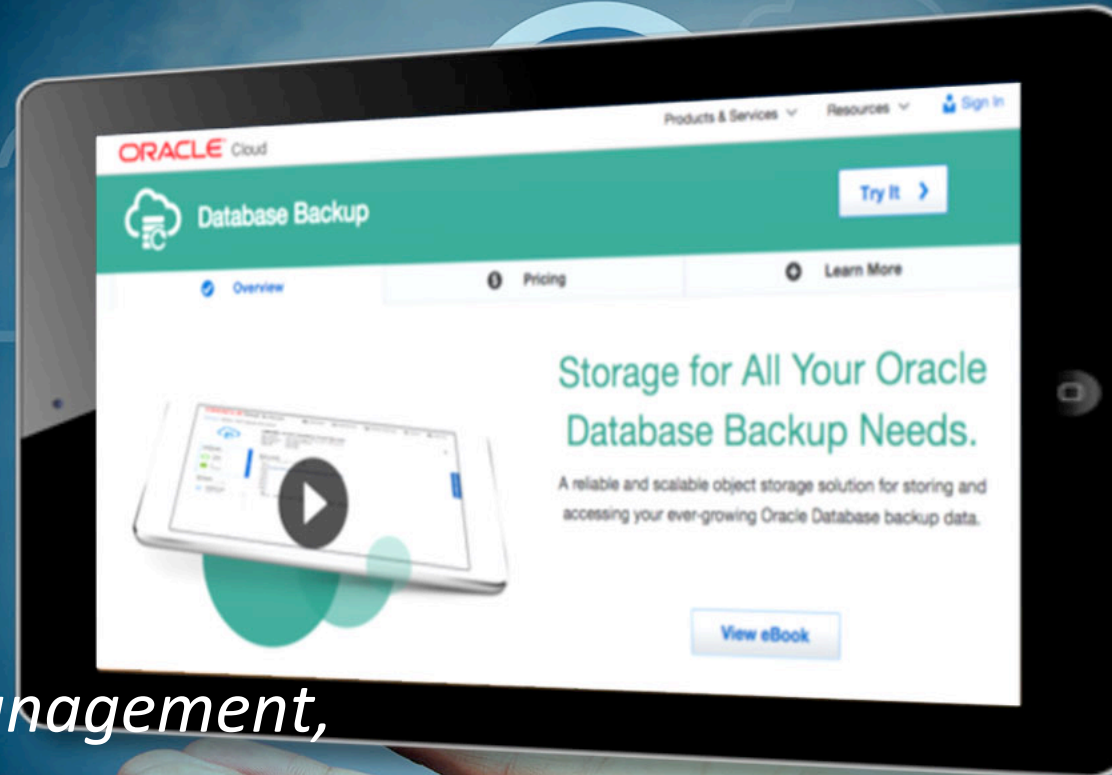


Oracle Database Backup Cloud Service

*Sridhar Ranganathan
High Availability Product Management,
Oracle*



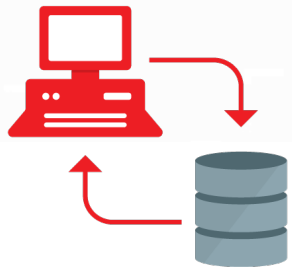
Safe Harbor Statement

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, and timing of any features or functionality described for Oracle's products remains at the sole discretion of Oracle.

Traditional Database Backup Best Practices

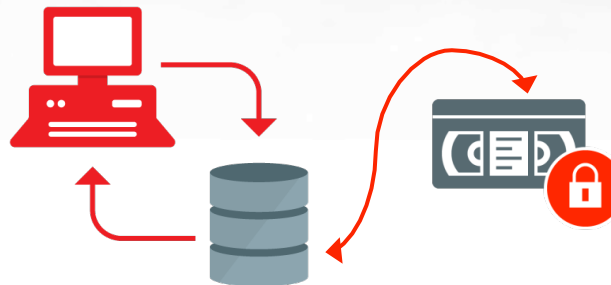
Local FRA Backups

- Local disk backups
- Short term retention
 - Example: 7 days
- Quickest RTO
 - Image copy
 - Backup Sets



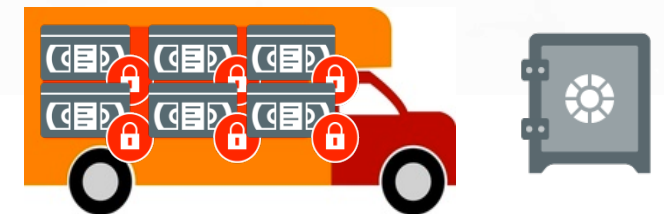
On-site Tiered Storage

- Storage tier based on data value & retention requirements
 - Disk-to-Disk (Example: 30 days)
 - Disk-to-Tape (Example: 90 days)
 - Disk-to-Disk-to-Tape (Example: 7-30-90 days)



Off-site Storage

- Tapes physically shipped to offsite (Tape Vaulting)
- Long term retention & Archiving (Example: 5 yrs)
- Compliance, Regulatory & DR purposes



Challenges with Backup Infrastructure



On-Demand Capacity Growth

With explosive data growth, storage capacity planning for the long term retention is a challenge



High Cost

Incurs capital expenditure to procure, higher operation cost to manage onsite & offsite storage infrastructure



No DR / Tape Infrastructure

Not everyone has tape infrastructure or remote (DR) site for taking backups and to store offsite



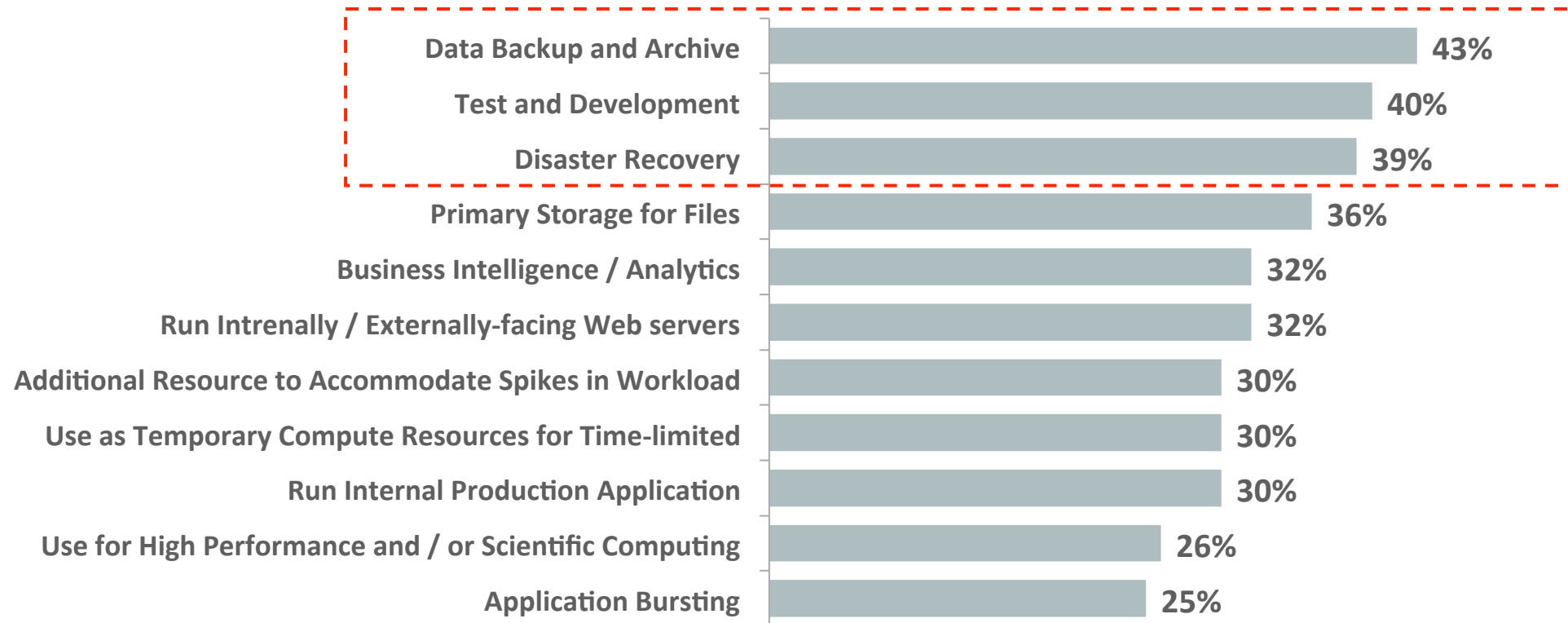
Accessibility Issues

With Tape-vaulting, offsite data is not immediately accessible which increases RTO

Cloud Storage Provides a Great Alternative!

Cloud Infrastructure for Backup & Archive – Top Preference

For which of the following purposes does / did your organization use cloud infrastructure services?
(Percent of respondents, N = 256, multiple responses accepted)



Source: Enterprise Strategy Group, 2014

Topics

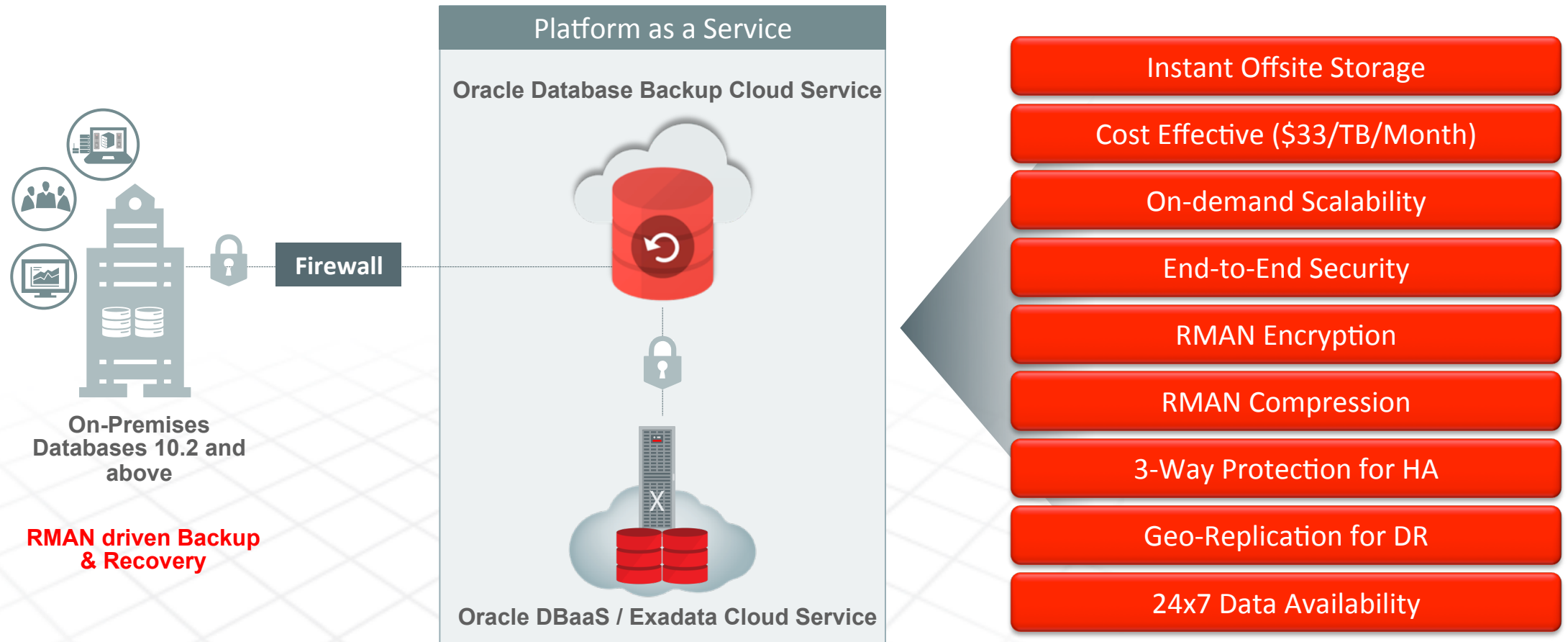
1. Oracle Database Backup Cloud Service Overview
2. Use Cases
3. Oracle Database Cloud Service Integration
4. Choosing Backup Strategy & Best Practices
5. Summary
6. Q&A

Topics

1. Oracle Database Backup Cloud Service Overview
2. Use Cases
3. Oracle Database Cloud Service Integration
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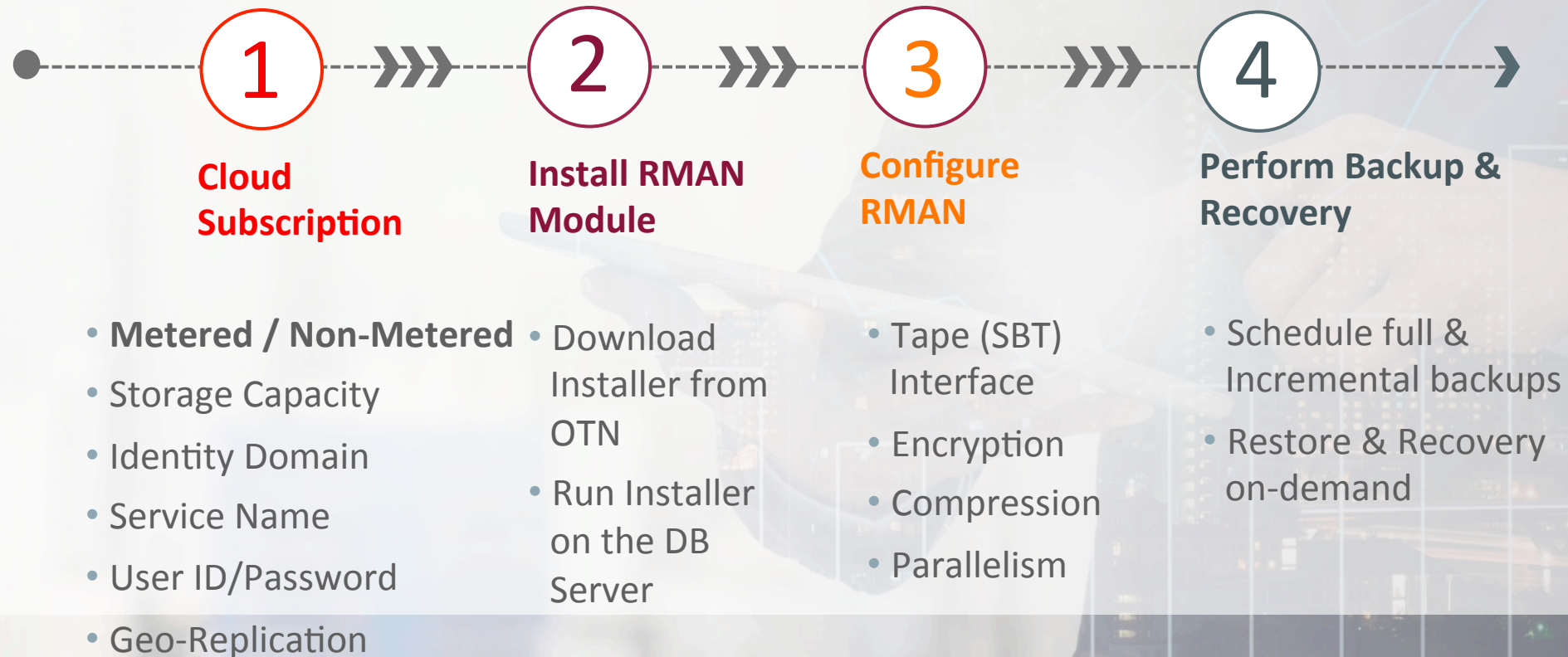
Oracle Database Backup Cloud Service (PaaS)

Low-Cost Offsite Cloud Storage for Oracle Database Backups



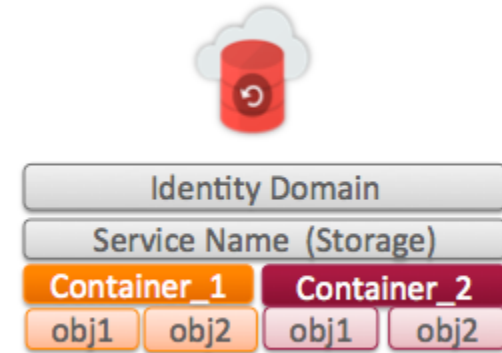
Backup Service: For your On-Premises Database Backups

Simple 4-Step Process



Cloud Side Operations

- Subscribe for Database Backup Cloud Service
- REST Endpoint & Authentication
 - Identity Domain, Service Name, User ID, Password
- Choose Geo-Replication
- Create Container
 - Auto-created (or) User pre-created
- Only SSL (HTTPS) access is allowed
- RMAN backup pieces are stored under the container as objects
- Stored in 3-way in the chosen datacenter
- Replicated to another datacenter within the same region if Geo-Replication* is chosen



Set Replication Policy

Select the data center (DC) and georeplication policy for your service instance.

- * ☒ Primary DC: Chicago (us2); Georeplication DC: None
- ☐ Primary DC: Ashburn (us6); Georeplication DC: None
- ☐ Primary DC: Ashburn (us6); Georeplication DC: Chicago (us2)
- ☐ Primary DC: Chicago (us2); Georeplication DC: Ashburn (us6)

Caution: Once set, the replication policy cannot be changed for the service instance.

Set **Cancel**

Example: Subscribe for Database Backup Cloud Service 1

Call +1 866 201 9198 for Customer Service

Live Chat

Email

Help

Change country **United States** or language **English**

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Data Management

Database Backup Service

Oracle Database Backup Service

Oracle Database Backup Service

Oracle Database Backup Service provides a simple, low-cost, and automated cloud based elastic storage solution for securely storing Oracle database backups. Oracle Database backups are encrypted at the source, optionally compressed, securely transmitted and stored in the cloud in a multiplexed way for added data protection.

Note: This service is for storing Oracle database backups. For storing other types of data, please use the [Oracle Storage Cloud Service](#)

[Learn More](#)

US\$33.00/Month

Metric:

TB of Storage Capacity

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SERVICE
ORACLE

Choose Term

Term:

Month-to-Month

Month-to-Month

1 Year

2 Year

3 Year

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SERVICE
ORACLE

Enter Quantity

Quantity:

1

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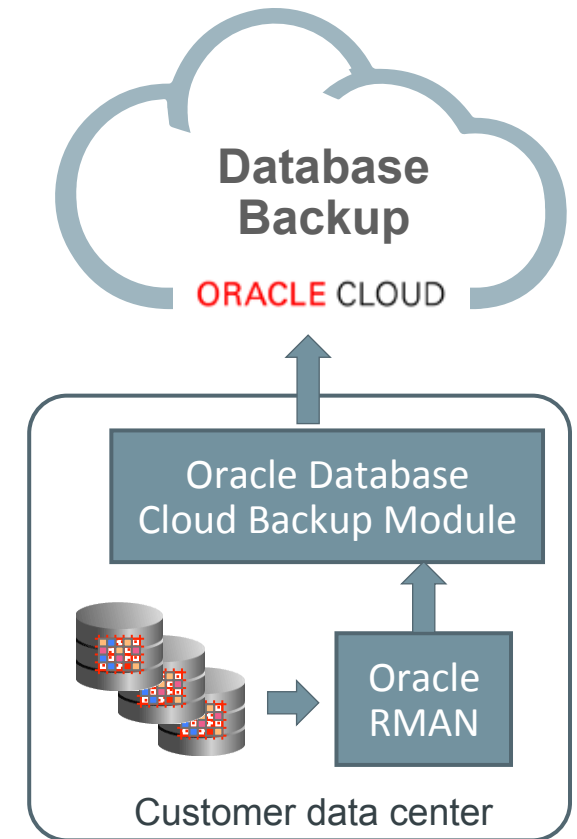
<https://shop.oracle.com/>

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On-Premises: Client Side Operations

- Download Oracle Database Cloud Backup Installer from OTN and run it
 - Installs platform specific SBT module, configures wallet and OPC parameter file
- Configure RMAN environment and perform backups
- RMAN streams backup data to the cloud via RMAN cloud library module using SBT interface (*libopc.so*) via REST calls
- Backup pieces are chunked into 100MB objects and shipped to the cloud
 - Uses REST end point
 - Each chunk is stored as an object under container
 - Failed transmissions are retried automatically by RMAN
- Manifest (metadata) file is created for every backup piece
 - Default container name (created by the RMAN module)
 - “**oracle-data**-[first 8 chars of service & domain]



Example: Download Oracle Database Cloud Backup Module

2

www.oracle.com/technetwork/database/availability/oracle-cloud-backup-2162729.html

Welcome Sridhar

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Products Solutions Downloads Store Support Training Partners About OTN

Oracle Technology Network > Database > High Availability

Database 12c
Database In-Memory
Multitenant
Options
Application Development
Big Data Appliance
Data Warehousing & Big Data
Database Appliance
Database Cloud
Exadata Database Machine
High Availability
Manageability
Migrations
Security
Unstructured Data
Upgrades
Windows

Oracle Database Cloud Backup Module

You must accept the [OTN License Agreement](#) to download this software.

☒ Accept License Agreement | ☐ Decline License Agreement

Oracle Database Cloud Backup Module is to be used only to back up to the [Oracle Database Backup Cloud Service](#) or the trial subscription of Oracle Storage Cloud Service.

Supported Oracle Database Versions (EE,SE,SE1,SE2): 10gR2 and above. (Refer to the [documentation](#) for more details)

Supported Platforms (64-bit) : Linux, Solaris, SPARC, Windows, HP-UX, AIX, zLinux

[All Supported Platforms](#) (2,584,016 bytes) Note: Requires **JDK version 1.7** or higher).

For installation instructions and patch requirements, see the Oracle Database Backup Cloud Service [documentation](#). See the [white paper](#) for more details about the service. For FAQ, refer to the MOS Note [1640149.1](#).

ORACLE OPEN WORLD September 18-22, 2016 San Francisco

See Us Here #oow16

Oracle Database Cloud

Get Started >

Example: Run the Installer

2

```
HybridDR_Commands — oracle@HCDR2:~ — ssh — 145x35

[oracle@localhost OPC] unzip opc_installer.zip

[oracle@localhost OPC] ls opc*
  opc_install.jar  opc_readme.txt

[oracle@localhost OPC]$ java -jar opc_install.jar -serviceName myService -identityDomain
myDomain -opcid sridhar.ranganathan@oracle.com -opcPass 'myPassword' -libDir /home/oracle/
OPC/lib -walletDir /home/oracle/OPC/wallet
Oracle Database Cloud Backup Module Install Tool, build 2016-07-12
Oracle Database Cloud Backup Module credentials are valid.
Oracle Database Cloud Backup Module wallet created in directory /home/oracle/OPC/wallet.
Oracle Database Cloud Backup Module initialization file /u01/products/db/12.1/dbs/opcodbs.ora
created.
Downloading Oracle Database Cloud Backup Module Software Library from file opc_linux64.zip.
Downloaded 23169388 bytes in 152 seconds. Transfer rate was 152430 bytes/second.
Download complete.
```


Files Configured During Installation

File Name	Location	Purpose
libopc.so	User specified library location.	SBT library which enables backup to Oracle Cloud which does REST calls to the cloud
opc<SID>.ora	\$ORACLE_HOME/dbs	Configuration information stored – like REST endpoint, wallet information, custom container etc.
cwallet.sso	User specified wallet location	Oracle wallet which securely stores backup service credentials. This is used implicitly to authenticate against Oracle cloud during RMAN backups and restore operations.

Note: Installation can be repeated to get latest module, update the password etc.

RMAN Compression and Encryption

- RMAN Compression

- **Optional**

- 10g: BASIC
 - 11g and above: HIGH, BASIC, MEDIUM, LOW

- **MEDIUM** recommended

- No ACO licensing required

CONFIGURE COMPRESSION ALGORITHM 'MEDIUM';
BACKUP AS COMPRESSED BACKUPSET DATABASE PLUS
ARCHIVELOG;

- RMAN Encryption

- **Mandatory**

- Password, Transparent Data Encryption (TDE), Dual-Mode

- No ASO licensing required

- Keys are kept local (not in the storage cloud)

- If TDE is used (preferred), then simply use **SET ENCRYPTION ON** before backups and restores

- For password encryption:

**SET ENCRYPTION ON IDENTIFIED BY '<password>'
ONLY;**

- Before doing restore,

SET DECRYPTION IDENTIFIED BY '<password>';

Example: RMAN Configuration

3

```
HybridDR_Commands — oracle@HCDR2:~ — ssh — 145x35

$ rman target /
Recovery Manager: Release 12.1.0.1.0 - Production on Sun Aug 14 09:41:08 2016
Copyright (c) 1982, 2013, Oracle and/or its affiliates. All rights reserved.
connected to target database: odba (DBID=2636081010, open)

RMAN>CONFIGURE CHANNEL DEVICE TYPE 'SBT_TAPE' PARMS 'SBT_LIBRARY=/home/oracle/
    OPC/lib/ libopc.so, ENV=(OPC_PFILE=/u01/products/db/12.1/dbs/opcodbs.ora)';

RMAN> CONFIGURE COMPRESSION ALGORITHM 'MEDIUM';

RMAN> CONFIGURE CONTROLFILE AUTOBACKUP ON;

RMAN> CONFIGURE DEVICE TYPE 'SBT_TAPE' PARALLELISM 8 BACKUP TYPE TO BACKUPSET;

RMAN> SHOW ALL;
```

Example: Perform RMAN Backups

4

```
HybridDR_Commands — oracle@HCDR2:~ — ssh — 145x35  
RMAN> SET ENCRYPTION ON IDENTIFIED BY 'abc123' ONLY;
```

```
executing command: SET encryption
```

```
RMAN> BACKUP DEVICE TYPE SBT AS COMPRESSED BACKUPSET DATABASE PLUS ARCHIVELOG FORMAT '%d_%U';
```

```
Starting backup at 14-AUG-16
```

```
current log archived
```

```
released channel: ORA_DISK_1
```

```
released channel: ORA_DISK_2
```

```
released channel: ORA_DISK_3
```

```
released channel: ORA_DISK_4
```

```
released channel: ORA_DISK_5
```

```
released channel: ORA_DISK_6
```

```
released channel: ORA_DISK_7
```

```
released channel: ORA_DISK_8
```

```
allocated channel: ORA_SBT_TAPE_1
```

```
channel ORA_SBT_TAPE_1: SID=42 device type=SBT_TAPE
```

```
channel ORA_SBT_TAPE_1: Oracle Database Backup Service Library VER=3.15.1.16
```

Example: Perform RMAN Restore & Recovery

4

```
HybridDR_Commands — oracle@HCDR2:~ — ssh — 145x35  
RMAN> SET DECRYPTION IDENTIFIED BY 'abc123';
```

executing command: SET decryption

using target database control file instead of recovery catalog

```
RMAN> RESTORE DATABASE;
```

Starting restore at 13-SEP-15

allocated channel: ORA_SBT_TAPE_1

channel ORA_SBT_TAPE_1: SID=22 device type=SBT_TAPE

channel ORA_SBT_TAPE_1: Oracle Database Backup Service Library VER=3.15.1.16

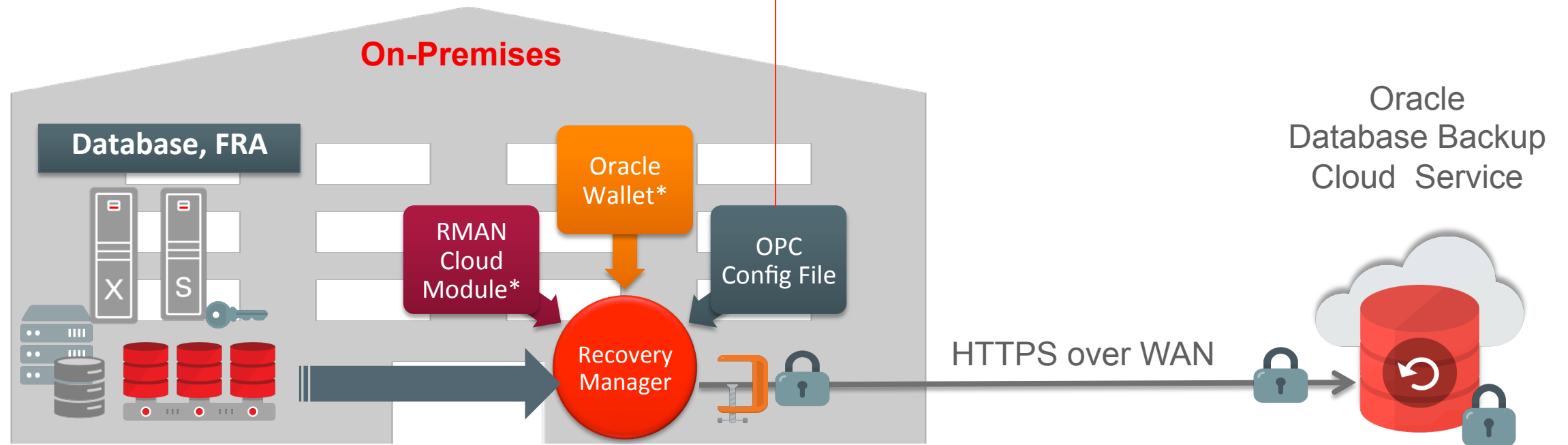
allocated channel: ORA_SBT_TAPE_2

channel ORA_SBT_TAPE_2: SID=19 device type=SBT_TAPE

...

```
RMAN> RECOVER DATABASE;
```

End-To-End Flow



```
opc_host=https://odbs_dom.storage.oraclecloud.com/  
odbs_svc-odbs_dom  
opc_wallet='location=file:/abc/opcwallet'  
opc_container='myContainer'
```

```
$ rman target /  
RMAN> CONFIGURE CHANNEL DEVICE TYPE SBT PARMS='SBT_LIBRARY=  
/opc/libopc.so' , SBT_PARMS=(OPC_PFILE=/opc/opcSID.ora);  
RMAN> CONFIGURE DEVICE TYPE SBT PARALLELISM 8;  
RMAN> SET ENCRYPTION ON IDENTIFIED BY "mypwd" ONLY;  
RMAN> BACKUP AS COMPRESSED BACKUPSET DATABASE PLUS ARCHIVELOG;
```

```
https://  
odbs_dom.storage.oraclecloud  
.com/v1/odbs_svc-odbs_dom/  
myContainer/H8djKj86/  
BA387934/0000001
```

RMAN Operations Supported with Cloud Backups

All Typical Tape (SBT) Operations

Database (Backupset)

- BACKUPSET Backups
- Full Database
- Selected Tablespace(s)
- Selected Data Files
- Incremental – Differential
- Incremental – Cumulative
- Compressed
- Encrypted

Backups From Fast Recovery Area

- Image Copies
- Archived logs
- Compressed
- Encrypted backup sets

Restore from Cloud

- Full Database
- Tablespace
- Datafile
- Table Recovery (12c)
- Block Recovery

Maintenance

- Retention Period
- Crosscheck
- Obsolete
- Delete Obsolete
- Delete Backups

Support Matrix (On-Premises)

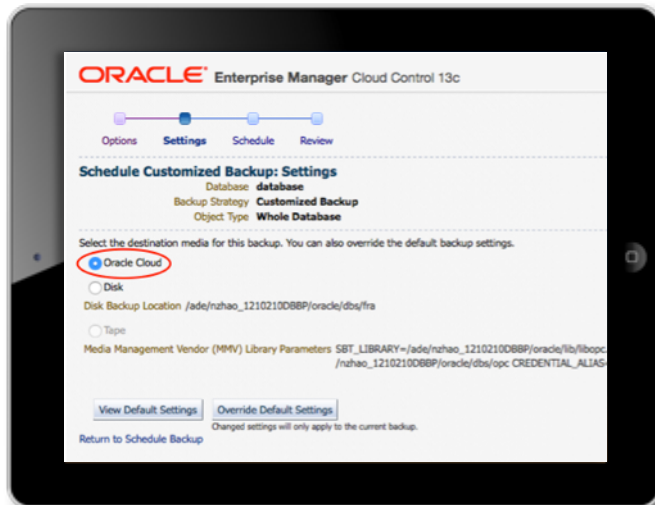
Database / Features	Supported Versions / Options
Oracle Database – Enterprise Edition*	10.2.0.5, 11.1,11.2, 12c (64 bits)
Oracle Database – SE/SE1/SE2*	10.2.0.5, 11.1.0.7, 11.2.0.3, and versions 11.2.0.4 and above
Platforms (64 bits)	Linux, Solaris, SPARC, Windows, HP-UX, AIX, zLinux
RMAN Compression (Included)	HIGH, MEDIUM, BASIC, LOW (depends on DB version)
RMAN Encryption (Included)	Password, TDE, Dual-mode

* Older Database versions no longer supported by Oracle are in deprecated mode

UI Management for Backup & Recovery

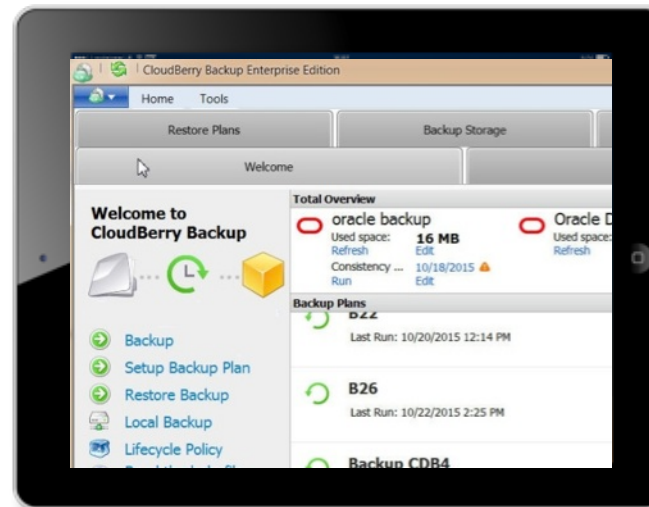
Enterprise Manager 13c

- Oracle Cloud as a backup destination
- Configure, schedule, B&R



Cloudberry Lab

- Simple UI to perform backup & recovery operations



RMAN CLI

- Perform complex operations via scripting

```
$ rman target /  
RMAN> CONFIGURE CHANNEL DEVICE TYPE  
SBT PARMS='SBT_LIBRARY=  
/opc/libopc.so' ,  
SBT_PARMS=(OPC_PFILE=/opc/  
opcSID.ora)';  
RMAN> CONFIGURE DEVICE TYPE SBT  
PARALLELISM 8;  
RMAN> SET ENCRYPTION ON IDENTIFIED  
BY "mypwd" ONLY;  
RMAN> BACKUP AS COMPRESSED  
BACKUPSET DATABASE PLUS ARCHIVELOG;
```

3rd Party Application Support : **VERITAS** **COMMVAULT** 

Topics

1. Oracle Database Backup Cloud Service Overview
2. Use Cases
3. Oracle Database Cloud Service Integration
4. Choosing Backup Strategy & Best Practices
5. Summary
6. Q&A

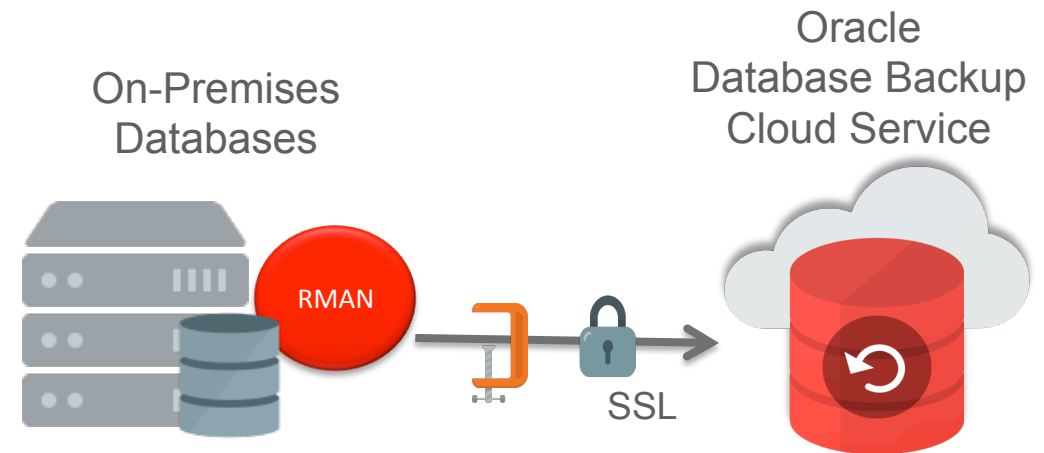
Use Case: Non-Critical Database Backups

- **Scenario**

- A number of **non-critical databases (Test/dev)**
- Database Server connected to internet (directly or via Proxy)
- Retention requirement : 6 months - 5 years
- RTO : Hours to Days
- Data Loss Exposure: As of last backup

- **Solution**

- Directly backup databases + archived logs to Oracle Cloud over public network
- Weekly full + Daily Incremental strategy
- Perform frequent Archived logs backup to reduce data loss exposure



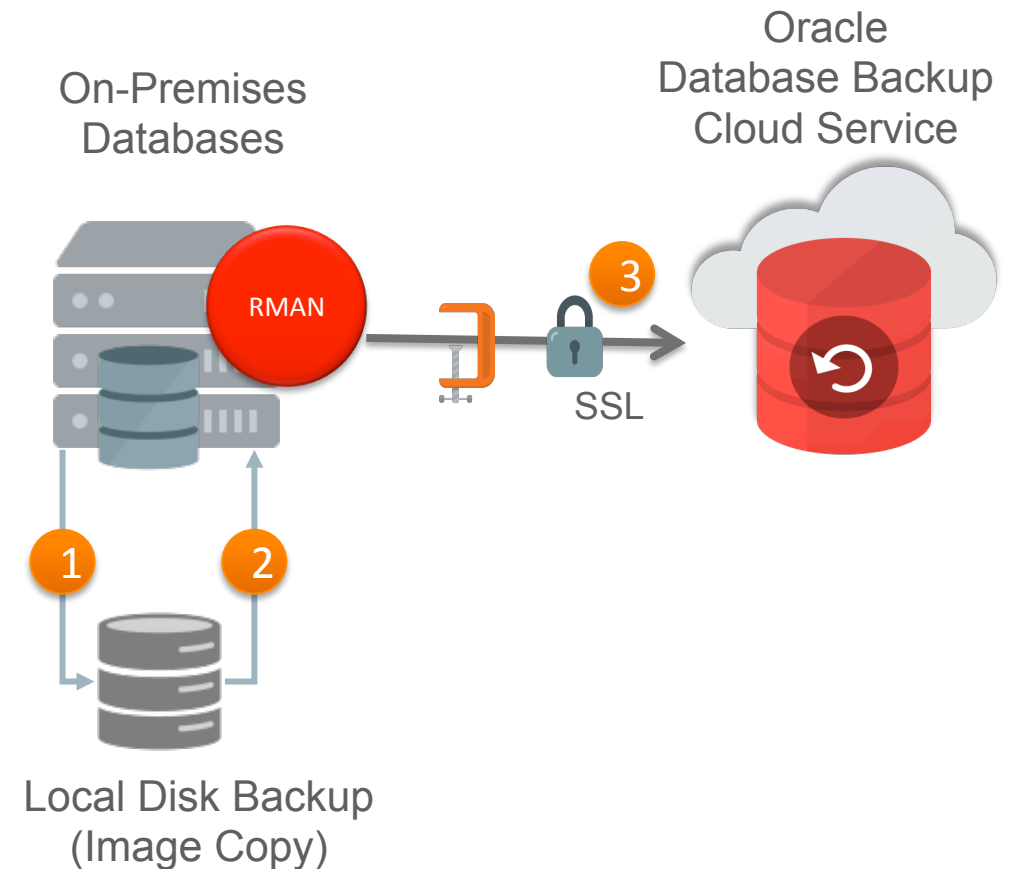
Use Case: Business Critical Database Backups

- **Scenario**

- A number of **business critical production databases**
- Wants to store recent backups on local disk and older backups in the cloud for long term retention
- Database server is connected to the internet
- Retention
 - Local disk: 1 month, Cloud: 1-5 years

- **Solution**

1. Do RMAN image copy backups to local disk
2. Backup those image copies to the cloud using RMAN from the same DB server



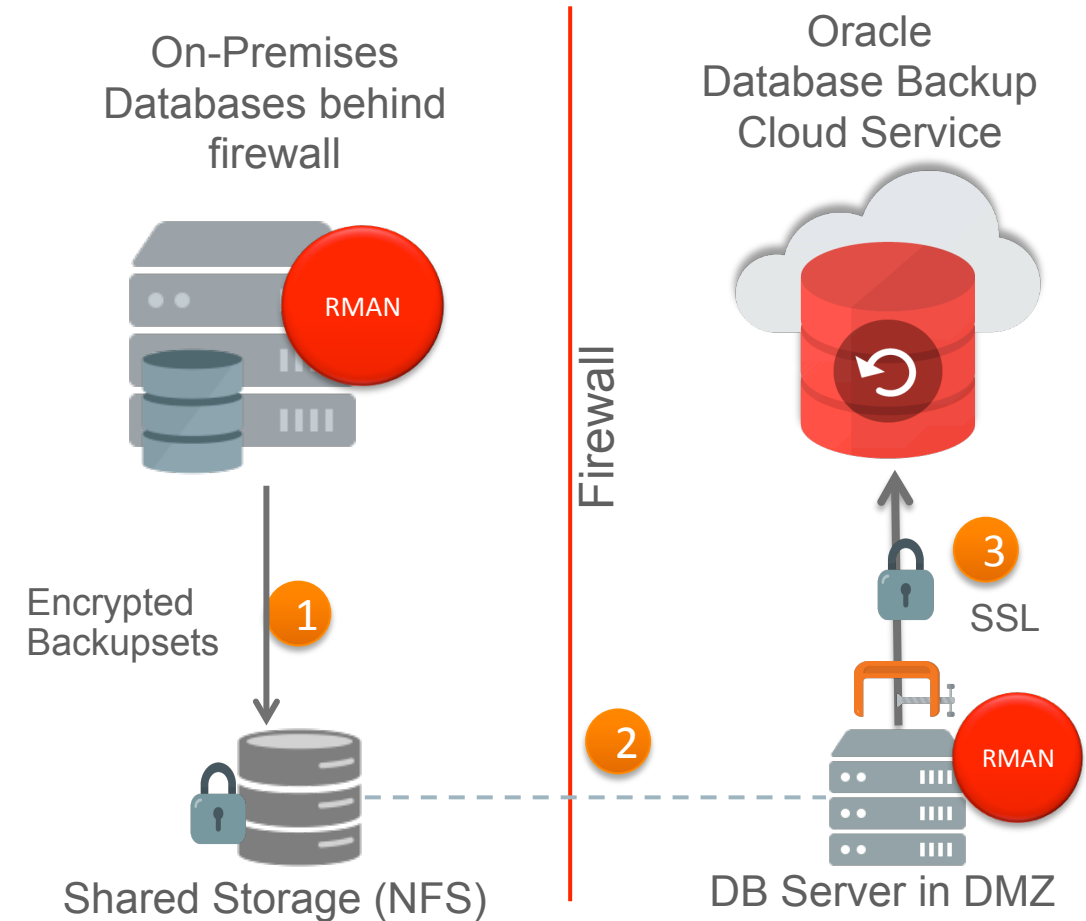
Use Case: DB Server Not Connected to Internet

- **Scenario**

- A number of business critical databases
- Wants to store recent backups on local disk and older backups in the cloud for long term retention
- Database Server is **NOT** connected to the internet
- Retention
 - Local disk: 1 month, Cloud: 1-5 years

- **Solution**

1. Perform encrypted BACKUPSET backups to a shared disk (NFS)
2. Start a database instance in a server that is connected to the internet
3. Backup encrypted RMAN backups to cloud



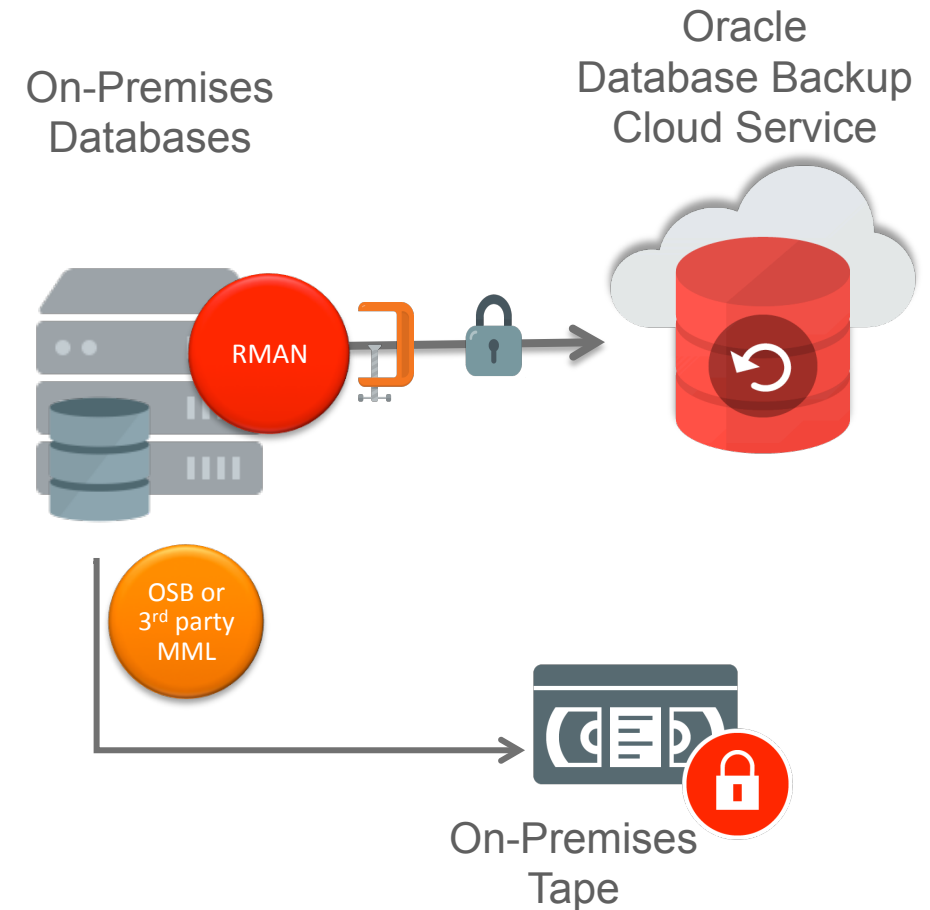
Use Case: Customers already having Tape Backups

- **Scenario**

- Already has Tape infrastructure & tape software and want to continue to use that for local copies
- Cloud for offsite storage for long term backup retention
- Since RMAN uses Tape interface for cloud backups, wondering if cloud backups work along-side of Tape backups

- **Solution**

- Do not change the existing RMAN Tape configuration
- Use RMAN Tags (Backup Name) to differentiate cloud & tape backups
- Backup to Tape and then to cloud(using ALLOCATE CHANNEL option)
 - Cannot simultaneously backup to tape & cloud in a single command



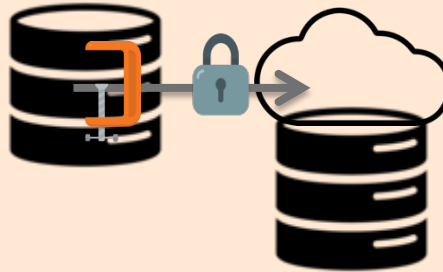
Oracle Database Backup Cloud Service

Additional Use Cases

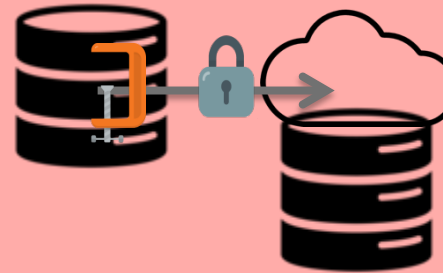
**Move Test/Dev,
Sandbox to the
cloud**



**DR to the Cloud
using Backups (or)
Create Standby in
the Cloud**



**Migrate
Production to
Oracle Cloud**

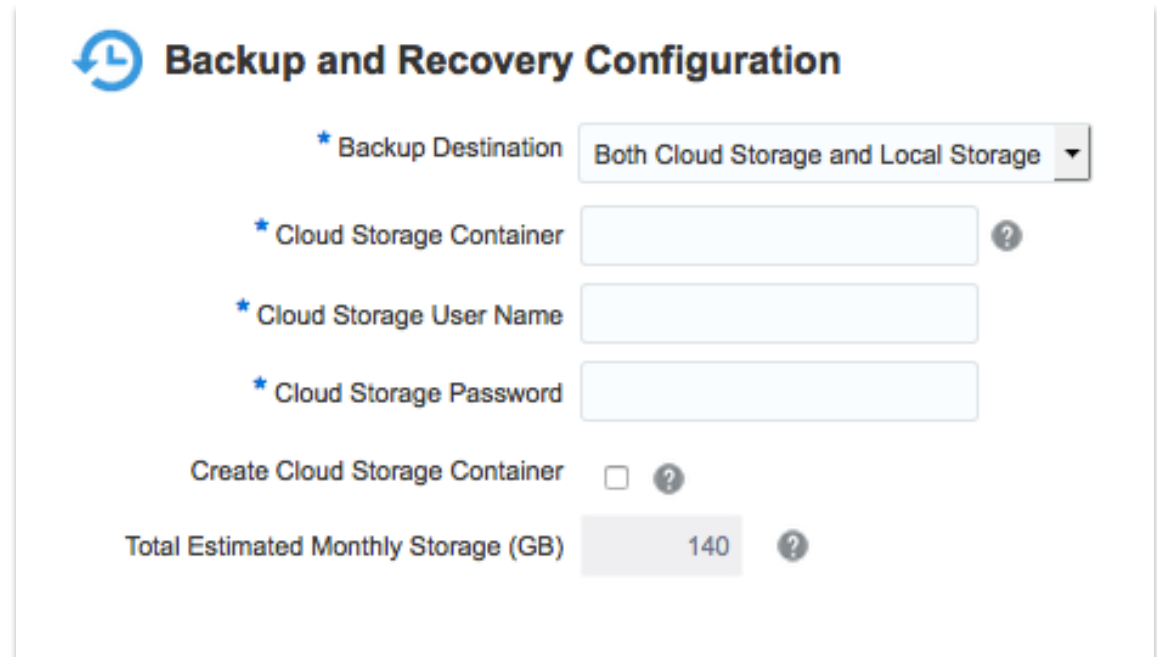


Topics

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Backup Configuration in Database Cloud Service

- At Provision Time: Configure Cloud Storage backups for DBCS / ExaCS
 - Cloud & Local Storage (DBCS Only)
 - Local backups for 7 days (Image Copy)
 - Cloud Storage 30 days
 - Cloud Only (DBCS / ExaCS)
 - Cloud Storage for 30 days (Backupset)
- Automated backups done every day
- On-Demand UI/CLI based backup & recovery
 - Recovery: Specific backup / Full / PIT
- Weekly automated RESTORE VALIDATE



The screenshot shows the 'Backup and Recovery Configuration' window. It features a blue circular icon with a clock and a play symbol. The configuration includes a dropdown for 'Backup Destination' set to 'Both Cloud Storage and Local Storage'. Below are input fields for 'Cloud Storage Container', 'Cloud Storage User Name', and 'Cloud Storage Password', each with a help icon. A checkbox for 'Create Cloud Storage Container' is present. At the bottom, a 'Total Estimated Monthly Storage (GB)' field shows '140' with a help icon.

Backup and Recovery Configuration

* Backup Destination: Both Cloud Storage and Local Storage

* Cloud Storage Container: [Input Field] ?

* Cloud Storage User Name: [Input Field]

* Cloud Storage Password: [Input Field]

Create Cloud Storage Container: ☐ ?

Total Estimated Monthly Storage (GB): 140 ?

Instantiate Database in the Cloud using Backups

Based on On-Premises (or) Cloud Database Backups

Select if you want to create instance from existing backup

* Create Instance from Existing Backup

* Character Set

* National Character Set

Database Clustering with RAC ☐ ?

Standby Database with Data Guard ☐ ?

Enable Oracle GoldenGate ☐ ?

Include "Demos" PDB ☐ ?

* Create Instance from Existing Backup

* Database ID

* Decryption Method ?

* Cloud Storage Container ?

* Cloud Storage User Name

* Cloud Storage Password

Topics

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Choosing the Right Backup Strategy for your Databases

Typical Candidates for Cloud Backup

- Database sizes up to low-mid single digit TB
- Relaxed Recovery Time objective
- Direct from database or from disk backups for business-critical databases
- Additional copy of backup data in the cloud

Not Suitable for Cloud Backups

- Very large databases with many TBs of data*
- Strict downtime requirements
- Predictable recovery time requirement*
- Mission-critical databases with cloud backup as the only backup

	Cloud Backup Tier Level		
Database Type	1 st Copy	2 nd Copy	3 rd Copy
Non-Critical			
Important			
Mission Critical			

* For Large Database, choose Oracle Fast Connect

Backup Performance Over WAN

Usual Best Practices to Optimize Data Transfer

- Use RMAN compression (HIGH, MEDIUM, LOW, BASIC)
- Increase PARALLELISM (until you reach maximum network throughput)
- Use MULTISECTION backups
- Refer to MOS Note 2078576.1 for performance investigation
- If public network throughput is not sufficient
 - Oracle Fast Connect (Standard, Partner Edition, MPLS)



Best Practices

- ✓ Choose cloud storage as appropriate storage tier based on RTO/RPO
- ✓ Perform traditional weekly full and daily incremental backups
- ✓ Use Recovery Catalog for long-term retention
- ✓ You may schedule backing up archived logs frequently to reduce RPO
- ✓ Run Installer once in few months to pick up latest RMAN SBT module
- ✓ Run Installer with new credentials after changing Oracle Cloud password
- ✓ Use Global Namespace to access REST endpoint
- ✓ Copy opc<SID>.ora file to other SIDs if same ORACLE_HOME is used by multiple databases
- ✓ Configure CONTROLFILE AUTOBACKUP ON



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Why Backup to Oracle Cloud?



Extending Backups to HA/DR

All in the Cloud (or) On-Premises to Cloud



Using Backups

- **RMAN** backup to Database Backup Cloud Service
- Longer recovery time and potential data loss depending on the size and the last backup



Using Standby

- Real-time replicated data using **Data Guard**
- Faster failover and low to near-zero data loss



Using Active Standby

- Real-time replicated data using **Active Data Guard** with read-only capabilities (or) Active-Active multi-master using **GoldenGate**
- Faster failover and low to near-zero data loss
- Better return on investment with standby used for load balancing, read-only workloads, reporting.

Database High Availability on Oracle Cloud

Same Capabilities, On-Premises, Cloud & Hybrid Cloud

BRONZE

Dev, Test, Prod

DB Enterprise and
Backup Cloud
Services

SILVER

Prod/Departmental

Bronze +

DB Enterprise
Cloud Service
Oracle RAC

GOLD

Business Critical

Silver +

DB Enterprise
Cloud Service
(Active) Data Guard

PLATINUM


Mission Critical

Gold +

Exadata Cloud Service +
GoldenGate Cloud Service

Reference

- https://cloud.oracle.com/database_backup
– Documents under Learn More tab
- [Technical White Paper](#) (OTN)
- [Data Sheet](#)
- [Cloud Documentation](https://docs.oracle.com/cloud) (docs.oracle.com/cloud)
- MOS Note [1640149.1](#) (FAQ)

A red starburst graphic with multiple points, containing the text 'Try Now – Database Cloud Service' in white.

Try Now –
Database Cloud
Service

Example: Sign-up for a Trial

https://cloud.oracle.com/database_backup

The screenshot shows the Oracle Cloud Database Backup page. A modal titled "FREE 30-Day Trial" is displayed in the center. The modal contains three trial options:

- Oracle Database Backup Cloud Service**: Secured, protected, elastic cloud storage for Oracle database backups. Try the service for 30 days and experience the ease of use to configure and perform database backups to Oracle cloud. You can download the RMAN backup module installer from OTN, install the module, configure RMAN and start performing backups to cloud. This option includes a green circular icon with a cloud and a database symbol.
- Database Backup Cloud Service - Metered Trial**: This is the Database Cloud Service trial which includes Database, Java, Database Backup and Storage public cloud services. You may choose to use only the backup service or any other services. Trials are limited to 30 days with 500GB storage. The "Start Trial" button for this option is circled in red.
- Database Backup Service - Non-Metered Trial**: This is the trial for the non-metered cloud storage service only. Customers can try backing up and restoring their small databases. Trials are limited to 30 days with 10GB storage.

The background of the page shows the Oracle Cloud navigation bar with links for Applications, Platform, Infrastructure, Support, and Sign In. The Database Backup section header is visible, along with a "Try It" button. A sidebar on the left lists various resources like Demos and Videos, Data Sheets, eBooks, FAQs, White Papers, Solution Briefs, Documentation, and Additional Resources.

