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ORACLE[®] Autonomous Database Cloud



Implementing a Hybrid Cloud

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Agenda

- Hybrid Cloud Overview
- 2 Scenario 1: On-Prem with Oracle Cloud
- ³ Connectivity to the Cloud
- Scenario 2: Cloud to Cloud in place

5 Extras



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Public Cloud





Constraints Preventing Consumption of Public Cloud

Data Sovereignty

- Comply with regulatory, legal and privacy requirements
- Sensitive data on premises
- Custom security standards

Control

- Keep control over business-critical systems
- Use your own firewalls, load balancers, hardware VPNs, etc.
- Extremely high SLAs

Latency

- Connect with backend mainframes, databases, ERPs, etc. with near zero latency
- Dedicated
 infrastructure offers
 lower latency



Oracle Platform as a Service Strategy Oracle Database Cloud Architecture for the Hybrid Cloud







Same Architecture Same Software Same skills



Oracle Cloud



Oracle Cloud On-Premises Strategy

- Provide users the <u>choice</u> to deploy Oracle Cloud on their premises
- Offer the <u>same</u> PaaS and IaaS services, same software stack, same user experience, same cloud operations model, same commercial model across public and on-premises cloud
- Allow customers to easily <u>move</u> their Oracle and non-Oracle workloads between public and private cloud based on their business needs
- Satisfy on-premises control, governance, performance, and <u>security</u> requirements

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What is an Ideal On-Premises Cloud Solution?

- A self-contained cloud on premises
- Portability of workload across on-premises and public
- Same behavior of application on-premises or public cloud
- Single point of accountability
- Delivered and consumed as a service even on premises



Oracle Cloud @ Customer

Complete deployment choice



- Oracle Cloud operated and delivered as a service behind your firewall
- Same PaaS and IaaS software, same updates as Oracle Cloud
- Same cost-effective subscription pricing model as Oracle Cloud
- Conforms to regulatory, privacy, legal, and business requirements



Choice of Deployment Models



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On-Premise Applications to Oracle Cloud





Oracle Database Cloud for Backup and Disaster Recovery



- Backup Oracle database from onpremises to Oracle Cloud
- Uses the same rman tools
- Leverage Oracle Cloud for secure off-site backup and disaster recovery
- Restore backups to provision an Oracle database in Oracle Cloud



Uses for Database Backup Cloud and Storage Cloud Services

	Database Backup Cloud Service	OCI Object Storage	OCI Archive Storage
Oracle Database Backups	\checkmark		
Non-Oracle Database Backups		\checkmark	\checkmark
VM Image Backups		\checkmark	
General Purpose Backups		\checkmark	\checkmark
Cold Storage for Dormant Data / Long Term Archive			\checkmark
Compliance Data	\checkmark		\checkmark
Storage for Dev / Test or QA	\checkmark	\checkmark	
General Purpose Storage for Unstructured Data		\checkmark	
Off-site Disaster Recovery Storage	\checkmark	\checkmark	\checkmark
Big Data Storage		\checkmark	\checkmark



Oracle Database Cloud for Backup and Disaster Recovery

Database Sandboxes



- Ship database redo logs from onpremises, apply in Oracle Cloud using Active Data Guard
- Use standby database in Oracle Cloud for disaster recovery and read-only operations
- Offload backups and reporting to standby database in Oracle Cloud
- Clone standby databases for analysis sandboxes

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DR to Cloud using Passive Standby

Data Guard Replication (for low-cost replication)



www.oracle.com/technetwork/database/availability/dr-to-oracle-cloud-2615770.pdf

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Hybrid DR (replication

based)

DR to Cloud using Active Standby

Active Data Guard Replication (for higher ROI)



*Active Data Guard requires Database Cloud Extreme Performance, Exadata Cloud or Exadata Cloud at Customer

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DR to Cloud for Zero Data Loss & Zero App Outage

Active Data Guard plus GoldenGate Cloud Service





Active Data Guard and GoldenGate Cloud Service Complementary Solutions Often Used Together

Active Data Guard: Disaster Recovery and Data Protection

- High-performance, simple, physical replication for HA and DR
- Zero data loss, unique corruption protection, automatic failover, offload read workloads
- Disaster recovery for all data types, applications and workloads

GoldenGate: Flexible HA, Maintenance and Migrations, Real-time Data Integration

- Logical replication enables greater flexibility; fully utilize all databases
- Enable minimal / zero downtime database maintenance and platform migrations
- Heterogeneous platforms, bi-directional replication, multiple topologies

Oracle GoldenGate Slide





Okay, So What About the Application Tier ?

Full Stack DR

- Requirements
 - Application stack co-located with database stack
 - Low latency requirements due to chatty nature of applications
- Oracle Cloud IaaS / PaaS
 - DBaaS / Exadata Cloud for the Database Tier
 - Compute or Dedicated Compute for the application tier (Application binaries are installed)
- DR options
 - 1. DR using backups
 - 2. DR using replication





Full Stack DR to Cloud with Periodic Updates Using Backups

- Database Tier
 - Periodically send on-premises database backups
 - Using Oracle Database Backup Cloud Service
- Application Tier
 - Periodically copy on-premises application data to Oracle Storage Cloud Service (object storage)
 - Using JAVA, REST, OSCS Appliance
- In a DR situation
 - Restore the database in the cloud (DBaaS / Exadata Cloud Service) from the backup
 - Restore the data into the compute cloud from the object storage



On-Premises (Production)

Oracle Public Cloud (DR Site)

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Full Stack DR to Cloud with Minimal Downtime or Data Loss

Using Data Replication

- On Premises
 - Application Tier: Periodic data from the application stack is copied into the database's DBFS using *rsync*
 - Database Tier: Replicate database using (Active) Data Guard to the cloud which also replicates DBFS data
- In the Cloud
 - Database Tier: DBFS has the latest data from the last from the standby
 - Application Tier: Periodically copy DBFS data into the compute stack using *rsync*
- During Failover / Switchover
 - Using Data Guard, bring up the standby database in the cloud and then copy DBFS data to the compute
 - Using Active Data Guard, periodically copy DBFS data out of standby database into compute in the cloud
 - Ideal for infrequent app data changes



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Bringing it all together: Hybrid Cloud Management

Single view of on-premises and Oracle Cloud Clone or move workloads between Oracle Cloud and on-premises



Single Management Tool for On Premises and Public Cloud 100% reuse EM management practices



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Oracle Apps Unlimited on Oracle IaaS



- Rapid provisioning of new application environment for dev/test or demo
 - Pre-configured entire application environment ready to deploy from point of download
- Migrate Dev/ test applications from on-premises to cloud
- Test new products on existing data cloned to the cloud
- Validate migration, application workload to run on Oracle Database 19c
 - End-to-end test
 - Performance validation: stress/load testing
- Development Tools Image for customizations on the cloud

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Oracle Integration Cloud Service (ICS)





Oracle Applications, SAP, customer, legacy...

ON PREMISES

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What it Does

- Designed for SaaS
- Integrates applications across clouds and on-premises
- Key Features
 - Easy to use for LOB/Apps IT and IT developed integration
 - Prebuilt integrations for common scenarios
 - Recommendations to guide mapping
 - **Automated** provisioning, back-up, patch updates, and upgrades
 - Rich Library of **adapters/APIs** for Oracle and third party applications
 - Secure On-premise integration using lightweight agent

Benefits

- Faster integration of applications
- Increased business agility
- Lower cost of ownership

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Connectivity Challenges

Security

Scalability

Latency

High Availability

Performance

- How Businesses can protect their data?
- How to maintain and manage many secure connections to the various VCNs?
- Applications require consistent and very low latency
- Continuous availability of workloads under all conditions and scenarios
- Heavy usage and network congestion



VPN – IPSec (Dynamic Routing Gateway)

Summary:

- Connect an on-premises network to a virtual cloud network (VCN) with an point-to-point IPSec VPN.
 IPSec (IP Security) encrypts the entire IP traffic before the packets are transferred from the source to the destination.
- On the customer side a dedicated data center device is used to connect (CPE)
- On the Oracle side a Dynamic Routing Gateway must be provisioned

Customer Benefit:

- Public telecommunication lines are used to transmit data, so dedicated, expensive lease lines from one site to another aren't necessary.
- The internal IP addresses of the participating networks and nodes are hidden from external users.
- The entire communication between the source and destination sites is encrypted, significantly lowering the chances of information theft.



FastConnect (Dynamic Routing Gateway)

Summary:

FastConnect provides an easy, elastic, and economical way to create a dedicated and private connection with higher bandwidth options, and a more reliable and consistent networking experience when compared to internet-based connections.

- Private peering: To extend your existing infrastructure into a virtual cloud network (VCN) in Oracle Cloud Infrastructure
- Public peering: To access public services in Oracle Cloud Infrastructure without using the internet.

Customer Benefit:

- **Reliability** Uses a dedicated and pre-established path to Oracle Cloud, backed by our SLA
- Scalability More consistent network performance and low latency
- Private Connectivity Improve privacy because data traffic flows strictly over trusted endpoints
- **Predictable and Economical** Low pricing and no inbound or outbound bandwidth charges



Local VCN Peering (Local Peering Gateway)

Summary:

Oracle Cloud Infrastructure supports peering between two VCNs that are in the same region, and in the same tenancy (whether they are in the same compartment or not), or in different tenancies.

Customer Benefit:

Increased capabilities to deploy separate VCNs for separate governance boundaries.

For example:

- Business units can choose to share resources, without having to give each other full access to their networks
- Companies can use peering to give access to shared resources, such as logs, on a shared (hub) VCN.



Remote VCN Peering (Dynamic Routing Gateway)

Summary:

Remote VCN peering is the process of connecting two VCNs in different regions (but the same tenancy), routing the traffic over a private network.

- This is currently enabled between:
- Ashburn (IAD) and Phoenix (PHX)
- London, UK (LHR) and Frankfurt, Germany (FRA)

In the near term we'll add peering between:

- Ashburn, US (IAD) and Frankfurt, Germany (FRA)
- Ashburn, US (IAD) and London, UK (LHR)
- Phoenix, US (PHX) and Frankfurt, Germany (FRA)

- Phoenix, US (PHX) and London, UK (LHR)

Customer Benefit:

The peering allows disparate VCNs' resources to communicate using private IP addresses without routing the traffic over the internet or through an onpremises network.

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Extras



AWS – OCI Connectivity Using Libreswan VM on AWS*





AWS – OCI Connectivity via Megaport Logical Connectivity – L3



Demo available on Confluence (Demo Section)



Overview

Cloud Native

Technologies "to build and run scalable apps in public, private and hybrid clouds"

- ✓ Enable agile deployment
- ✓ Use and scale resources more efficiently
- ✓ Develop portable apps, reduce lock-in
- ✓ Use preferred languages / frameworks
- Examples:
 - Light-weight containers for microservices
 - Automation with infrastructure as code (IaC)
 - Streaming for real-time data processing
 - Functions (Fn Project) for serverless apps

Cloud Native Tools



Docker is the de-facto technology to create, manage and run containers



Kubernetes is the leading solution for container orchestration



Terraform is an infrastructure-as-code tool to provision and update resources



Fn Project is an Oracle-led serverless framework that can run anywhere

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How Containers and Cloud Native Are Used

- Develop new, more scalable applications
- Re-factor / re-write existing apps
- Develop multiple microservices instead of monolithic apps
- Move apps to cloud in a portable manner
- Develop serverless apps which require containers to be spun up / down rapidly











Oracle Cloud Native Services Are Open



Unmodified Codebase

- No lock-In
- Portability for on-premises and 3rd party clouds

Application

Linux Cloud Native Environment



Cloud Native Services



Cloud Native Framework

- Container-based app portability
- Lift and shift migrations
- Reusable Terraform configurations

Interoperable & Open

- Interoperate with container services on 3rd parties
- Utilize existing DevOps and development tools

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Oracle Cloud Native Services





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Oracle Database on Docker

- Docker container contains single-PDB CDB
- PDB can be plugged, unplugged, etc.
- PDB can move bi-directional





Oracle Cloud and Docker Containers

Oracle Cloud Infrastructure



OKE – Oracle Container Engine for Kubernetes

Participation Pathboard Participation Pariton

Application Container CS





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Discussion.... Gotchas

- 1. Consistency across the
- 2. Same UI, CLI, APIs
- 3. Same



Small Change

Small but important...





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Integrated Cloud Applications & Platform Services



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