ORACLE

Backup and Disaster Recovery Solutions on Oracle Cloud Infrastructure

Speakers

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Oracle

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Oracle Database, Data Security, and HA
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Guest

Neb Maciver

Magician and Mindreader

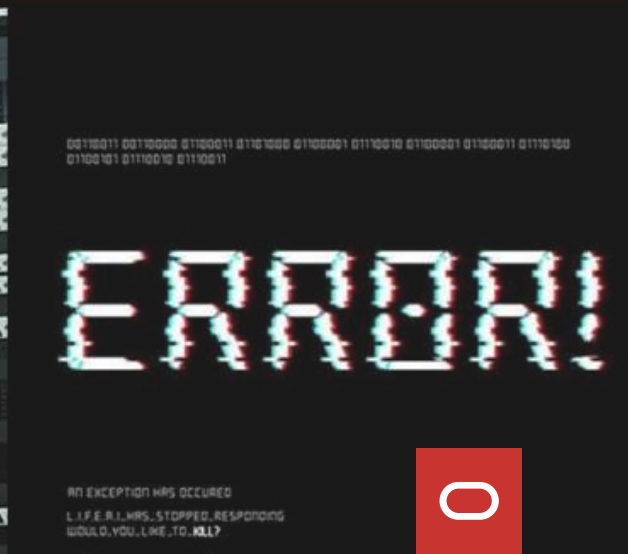
Safe harbor statement

The following is intended to outline our general product direction. It is intended for information purposes only, and may not be incorporated into any contract. It is not a commitment to deliver any material, code, or functionality, and should not be relied upon in making purchasing decisions. The development, release, timing, and pricing of any features or functionality described for Oracle's products may change and remains at the sole discretion of Oracle Corporation.

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

Is this a disaster?

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)

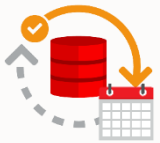
Top 3 data loss causes: technology malfunction, human error, and cybersecurity events.

(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



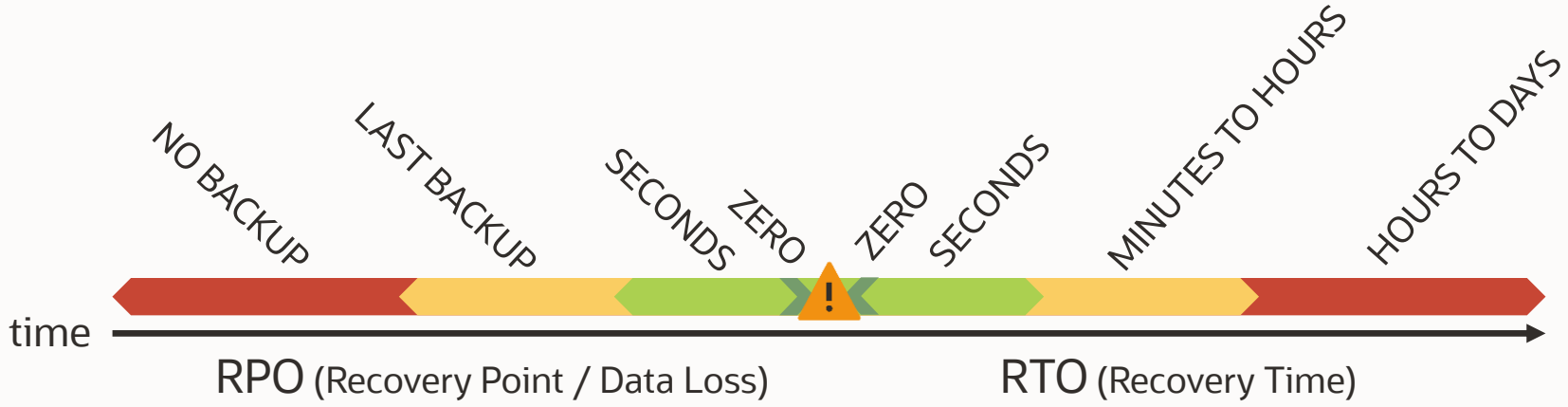
PLANNED MAINTENANCE

UPGRADE

RECOVERABLE LOCAL FAILURE

UNRECOVERABLE OR SITE FAILURE

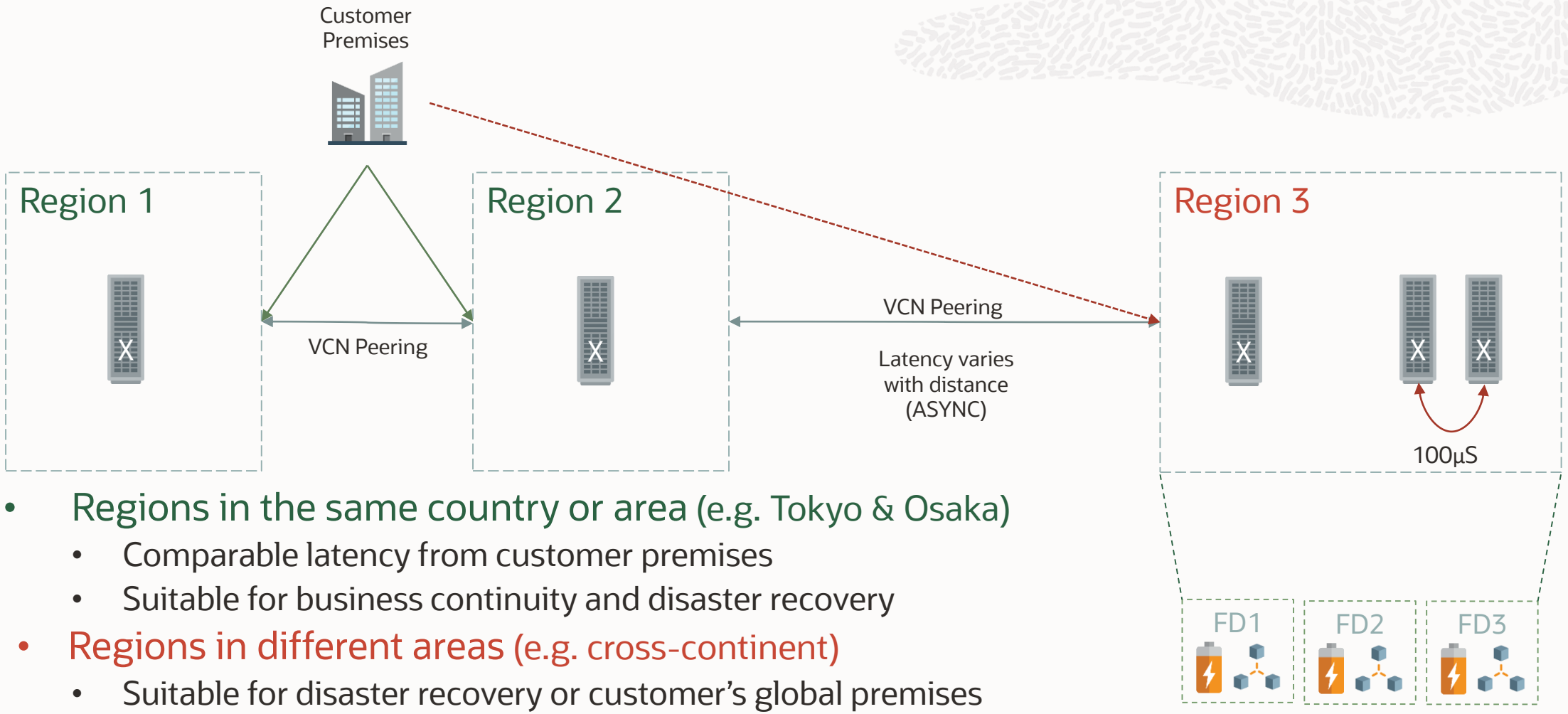
Recovery objectives



Oracle Cloud Infrastructure Global Footprint

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

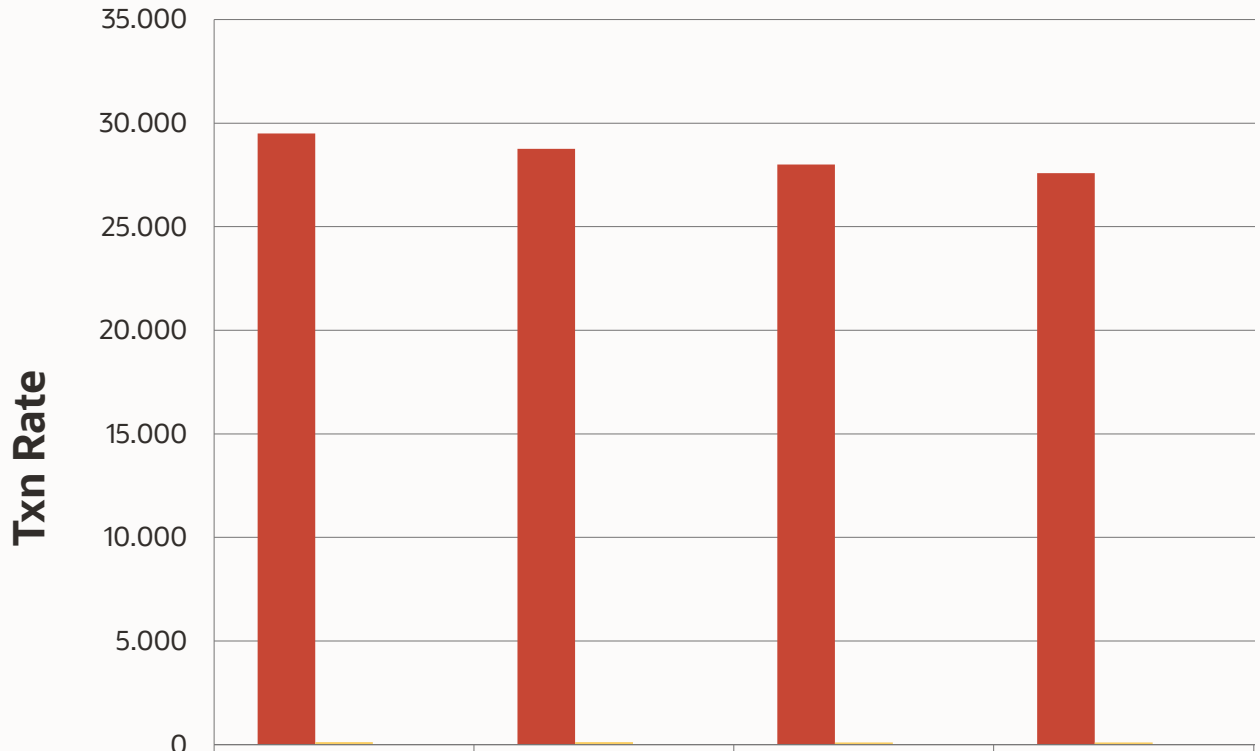
Oracle Cloud Infrastructure topology



- 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



	No Sync	0ms	2ms	5ms
Txns/s	29.496	28.751	27.995	27.581
Redo Rate (MB/sec)	116	112	109	107
% Workload	100%	97%	95%	94%

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 **`oratcptest`** 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
```

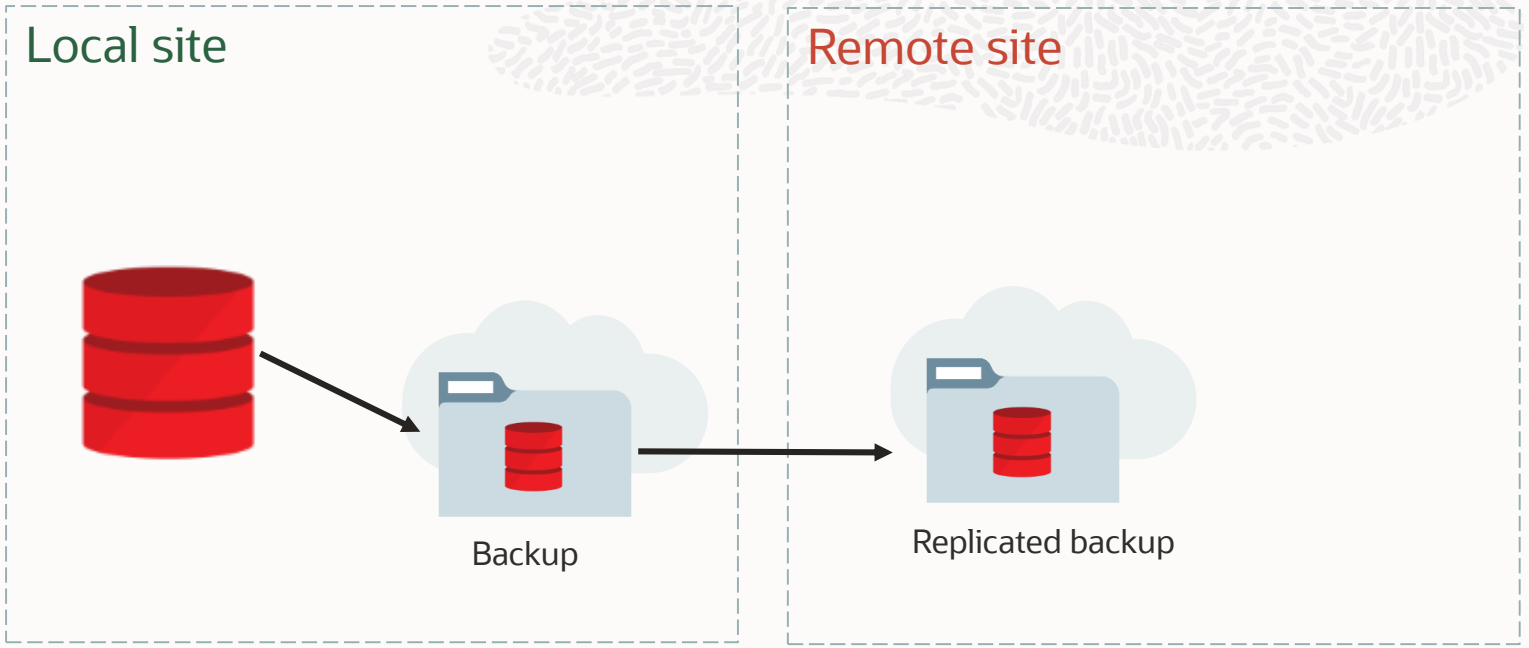
Database Backup

Underlying Technologies

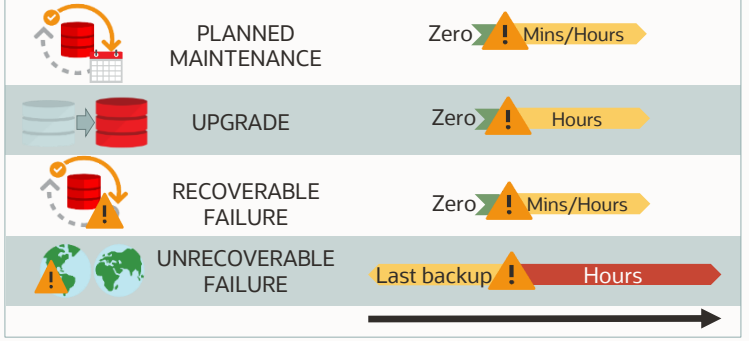
RMAN

- 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



Outage Matrix



Oracle Database Zero Data Loss Autonomous Recovery Service

Ransomware Resiliency

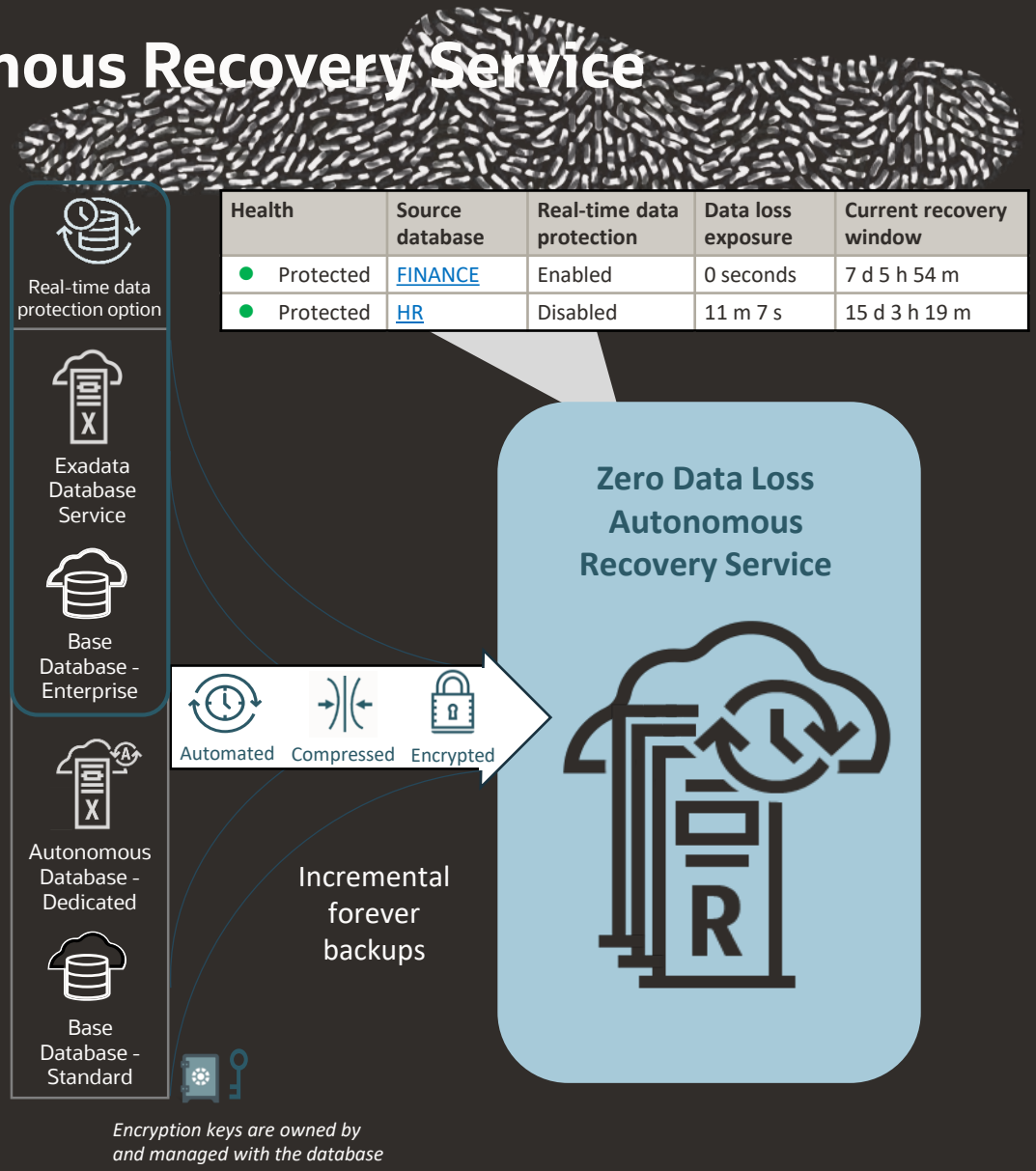
- Automated and mandatory encryption to help prevent data theft
- Safeguards backups with enforced minimum 14-day retention
- Optimizes backups in background for fast recovery with zero data loss

Operational Efficiency

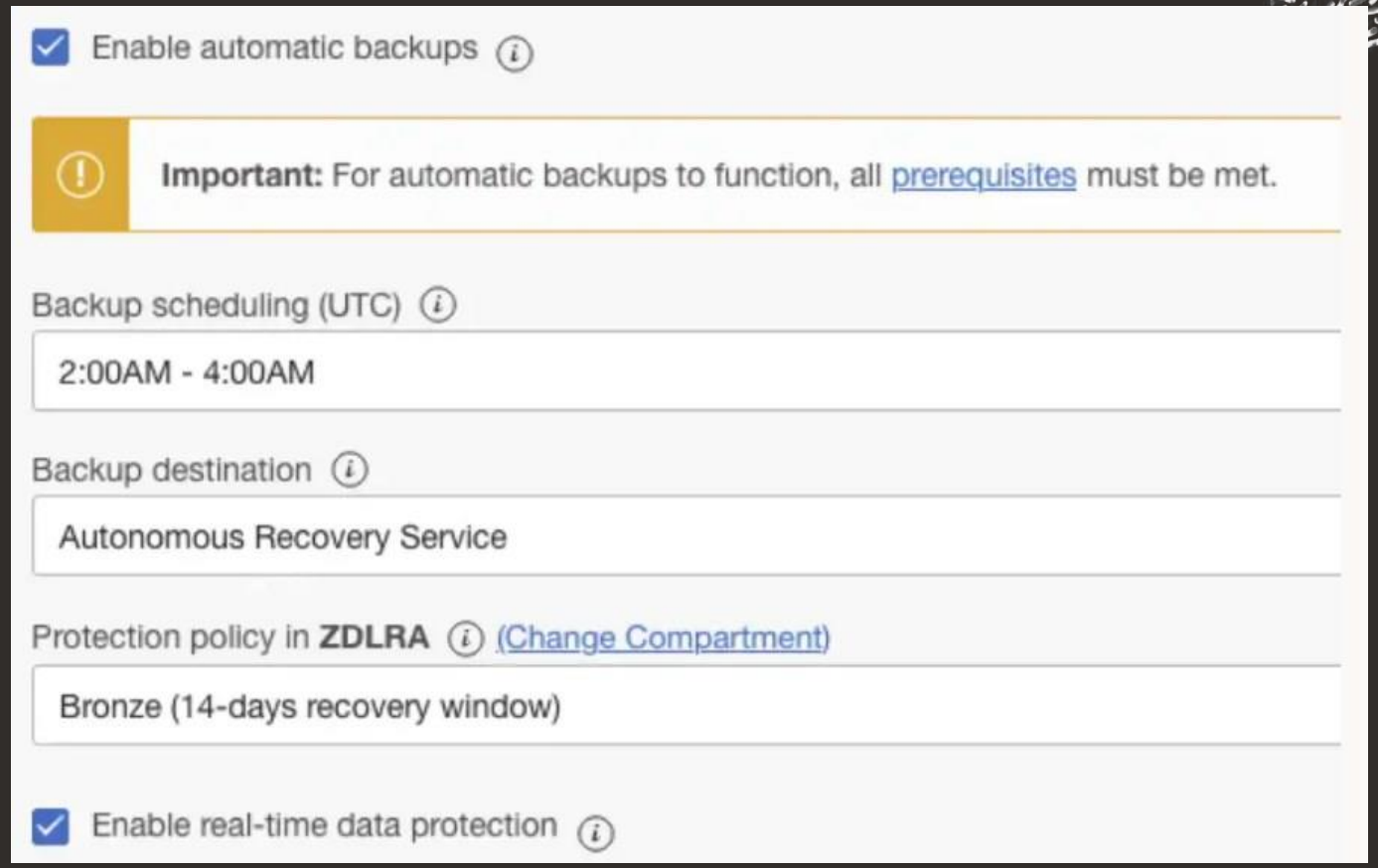
- No more weekly full backups - eliminates production database overhead
- Shorter backup windows with incremental forever strategy
- Zero-impact database recovery validation for every backup

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



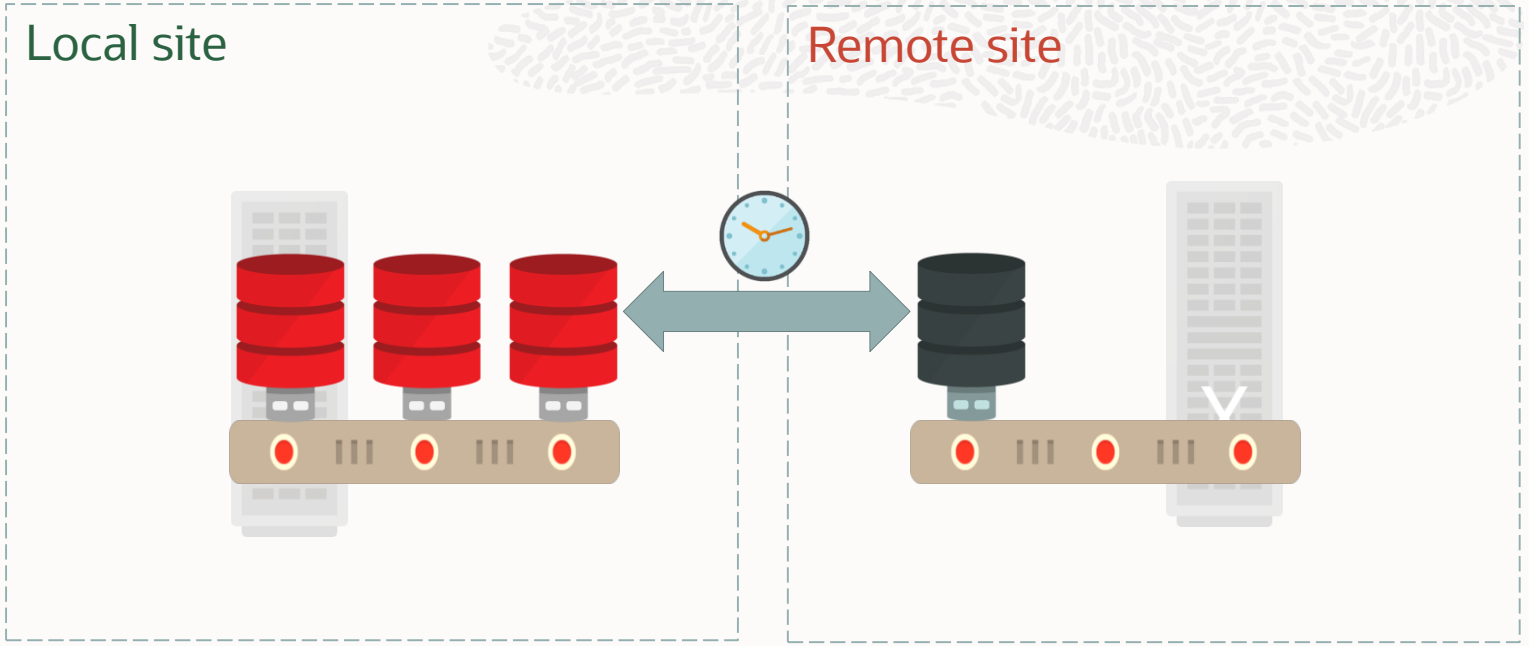
https://blogs.oracle.com/maa/post/introducing-recovery-service
https://www.youtube.com/watch?v=p0-YyVEY140

Refreshable PDB Switchover

Underlying Technologies

REFRESHABLE PDB SWITCHOVER

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



Outage Matrix

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

* Based on Oracle RAC

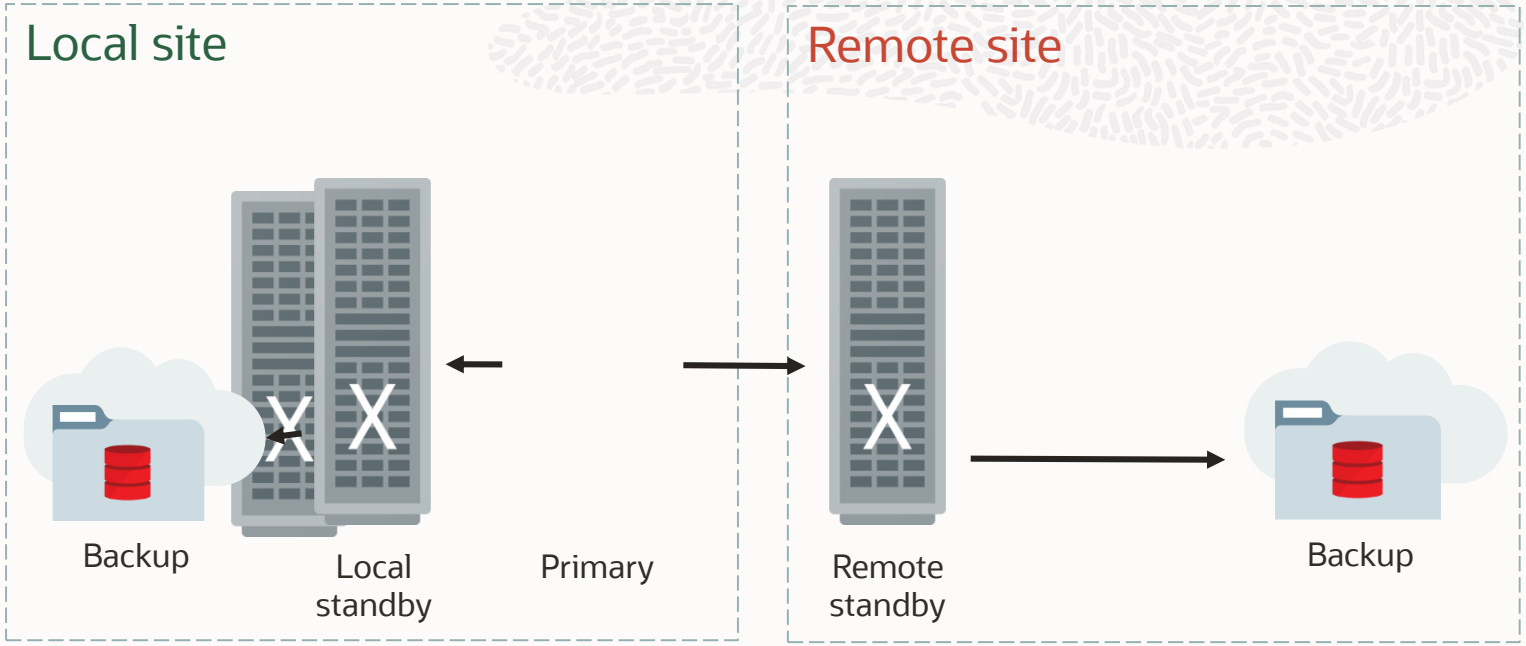
Data Guard

Underlying Technologies

DATA GUARD

- 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



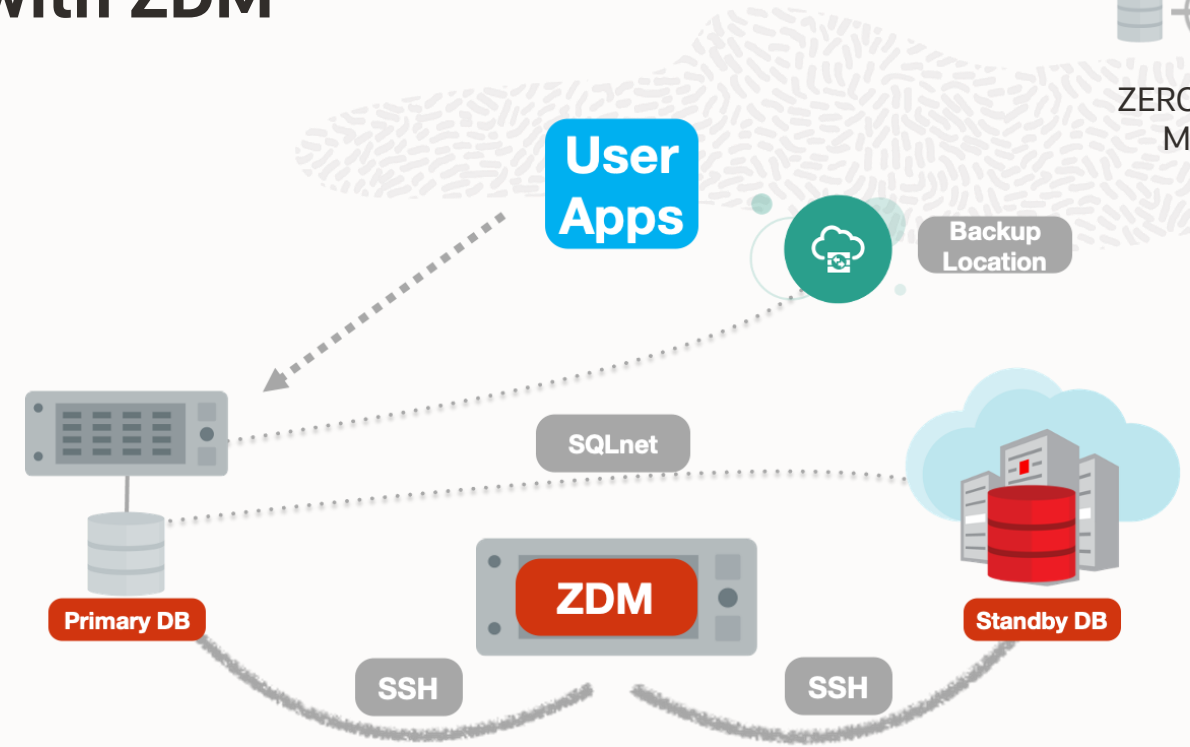
Outage Matrix

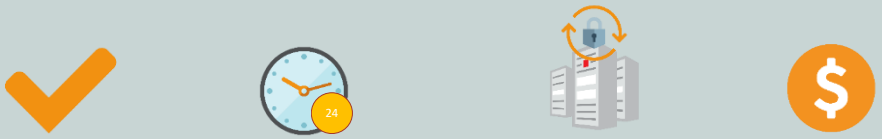
PLANNED MAINTENANCE	Zero ! Zero
UPGRADE	Zero ! Secs
RECOVERABLE FAILURE	Zero ! Secs
UNRECOVERABLE FAILURE	Zero ! Secs

Hybrid Cloud: automatic setup with ZDM

ZERO DOWNTIME MIGRATION

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



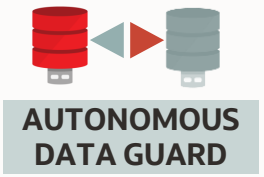


Simple | Leverages Oracle MAA best practices | Zero data loss | Free

https://oracle.com/goto/zdm

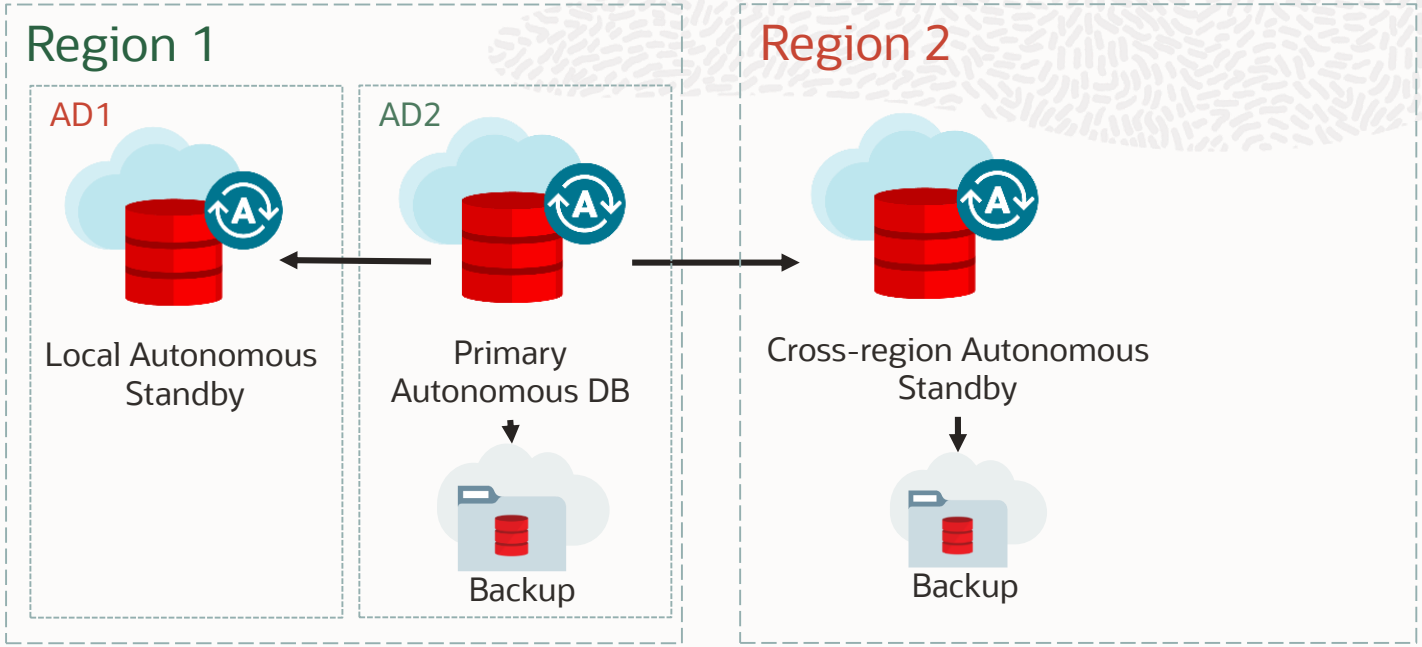
Autonomous Data Guard | Shared Exadata Infrastructure

Underlying Technologies

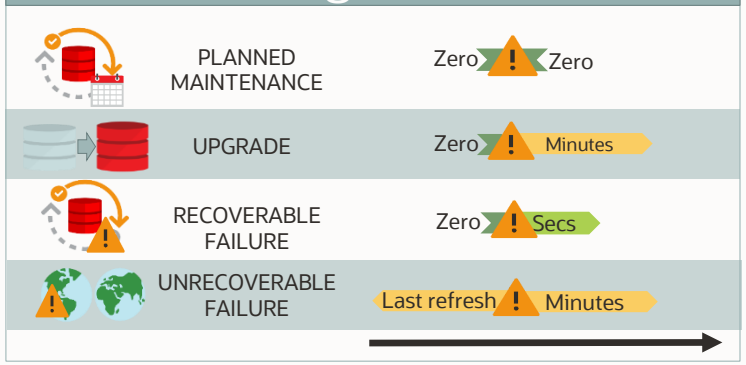


- Max 2 Standbys: 1 local and 1 cross-region
- 1-click setup
- Async configuration
- Switchover and failover available through Cloud Tooling
- Connection string does not change
- No access to standby database
- Additional read-only clones can be created and refreshed manually

Demo



Outage Matrix



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:

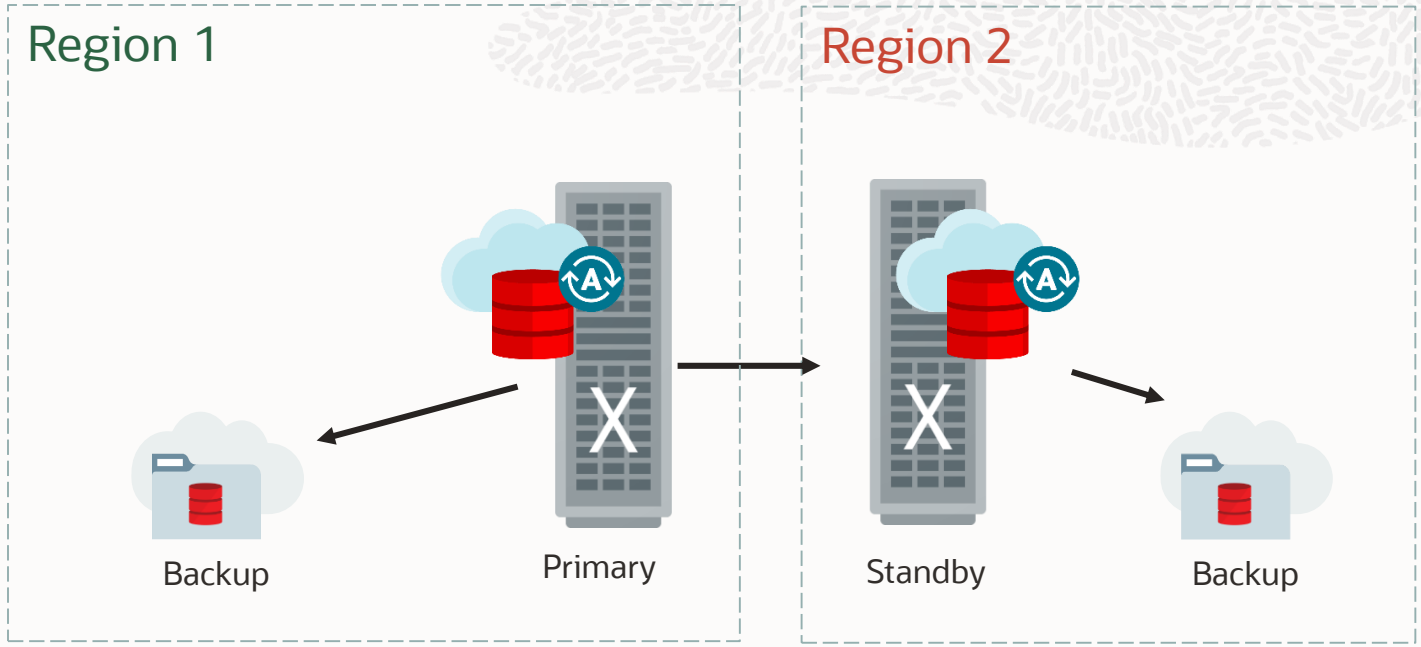
- **Switchover**: the RTO is fifteen (15) minutes and RPO is zero (0).
- **Automatic Failover**: Not available
- **Manual Failover**: the RTO is fifteen (15) minutes and RPO is up to one (1) minute.

Autonomous Data Guard | Dedicated Exadata Infrastructure

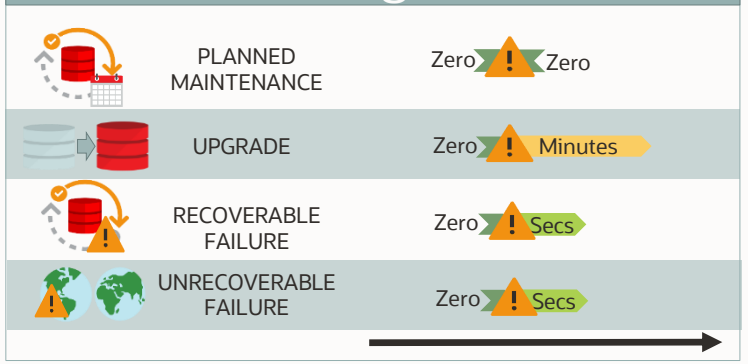
Underlying Technologies

AUTONOMOUS DATA GUARD

- 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



Gold Outage Matrix



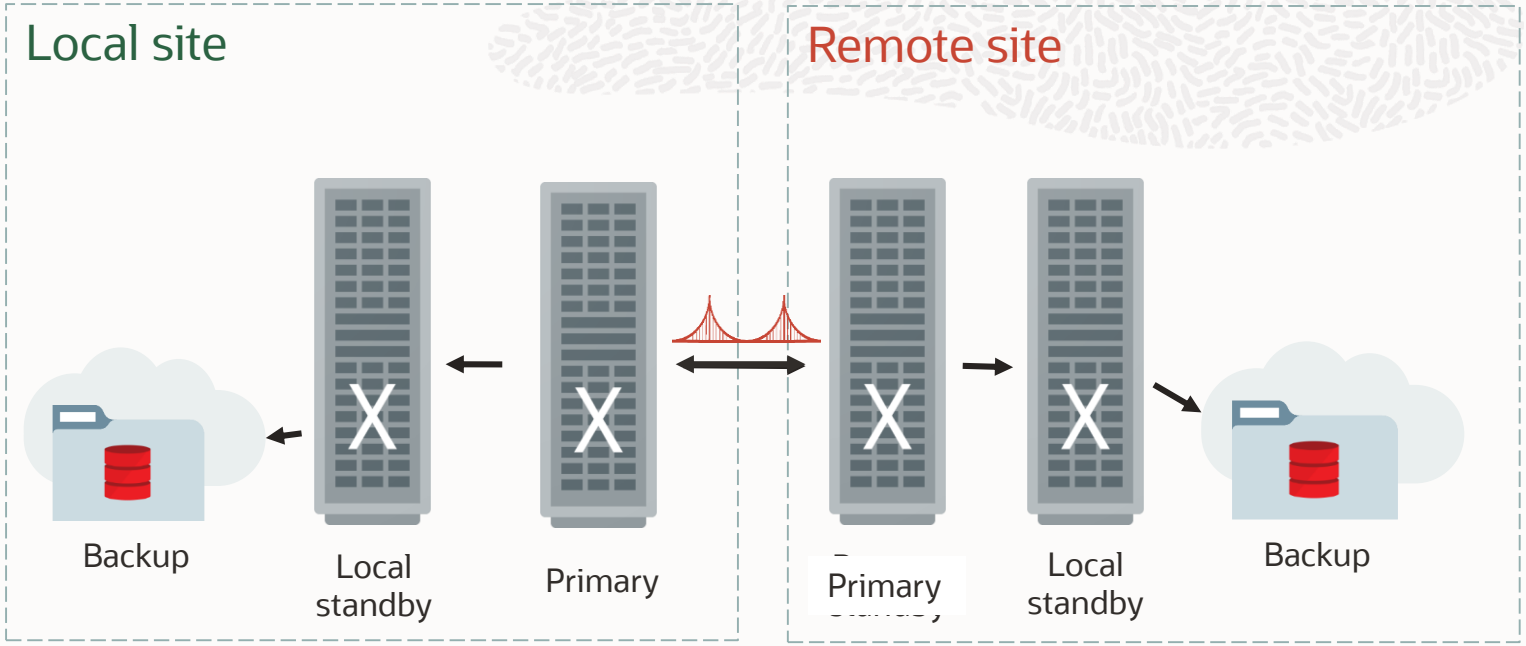
99.995% SLA

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

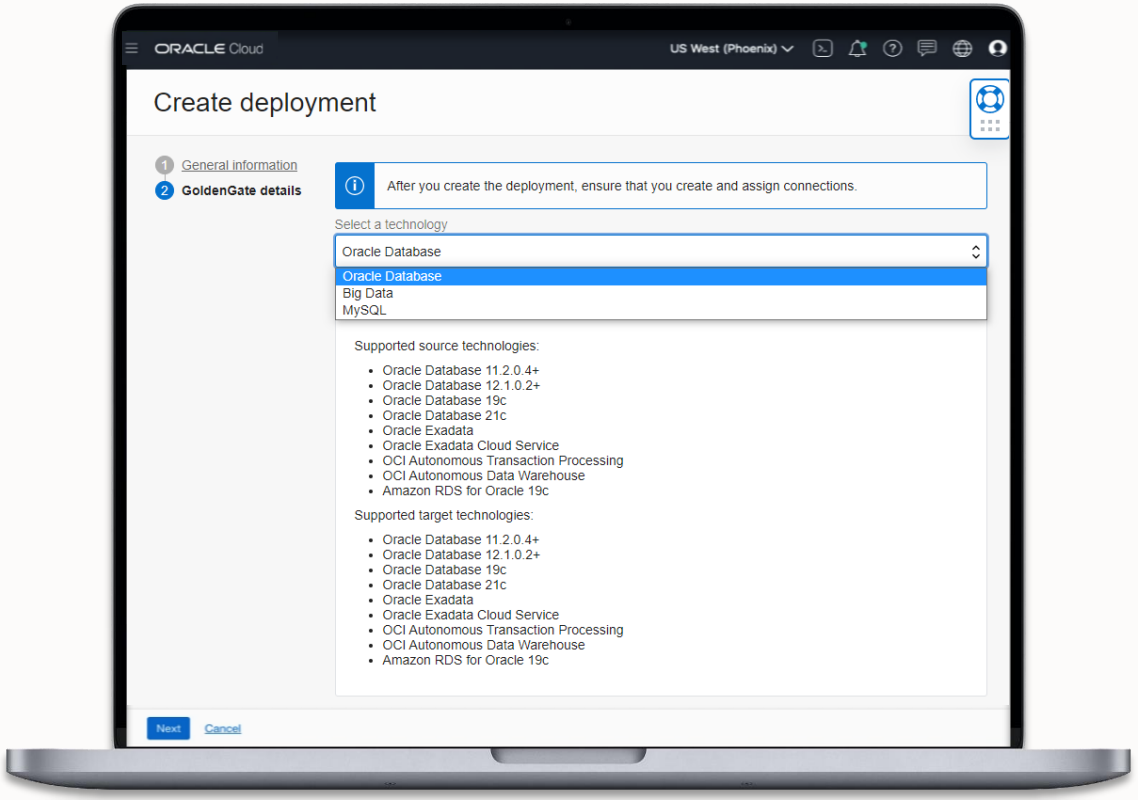
- Powered by the latest GoldenGate 21c microservices architecture

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

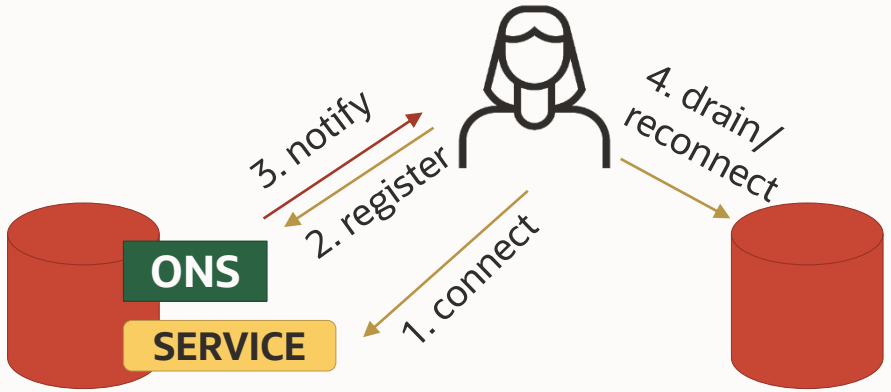


Client-side required technologies

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

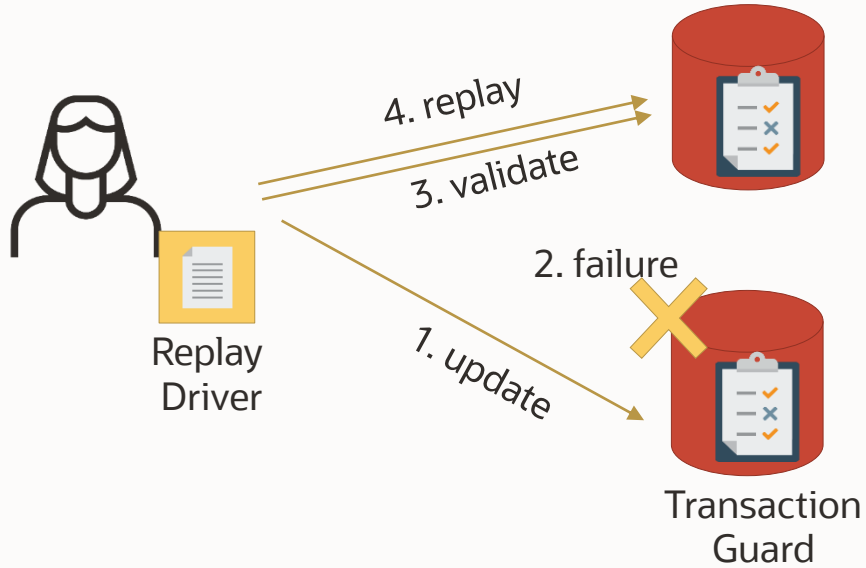
PLANNED MAINTENANCE

Fast Application Notification
(Session Draining)



UNPLANNED MAINTENANCE

Application Continuity [1]
(Transaction Replay)

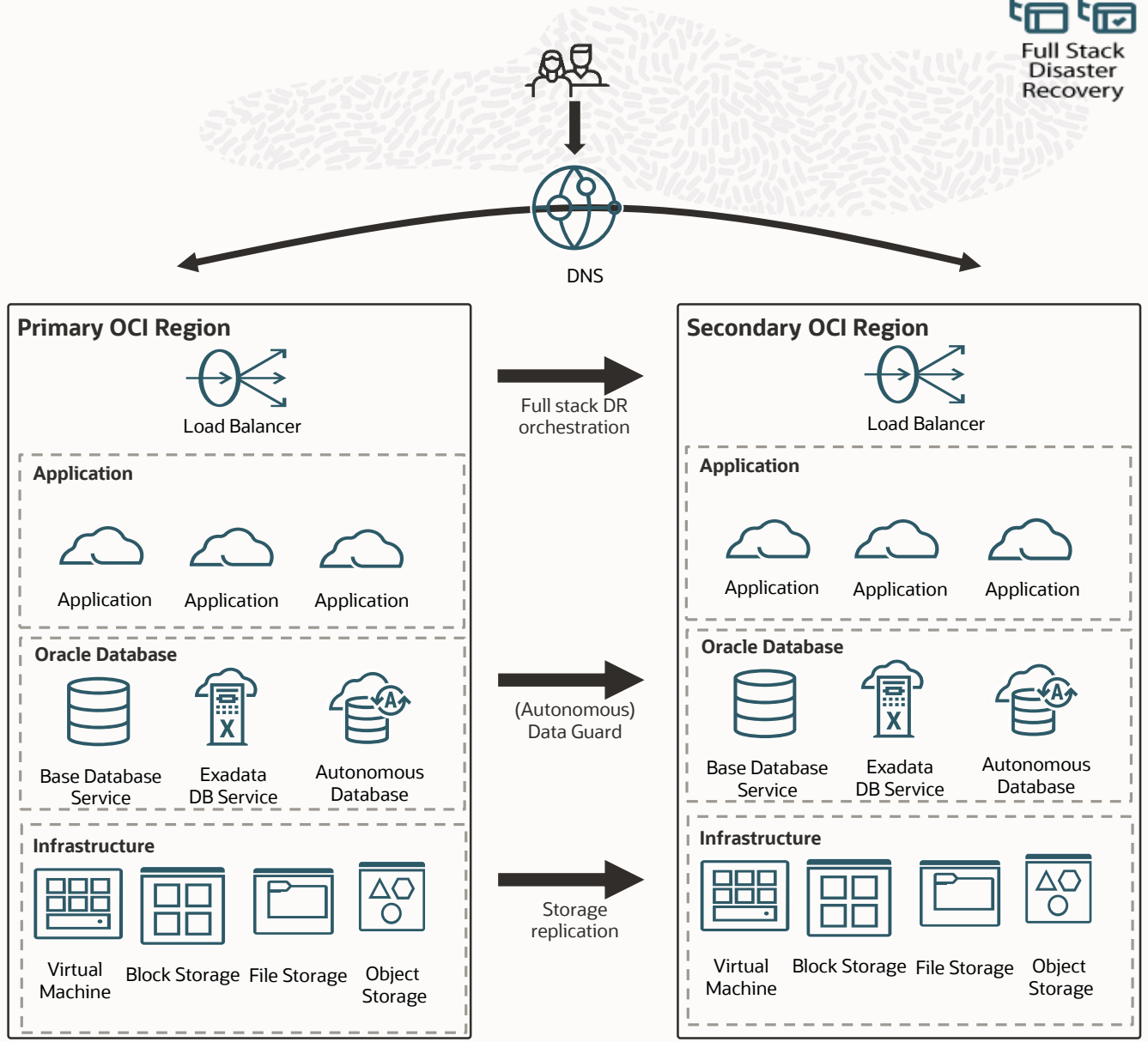


[1] Application Checklist for Continuous Service for MAA Solutions
https://www.oracle.com/a/tech/docs/application-checklist-for-continuous-availability-for-maa.pdf

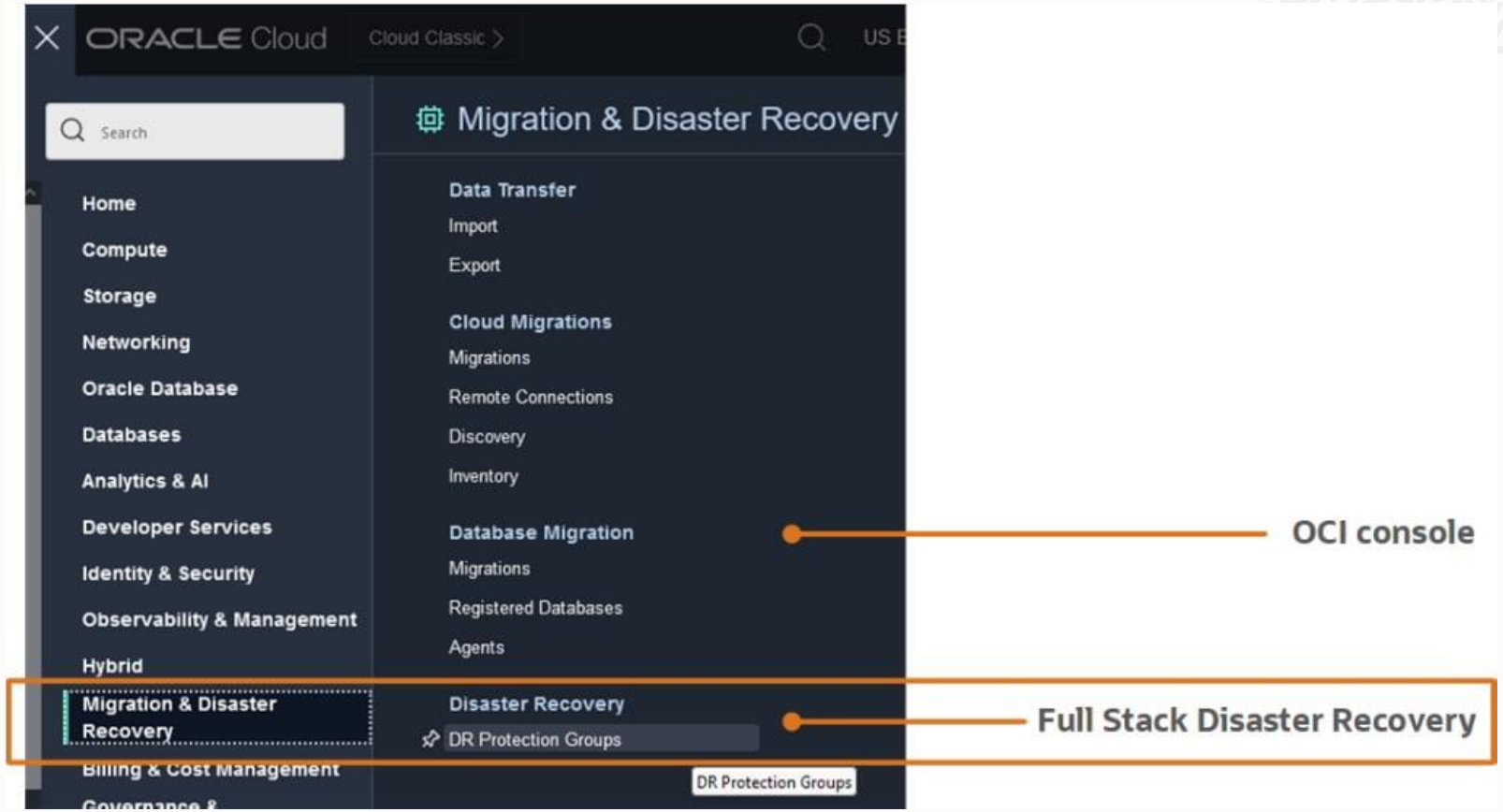
OCI Full Stack Disaster Recovery

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

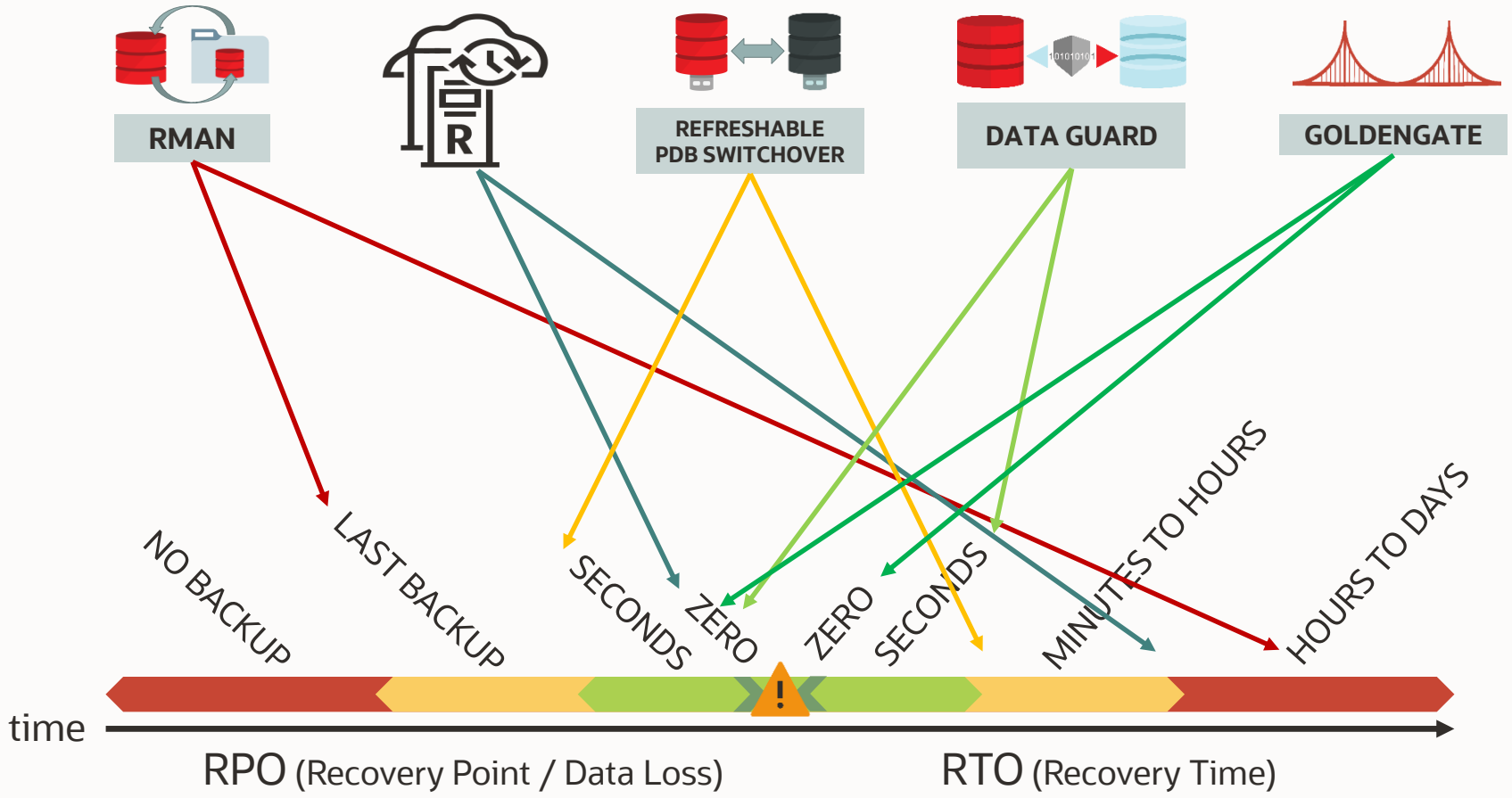


OCI Full Stack Disaster Recovery



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

Our mission is to help people see data in new ways, discover insights, unlock endless possibilities.