ORACLE

OCI Foundations Day 1

Pass OCI Foundations Certification Exam

Sub-heading

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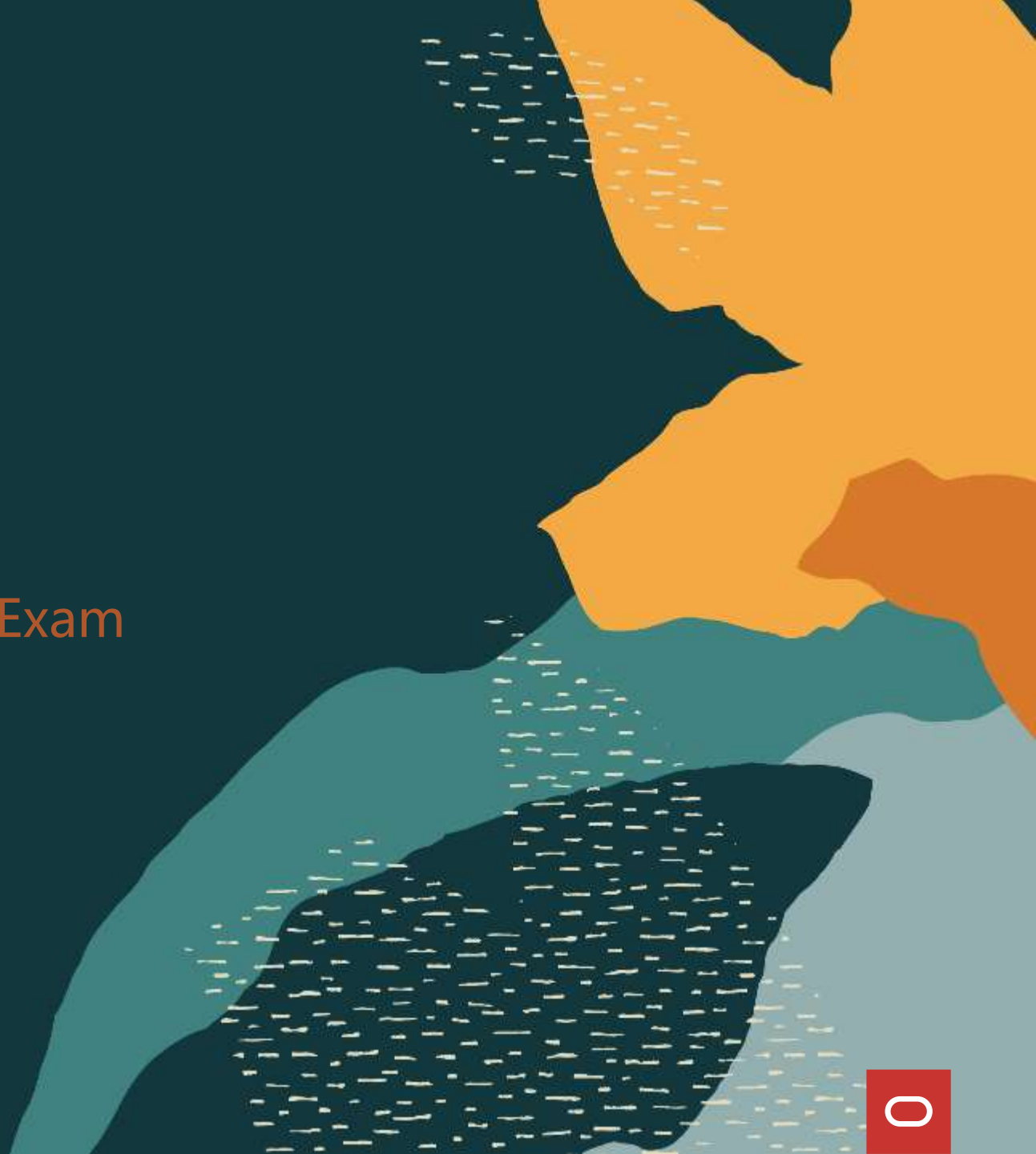
Marcel Lamarca
April, 2024



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Access the Community

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Agenda

- Free Training OU / OCI Foundations 2023
- Getting Started With OCI
- OCI Core Services: Compute Services
- OCI Core Services: Networking Services
- OCI Core Services: Database Services
- OCI Core Services: Storage Services
- Security and Compliance
- Governance and Administration

OCI Foundations

Exam Topics

The following table lists the exam objectives and their weightings.

Objectives	% of Exam
Getting Started with OCI	10%
Core OCI Services	60%
Security and Compliance	20%
Governance and Administration	10%

Getting Started with OCI [10%]

- ✓ Describe the key features and components of OCI
- ✓ Discuss OCI Regions and Availability Domains

Core OCI Services [60%]

- ✓ Describe OCI Compute services
- ✓ Describe OCI Networking services
- ✓ Describe OCI Database services
- ✓ Describe OCI Storage services

Security and Compliance [20%]

- ✓ Explain the OCI Shared Security Model
- ✓ Describe OCI Security services
- ✓ Describe OCI Identity and Access Management services

Governance and Administration [10%]

- ✓ Explain the OCI Pricing model
- ✓ Describe OCI Cost Management Tools

Became OCI Foundations Associate (2023)

Join the Race to Certification. Activate here!

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Latest updates and new features are included on an ongoing basis to keep the content current.

Your goal: Pass Certification Exams

7+ Hours of expert training

Oracle Learning Link

Oracle Certification Program Guidelines

- **Export Restrictions Policy**
- Retake Policy
- Exam Voucher Policy
- Pricing Policy
- Recertification Policy
- Exam Scoring Policy

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https://www.oracle.com/br/cloud/free/

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Services you can use for an unlimited time.

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30-Day Free Trial
US$300 in free credits.

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https://www.oracle.com/br/cloud/free/faq/

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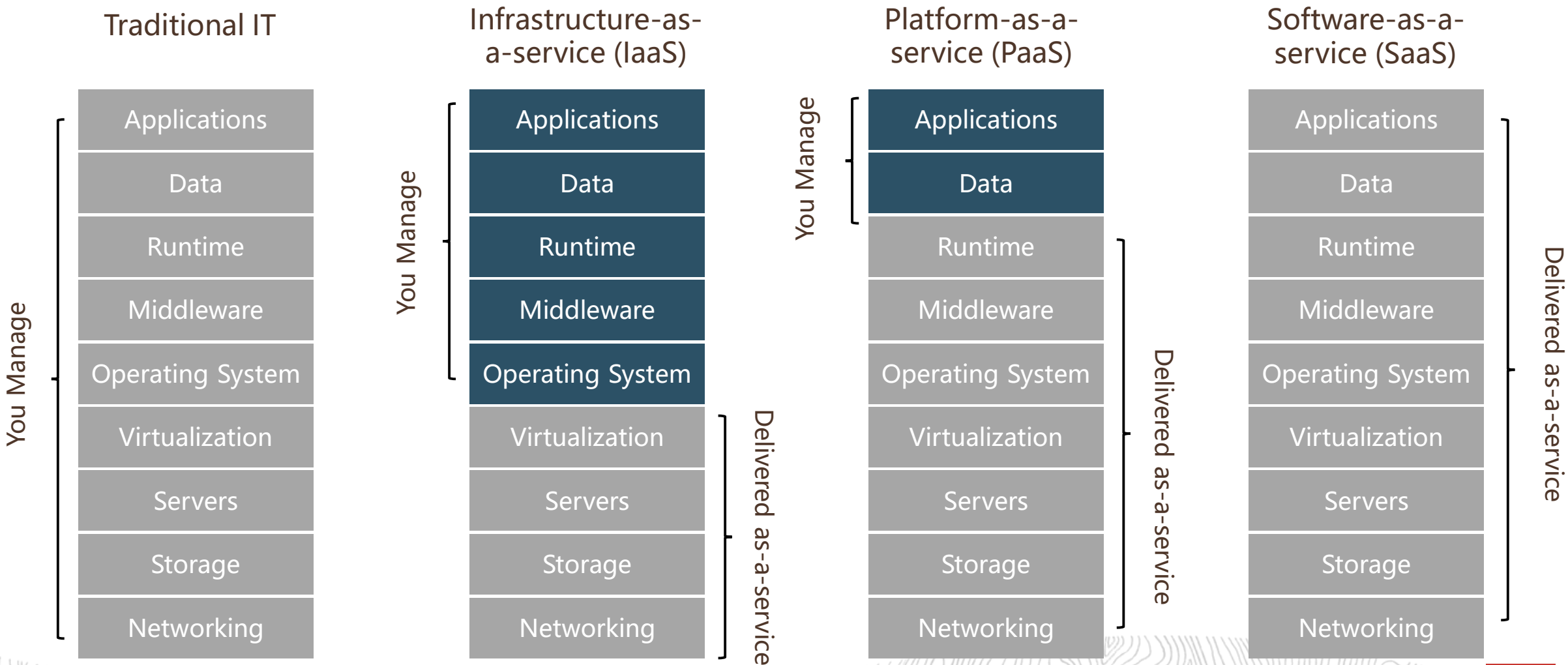
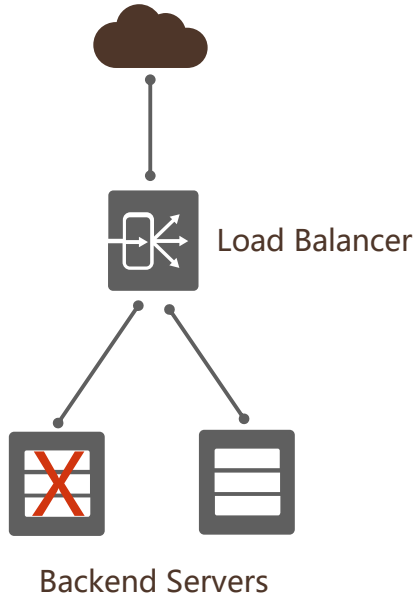
Service Models



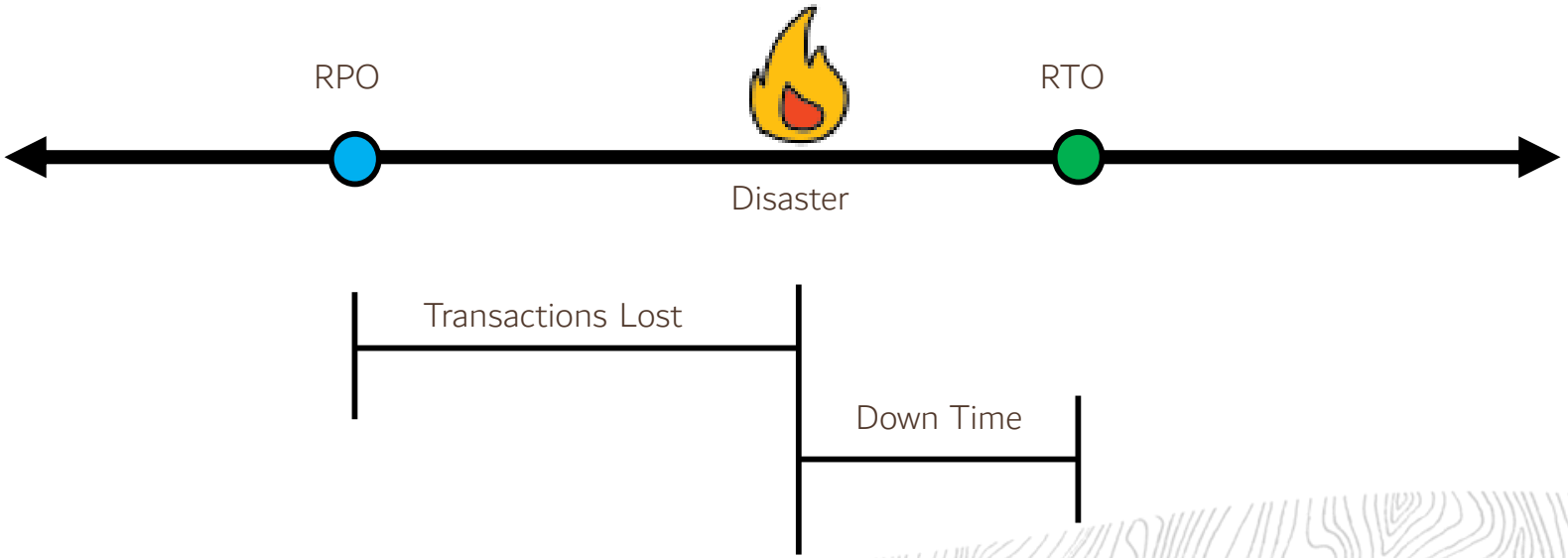
High Availability

- Computing environments configured to provide nearly full-time availability are known as high availability systems
- Such systems typically have redundant hardware and software that makes the system available despite failures
- Well-designed high availability systems avoid having single points-of-failure
- When failures occur, the failover process moves processing performed by the failed component to the backup component. The more transparent that failover is to users, the higher the availability of the system



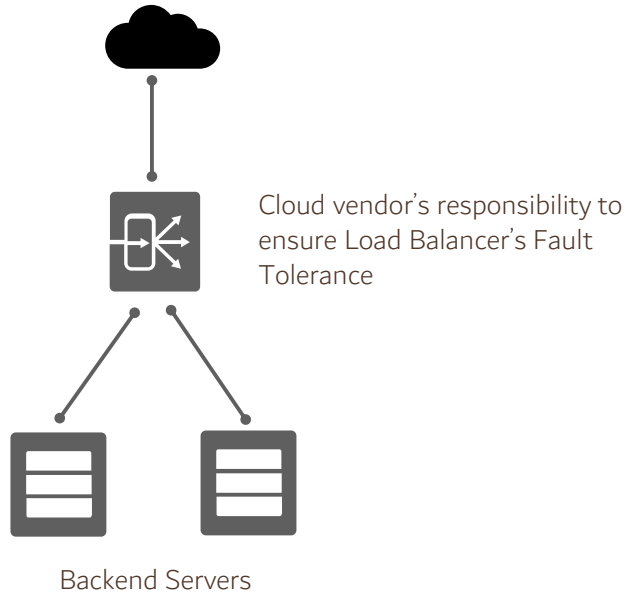
Disaster Recovery

- Disaster recovery (DR) involves a set of policies, tools and procedures to enable the recovery or continuation of vital technology infrastructure and systems
- Disaster recovery should indicate the key metrics of recovery point objective (RPO) and recovery time objective (RTO)



Cloud Terminology

- **Fault Tolerance** describes how a cloud vendor will ensure minimal downtime for services provided
- **Scalability** refers to scaling out (or in) or scaling up (or down).
  - Scaling out (or in) is called horizontal scaling
  - Scaling up (or down) is called vertical scaling
- **Elasticity** is the ability to quickly increase or decrease resources



CAPEX vs. OPEX

CAPEX

Capital expenditure or capital expense (CAPEX) is the money an organization or corporate entity spends to buy, maintain, or improve its fixed assets, such as buildings, vehicles, equipment, or land

OPEX

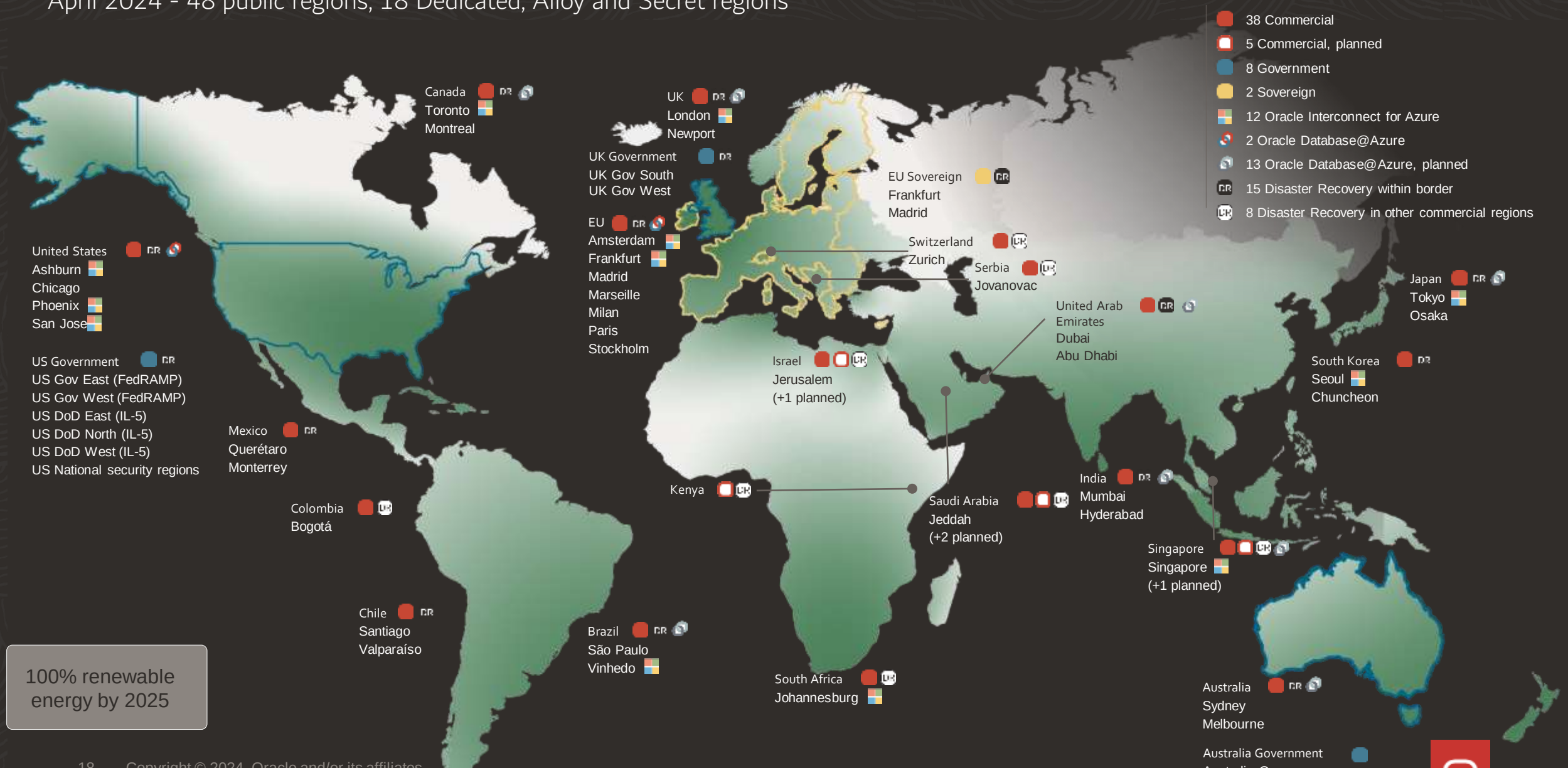
Operational expenditure or OPEX is an ongoing cost for running a product, business, or system

Cloud lets you trade CAPEX for OPEX

Instead of having to invest heavily in data centers and infrastructure, in the cloud, you can pay only when you consume resources, and pay only for how much you consume

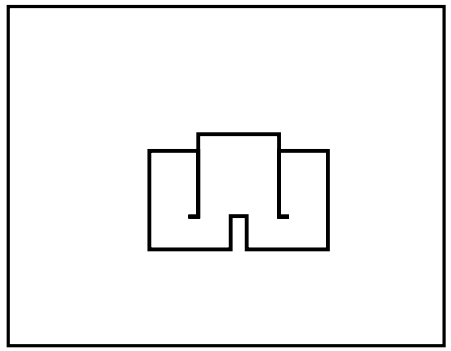
Oracle Cloud Infrastructure global footprint – 68 regions

April 2024 - 48 public regions, 18 Dedicated, Alloy and Secret regions



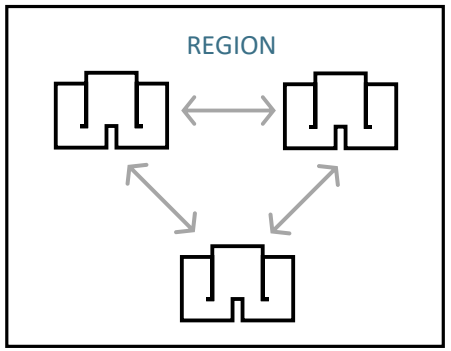
100% renewable energy by 2025

OCI Architecture



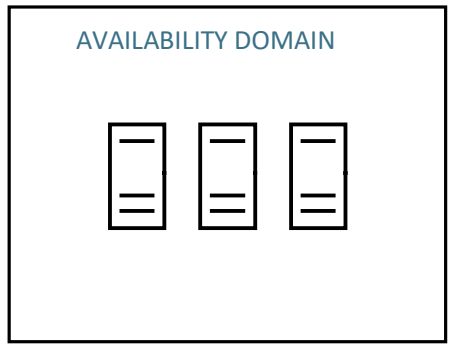
Regions

Localized geographic area, comprised of one or more Availability Domains (AD)



Availability Domains (AD)

One or more fault-tolerant, isolated data centers located within a region, but connected to each other by a low latency, high bandwidth network

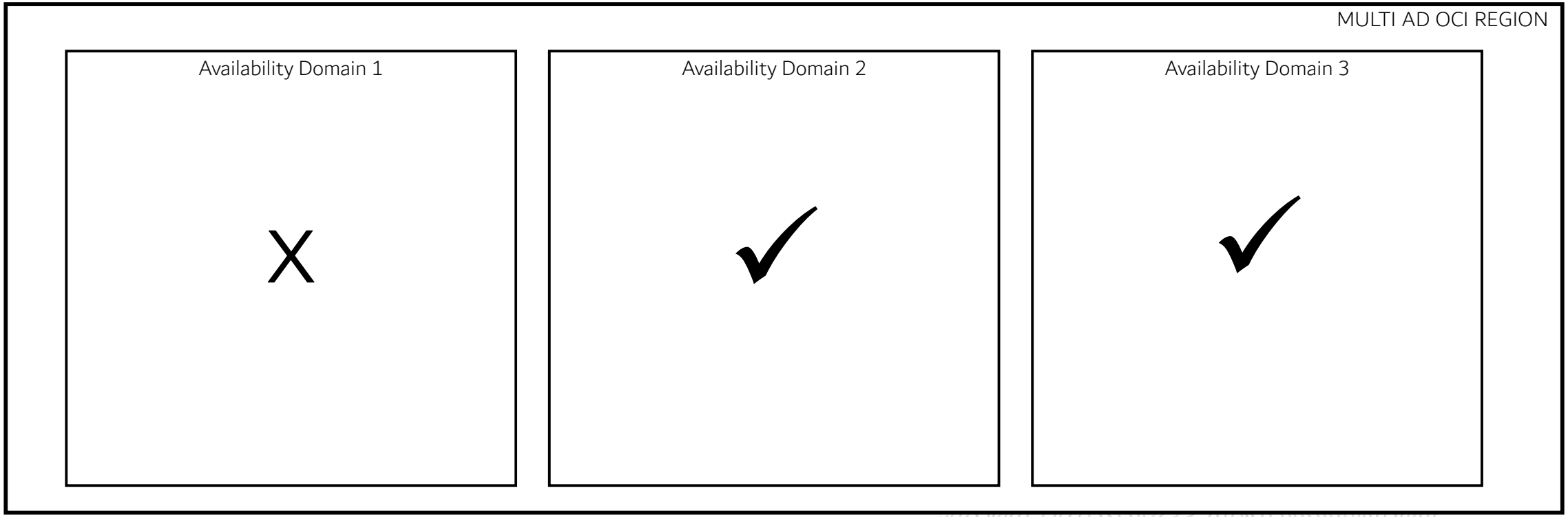


Fault Domains (FD)

Grouping of hardware and infrastructure within an Availability Domain to provide anti-affinity (logical data center)

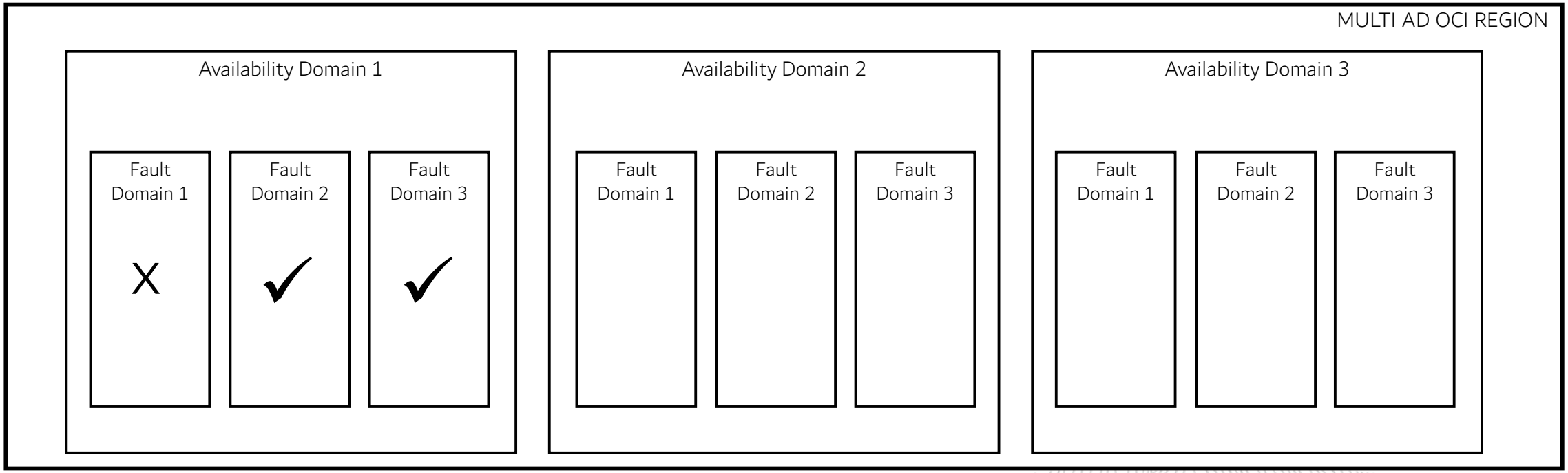
AD – Availability Domain

- Availability domains are **isolated from each other**, fault tolerant, and very unlikely to fail simultaneously.
- Because availability domains **do not share physical infrastructure, such as power or cooling, or the internal availability domain network**, a failure that impacts one AD is unlikely to impact the availability of the others



FD – Fault Domain

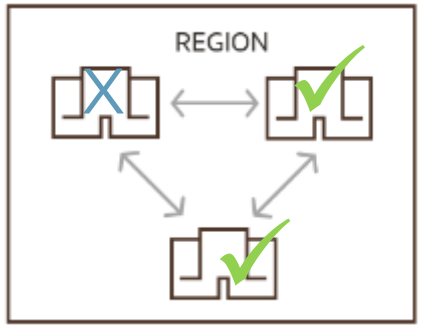
- Each Availability Domain has three Fault Domains (FD)
- FDs act as a **logical data center** within an AD. Usage of multiple FDs reduces correlation of failures within an AD
- Resources placed in different FDs will not share single points of hardware failure (same physical server, physical rack, top of rack switch or power distribution unit)



High Availability Design

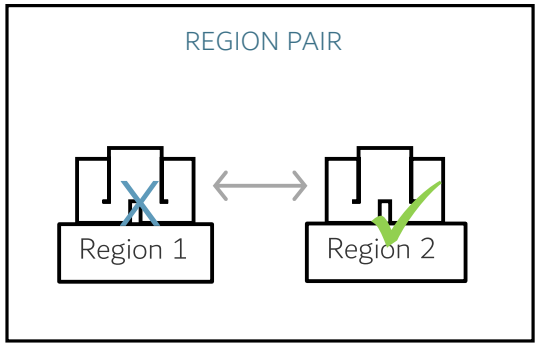
Fault Domains

Protection against failures within an Availability Domain



Availability Domains

Protection from entire Availability Domain failures (multi-AD region)



Region Pair

Protection from disaster with data residency & compliance

SLAs on Availability, Management and Performance

Summary

OCI Regions, Availability Domains, Fault Domains

Availability domains are isolated from each other,
fault tolerant, and very unlikely to fail simultaneously

FDs act as a logical data center within an AD.
Usage of multiple FDs reduces correlation of failures within an AD

Compartments:
Collection of related resources helps you isolate and control access to your resources

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OCI Compute Services

Bare Metal

Code
App Container
Language Runtime
Operating System
Virtualization

Dedicated Virtual Hosts

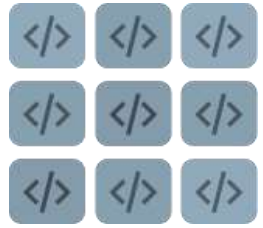
Code
App Container
Language Runtime
Operating System

Virtual machines

Code
App Container
Language Runtime
Operating System

Container Engine

Code
App Container

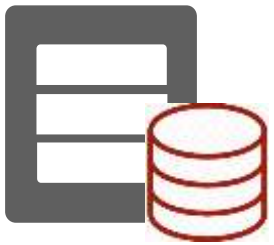


Functions

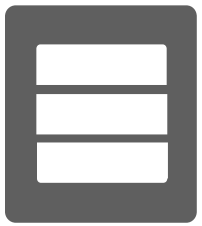
Code

Bare Metal Use Cases

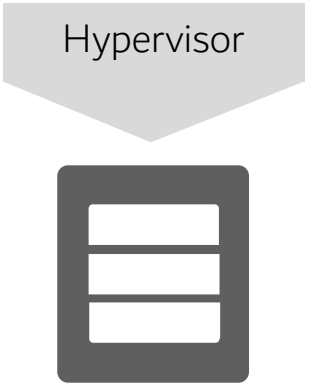
Direct Hardware Access with all the Security, Capabilities, Elasticity and Scalability of OCI



Workloads that are Performance-intensive



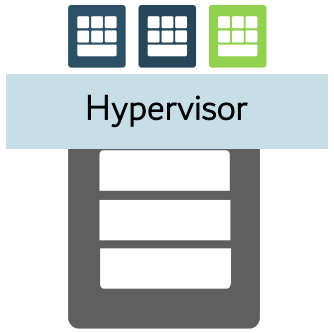
Workloads that are not virtualized



Workloads that require a specific hypervisor

Workloads that require BYO Licensing

VM Use Cases



Use VMs when you want to control all aspects of an environment

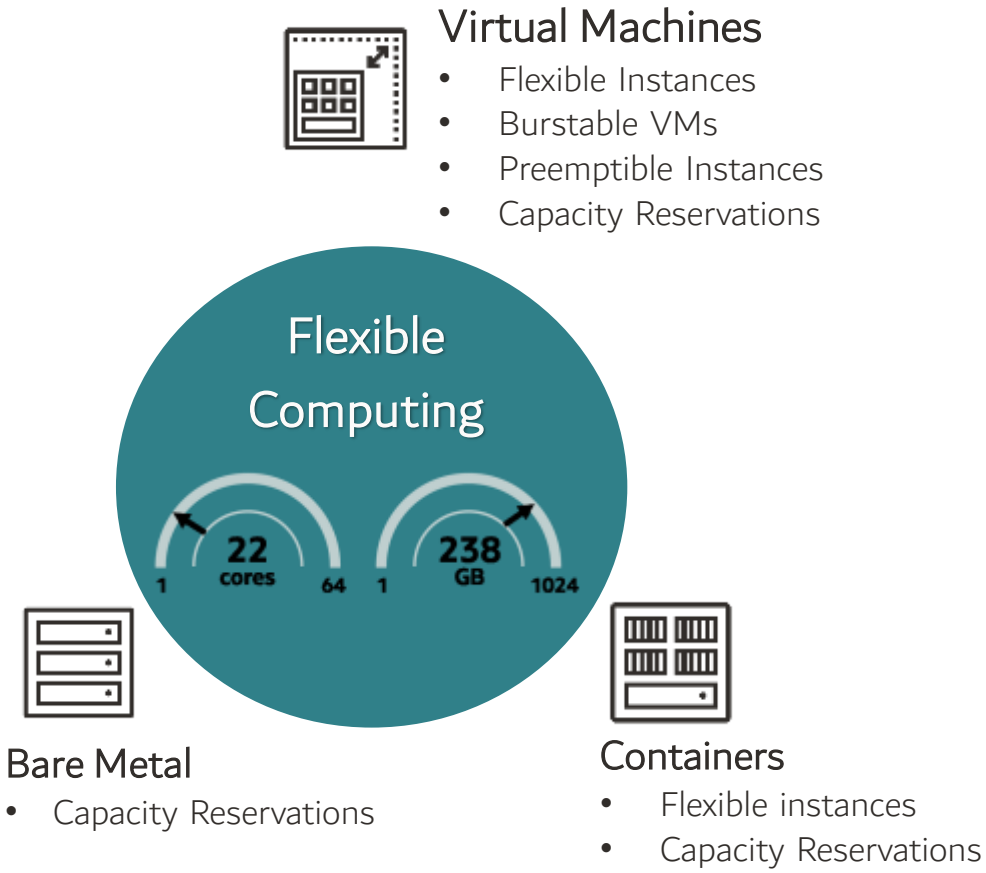
Use VMs when you want to deploy a legacy app running on Windows or Linux

You can use VMs to move applications from on-premises to Oracle Cloud Infrastructure

VMs require work – OS patch management, security configuration, monitoring, application configuration and scaling to handle variable traffic

OCI Instance Options

- **Preemptible Instances**: Run at 50% cost of on-demand compute for fault-tolerant and interruptible workloads
- **Burstable VMs:** Pay for what you need, burst to get more power
- **Flexible Instances:** Run flexible shapes with odd core counts and non-std memory (ex: 3 cores, 156G RAM)
- **Capacity Reservations:** Ensured capacity for critical events and unexpected spikes



More information

Ensure business continuity with capacity reservations (oracle.com);
Run your low-CPU workloads more cost-effectively with burstable VMs (oracle.com)

Dedicated Virtual Machines Hosts

Run critical workloads safely, optimize your costs and get assured capacity

- Users easily manage shape, capacity and instance type launched for the host
- Runs flexibly on dedicated, single tenant servers
- Safely complies with requirements for regulatory isolation
- License options with node-based or host-based licensing
- Coming - DVM Health Metrics, DVM Reboot, Migrate & Auto Recover

Workloads

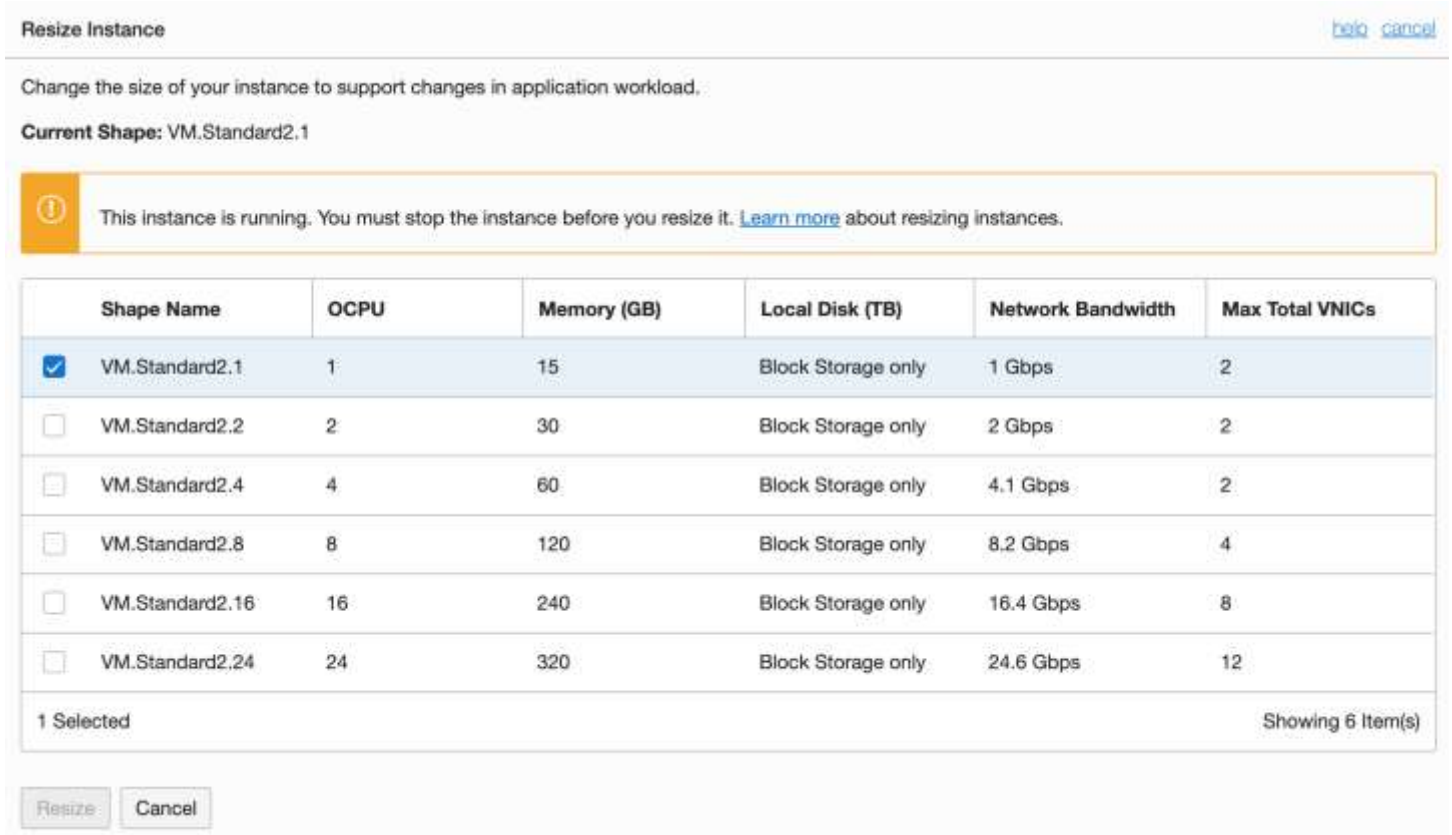
- High availability workloads where each second of pause has impact
- High performance gaming, AI/ML or image rendering workloads
- Finance or healthcare workloads with tight security requirements
- Workloads requiring increased input/output operations per second and decreased latency

More Information

Dedicated Virtual Machine Hosts (oracle.com)

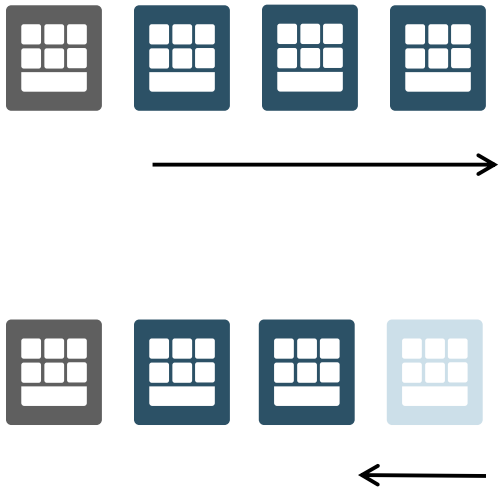
Vertical Scaling

- Scale-up and Scale-down instance shape supported
- New shape must have the same hardware architecture.
- Downtime is required. The instance must be stopped before resize it



Bustable Instances
Right-Size Your VM Instances to Support Your Workload

Autoscaling



Enables large scale deployment of VMs from a single gold image with automatic configuration

Referred to as scale-out or scale-in

If one VMs fails in the Autoscaling group, others will keep working

Match traffic demand by adding or removing VMs automatically (supports auto scaling based on metrics – CPU or Memory utilization

No extra cost for using Autoscaling

Autoscaling

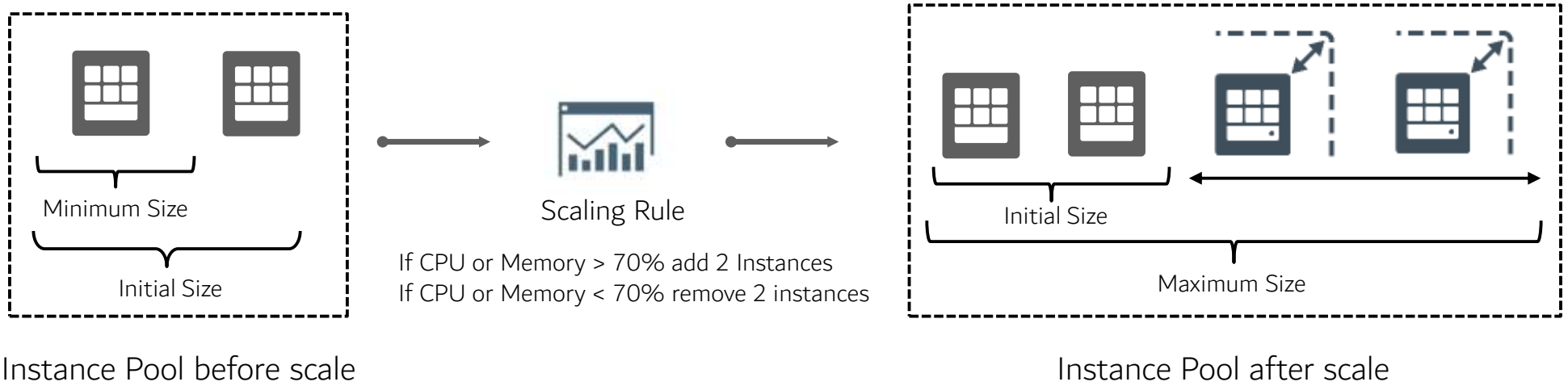
1

- OS image, metadata, shape
- vNICs, Storage, subnets

2

- Put in different Availability Domains
- Manage all together (stop, start, terminate)

3



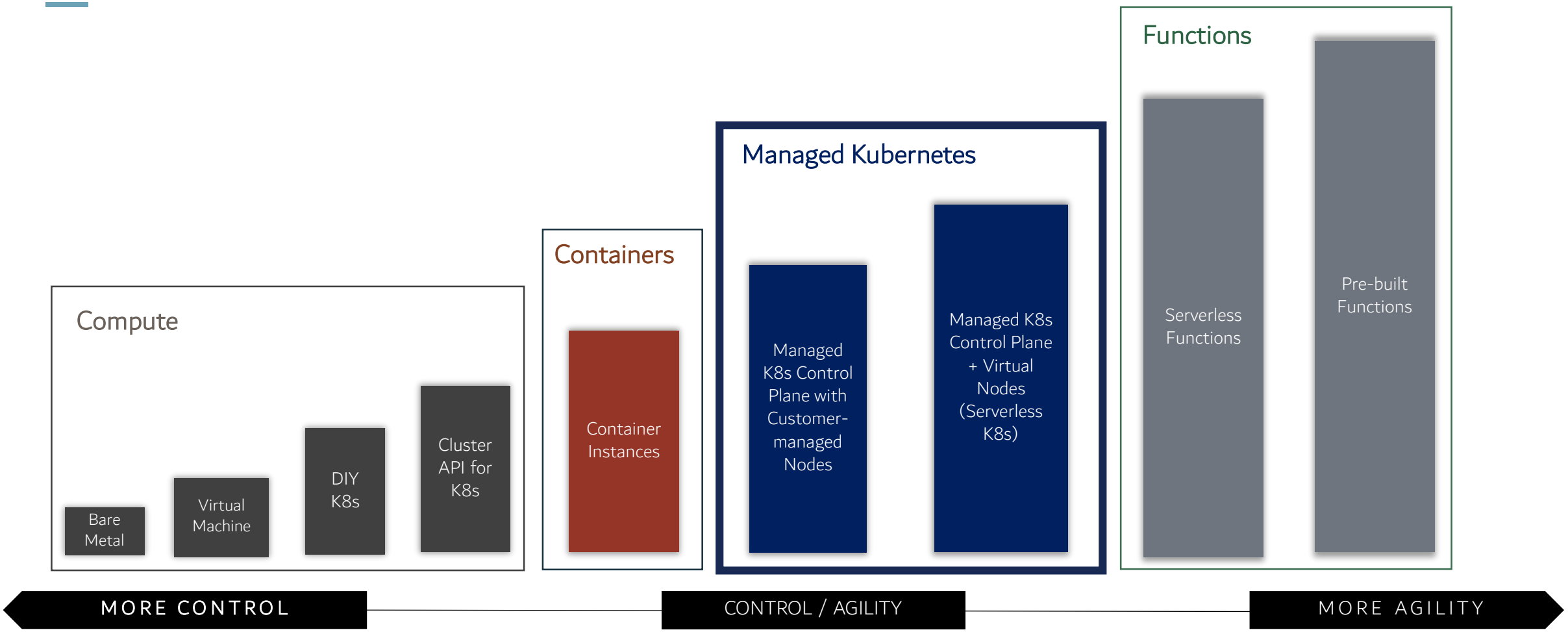
Instance Pool before scale

Instance Pool after scale

What's Kubernetes (K8s) ?

- **Open-source system** for automating deployment, scaling, and management of containerized apps
- **K8s is synonymous with Cloud Native** and modernization – most popular technology in stack
- **Kubernetes is mainstream –** and growing rapidly
- **Use cases expand beyond applications –** includes **auxiliary workloads & IT operations**:
  - ETL, Batch jobs, Pipelines
  - Messaging, Utilities, Security operations
  - consuming compute such as HPC or GPUs
  - and even databases running in Kubernetes

Container Strategy: Flex Runtimes



OKE Key Features

Built-in Management

- Fully managed control plane
- Highly-managed data plane components
- Automatic scaling

Reliability

- Highly available by default
- Node Doctor for easy troubleshooting

Price Performance

- Rightsized compute through Flex shapes and Flexible Load Balancers
- Predictable and consistent performance
- Enterprise support included

Open Standards

- Certified Kubernetes conformant
- Open Container Initiative compliant
- No vendor lock-in

Advanced Security

- Private clusters and registry
- Encryption by default
- Container Image Scanning & Signing
- Conformance with Kubernetes STIG, NSA, DoD, CISA
- Regulatory Compliance (FedRAMP, HIPAA, SOC, etc.)

Deployment Flexibility

- Choose from Managed or Virtual Nodes (for a complete serverless experience)
- DevOps integration for deployment
- Rich compute shape support: HPC, GPU, ARM, Flex, Bare Metal, and VM
- Available in all commercial regions and OCI Dedicated Region

Extensibility

- Operators for OCI services and Oracle DB
- Leverage any Kubernetes software
- Seamless integration with OCI services

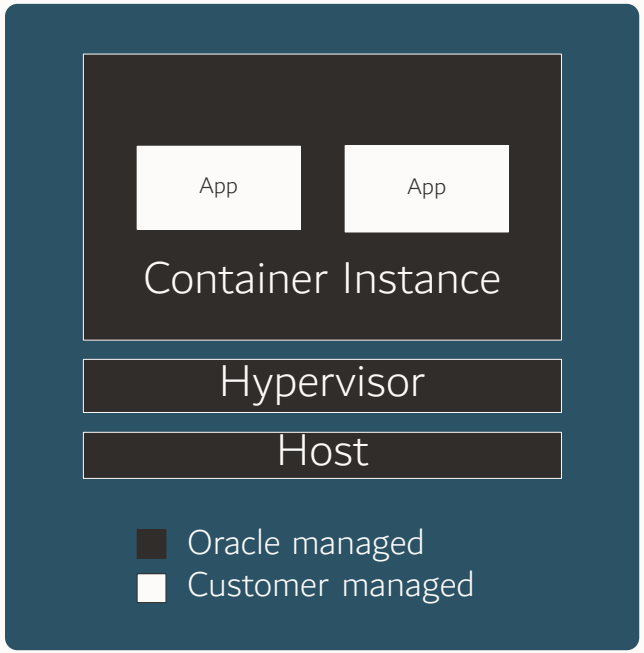
Container Instances: Simple, quick, and secure way to run containers in OCI

A serverless runtime designed for container workloads

- No learning curve
- Focus on your applications, not infrastructure
- Strong isolation of virtual machines for containers
- Pay only for the compute resources used

- **Workloads**
  - Bursty workloads including web applications that quickly spin up and then get torn down
  - Discrete, short-lived workloads including single-purpose jobs that run on a schedule and don't require a constantly-running VM

90% of users leverage containers for cloud-managed services

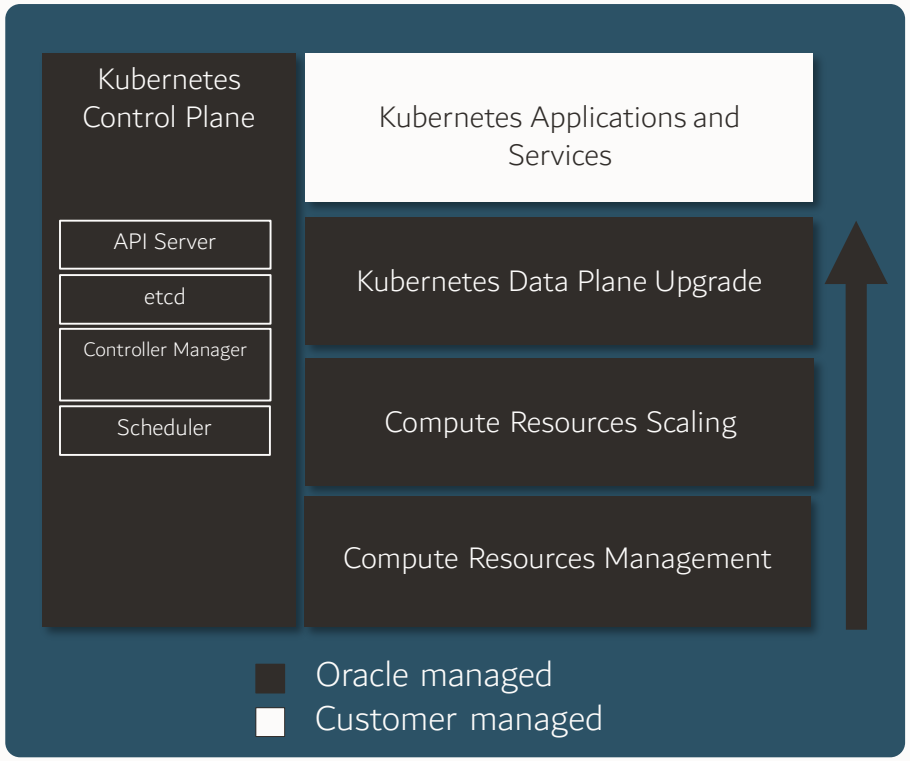


OKE Virtual Nodes: Serverless K8s, Because your cloud should be simple to manage

- Eliminates overhead of managing, scaling, upgrading and troubleshooting your infrastructure
- Simplified and granular resource scaling
- Managed upgrades and security patching
- Pay for pods, not nodes

Workloads:

- Bursty workloads - E-commerce app or data processing applications benefit from the near unlimited resources virtual nodes provide.
- Kubernetes without infrastructure operations, Seamless upgrades



Oracle Functions

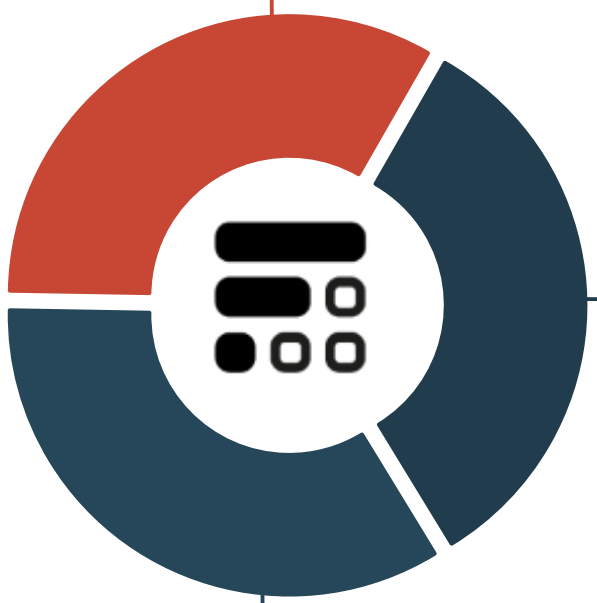
Functions-as-a-Service

Oracle Cloud Integrated

Container Native

Open Source

Secure



Pay per use

Pay for execution, not for idle time

Autonomous

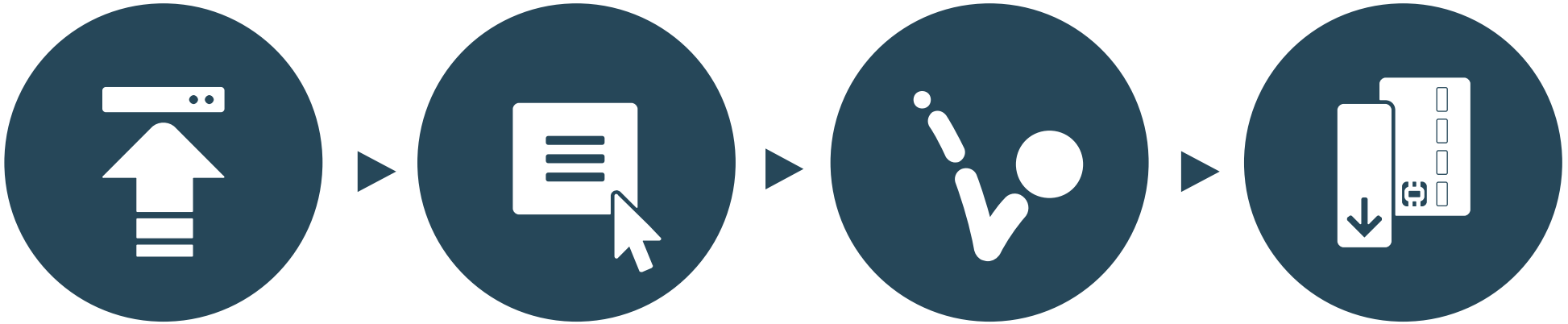
Platform auto-scales functions

No servers to provision, manage

Event-driven

Oracle Cloud Infrastructure triggers to run your code

How does it work ?



Push function image to registry

Configure function trigger

Code runs only when triggered

Pay for code execution time only

Summary

- Compute Shapes and OCI IaaS
- Bare Metal, Dedicated Virtual Machines and VMs
- Scaling
- Container Engine
- Functions

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- OCI Core Services: Compute Services
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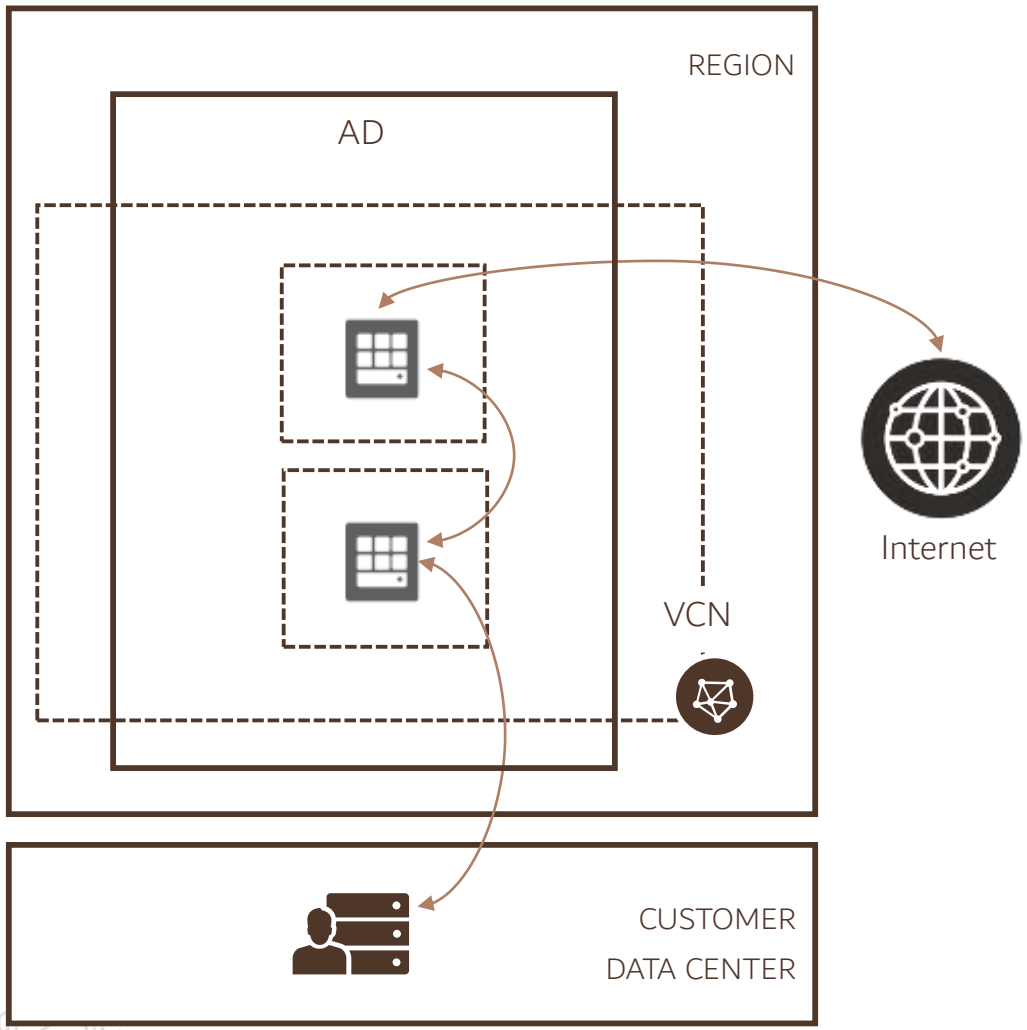
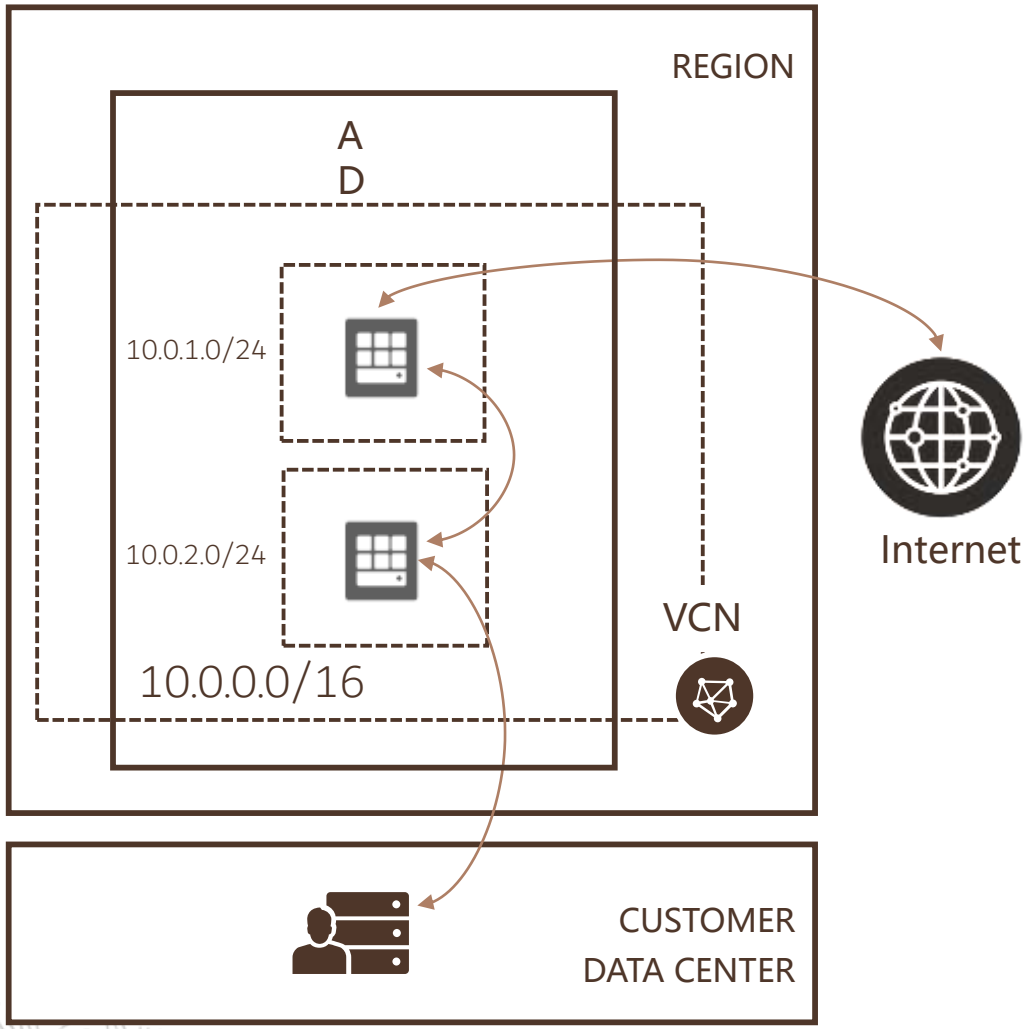
VCN Overview



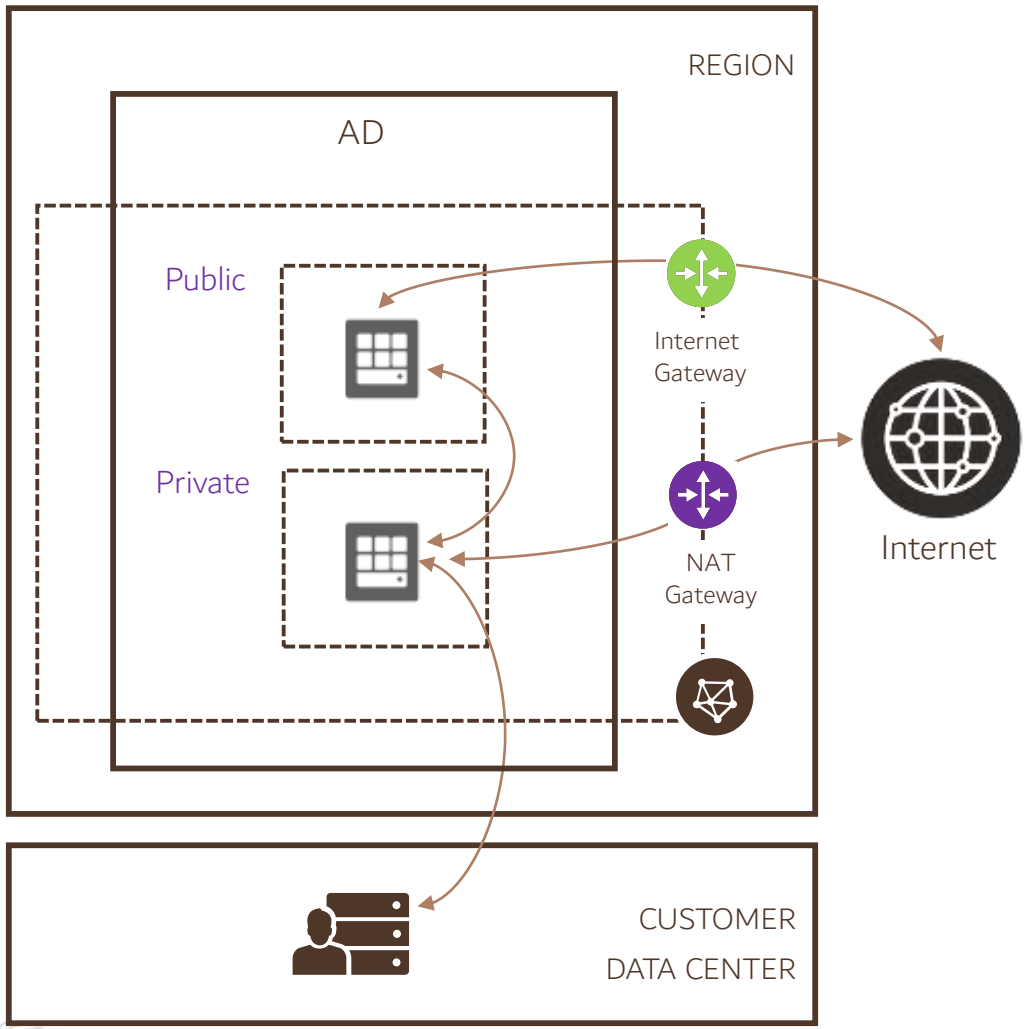
- Software defined private network that you set up in OCI
- Enables OCI resources such as compute instances to securely communicate with Internet, other instances or on-premises data centers
- Lives in an OCI region
- Highly Available, Scalable and Secure

VCN Address Space



- Address space is a range of IP address that you assign to a VCN E.g., 10.0.0.0/16
  - Range: 10.0.0.0 – 10.0.255.255
- Every resource that is connected to this VCN will get its own unique private IP address
  - Server 1 : 10.0.1.2
  - Server 2: 10.0.2.2
- Subnets let you divide the VCN into one or more sub networks
  - E.g., 10.0.0.0/16 – 10.0.1.0/24, 10.0.2.0/24..
  - Compute instances are placed in subnets
  - Subnets can be isolated and secured

Communication with the Internet

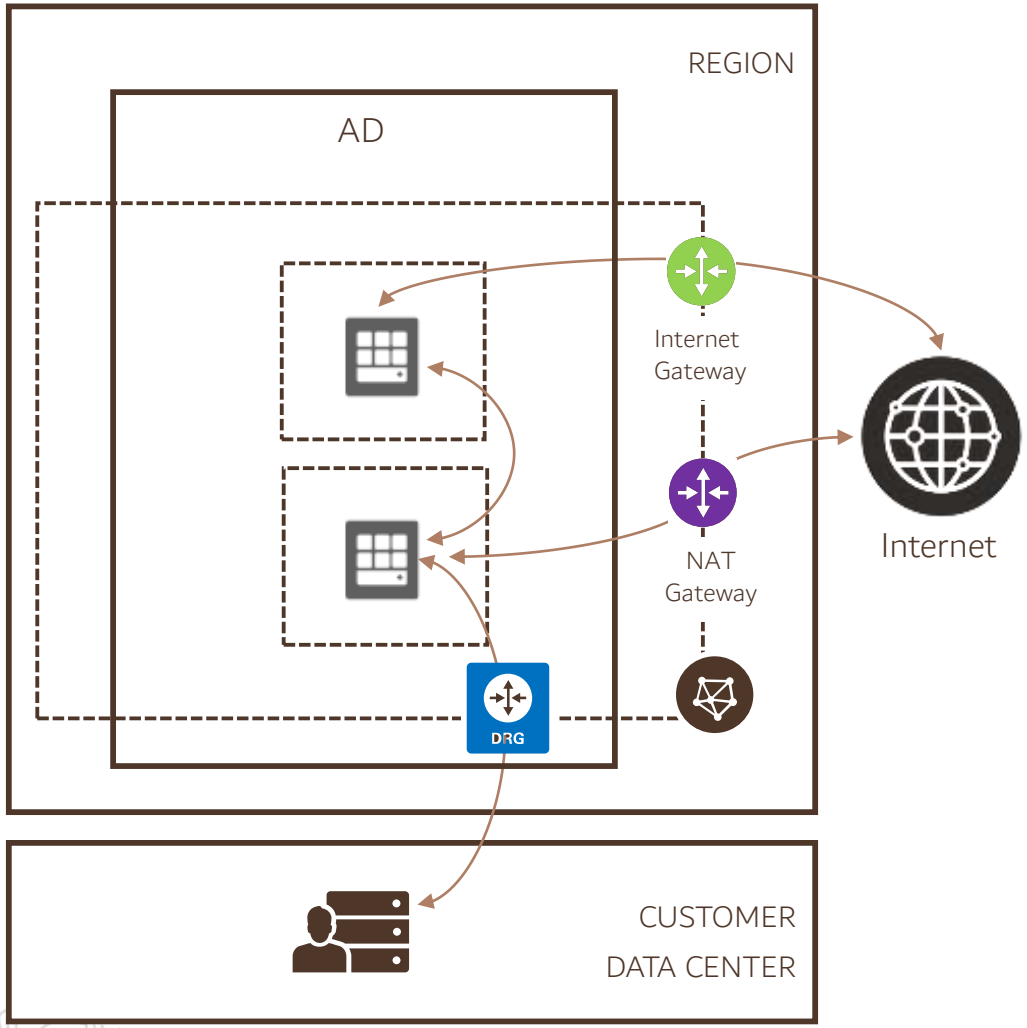


Internet gateway provides a path for network traffic between your VCN and the internet

NAT Gateway enables outbound connections to the internet, but blocks inbound connections initiated from the internet

Use case: updates, patches

Communication to On-Premises

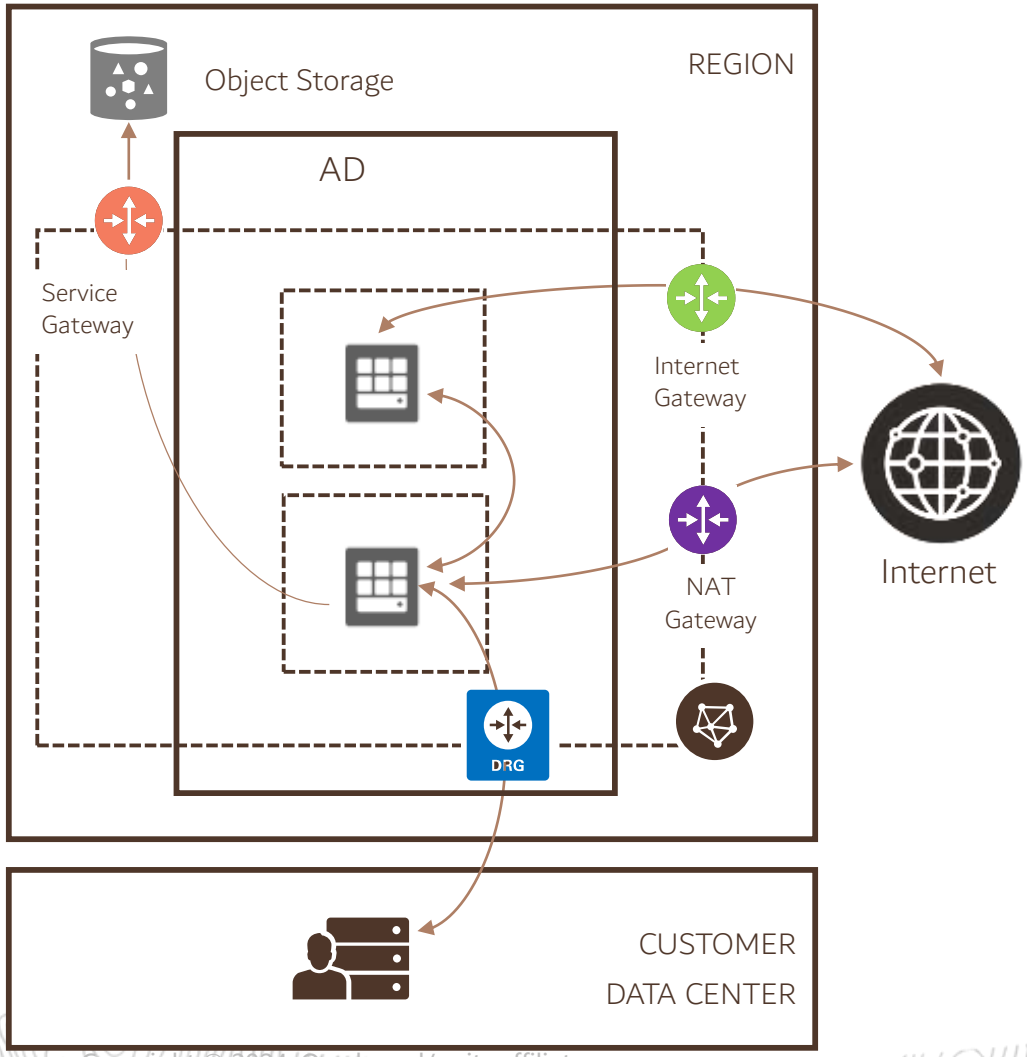


DRG is a virtual router that provides a path for private traffic between your VCN and destinations other than the internet

You can use it to establish a connection with your on-premises network via

- IPsec VPN
- FastConnect (Dedicated connectivity)

Communication to Public OCI Services

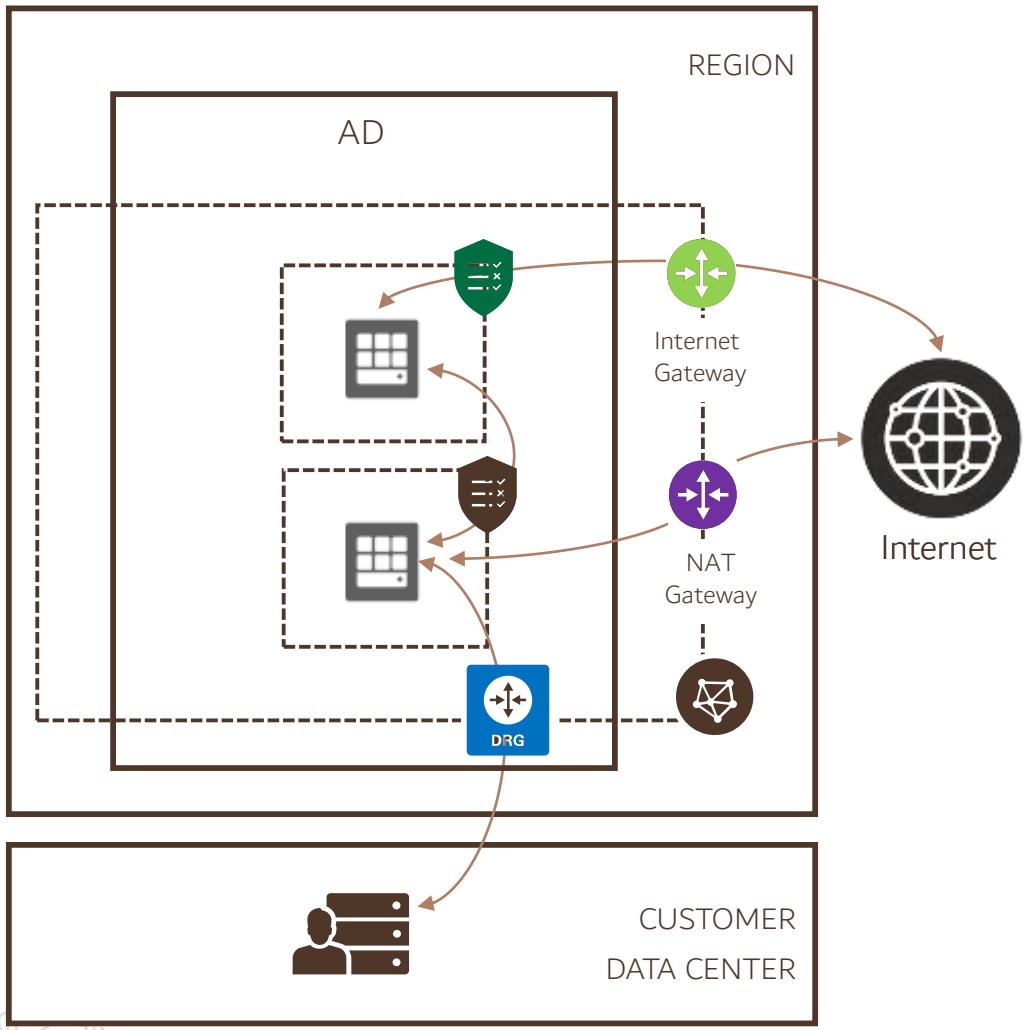


Service gateway lets resources in VCN access public OCI services such as Object Storage, but without using an internet or NAT gateway

Any traffic from VCN that is destined for one of the supported OCI public services uses the instance's private IP address for routing, travels over OCI network fabric, and never traverses the internet.

Use case:
Back up DB Systems in VCN to Object Storage

VCN Security



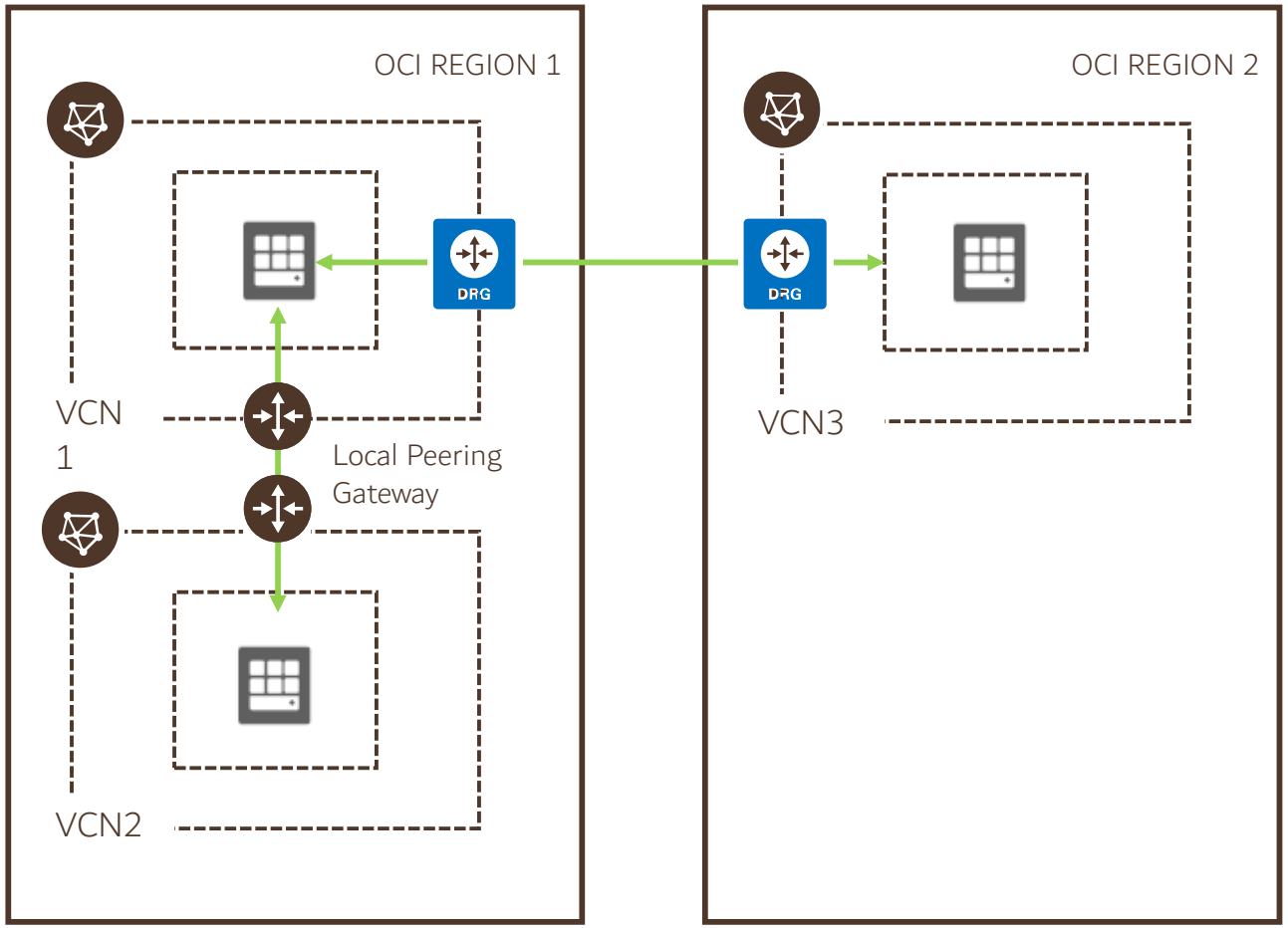
A common set of firewall rules associated with a subnet and applied to all instances launched inside the subnet

- Security list consists of rules that specify the types of traffic allowed in and out of the subnet
- Security list apply to a given instance whether it's talking with another instance in the VCN or a host outside the VCN
- Stateful or stateless

	Direction	CIDR	Protocol	Source Port	Dest Port
Stateful	Ingress	0.0.0.0/0	TCP	All	80
Stateful	Egress	10.0.2.0/24	TCP	All	1521

- Network Security Group consists of set of rules that apply only to a set of VNICs of your choice

Communications to Others VCN: Peering



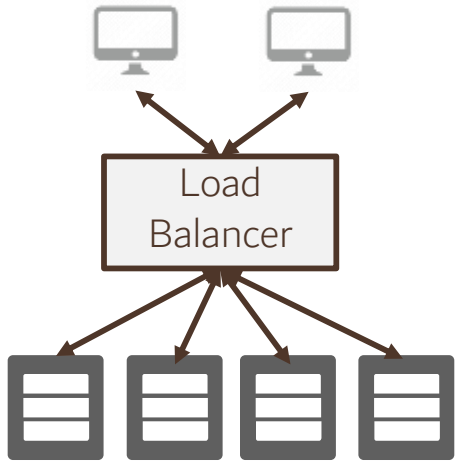
VCN peering is the process of connecting multiple VCNs

Local VCN Peering is the process of connecting two VCNs in the same region so that their resources can communicate using private IP addresses

Remote VCN Peering is the process of connecting two VCNs in different regions so that their resources can communicate using private IP addresses

Load Balancer

- A load balancer sits between the clients and the backends performs tasks such as:
  - **Service Discovery**: What backends are available? How should LB talk to them?
  - **Health Check**: What backends are currently healthy to accept requests?
  - **Algorithm**: What algorithm should be used to balance individual requests across the healthy backends?

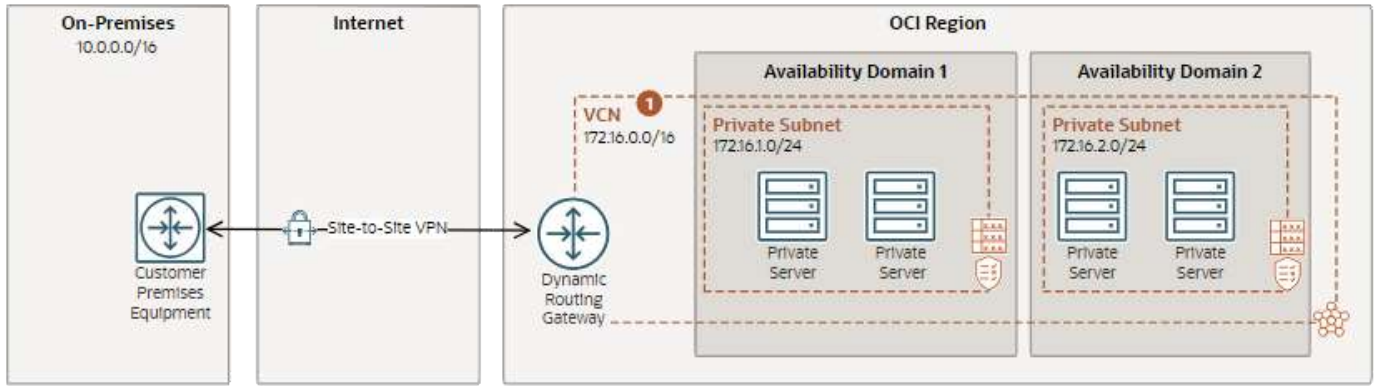


Load Balancer benefits

- **Fault tolerance and HA**: using health check + LB algorithms, a LB can effectively route around a bad or overloaded backend
- **Scale**: LB maximizes throughput, minimizes response time, and avoids overload of any single resource
- **Naming abstraction**: name resolution can be delegated to the LB; backends don't need public IP addresses

VPN Basics

VPN – using a public network to make end to end connection between two private networks in a secure fashion



Callout 1: Default VCN route table

Destination CIDR	Route target
0.0.0.0/0	DRG

- **Tunnel** – a way to deliver packets through the internet to private RFC 1918 addresses
- **Authentication** – provides a mechanism to authenticate who you are
- **Encryption** – packets need to be encrypted, so they cannot be sniffed over the public internet
- **Static routing**: configure a router to send traffic for particular destinations in preconfigured directions
- **Dynamic routing**: use a routing protocol such as BGP to figure out what paths traffic should take

Fast Connect

- FastConnect provides a dedicated and private connection with higher bandwidth options, and a more reliable and consistent networking experience when compared to internet-based connections
- Connect to OCI directly or via pre-integrated Network Partners
- Port speeds of 1 Gbps and 100 Gbps increments
- Extend remote datacenters into Oracle ("**Private peering**") or connect to Public resources **("Public peering")**
- No charges for inbound/outbound data transfer
- Uses BGP protocol

Summary

- Virtual Cloud Network
- Gateways
- Peering
- VCN Security
- Load Balancer

Agenda

- Getting Started With OCI
- OCI Core Services: Compute Services
- OCI Core Services: Networking Services
- OCI Core Services: Database Services
- OCI Core Services: Storage Services
- Security and Compliance
- Governance and Administration

OCI Oracle Database Cloud Service

Enterprise or Standard Database Service

Exadata Database Service

Dedicated, fully elastic

Autonomous Database

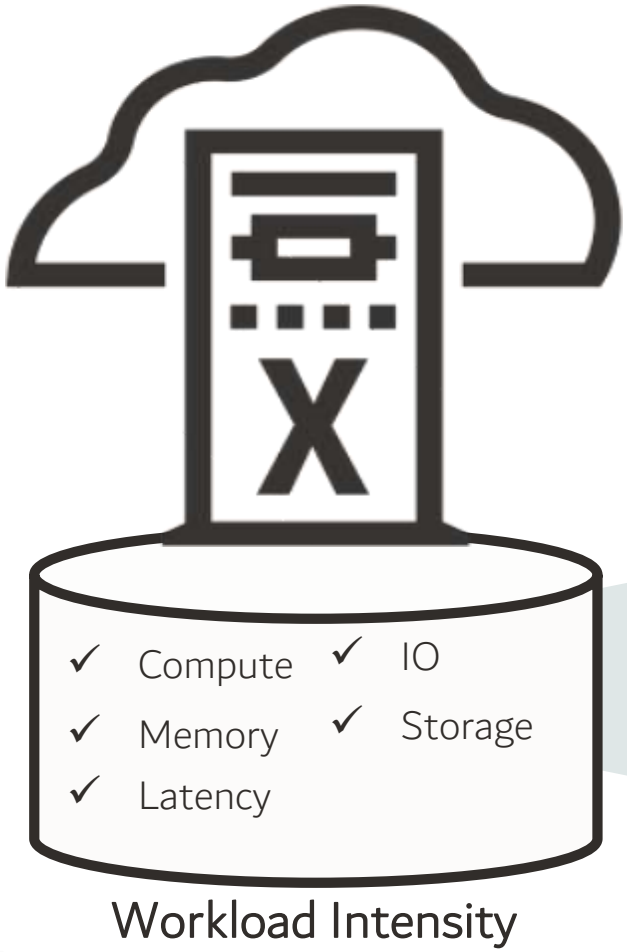
Transaction Processing or Data Warehouse

Most Affordable	Highly Differentiated	Leading Edge
Managed Infrastructure		Fully Managed
Singular / Smaller Workloads	Best performance, availability with massive scale	

→ Automation →

Exadata Cloud Service

- Full Oracle Database with all advanced options
- On fastest and most available database cloud platform
  - Scale-Out Compute, Scale-Out Storage, Infiniband, PCIe flash
  - Complete Isolation of tenants with no overprovisioning
- All Benefits of Public Cloud
  - Fast, Elastic, Web Driven Provisioning
  - Oracle Experts Deploy and Manage Infrastructure



As low as 19µs. latency

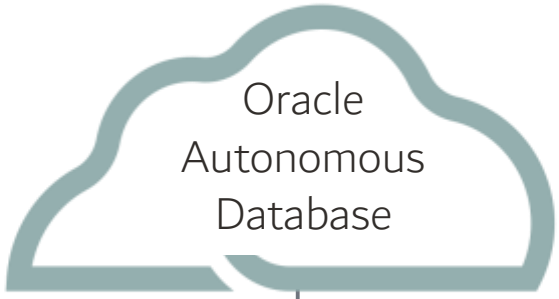
Scale up to:

- 48 TB memory, 8,064 vCPUs
- 96 TB PMem, 1,638 TB NVMe flash
- 4 PB usable storage

Databases up to 31 PB in size*

* Assumes 10:1 HCC compression

Oracle Autonomous Database



Autonomous Data Warehouse (ATP)	Autonomous Transaction Processing (ATP)	Autonomous JSON Database
Analytics Workloads	OLTP and Mixed Workloads	Application Development
• Data warehouse, data mart • Data lake, machine learning	• Transactions, batch, reporting, IoT • Application development, machine learning	• Mobile applications • User profile management • Customer 360 • Catalog and content management

Choose the one that best meets your workload needs

A new era of cloud database – everything is automated

Self-Driving

With true cloud-elasticity for low cost

Most Productive

Converged Database plus self-service tools for business analysts, developers and more

Enterprise-Class Oracle Cloud Infrastructure

Shared Dedicated

Security, availability, scalability, and performance

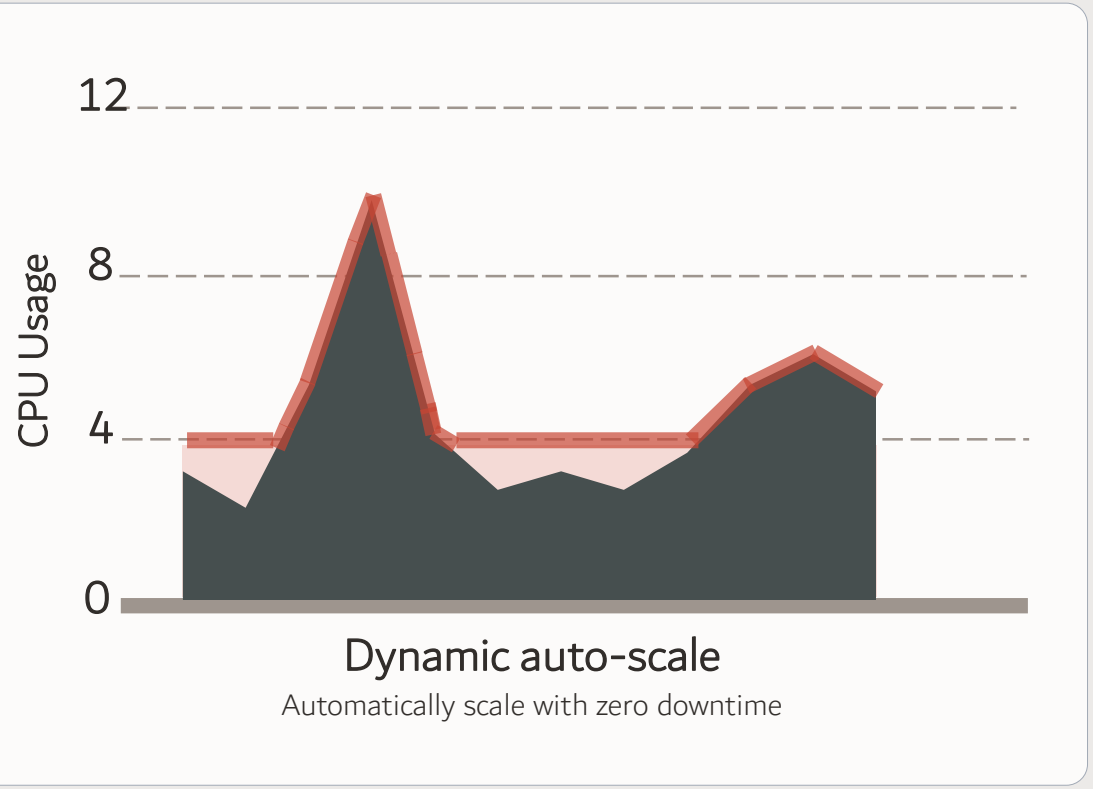
Consistent High Performance and Scaling

Size to number of OCPUs and TBs required

- Not constrained by fixed shape ‘t-shirt’ sizes
- Simple incremental growth
- Lower operating costs

Auto-scaling for changing workloads

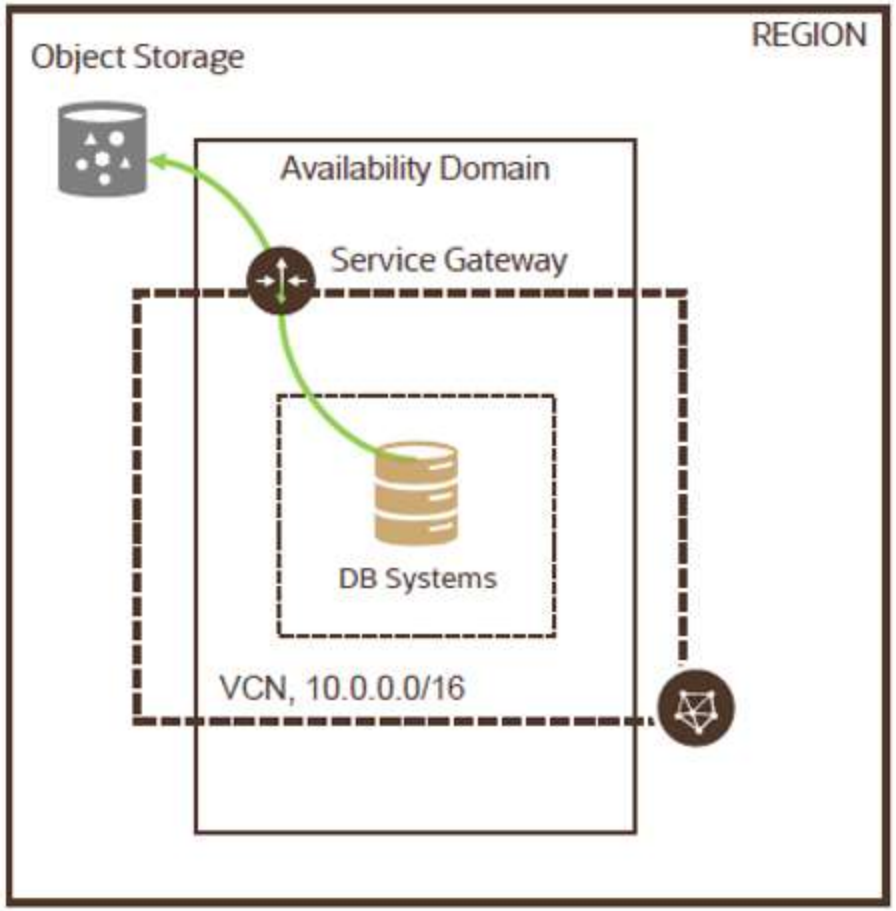
- Dynamically adjusts CPU and IO resources based on workload requirements
- Zero delay while scaling up or down
- No ‘cache warm-up’ after scaling



DB System Backup / Restore

- Manual or Automatic Backups
- Automatic Backups Written in Object Storage
- Preset Retention Period:
  7, 15, 30, 45 and 60 days

- Recover Database from a Backup in Object Storage
  - Last to know good state
  - Using specific timestamp value
  - Using the SCN specified



DB Systems DR

Oracle Data Guard provides a set of services that create, maintain, manage and monitor one or more standby data bases, to enable Oracle databases to survive disasters and data corruption.

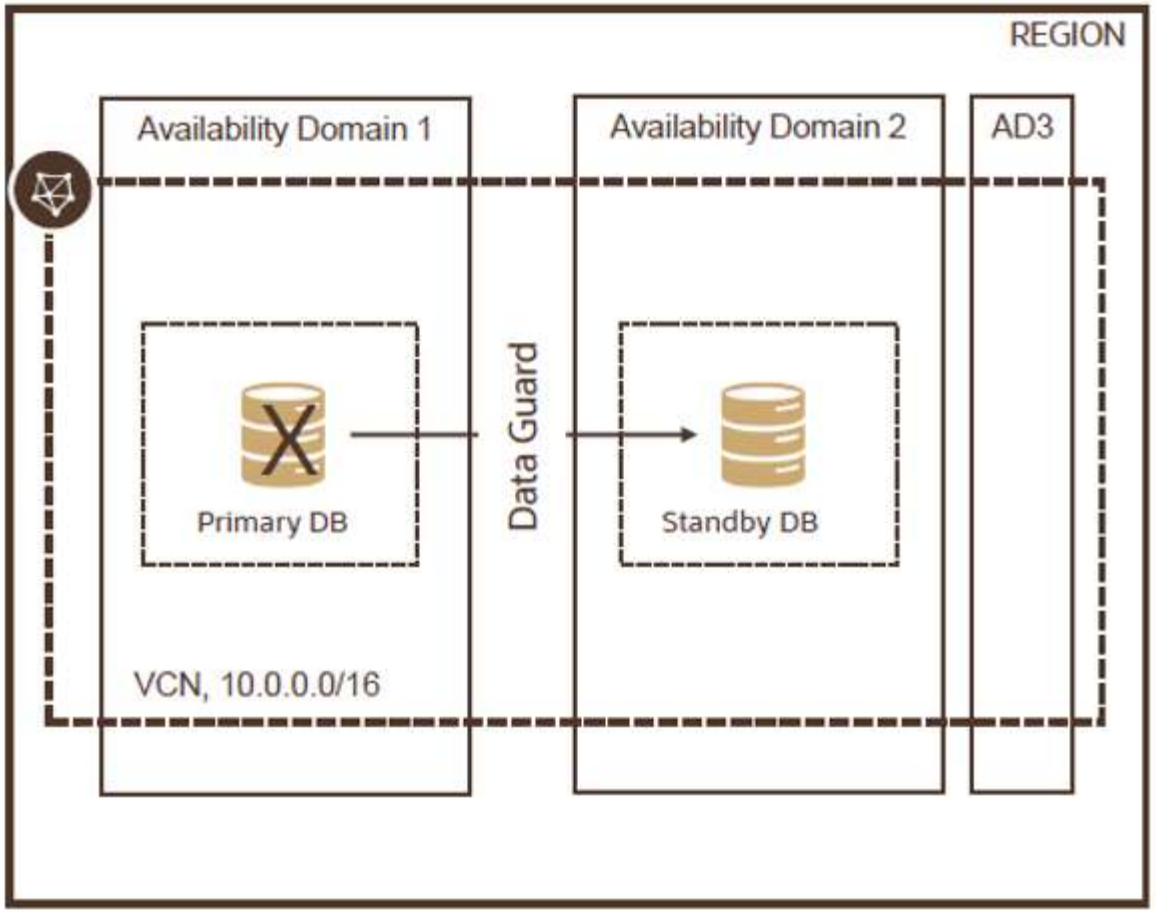
It maintains synchronization between the primary and the standby databases.

Active Data Guard extends the Data Guard by providing advanced features for data protection and availability. It's included in the Extreme Performance Edition and Exadata Service.

Two modes:

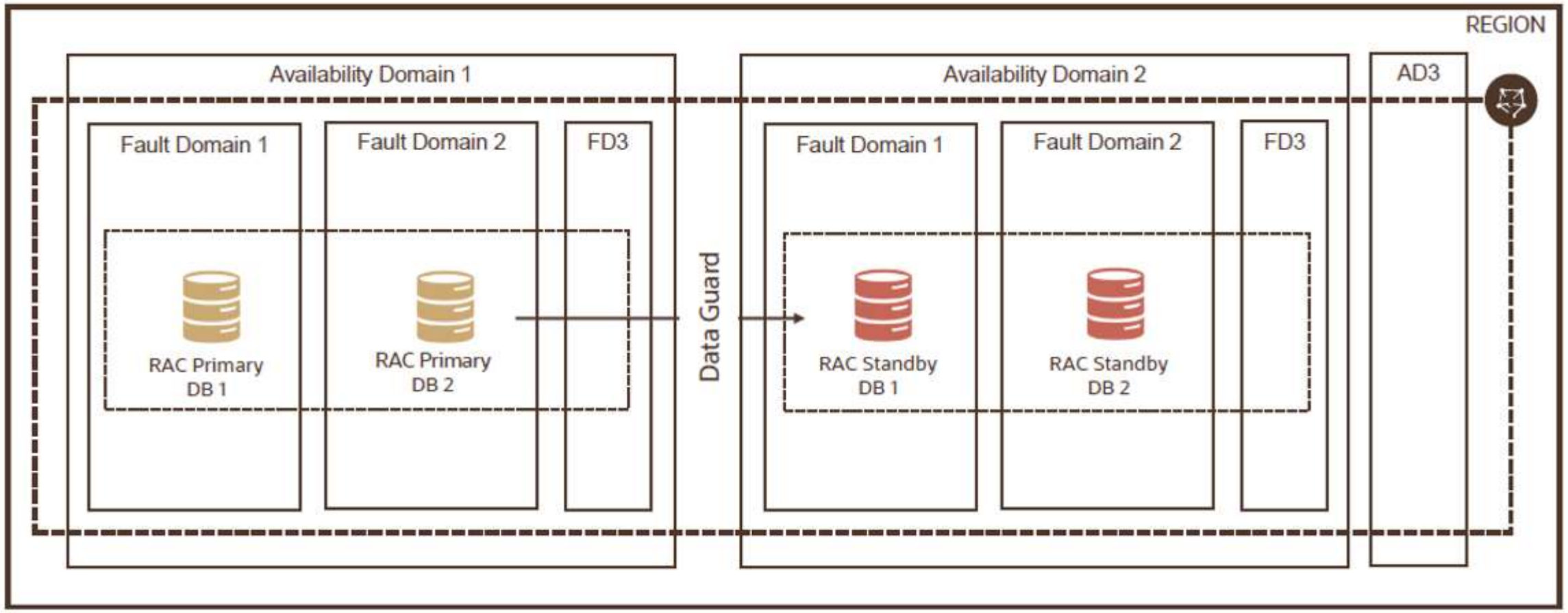
Switch Over, planned migration no data loss

Fail Over, unplanned migration minimal data loss



DB System HA and DR (multi AD region)

Primary and Standby Databases can be either single instance or RAC



DB System HA and DR (single AD region)

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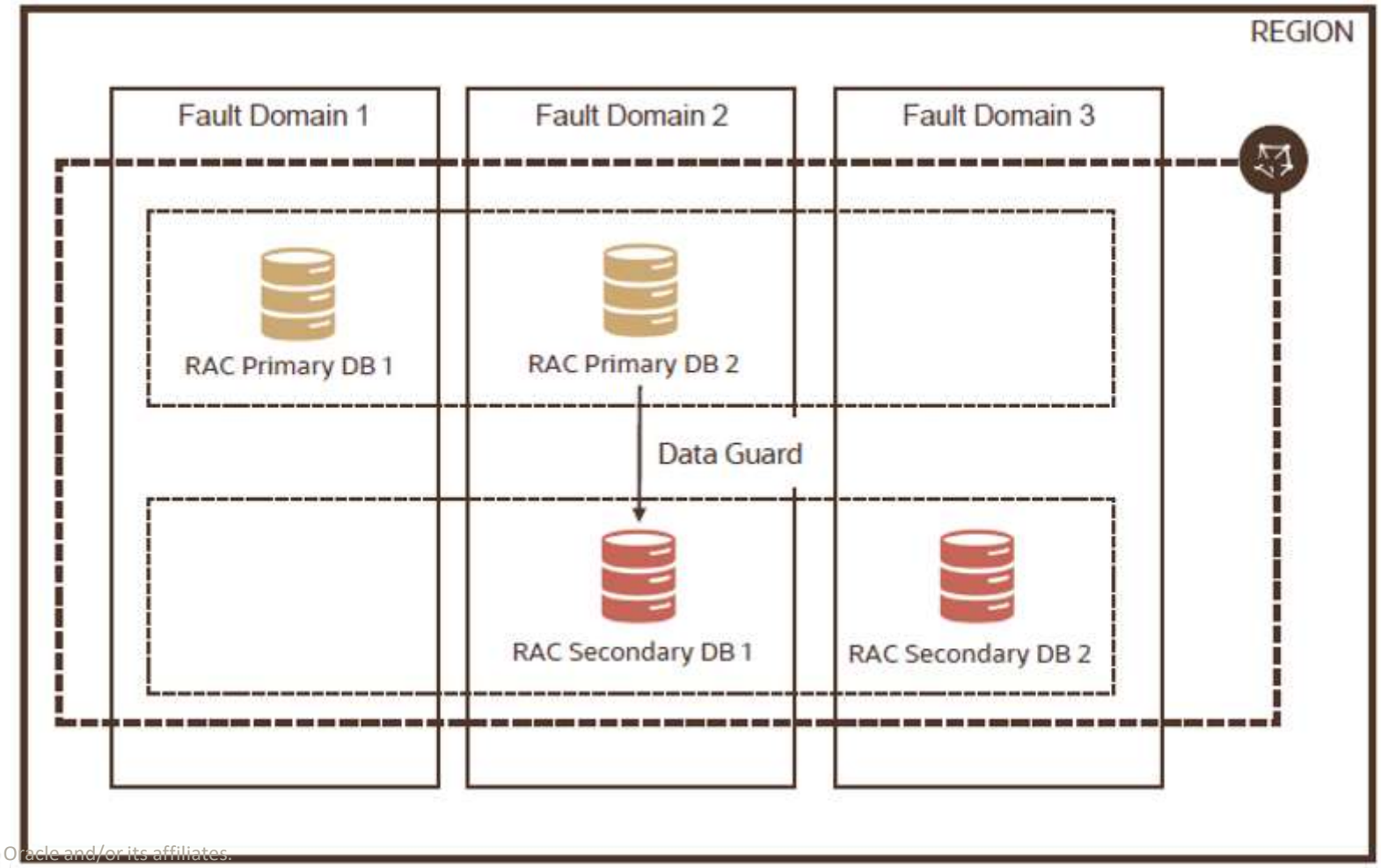
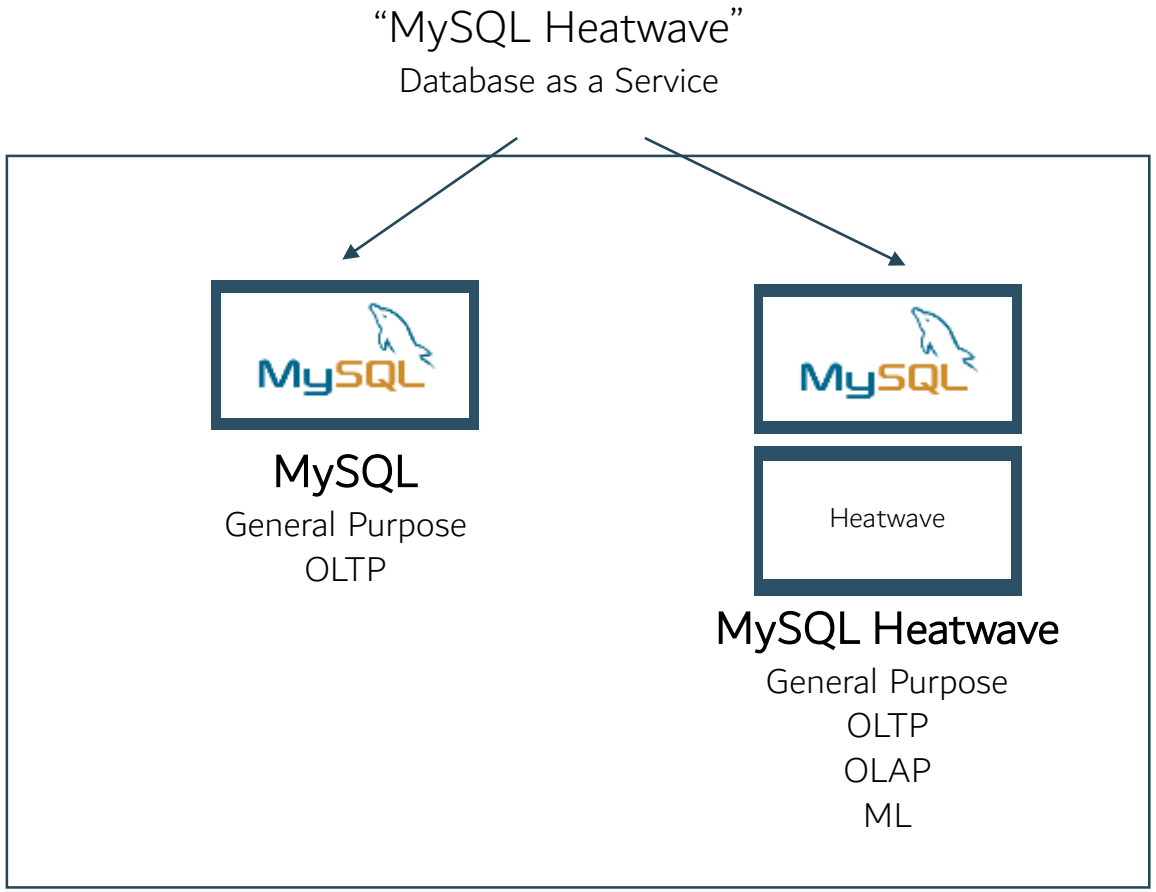


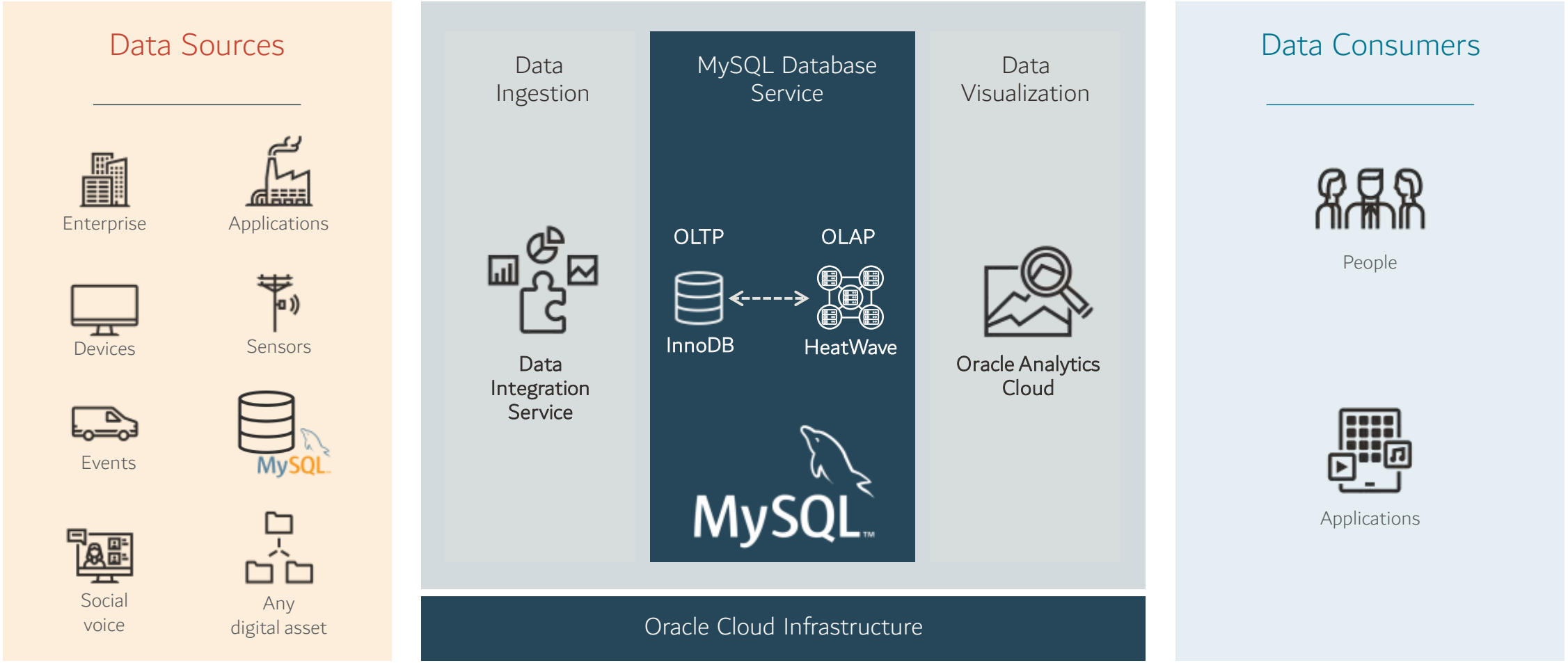
MySQL Database Service

- Fully managed MySQL Enterprise database running on OCI
- MySQL automatizes a series of manual opertaions, such as scaling, applying patches and upgrades, OS management, etc...
- Cheaper than running MySQL on VMs in other clouds.
- Includes Security features like Masking, TDE, Audit and Backup.
- User may deploy Heatwave to leverage faster analytics via this OLAP Engine
- Possible to dpeloy HA archtecture, replicated in 3 different sites.

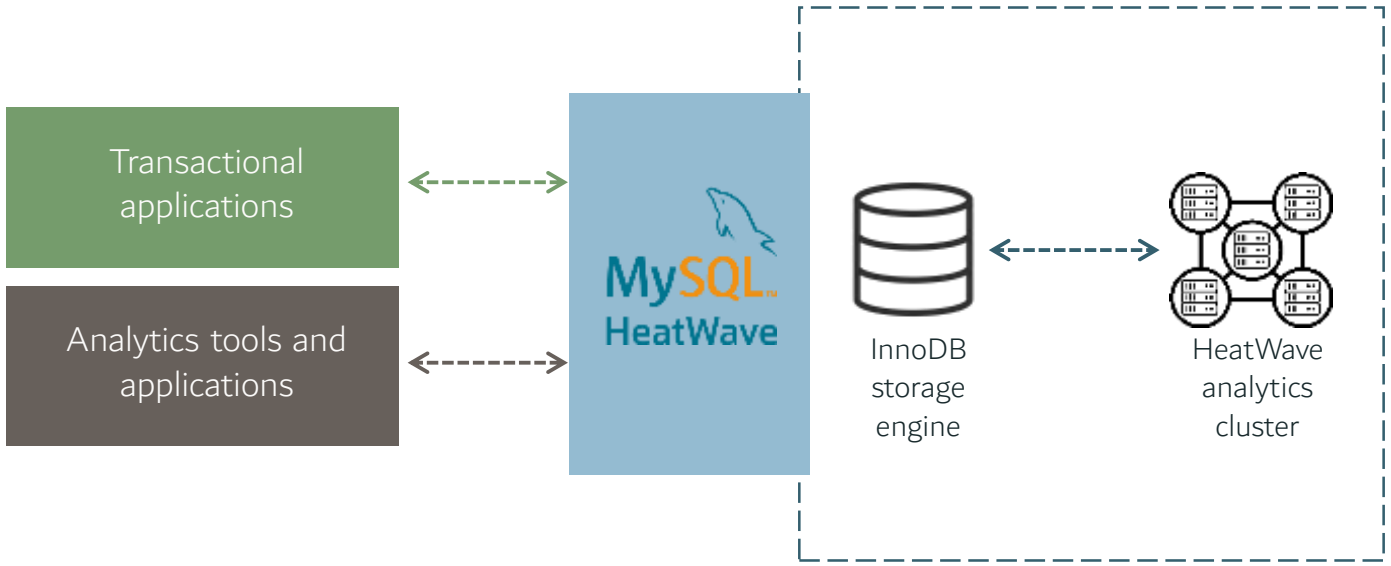
MySQL HeatWave Family



MySQL Database Services is integrated with other Oracle Services



One Database is Better than Two



1>2 with MySQL HeatWave

One service for OTLP & OLAP

No ETL duplication

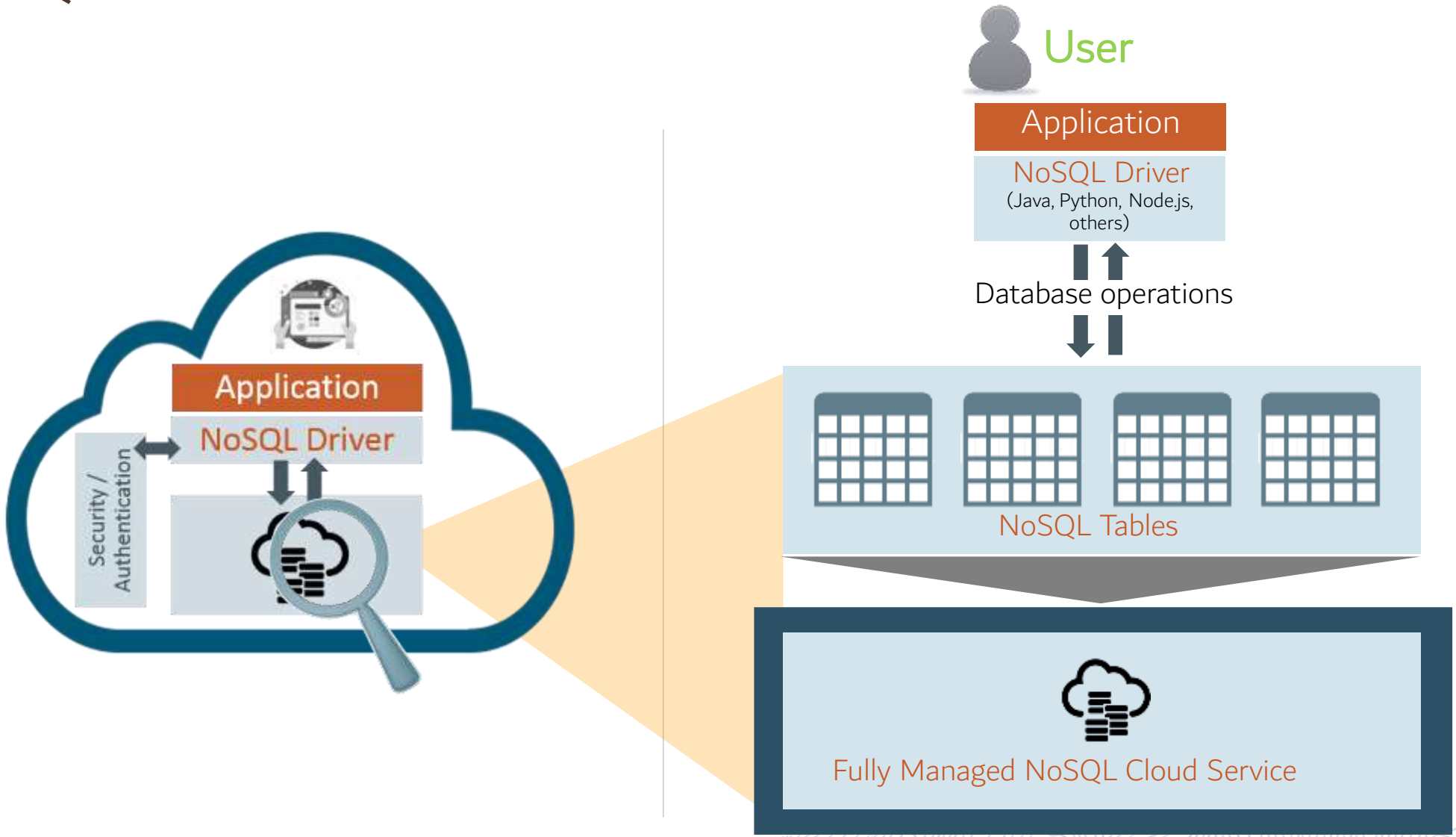
Unmatched performance, at a fraction of the cost

Real-time analytics

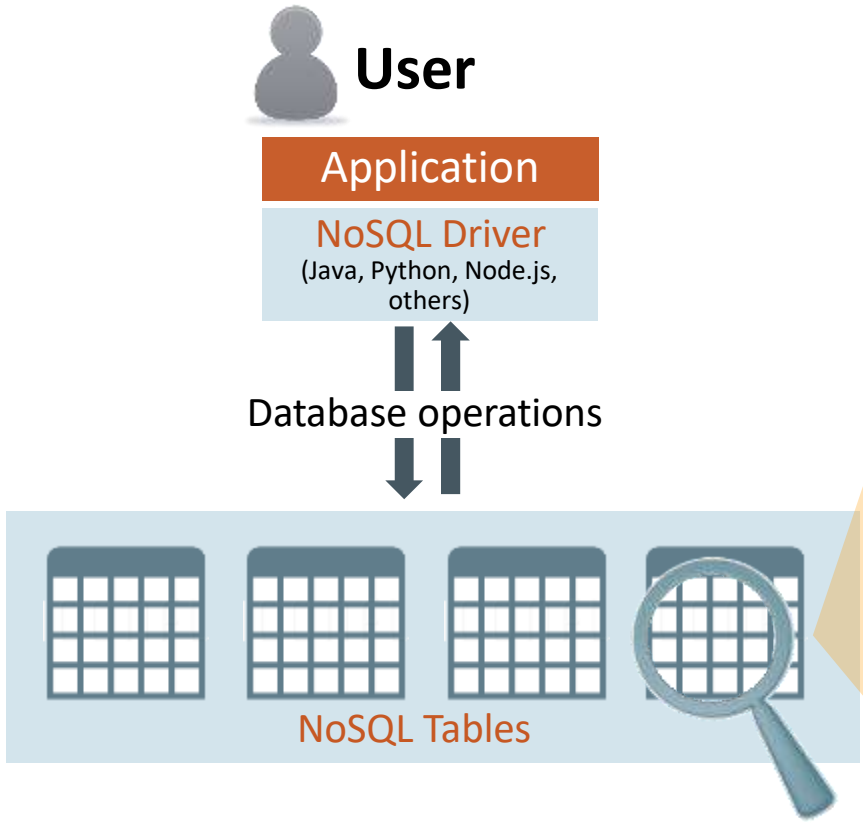
Improved security

Applications work without changes

NoSQL Service



NoSQL Table

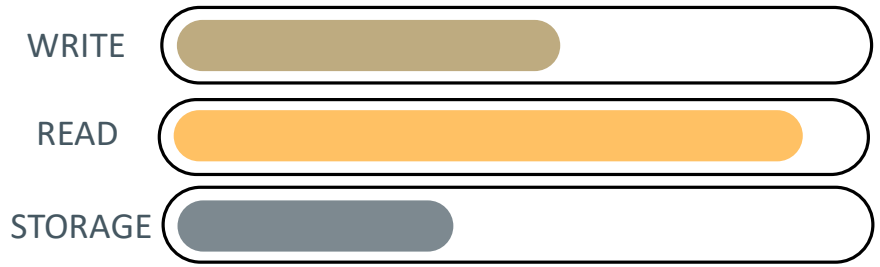


NoSQL Table

DATA

Integer (key)	String (data)	String (data)	Json (data)
num1	string1	string1	json1
num2	string2	string2	json2
num3	string3	string3	json3
num4	string4	string4	json4

CAPACITY PROVISIONED



Oracle NoSQL Database Cloud Service

Fully Managed

Database operation, maintenance, tuning are managed by Oracle

Elastic

Dynamically change throughput and storage capacities based on workloads

High Performance

Predictable low latency for all types of workloads

Data Model Flexibility

Document, columnar, key/value models supported with a single application interface

Security

Enterprise grade security with roles, privileges, encryption

Low Operating Cost

Pay only for the throughput and storage capacities provisioned

Developer Friendly

Easy-to-use APIs and integrated with different developer tools

Always Available

Built-in high availability to ensure business continuity

Hybrid Cloud

Interoperate with Oracle NoSQL on-premise solution using a single application interface

Summary

- Oracle Database Cloud Services
- DBCS, Autonomous DB, Exadata CS
- MySQL Database Service and HeatWave
- NoSQL Cloud Service

Thank you