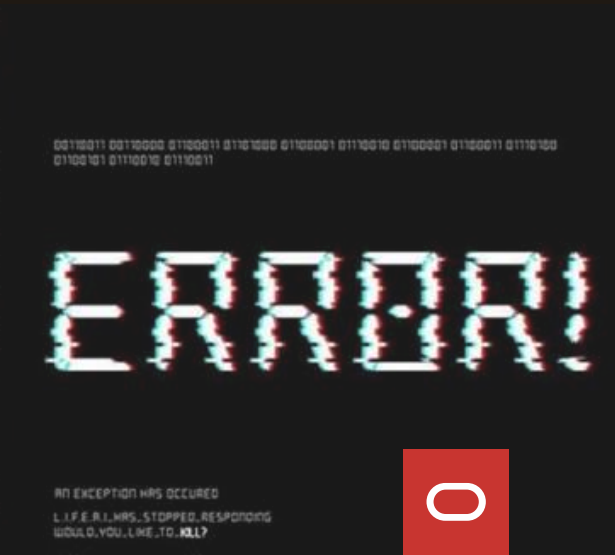
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RANSOMWARE



POWER OUTAGE

But also...



The importance of a Disaster Recovery plan

Financial risk



- Business interruption means revenue loss
- Unplanned recovery costs
- Reputational / brand damage can reduce market value

Customer risk



- Customers who have a bad experience may not return
- Widely publicized outages make it harder to attract new customers

Regulatory risk



- Regulated businesses may face penalties for unplanned interruptions
- May also be subject to additional ongoing scrutiny

Business (dis)Continuity in numbers – The cost of an Outage

40% outages or service interruptions in businesses cost between **\$100k** and **\$1 Million**

(source: Uptime Institute's Annual Outage Analysis 2021)

43% of **companies** experiencing disasters **never reopen**

(source: Varonis 2020)

Over **623 million ransomware attacks** in 2021, more than double than 2020

(source: 2022 SonicWall Cyber Threat Report)

40% of servers suffer **at least one** unexpected **outage per year**

(source: 2022 Data Protection Trends Report, Veeam)

80% of data center managers and operators have **experienced** some type of **outage** in the past 3 years

(source: Uptime Institute's Annual Outage Analysis 2021)

Top 3 data loss causes: technology malfunction, human error, and cybersecurity events.

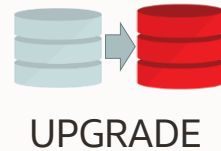
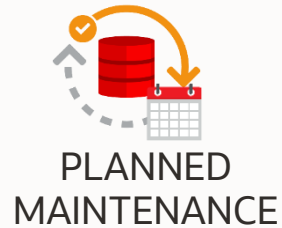
(source: 2022 Data Protection Trends Report, Veeam)

If the unexpected does happen,
your **Disaster Recovery** plan
may be the **difference between**
your business **recovering** or
failing from the event.

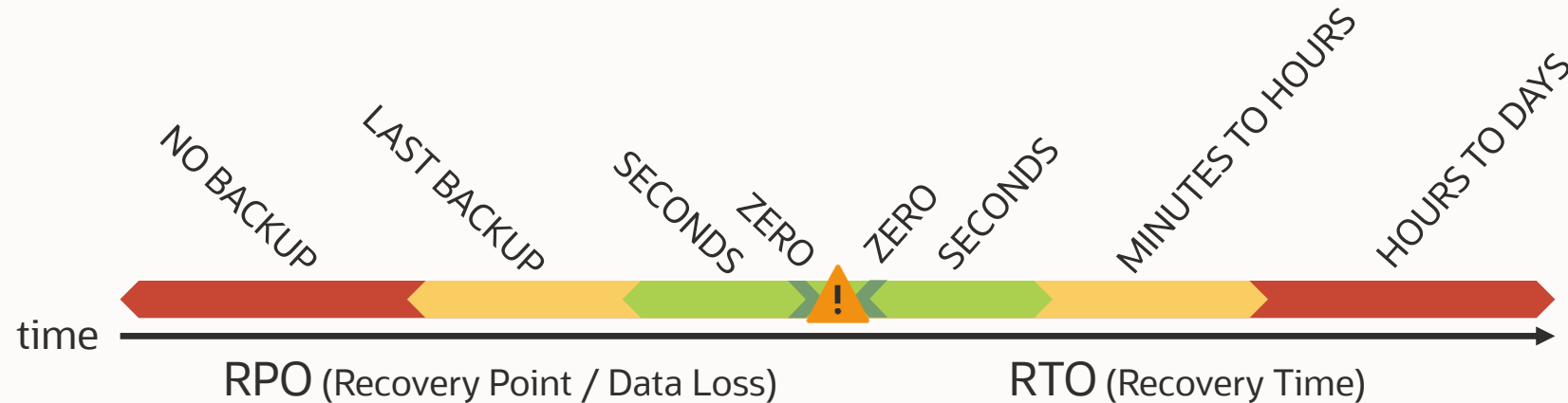


Types of Downtime and Recovery Objectives

Types of downtime

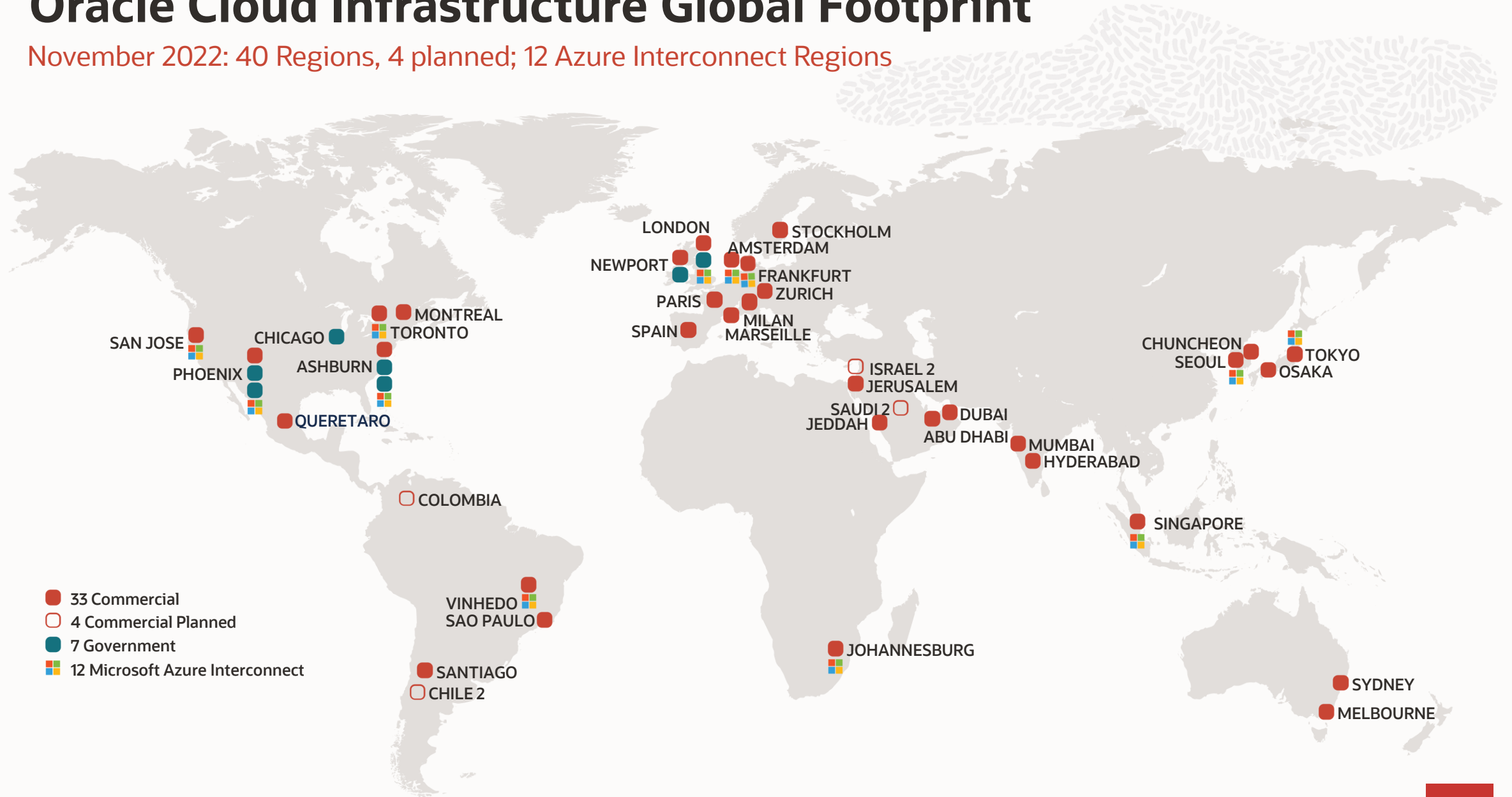


Recovery objectives

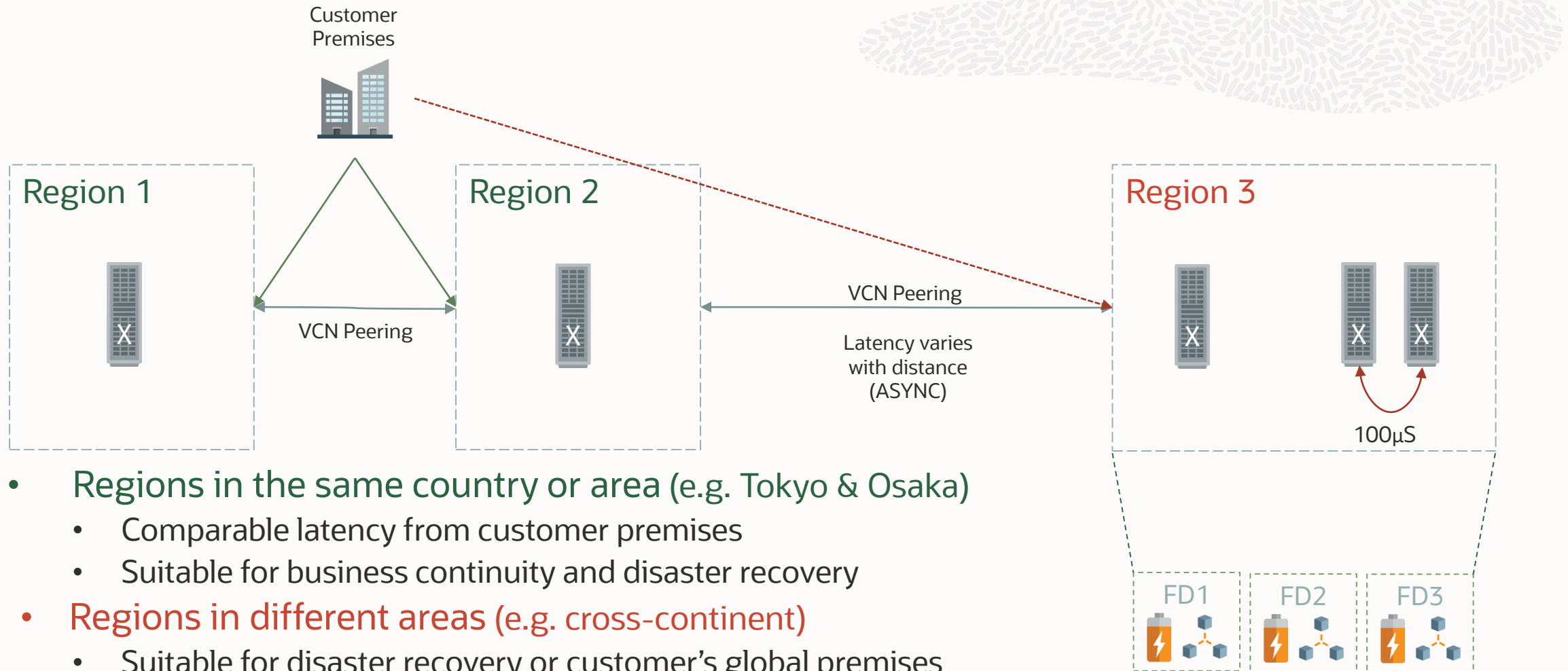


Oracle Cloud Infrastructure Global Footprint

November 2022: 40 Regions, 4 planned; 12 Azure Interconnect Regions



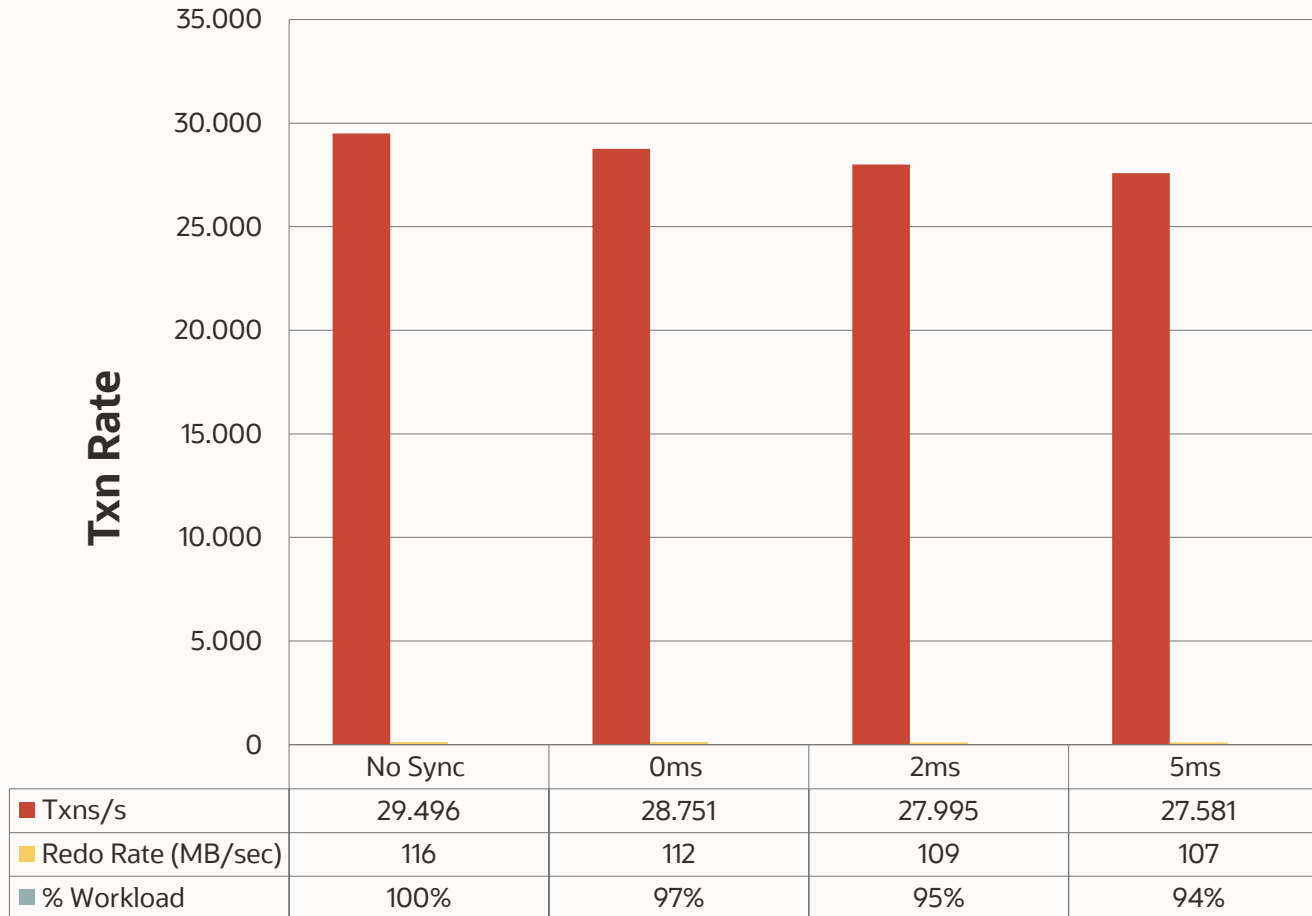
Oracle Cloud Infrastructure topology



- Regions in the same country or area (e.g. Tokyo & Osaka)
 - Comparable latency from customer premises
 - Suitable for business continuity and disaster recovery
- Regions in different areas (e.g. cross-continent)
 - Suitable for disaster recovery or customer's global premises
- Fault Domains
 - Isolated Power & Network

High Performance – Synchronous Redo Transport

Mixed OLTP workload with Metro-Area Network Latency



Note: 0ms latency on graph represents values <1ms

Workload profile

- Swingbench OLTP plus large inserts
- **112 MB/s redo**

3% impact at < 1ms RTT

5% impact at 2ms RTT

6% impact at 5ms RTT

Use **oracptest** to assess your network bandwidth and latency

Network Latency Measurement

➤ oratcptest

➤ Assessing and Tuning Network Performance for Data Guard and RMAN (Doc ID **2064368.1**)

-- on both machines

```
sudo yum install java -y
sudo firewall-cmd --zone=public --add-port=1521/tcp --permanent
sudo firewall-cmd --reload
sudo firewall-cmd --list-all
```

-- server:

```
java -jar oratcptest.jar -server <server_private_ip> -port=1521
```

```
[opc@vmad2 ~]$ java -jar oratcptest.jar -server 10.10.0.6 -port=1521
OraTcpTest server started.
```

-- client:

-- SYNC

```
java -jar oratcptest.jar <server_private_ip> -mode=sync -duration=1200s -interval=20s -length=8k -port=1521 -write
```

-- FastSync

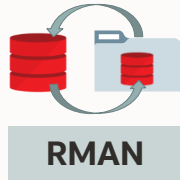
```
java -jar oratcptest.jar <server_private_ip> -mode=sync -duration=1200s -interval=20s -length=8k -port=1521
```

-freq=10m/1h → runs every 10 minutes for 1 hour

```
Throughput      Latency
13.619 Mbytes/s  0.575 ms
15.556 Mbytes/s  0.503 ms
14.358 Mbytes/s  0.545 ms
13.845 Mbytes/s  0.565 ms
14.136 Mbytes/s  0.553 ms
14.524 Mbytes/s  0.539 ms
Test finished.
Socket send buffer = 166400 bytes
Avg. throughput = 14.339 Mbytes/s
Avg. latency = 0.546 ms
```


Database Backup

Underlying Technologies



- Basic DB protection
- Protection from data loss
- Automatic Backup
 - 1-click setup
 - Managed by Oracle
- Backup to Object Storage
 - 3-ways mirrored backup
 - Cost-efficient

Demo

Local site



Backup

Remote site



Replicated backup

Outage Matrix

	PLANNED MAINTENANCE	Zero Mins/Hours
	UPGRADE	Zero Hours
	RECOVERABLE FAILURE	Zero Mins/Hours
	UNRECOVERABLE FAILURE	Last backup Hours

Oracle Database Zero Data Loss Autonomous Recovery Service

Ransomware Resiliency

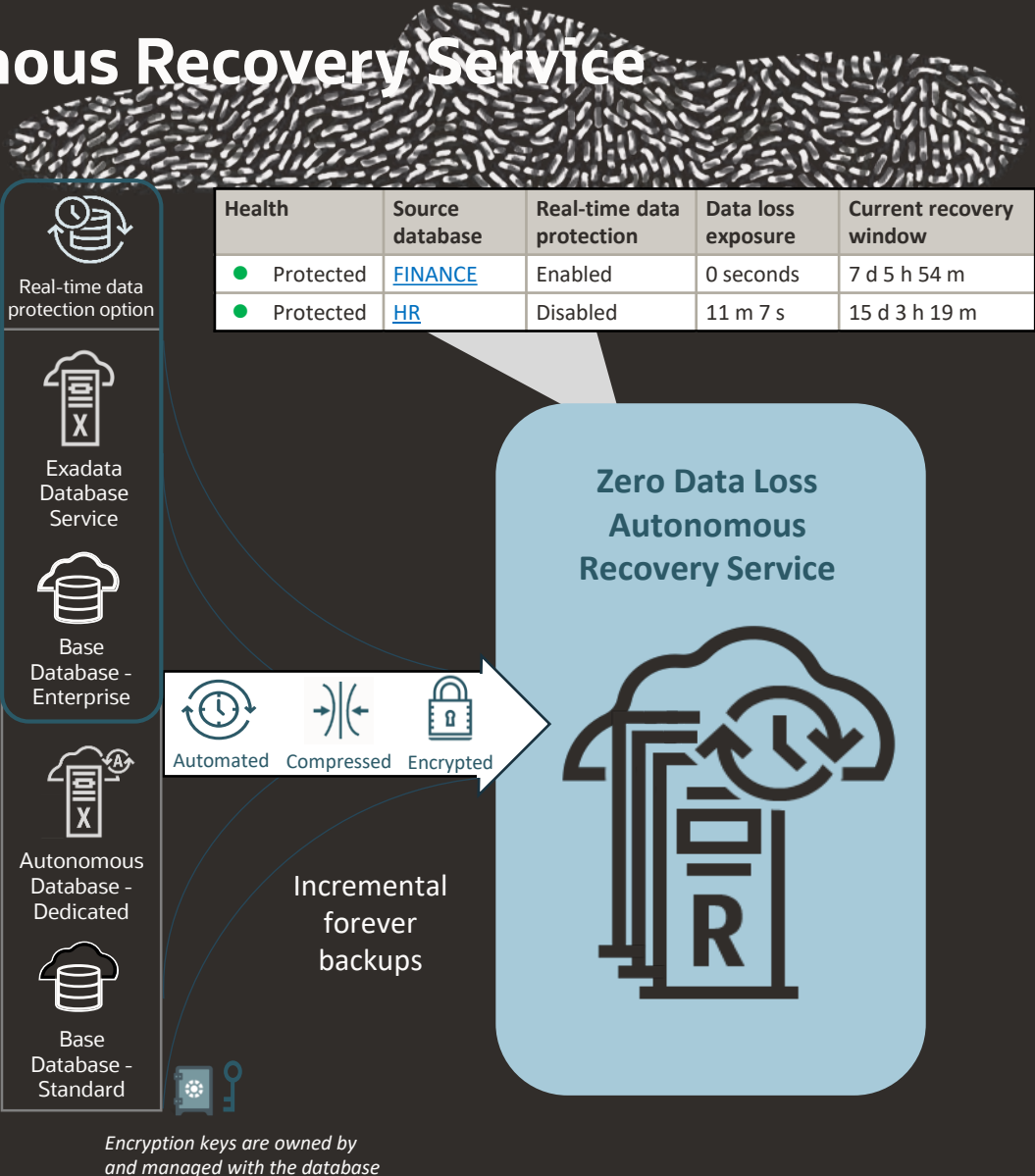
- Automated and mandatory encryption to help prevent data theft
- Safeguards backups with enforced minimum 14-day retention
- Optimizes backups in background for fast recovery with zero data loss

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



Oracle Database Zero Data Loss Autonomous Recovery Service

☒ Enable automatic backups ⓘ

Important: For automatic backups to function, all [prerequisites](#) must be met.

Backup scheduling (UTC) ⓘ

2:00AM - 4:00AM

Backup destination ⓘ

Autonomous Recovery Service

Protection policy in **ZDLRA** ⓘ [\(Change Compartment\)](#)

Bronze (14-days recovery window)

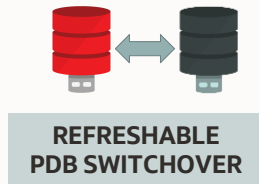
☒ Enable real-time data protection ⓘ

<https://blogs.oracle.com/maa/post/introducing-recovery-service>

<https://www.youtube.com/watch?v=p0-YyVEY140>

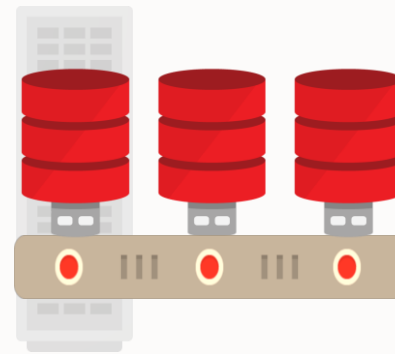
Refreshable PDB Switchover

Underlying Technologies

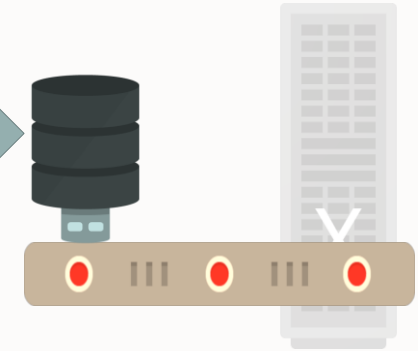


- Site failure protection
- Switchover and failover capability
- PDB relocate to an upgraded database
- Single command line setup
- Available for BaseDB Standard Edition

Local site



Remote site



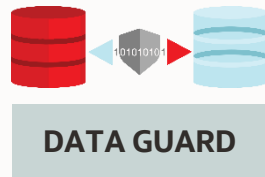
Outage Matrix

	PLANNED MAINTENANCE	Zero Zero*
	UPGRADE	Zero Minutes
	RECOVERABLE FAILURE	Zero Secs*
	UNRECOVERABLE FAILURE	Last refresh Minutes

* Based on Oracle RAC

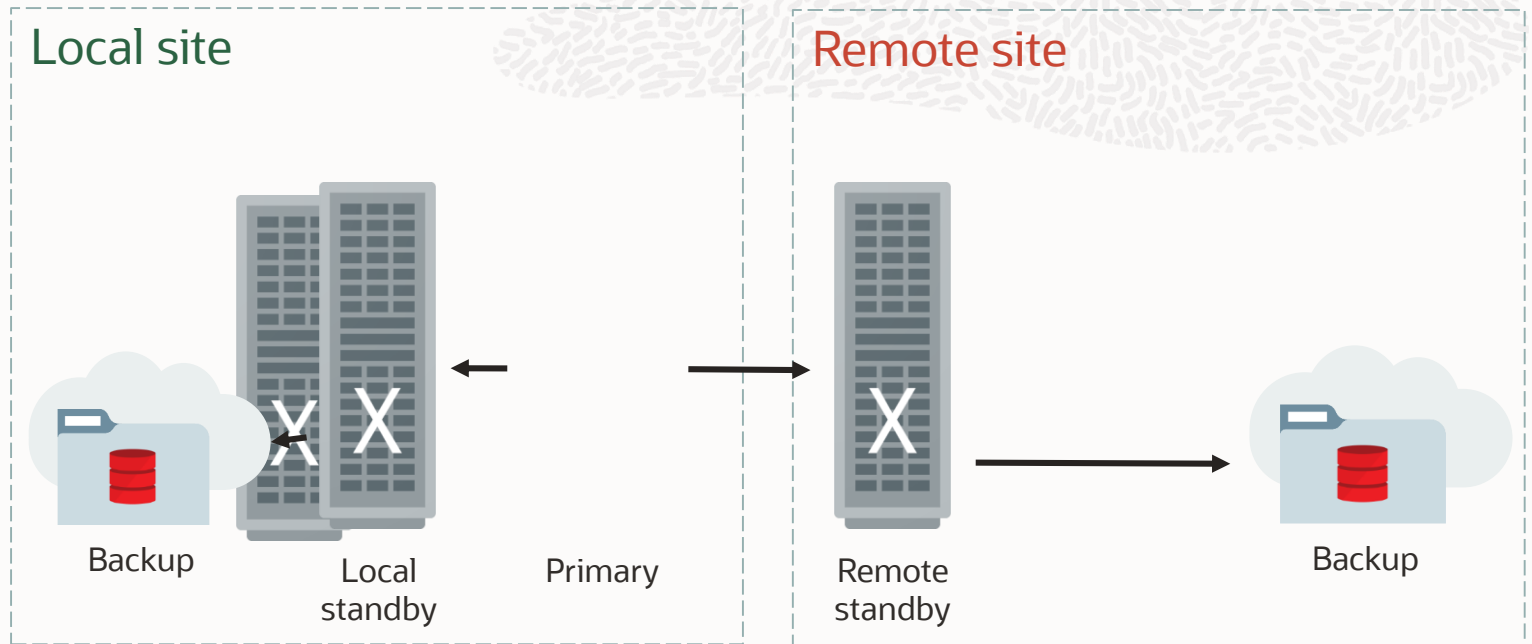
Data Guard

Underlying Technologies



- Site failure protection
- Sync (zero data loss) or Async replication
- Comprehensive corruption prevention
- Fast-Start Failover (FSFO)
 - Automatic Failover
 - Reduce RTO
- 1-clicks setup
 - Across ADs or across Regions
- Offload work to standby with read-mostly scale-out (Requires Active DG)

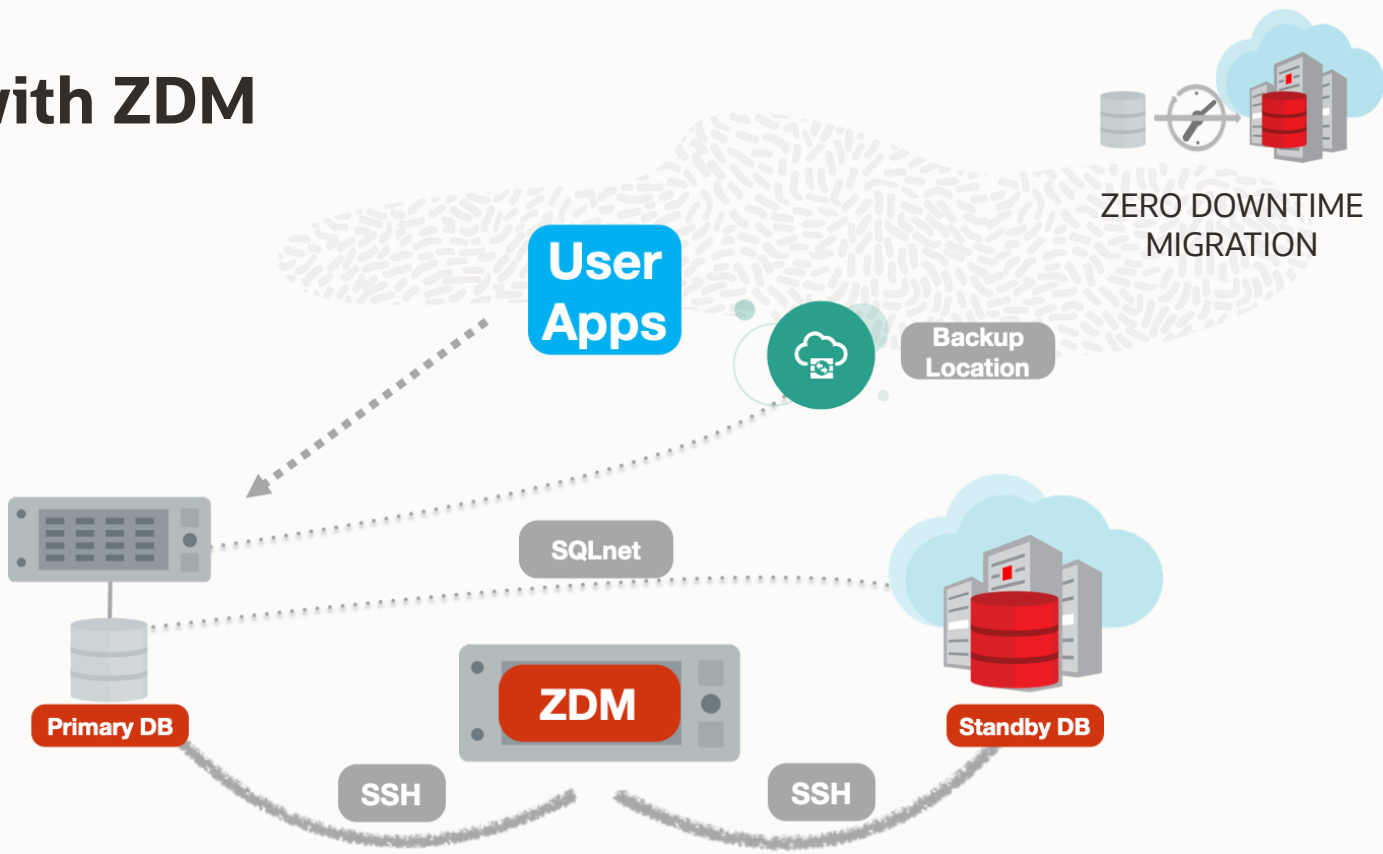
Demo




Outage Matrix		
	PLANNED MAINTENANCE	Zero Zero
	UPGRADE	Zero Secs
	RECOVERABLE FAILURE	Zero Secs
	UNRECOVERABLE FAILURE	Zero Secs


Hybrid Cloud: automatic setup with ZDM

ZDM PHASES	
1	Download & Configure ZDM
2	ZDM Starts Database Migration
3	ZDM Connects the Source to the Object Store
4	ZDM Orchestrates Transfer of Backup Files
5	ZDM Instantiates a Standby DB
6	ZDM Synchronizes Primary & Standby
7	ZDM Switches Over & Swaps Roles
8	ZDM Finalizes the Migration Process







Simple



Leverages
Oracle MAA
best practices



Zero data loss



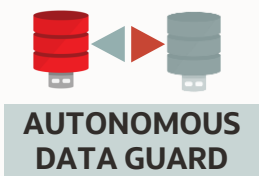
Free

<https://oracle.com/goto/zdm>



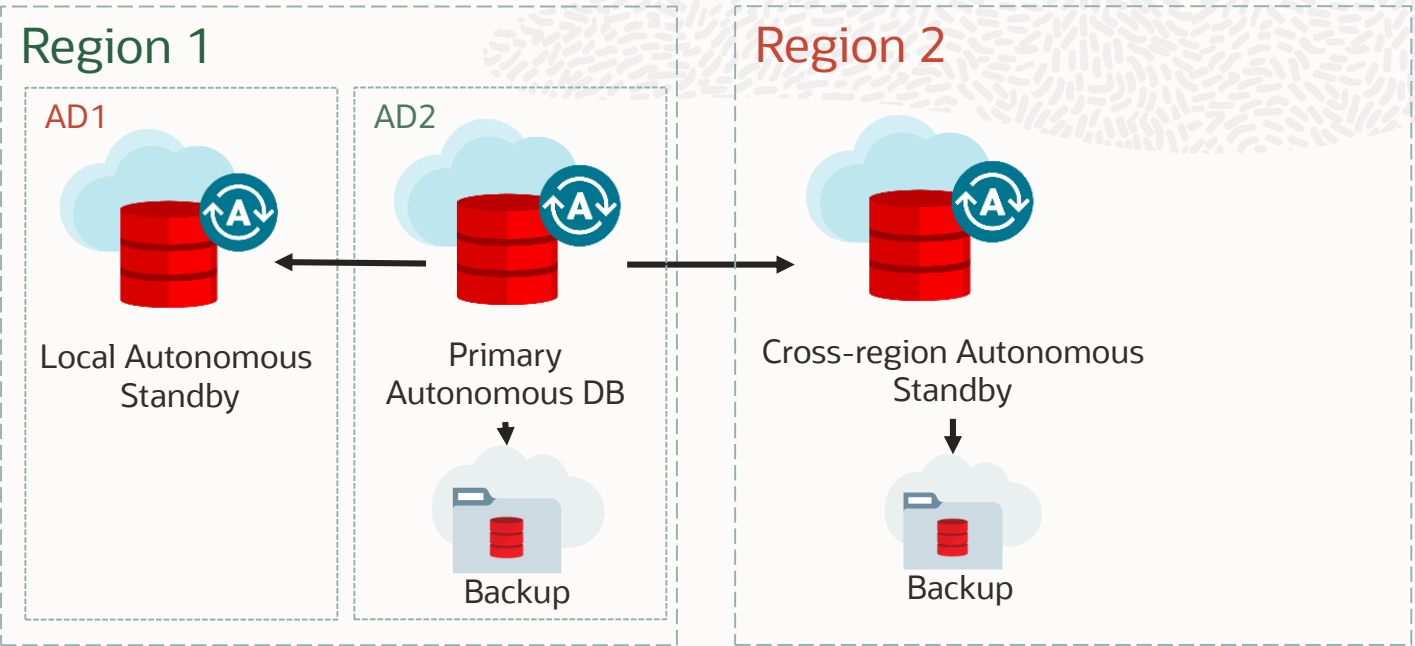
Autonomous Data Guard | **Shared** Exadata Infrastructure

Underlying Technologies



- Max 2 Standbys: 1 local and 1 cross-region
- 1-click setup
- Async configuration
- Switchover and failover available through Cloud Tooling
- Connection string does not change
- No access to standby database
- Additional read-only clones can be created and refreshed manually

Demo



Outage Matrix

	PLANNED MAINTENANCE	Zero Zero
	UPGRADE	Zero Minutes
	RECOVERABLE FAILURE	Zero Secs
	UNRECOVERABLE FAILURE	Last refresh Minutes

**99.995%
SLA**



Autonomous Data Guard | **Shared** Exadata Infrastructure

Autonomous Data Guard Recovery Time Objective (RTO) and Recovery Point Objective (RPO)

When Autonomous Data Guard is enabled with a local standby database, the RTO and RPO numbers are as follows:

- **Automatic Failover or Switchover:** the RTO is two (2) minutes and RPO is zero (0).
- **Manual Failover:** the RTO is two (2) minutes and RPO is up to one (1) minute.

When Autonomous Data Guard is enabled with a cross-region standby database, the RTO and RPO numbers for failover to the cross-region standby are as follows:

- **Switchover:** the RTO is fifteen (15) minutes and RPO is zero (0).
- **Automatic Failover:** Not available
- **Manual Failover:** the RTO is fifteen (15) minutes and RPO is up to one (1) minute.

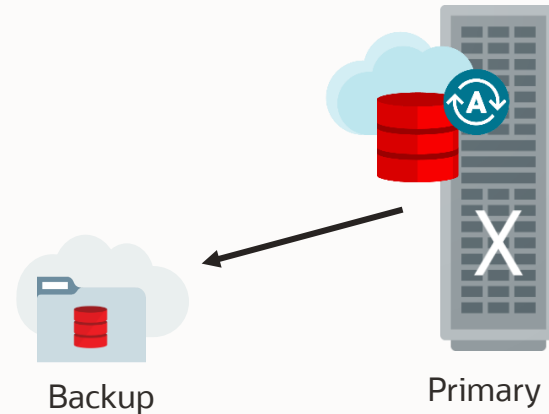
Autonomous Data Guard | **Dedicated** Exadata Infrastructure

Underlying Technologies

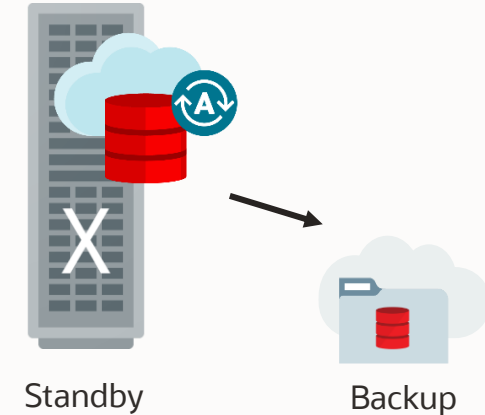


- 1 Standby: local or remote
- 1-click setup
- Sync or Async configuration
- Automatic failover via FSFO
- Possible between same type
 - ADB-D to ADB-D
 - ADB-ExaCC to ADB-ExaCC
- Switchover and failover available through Cloud Tooling
- Connection string is aware of Autonomous Data Guard
- Standby database is open read-only
- Standby role services available

Region 1



Region 2



Gold Outage Matrix

	PLANNED MAINTENANCE	Zero Zero
	UPGRADE	Zero Minutes
	RECOVERABLE FAILURE	Zero Secs
	UNRECOVERABLE FAILURE	Zero Secs

**99.995%
SLA**

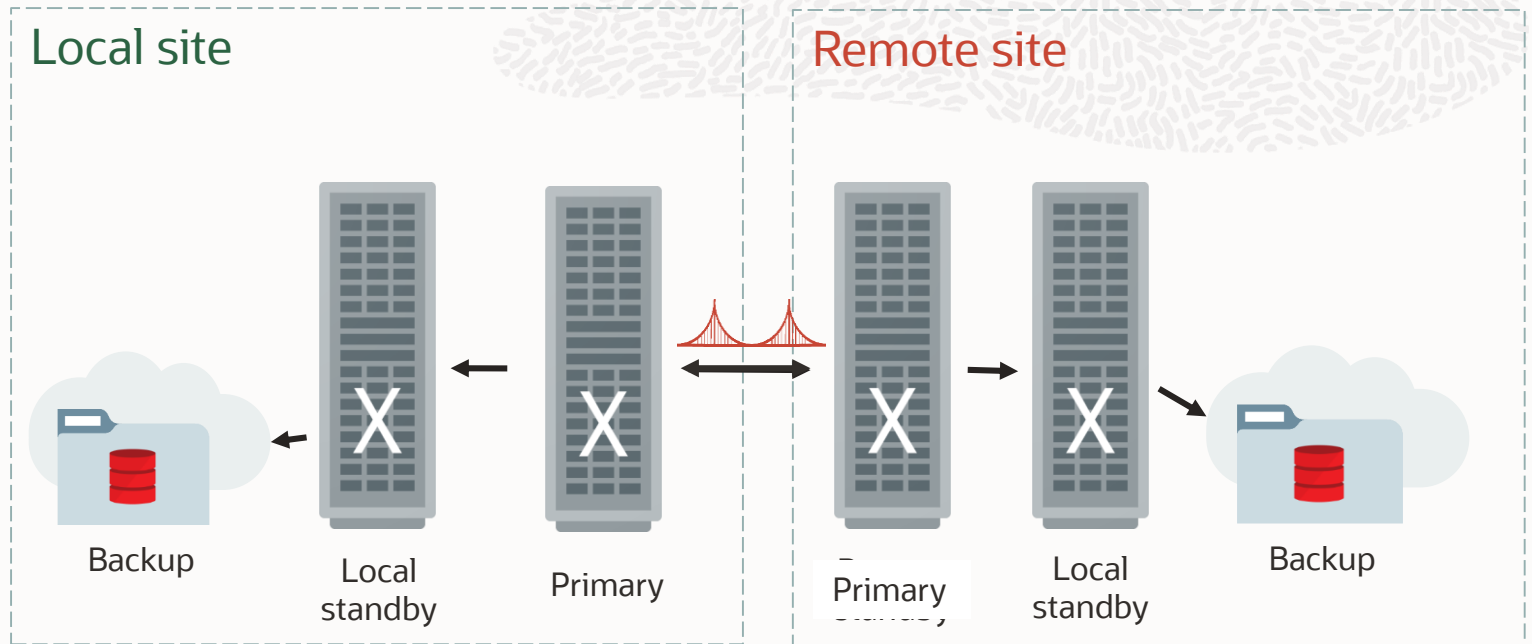
Oracle GoldenGate

Underlying Technologies



GOLDENGATE

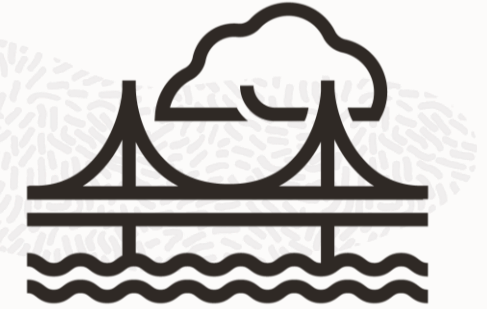
- Active/Active
- Always online
- Online database upgrades
- Site switch with zero database downtime
- Read-write scale-out
- The application must be aware of the replica(s)



Outage Matrix		
	PLANNED MAINTENANCE	Zero Zero
	UPGRADE	Zero Zero
	RECOVERABLE FAILURE	Zero Zero
	UNRECOVERABLE FAILURE	Zero Zero

Oracle Cloud Infrastructure GoldenGate

Market-leading real-time data solution is also available as a fully managed service



Industry Leader for Real-Time Data Events

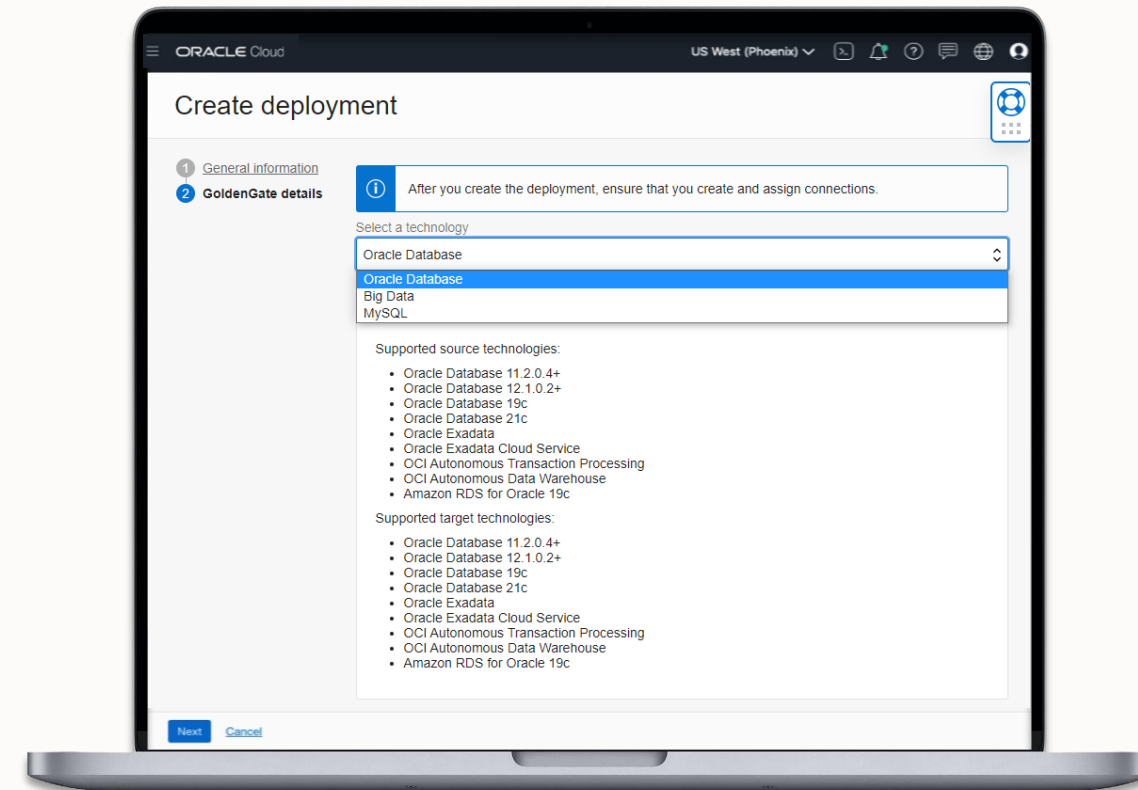
- Powered by the latest GoldenGate 21c microservices architecture

Cloud Native

- Fully managed by Oracle: upgrades, patching, etc.
- Auto-scale: true cloud elasticity, low operations cost
- Connect to the most popular Oracle, MySQL, MariaDB, and Big Data technologies

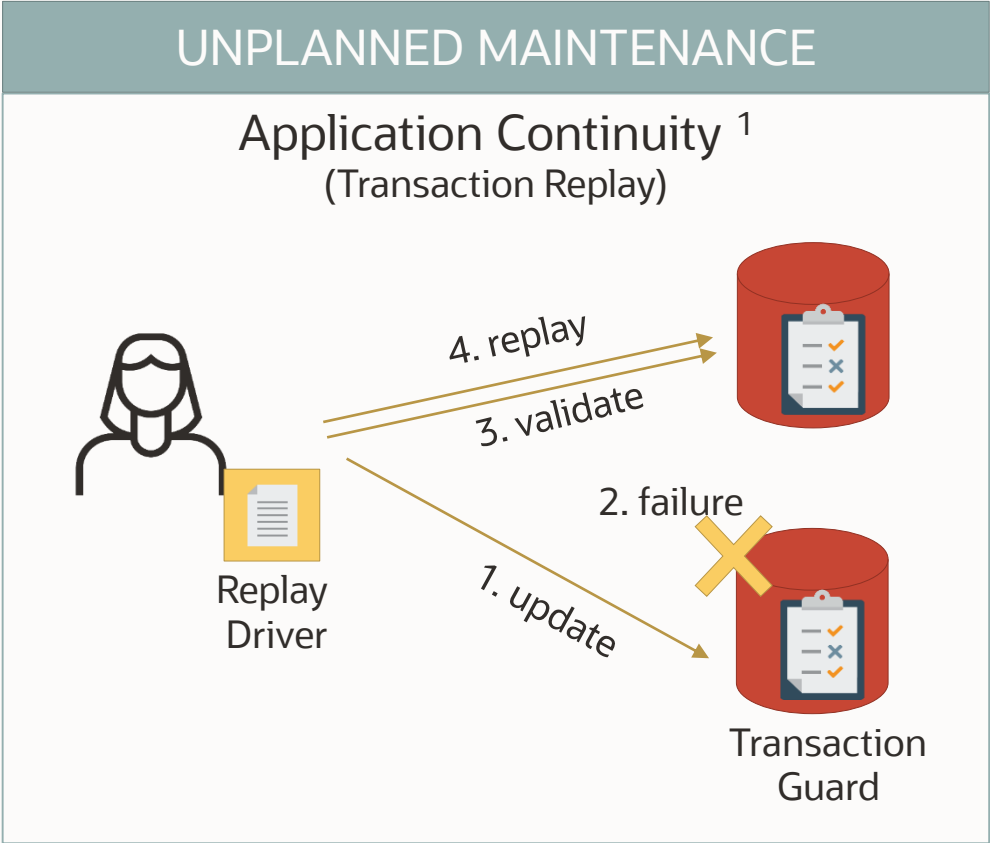
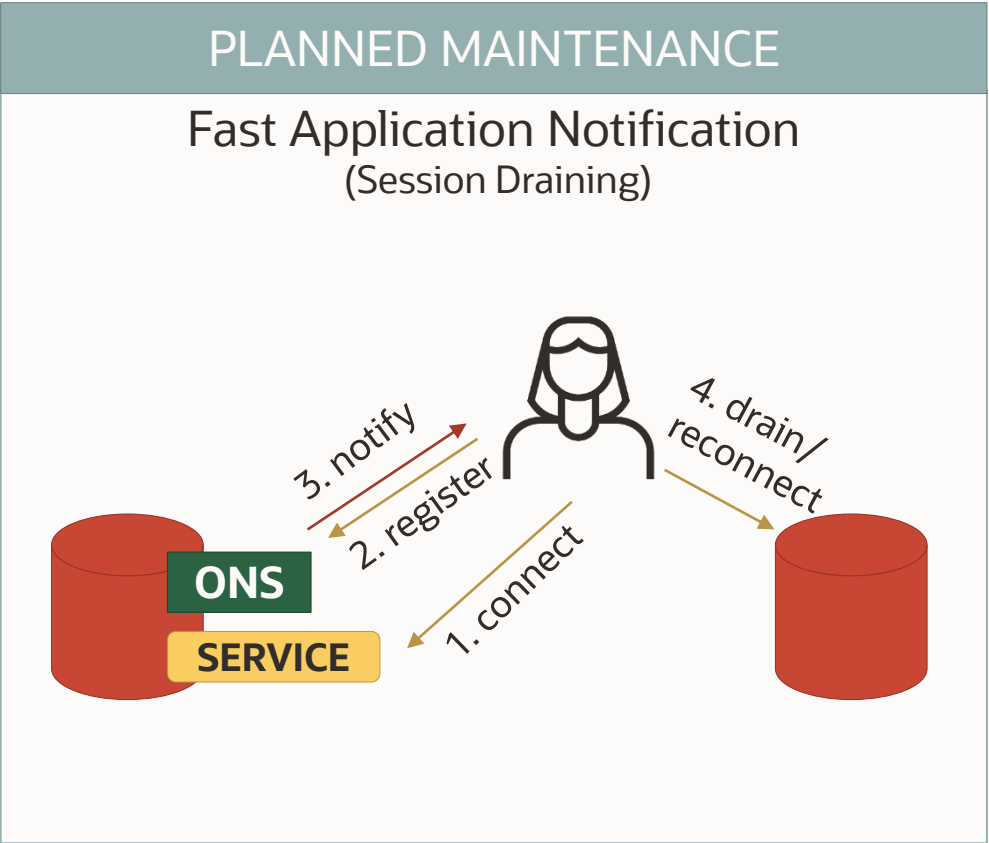
Differentiated Use Cases

- Active-active, real-time data warehouse, data lake, data lakehouse, data mesh and more...
- Capture or deliver data with Autonomous DBs
- Sources and targets may be running in Oracle Cloud, on-premises, and 3rd party Cloud



Client-side required technologies

Client draining/failover is a crucial part of high availability for applications connecting to the database.



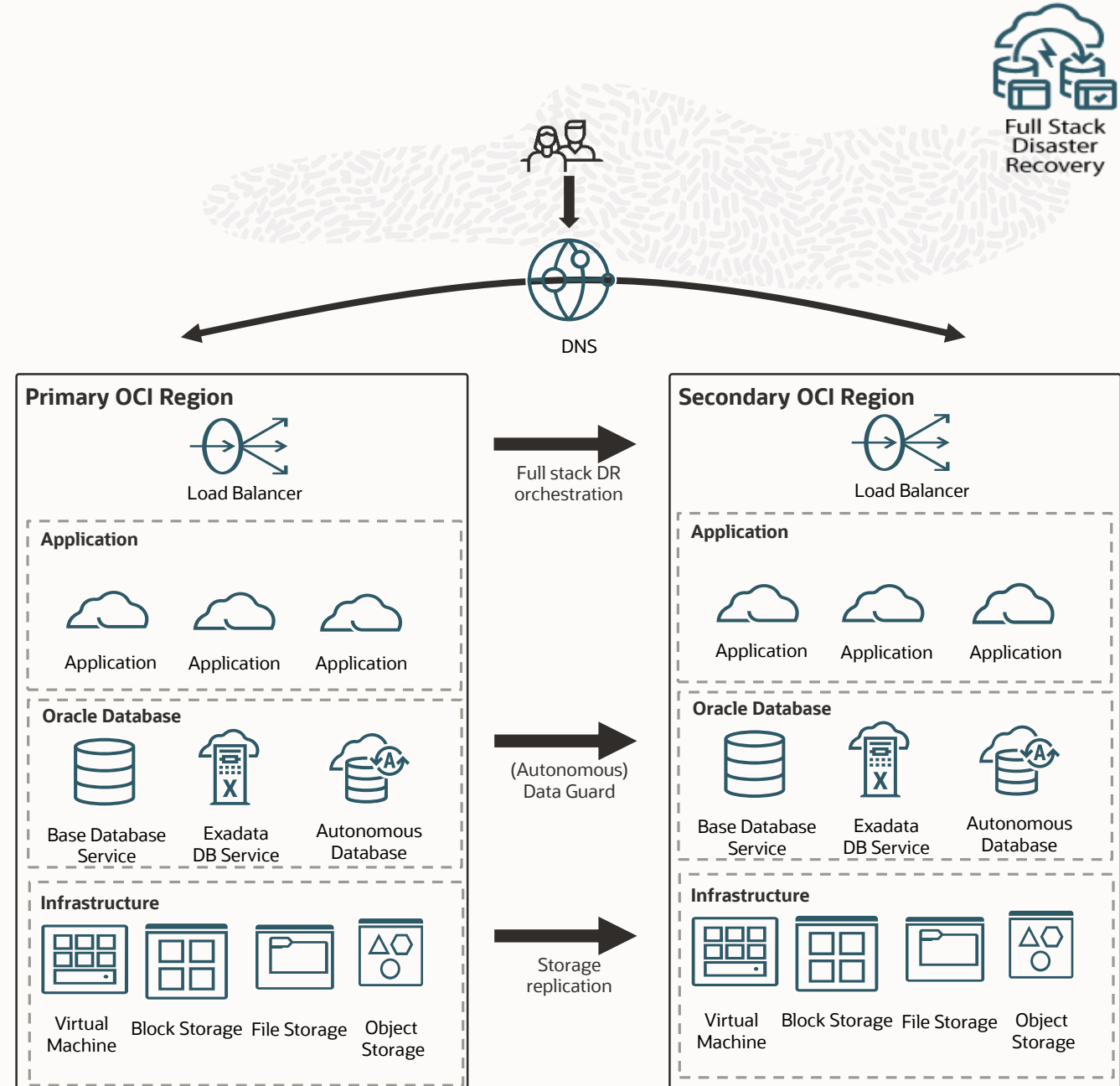
¹ Application Checklist for Continuous Service for MAA Solutions
<https://www.oracle.com/a/tech/docs/application-checklist-for-continuous-availability-for-maa.pdf>



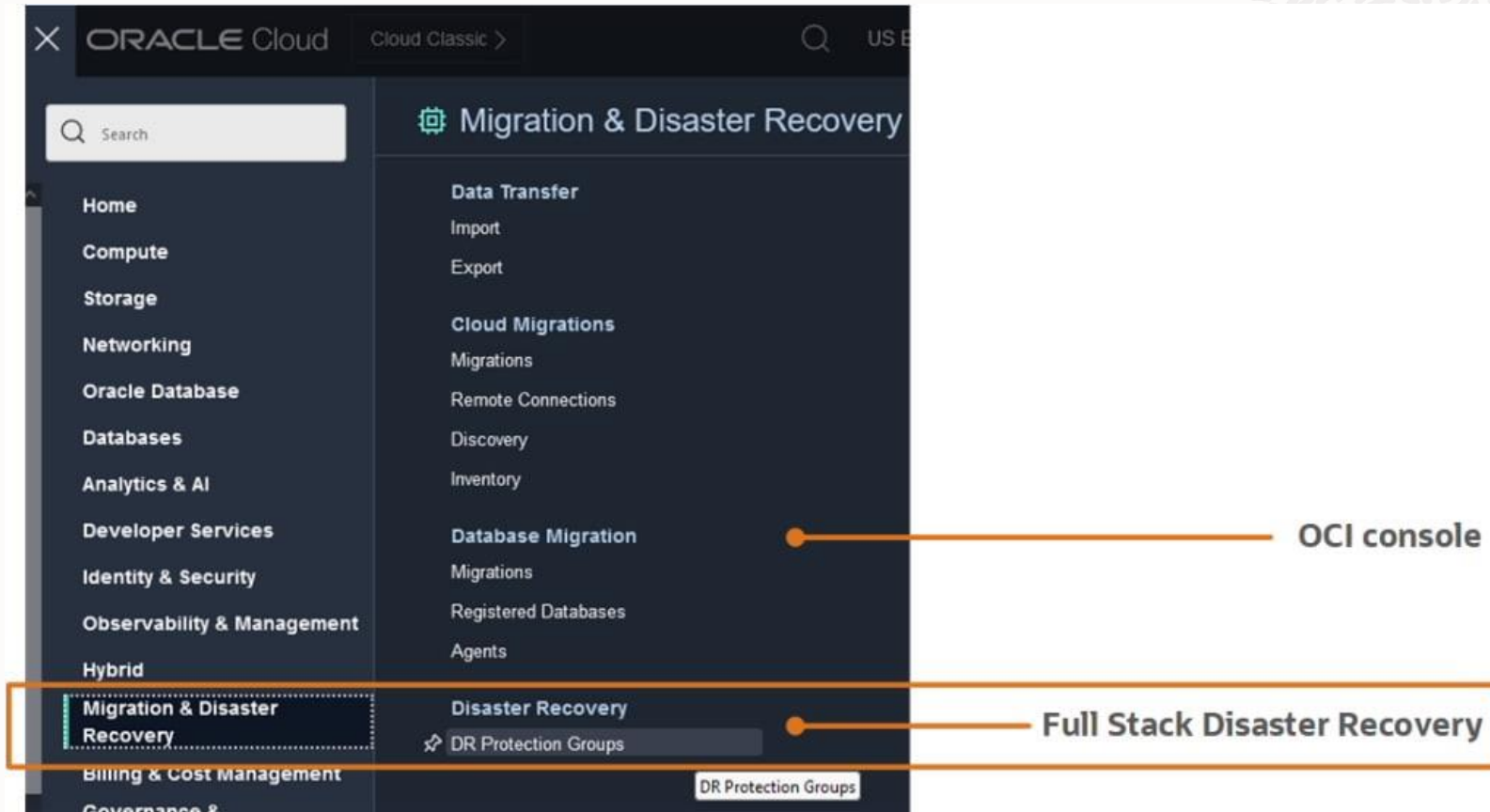
OCI Full Stack Disaster Recovery

Fully-managed disaster recovery (DR) service providing

- **DR for the entire application stack**
 - Orchestrated single-click DR for infrastructure, applications & databases
- **Automated DR plan creation**
 - Reduced time and effort to create and manage DR plans
- **Unified management**
 - Validated and monitored execution of DR plans through an integrated UI / API

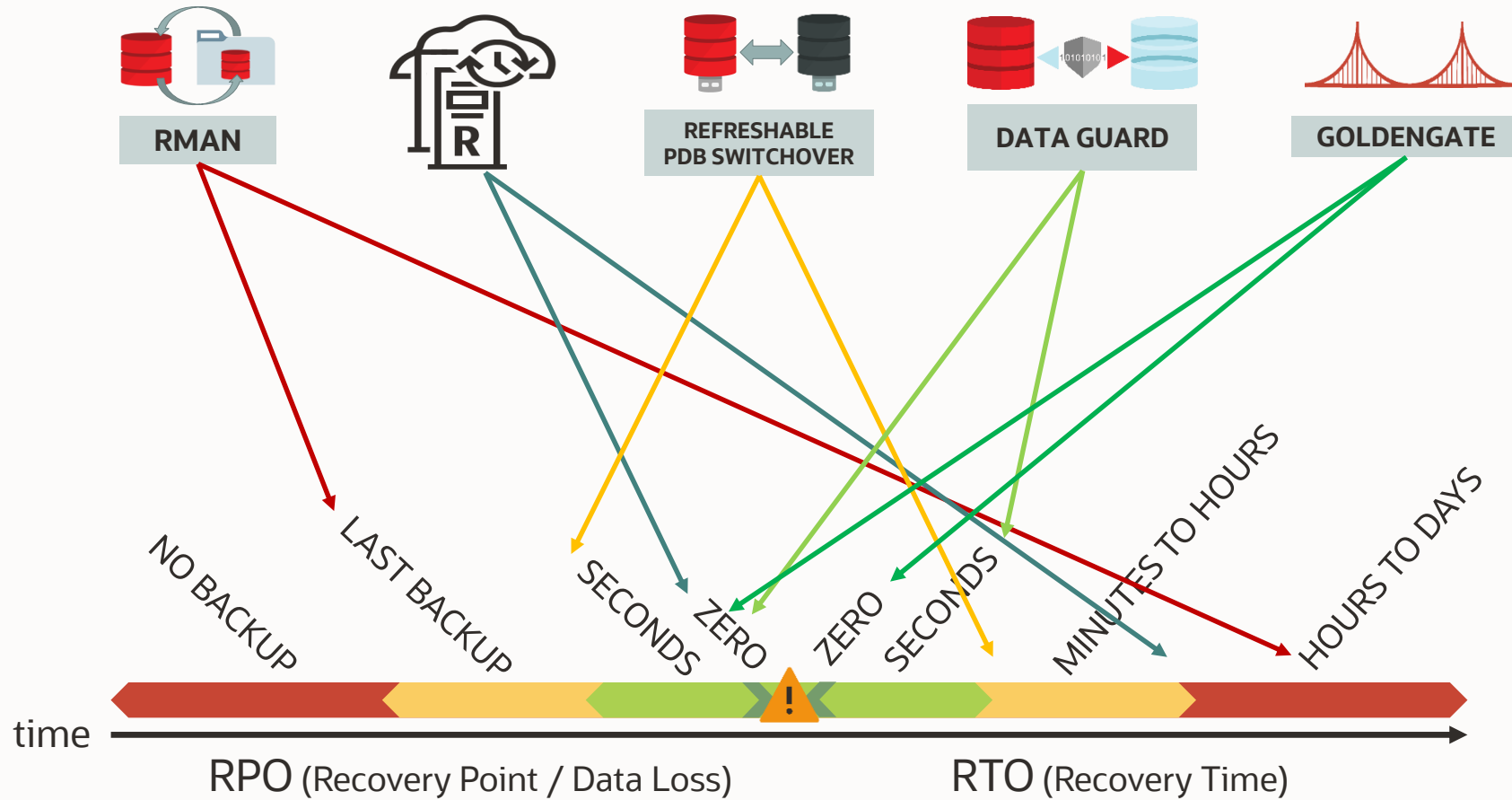


OCI Full Stack Disaster Recovery



Blog Post: <https://blogs.oracle.com/cloud-infrastructure/post/fsdr-launch>
Demo:

Summary



Additional Information: read more



MAA Best Practices for the Oracle Cloud

<https://www.oracle.com/database/technologies/high-availability/oracle-cloud-maa.html>

MAA Best Practices - Oracle Database

<https://www.oracle.com/database/technologies/high-availability/oracle-database-maa-best-practices.html>

MAA Best Practices - Exadata Database Machine

<https://www.oracle.com/database/technologies/high-availability/exadata-maa-best-practices.html>

Best Practices for Corruption Detection, Prevention, and Automatic Repair - in a Data Guard Configuration (Doc ID 1302539.1)

<https://support.oracle.com/epmos/faces/DocumentDisplay?id=1302539.1>

Continuous Availability Best Practices for Applications Using Autonomous Database - Dedicated

<https://www.oracle.com/technetwork/database/options/clustering/applicationcontinuity/continuous-service-for-apps-on-atpd-5486113.pdf>



Thank you



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ORACLE

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data in new ways, discover insights,
unlock endless possibilities.

