ORACLE

So you want to run your Oracle Database in the cloud?

NYOUG May 2022

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sean-stacey-oracle

Let's take a quick look at Oracle's public cloud

Built modern SaaS versions of
all our major business applications

Brand-new cloud infrastructure platform
with 80+ unique services

The most flexible approach to the cloud:
public cloud, your data center, at the edge

Only cloud provider offering
financially backed, end-to-end SLAs

Your success in the cloud is our priority

Cloud Lift: Free assistance for migrating to OCI

SOAR: Accelerate migrations to Oracle Fusion Cloud Applications

Programs to repurpose license/support spend into cloud subscriptions

200,000+ member community for Oracle Cloud Applications— transparent 12-month roadmaps

BYOL: Bring your Oracle licenses to any cloud platform

Guided journeys to automate customer onboarding with our cloud applications and infrastructure (coming soon)

The only infrastructure and applications cloud

Oracle Cloud Applications / Oracle Applications					Third Party Applications	
ERP Enterprise Resource Planning	**SCM** Supply Chain Management	**HCM** Human Capital Management	**ACX** Advertising and Customer Experience	**IA** Industry Applications	**ISV** Packaged Applications	**CUS** Custom and Open Source Applications

Developer Services	Containers and Functions	Application Integration	Analytics and BI	Machine Learning and AI	Data Lakehouse
Compute	Storage	Networking	Oracle Databases	Open Source Databases	OS, Native VMWare

Security | Observability and Management | Compliance

Global Cloud Datacenter Infrastructure

Commercial and Government Public Cloud Regions | Hybrid Cloud: Cloud@Customer, Dedicated Regions, Roving Edge

Oracle Cloud Infrastructure Global Locations

Stockholm
Amsterdam
Frankfurt
Montreal
London
Israel 2
Toronto
Newport
Zurich
Saudi 2
Dubai
Mumbai
Chuncheon
Chicago
Jerusalem
Hyderabad
San Jose
Spain
Milan
Ashburn
Vinhedo
Marseille
Abu Dhabi
Seoul
Phoenix
France 2
Jeddah
Tokyo
Colombia
Singapore
Osaka
Sao Paulo
Mexico
Santiago
Chile 2
Johannesburg
Melbourne
Sydney

May 2022

**37 regions**; 7 more planned by end of 2022

11 Azure Interconnect Regions

- ■ Commercial
- □ Commercial Planned
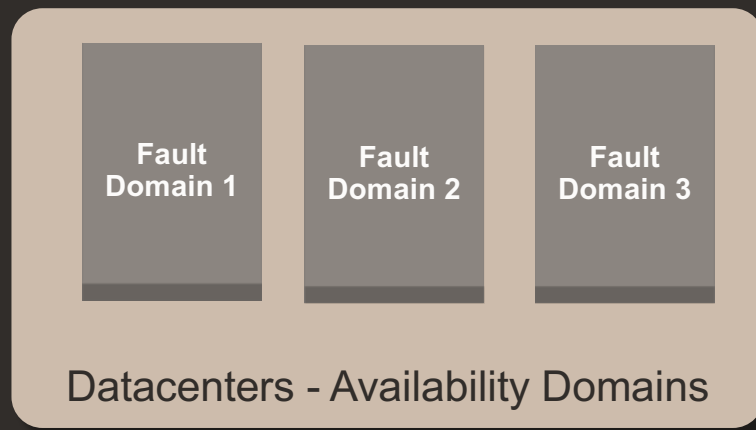- ■ Government
- ⊞ Microsoft Interconnect Azure

Inside a Region – High Availability Building Blocks

- Availability Domains are fault-de-correlated data centers

- < 500µs one-way latency between Availability Domains

- High Availability for traditional and cloud-native applications

Governance

Services

Virtual Layer

Physical Layer

AD1 ——— AD2 ——— AD3

Datacenters - Availability Domains
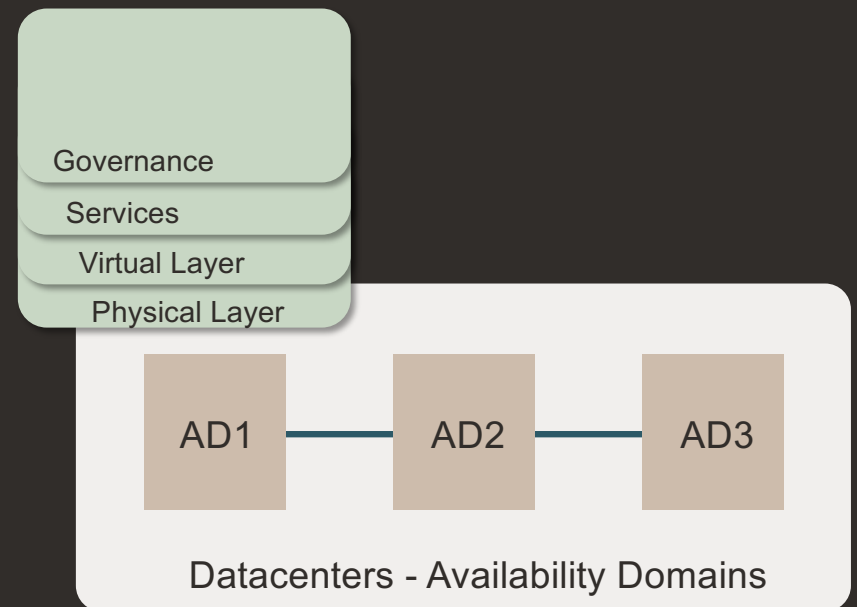
Inside an AD: Fault Domains

| Fault Domain 1 | Fault Domain 2 | Fault Domain 3 |

Datacenters - Availability Domains

- Fault Domains provide Isolation within the AD
- Ensures that servers run on different physical hardware
- Maintenance will only affect 1 FD in an AD
- Reboot Migration allows the customer to define their impact
- RAC used a similar concept and is moving to FD

https://blogs.oracle.com/cloud-infrastructure/introducing-fault-domains-for-virtual-machine-and-bare-metal-instances

Fast and predictable physical network infrastructure

- Non-oversubscribed network
- Flat network speeds traffic by reducing the switches between any two hosts
- High speed interconnects: 2 x 50Gbps bandwidth
- Predictable, low latency < 100µs expected one-way latency between hosts in an AD, <500µs between ADs
- The only cloud network performance SLA

Governance

Services

Virtual Layer

Physical Layer

Datacenters - Availability Domains
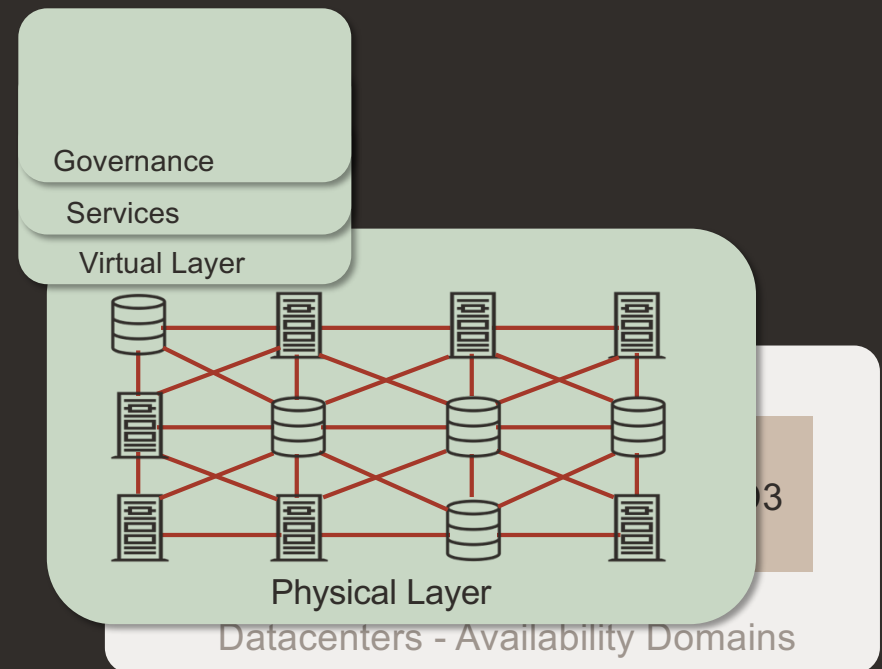
Oracle Database Platform
One Database, Deploy Anywhere

Developers
- *Popular languages, APIs, tools*
- *Run any workload*
- *Data integration*

Oracle Database
(Core Capabilities)

Analysts & Ops
- *Standard SQL across all data*
- *Fewer technologies to manage*
- *Lower Cost*

| Traditional Hardware | Exadata | Oracle Cloud | AWS/Azure/GCP |

Customer Choice & Portability

You Choose Where to Run Your Workloads

- Flexibility - a combination of private and public cloud environments

- Consistency - shared management, development models, security, and data integration

- Open - portability minimizes vendor lock in

On-Premise

Commodity Hardware

Engineered Hardware

Cloud@Customer

3rd Party Clouds
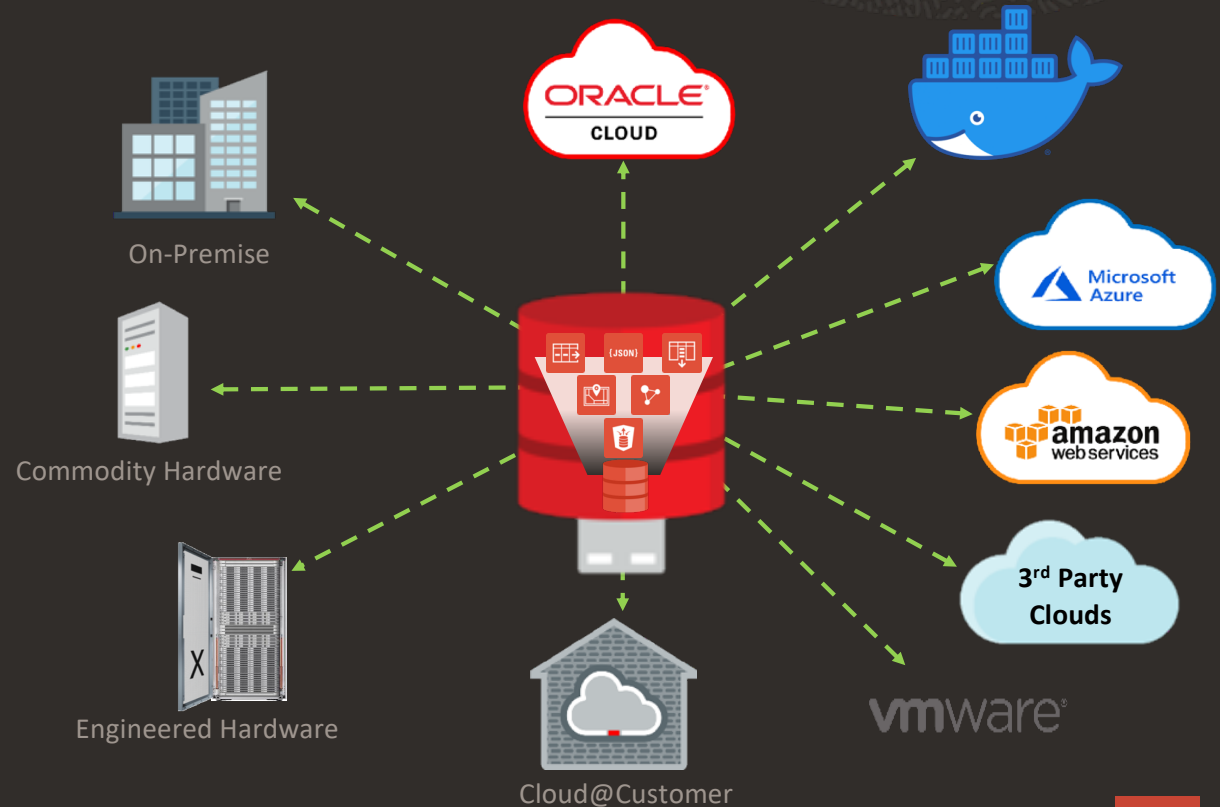
The Best Database on the Best Cloud Platform

- **Oracle Cloud** provides the best infrastructure for running your database workload.

- **Cloud simplicity:** automated provisioning, maintenance, and elasticity

- **Built-in high availability and redundancy** provide a trusted platform for running enterprise, mission critical workloads

- **Security first:** encrypted databases, secure communications, and private networks by default

- **Flexible Subscription Options** to meet your Licensing needs

- **100% compatible with your on-premises Oracle workloads** and applications: seamlessly move between the two platforms

Database Service portfolio in Oracle Cloud Infrastructure

Broad service offering at every scale to meet diverse business requirements

Shared

Dedicated

Enterprise or Standard Database Service

Exadata Database Service
Dedicated, fully elastic

Autonomous Database
Transaction Processing or Data Warehouse

Most Affordable	Highly Differentiated	Innovative
Co-Managed		Autonomous
Singular / Smaller Workloads	Extreme Performance, Availability with Massive Scale	

→ **Automation** →

Know Your Databases & Choose Wisely

Workload	Database Requirements	On-Prem *	Public Cloud **	OCI ***
Departmental	Small to Medium resource requirements (CPU, IO, Network), Single Instance DB RTO & RPO – Hours to Days	✔️	✔️	✔️
Enterprise Single Instance	Medium to High resource requirements (CPU, IO, Network), Single Instance DB RTO & RPO – Minutes - requiring HA Clustering and DR	✔️	✔️	✔️
Enterprise Business Critical RAC Enabled	Medium to High resource requirements (CPU, IO, Network), RAC DB or Exadata RTO & RPO - Seconds requiring RAC and DR	✔️	✖️	✔️
Enterprise Mission Critical RAC Enabled	High resource requirements (CPU, IO, Network), RAC / Exadata and/or Proprietary HW with RAC High - RTO & RPO - Zero Data Loss & Zero Downtime	✔️	✖️	✔️

* Suitable Deployment Options - Commodity HW, Dedicated HW, VM, Exadata, ExaCC, Unix

** Properly Size your IaaS environment based on your Public Cloud Vendor of Choice Best Practices

*** Suitable Deployment Options - ExaCC, Bare Metal, DBCS, ExaCS, Autonomous, Dedicated Region

Oracle Database Cloud Services

	IaaS	Database - VM	Exadata	Autonomous
Editions	BYOL	SE2, EE, HP, EP	EP	N/A
Implementation	Up to customer	1 Dedicated CDB	1+ Dedicated DBs	Serverless / Dedicated
Management	Customer	Customer	Customer	Oracle
Max DB size	1024 TB	40TB	464 TB	128TB
CPU range	1 – 52	1 – 24	1 – 100's	1 – 128
Storage	Block: Elastic per GB	Block: Elastic per GB	Exadata,Flash:Fixed	Exadata,Flash:Variable

IaaS – Roll your own database

Provision Compute → [**Allocate Compute** → **Allocate Storage** → **Provision OS** → **Set Keys & Privileges**] → **Install & Configure Database** → **Configure Backups** → **Configure Tools** → **Configure Access** → **Database Ready for Use**

Benefits

Reduced time and complexity to provision database services

Increased standardization of the "fleet"

Also use to deploy with Data Guard or Real Application Clusters (RAC)

Predictable Performance / No noisy neighbours

VM is your "own"

- VM CPUs are not shared
- Memory is not overprovisioned
- Network is dedicated

=> Your Workload on a VM will always have same performance

Servers are partitioned

- You can't grow CPUs
- Memory has a dependency on shape
- Network is limited
- No special Patches (but therefore same schedule as OnPremise)

=> Your Workload will be "capped"

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Virtual Machine Database Cloud Service Overview
A full instance of Oracle running in the cloud

Full database instance of Oracle

Choose from Standard Edition or Enterprise Editions

Highly available, network-attached storage volumes

Database Versions 12.2, 18c, 19c and 21c

Full database instance of Oracle

For Databases up to 40 TB in size

Supports Real Application Clusters and Data Guard

DBCS-VM

- Virtual Machine (1/2/4/8/16/24)
  - Block Storage Only (External Redundancy / 40 TB for DATA)
- Cluster stack always included
- Single Instance and RAC
- 1 CDB (multiple PDBs)
- TDE included (SE2), Enterprise Edition includes EM Packs
- Online Storage Scaling (UP not Down)
- Full Root Access
- Backup (OCI Bucket), Patching, Data Guard, Tooling
- Deployment integrated (Terraform, CLI, SDK)

Licensing is Different in the Cloud

Oracle Database License Included

- Choose from
  - Standard Edition, Enterprise Edition
  - Enterprise High Performance and Enterprise Extreme Performance
- *For customers who don't have existing Oracle licenses or want to leverage all the database options*

Bring Your Own License (BYOL) entitlements to the Database Cloud

- Standard or Enterprise Edition, add preferred DB Options currently used on-premises
- Enterprise Edition Licenses include entitlements for the following Oracle Database features
  - Data Masking and Subsetting Pack
  - Diagnostics Pack and Tuning Pack, Real Application Testing
- One Oracle Processor License maps to 2 OCPUs
- All Editions include Oracle Database Transparent Data Encryption.
- *For Customers who want to leverage their on-premises investment in Oracle*

Oracle Database Cloud Services: DBCS-VM

Standard	Enterprise	High Performance	Extreme Performance
	Adds all Enterprise Edition features	**Adds most Enterprise Edition options**	**Adds all Enterprise Edition options**
• Full database instance • Up to 16 OCPUs and 240GB of memory	• Flashback Database • Data Guard • Parallel Backup and Recovery • Virtual Private Database • Spatial • Graph • JSON • OLAP, Analytics and Machine Learning Algorithms	• Multitenant • Partitioning • Advanced Compression • Advanced Security • Label Security • Database Vault • Real Application Testing • Management Packs	• Real Application Clusters • Database In-Memory • Active Data Guard

All tablespaces are encrypted by default across all versions

Same Oracle database software as available on premises offered with consolidated editions

Disaster Recovery

Data Guard

- Can be setup any time
- Exact/known placement of Data Guard between ADs
- Data Guard within same AD or Region
- Network within Region allows for SYNC transport (not yet in API)
- Console supported Switchover/Failover
- Oracle Notification Service (ONS) always available to reduce Application Brownout
- Definable Services for Application Continuity in all Shapes

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Exadata Cloud Service

- Exadata Quarter/Half/Full Rack
- Multiple CDBs
- Only Enterprise Extreme Performance
- Online CPU Scaling (0 - 92 for a Quarter Rack)
- Full "Root" Access
- Backup (OCI Bucket), Patching, Data Guard, Tooling
- Deployment integrated (Terraform, CLI, SDK)
- Oracle patches Dom0 & Storage Cells (Rolling)

Exadata Cloud Service

- Pay as you go Subscriptions
  - Provision services as you need them
  - No upfront commitment
  - No minimum service period
  - Only charged for what you use

- Annual Subscriptions
  - Oracle Annual Cloud Credits
  - Can use any Oracle Cloud service (IaaS, PaaS)at any time in any region
  - Can be ramped up
  - Discounted pricing

- Per Second Billing
  - After the first 48 hours

Oracle Database Exadata Cloud Service

Exadata Specs	Base	X8 Quarter	X8 Half	X8 Full
CPU and Memory	CPU: 0 – 48 Memory: 720 GB	CPU: 0 – 100 Memory: 1440 GB	CPU: 0 – 200 Memory: 2880 GB	CPU: 0 – 400 Memory: 5760 GB
Compute/Storage Nodes	2/3	2/3	4/6	8/12
Storage Type	Exadata			
Flash Storage	38.4 TB	76.8 TB	153.6 TB	307.2 TB
Max DB Size	59.8 TB	119.8 TB	239.5 TB	479 TB
Scaling	CPU Scaling			
High Availability	RAC			
Backups	Automatic (Incremental) as well as On Demand (Full)			
Disaster Recovery	Data Guard			
Patching	User Controlled			
Versions	11.2,12.1, 12.2, 18c, 19c Extreme Performance Editions			
Licensing	BYOL or License Included			

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Autonomous Database Shared

- Predefined Services
- Runs on Exadata infrastructure (Full Rack)
- Auto scaling CPU and Storage
- No Root Access
- Public and Private Endpoints
- Patching / Backup done by Oracle
- Data Guard available
- Online CPU/Storage Scaling
- Automatic CPU Scaling

Oracle Autonomous Database supports a wide range of transactional and analytics workloads

Oracle Autonomous Data Warehouse

Analytical and machine learning workloads

62% lower
total cost of operations

Oracle Autonomous Transaction Processing

Business applications and mixed workloads

50X better storage latency
than Amazon Aurora

Oracle Autonomous JSON Database

Document database

30% cheaper
than MongoDB Atlas

Support multiple data models without sacrificing security and governance controls

Autonomous services automatically secure, tune, and scale your apps

| Automatic provisioning | Automatic configuration | Automatic encryption | Automatic online patching and updating | Automatic elastic scaling | Automatic tuning |

✓ Eliminates human labor ✓ Eliminates human error ✓ Eliminates downtime ✓ Eliminates scaling complexity ✓ Eliminates performance tuning

Autonomous Database - Dedicated

- Autonomous in your VCN
- Dedicated Hardware (Quarter Rack, Half Rack, Full Rack)
- More Control on Patching
- Access to multiple Pluggable Database Instances
- Mission Critical Setup (Across ADs with Zero Data Loss)

Autonomous Dedicated

**Autonomous Dedicated
Cloud@Customer**

Autonomous Database Summary
Database management simplified…

1 Auto-Provisioning
Automatically deploys mission-critical databases (RAC on Exadata infrastructure) which are fault-tolerant and highly available. Enables seamless scale-out, protection in case of a server failure and allows updates to be applied in a rolling fashion, while apps continue to run.

2 Auto-Configuration
Automatically configures the database to optimize for specific workloads. Everything from the memory configuration, the data formats, and access structures are optimized to improve performance. Customers can simply load data and go.

3 Auto-Indexing
Automatically monitors workload and detects missing indexes that could accelerate applications. It validates each index to ensure its benefit, before implementing it and uses machine learning to learn from its own mistakes.

4 Auto-Scaling
Automatically scales compute resources when needed by workload. All scaling occurs online, while the application continuously runs. Enables true pay per use.

5 Automated Data Protection
Automatically protect sensitive and regulated data in the database, all via a unified management console. Assess the security of your configuration, users, sensitive data, and unusual database activities.

6 Automated Security
Automatic encryption for the entire database, backups and all network connections. No access to OS or admin privileges prevents phishing attacks. Protects the system from both cloud operations and any malicious internal users.

7 Auto-Backups
Automatic daily backup of database or on-demand. Restore or recover a database to any point-in-time you specify in the last 60 days.

8 Auto-Patching
Automatically patch or upgrade with zero downtime. Applications continue to run as patching occurs in a round-robin fashion across RAC nodes or servers.

9 Automated Detection and Resolution
Using pattern recognition, hardware failures are automatically predicted without long timeouts. IOs are immediately redirected around unhealthy devices to avoid database hangs. Continuous monitoring for each database automatically generates service requests for any deviation.

10 Automatic Failover
Automatic failover with zero-data loss to standby. It's completely transparent to end-user applications.

Oracle Data Safe

Unified database security control center

- Risk dashboard: configuration, data, users
- Monitor user activity
- Mask data for test
- Extensible - more features to come…

Benefits

- ✓ No special expertise needed: click-and-secure
- ✓ Saves time and mitigates security risks
- ✓ Defense-in-depth security for all customers

Securing both your cloud and on-premises databases

Assess   Users   Audit   Discover   Mask
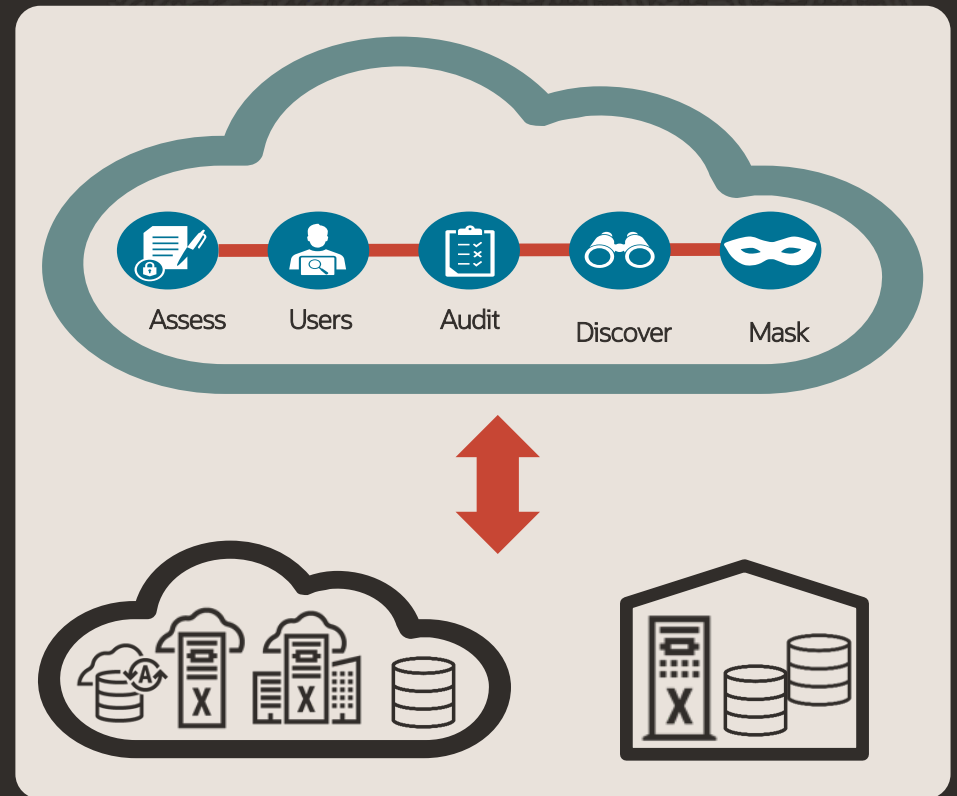
Tooling options

- OCI CLI (SDK / Terraform)
- Kubernetes Operators
- DBCS-VM: DBCLI
- Rest APIs
- ExaCS: DBAASAPI, DBAASCLI, EXACLI

Multicloud is the new normal

Different cloud providers bring unique strengths—choose the right cloud for the right job

Have additional capacity available when you need it

Eliminate single-source supplier risk

Improve resiliency

"Adopt a multicloud strategy to maximize access to technology choices and innovative best-of-breed capabilities, and reduce vendor concentration risks."

Gartner Research

Source: *Gartner Research, Innovation Insight for Multicloud Computing*
David Smith, Lydia Leong, 14 December 2020

The most complete support for hybrid cloud strategies

Oracle Public Regions

Hyperscale cloud regions in 37 worldwide locations

Dedicated Regions

All OCI services, running in customer data centers

Oracle Cloud VMware Solution

Native VMware on OCI in public cloud or dedicated regions

Exadata Cloud@Customer

Cloud Autonomous Databases, running in your data center

Roving Edge Infrastructure

OCI compute and storage for remote, disconnected scenarios

Worldwide or exactly where you need it, with scale and control

Rethinking *Integration* to Bridge your Hybrid Clouds
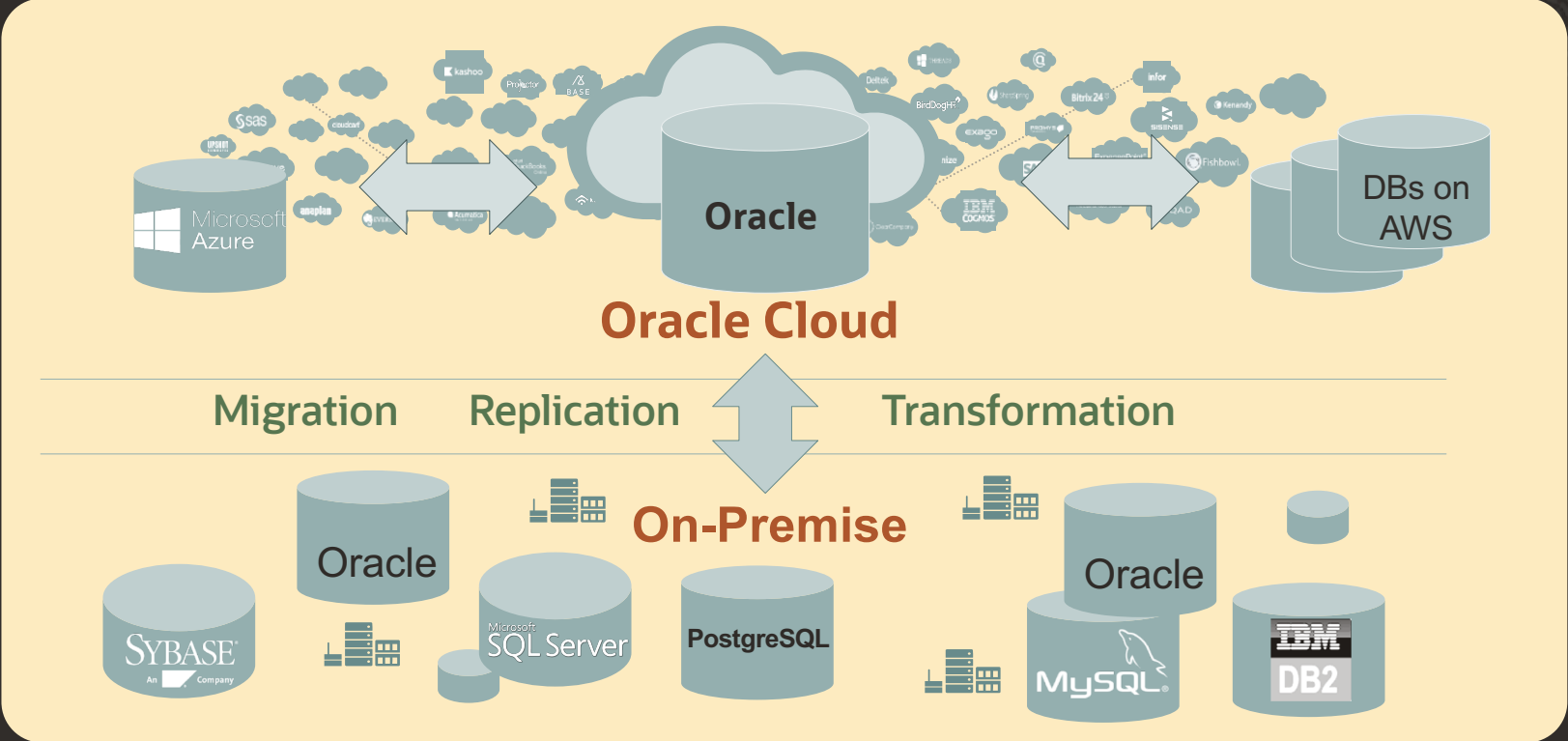
"Through 2022, integration work will account for 50% of the time and cost of building a digital platform."

- Gartner

Telecom Italia Mobile Brasil's multicloud strategy

Business challenges

TIM

Deliver excellent customer service by upgrading and consolidating primary customer-facing systems

Simplify management of IT infrastructure and reduce carbon emissions

Strategy

Move 100% of their workloads to the cloud—50% on OCI / 50% on Azure

Oracle Cloud Infrastructure

Core customer billing systems

Custom Oracle Database apps

4,000+ server VMware environment

Oracle SaaS

Siebel CRM
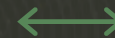
Microsoft Azure

SAP HANA environments

Virtual desktops

Windows Server custom applications

40 Gbps interconnection, 2 ms latency

Federated identity · 99.95% SLA

Migrating Databases to the Cloud

- 100% Oracle Database compatibility makes migration easy and low risk
- Oracle Zero Downtime Migration
  - Simple, Automated, One button approach solution for moving your Oracle Databases into the Oracle Cloud
- Create cloud database from on-premises backup
- Data movement options:
  - Physical and Logical Migrations
  - Use public internet
  - Private high bandwidth virtual network (FastConnect)
  - Data Transfer Services

https://www.oracle.com/database/technologies/rac/zdm.html

Zero Downtime Migration

Migrating Databases to the Cloud

Oracle Data Management Platform
Any Data, Anywhere, Anytime

Simplicity of Multi-Model - Unified Platform that absorbs and delivers data of any size and shape across public cloud, hybrid cloud, and on-premises environments


Portability of Multi-Cloud – Deploy Oracle technology without constraint and without boundary via friction-less licenses that can go anywhere, anytime

Flexibility of Multi-Workload – Single platform that delivers consistent capabilities for transactional, analytic, in-memory, IoT, streaming, and blockchain applications

Lower Product Pricing Across The Stack

On-demand pricing
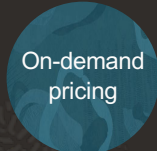
			Oracle (OCI)	Amazon (AWS)	Microsoft Azure	Google (GCP)
COMPUTE	**Virtual Machine Instance** [1]	(AMD, 4 vCPU, 16 GB RAM, Monthly)	**$54**	+132%	+132%	+83%
	DenseIO Virtual Machine Instances	($/OCPU/Hour)	**$0.1275**	+22%	+35%	+3% [2]
	Bare Metal Standard	($/OCPU/Hour)	**$0.0638**	+50%	N/A [3]	N/A [4]
	Kubernetes Cluster	(100 vCPU, 750 GB RAM, Monthly)	**$2,329**	+101%	+80%	+45%
STORAGE	**Block Storage** [5]	(400 GB, 25K IOPS, Monthly)	**$24**	69x	25X	69X
	Object Storage [6]	(1 TB, standard access, Monthly)	**$26**	-6%	-29%	-22%
NETWORK	**Public Bandwidth Transferred Out**	(50 TB, Monthly)	**$340**	12X	9X	12X
	Private Line Network	(1 Gbps, 100 TB Data, Monthly)	**$155**	14X	18X	13X
DATABASE	**MySQL Database**	(16 vCPU, 64 GB RAM, 500 GB, Monthly)	**$345**	+206%	+98%	+159%

[1] Leveraging OCI flexible shape (AMD processors for all cloud vendors).
[2] No local storage is included. This will be an additional cost.
[3] Microsoft does not publicly disclose its bare metal pricing.
[4] Google does not publicly disclose its bare metal pricing.

[5] AWS EBS io2, Azure LRS P30, GCP Persistent Disk.
[6] AWS S3 Intelligent Tiering, Azure Block Blob, Hot (LRS), GCP Cloud Storage, Standard. Read and write requests are additional costs (not included here).

Green = Lowest cost
Based on published pricing as of April 4, 2022

Oracle Cloud Infrastructure
Free Tier : Try it for yourself

Always Free cloud services

Services you can use for an unlimited time.

- Two Oracle Autonomous Databases with powerful tools like Oracle APEX and Oracle SQL Developer
- Two AMD Compute VMs
- Up to 4 instances of ARM Ampere A1 Compute with 3,000 OCPU hours and 18,000 GB hours per month
- Block, Object, and Archive Storage; Load Balancer and data egress; Monitoring and Notifications

See below for a list of eligible services

+

30-day free trial

US$300 in free credits.

- Access to a wide range of Oracle Cloud services for 30 days, including Databases, Analytics, Compute, and Container Engine for Kubernetes
- Up to eight instances across all available services
- Up to 5 TB of storage

See below for a list of eligible services

https://oracle.com/cloud/free

Database Cloud Certifications

Oracle Cloud Database Services Specialist

Find out more here.

Oracle Autonomous Database Specialist

Find out more here.

Oracle Database Cloud Migration & Integration Specialist

Find out more here.

https://education.oracle.com/oracle-certification-path

Oracle LiveLabs

Showcasing how Oracle's solutions solve your business problems

1 million
people have already visited LiveLabs

400+
events run using LiveLabs workshops

400+
free workshops, available or in development

Head over to **bit.ly/golivelabs** and learn something new …at your pace!

http://developer.oracle.com/livelabs

Thank You