High Availability and Disaster Recovery for Oracle Public and Hybrid Clouds

Oracle MAA Database Technologies

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Equinix

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Program Agenda

1. Cloud Backup for On-Premises Databases
2. DR to Oracle Cloud using Active Data Guard
3. Oracle Fast Connect using Equinix
4. HA & DR options for PaaS/SaaS Databases in Oracle Cloud
5. Customer Use Case: Migrate Test/Dev to Oracle Cloud
6. Upcoming Oracle Cloud HA/DR Enhancements
7. Summary
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Oracle Database Backup Cloud Service

Offsite Backups with Simple and Low Cost Cloud Storage

- Backup on-premise or Cloud Databases to Oracle Database Backup Service hosted in Oracle Cloud
- Cost effective, scalable cloud storage for database backups (10.2 and above)
- End-to-end enterprise-grade data encryption, compression and protection
  - **Clients**: Data is always encrypted with keys kept locally at client, optionally compressed, and securely transmitted
  - **Cloud**: Encrypted data is protected with 3-way mirroring on every write

https://cloud.oracle.com/database_backup
Database Backup Service: Client & Cloud Side Components

**Client Side (Database Server)**
- Recovery Manager – Primary Interface
  - Backup, Restore & Recovery
  - RMAN Compression & RMAN Encryption
- RMAN Plugin Module (SBT)
  - Interfaces with Oracle Storage Cloud
  - Streams data between DB Server & Cloud
- Connectivity from your Datacenter to Oracle Cloud over HTTPS
  - Over Public Network
  - Oracle Fast Connect (High Bandwidth)

**Cloud Side (Object Storage)**
- Subscription
  - Identity Domain
  - Service Name
  - User ID
  - Password
- Container
  - User defined or auto created
- Objects
  - Stored in the context of the Container
  - Chunked (20MB) backup pieces
Backup Service: End-to-End Flow

Simple 4-Step Process

1. Cloud Subscription & Activation
   - Storage Capacity
   - Identity Domain
   - Service Name
   - User ID/Password

2. Install RMAN Module
   - Download & Execute Installer
   - Library module installed along with config file & wallet

3. Configure RMAN
   - Tape Interface
   - Encryption
   - Compression
   - Parallelism

4. Perform Backup & Recovery
   - RMAN Interface
   - Full & Incremental backups
   - Restore & Recovery
Option #1: Purchase 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 only. For storing other types of data, please use the Oracle Storage Cloud Service.

US$33.00/Month
Metric: TB of Storage Capacity
Term: [Select Term]
Quantity: [Select Quantity]

Add to Cart
Option #2: Sign-up for a Trial

https://cloud.oracle.com/database_backup
Option #2: Sign-up for a Trial – Non-Metered Contd..
Option #2: Sign-up for a Trial – Non-Metered Contd..

After Submission, wait for the activation email. Then Activate the Service
Cloud Service Portal

**Service Details:** myService (Oracle Storage Cloud Service)

- **Description:** Add description
- **Data Center:** US Commercial 2 (Time zone: US/Central)
- **Identity Domain:** myDomain
- **Subscription:** Production
- **Instance:** Production

**Service Status - September 2015**

- **100% Uptime**
- **0 Outages**

**Additional Information**

- **Plan:** Oracle Storage Cloud Service
- **Version:** 15.2.0.0.0
- **Status:** Active
- **Service Instance URL:** Not available
- **Service REST Endpoint:** https://storage.us2.oracle.com
- **Service Start Date:** 11-Mar-2014
- **Subscription ID:** 123456
- **Customer Account:** Oracle Internal (US)
- **CSI Number:** Not available
- **Data Center:** US Commercial 2
Download Oracle Database Cloud Backup Module from OTN

Run the Installer

[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 2015-05-12
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.
Example: End-To-End Flow

$ 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;

* Configured during database backup cloud module install procedure

opc_host=https://odbs-dom.Storage.oraclecloud.com/odbs_svc-odbs_dom
opc_wallet='location=file:/abc/opcwlt'
opc_container='myContainer'
Support Matrix

<table>
<thead>
<tr>
<th>Versions</th>
<th>10.2, 11g, 12c (64 bits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oracle Database – EE/SE/SE1/SE2</td>
<td></td>
</tr>
<tr>
<td>Platforms (64 bits)</td>
<td>Linux, Solaris, SPARC, Windows, HP-UX, AIX, zLinux</td>
</tr>
<tr>
<td>RMAN Compression*</td>
<td>HIGH, MEDIUM, BASIC, LOW (depends on DB version)</td>
</tr>
<tr>
<td>RMAN Encryption*</td>
<td>Password, TDE, Dual-mode</td>
</tr>
</tbody>
</table>

* RMAN encryption & RMAN compression licensing included
Best Practices for Cloud Backups

• Backup to Oracle Database Backup Cloud Service
  – Databases (Production or from Standby Database)
  – Backups stored in Local Fast Recovery Area (FRA)
  – Backups stored in External storage (eg. NAS)
  – FRA Backupsets to cloud: BACKUP BACKUPSET
  – FRA Image Copies to cloud: BACKUP COPY OF DATABASE or BACKUP RECOVERY AREA

• Choose cloud tier based on RTO / RPO for the database
  – Public network has unpredictable bandwidth & latency
  – High bandwidth Cloud-Connect options such as Oracle FastConnect to cloud storage

• All RMAN backup & recovery best practices apply
  – **Incremental Strategy**: Weekly full, Daily Incrementals + Archivelog
  – For non-archivelog Databases: Full backups
Use Cases for Backups in Oracle Cloud

- Database Migration to Oracle Cloud
- Create a DR instance in the Oracle cloud with periodic updates from backups

- Create test & dev instances in the Oracle Cloud
- Create a Data Guard Standby instance in the Oracle cloud
Graphical User Interface by CloudBerry Lab

(Oracle Partner)
CloudBerry Backup for Oracle Databases

Back up your Oracle Database directly to Oracle Database Backup Cloud with an easy to use GUI application leveraging RMAN & Backup Module

Centralized Backup Management
- Centralized management for all your databases
- Database servers are configured with RMAN Backup Module to Oracle Cloud
- Specify tags to identify backups
- Cloudberry sends RMAN commands to the database server

Schedule Backups:
- Setup schedules for automatic backup
- Choose the mode best suited for you

Monitor & Manage Backups
- Search backup data in the cloud with tag and date.
- Delete previous backups.
- View percent of data being transferred and network speeds
- Remembers configuration for reuse.
CloudBerry GUI application

- Dashboard
- Schedule Backup
- Transfer Monitoring
- List of Backups

http://www.cloudberrylab.com/oracle-db-backup-software.aspx
## Oracle Database Backup Cloud Service: Value Proposition

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offsite backup location to protect from disasters and for regulatory requirements</td>
<td>No CAPEX and low OPEX cloud storage and no licensing for encryption &amp; compression</td>
</tr>
<tr>
<td>Additional (long-term) secured copy in the cloud for creating sandbox environments</td>
<td>24x7 accessibility to the backup data</td>
</tr>
</tbody>
</table>
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Cloud-Based Disaster Recovery: Requirements

• Enterprises that do not have a DR site
  – Cannot afford CAPEX for deploying an on-prem DR site
  – Want low OPEX DR site with no active management
  – Offsite copy for regulatory & compliance reasons
  – Want a lower RTO / RPO

• Enterprises that already have a DR site
  – Want to reduce cost by migrating DR site to cloud
  – Want to have a sandbox environment in the cloud
  – Additional copy in the cloud (offsite)
  – Want on-demand commission & de-commission of DR site
Disaster Recovery Solution Using Oracle Cloud

Using (Active) Data Guard

• Production: On-Premises
• Standby: Oracle Cloud
  – General Purpose DBaaS (or) Exadata Cloud Service
• (Active) Data Guard replication
• MAA Best Practices
• Currently a Manual Process
  – White paper published
  – Automation planned

# DR To Cloud: Complete Life Cycle

## Provisioning Steps
- **Oracle Database Cloud Service Subscription**
  - General Purpose DBaaS, Exadata Cloud
- **Secure Network Configuration**
  - **Access**: SSH/NAT IP/Port Forwarding
  - **Security**: Oracle Net encryption/TDE (optional)
    - Oracle Net encryption
    - VPN connectivity for Exadata Cloud Service
- **Standby Instantiation in Oracle Cloud**
  - Duplicate from Source (or)
  - From Database Backup Cloud Service

## Steady State / DR / Additional Steps
- **Configuration best practices**
  - Throughput: MAA Best Practices
- **Monitoring & Management**
  - Transport (RPO) and apply (RTO) lag
- **Role Transitions**
  - Switchover / Switchback
  - Failover / Failback
- **Using Cloud Standby for**
  - Reporting, cloning etc.
## Database / Platform Support Matrix

<table>
<thead>
<tr>
<th>Operating System</th>
<th>On-Premises</th>
<th>Database Cloud Service</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Linux, Windows or Solaris X86 (64-bit)</td>
<td><strong>Oracle Enterprise Linux (64-bit)</strong></td>
</tr>
</tbody>
</table>
| Oracle Database  | Oracle Database Enterprise Edition 11.2.0.4 (64-bit) (or) Oracle Database Enterprise Edition 12.1.0.2 (64-bit) | **Data Guard** Database as a Service (or) Virtual Image: Enterprise, High Performance and Extreme Performance editions
**Active Data Guard** Database as a Service (or) Virtual Image: Extreme Performance Edition (or) Exadata Cloud Service |
| Database Size    | Any size | **DBaaS: 2.3TB with backups** *
**DBaaS: 5TB without backups** *
**Exadata Service: Any size** |

* Size may increase in the future
DR To Cloud: Deployment Options

**Over Public Internet**
- On-Premises Production
- Standby in Oracle Cloud (DBaaS)
- Secured data transmission over public internet
- Unpredictable latency / low bandwidth

**Using Oracle Fast Connect**
- Production co-located in Equinix Data Center
- Standby in Exadata Cloud Service
- Oracle Fast Connect provides a shared 10gigE network
- Predictable latency / High bandwidth
## Network Deployment Options: Comparison

<table>
<thead>
<tr>
<th></th>
<th>Public Internet</th>
<th>Oracle Fast Connect</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Production Database</strong></td>
<td>On-Premises</td>
<td>Equinix Data Center (Metro)</td>
</tr>
<tr>
<td><strong>Standby Database</strong></td>
<td>General Purpose DBaaS</td>
<td>Oracle Database Exadata Cloud Service</td>
</tr>
<tr>
<td></td>
<td>Exadata Cloud Service</td>
<td></td>
</tr>
<tr>
<td><strong>Throughput observed</strong></td>
<td>Up to 20MB/sec*</td>
<td>From 100MB/sec – 600MB/sec*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Standby Instantiation: 5-60x faster)</td>
</tr>
<tr>
<td><strong>Latency</strong></td>
<td>Unpredictable</td>
<td>&lt; 5ms</td>
</tr>
<tr>
<td><strong>Replication Mode</strong></td>
<td>Asynchronous</td>
<td>Synchronous or Asynchronous</td>
</tr>
<tr>
<td><strong>Recommended</strong></td>
<td>Good for most OLTP workload</td>
<td>High volume transactions, DW,</td>
</tr>
<tr>
<td><strong>Recommended Workloads</strong></td>
<td></td>
<td>Consolidation with low RPO</td>
</tr>
</tbody>
</table>

**Your experience may vary depending on network, client, size of database, change rate etc.**
DR to Oracle Cloud: Value Propositions

- Zero CAPEX, elastic provisioning of DR site with low RTO & RPO
- High ROI – utilize DR copy for reporting and test
- Satisfy compliance & regulatory requirements for an off-site copy
- Scale DR for database consolidation and high volume apps using Cloud Connect Options
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Our Leading Interconnection Platform **Accelerates Your Business**

The leading, global interconnection platform

**Global Data Centers**
- 100+ Data Centers
- 33 Metros
- 11M+ Square Feet
- Green by Design

**Interconnection Solutions**
- 160,000+ Cross Connects
- Cloud Exchange™
- Performance Hub™
- Internet Exchange
- 100% of Tier 1 Network Routes

**Business Ecosystems**
- 6,250+ Businesses
- Equinix Marketplace™
- Revenue Opportunities

**Proven Expertise**
- 99.9999% Uptime Record
- World Class Partners
- Solution Design and Validation
- Professional Services

The global interconnection platform for the world’s leading businesses.
Why is a data center company talking during a cloud session?

Because…

Oracle Cloud uses Equinix data centers

Equinix is an Oracle customer

Equinix is partner & enabler of Oracle Fast Connect
## Relevant Use Cases for Equinix IT in Oracle Cloud

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Use Cases</strong></td>
<td><strong>Active – Standby DB Replication</strong></td>
<td><strong>Active – Active DB Replication</strong></td>
</tr>
<tr>
<td>DB Backup in cloud</td>
<td>Offload reads to Cloud DB</td>
<td>Big Data &amp; IoT service</td>
</tr>
<tr>
<td>DR from cloud backup</td>
<td>Mobile &amp; BI service on Cloud DB</td>
<td>Multi-cloud</td>
</tr>
<tr>
<td>Dev / Test in cloud</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Challenges**

- Limited throughput and unpredictable latency

**Solution**

Oracle Fast Connect using Equinix Cloud Exchange (ECX)

**Benefits**

- Agility
- Flexibility of Hybrid IT
- Better TCO
- Lower RTO & RPO
- Globally scalable
- Multi-cloud
Oracle Fast Connect via ECX (Equinix Cloud Exchange)
Provides agile, secure, instant interconnection to cloud services

Use case examples

**PaaS Services:**
- Database Backup
- Big Data Service
- Exadata Service

**IaaS Services:**
- Object Storage
- Compute
Test with Oracle Fast Connect over ECX with Equinix IT as a Customer

**GOAL**: Test latency, throughput and predictability of connectivity over ECX vs. Internet

- **Ethernet to 2*10G redundant ports on ECX**
- A vs. B effective path

---

**Equinix IT**

- **Private Cloud**
  - **VM with Oracle DB**
  - **Network Address Translation (NAT)**
  - **Oracle public IP Address Space**

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**Oracle Public Cloud**

- **Internet**
  - **Customer public IP Address Space**
  - **Equinix IT Internet connectivity – 1Gbps**

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**Equinix Chicago Metro**

- **Compute Service**
- **DB Backup Service**

---
## Test Results - Oracle Fast Connect over ECX

### Database Backup Service
Test Scenario: Database size: ~1TB, Backup Datasets: ~250GB, # of threads: 15, Connectivity Details - Internet bandwidth: 1 Gbps, ECX Bandwidth: 1 & 10Gbps

<table>
<thead>
<tr>
<th>Test</th>
<th>Internet (1 Gbps)</th>
<th>ECX (1 Gbps)</th>
<th>ECX (10 Gbps)</th>
<th>ECX Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backup Time</td>
<td>6.5 hours</td>
<td>41 minutes</td>
<td>26 minutes</td>
<td>Up to 6+ hrs. faster</td>
</tr>
<tr>
<td>Backup Network Throughput</td>
<td>0.08 Gbits/sec</td>
<td>0.79 Gbits/sec</td>
<td>1.25 Gbits/sec</td>
<td>Up to 15x faster</td>
</tr>
<tr>
<td>Restore Time</td>
<td>4 hours</td>
<td>39 minutes</td>
<td>24 minutes</td>
<td>Up to 3.5+ hrs. faster</td>
</tr>
<tr>
<td>Restore Network Throughput</td>
<td>0.14 Gbits/sec</td>
<td>0.84 Gbits/sec</td>
<td>1.36 Gbits/sec</td>
<td>Up to 9.7x faster</td>
</tr>
</tbody>
</table>

### Compute Service
Test Scenario: # of threads: 15, Connectivity Details - Internet bandwidth: 1 Gbps, ECX Bandwidth: 1 & 10Gbps

<table>
<thead>
<tr>
<th>Test</th>
<th>Internet (1 Gbps)</th>
<th>ECX (1 Gbps)</th>
<th>ECX (10 Gbps)</th>
<th>ECX Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network Throughput (iperf3 –P 15)</td>
<td>0.08 Gbits/sec</td>
<td>0.999 Gbits/sec</td>
<td>5.42 Gbits/sec</td>
<td>Up to 60x faster</td>
</tr>
<tr>
<td>Latency (ping avg)</td>
<td>3.6 ms</td>
<td>2.6 ms</td>
<td></td>
<td>27% less latency</td>
</tr>
<tr>
<td>Hops (traceroute)</td>
<td>15</td>
<td>9</td>
<td></td>
<td>40% more direct path</td>
</tr>
</tbody>
</table>

Above results were collected across multiple samples at different times. Actual customer’s results will depend upon source & destination locations and the connectivity between those locations.
Lessons Learned

1. **Bottlenecks are everywhere:**
   
   End – End throughput is as fast as the slowest pipe in the pipeline.

   Increased network throughput by using Fast Connect will expose other bottlenecks – sometimes by design…

2. **Think parallel:**
   
   Fat pipes mean multiple services are simultaneously accessible using Oracle Fast Connect.

3. **Location matters:**
   
   Location matters especially for latency and throughput sensitive IaaS / PaaS workloads
For more details visit www.equinix.com/partners/oracle/
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Oracle Database Cloud – Editions

**Standard Edition 2**
- Full database instance
- Limited to 16 OCPUs
- Block (Local) & Database Backup Service

**Enterprise Edition**
- Adds...
  - Transparent Data Encryption
  - All standard EE features
  - Data Guard*

**EE High Performance**
- Adds...
  - Multitenant
  - Partitioning
  - Advanced Compression
  - Real Application Testing

**EE Extreme Performance**
- Adds...
  - RAC & RAC One Node
  - In Memory
  - Active Data Guard*

* Available soon

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Exadata Service: Complete, Compatible, Secure, Available, Scalable
37 Years of Database Innovation - Proven at Millions of Mission Critical Deployments

All Oracle Database Innovations

- Multitenant
- In Memory Database
- Real Application Clusters
- Active Data Guard
- Backup & Recovery
- Advanced Compression
- Real Application Testing
- OLAP, Analytics, Spatial and Graph Management Packs

All Exadata Machine Innovations

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

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Backup & Recovery in the Cloud: Oracle DBaaS

- **DBaaS Backup Options**
  - Block Only (local FRA)
  - Block (FRA) + Object Storage (Cloud Backup)
  - None (No Backups)

- **Automated RMAN backups**
  - Weekly Full
  - Daily Incremental
  - 7 days on local + 30 days on object storage

- **Manual RMAN backups**
  $ /var/opt/oracle/bkup_api/bkup_api bkup_start

- **On-demand full / PIT recovery**
  $ dbaascli orec --args -pitr TAG20150916T153521

- **Similar B&R for the Exadata Cloud Service**

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https://docs.oracle.com/cloud/latest/dbcs_dbaas/CSDBI/GUID-0864AA36-8FE4-4D62-9F18-A0550D4BC89B.htm#CSDBI3342
Oracle SaaS: High Availability Architecture

Complete Oracle MAA Implementation

• Protection for Database Tier
  – Active Data Guard DR
  – RMAN, Flashback
  – RAC for Server Availability
  – ASM for Storage

• Protection for Middle Tier
  – ZFS Replication
  – Multiple VMs for server failover

• Site Guard for planned/unplanned failover orchestration between sites
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ON2641:
SEI Accelerates Development & Testing with Oracle Public Cloud
Oracle technologies in scope > Getting Data to the Cloud

› **Oracle Database Backup Service (ODBS)** *(available on Oracle Cloud)*
  Oracle Database Backup Service is a secure, scalable, on-demand solution for storing Oracle Database backups in Oracle Cloud. Oracle databases are backed up to Oracle Database Backup Service using the Oracle Database Cloud Backup Module. This is foundational service such that DG & GG below make use of this service at least once for the initial setup of a replica of the on premise database.

› **Data Guard (DG)** *(available across Hybrid Oracle Cloud)*
  Oracle Data Guard ensures data replication to the Cloud and facilitates sync of Test master on premise with that on the Cloud. This replicates the entire CDB database as a unit.

› **Lift & Shift PDB (OEM)** *(available across Hybrid Oracle Cloud)*
  Copy a PDB from on-prem to Oracle Cloud vice-versa

› **Golden Gate (GG)** *(available by Dec-15)*
  Low-impact, real-time change data capture, distribution, and delivery for transactional data across heterogeneous systems for continuous availability, zero downtime migration, and business intelligence. This solution has the advantage of reducing the data movement footprint to the bare essentials.
Option # 1 > RMAN Sync job on-prem Test Master to Cloud

One Full level 0 backup followed by incremental 1 – the cloud database will be maintained in mounted state to apply delta changes from the on-prem to Test Master on the cloud – this ensures that there is complete copy in the cloud that has all the DDL, Structure, data changes in sync with on-prem on a daily basis.
Option # 2 > Data Guard to sync up on-prem Test Master to Cloud

This is similar to the option # 1, just that Data Guard can continue to accept incremental changes from the on-prem to Test Master on the cloud – this ensures that there is complete copy in the cloud that has all the DDL, Structure, data changes in sync with on-prem on a daily basis
Bringing it all together
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Hybrid & In the Cloud: Future HA/DR Enhancements

**Database Backup Service**
- Geo Replication
- Integration with Archive Service, OSCS Appliance
- Enterprise Manager Integration
- More 3rd party backup software integration
- Enable more use cases with cloud backups

**DR to Cloud**
- Complete DR to Cloud Automation
- Full-Stack DR
- High bandwidth connectivity options

**In the Cloud**
- (Active) Data Guard in the cloud
- Database Cloning
- Simplified HA/DR Management
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Oracle Cloud for High Availability

High Availability and Disaster Recovery for Oracle Public and Hybrid Clouds

✓ Comprehensive Data Protection capabilities for on-premises & cloud databases
✓ Oracle Cloud provides IaaS, PaaS and SaaS across the application and database stacks
✓ Seamless Hybrid Cloud deployment between your on-premises and Oracle Cloud using Public Network or Oracle Fast Connect
✓ Use your data in the cloud for a wide variety of use cases - DR, sandbox, reporting
✓ Many architecture and management enhancements in pipeline
Reference

• Oracle Database Backup Service
  https://cloud.oracle.com/database_backup (Click under Learn More for all collateral)

• DR to Cloud White Paper

• Oracle Database Cloud Service
  https://cloud.oracle.com/database

• Maximum Availability Architecture
  http://oracle.com/goto/maa
Integrated Cloud
Applications & Platform Services