



Oracle Cloud Infrastructure Multicloud Architect Professional (2025)

Student Guide
S1110202GC10

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Table of Contents

Multicloud Introduction	12
Multicloud – The New Normal	13
Autonomous Database	17
Oracle Database Service for Azure	18
Oracle Database@Azure	19
OCI- Azure Interoperability	20
Multicloud Announcements	21
Oracle Multicloud Milestones	22
Multicloud – Major Announcements	23
Autonomous Database	24
Oracle Database@Google Cloud	27
OCI- GCP Interoperability	28
Oracle Cloud Migrations can now migrate AWS EC2 instances to OCI	30
OCI Multicloud Use Cases	31
Split Stack Architecture	32
Distributed Cloud	34
SaaS Integration	35
Split Stack	36
Split Stack Architecture	37
Distributed Cloud	38
SaaS Integration	39
High Availability and Data Protection	40
OCI IAM Basics	41

What is OCI IAM?	42
OCI Identity Concepts	43
AuthZ	45
Identity Domain	47
Identity Domains	48
Identity Domain Types	49
Federation Concepts	50
Identity Federation	51
What is Identity Federation?	52
Identity Federation Concepts	53
How does Identity Federation work?	54
Getting started with OCI Virtual Networks	55
Virtual Cloud Network	56
IP address range for your VCN	58
IPv6	59
VCN Subnet	60
Subnet	61
VCN Security	63
Security list	64
Stateful security rules	66
Stateless security rules	67
Security list	68
Network security groups	69
Security list + network security groups	70
VCN Gateways	71
Internet Gateway	72

NAT Gateway	74
Service Gateway	76
VCN Peering	78
Local Peering Gateway	79
Dynamic Routing Gateway	80
VCN gateways	81
Dynamic Routing Gateway	82
VCN Routing	83
Route table	84
Multicloud Network Connectivity	86
Multicloud Connectivity Options	87
Site-to-Site VPN and FastConnect	88
FastConnect Partners	89
Site-to-Site VPN	91
Site-to-Site VPN: Overview	92
Site-to-Site VPN: Use Cases	93
Site-to-Site VPN Setup	94
Site-to-Site VPN: Equipment on Customer Premises	95
Site-to-Site VPN: Overview	96
Site-to-Site VPN: Tunnel Mode	97
Site-to-Site VPN: CPE Behind a NAT Device	98
Multicloud Site-to-Site VPN	99
Multicloud VPN	100
Site-to-Site VPN: AWS	101
Site-to-Site VPN: Azure	102
FastConnect	104

Use Cases for Low-Latency, Dedicated Connectivity	106
Virtual Circuit	107
FastConnect and IPv6	108
Option 1 - FastConnect with an Oracle Partner	110
Option 1 - FastConnect with an Oracle Partner - Layer 2 and Layer 3	111
Option 2 - FastConnect with a Third-Party Provider	112
OCI-Azure Interconnect Introduction	118
OCI-Azure Interconnect	119
OCI-Azure Interconnect Regions	120
Architecture OCI-Azure Interconnect	121
Common Use Cases	122
Building Blocks	123
Partnership Benefits	124
OCI-Azure Interconnect Scenarios	125
OCI-Azure Interconnect Scenarios	126
Connect OCI VCN to Azure VNet	127
Connect Peered OCI VCNs in the same OCI Region to Azure	128
Connect Peered OCI VCNs in different OCI Regions to Azure	129
Connect services in Oracle Services Network to Azure	130
On-prem Private Connectivity to OCI	131
OCI-Azure Interconnect Setup	132
OCI-Azure Interconnect	133
BGP Requirements	135
Redundancy and High Availability	136
Bandwidth and Cost Considerations	137
Oracle Interconnect for Google Cloud	138

Oracle Interconnect for Google Cloud Overview	139
Benefits	140
Oracle Interconnect for Google Cloud Regions	141
Common Architectures	142
Interconnect Setup Process	144
Provisioning Workflow (GCP)	145
Provisioning Workflow (OCI)	148
OCI Database Services Introduction	151
Database Services in Oracle Cloud	152
Oracle Base Database Service	157
Oracle Base Database Service	158
License-Included Oracle Database Options	159
VM DB Systems Storage Architecture	160
Cloud Automation for Life Cycle Management	161
High Availability and Disaster Recovery	163
Integrated Security from Data to Identity	164
Autonomous Databases	165
Autonomous Services Automatically Secure, Tune, and Scale Your Apps	166
Autonomous Database	167
Exadata Database Service	169
What Is Exadata Database Service?	170
Database Services on Exadata in Oracle Cloud	171
OCPU Scaling Options for Exadata Database Service	173
Cost-Effective Software Licensing Models	174
MySQL Database Service	175
MySQL	176

MySQL Database Service	177
MySQL Database Service – High Availability Configuration	180
MySQL Database Service	181
MySQL Database Service – HeatWave Overview	185
MySQL Database Service	186
MySQL Database Service – HeatWave Features	189
MySQL Database Service	190
Introduction to Oracle Database@Azure	193
Multicloud	194
OCI- Azure Interoperability	195
Oracle Database@Azure	196
Oracle Database@Azure Service Overview	197
Oracle Database@Azure Easy Adoption	198
Oracle Database@Azure Operational Responsibilities	199
Oracle Database@Azure – Use Case Scenarios	200
Migrate Workloads from On-Premises	201
Migrate Database Workloads from Non-Oracle Cloud	202
Oracle Database@Azure - Architecture	203
Physical Data Center Level Architecture	204
Oracle Database@Azure - Onboarding	205
Subscribe and Onboard Oracle Database@Azure	206
Subscribe To Oracle Database@Azure	207
Oracle Database@Azure Resource	208
Onboard Oracle Database@Azure	209
Oracle Database@Azure Identity	210

Identity – Azure Roles	211
Groups and Roles in Azure	212
Groups and Roles in OCI	213
Oracle Database@Azure Networking	214
Oracle Database@Azure network requirements	215
Client Subnet IP address requirements	216
Backup Subnet IP address requirements	217
Usable IPs for Client & Backup subnets by CIDR size	218
Subnet Delegation in Azure VNet	219
Subnet Delegation Benefits	220
Local VNet Topology	221
VNet Peering Topology	222
Hub-spoke VNet Peering topology	223
Connect OCI application or service in same VCN	224
Oracle Database@Azure - Provisioning	225
Provision Oracle Database@Azure Resources	227
Provision Oracle Exadata Infrastructure	228
Provision Oracle Exadata VM Cluster	229
Provision Oracle Exadata Database	231
Oracle Database@Azure - Operations	232
Operational Resources	233
Monitoring Resources in Azure	234
High Availability & Disaster Recovery with Oracle Database@Azure	235
Objectives	236
Automatic Backup to OCI Object Storage	237
Configure Automatic Backup in OCI Console	238

Disaster Recovery - Configuring Local Standby	239
Disaster Recovery - Configuring Remote Standby	240
Automated Data Guard Deployment	241
Configure Data Guard or Active Data Guard in OCI Console	242
Configure Hybrid Data Guard with Oracle Database@Azure	243
Introduction to Oracle Database@Google Cloud	244
Oracle And Google Cloud Partnership	245
Oracle and Google Cloud Partnership Offering	246
Oracle Database@Google Cloud	247
Oracle Database@Google Cloud Easy Adoption	248
Operational Responsibilities	249
Oracle Database@Google Cloud – Architecture	250
Deployment Architecture in Google Cloud Zone	251
Oracle Database@Google Cloud - User Journey	252
User Journey	253
Oracle Database@Google Cloud – Onboarding	254
Onboarding Oracle Database@Google Cloud	255
Onboarding Prerequisites	256
Onboarding Oracle Database@Google Cloud	257
Purchase - Public Offer	258
Purchase - Private Offer	259
Configuration	260
Oracle Database@Google Cloud - Networking Topologies	261
Single VPC - Multiples Subnets	262
Multiple VPC	263
VPC Peering	264

Hub-and-Spoke network virtual appliance (NVA)	265
Oracle Database@Google Cloud – Provisioning	266
Role Based Access Grants for OD@GCP	267
Network Requirement for Database Service in OD@GCP	268
Provision Oracle ADB-S in OD@GCP	269
Provision ExaDB –D in OD@GCP	271
Provision Oracle Exadata Infrastructure	272
Provision Oracle Exadata VM Cluster	273
Provision Oracle Exadata Database	274
Oracle Database@Google Cloud - Manage	275
Operations And Interfaces	276
Configure Backup for Exadata Database Service	277
Configure Backup for Autonomous Database Service	278
Monitoring Resources in Google Cloud	279

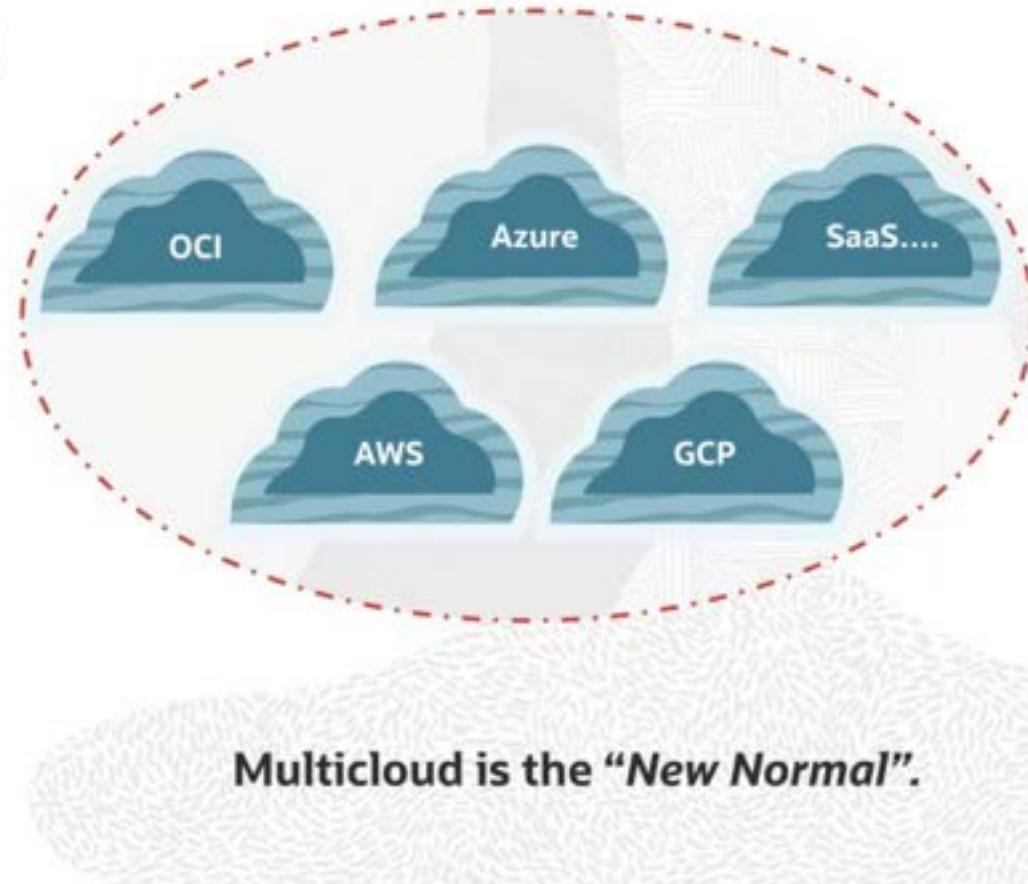
Oracle Multicloud

Multicloud Introduction

Multicloud – The New Normal

Multicloud is the coordinated use of cloud services from more than one provider

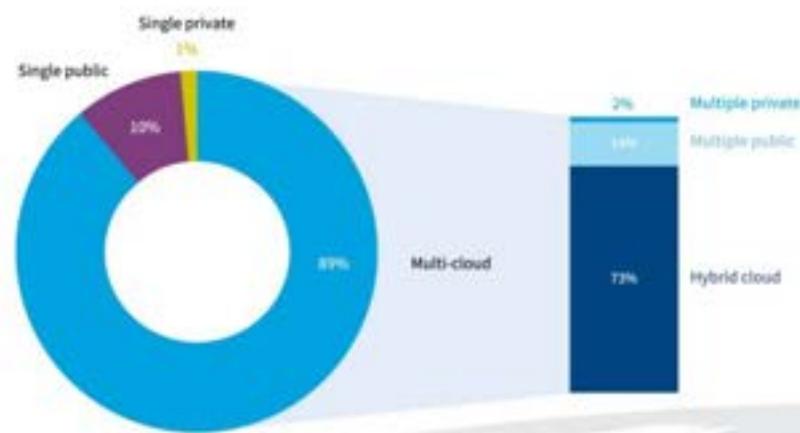
- Top drivers of multicloud adoption include data sovereignty and cost optimization.
- Other drivers include business agility, best of breed cloud services and mitigating vendor lock-in concerns.
- Multicloud enables organizations more control over where and how data is stored and used, while also controlling costs by adjusting which services they use from different providers.



Multicloud is the “New Normal”.

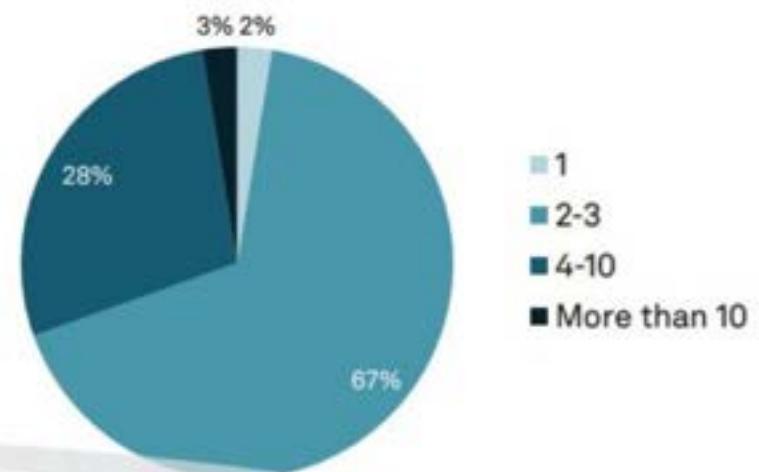
Multicloud remains the de facto standard for all organizations.

Organizations embrace multi-cloud



Flexera 2024 State of the Cloud Report

Number of Cloud Providers used in organizations



451 Research commissioned by Oracle, Q3 2022

Drivers for using multiple clouds?



451 Research commissioned by Oracle, Q3 2022

Multiple clouds helped advance your company's business goals?



HashiCorp 2023 State of Cloud Strategy Survey

OCI Distributed Cloud offers exceptional flexibility and choice



Multicloud

Our products work with your other providers, including Oracle Database Service at Azure, Oracle Database Service for Azure, Oracle Interconnect with Azure, and Oracle MySQL Heatwave on AWS



Public cloud

Access cloud services in 45+ global locations including Commercial, US Government, UK Government, US National Security Regions, and EU Sovereign (2024)



Hybrid cloud

We bring cloud services to you, including Oracle Exadata Cloud@Customer, Oracle Roving Edge Infrastructure, OCI Observability and Management, and Oracle Database



Dedicated cloud

We build a cloud just for you, with all 100+ OCI services running in customer data centers, including OCI Dedicated Region and Oracle Alloy

OCI-Azure Interconnect

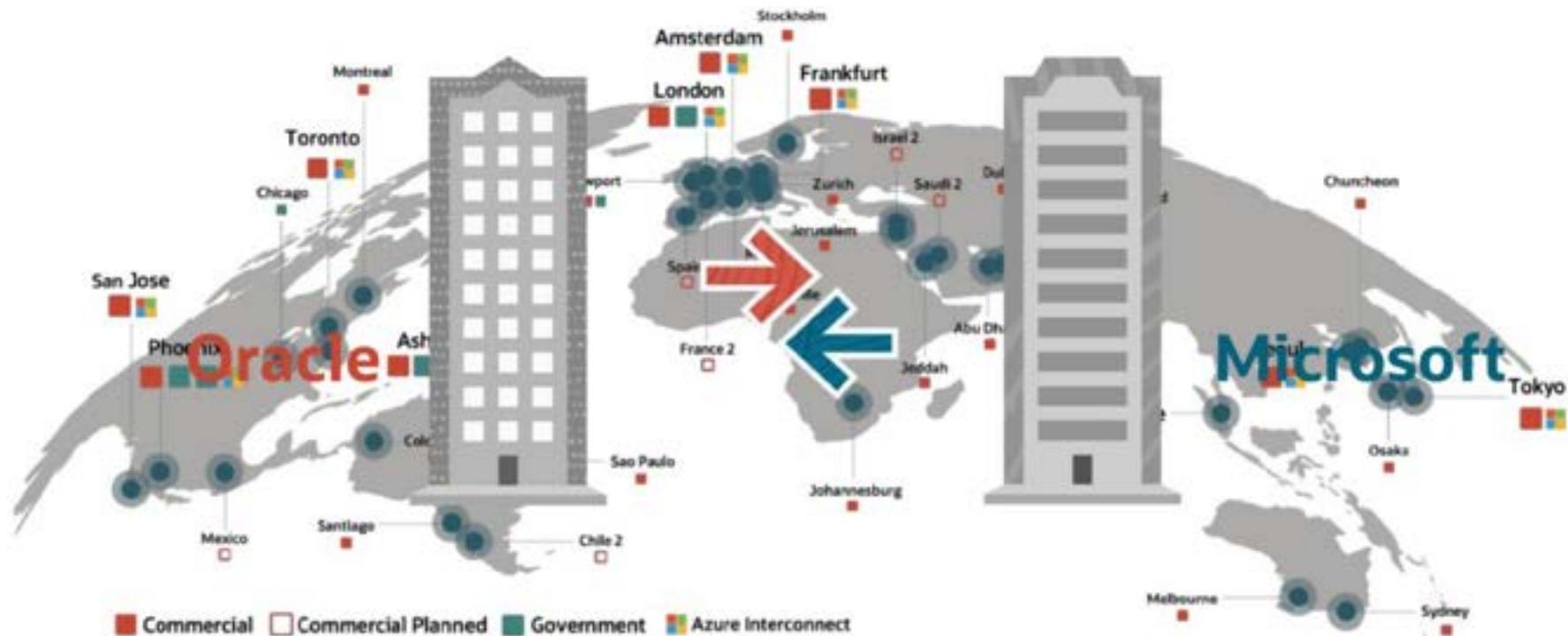


Highly optimized, secure, and unified cross-cloud experience

12 Azure
Interconnect regions

< 2 millisecond latency
private interconnection

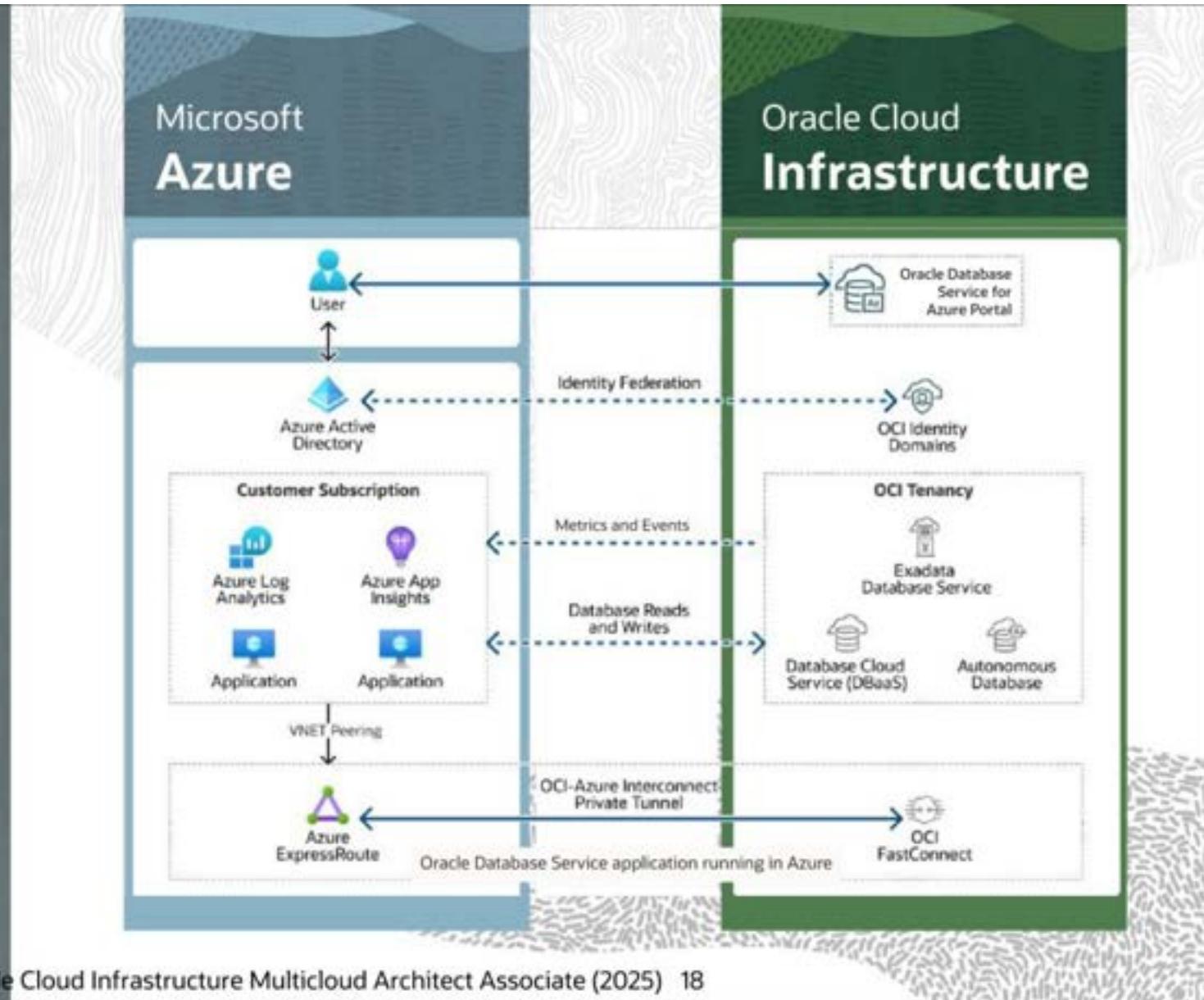
No egress or ingress
charges for data



Oracle Database Service for Azure

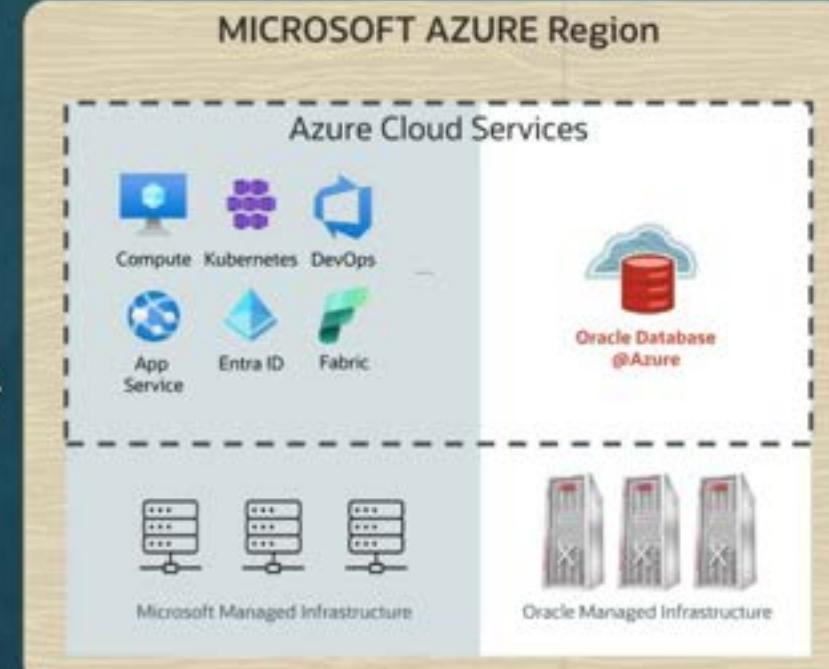


- Familiar Azure-native user experience
- Automated identity, networking, and monitoring integration
- < 2 MS latency private interconnect
- No additional cost



Oracle Database@Azure

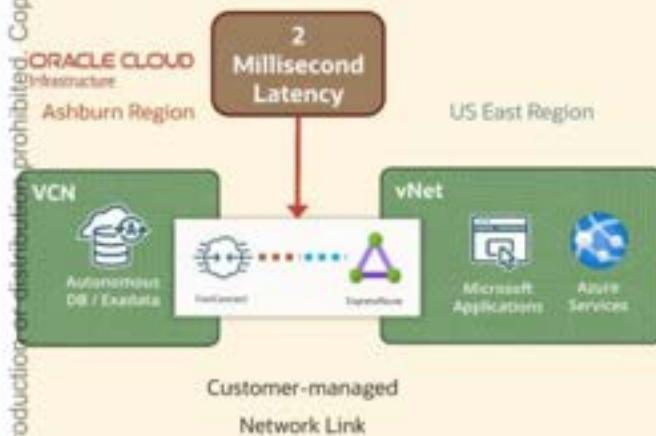
*Oracle and Microsoft deliver
Oracle database services on OCI
in Microsoft Azure datacenters*



OCI- Azure Interoperability

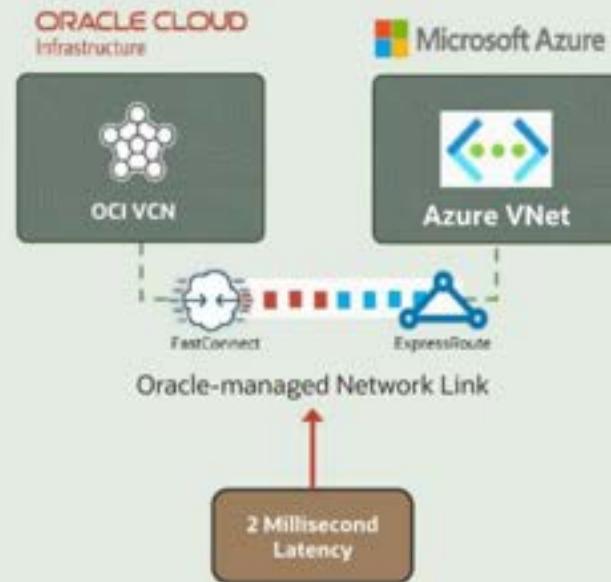
Oracle Interconnect for Microsoft Azure

2019



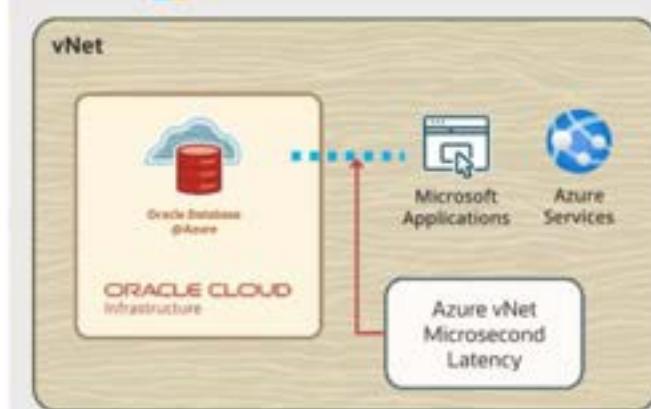
Oracle Database Service for Azure

2022



Oracle Database Service at Azure

2023



Oracle Multicloud

Multicloud Announcements

**ORACLE
CLOUD**
Infrastructure

Milestones

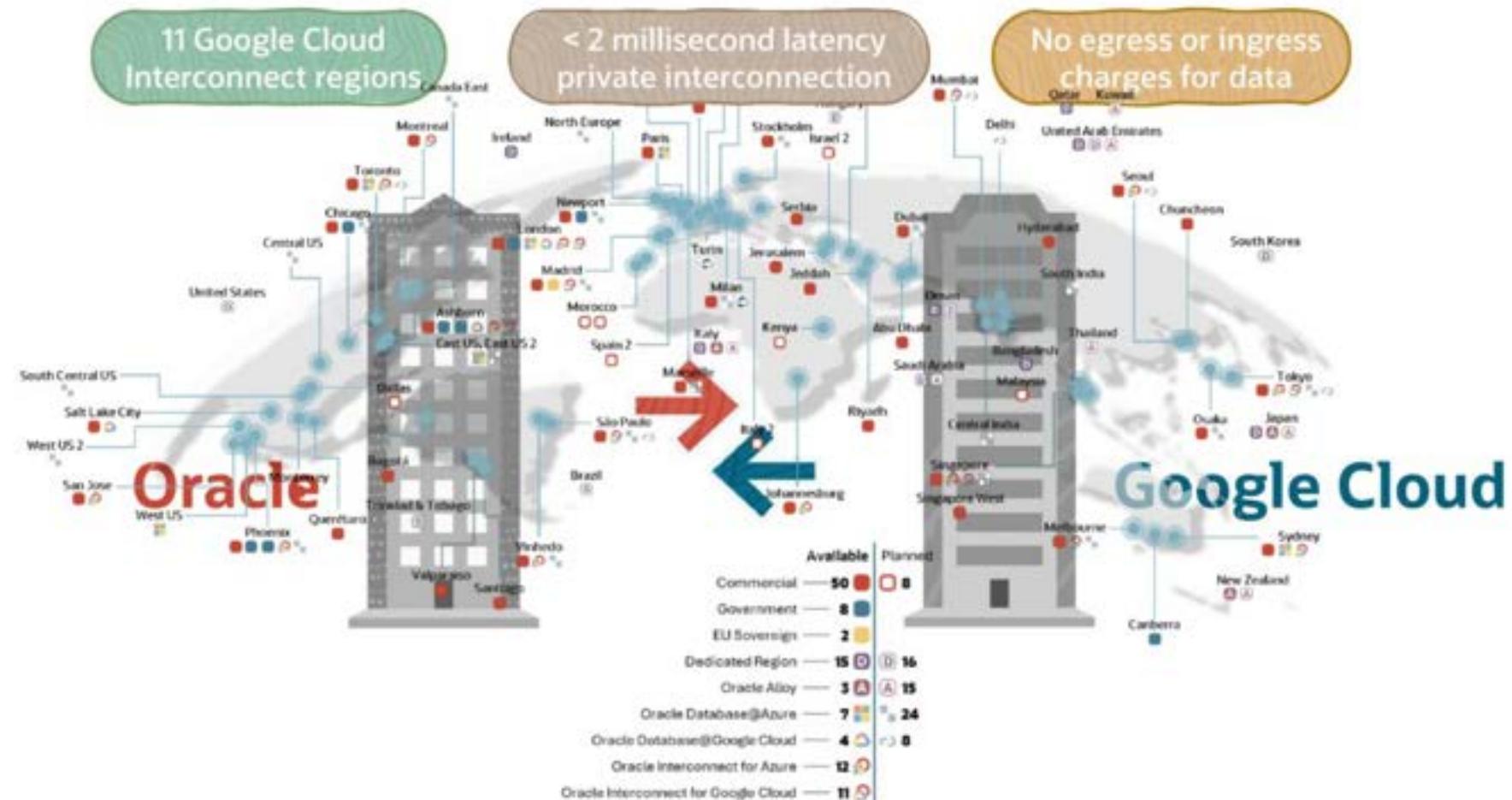


Multicloud – Major Announcements

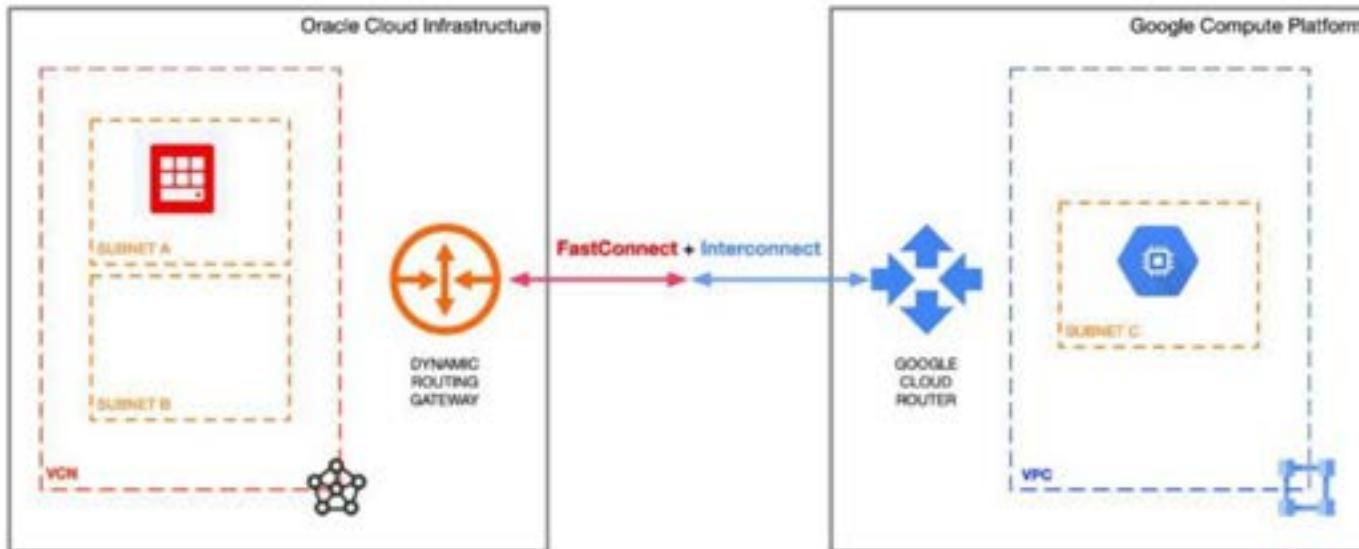


Oracle Interconnect for Google Cloud

Highly optimized, secure, and unified cross-cloud experience



Oracle Interconnect for Google Cloud



With the **Oracle Interconnect for Google Cloud**, Oracle and Google have created an integrated cloud experience using OCI FastConnect and Google Cloud Interconnect.

This multicloud interconnection allows you to run mission-critical enterprise workloads across your Google Cloud and OCI environments and access the best-in-class services of each cloud provider, using a dedicated, low-latency private connection.

Oracle Interconnect for Google Cloud is available in the following regions:

OCI region	Google Cloud region
US East (Ashburn)	us-east4 (Ashburn)
Canada Southeast (Montreal)	northamerica-northeast1 (Montreal)
Germany Central (Frankfurt)	europe-west3 (Frankfurt)
Spain Central (Madrid)	europe-southwest1 (Madrid)
UK South (London)	europe-west2 (London)
Australia East (Sydney)	australia-southeast1 (Sydney)
Australia Southeast (Melbourne)	australia-southeast2 (Melbourne)
India West (Mumbai)	asia-south1 (Mumbai)
Japan East (Tokyo)	asia-northeast1 (Tokyo)
Singapore	asia-southeast1 (Singapore)
Brazil East (Sao Paulo)	southamerica-east1 (Sao Paulo)

OCI location	Azure ExpressRoute location
Canada Southeast (Toronto) - YYZ	Toronto and Toronto2
US East (Ashburn) - IAD	Washington DC and Washington DC2
US West (Phoenix) - PHX	Phoenix
US West (San Jose) - SJC	Silicon Valley
Japan East (Tokyo) NRT	Tokyo
Singapore (Singapore) - SIN	Singapore
South Korea Central (Seoul) - ICN	Seoul
Brazil Southeast (Vinhedo) - VCP	Campinas
Germany Central (Frankfurt) - FRA	Frankfurt and Frankfurt2
Netherlands Northwest (Amsterdam) - AMS	Amersterdam2
UK South (London) - LHR	London
South Africa Central (Johannesburg) - JNB	Johannesburg

Oracle Database@Google Cloud

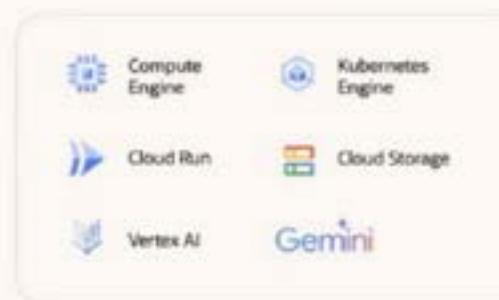
Oracle Database@Google Cloud NEW

Enterprise grade data management services



Exadata · Autonomous Database ·
Autonomous Recovery Service

Innovative cloud services



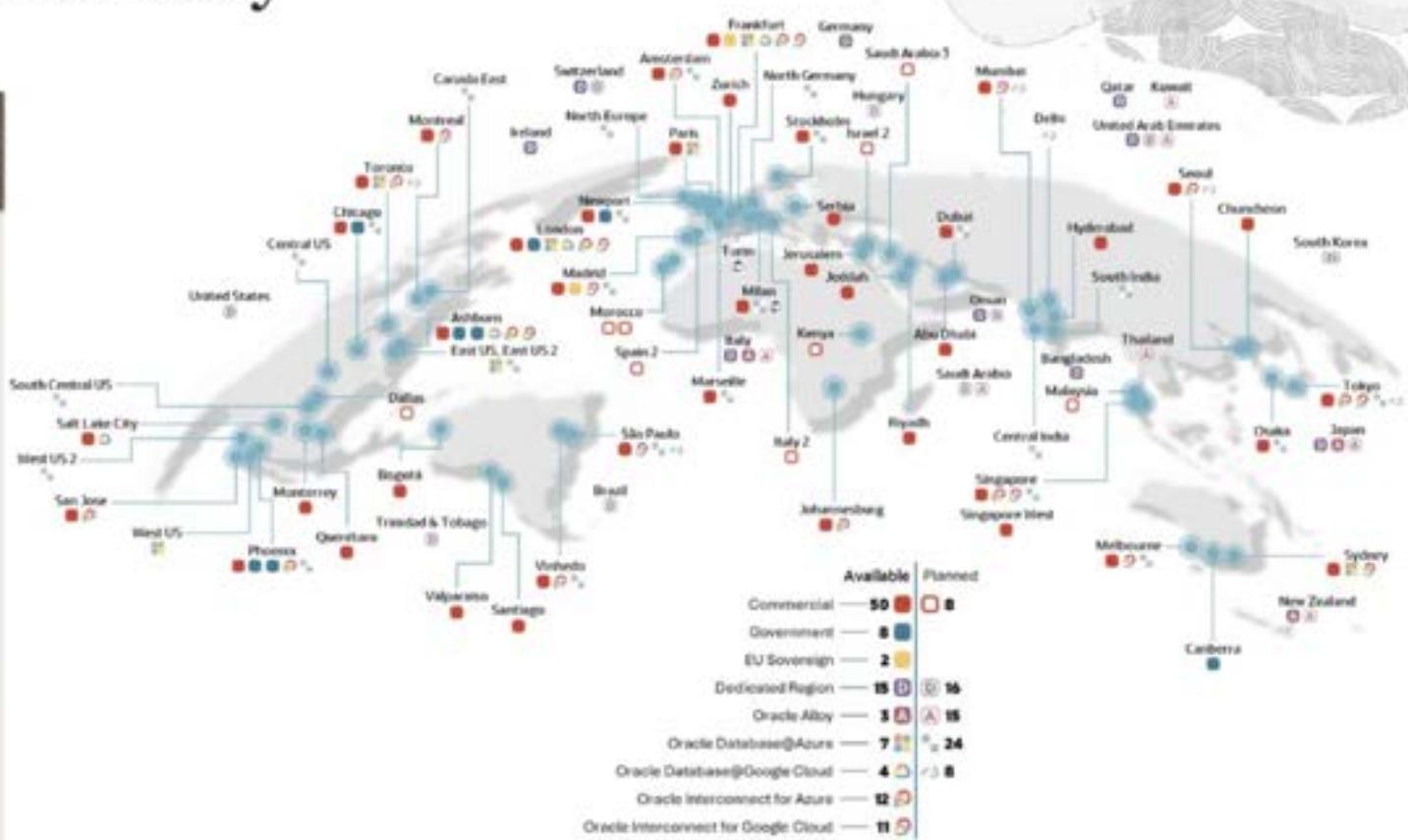
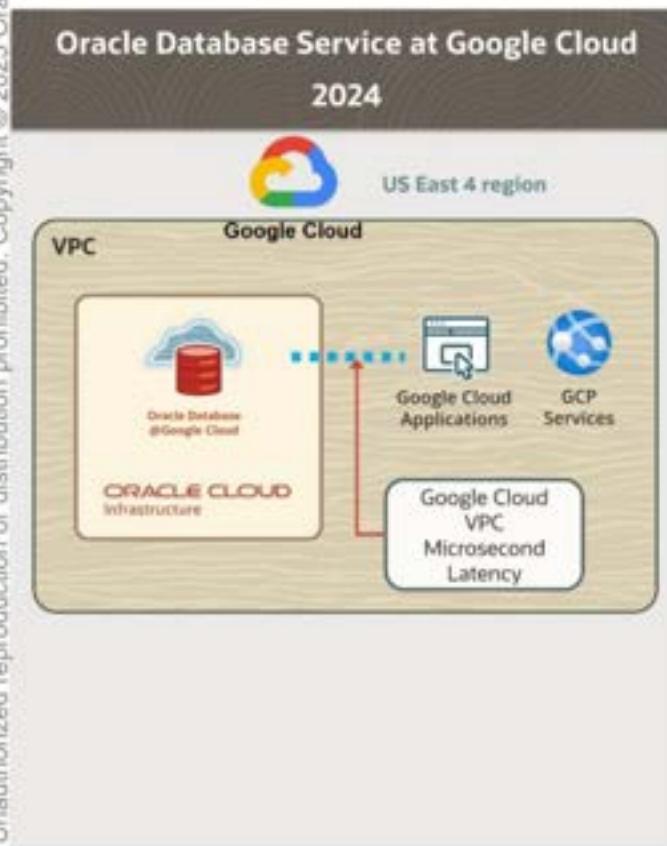
*Oracle and Google Cloud deliver
Oracle database services on OCI
in Google Cloud datacenters*

ORACLE



Google Cloud

OCI- GCP Interoperability





ORACLE

Oracle Database@AWS

Oracle and AWS are partnering together to provide a unified experience for collaborative support, purchasing, management, and operations. You can pay for Oracle Database services using your existing AWS Private Pricing Agreements, and use your existing Oracle license benefits and discount programs

*Oracle and Amazon Web Services deliver
Oracle database services on OCI
in AWS datacenters*



Oracle Cloud Migrations can now migrate AWS EC2 instances to OCI



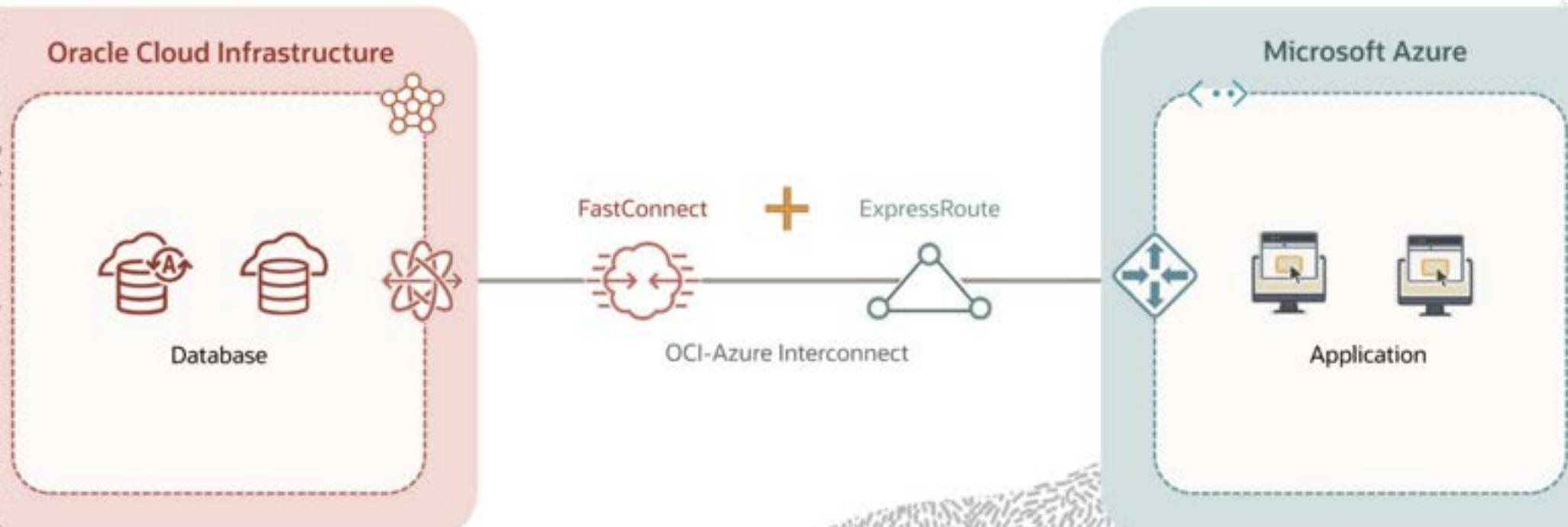
Compute



Amazon
EC2

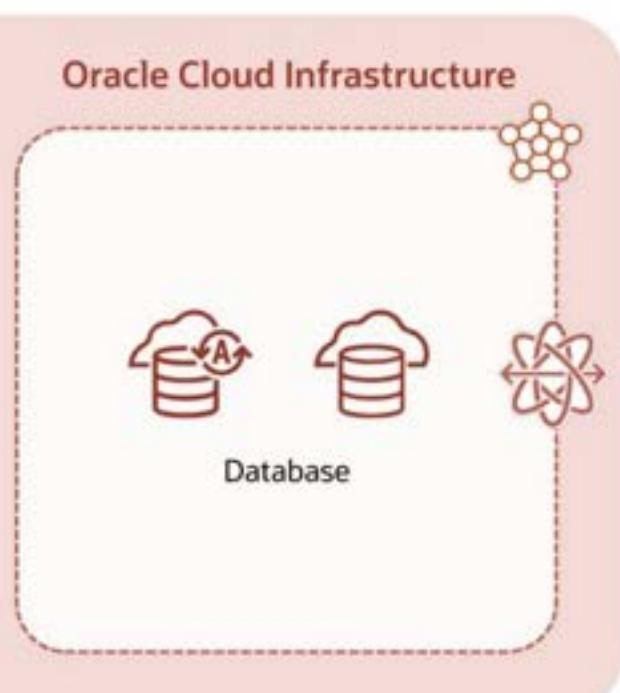
Oracle Cloud Infrastructure OCI Multicloud Use Cases

Split Stack Architecture

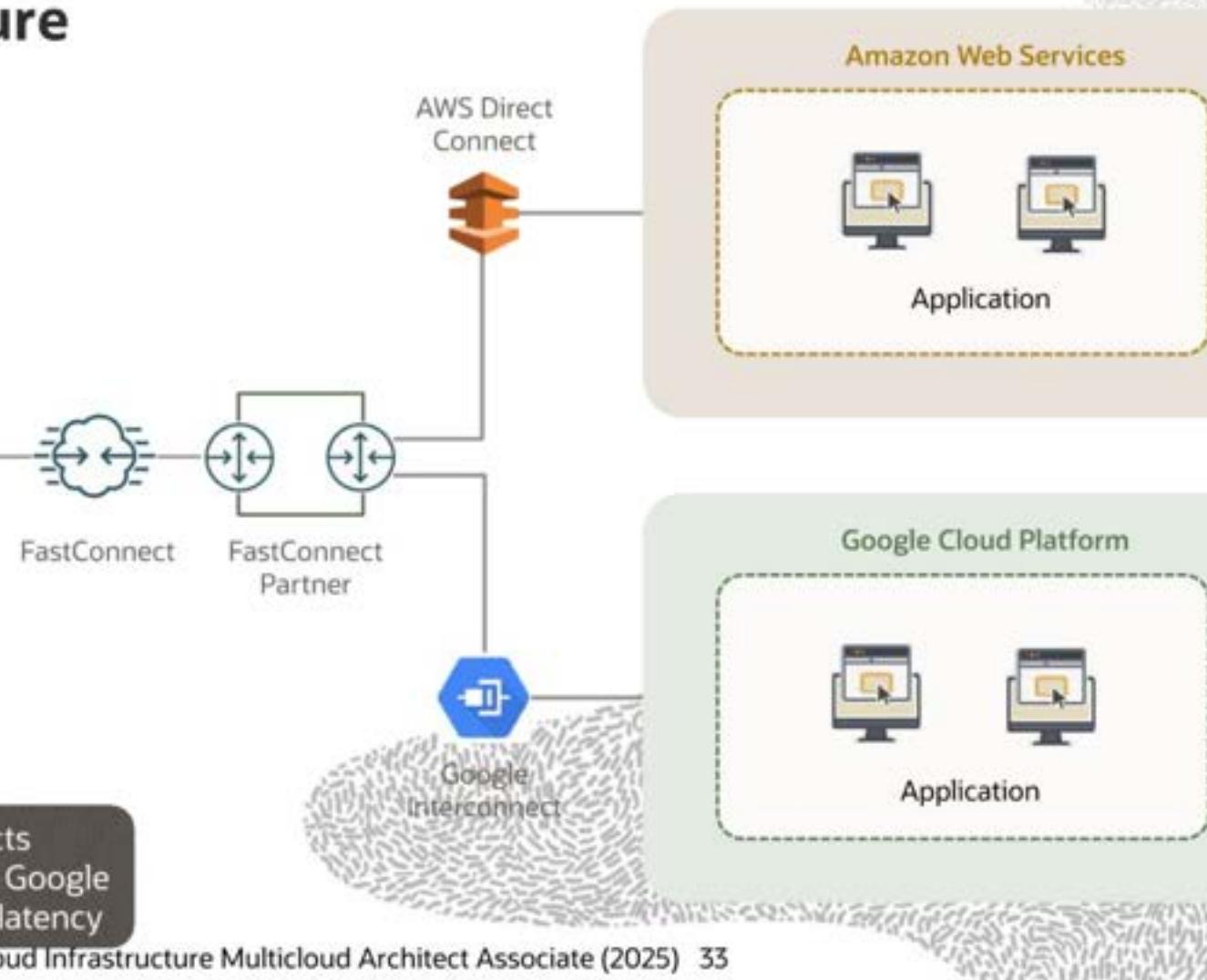


Direct connection with ~ 2ms round trip latency between clouds
– no intermediate connectivity provider is required

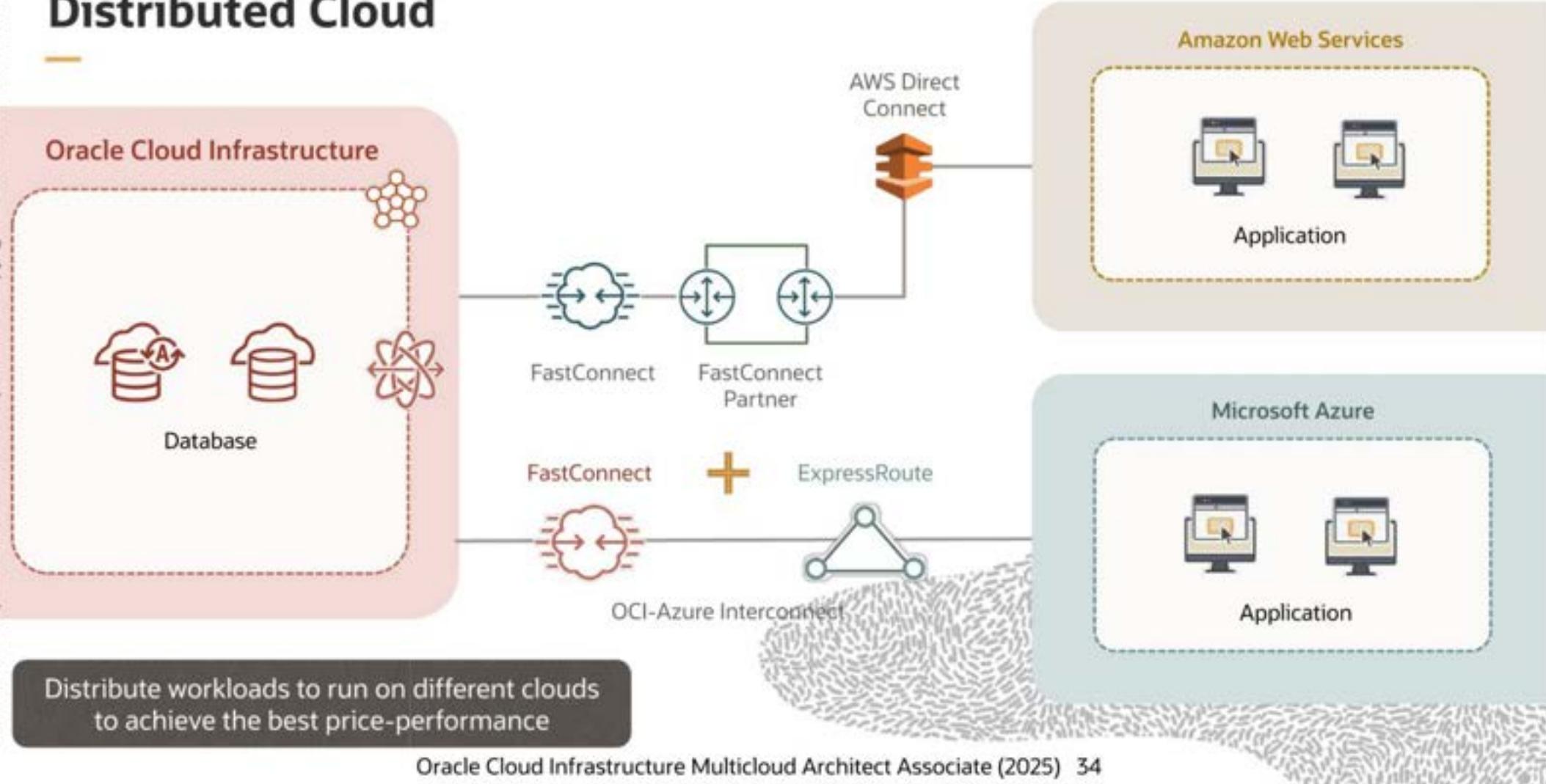
Split Stack Architecture



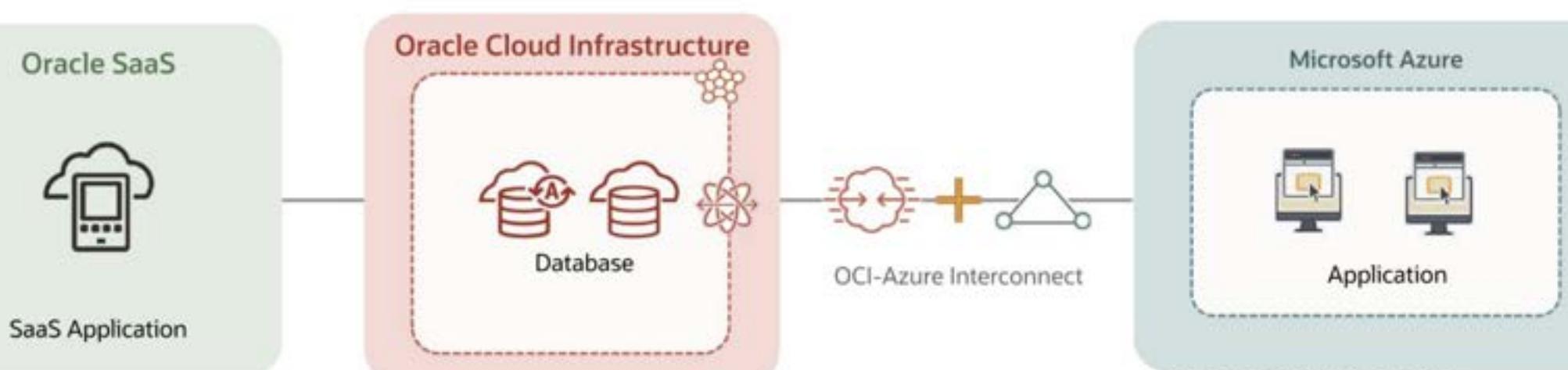
Oracle FastConnect partner connects
FastConnect to AWS Direct Connect and Google
Interconnect with 2 -4 ms of round-trip latency



Distributed Cloud

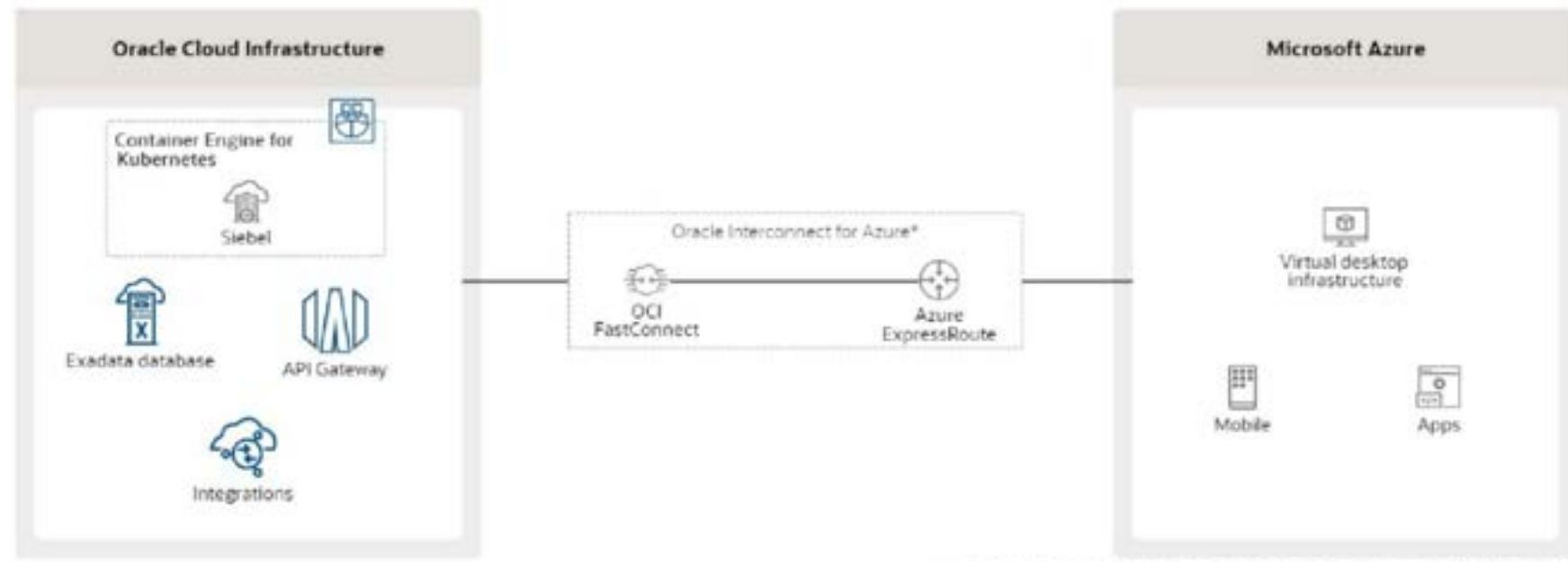


SaaS Integration



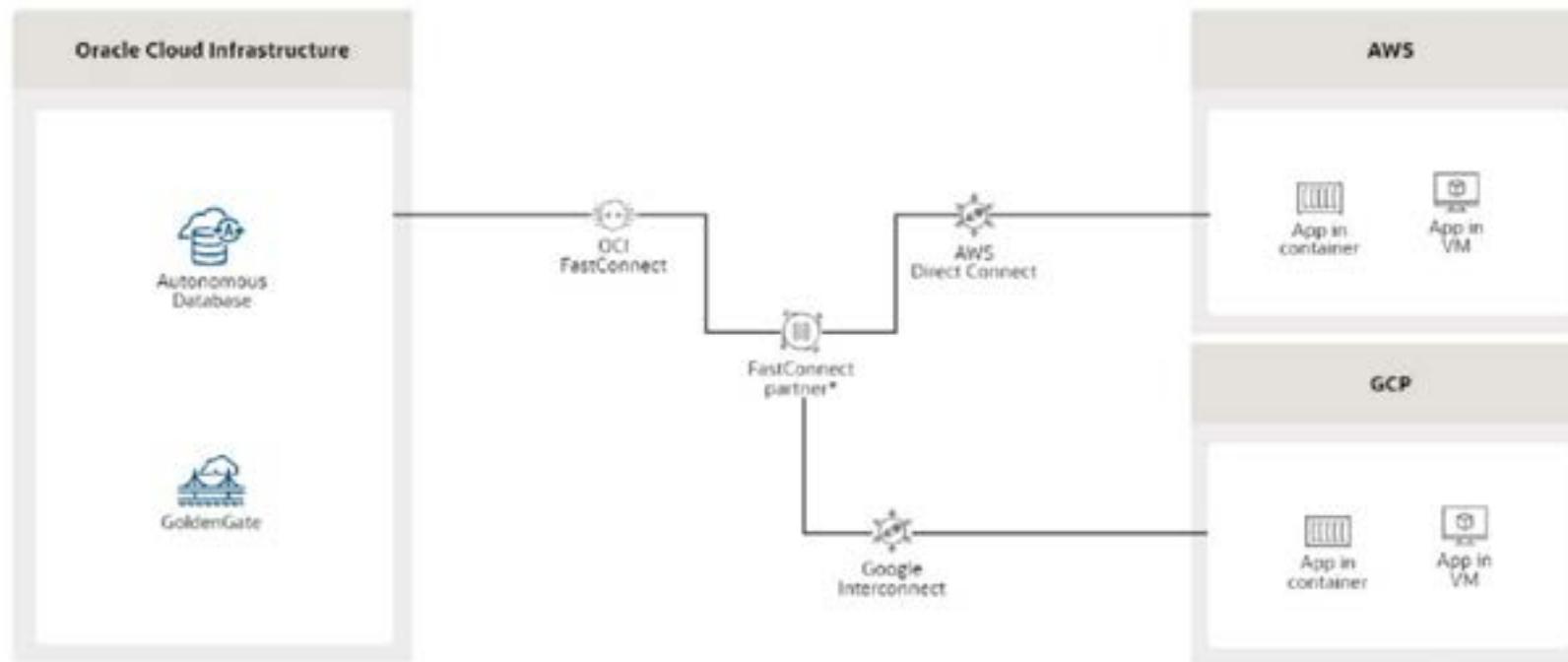
Integrate SaaS applications with applications on different clouds to achieve business agility and innovation.

Split Stack



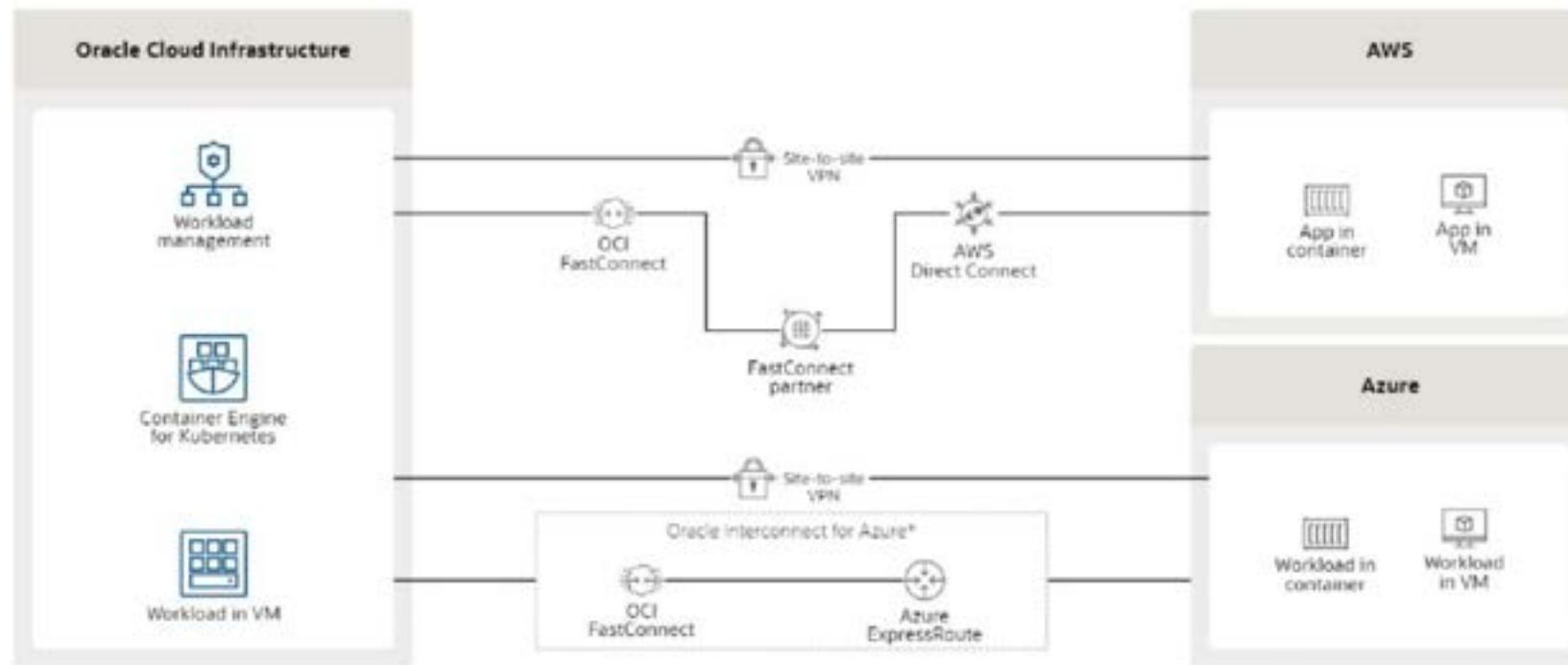
Direct connection with ~ 2ms round trip latency between clouds –
no intermediate connectivity provider is required

Split Stack Architecture



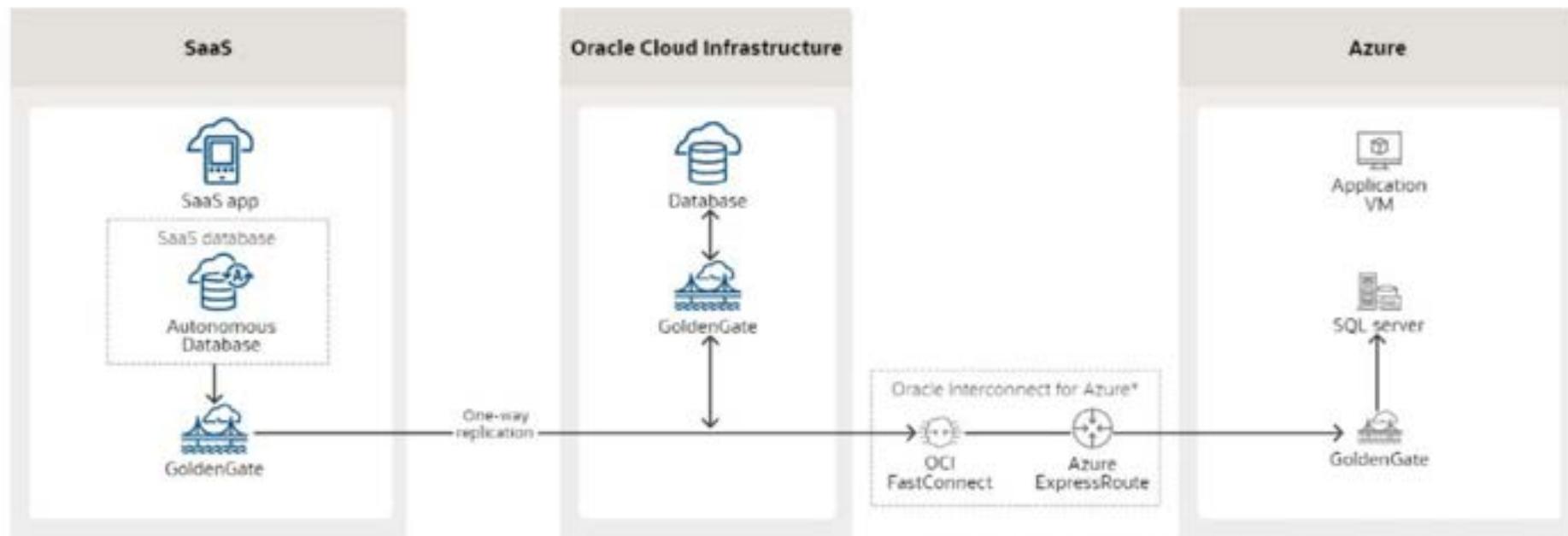
OCI FastConnect partner connects FastConnect to AWS Direct Connect and Google Interconnect with two to four milliseconds of round-trip latency

Distributed Cloud



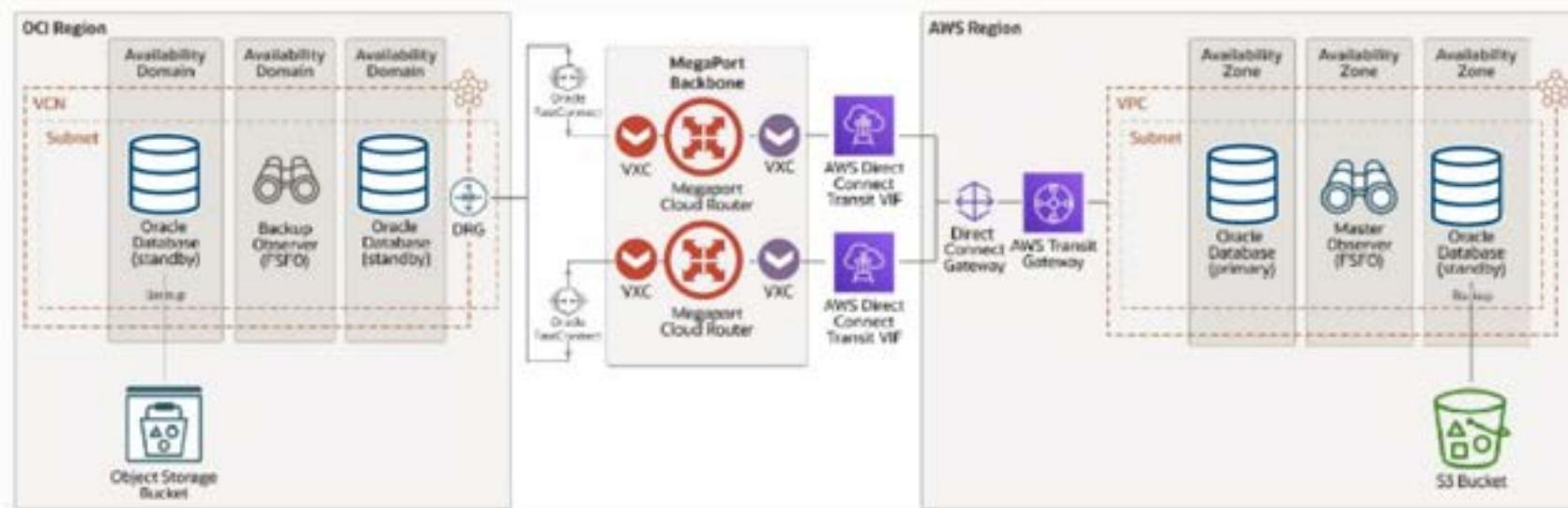
Distribute workloads to run on different clouds to achieve the best price-performance

SaaS Integration



Integrate SaaS applications with applications on different clouds to achieve business agility and innovation

High Availability and Data Protection



This architecture provides reliable failover for key databases in a multicloud environment

OCI Multicloud Architect

OCI IAM Basics

OCI Identity and Access Management

What is OCI IAM?

IAM = Identity and Access Management Service

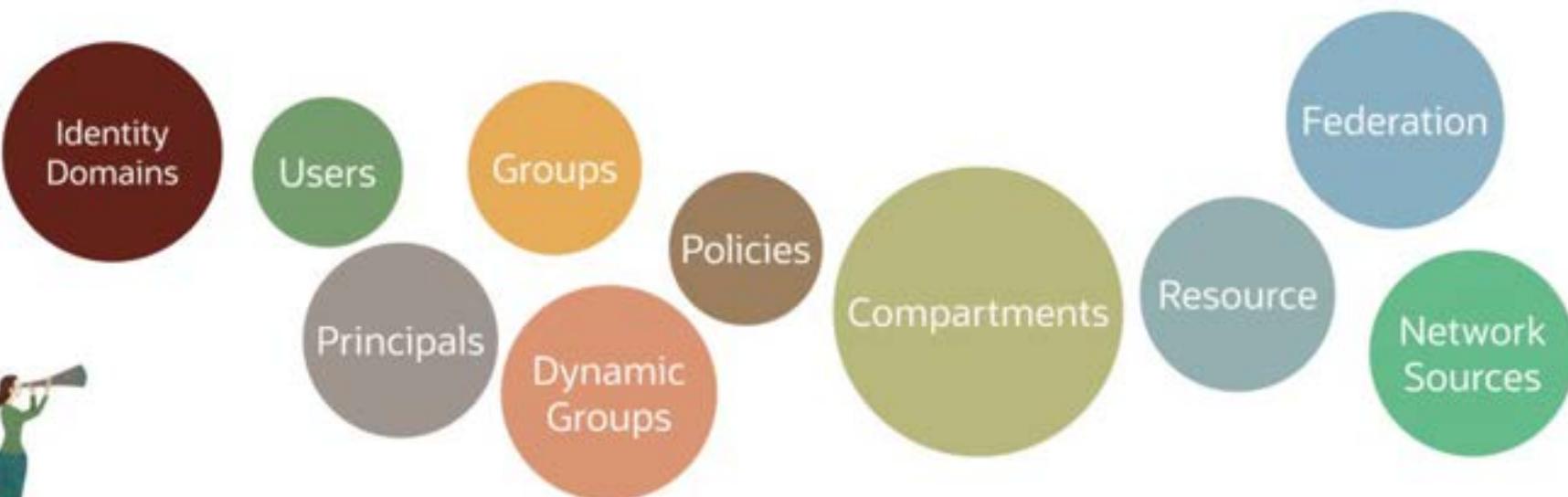
Fine-grained Access Control

AuthN – Who are you?

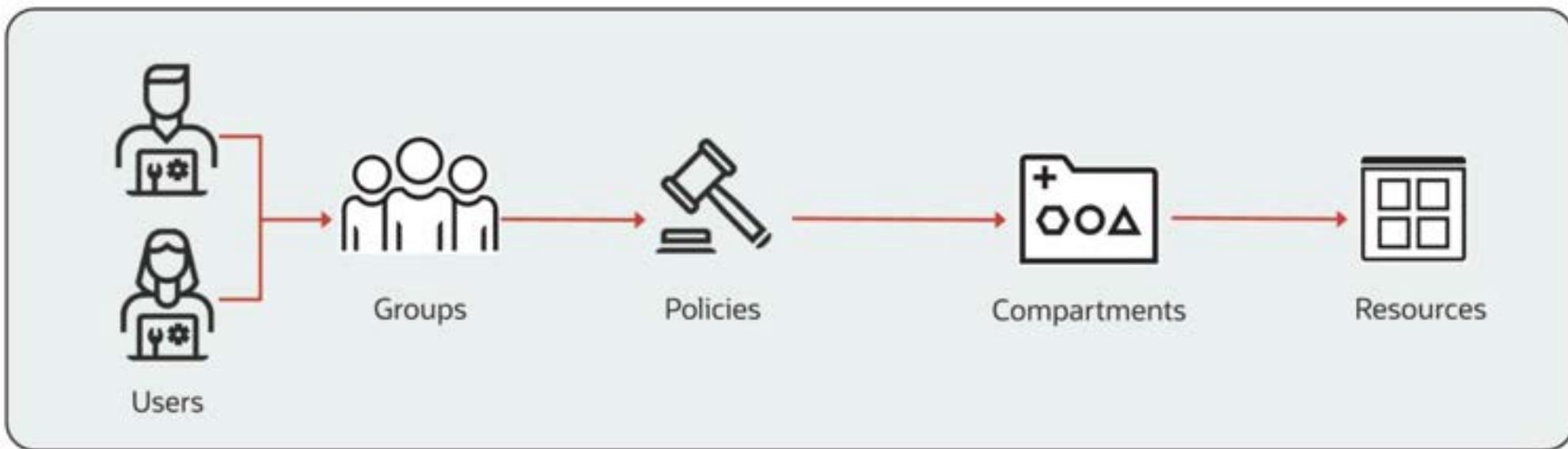
AuthZ – What permissions do you have?



OCI Identity Concepts



OCI Identity Concepts



AuthZ

What permissions do you have?

AuthZ in OCI – IAM Policies





Compartment

Collection
of related
resources

Isolate and
control
access

Tenancy/ Root Compartment

Compartment Network



Virtual Cloud
Network



Load
Balancer

Compartment Storage



Block
Storage



File
Storage



Object
Storage

Root Compartment can hold all the cloud resources



Best practice: Create dedicated compartments to isolate resources.

OCI Multicloud Architect

Identity Domain

OCI Identity and Access Management

Users

Groups

Dynamic Groups

Single Sign On

OAuth

Federation

MFA

Adaptive Access

Branding

Notifications

Provisioning

AD Bridge

...

Audit & Reporting

Linux PAM

RADIUS Proxy

App Gateway

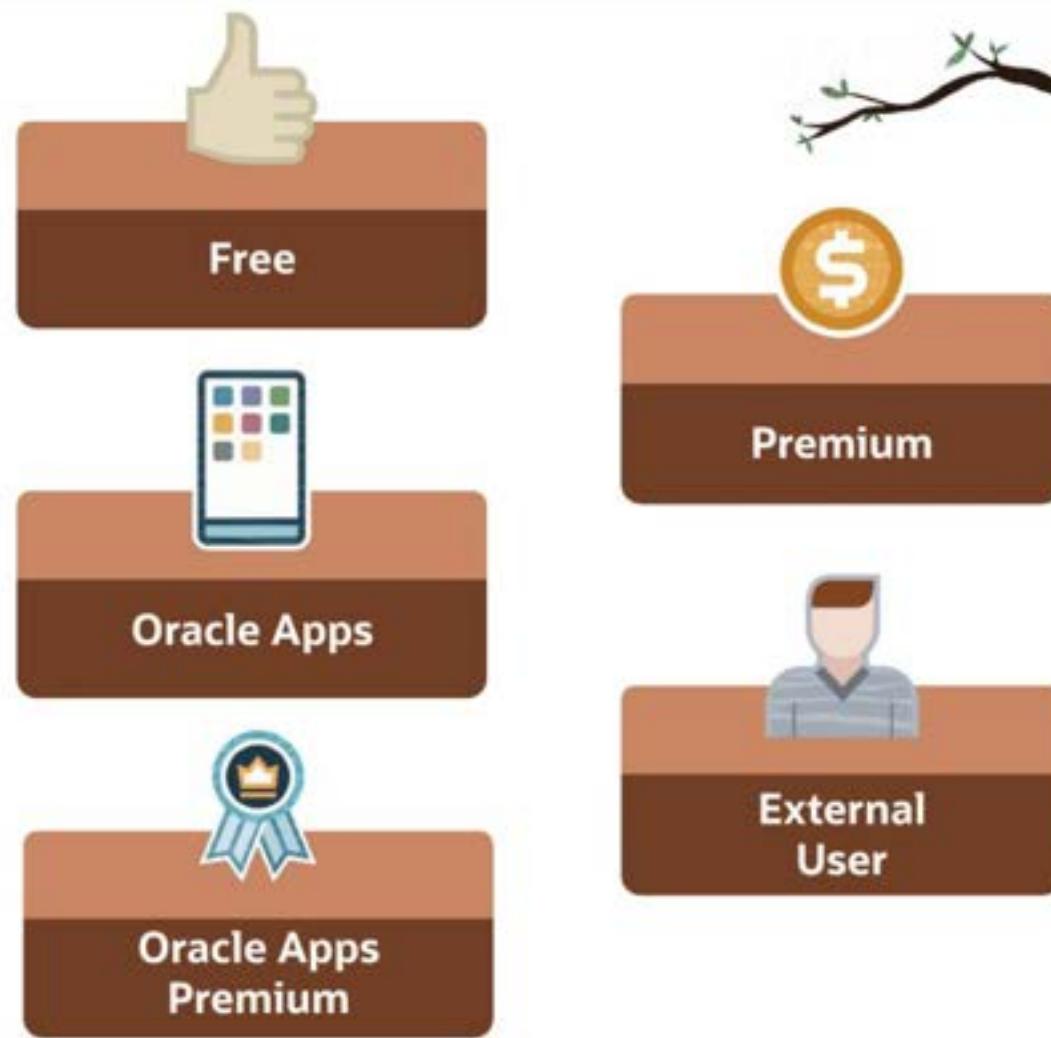
IDENTITY DOMAIN

A user population in OCI and associated configurations and security settings.

Oracle Cloud Infrastructure Multicloud Architect Associate (2025) 48



Identity Domain Types



Each account includes a default identity domain allowing customers to manage access to OCI resources. Customers can elect to create additional identity domains based on their specific needs.

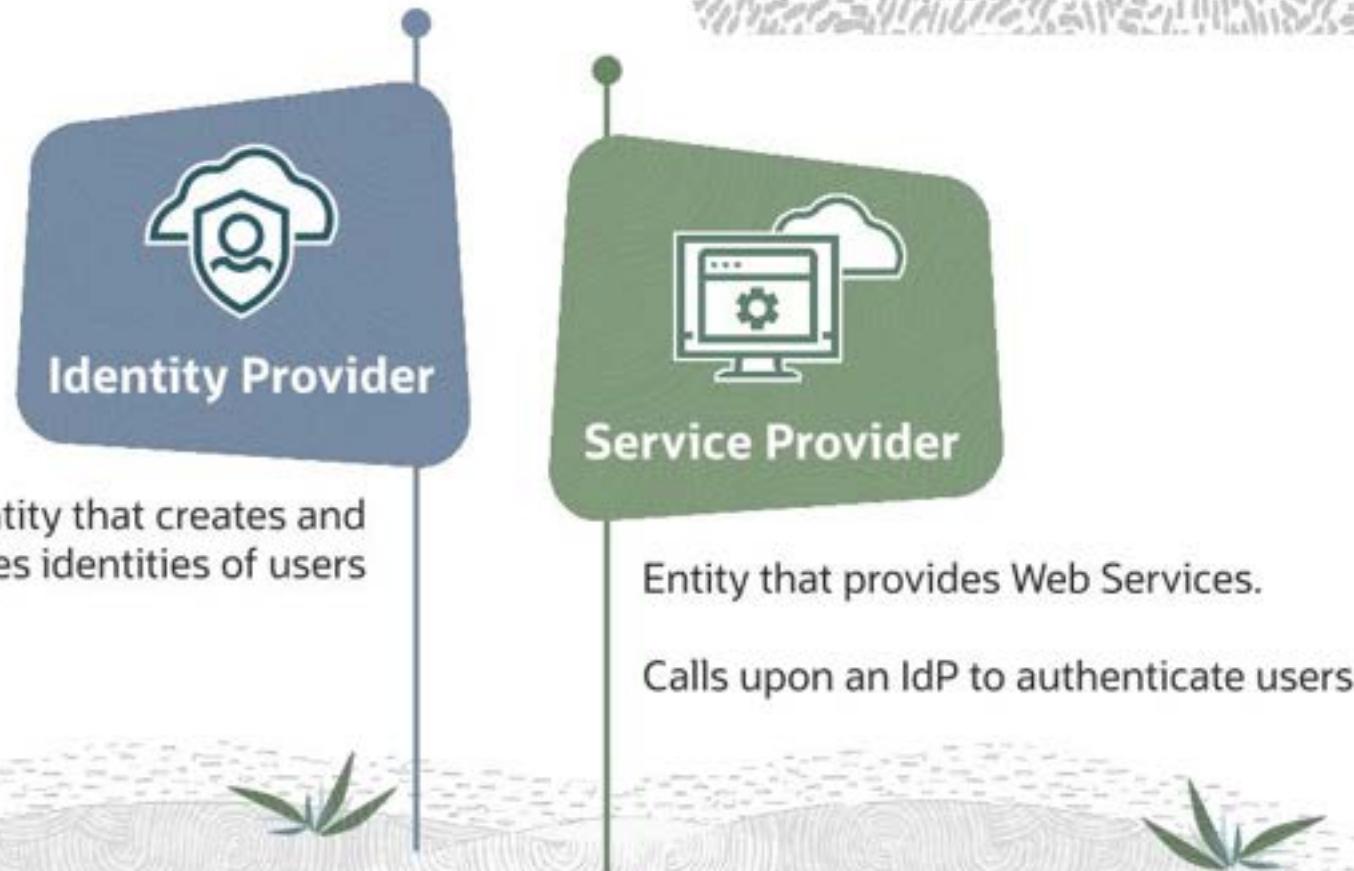


OCI Multicloud Architect

Federation Concepts

OCI Identity and Access Management

Identity Federation



What is Identity Federation?

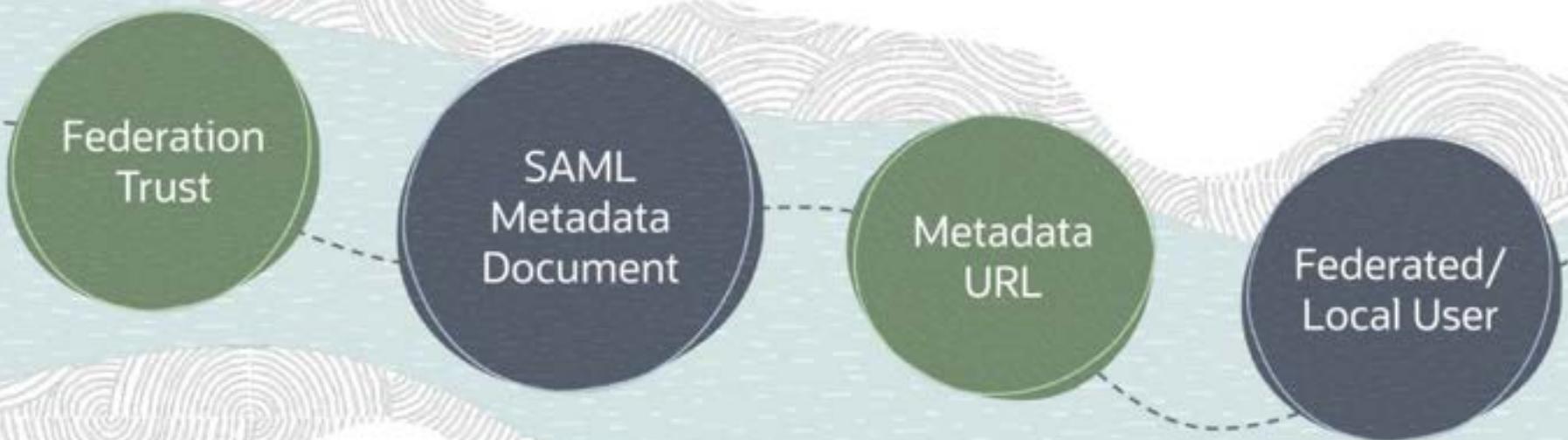
Relationship built between the identity provider and service provider

Delegate authentication responsibility to a trusted external party

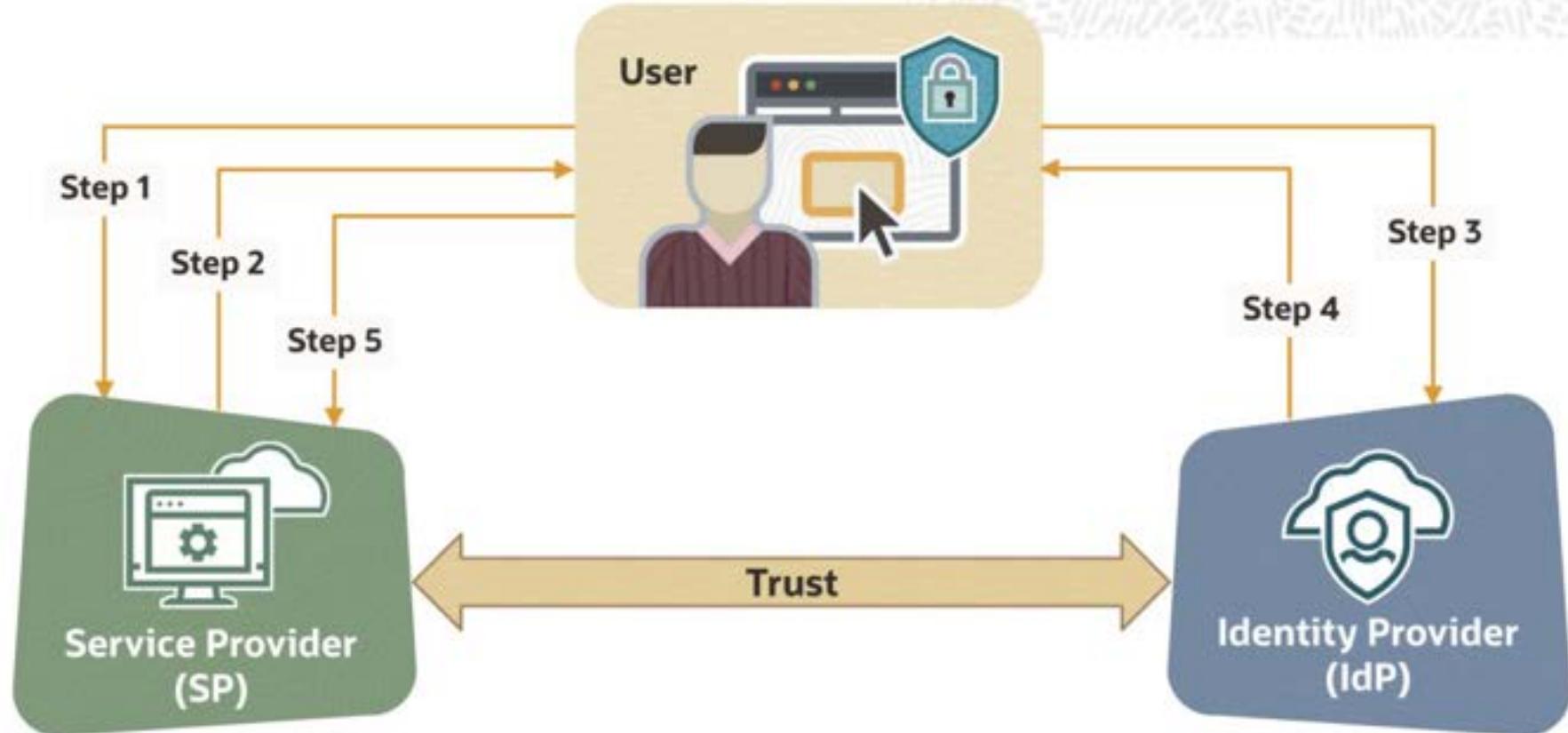
Oracle Cloud Infrastructure (OCI) can be federated with any IdP that supports the Security Assertion Markup Language (SAML) 2.0 protocol.



Identity Federation Concepts



How does Identity Federation work?



Oracle Cloud Infrastructure

Getting started with OCI Virtual Networks

Virtual Cloud Network

Networking > Virtual cloud networks > Virtual Cloud Network Details



MyVCN

[Move resource](#) [Add tags](#) [Delete](#)

[VCN Information](#) [Tags](#)

Compartment: MultiCloud

OCID: ...2bgI3q [Show](#) [Copy](#)

Created: Wed, Feb 22, 2023, 02:04:10 UTC

DNS Resolver: [MyVCN](#)

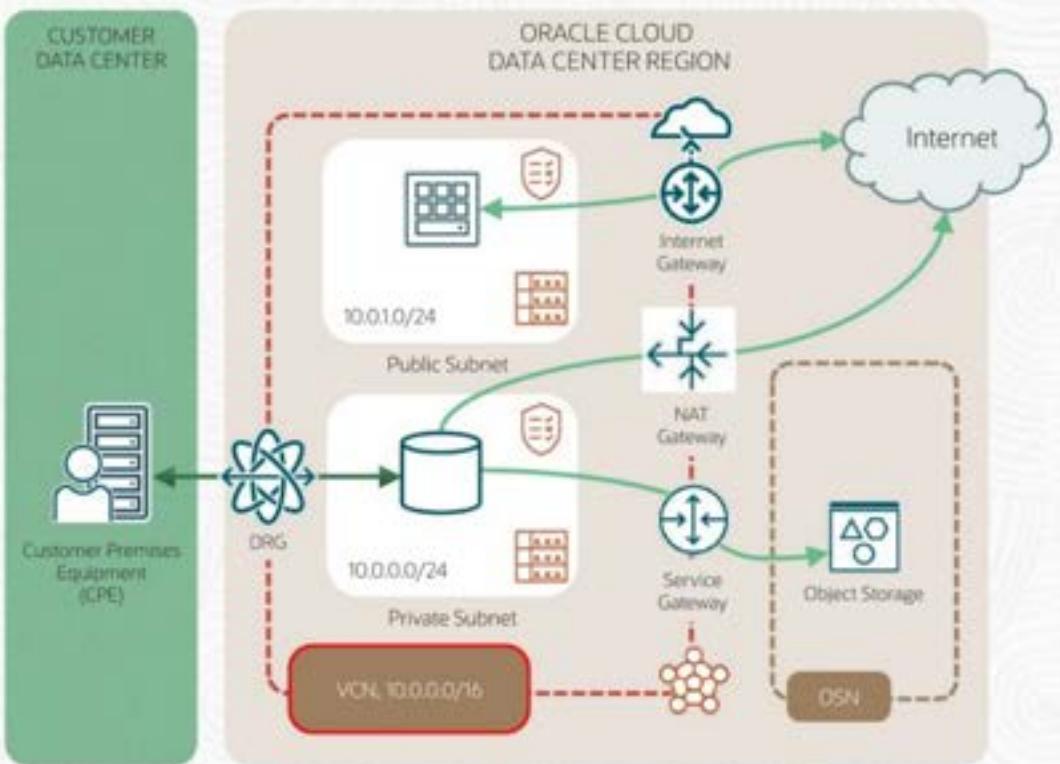
IPv4 CIDR Block: 10.0.0.0/16

Default Route Table: [default route table for MyVCN](#)

IPv6 Prefix: 2603:c020:e6500::/56

DNS Domain Name: myvcn.oraclevcn.com

Virtual Cloud Network



Resides in a single region

Can have more than one
IPv4 CIDR range

CIDR blocks can be modified
after VCNs are created

IP address range for your VCN

Avoid CIDR overlaps



RFC 1918

Use private IP address ranges specified in RFC 1918.

VCN size range

Allowable OCI VCN CIDR range is from /16 to /30

VCN reserves three IP addresses

10.0.0.0/16

Recommended RFC 1918 Range

Recommended /16 size (65,536 IP addresses)

IPv6

You can have up to 5 IPv6 prefixes per VCN

Of which one is assigned by Oracle Cloud Infrastructure

You can import BYoIP IPv6 prefixes

Up to four

You can permit or prohibit Internet access to a subnet by specifying the "public/private" subnet level flag



VCN Subnet



Networking > Virtual cloud networks > MyVCN > Subnet Details > IPv6 Prefixes > Subnet Details

public subnet-MyVCN

Edit Move resource Add tags Terminate

Subnet Information Tags

OCID: ...ag5i4a Show Copy	Compartment: MultiCloud
IPv4 CIDR Block: 10.0.0.0/24	DNS Domain Name: sub02220204080... Show Copy
IPv6 Prefix: 2603:c020:000e:657e:0000:0000:0000/64	Subnet Access: Public Subnet
Virtual Router Mac Address: 00:00:17:E0:3A:E5	DHCP Options: Default DHCP Options for MyVCN
Subnet Type: Regional	Route Table: default route table for MyVCN



Subnet



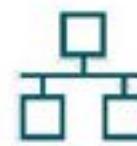
VCNs are divided into subnets



Instances are placed in subnets.



Subnets are designated either Private or Public



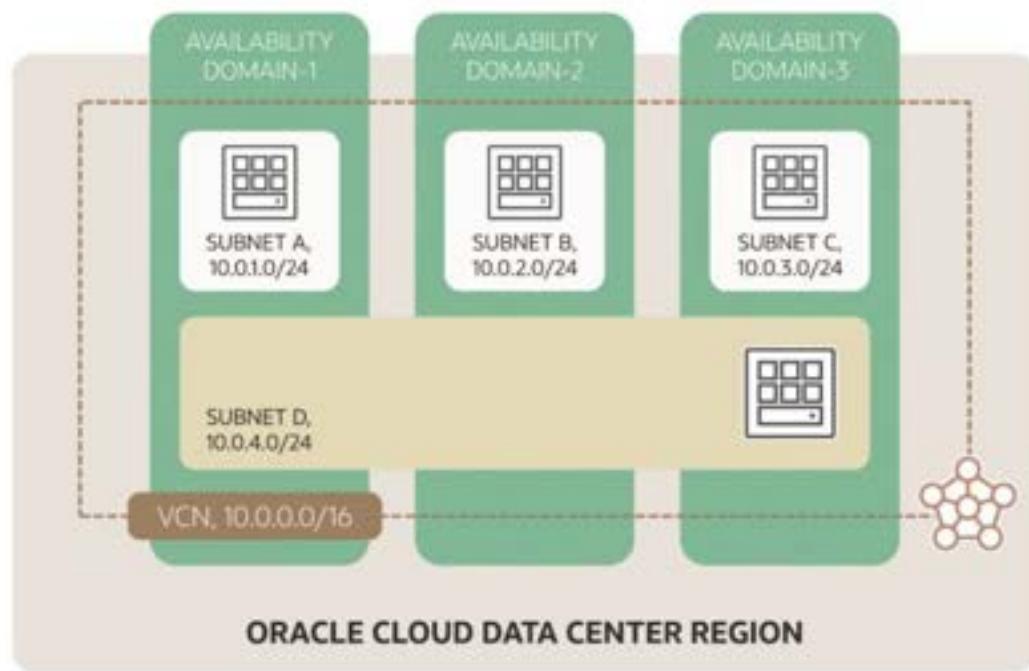
Subnets are either regional or AD Specific

Subnet

A subnet can grow or shrink after creation

Instances draw their internal IP address and network configuration from their subnet.

The Virtual Network Interface Card (vNIC) determines how the instance connects with endpoints inside and outside the VCN



VCN Security



Networking > Virtual cloud networks > MyVCN > Security List Details

Default Security List for MyVCN

Instance traffic is controlled by firewall rules on each Instance in addition to this Security List.

Move resource Add tags Terminate

Security List Information Tags

OCID: ...zgkfa_8iam_5axc Compartment: Multicloud
Created: Wed, Feb 22, 2023, 02:04:10 UTC

Resources	Ingress Rules
Ingress Rules (3)	Add ingress Rule Edit Remove
Egress Rules (1)	
	<input type="checkbox"/> Stateless • Source IP Protocol Source Port Range Destination Port Range Type and Code Allows Description
	<input type="checkbox"/> No 0.0.0.0 TCP All 22 TCP traffic for port: 22 SSH Remote Logon Protocol

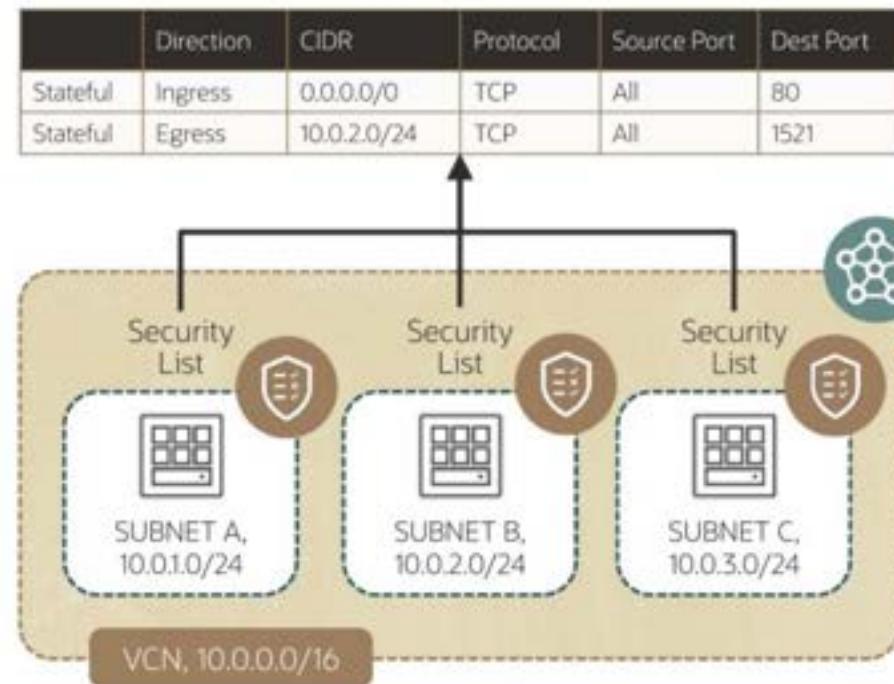




Security list

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

Choose whether a given rule is stateful or stateless





Security list

A security list:

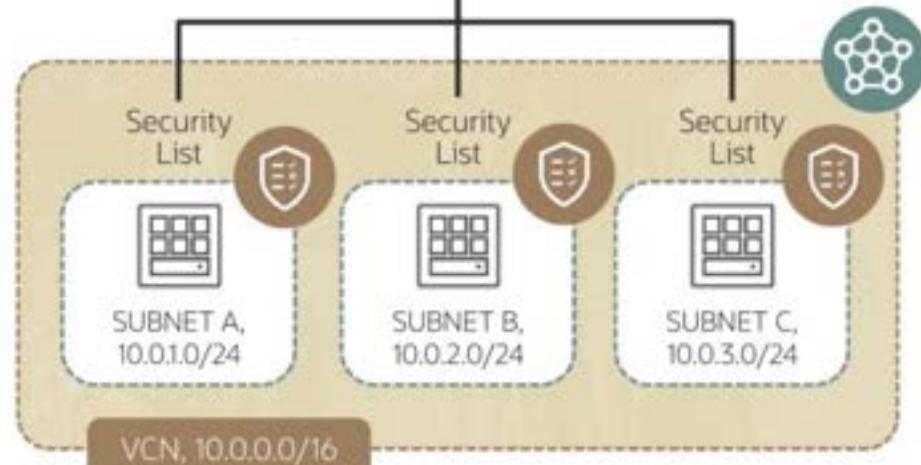
Is enforced at the vNIC level

Consists of rules that specify the types of traffic allowed in and out of the subnet

Is associated with the subnet either during or after subnet creation

Applies to a given instance, whether it's talking with another instance in the VCN or a host outside the VCN

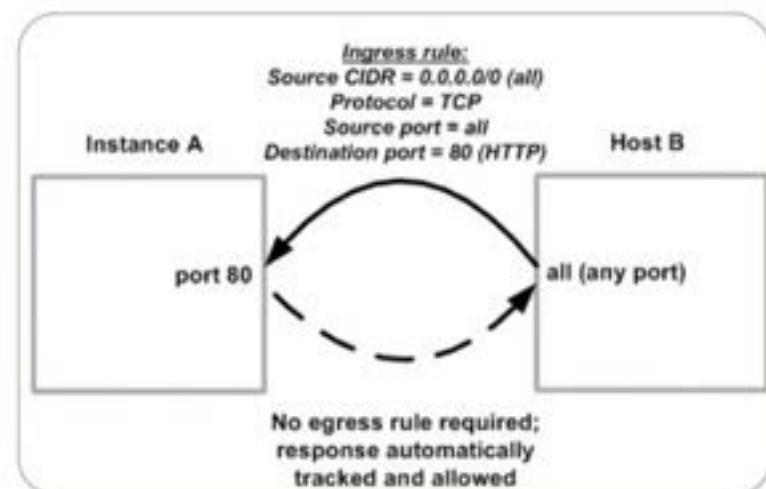
	Direction	CIDR	Protocol	Source Port	Dest Port
Stateful	Ingress	0.0.0.0/0	TCP	All	80
Stateful	Egress	10.0.2.0/24	TCP	All	1521





Stateful security rules

- **Connection Tracking:** When an instance receives traffic matching the stateful ingress rule, the response is tracked and automatically allowed regardless of any egress rules; similar to sending traffic from the host.
- Default security list rules are stateful.



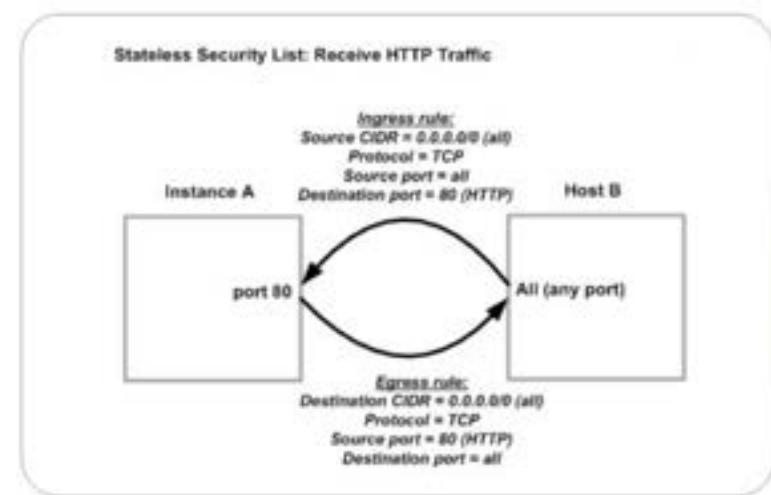
SOURCE TYPE	SOURCE CIDR	IP PROTOCOL	SOURCE PORT RANGE (OPTIONAL)	DESTINATION PORT RANGE (OPTIONAL)
CIDR	0.0.0.0/0	TCP	All	80
Specified IP addresses: 0.0.0.0 - 255.255.255.255 (4,294,967,296 IP addresses)		(more information)	Examples: 80, 20-22 or All (more information)	Examples: 80, 20-22 or All (more information)

Hosts in this subnet are reachable from the internet on Port 80.



Stateless security rules

- Response traffic is not automatically allowed.
- To allow response traffic, create a corresponding stateless egress rule.
- If you add a stateless rule to a security list, it indicates that you do NOT want to use connection tracking for any traffic that matches that rule.
- Better for scenarios with large numbers of connections (Load Balancing, Big Data).





Security list

- Some protocols, like ICMP, require an egress rule regardless of the state option.
- IPv6 is supported and requires a protocol-specific rule (that is, an ICMP rule for IPv4 will not include support for IPv6).

Ingress Rules

		Add Ingress Rules	Edit	Remove						
	Stateless	Source	IP Protocol	Source Port Range	Destination Port Range	Type and Code	Allows	Description		
<input type="checkbox"/>	No	0.0.0.0/0	ICMP		8		ICMP traffic for: 8 Echo			
<input type="checkbox"/>	No	::/0	IPv6-ICMP		All		IPv6-ICMP traffic for: All			

0 Selected Showing 2 items < 1 of 1 >



Network security groups

NSG

Provides a virtual firewall for a set of cloud resources that all have the same security posture

NSG

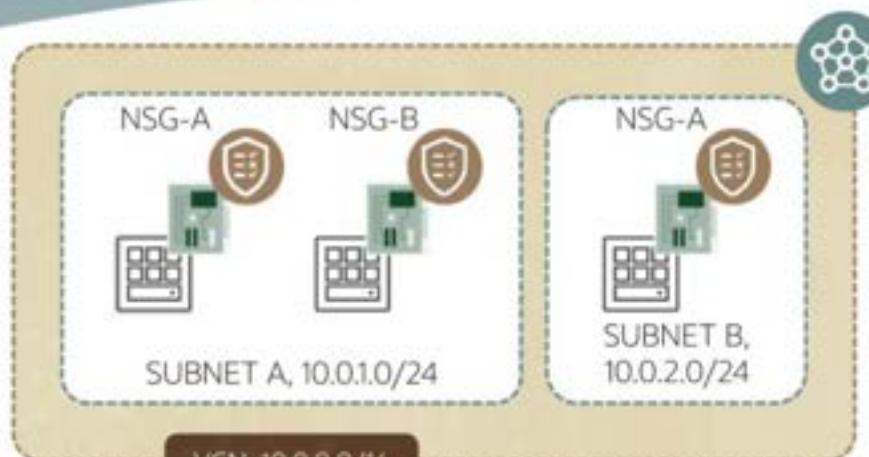
Consists of rules that apply only to a set of vNICs of your choice in a single VCN

NSG

Maximum five NSGs per vNIC

NSG

Supports resources such as compute instances, load balancers, DB systems, Autonomous DBs, and Mount targets



		Direction	CIDR	Protocol	Source Port	Dest Port
NSG-A	Stateful	Ingress	0.0.0.0/0	TCP	All	80
NSG-B	Stateful	Ingress	0.0.0.0/0	TCP	All	22

Security list + network security groups

Use SLs alone, NSGs alone, or both together



A packet in question is allowed if any rule in any of the relevant lists and groups allows the traffic



Oracle recommends using NSGs instead of SLs because NSGs let you separate the VCN's subnet architecture from your application's security requirements.



Security List

To enforce security rules for all vNICs in a VCN, put the rules in one SL, and then associate that SL with all the subnets in the VCN

Specify a CIDR as the source or destination



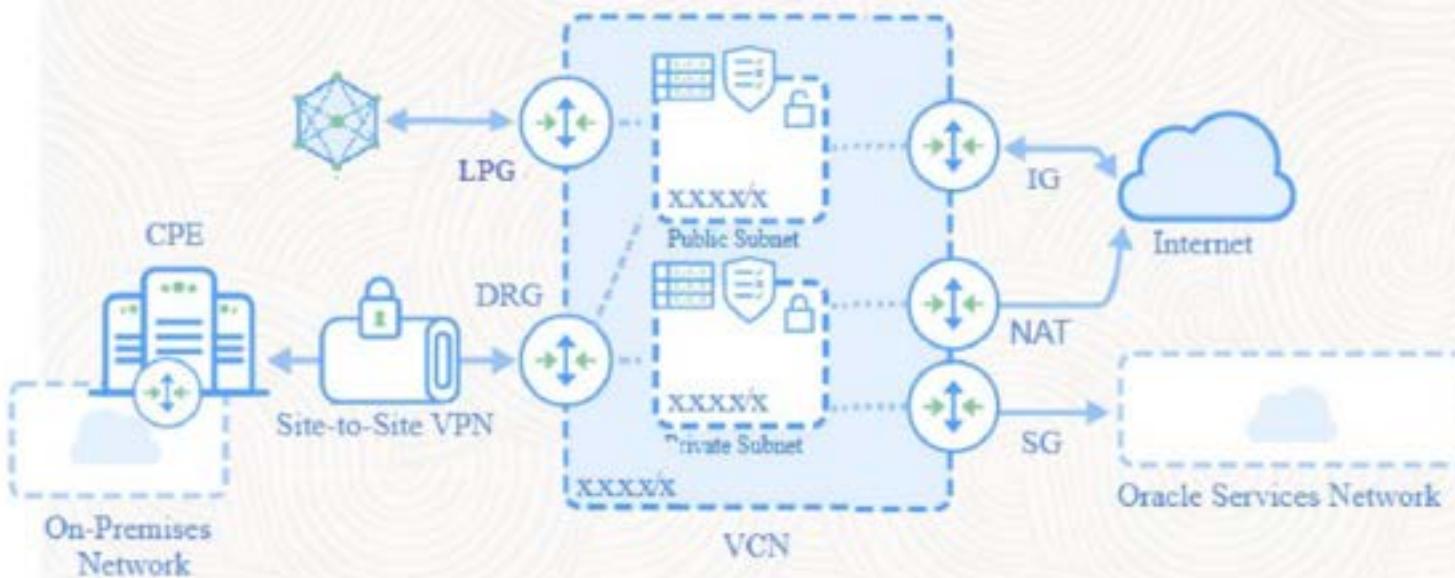
Network Security Groups

NSG can allow you to create exceptions for a giving instance in a subnet by adding permissions in additions to those in a SL

Specify an NSG as the source of traffic (for ingress rules) or the traffic's destination (for egress rules)



VCN Gateways



Internet Gateway



Internet Gateway

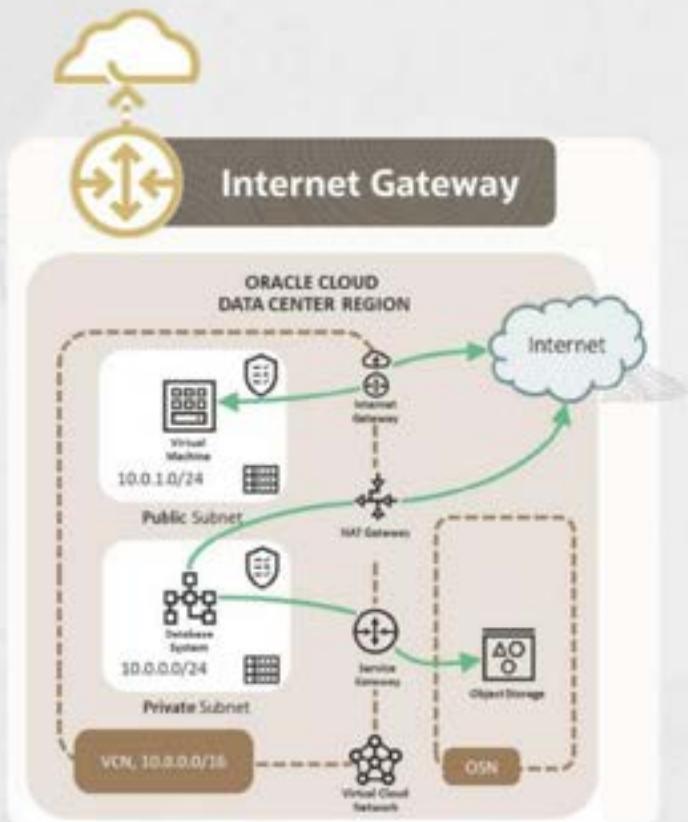
Is an optional virtual router you can add to your VCN to enable direct connectivity to the internet

Supports connections initiated from within the VCN (egress) and from the internet (ingress)

Requires resources that use it for internet access to be in a public subnet and have public IP addresses

Requires each public subnet that uses it to have a route table rule specifying the gateway as the target

Internet Gateway



Use security rules to control the types of traffic allowed in and out of resources in that subnet.

An internet gateway can be used only by resources in the gateway's VCN, not by hosts in the connected on-premises network or in a peered VCN.

You can't add or move an internet gateway to a VCN within a security zone. Security zones do not permit public subnets.

NAT Gateway



NAT Gateway

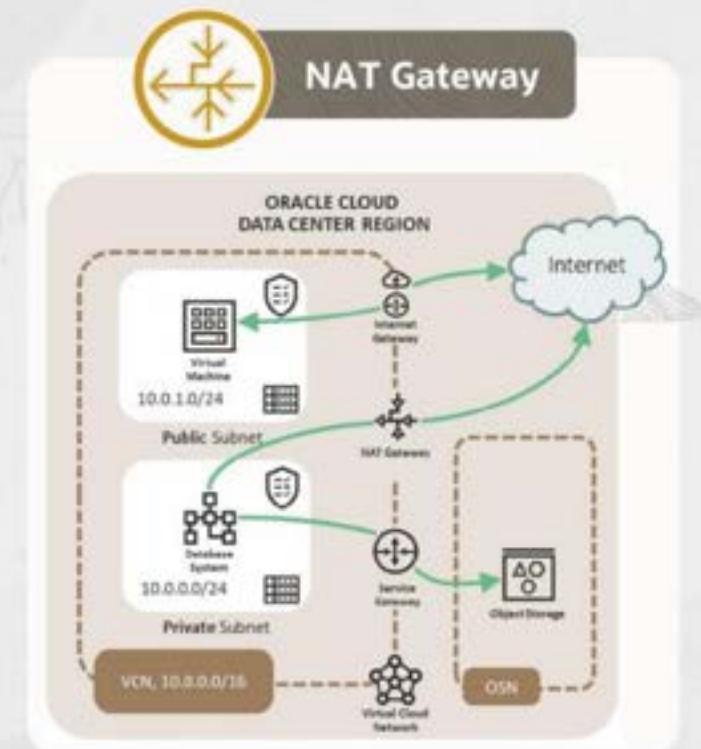
Instances in a private subnet don't have public IP addresses.

Add a NAT gateway to your VCN to give instances in a private subnet access to the internet.

NAT gateways are highly available and support TCP, UDP, and ICMP ping traffic.



NAT Gateway



Supports a maximum of 20,000 concurrent connections to a single destination address and port

Can use an Ephemeral or Reserved IP address

Has a limit on the number of NAT gateways per VCN

Can be used only by resources within the VCN. VCN peering does not provide access to it. Nor does DRG connectivity to on-premises.

Service Gateway

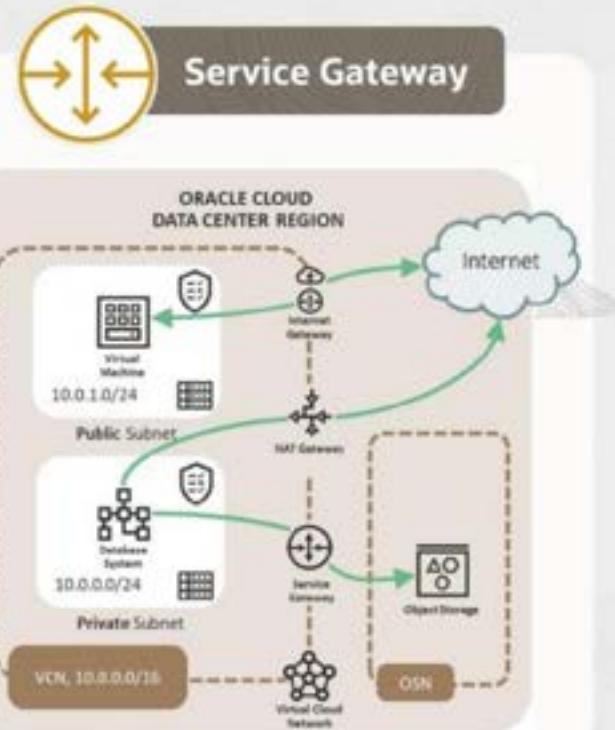


Service Gateway

Provides a secure, private path for network traffic between your VCN and Oracle Services Network to reach services like Object Storage, bypassing the internet

The Oracle Services Network is a conceptual network in Oracle Cloud Infrastructure that is reserved for Oracle services. These services have public IP addresses that you typically reach over the internet. However, you can access the Oracle Services Network without the traffic going over the internet. There are different ways of doing this, depending on which of your hosts need access.

Service Gateway



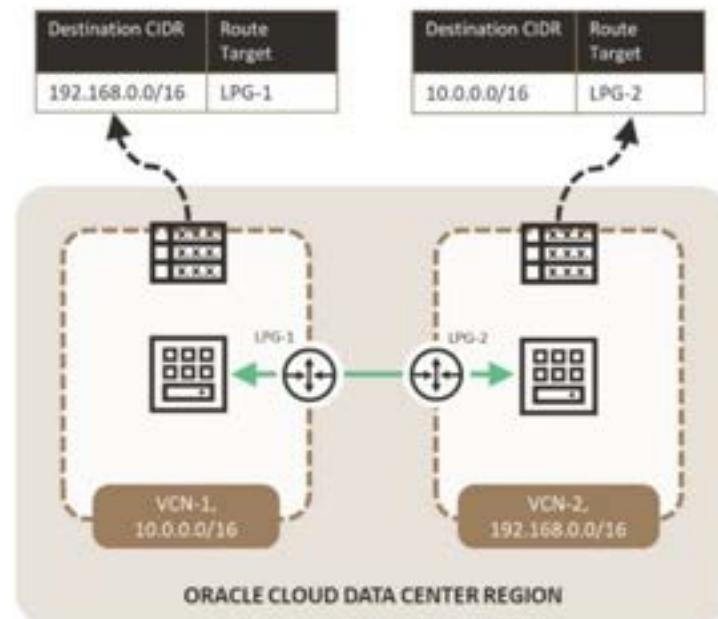
Hosts in your on-premises network:

- Private access through a VCN with FastConnect private peering or Site-to-Site VPN: Use private IP addresses and reach the Oracle Services Network by way of the VCN and the VCN's service gateway.
- Public access with FastConnect public peering: Use public IP addresses.

A service gateway is regional and enables access only to supported Oracle services *in the same region* as the VCN.

VCN Peering

Local peering (within regions)



Local Peering Gateway

Local VCN peering (within region)

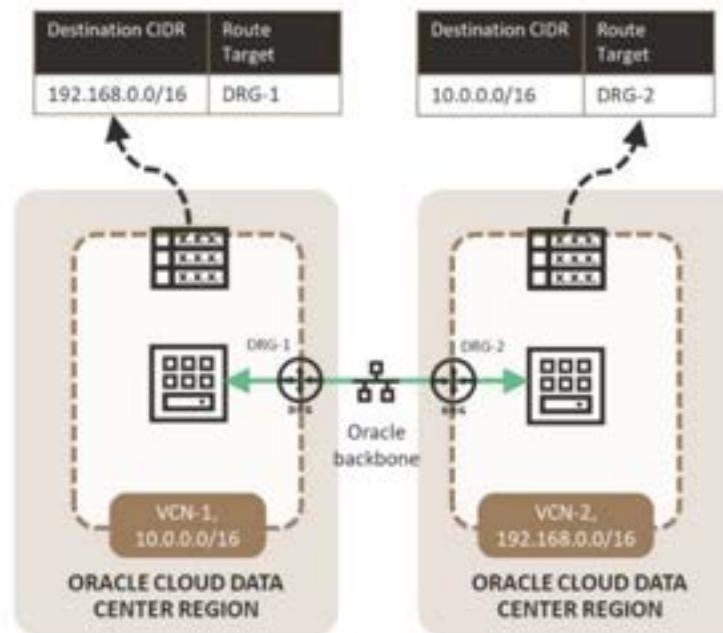
A typical local peering includes:

- Two VCNs with nonoverlapping CIDRs in the same region
- An LPG on each VCN in the peering relationship
- A connection between those two LPGs
- Supporting route rules to enable traffic to flow over the connection, and only to and from select subnets in the respective VCNs (if desired)
- Supporting security rules to control the types of traffic allowed to and from the instances in the subnets that need to communicate with the other VCN



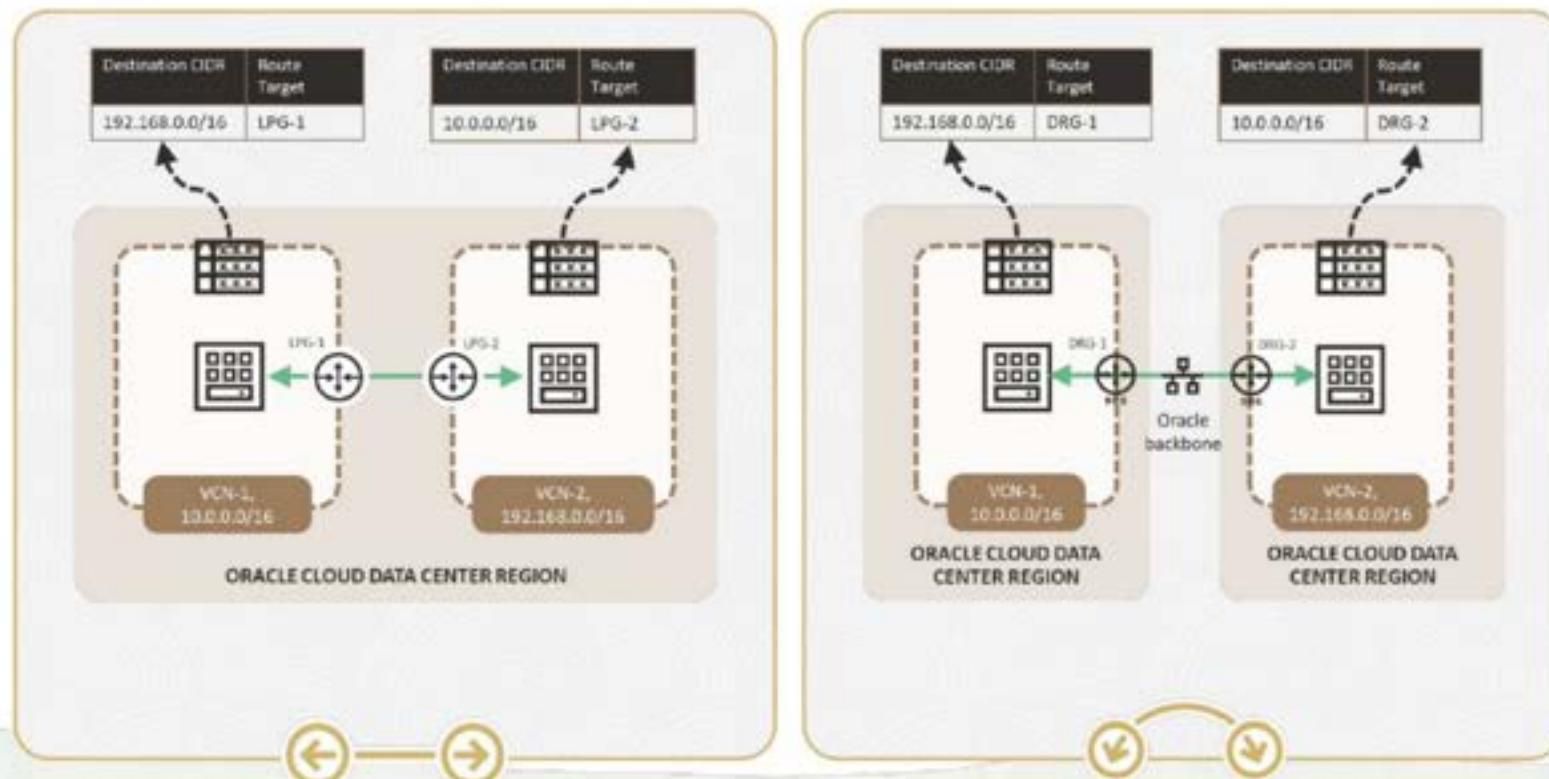
Dynamic Routing Gateway

Remote peering (across regions)



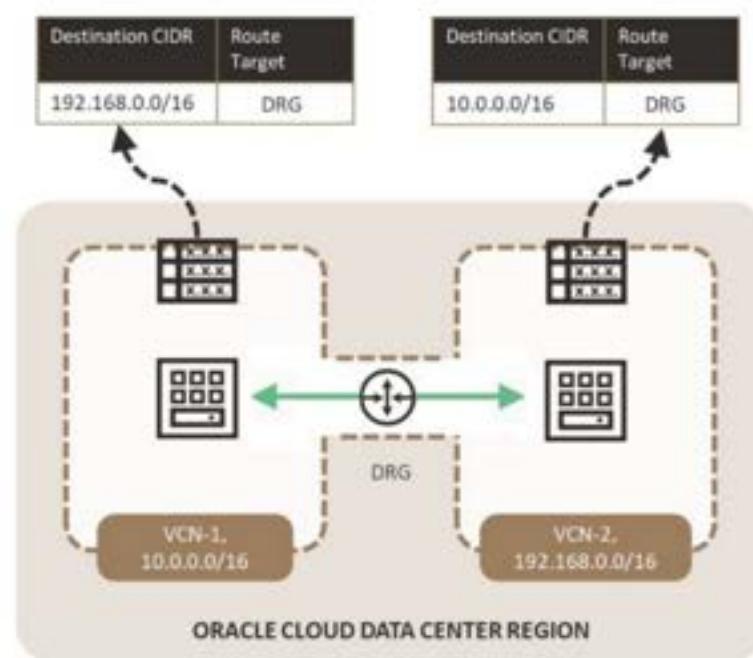
VCN gateways

Local peering vs. remote peering



Dynamic Routing Gateway

DRG with VCN attachments



VCN Routing



Networking > Virtual cloud networks > MyVCN > Route Table Details

route table for private subnet-MyVCN

Move resource Add tag **Terminate**

Route Table Information Tags

OCID: `1zvryq-5t8c-2c2y` Compartment: MultiCloud
Created: Wed, Feb 22, 2023, 02:54:12 UTC

Route Rules

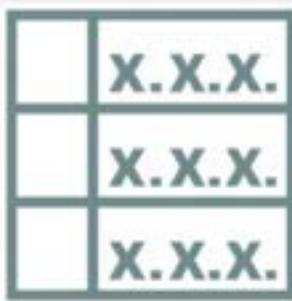
Traffic within the VCN is handled by the VCN's local routing by default. Intra-VCN routing allows you more control over routing between subnets. [Learn more](#)

Add Route Rule	Edit	Remove	Destination	Target Type	Target	Route Type	Description
<input type="checkbox"/>			0.0.0.0	NAT Gateway	NAT gateway-MyVCN	Static	
<input type="checkbox"/>			All F10X Services In Oracle Services Network	Service Gateway	Service gateway-MyVCN	Static	

Showing 2 items. < 1 of 1 >



Route table



The primary routing scenario is for sending a subnet's traffic to destinations outside the VCN.

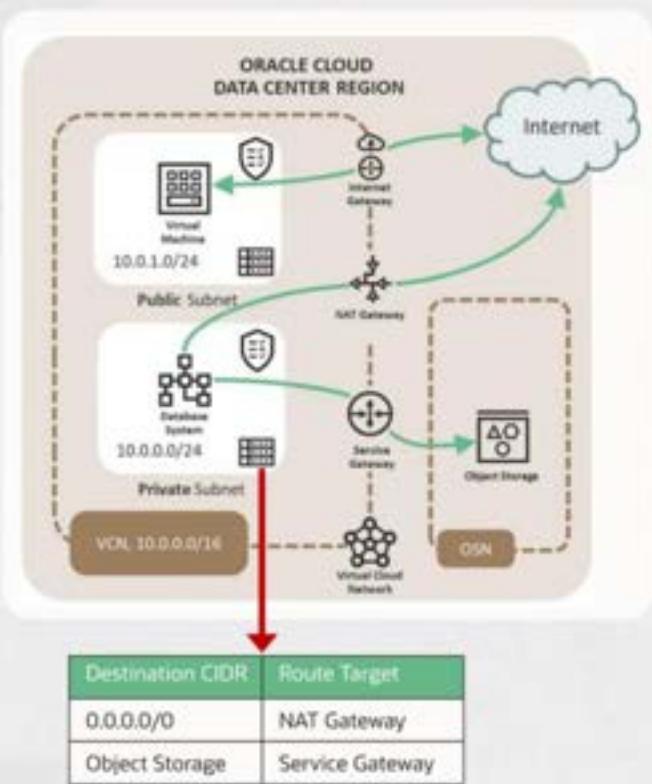
Traffic within the VCN's subnets is automatically handled by the VCN local routing.

If a route table has overlapping rules, Oracle uses the most specific rule in the table to route the traffic.

If there is no route rule that matches the network traffic you intend to route outside the VCN, the traffic is dropped.

IPv6 addressing is supported for all commercial and government regions.

Route table



Used to send traffic out of the VCN

Consists of a set of route rules; each rule specifies the:

- Destination CIDR block
- Route target (the next hop) for traffic that matches that CIDR

X.X.X.
X.X.X.
X.X.X.

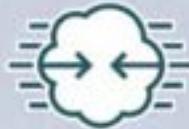
Oracle Multicloud

Multicloud Network Connectivity

Multicloud Connectivity Options



Site-to-Site VPN



FastConnect



OCI-Azure
Interconnect



Oracle Database
Service for Azure

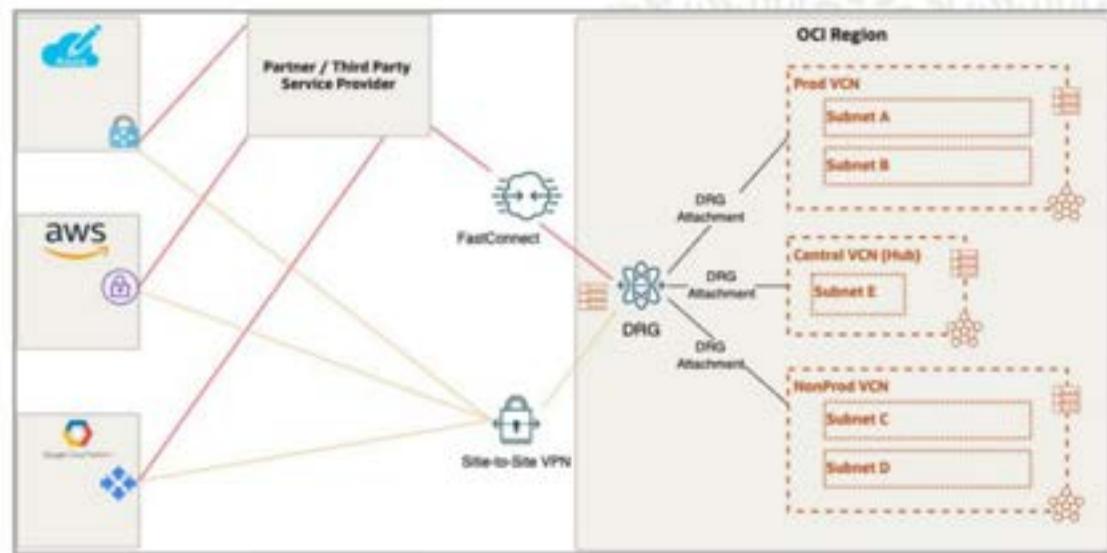
Site-to-Site VPN and FastConnect

➤ Site-to-site VPN

- Uses public Internet for connectivity
- Connection consists of multiple redundant IPSec tunnels
- Bandwidth/latency can vary

➤ FastConnect

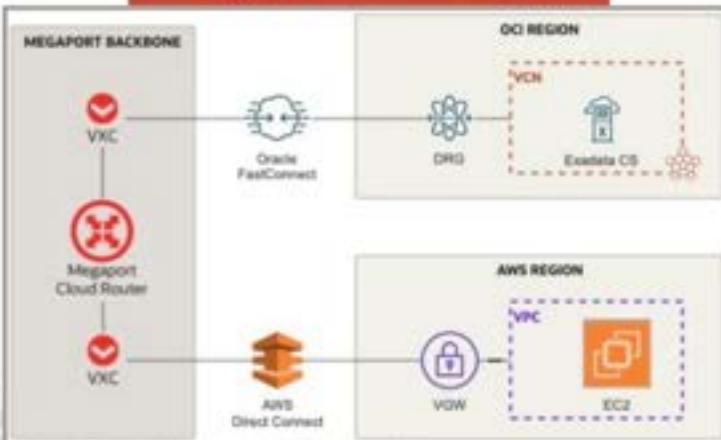
- Uses dedicated connection
- Fixed bandwidth/latency
- Supports Private and Public Peering



Equinix Multicloud

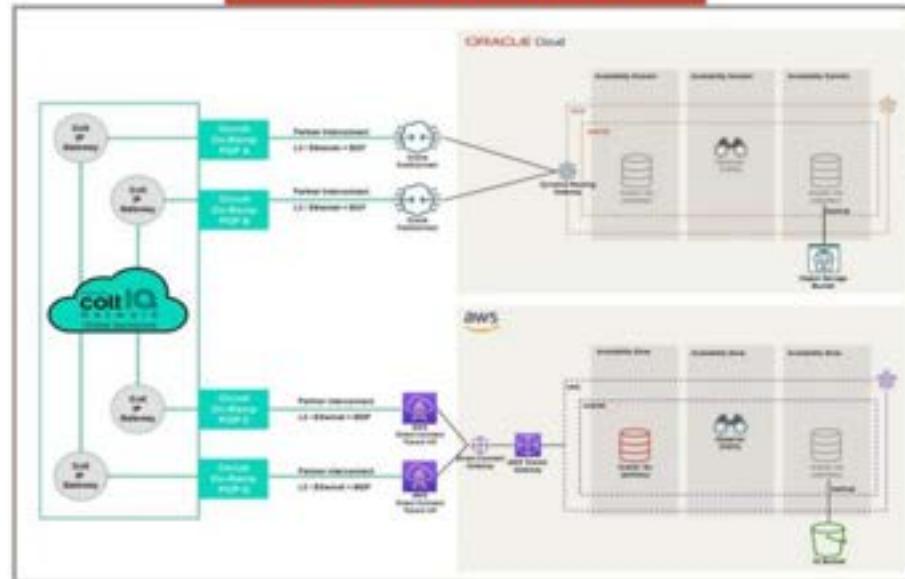


Megaport Multicloud



FastConnect Partners

Colt Multicloud



In the diagrams, few of our largest connectivity partners are shown: Equinix, Megaport, and Colt

Connections to other clouds from OCI is quick and easy to establish through Oracle FastConnect partners.



	Site-to-Site VPN	FastConnect	OCI-Azure Interconnect	Oracle DB for Azure
Connectivity	Public Internet	Private Connection	Private Connection	Private Connection
Encryption	IPsec	Can be added	Can be added	Can be added
Latency	Depends on distance	Depends on distance	Low latency	Low latency
Bandwidth	Usually low	High	High	High
Availability	Broad geographic reach	Broad geographic reach	12 regions globally	12 regions globally
Requires 3 rd party providers	No	Yes	No	No
Set-up	Easy and quick	Depends on 3 rd party provider	Easy, quick and automated	Oracle managed
Reliability	Depends on public internet	Reliable	Reliable	Reliable
SLA	No	Depends on 3 rd party provider	FastConnect and ExpressRoute independent SLAs	No (SLO coming soon)
Support	No	Oracle and 3 rd party provider	Oracle and Microsoft (collaborative)	Oracle and Microsoft
Connecting Clouds	Any Clouds	Oracle to any Cloud	Oracle to Azure	Oracle to Azure
FastConnect Port charges	No	Yes	Yes	No
Egress Traffic cost	Yes	No	No	No

Oracle Multicloud Site-to-Site VPN

Site-to-Site VPN: Overview

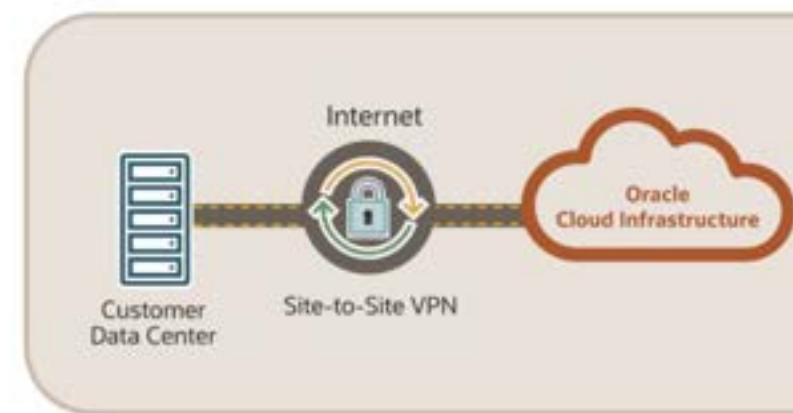
- Offers a simple and secure way to connect your corporate network to Oracle Cloud Infrastructure over your existing internet connection
- Encrypts your data and tunnels it through the public internet for enhanced security and privacy with an IPSec VPN connection

Features

Site-to-site VPN for a secure connection between your network and the Oracle Cloud

High availability with two tunnels connected to redundant Oracle routers

Industry-standard Internet Key Exchange version 1 (IKEv1 and IKEv2) protocol



Site-to-Site VPN: Use Cases



Use for Proof of Concept



No contracts or commitment. Build as many VPN tunnels to Oracle Cloud Infrastructure as desired and decide how long you want them active.

Connect multiple locations to the cloud



Connect your headquarters, branch locations, and private datacenters to the Oracle Cloud so all of your offices can access applications.

Securely connect your existing infrastructure to the cloud



Securely connect your existing infrastructure to the cloud or connect multiple clouds.

Build redundant connectivity for Oracle FastConnect



Already have Oracle FastConnect? Site-to-Site VPN can provide a redundant connection to Oracle Cloud Infrastructure.

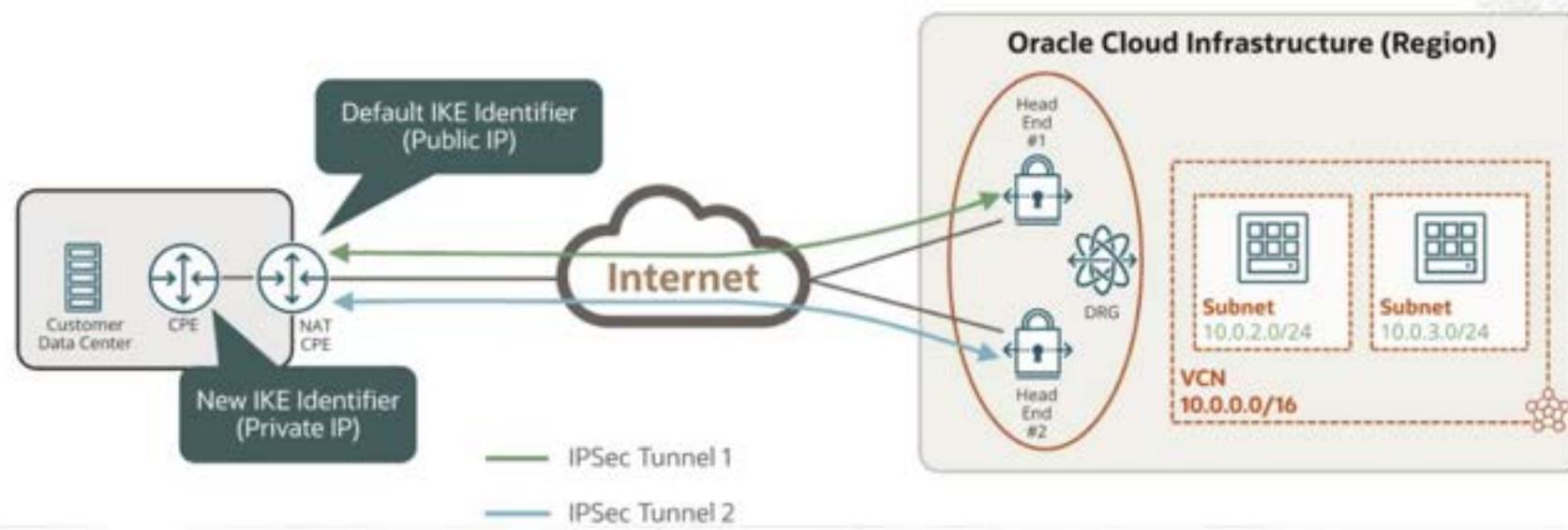
Site-to-Site VPN Setup

- › Supports IKEv1 and IKEv2
- › Dynamic Routing Gateway (DRG) - VPN headend at OCI end of the Site-to-Site VPN
- › Customer Premise Equipment (CPE)
 - Actual VPN router in your on-premises network (hardware or software)
 - When setting up the VPN, you create a **virtual representation** of your on-premises router, which is known as CPE object.
 - To create a CPE Object – Name, Outside Public IP address
- › IPSec Connection
 - After creating the CPE object and DRG, you connect them by creating an IPSec connection, which results in two redundant IPSec tunnels.
 - Static Routing and BGP Routing Supported

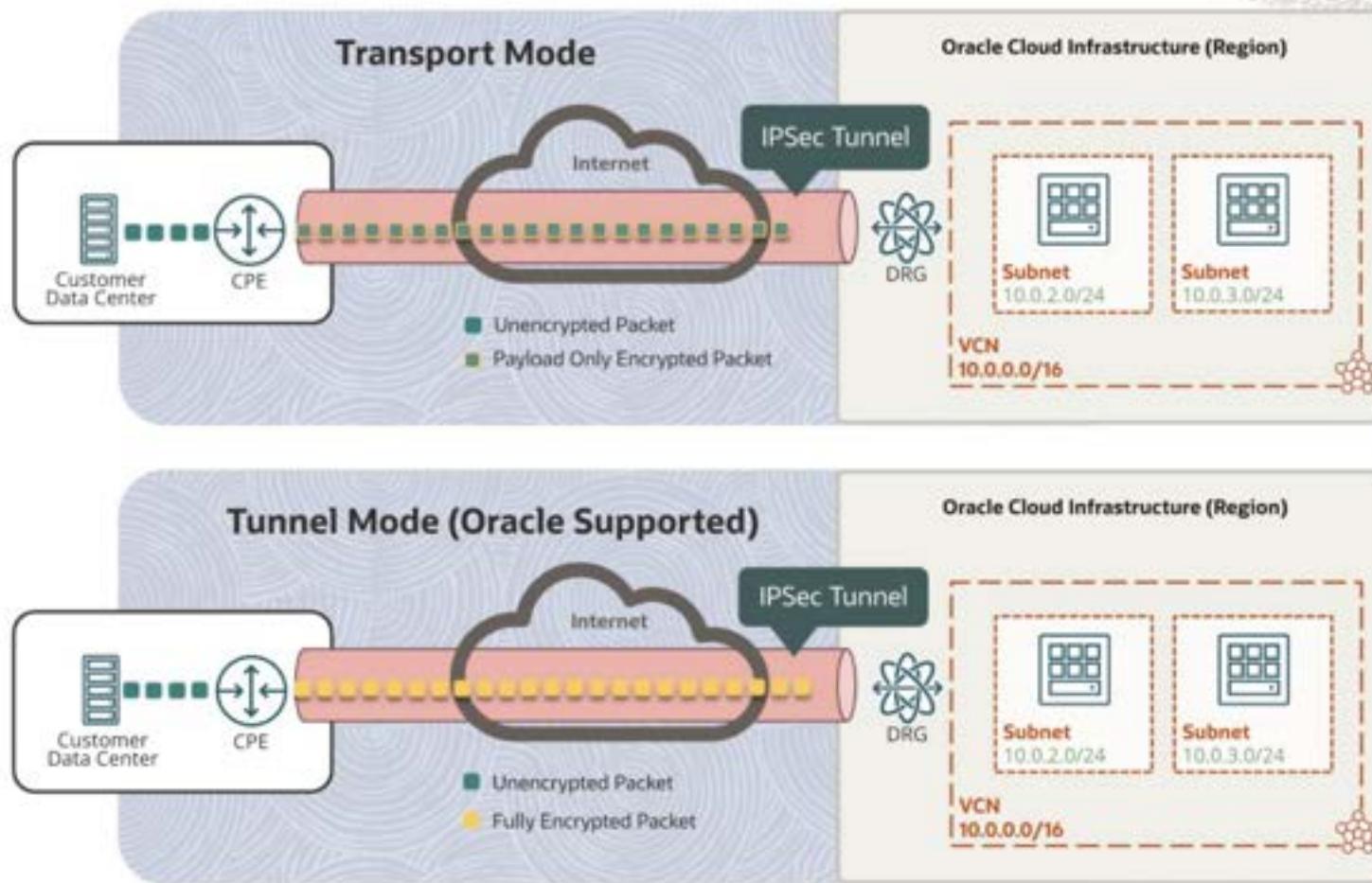
Site-to-Site VPN: Equipment on Customer Premises

- Oracle Cloud Infrastructure uses standard-based IPSec encryption.
- Verified Equipment Vendors
 - > Check Point
 - > Cisco
 - > FortiGate
 - > Juniper
 - > Libreswan (or Openswan)
 - > Palo Alto
 - > WatchGuard
 - > Yamaha

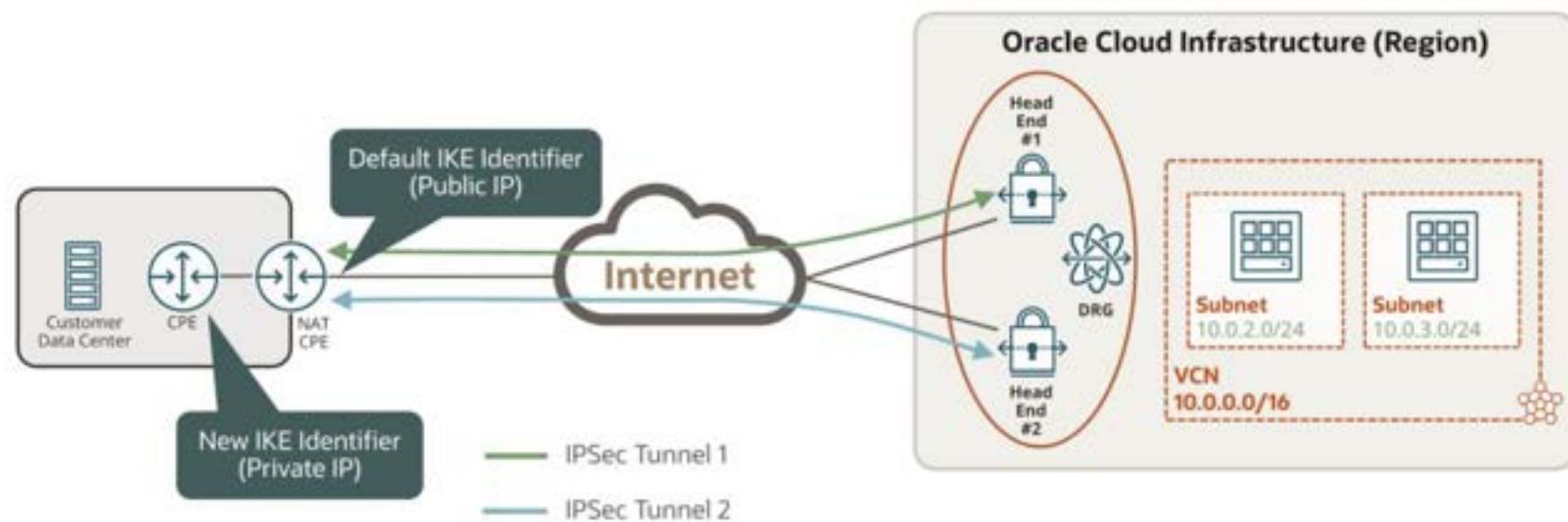
Site-to-Site VPN: Overview



Site-to-Site VPN: Tunnel Mode



Site-to-Site VPN: CPE Behind a NAT Device



Do we need this slide?
looks the same as the
VPN overview slide

Oracle Multicloud

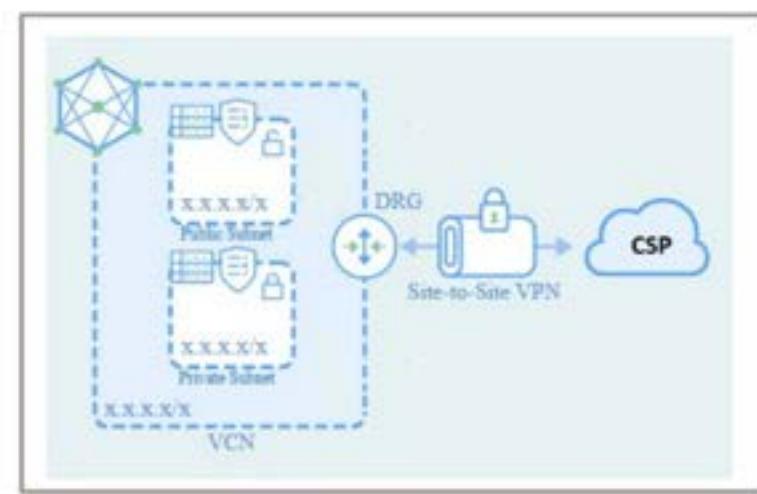
Multicloud Site-to-Site VPN

Multicloud VPN

- The Oracle Cloud Infrastructure (OCI) Site-to-Site VPN service offers a secure IPSec connection between your on-premises network and a virtual cloud network (VCN).
- You can also use Site-to-Site VPN to connect OCI resources to other cloud service providers.

Oracle Multicloud VPN Guides

- Site-to-site VPN between OCI and AWS
- Site-to-site VPN between OCI and Azure
- Site-to-site VPN between OCI and GCP

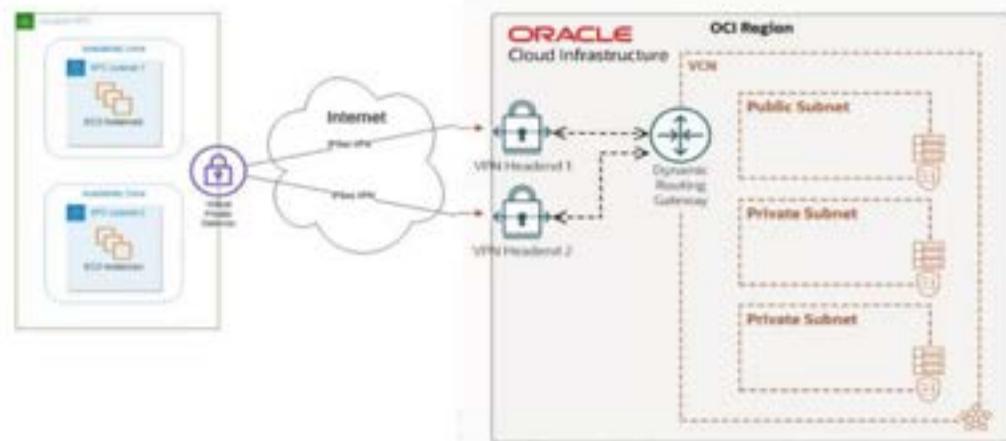


Site-to-Site VPN: AWS



Configuration Process

- AWS - Create Temporary Customer Gateway
- AWS - Create and Attach Virtual Private Gateway
- AWS - Create VPN Connection
- AWS - Download Configuration
- OCI - Create CPE Object
- OCI - Create IPSec Connection
- AWS - Create New Customer Gateway
- AWS - Modify VPN Connection for New Customer Gateway
- Verification

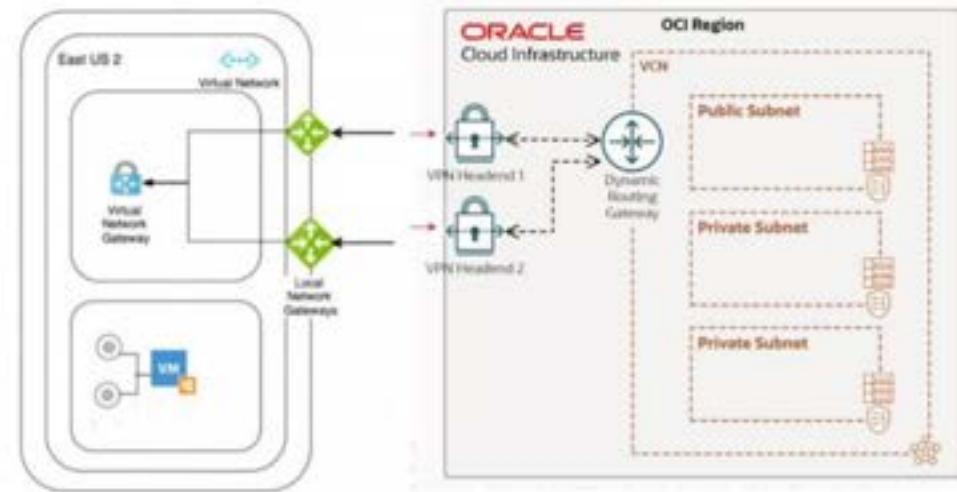


Site-to-Site VPN: Azure



Configuration Process

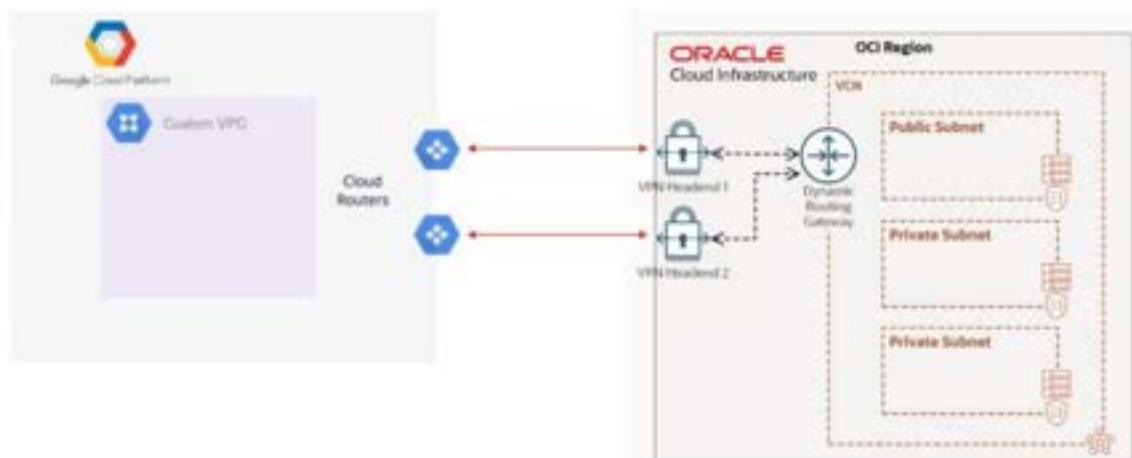
- Azure - Create VPN Gateway
- OCI - Create CPE Object
- OCI - Create IPSec Connection
- OCI - Open Oracle Service Request to Change PFS
- OCI - Save Site-to-Site VPN IP Address and Shared Secret
- Azure - Create Local Network Gateway
- Azure - Create a VPN Connection



Site-to-Site VPN: GCP

Configuration Process

- GCP - Start VPN Configuration
- OCI - Create CPE Object
- OCI - Create IPSec Connection
- OCI - Save Oracle VPN IP Address and Shared Secret
- GCP - Create a VPN Peer Gateway
- GCP - Create a Cloud Router
- GCP - Complete configuring VPN Tunnel
- GCP - Configure BGP Sessions
- Verification



Oracle Cloud Infrastructure

FastConnect

Design Considerations

Overview

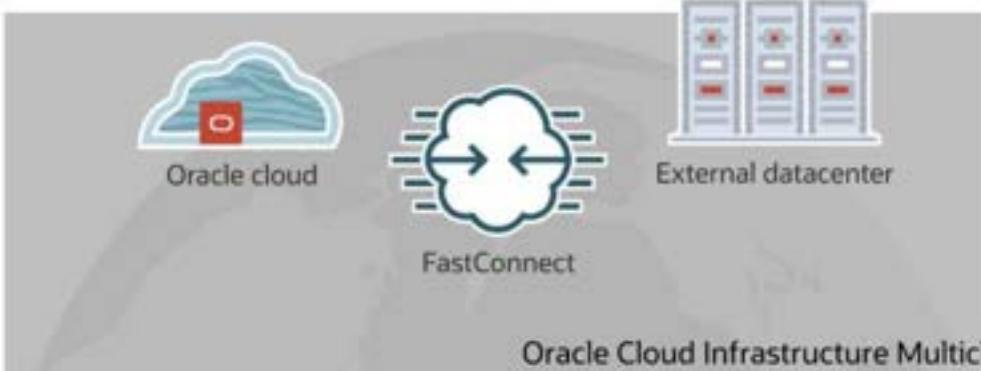
With FastConnect, enterprises can create high-speed, low-latency, private connections between Oracle cloud and their external datacenter deployment for consistent and predictable performance.

High Availability

Elasticity and Scalability

- › Connect to OCI directly or via pre-integrated Network Partners
- › 1 Gbps, 10 Gbps, and 100 Gbps* ports
- › Extend remote datacenters into Oracle (“Private peering”) or connect to Public resources (“Public peering”)
- › Supported Services

No data transfer charges



Use Cases for Low-Latency, Dedicated Connectivity



ORACLE Applications
ORACLE JD Edwards
ORACLE Siebel

ORACLE E-Business Suite
ORACLE PeopleSoft
ORACLE Hyperion



Latency-sensitive enterprise applications

Applications with relational database back-ends are especially vulnerable to latency and require predictable performance.



Sensitive data that cannot traverse the public internet

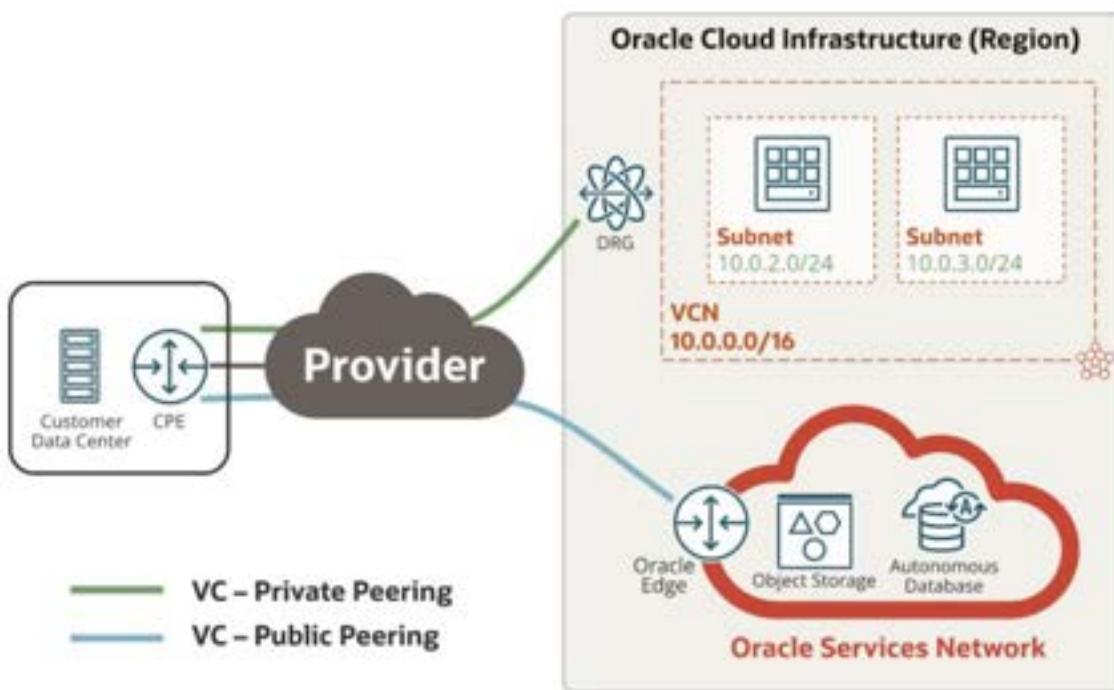
Applications that contain sensitive data benefit from an extra level of privacy and isolation.



Lift-and-shift to Cloud

Moving Web-App-DB tiers to Oracle Cloud needs dedicated network connectivity.

Virtual Circuit



- A virtual circuit is an isolated network path that runs over one or more physical network connections to provide a single, logical connection between the customer's CPE and the DRG.
- Each virtual circuit is made up of information shared between the customer, Oracle, and a provider.
- The customer could have multiple virtual circuits to isolate traffic from different parts of their organization (e.g. one virtual circuit for 10.0.1.0/24; another for 172.16.0.0/16), or to provide redundancy.
- FastConnect uses Border Gateway Protocol (BGP) to exchange routing information between the various autonomous systems involved in the connection.
- Virtual circuits can be for Private Peering and Public Peering.

FastConnect and IPv6

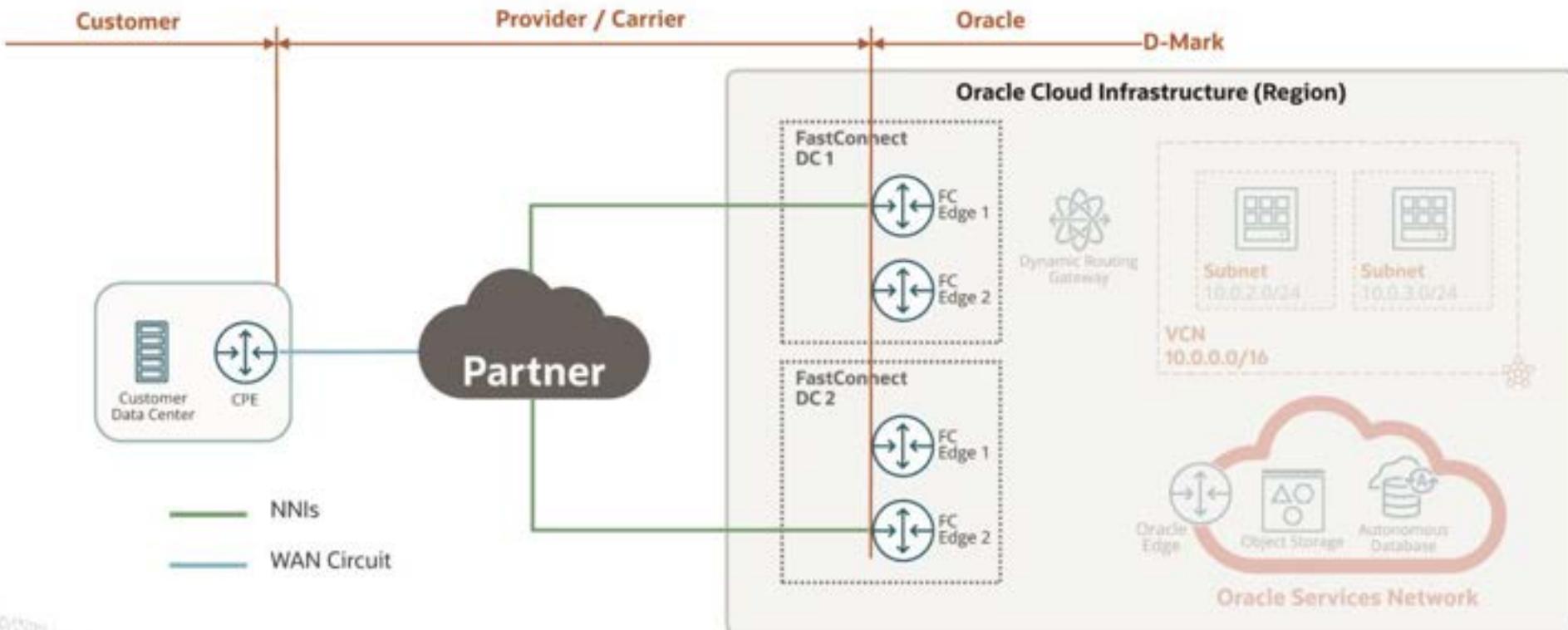
- The on-premises hosts with IPv6 addresses can communicate with an IPv6-enabled VCN over FastConnect.
- The FastConnect virtual circuit needs to have IPv6 BGP addresses.
- When you specify the BGP address pair, you must include a subnet mask that contains both addresses:
 - Allowed subnet masks are: /64, /96, /126, /127



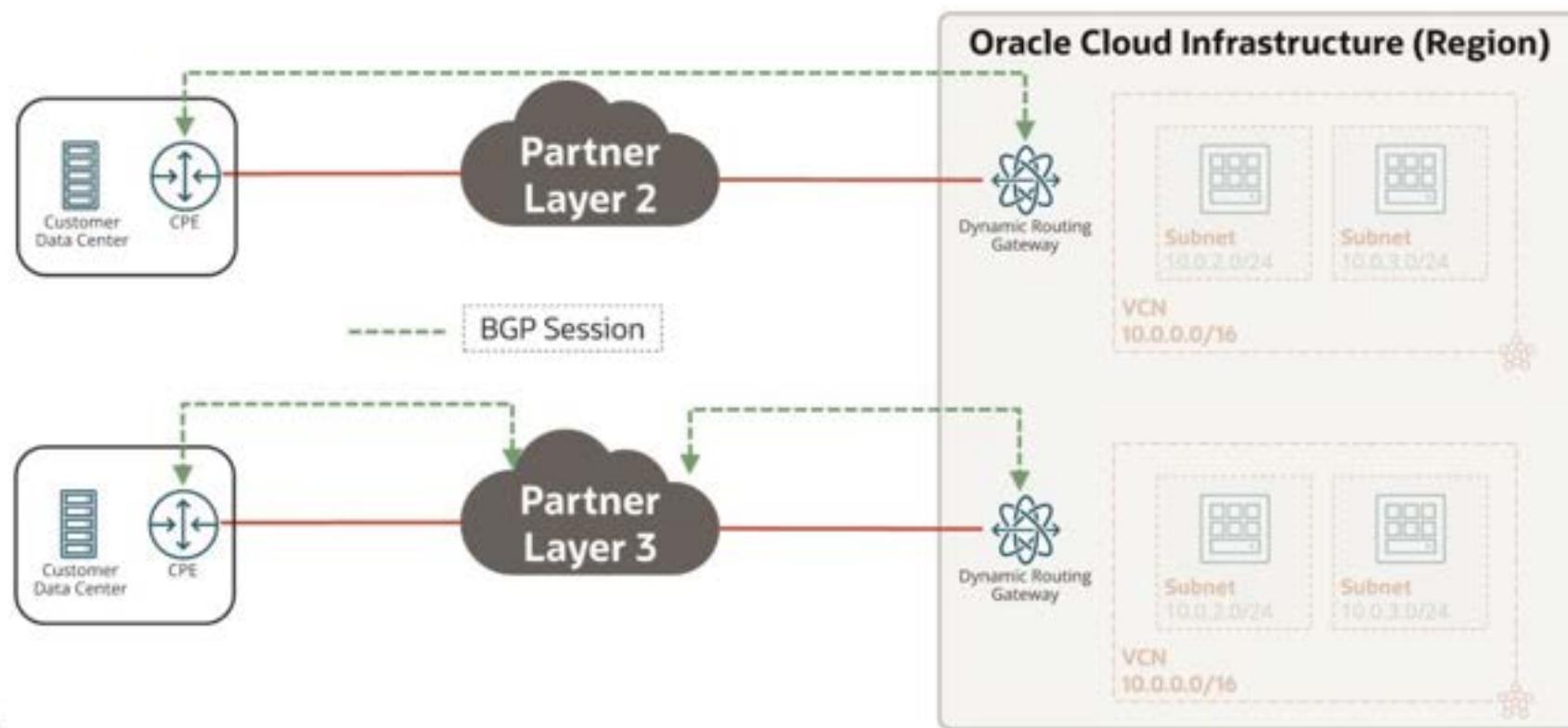
FastConnect Connectivity Options

FastConnect Option	Implementation Time	Complexity	Carrier Virtual Circuit Charge	Carrier Charge
1. With an Oracle Partner	Quick	Easy	\$	\$\$
2. With a Third-Party Provider	Long	Complex	Included	\$\$\$
3. Colocation with Oracle	Short	Easy	Included	\$

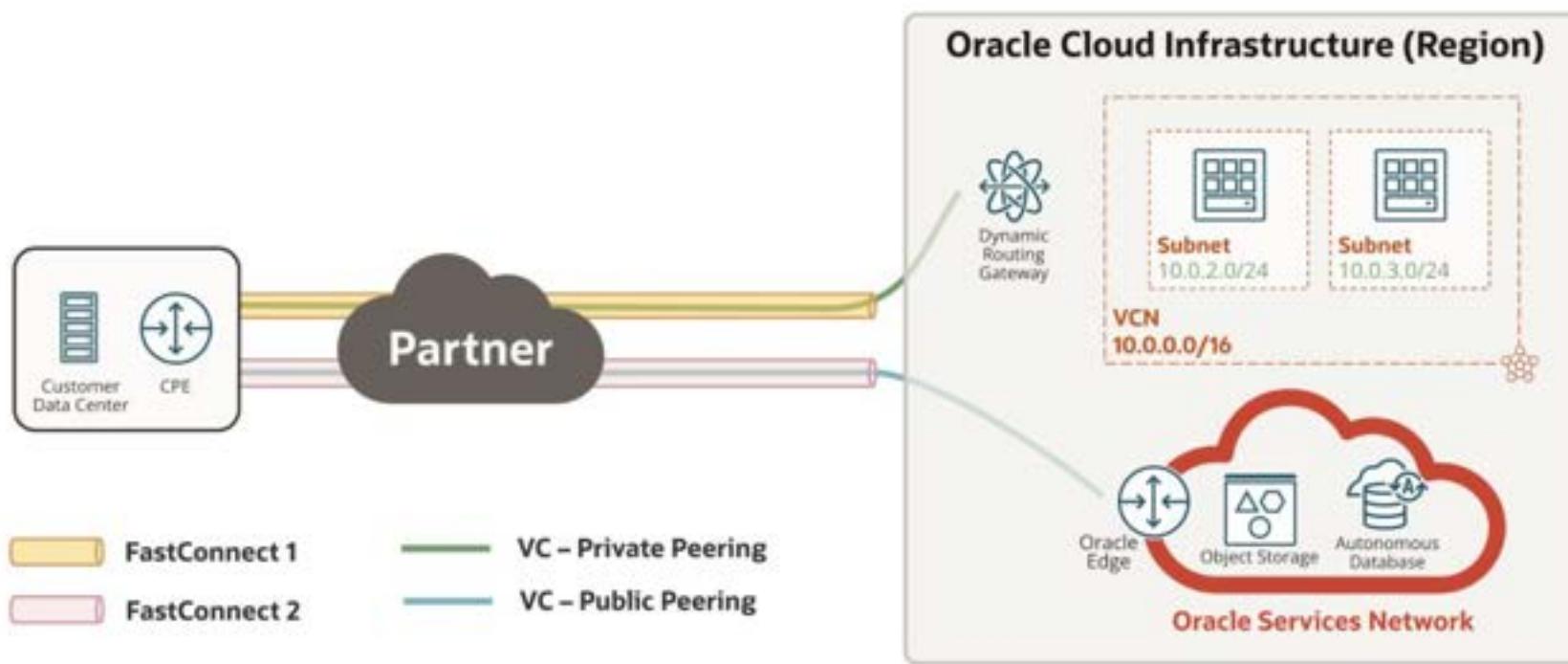
Option 1 - FastConnect with an Oracle Partner



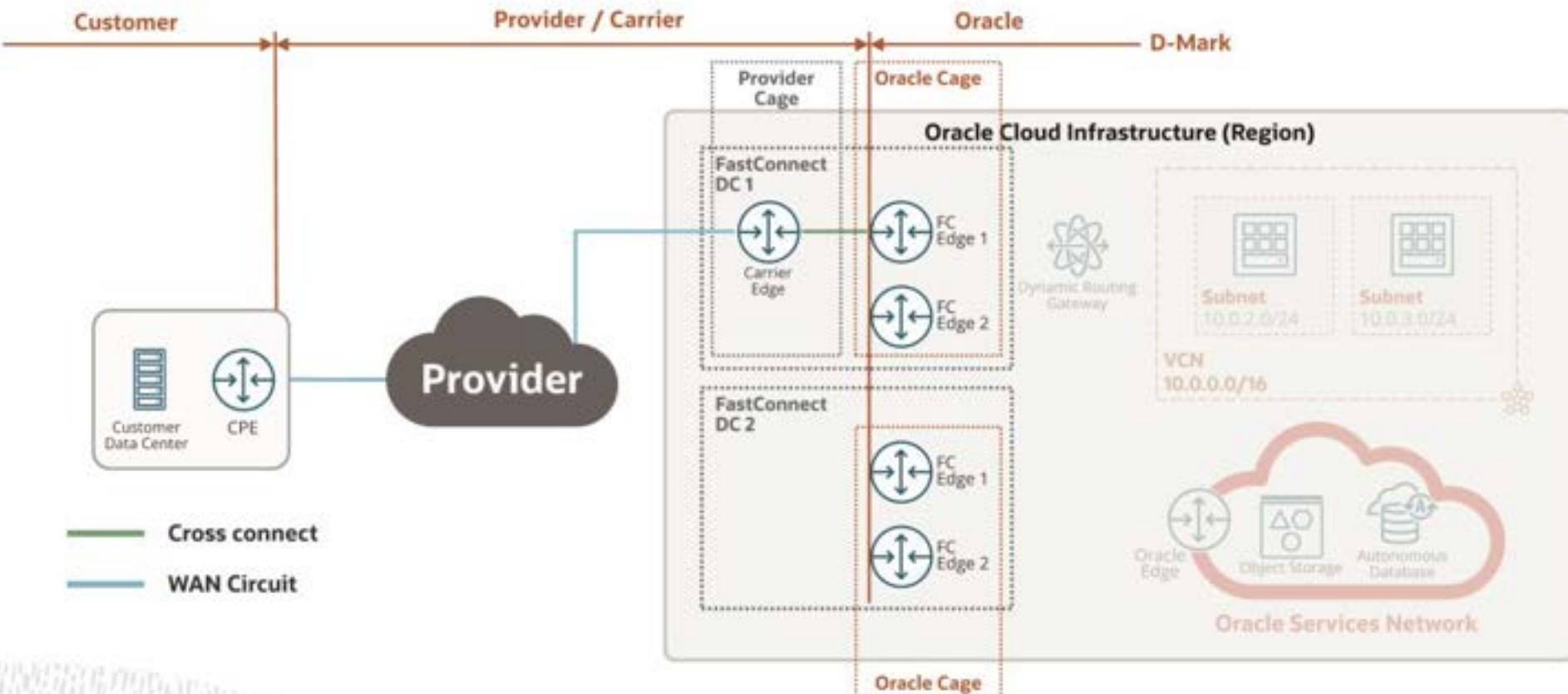
Option 1 - FastConnect with an Oracle Partner - Layer 2 and Layer 3



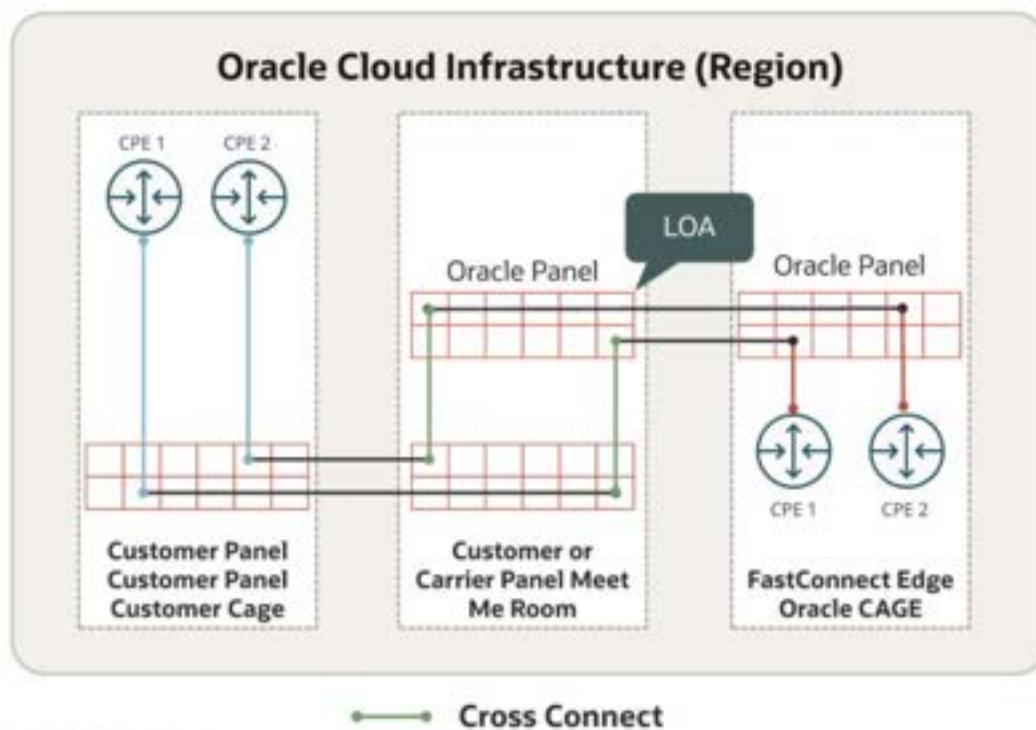
Option 2 - FastConnect with a Third-Party Provider



Option 2 - FastConnect with a Third-Party Provider

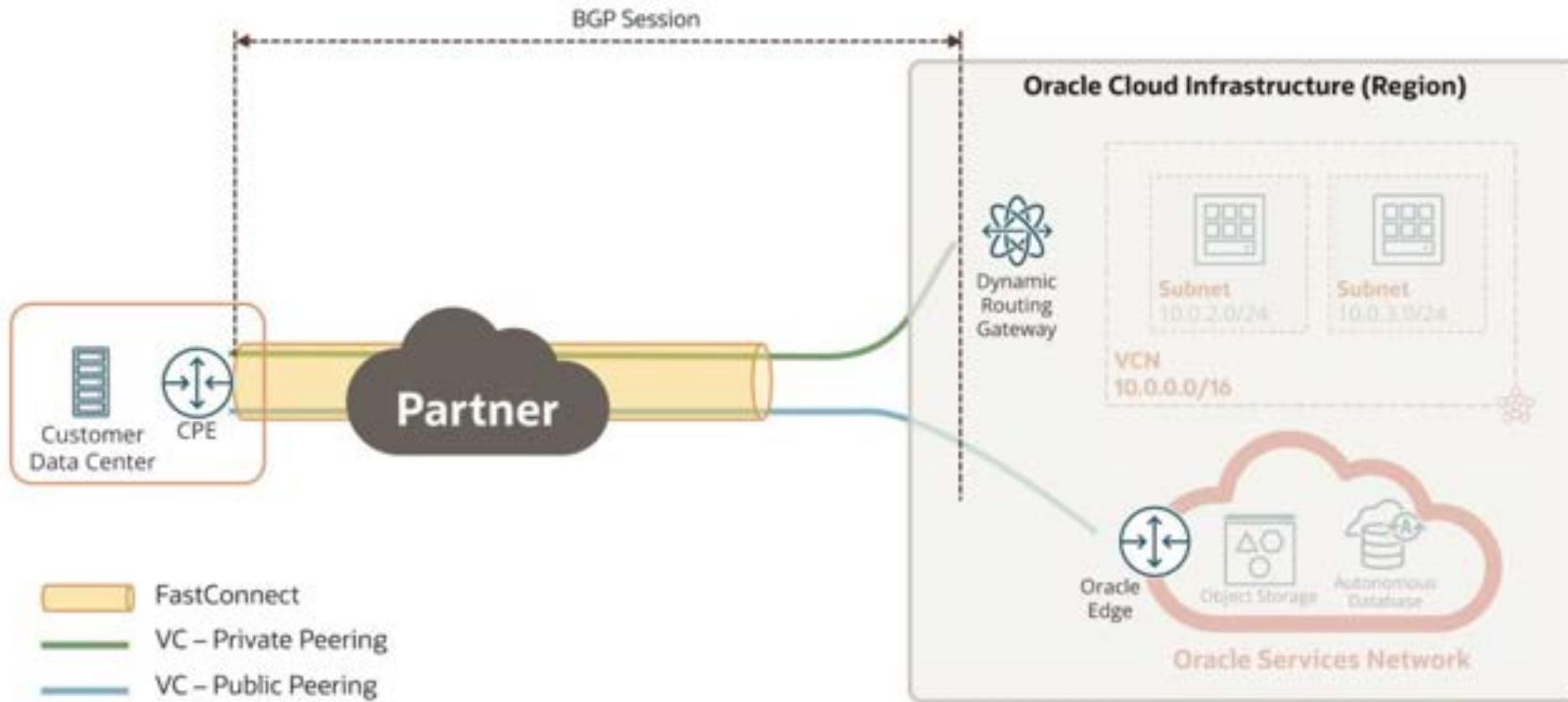


FastConnect with a Third-Party Provider or Colocation with Oracle Cross Connect - Meet Me Room

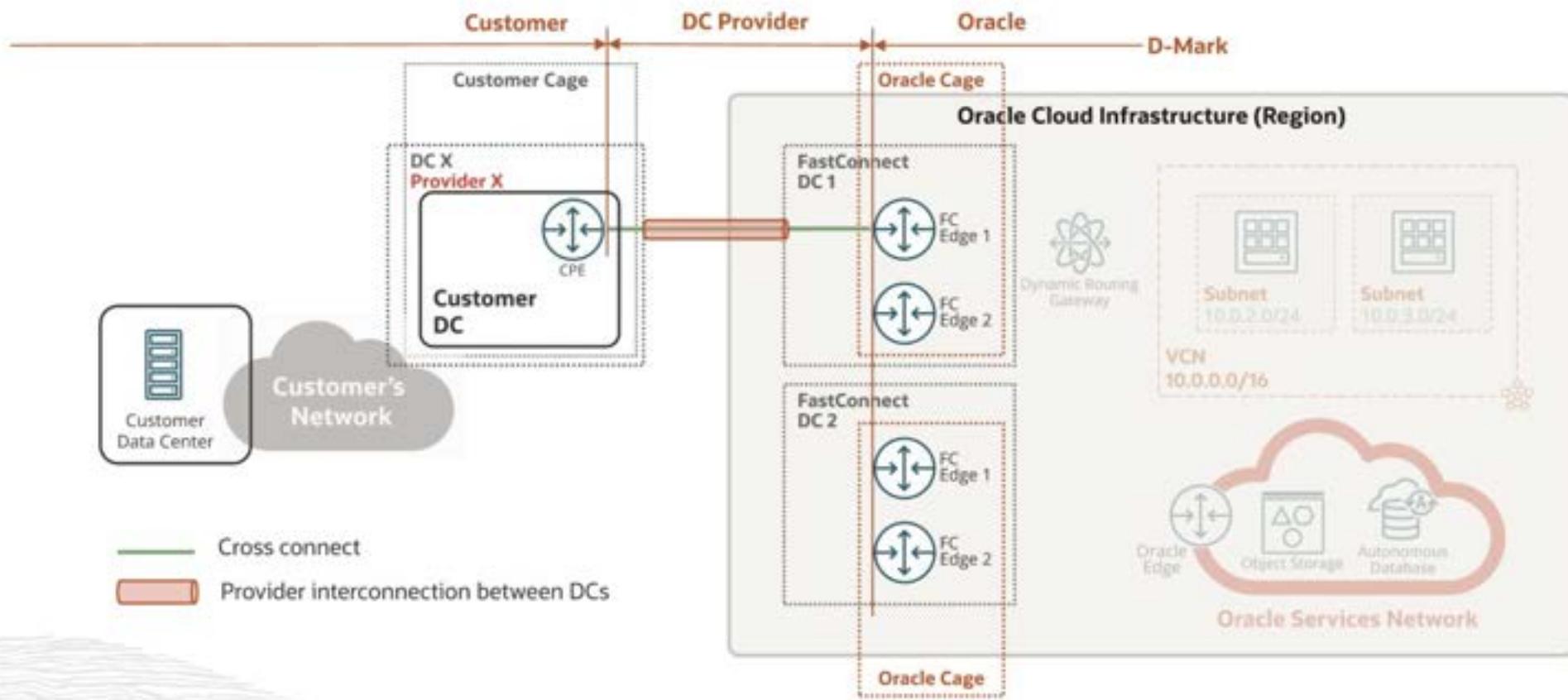


- › Customer submits cross connect order to Colocation provider such as Coresite
- › Coresite patches from Customer Panel to Oracle Panel
- › Bulk cable runs are pre-ran from Oracle Panel in OCI Cage to Meet Me Room
- › Customer may need Colo to run a fiber from the Customer Cage to Meet Me Room
- › **Third-Party provider should have capability to order cross connect with the colocation provider**

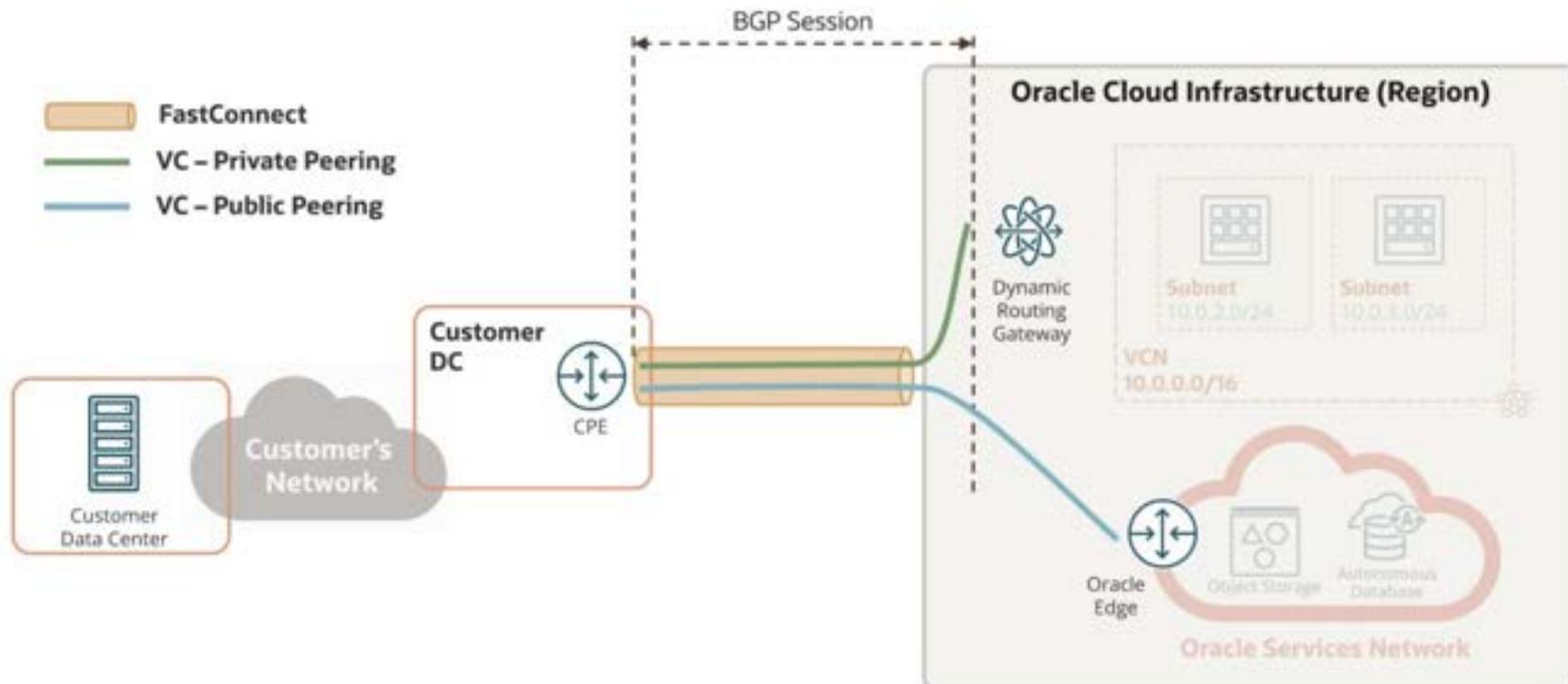
Option 2 - FastConnect with a Third-Party Provider - Virtual Circuits



Option 3 - FastConnect Colocation with Oracle - Multiple DCs same Provider



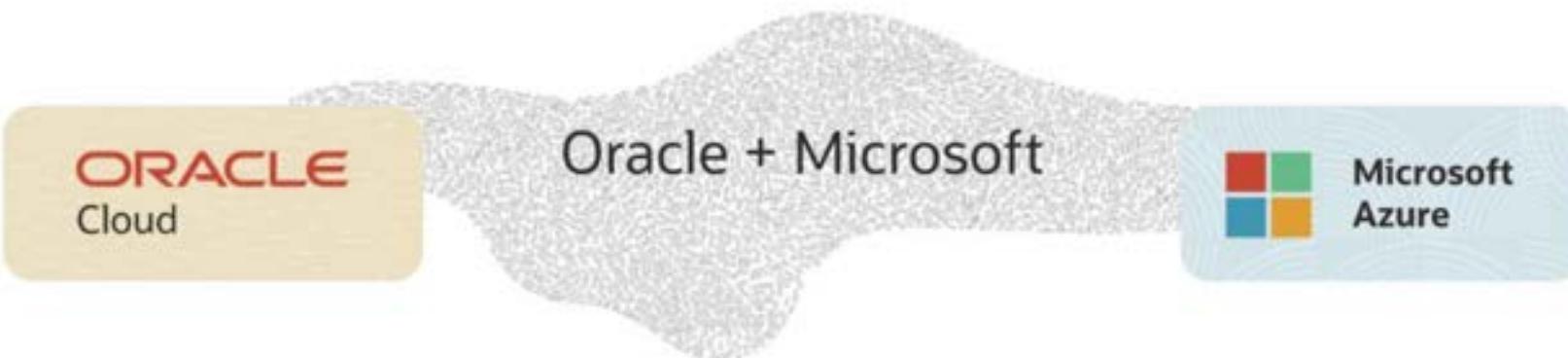
Option 3 - FastConnect Colocation with Oracle - Virtual Circuits



OCI-Azure Interconnect Introduction



OCI-Azure Interconnect



Cross-cloud
connection

- One time setup without the need for any intermediate network provider.
- Migrate and run mission-critical enterprise workloads across Microsoft Azure and Oracle Cloud.
- Consistent network performance (~2 ms latency)
- Provide single sign-on access to resources deployed in Oracle Cloud and Microsoft Azure.
- Gain a highly optimized, secure, and unified cloud experience.

OCI-Azure Interconnect Regions

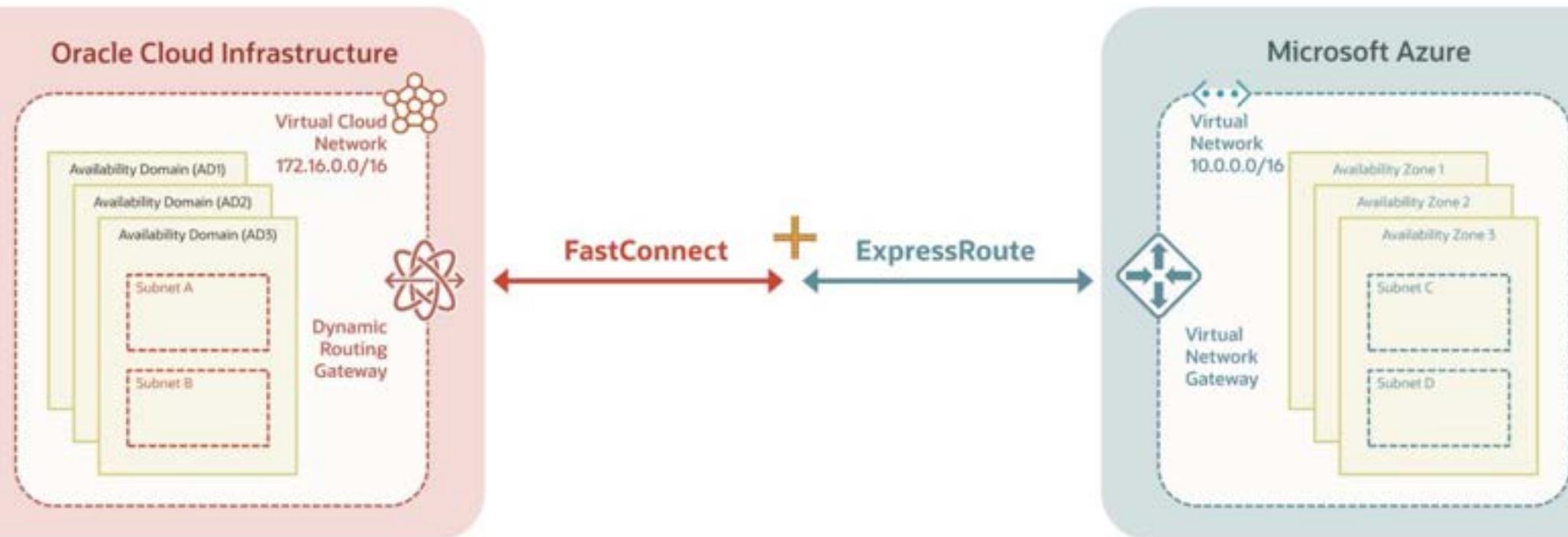


- Commercial
- Commercial Planned
- Sovereign Planned
- Government
- Microsoft Interconnect Azure

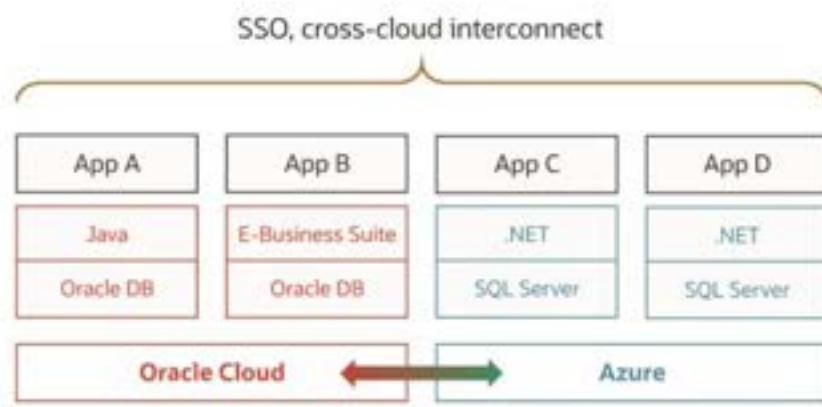
12 Azure Interconnect Regions
41 OCI Public Regions; 9 more planned

Architecture

OCI-Azure Interconnect



Common Use Cases



Supported Deployments:

Full stack Oracle or custom apps on Oracle Database on OCI and full stack apps on Azure that interoperate and share data

Oracle Apps (PSFT, JDE) on Azure using Oracle Database on OCI

Custom .NET applications on Azure using Oracle Database on OCI

Custom Cloud Native apps on Azure using Oracle Autonomous DB

Applications/Oracle Database in OCI, Azure Data Lake for analytics, and Cognitive Services for AI

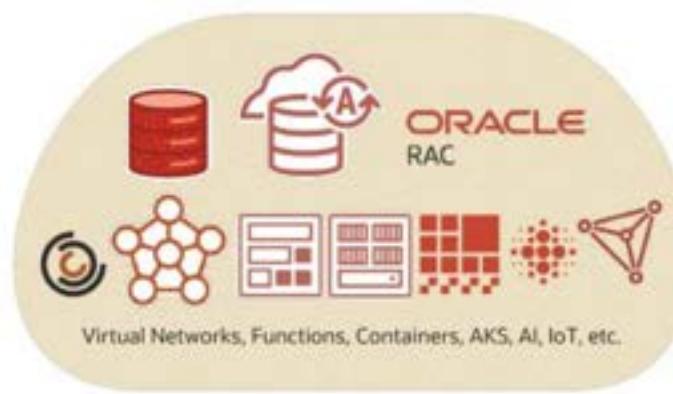
SQL Azure, SQL Server, SQL DW on Azure and Oracle Analytics Cloud, and Data Science service on OCI

Building Blocks

Component	OCI	Azure
Virtual Network	VCN	VNet
Virtual Circuit	FastConnect Virtual Circuit	ExpressRoute Circuit
Gateway	Dynamic Routing Gateway	Virtual Network Gateway
Routing	Route Tables	Route Tables
Security/Firewall	Security Lists Network Security Groups	Network Security Groups



Partnership Benefits



Innovate across clouds

Run enterprise-grade, multi cloud applications between Oracle Cloud and Azure.

Enjoy a choice of services

Access a one-stop shop for all database and cloud service needs.

Leverage existing investments

Migrate on-premises apps and databases to the cloud without re-architecting technology.

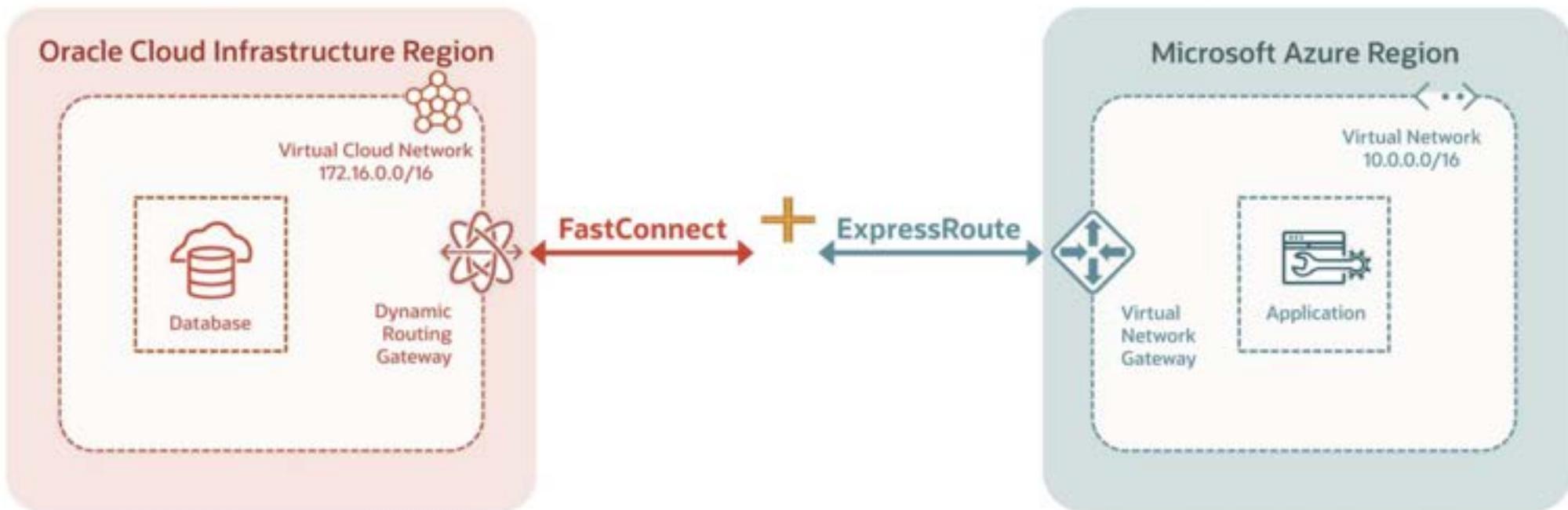
Oracle Cloud Infrastructure

OCI-Azure Interconnect Scenarios

OCI-Azure Interconnect Scenarios

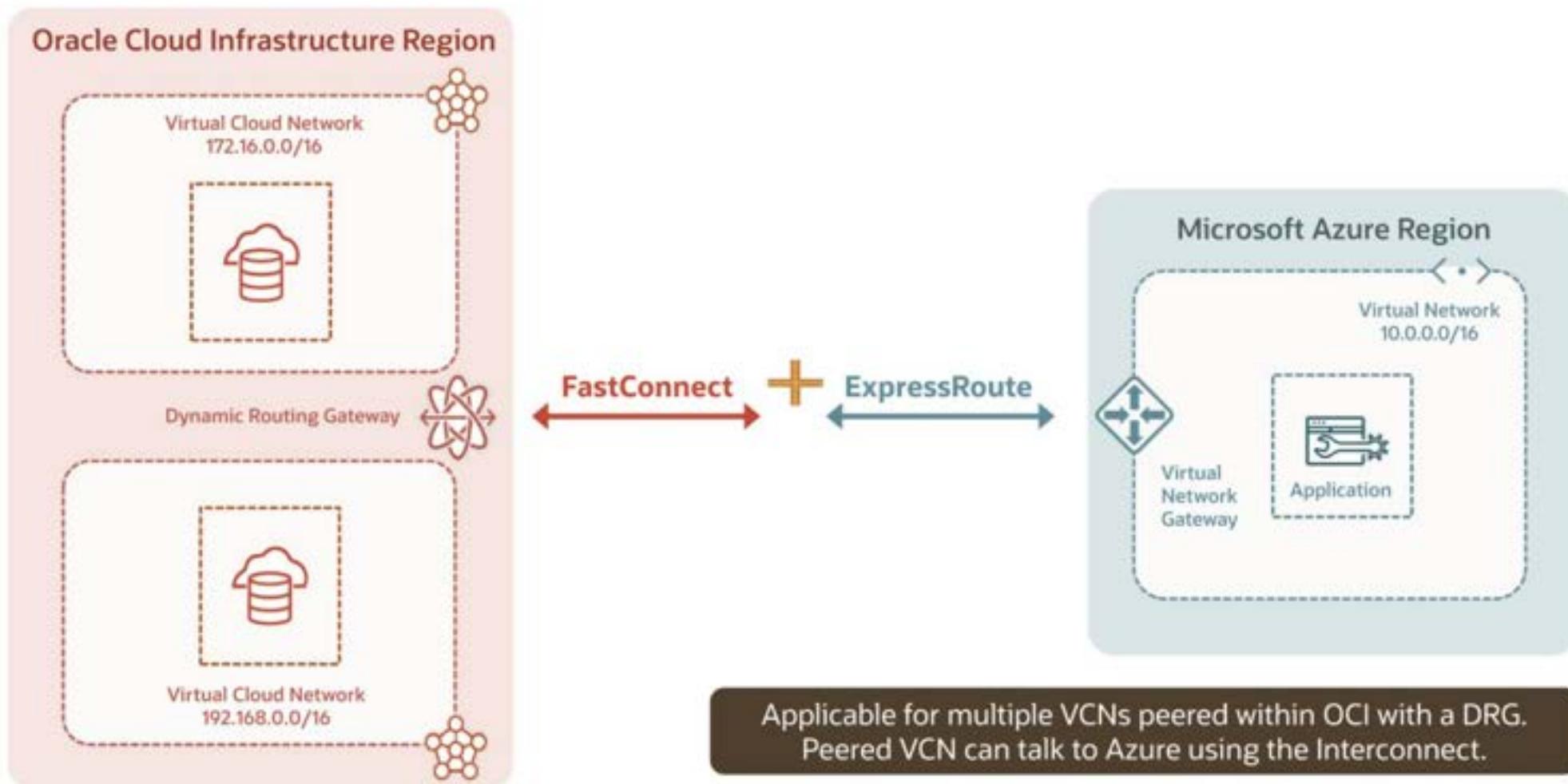
Scenarios	Supported
Connect OCI VCN to Azure VNET (Basic Deployment)	Yes
Connect peered OCI VCNs in the same region to Azure	Yes
Connect peered OCI VCNs in different regions to Azure	Yes
Connect services in Oracle Services Network to Azure	Yes
Connect on-premises environments to Azure via OCI VCN (and vice versa)	No

Connect OCI VCN to Azure VNet

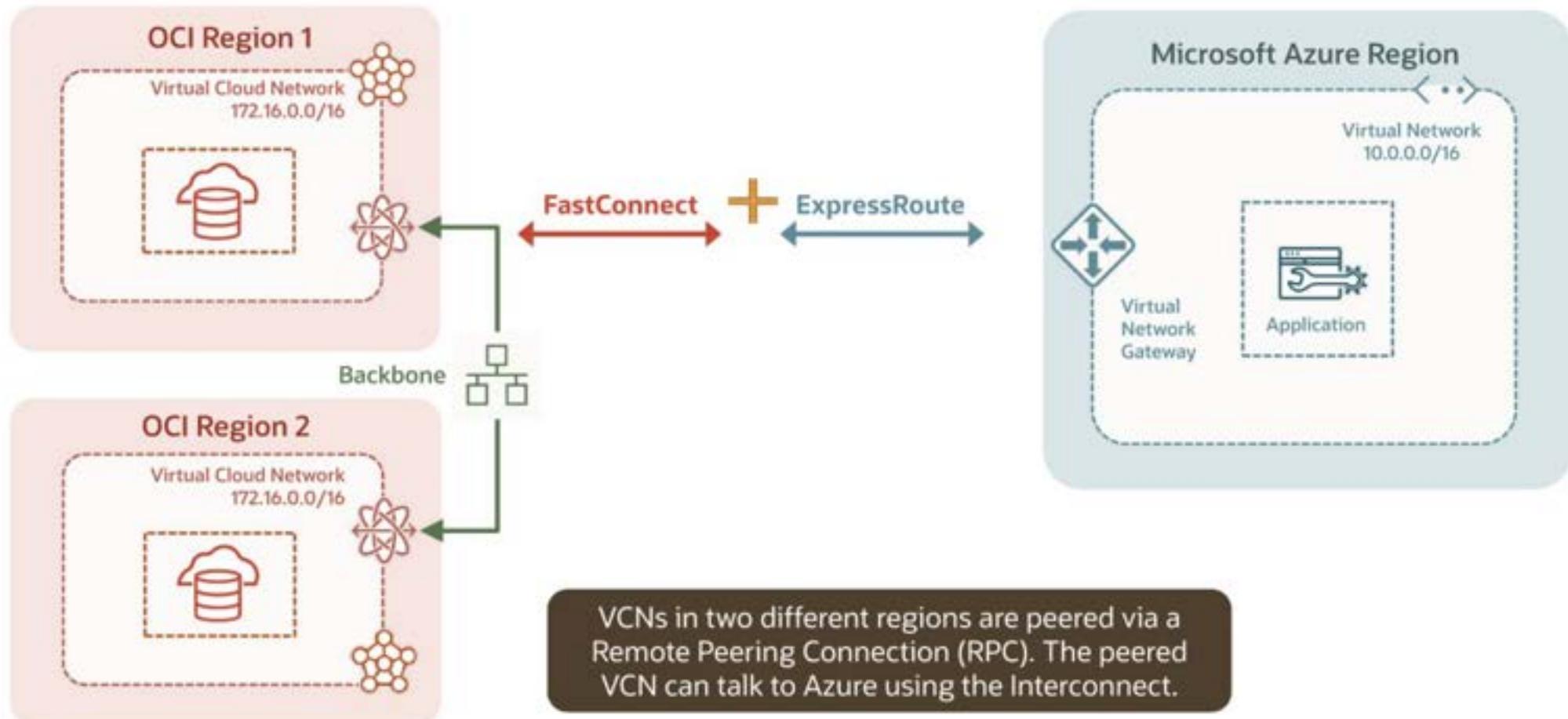


This is the basic configuration of the Interconnect from the Oracle Console and the Azure Portal to create a private path between Oracle VCN and Azure VNET

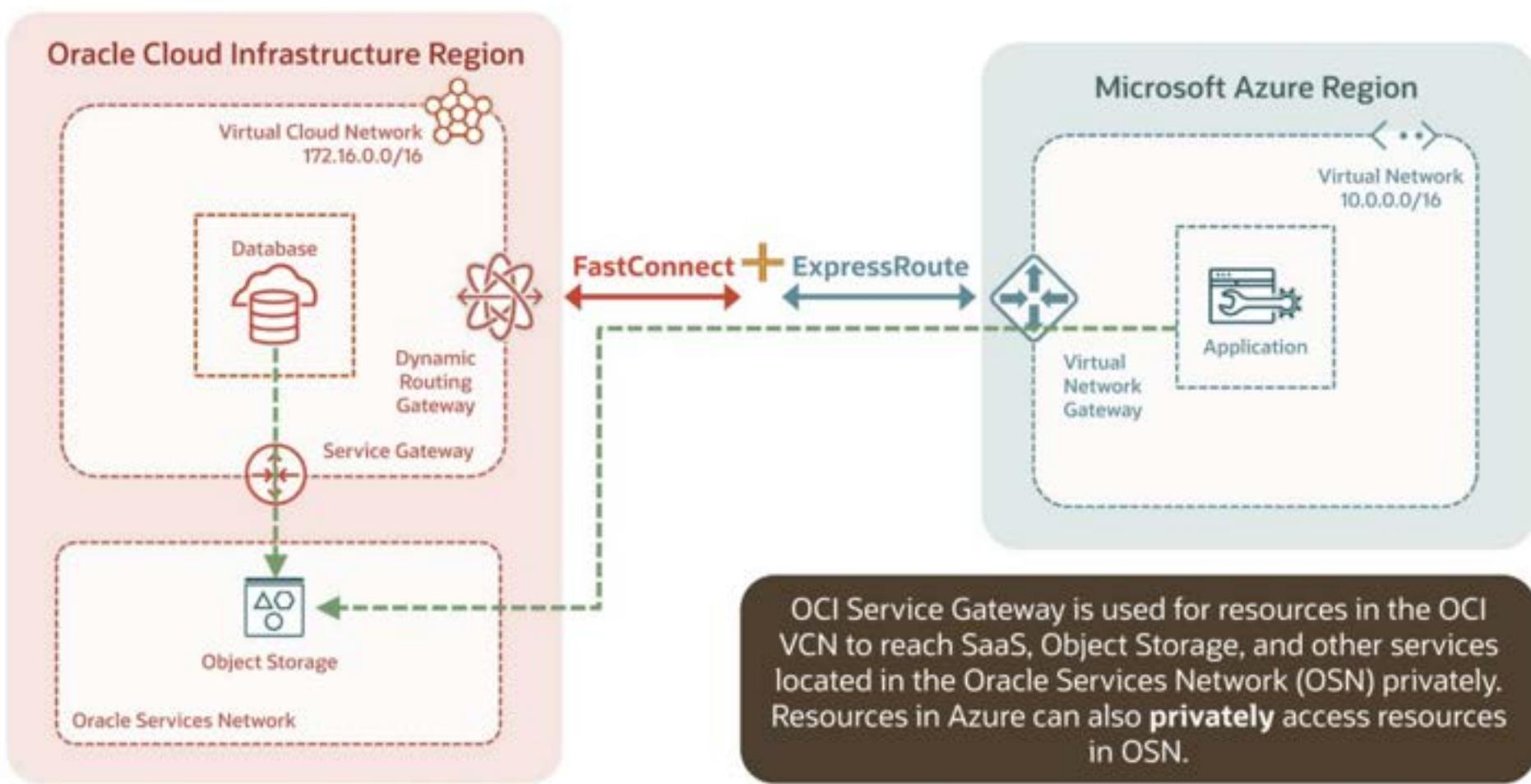
Connect Peered OCI VCNs in the same OCI Region to Azure



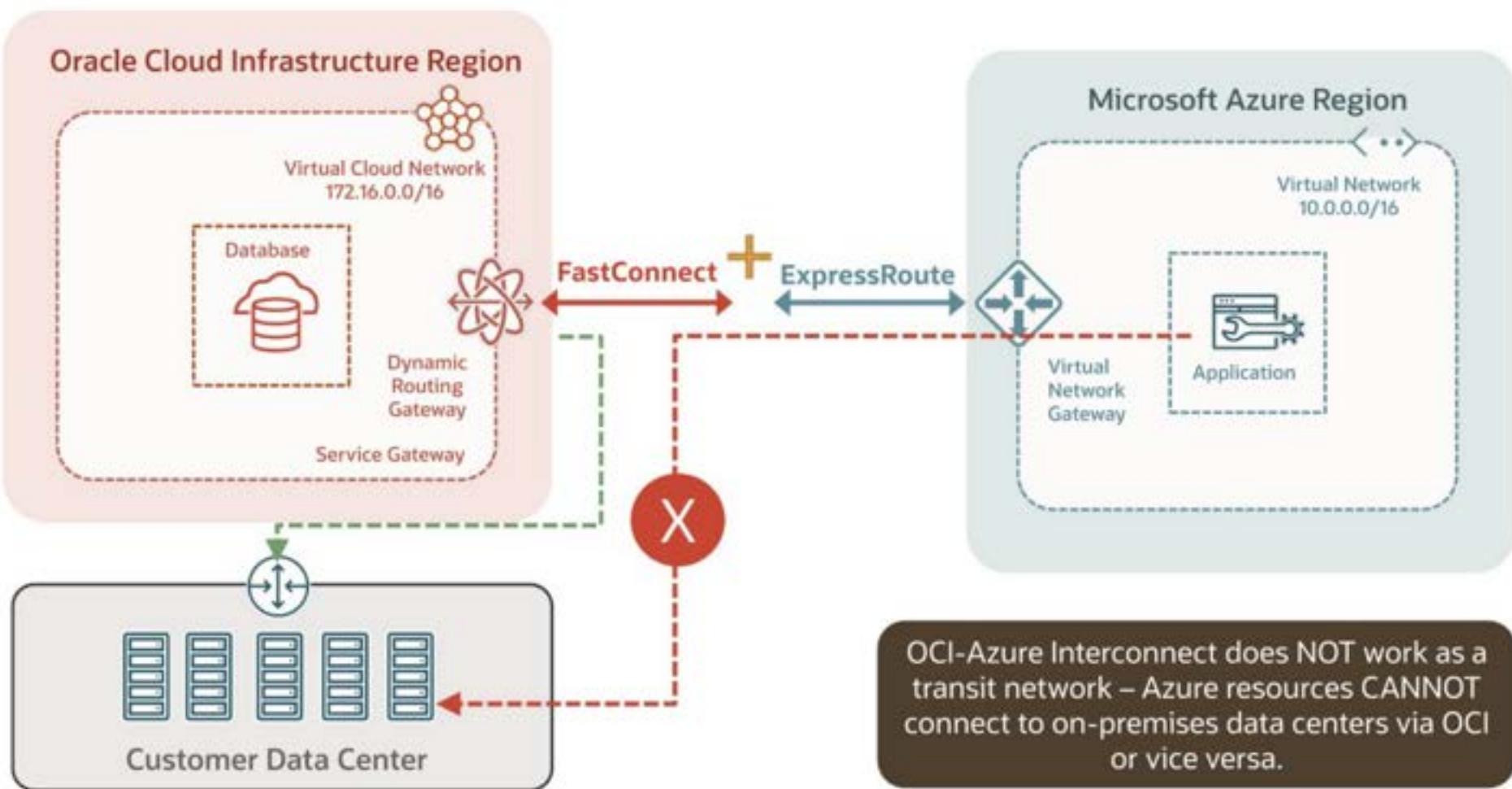
Connect Peered OCI VCNs in different OCI Regions to Azure



Connect services in Oracle Services Network to Azure



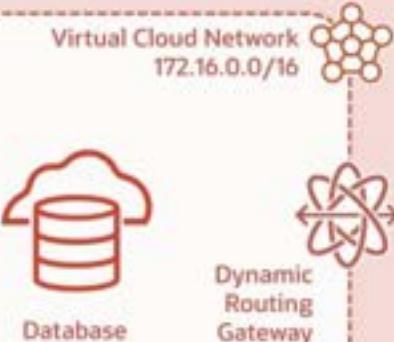
On-prem Private Connectivity to OCI



Oracle Cloud Infrastructure OCI-Azure Interconnect Setup

OCI-Azure Interconnect

Oracle Cloud Infrastructure Region



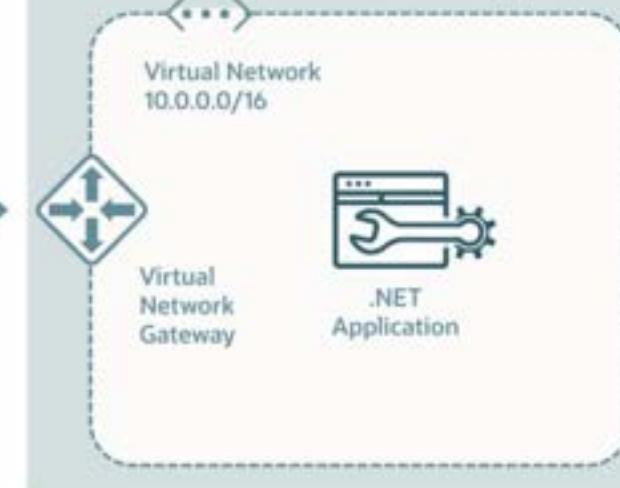
FastConnect



ExpressRoute



Microsoft Azure Region



Interconnect Setup Process

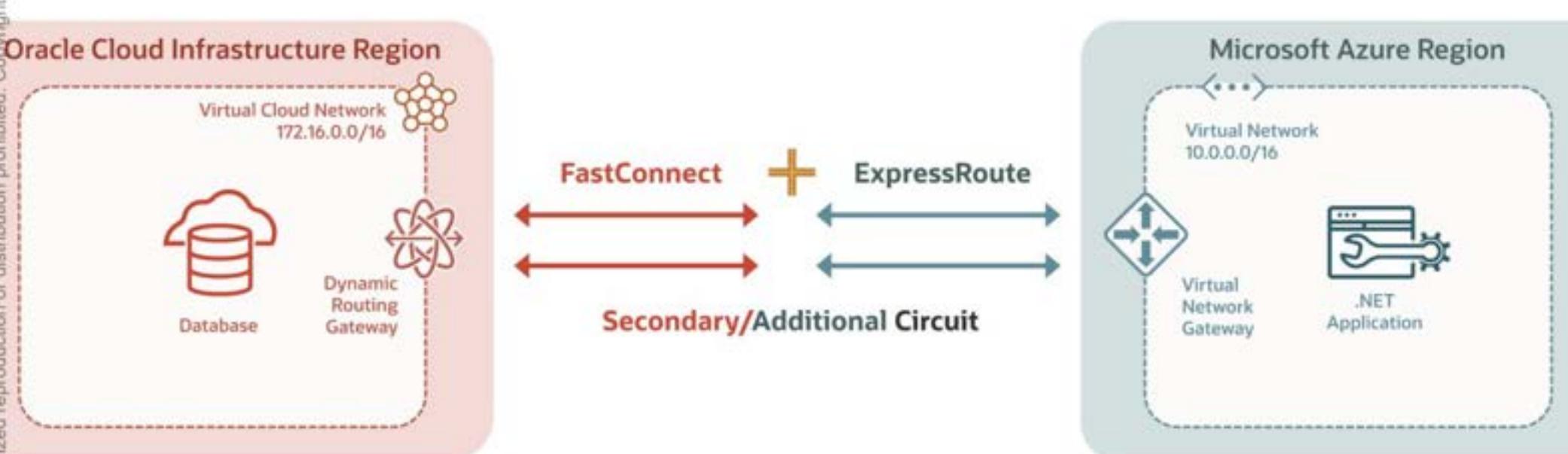
Tasks	Oracle Cloud Infrastructure	Microsoft Azure
Task 1	Configure VCN Security List	Configure VNET Security Group
Task 2		Setup Azure ExpressRoute circuit
Task 3	Setup Oracle Fastconnect Virtual circuit	
Task 4	Confirm circuits are provisioned	Confirm circuits are provisioned
Task 5	Configure routing for VCN	Configure routing for VNET
Task 6	Test the connection	Test the connection

BGP Requirements

- The connection between the Azure VNet and OCI VCN uses BGP dynamic routing
- The connection is redundant; therefore, two BGP sessions are required
- Administrators are required to provide IP ranges for the BGP advertising to use:
 - A primary pair of BGP addresses (one IP address each for OCI and Azure)
 - A separate, secondary pair of BGP addresses (one IP address each for OCI and Azure)
- For each pair, you must provide a separate block of addresses with a subnet mask from /28 to /31

Redundancy and High Availability

The connection is self-redundant, with two circuits and BGP sessions running in the background. However, admins may still deploy multiple circuits, Interconnect or IPSEC, as additional redundancy.



Bandwidth and Cost Considerations

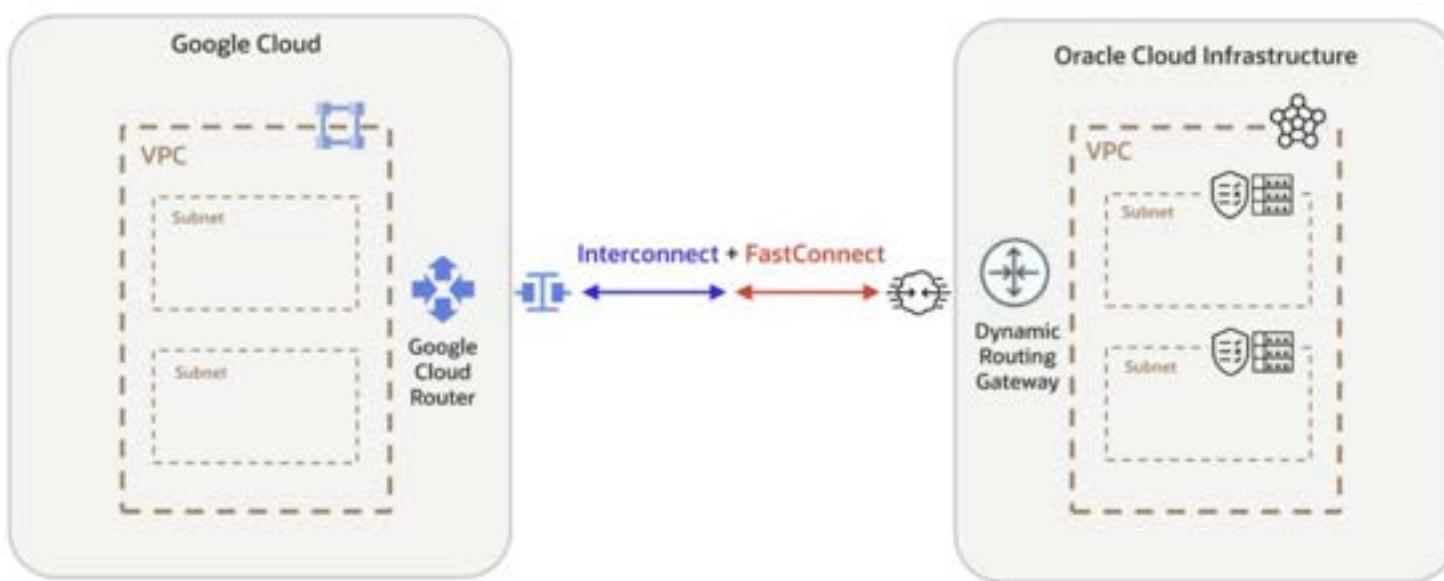
- The cost of Oracle FastConnect is the same across all the Oracle Cloud Infrastructure regions. There are no separate ingress or egress data charges.
- Azure has more than one SKU available for ExpressRoute, with different options and pricing. Pricing also varies from region to region.
- FastConnect is available in 1, 2, 5 or 10 Gbps, so a proper sizing exercise and planning is recommended.
- Azure ExpressRoute supports up to 10 Gbps bandwidth
- It is recommended to match bandwidth allocation on both ends.



Oracle Cloud Infrastructure

Oracle Interconnect for Google Cloud

Oracle Interconnect for Google Cloud Overview



A dedicated, private interconnection service

Benefits

Dedicated Connectivity

High Bandwidth

Fast, on-demand provisioning

Technology Integration

No Egress Fee

Collaborative support model

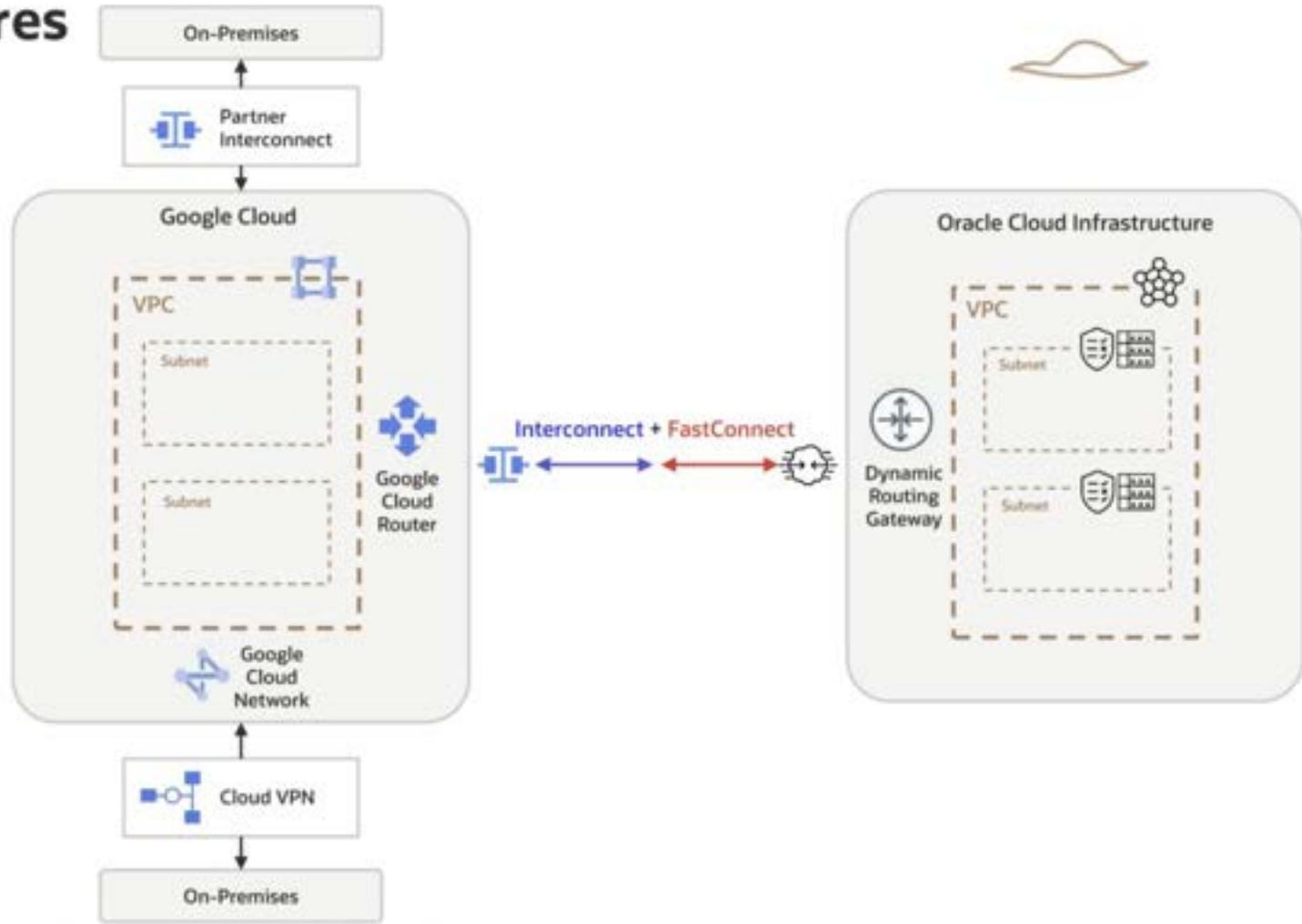
Oracle Interconnect for Google Cloud Regions



Google Cloud region	Paired Oracle Cloud Infrastructure region
asia-northeast1	ap-tokyo-1
asia-south1	ap-mumbai-1
asia-southeast1	ap-singapore-1
australia-southeast1	ap-sydney-1
australia-southeast2	ap-melbourne-1
europe-southwest1	eu-madrid-1
europe-west2	uk-london-1
europe-west3	eu-frankfurt-1
northamerica-northeast1	ca-montreal-1
southamerica-east1	sa-saopaulo-1
us-east4	us-ashburn-1

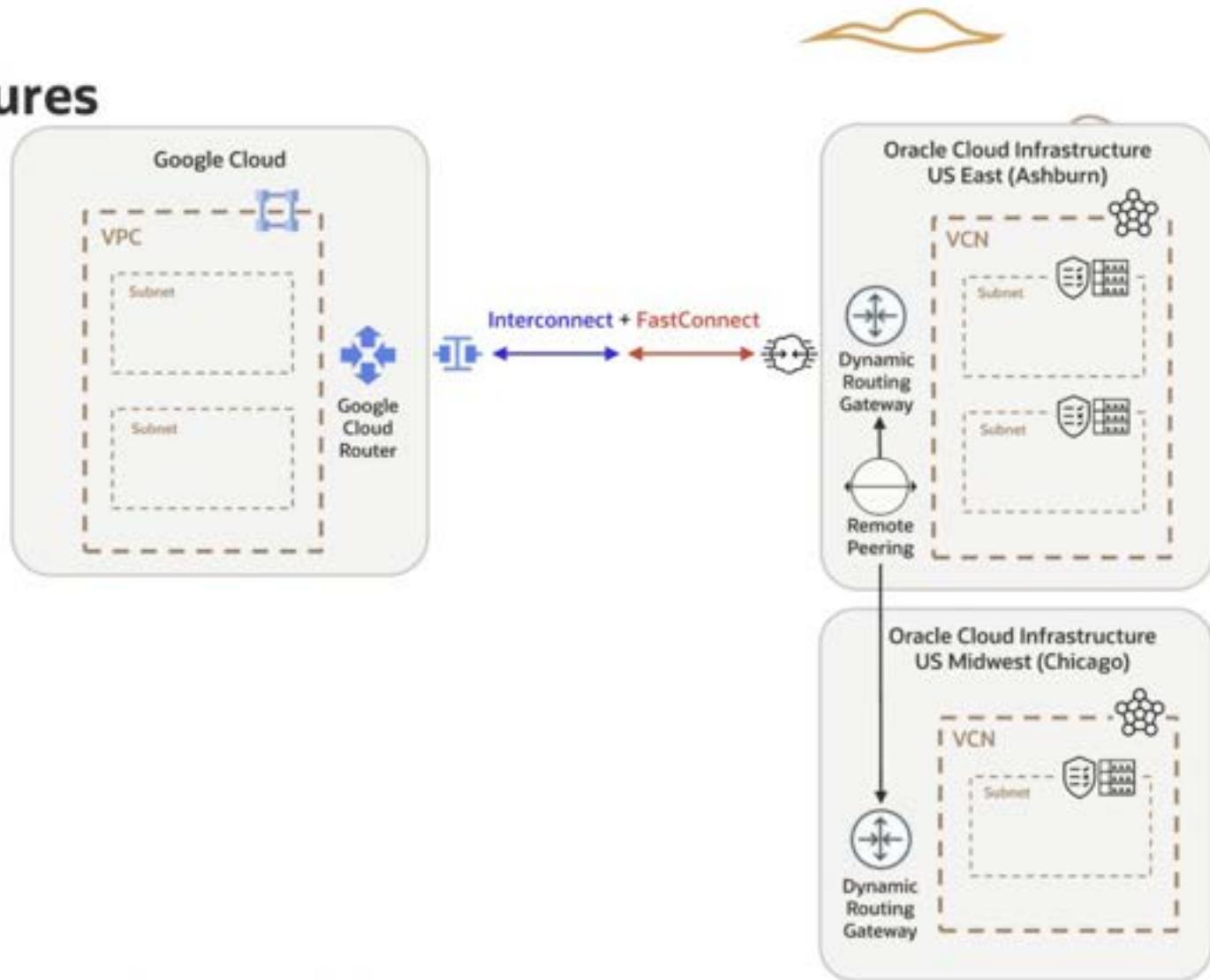
Common Architectures

Extend the Oracle Interconnect for Google Cloud with Network Connectivity Center



Common Architectures

Enable remote on-ramp to other regions using the Oracle backbone



Interconnect Setup Process



Tasks	Oracle Cloud Infrastructure	Google Cloud
Task 1	Create a DRG and attach it to VCN	Create Google Cloud Router
Task 2		Create VLAN attachment
Task 3	Setup Oracle Fastconnect Virtual circuit	
Task 4	Confirm circuits are provisioned	Confirm status of VLAN attachment
Task 5	Configure security/routing for VCN	Configure security/routing for VPC
Task 6	Test the connection	Test the connection

Provisioning Workflow (GCP)

Add VLAN attachment

Create a new partner interconnect attachment

Google Cloud My First Project INTERCONNECT

Network Connectivity Add VLAN attachment

Network Connectivity Center

VPN

Interconnect

Cloud Routers

INTERCONNECT

Interconnect type

Dedicated interconnect connection
Connect your on-premises network to your Google Cloud VPC network by connecting a router to your equipment. Supports IPv4 and IPv6 traffic. [Learn more \[?\]](#)

On-premises network Customer provided Cross-connect VPC network

Partner Interconnect connection
Connect your on-premises network to your Google Cloud VPC network through a connection from a supported service provider. Supports IPv4 and IPv6 traffic. [Learn more \[?\]](#) (Supported service providers: AT&T, Verizon)

On-premises network Partner network VPC network

Cross-Cloud Interconnect connection
Connect your Google Cloud VPC network to your other cloud service provider networks. [Learn more \[?\]](#)

Cloud service provider Google provided Cross-connect VPC network

Diagram illustrating the three types of interconnect connections:

- Dedicated interconnect connection:** Direct connection between On-premises network and VPC network via Customer provided Cross-connect.
- Partner Interconnect connection:** Connection between On-premises network, Partner network, and VPC network via Partner network (green line).
- Cross-Cloud Interconnect connection:** Connection between Cloud service provider network, Google provided Cross-connect, and VPC network.

Provisioning Workflow (GCP)

Pairing Keys

To complete the VLAN attachment, go to OCI and add a connection to Google.

You will be prompted to provide a pairing key

← Add Partner VLAN attachment

- ➊ Check your connection
- ➋ Add VLAN attachments
- ➌ Connect to your VPC networks

Connect to your VPC networks

Pairing keys

To complete the VLAN attachment, go to your service provider's portal and add a connection to Google. You'll be prompted to provide a pairing key to complete the connection.

VLAN attachment name ↑ Pairing key

testvlan

ab97/us-central1/1



Pre-activate these VLAN attachments ⓘ

Enable

OK

Provisioning Workflow (GCP)

Activate the connection

Activate the connection after completing the configuration on OCI

VLAN attachments

MANAGE FLOW LOGS ▾

Filter Enter property name or value

<input type="checkbox"/>	Name ↑	Region	Status	Type
<input type="checkbox"/>	testvlan	us-central1	⚠ Waiting for service provider	Partner

Provisioning Workflow (OCI)



Create a new FastConnect connection of the type “FastConnect partner”

Create connection

Connection type

FastConnect lets you access your existing network from your virtual cloud network (VCN) without traversing the Internet. Choose an option:

Connection type

FastConnect partner

Use this option if you have a relationship with a FastConnect partner. Here you set up the Oracle side of a virtual circuit that runs on the partner's connection. See the topics to the right.

FastConnect direct

Use this option if you want a dedicated connection by way of a third-party provider or by connecting in a FastConnect location. Here you request a cross-connect and receive the letter of authorization (LOA). After cabling is complete at the FastConnect location, you return here to activate the cross-connect and set up at least one virtual circuit. See the topics to the right.

Partner

Google Cloud: OCI Interconnect

Connection Type

Provisioning Workflow (OCI)

Create Connection

Select DRG, Provisioned bandwidth, MTU and pairing key (from GCP)

Dynamic routing gateway in intoraclerohit (root) ([Change compartment](#))

No dynamic routing gateways in intoraclerohit (root) compartment.

Provisioned bandwidth

Select a value

Partner service key ⓘ

MTU ⓘ

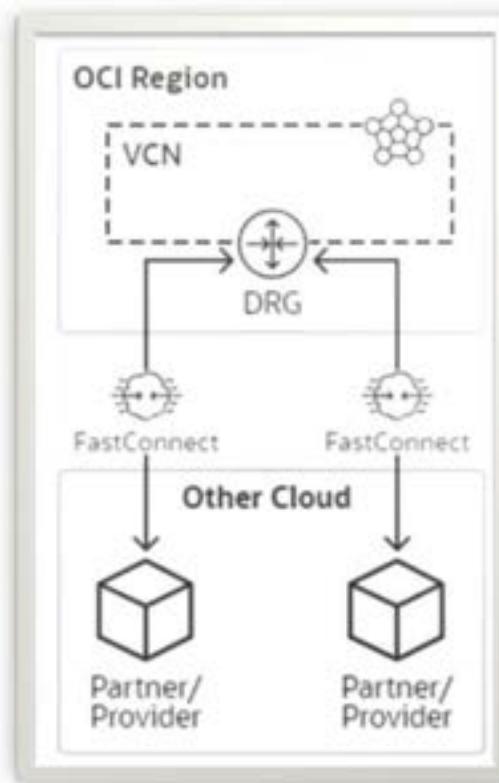
1500

[Show advanced options](#)

Provisioning Workflow (OCI)

Repeat for resiliency

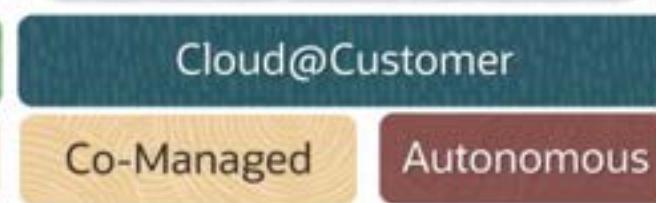
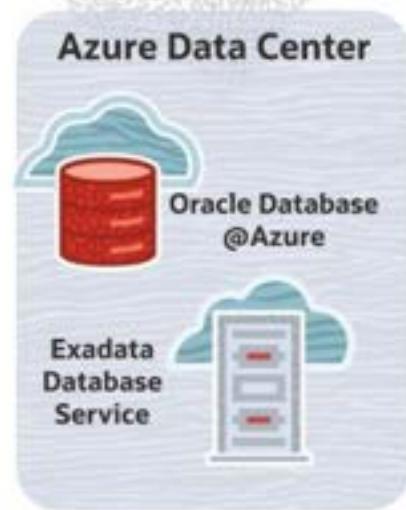
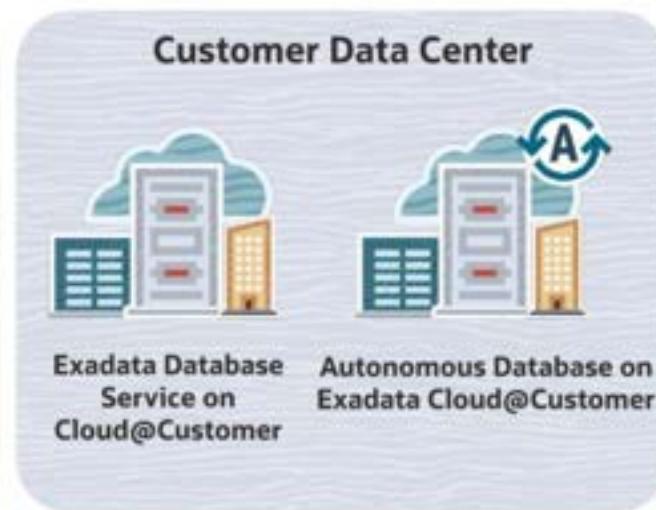
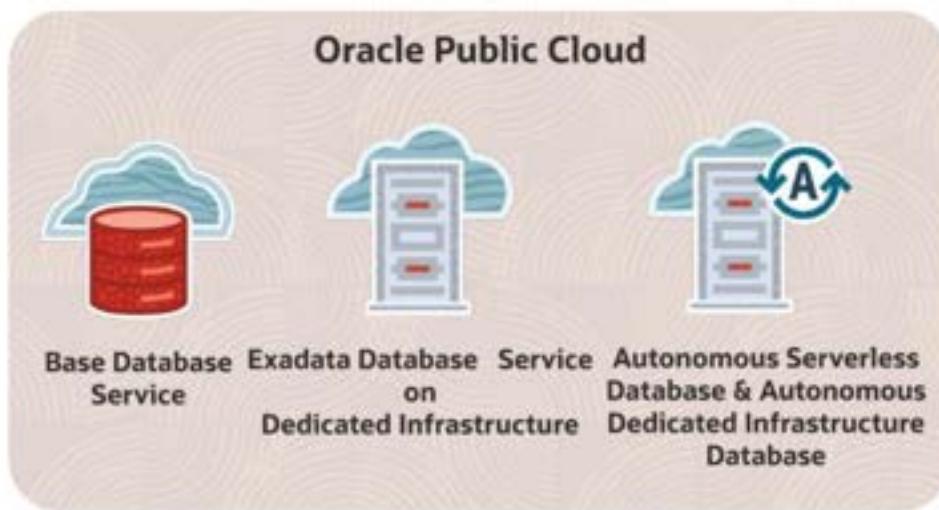
Create a new FastConnect partner connection to Google Cloud



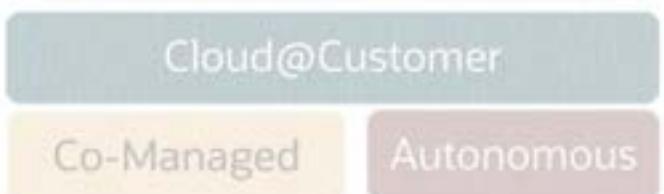
Oracle Multicloud

OCI Database Services Introduction

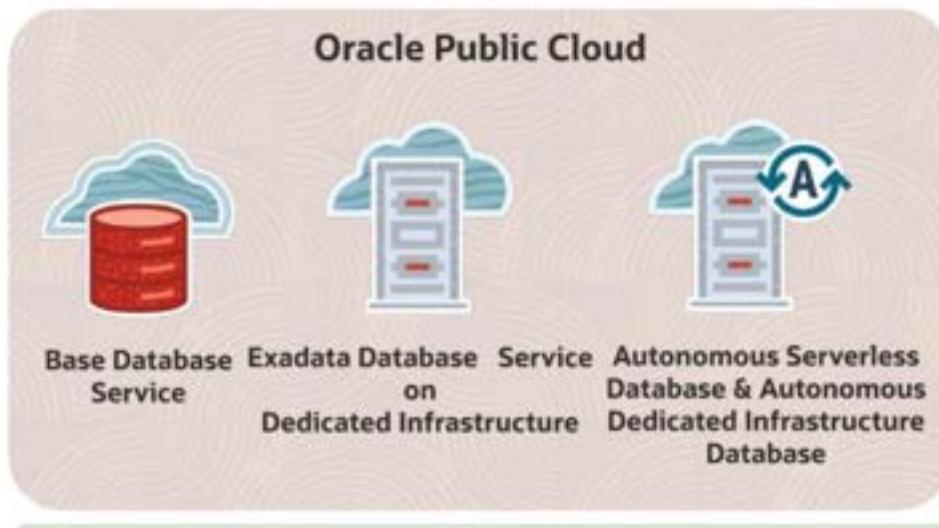
Database Services in Oracle Cloud



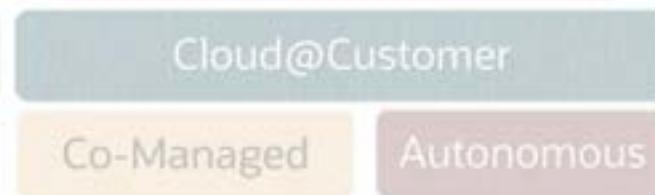
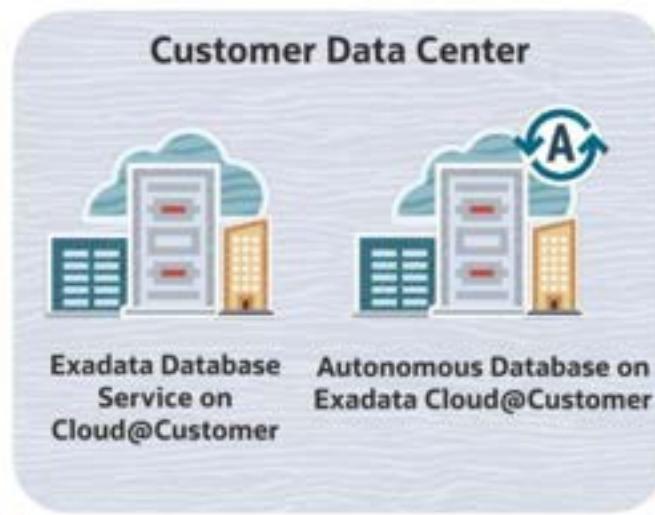
Database Services in Oracle Cloud



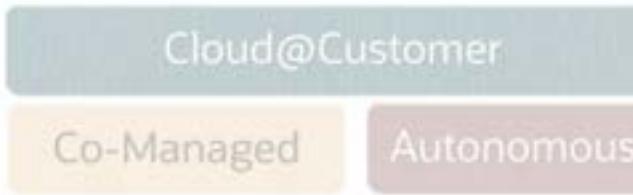
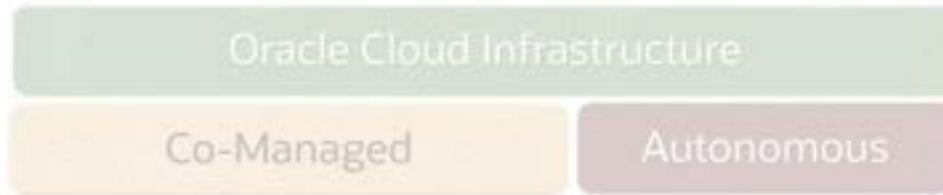
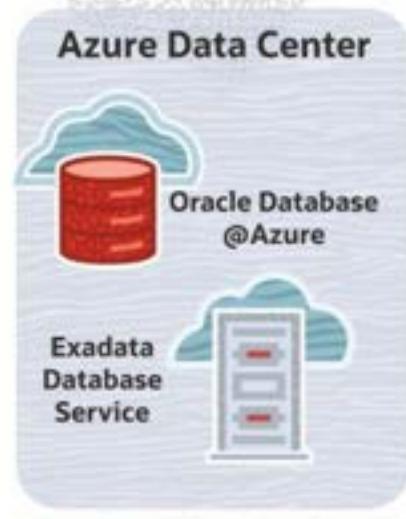
Database Services in Oracle Cloud



Database Services in Oracle Cloud



Database Services in Oracle Cloud



Oracle MultiCloud

Oracle Base Database Service

Virtual Machine DB Systems

Oracle Base Database Service



Efficiently run and manage database workloads

- Single-instance or 2-node RAC Virtual Machines
- Cloud automation under customer control—provisioning, patching, backup, disaster recovery
- 4 tiers of Oracle Database License Included options or Bring Your Own License
- Runs all supported Oracle database versions



Faster time to production



Improved Availability with RAC



Secure isolated environments

License-Included Oracle Database Options

4 licensing tiers of functionality to meet application-specific requirements

Enterprise Edition Extreme Performance

- Database In-Memory
- Active Data Guard
- Real Application Clusters
- Application Continuity*

Enterprise Edition High Performance

- Partitioning & Multitenant
- Advanced Compression
- Advanced Security
- Life Cycle and Cloud Management Packs

Enterprise Edition

- Data Guard
- Real Application Testing
- Data Masking and Subsetting Pack
- Tuning Pack and Diagnostic Packs

Standard Edition 2

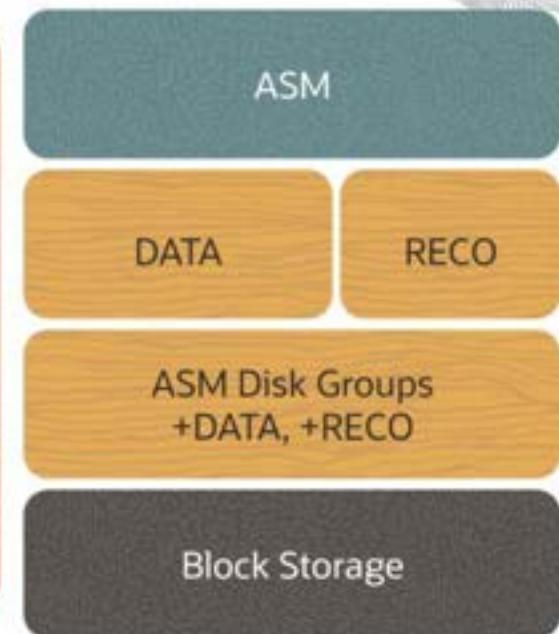
- Transparent Data Encryption (TDE)
- Multitenant with 3 PDB
- Machine Learning
- Spatial and Graph

* Requires the Oracle Active Data Guard or the Oracle Real Application Clusters option

VM DB Systems Storage Architecture



- There is a choice of LVM or Grid Infrastructure (ASM) storage management.
- ASM uses DATA and RECO disk groups.
- Block Storage provides triple mirroring of data.
- ASM redundancy is set to external.
- DB System clones are also supported.



Cloud Automation for Life Cycle Management

Change shape

- Oracle Cloud Web-based UI, REST APIs, SDK, CLI
- Scale OCPUs
 - Scale up storage

The screenshot shows the Oracle Cloud interface for configuring instance shapes. On the left, a yellow box highlights the 'Shape series' section. Three red arrows point from the text 'Scale OCPUs' in the main list to the 'Configure OCPU' section. The 'Configure OCPU' section includes a table with one row:

Name	OCPUs	Memory	Network bandwidth	Theoretical max IOPS
VM Standard (E.4.Flex)	4	64 GB	4 Gbps	54K

Below the table, it says 'You can customize the number of OCPUs. Other resources scale proportionately.' and 'Number of OCPUs per node' with a slider set to 4.

Scale storage up

The screenshot shows the Oracle Cloud interface for choosing storage management software. A red arrow points from the text 'Scale up storage' to the 'Choose storage management software' section. Two options are listed: 'Oracle Grid Infrastructure' (selected) and 'Logical Volume Manager' (recommended).

Configure storage performance

The screenshot shows the Oracle Cloud interface for configuring storage performance. A red arrow points from the text 'Scale up storage' to the 'Configure storage performance' section. It contains two options: 'Balanced' (selected) and 'Higher performance'. Below these are fields for 'Available data storage (GB)' (set to 256) and 'Recovery area storage (GB)' (set to 256).

Cloud Automation for Life Cycle Management



Oracle Cloud Web-based UI, REST APIs, SDK, and CLI

- Enable Data Guard
- Backup and recovery

Enable Data Guard

- 1 DB system information
- 2 Database Information

A new virtual machine DB system must be created for the standby database when the primary database belongs to a virtual machine DB system.

Create peer DB system

Display name ⓘ

Region

US West (Phoenix)

Availability domain

Select an availability domain

Primary database is in availability domain ad13/pho-ad-1

Configure automatic backups

Enable automatic backups ⓘ

Important: All [prerequisites](#) for backing up to Oracle Cloud Infrastructure must be met for automatic backups to work.

Backup destination ⓘ

Object Storage

Autonomous Recovery Service has the lowest operational cost and highest performance.

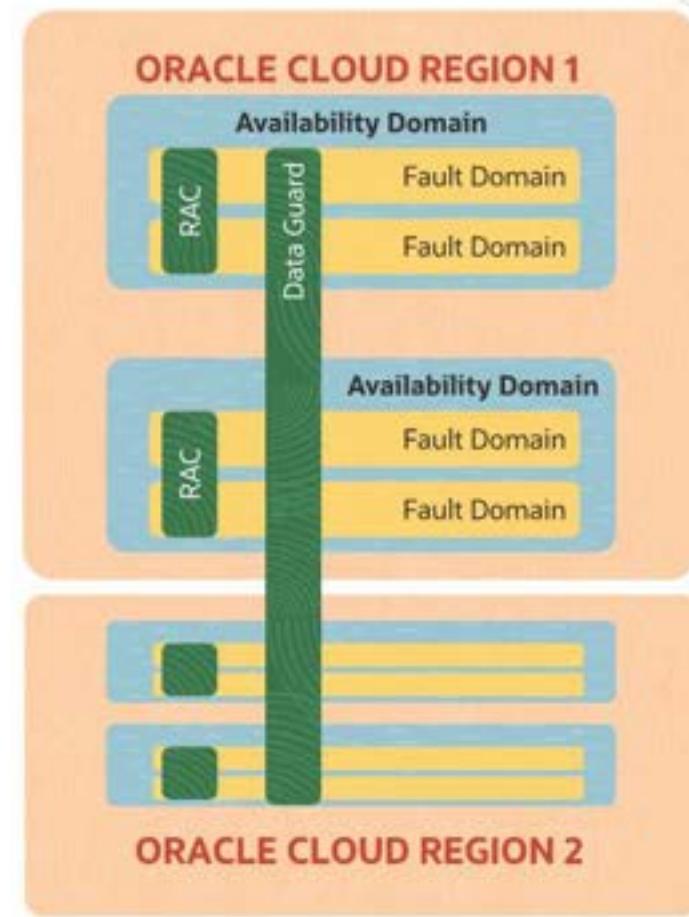
Backup retention period

30 days

You can change the backup retention period after provisioning.

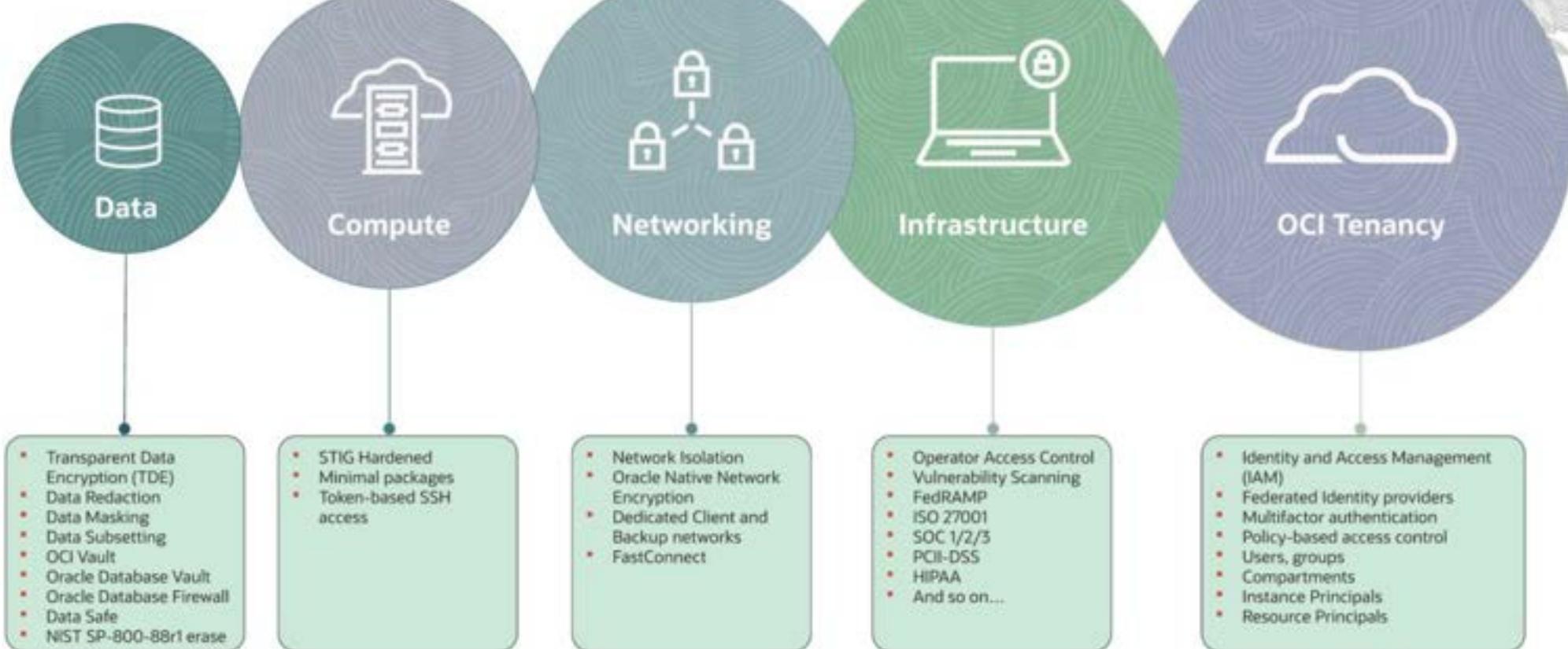
High Availability and Disaster Recovery

- Real Application Clusters (RAC) across Fault Domains provides database instance fault isolation.
- Data Guard deployed across availability domains within a region provides high availability.
- Data Guard deployed across regions provides geographic isolation for disaster recovery.



Integrated Security from Data to Identity

Defense in Depth



Oracle Multicloud Autonomous Databases

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 down time



Eliminates scaling complexity



Eliminates performance tuning complexity

Autonomous Database

Types

Fully managed database with two workload types



Autonomous
Transaction Processing



Autonomous
Data Warehouse



Autonomous
JSON Database

Fully managed database with two
development environments



Autonomous Database
with APEX

Autonomous Database

Deployment options

Serverless

It allows provision and management of only the Autonomous DB.

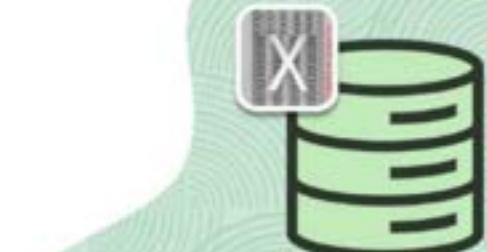
Oracle handles Exadata infrastructure deployment and management.



Autonomous – Serverless

Dedicated

It allows exclusive use of the Exadata hardware.



Autonomous – Dedicated

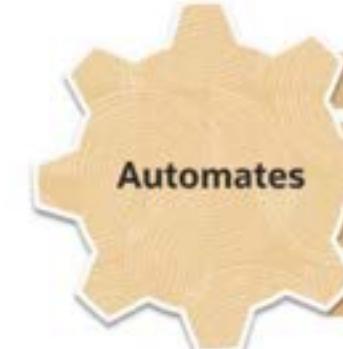
Fully managed database with two workload types



Autonomous Transaction Processing



Autonomous Data Warehouse



Backup

Patching

Upgrading

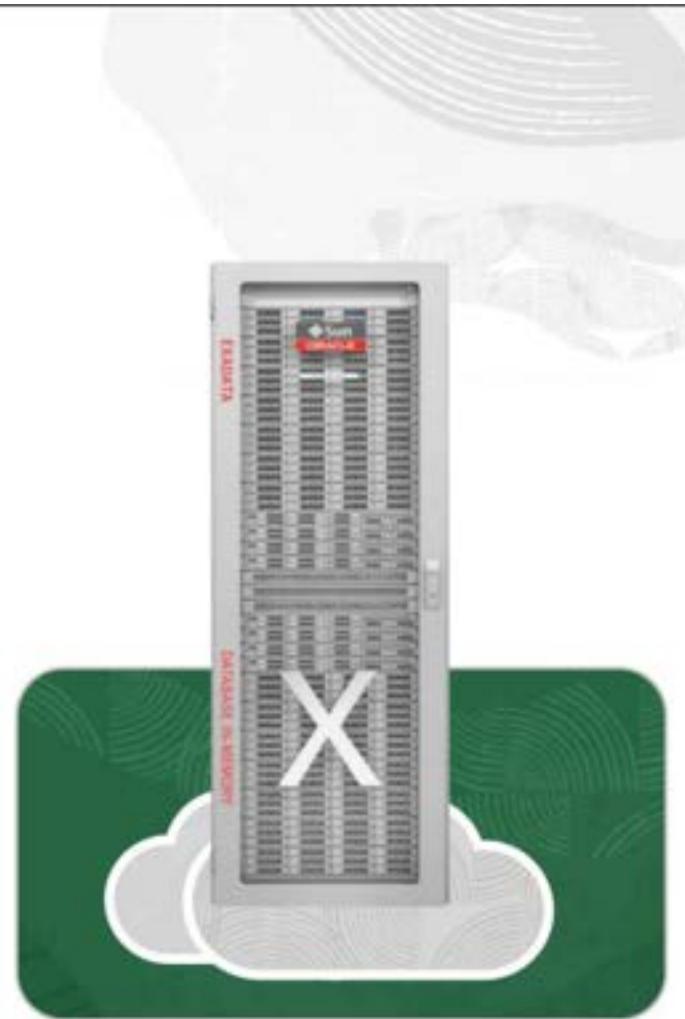
Tuning

Oracle Multicloud

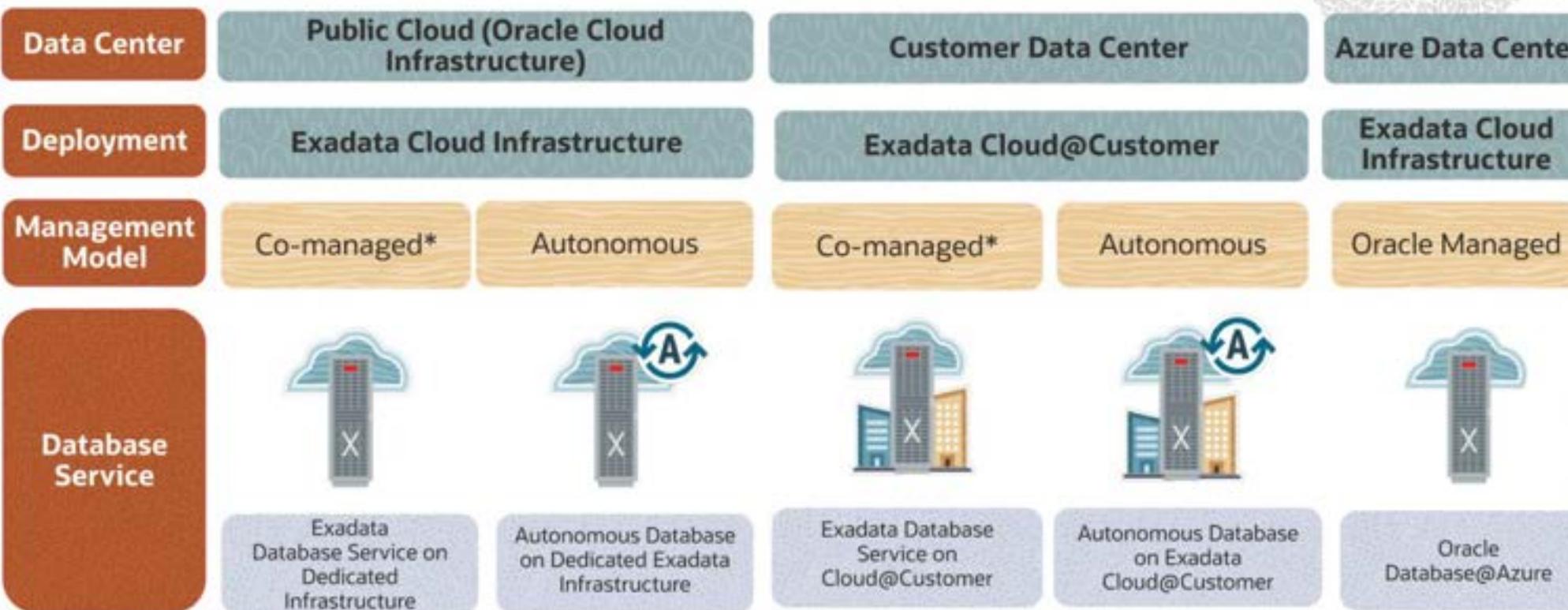
Exadata Database Service

What Is Exadata Database Service?

- **Oracle Database offering with all features and options:**
 - Industry-leading Oracle database for mission-critical OLTP and Analytics workloads
- **On Exadata Database Machine:**
 - The fastest and most available Oracle Database platform
 - Ideally suited for cloud computing
- **In the Oracle Cloud:**
 - Monthly subscription, no capital expenditure
 - Oracle deploys and manages the infrastructure
 - Simple, fast, web-driven service provisioning
 - Complete service isolation with no over-provisioning
 - 100% compatibility with on-premises applications and Oracle database

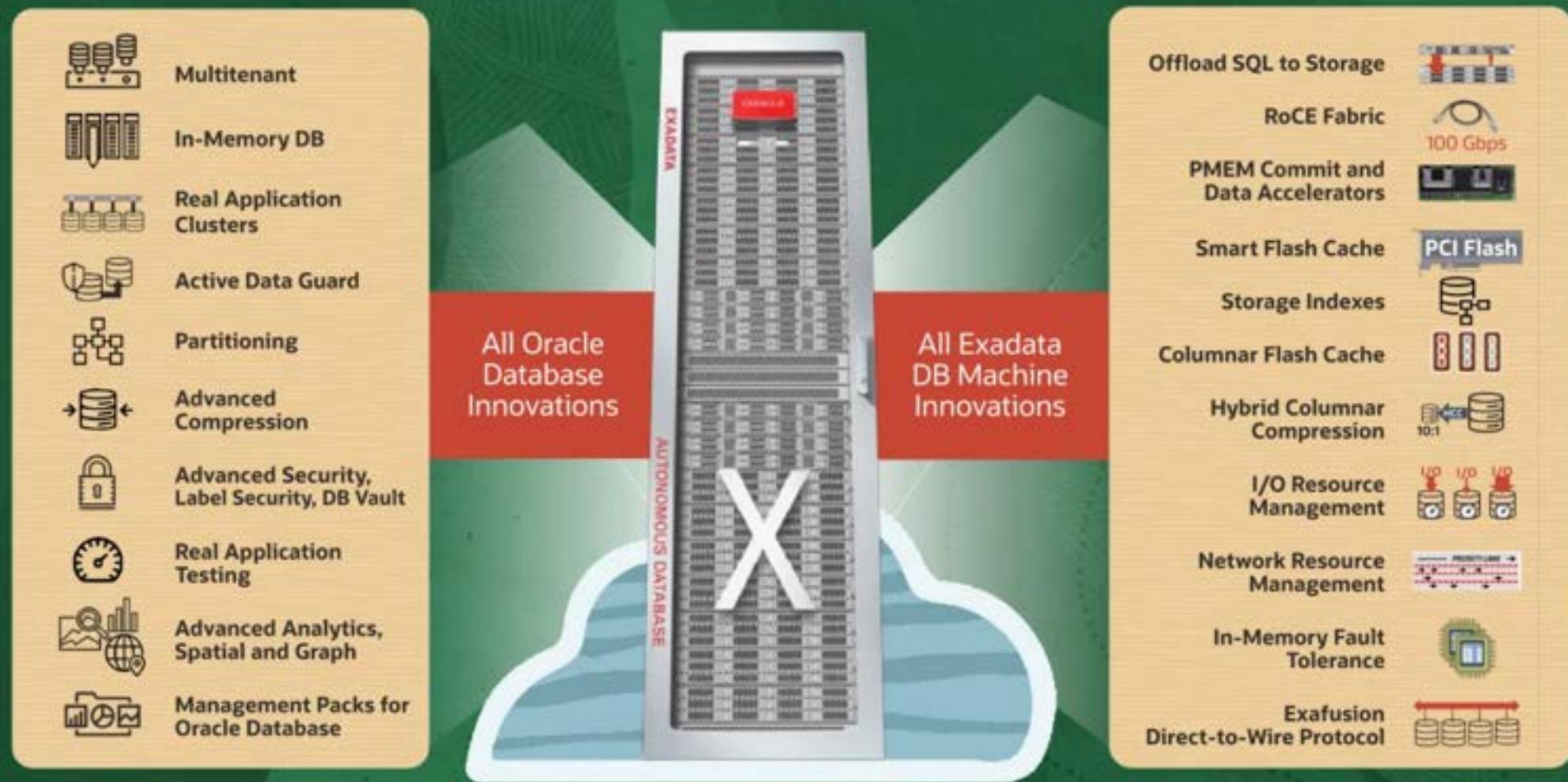


Database Services on Exadata in Oracle Cloud



❖ Co-managed*: Oracle-managed infrastructure, customer-managed virtual machines and databases

Exadata in Oracle Cloud: Most Complete Database Service Available



OCPU Scaling Options for Exadata Database Service

Exadata OCPUs can be scaled within existing servers as follows:

- **OCPUs can be scaled up or down online** symmetrically in multiples of the number of database servers currently provisioned for the Exadata VM cluster.
 - You can scale the Exadata Database Service instance down to zero enabled OCPUs.
 - **With zero-enabled OCPUs**, you are billed only for the infrastructure until you scale up the system.

Exadata OCPUs can also be scaled beyond existing servers as follows:

- **For X8M/X9M Flexible Infrastructure systems** can simply add Compute servers as required.
- **For X6,X7, X8 Fixed-shape systems** will need to change to a larger shape.

Cost-Effective Software Licensing Models

Subscribe to infrastructure and choose Licensing Model



License Included Pricing

Ideal for organizations with new workloads and dynamic utilization

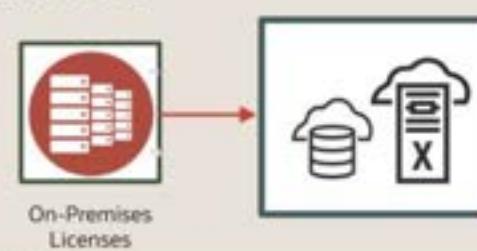
- Includes Oracle Database Enterprise Edition, Options and Management Packs at one low price
- Pay-per-use pricing for software and active OCPUs, all paid for with Universal Credits



Bring Your Own License Pricing

Ideal for organizations moving existing workloads with consistent usage to the cloud

- Utilize existing on-premises licenses and Save on existing software support
- Includes Transparent Data Encryption, Data Safe, Oracle Machine Learning, and select management packs at no additional cost



Oracle Cloud Infrastructure

MySQL Database Service

—
Oracle University

MySQL

World's best opensource database



Most popular
opensource
database of
choice

Very efficient for OLTP across many
industry (e-commerce, social media,
tech, finance, manufacturing)

Social media



ECommerce



FinTech



Manufacturing



High-performance,
highly reliable



Available with free
and enterprise
grade edition



MySQL Database Service



Transition from self-managed to fully managed



- Fully managed MySQL database in Oracle Cloud Infrastructure
- OCI native
- Beats on-premises deployment complexity
- Enterprise rich features – backup and recovery, patching, security, high-availability
- Full automation benefits
- Easy adoption for enterprises using application in on-premises MySQL DB



MySQL Database Service

A glance into the fully managed features

- Provisioning
 - choose your required compute shape,
 - MySQL Server Enterprise Edition 8.0
 - select your VCN
 - choose storage size for high performance block storage
 - choose Standalone/High Availability/HeatWave configuration
- Edit DB system shape, configuration, monitor and increase storage from console





MySQL Database Service

A glance into the fully managed features

- Connect to DB System endpoints using Compute, VPN, Bastion, Cloud Shell and OCI SQL worksheet
- Create, edit and monitor Read Replicas with Load Balancer
- Create full and incremental backup with point-in-time restore capability
- Migrate from on-premises to OCI MySQL DB Service using MySQL Shell `dumpX` and `loadDump` utilities
- Inbound and outbound Replication

Note: Only MySQL HeatWave and Standalone configuration is supported with ODSA provisioning of MySQL database service





Oracle Cloud Infrastructure

MySQL Database Service – High Availability Configuration

—
Oracle University



MySQL Database Service

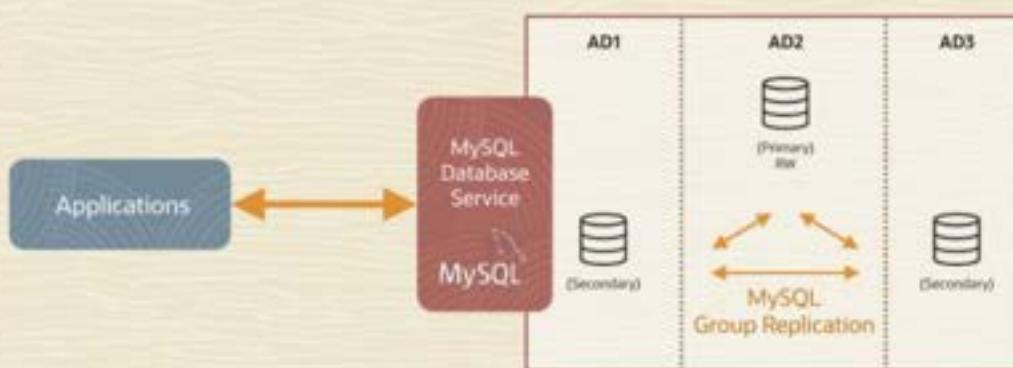
Increase application uptime with **High Availability** configuration



Zero Data Loss

Automatic Failover

Multi-AD region



- One primary (RW mode) and two secondary
- Deployed across multiple availability domains or Fault domains
- Uses Native MySQL Group Replication
- Replicated over secured and managed internal network
- Prerequisite: Define Primary Keys on tables

Note:

Not available for provisioning with ODSA currently

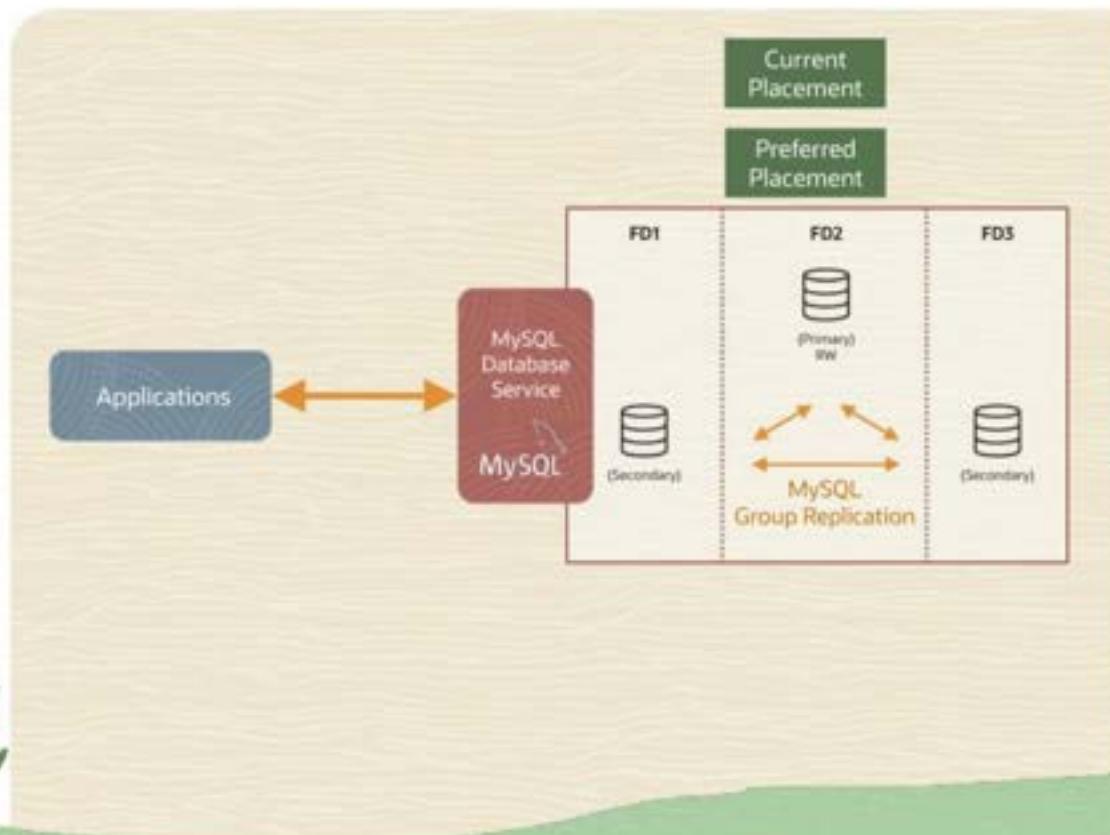
Supported Version of MySQL : 8.0.24



MySQL Database Service



High Availability Automatic Failover (Single AD region/Subnet within Single AD)



MySQL instances are placed in different fault domains if it is:

- Single AD Region
- Multiple AD regions but with AD specific subnet

Note:

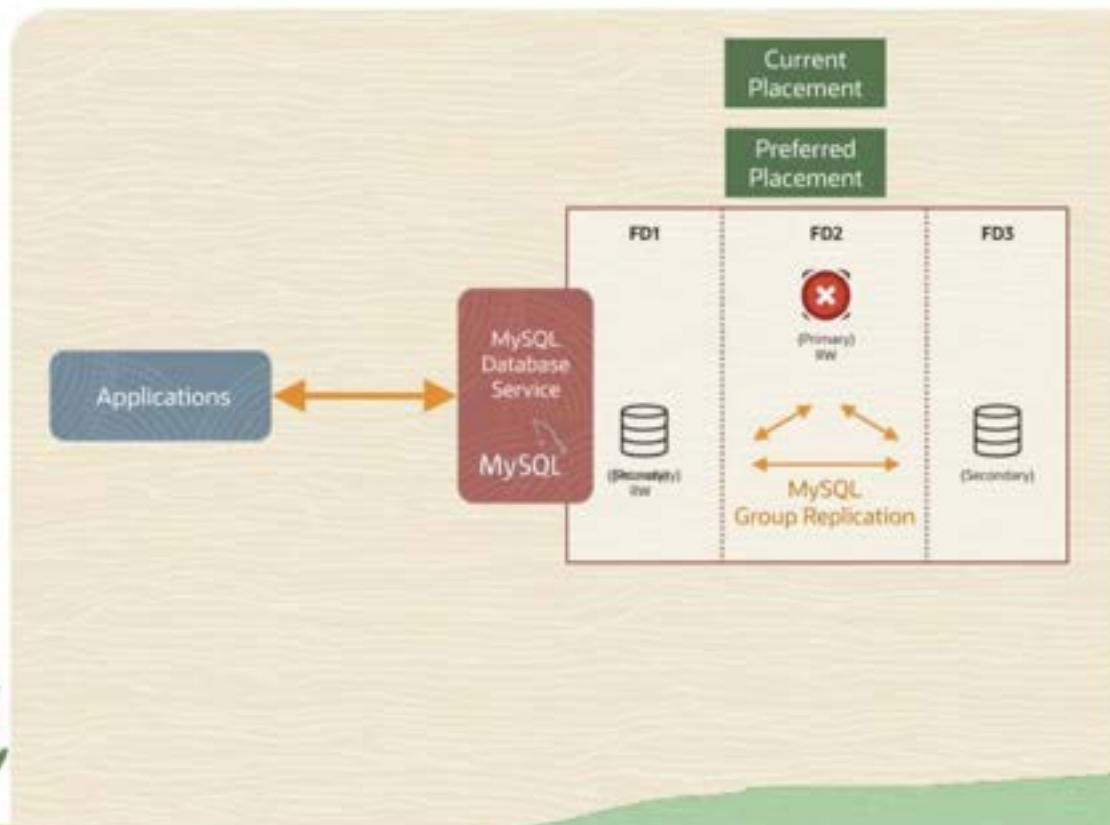
Same principle of automatic failover applies even in a multi AD region



MySQL Database Service



High Availability Automatic Failover (Single AD region/Subnet within Single AD)



- Automatic Failover
 - RPO = 0
 - RTO in minutes
- No change to DB endpoint during automatic failover or switchover

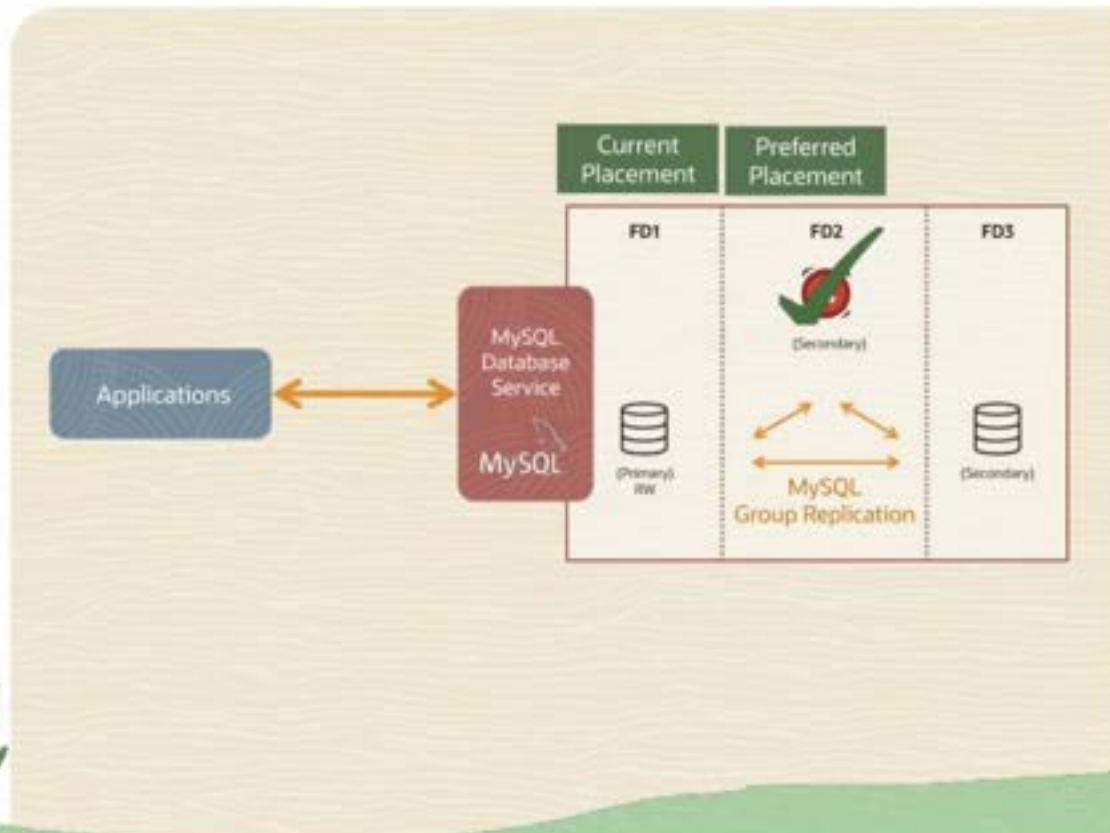
Message on DB Systems Details page:
Current placement (<DomainName>) differs from
preferred placement, due to failover or
maintenance activity.



MySQL Database Service



High Availability Automatic Failover (Single AD region/Subnet within Single AD)



- Manual Switchover from Current to Preferred Placement
- Switchover to Preferred Placement can happen when DB system restarts during maintenance
- No change to DB endpoint during automatic failover or switchover

Oracle Cloud Infrastructure

MySQL Database Service – HeatWave Overview

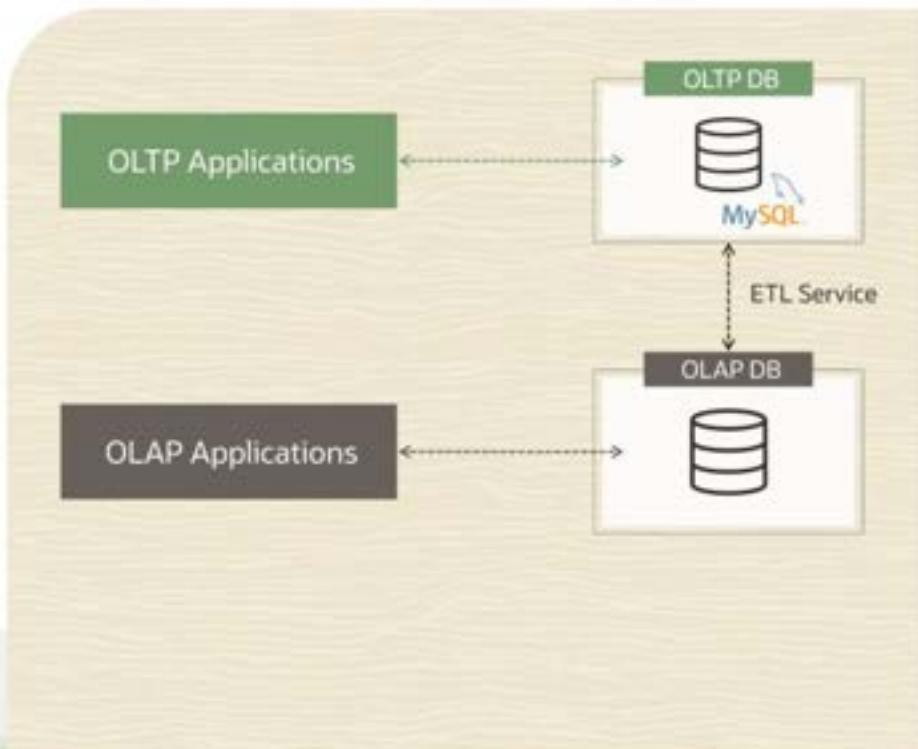
—
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MySQL Database Service



Operating OLTP and OLAP workloads in MySQL Database Service



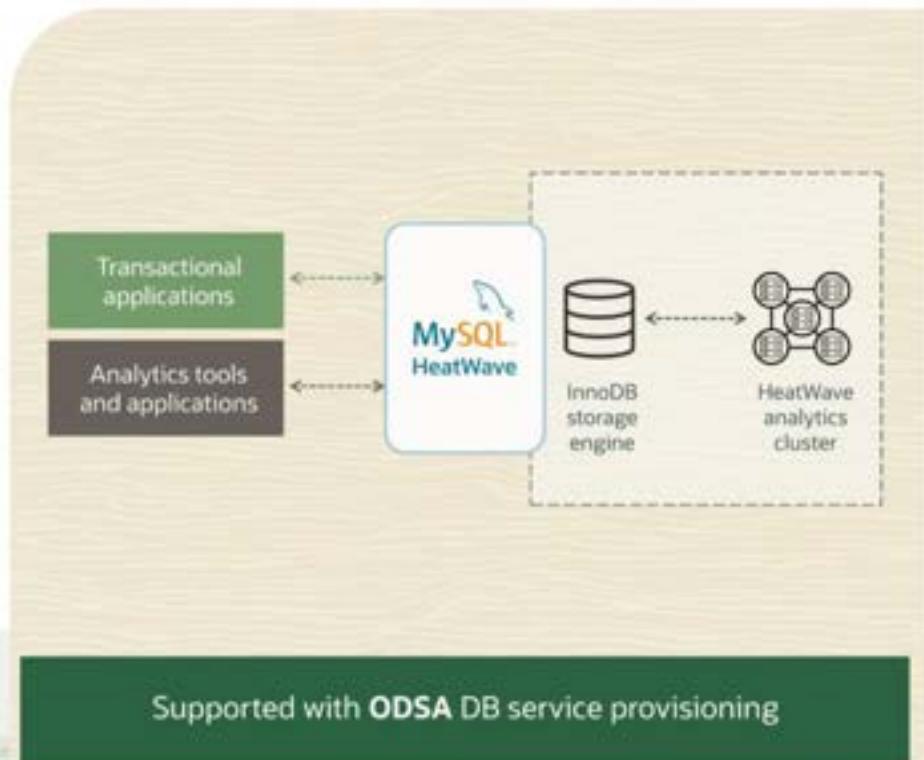
- Manage two separate databases
- Add ETL step for loading into OLAP database
- Lacks real time analytics
- Maintain dual compliance with security standards
- Billed for two databases and ETL software license



MySQL Database Service



MySQL HeatWave configuration– bring your OLTP and OLAP together

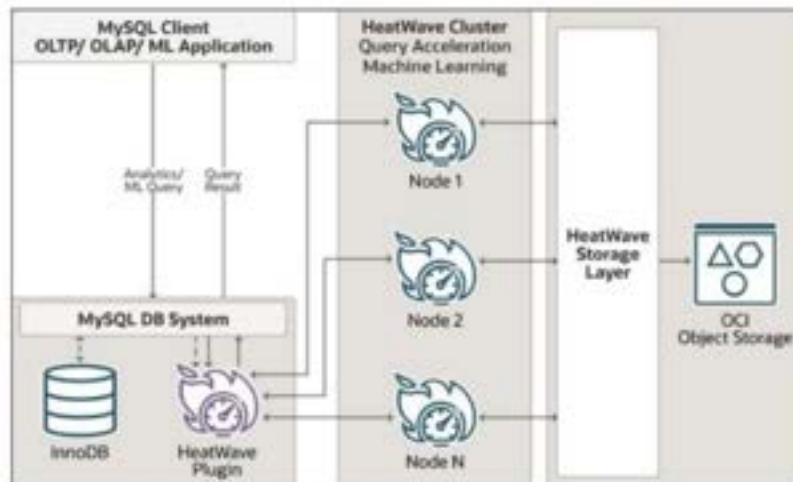


- Single database service for OLTP and OLAP
- No need of ETL processing
- Enables real time analytics
- No application changes needed
- Massively parallel query processing architecture
- Improves security with built-in security features
- Comparatively higher price-performance
- Integrated with OCI native and 3rd party tools



MySQL Database Service

HeatWave configuration



- Comprises of the MySQL DB System and HeatWave cluster nodes
- Distributed, scalable, shared-nothing architecture
- In-memory hybrid columnar query processing engine (RAPID)
- Scale-out Heatwave storage layer persists node data onto OCI Object Storage
- Data transmission between analytics nodes and OCI object storage is encrypted by default
- Faster automated recovery during cluster or node failure/maintenance



Oracle Cloud Infrastructure

MySQL Database Service – HeatWave Features

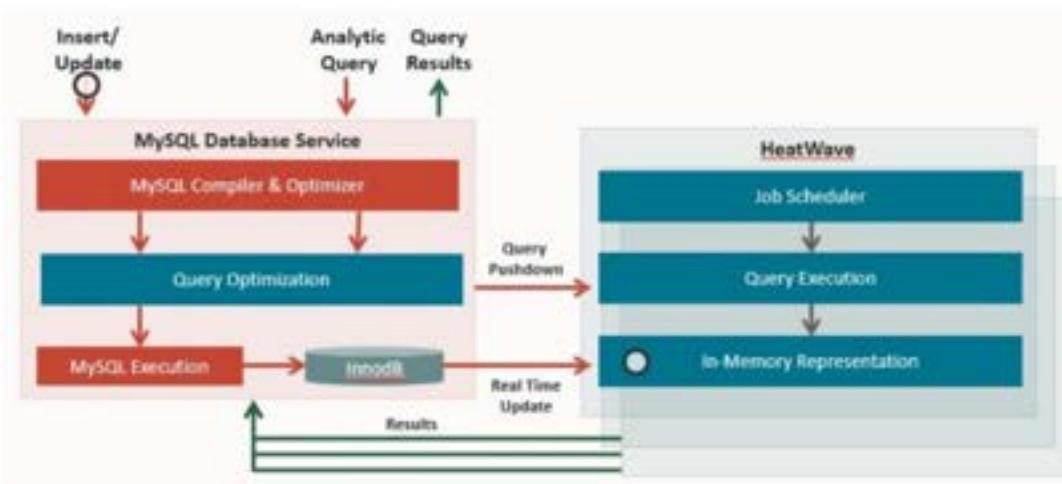
—
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MySQL Database Service



HeatWave configuration: single interface for OLAP, OLTP or Mixed workloads



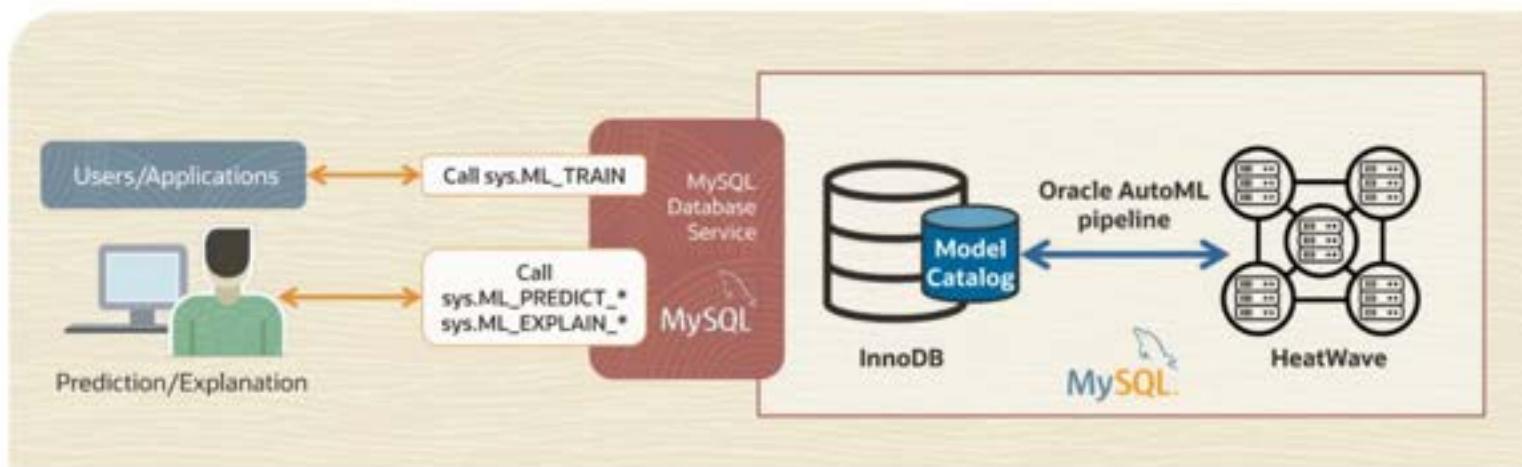
- No change to MySQL syntax
- Transparent Query Push down
- Automatic change propagation to Heatwave nodes



MySQL Database Service

In-database HeatWave AutoML with MySQL HeatWave configuration

- Natively available ML feature in MySQL HeatWave
- Ease of use – no ML/tool/algorithm expertise is needed
- Pre-created ML routines can be invoked as SQL call
- ML_TRAIN routine leverages Oracle AutoML technology





MySQL Database Service

MySQL Autopilot with MySQL **HeatWave** configuration



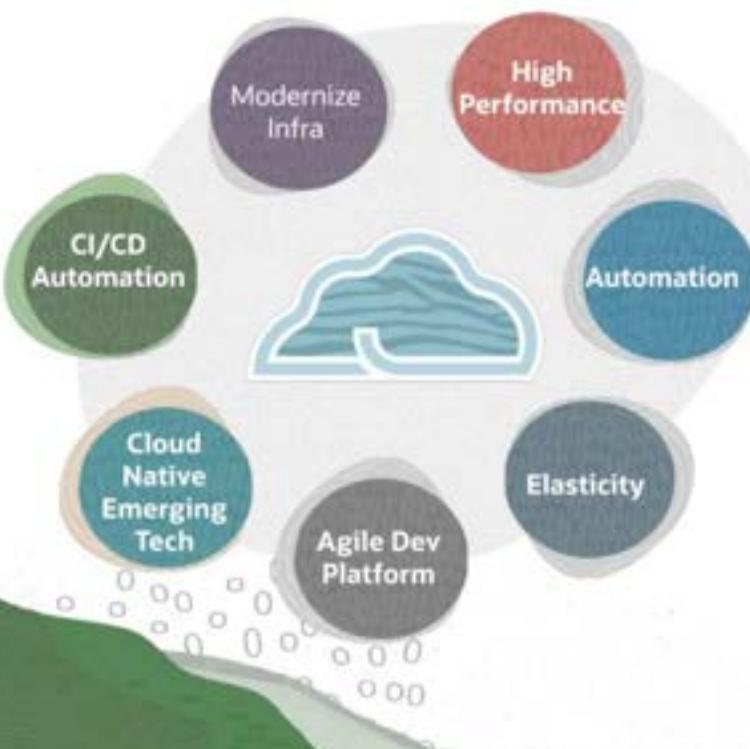
Oracle Cloud Infrastructure

Introduction to Oracle Database@Azure

Oracle University

Multicloud

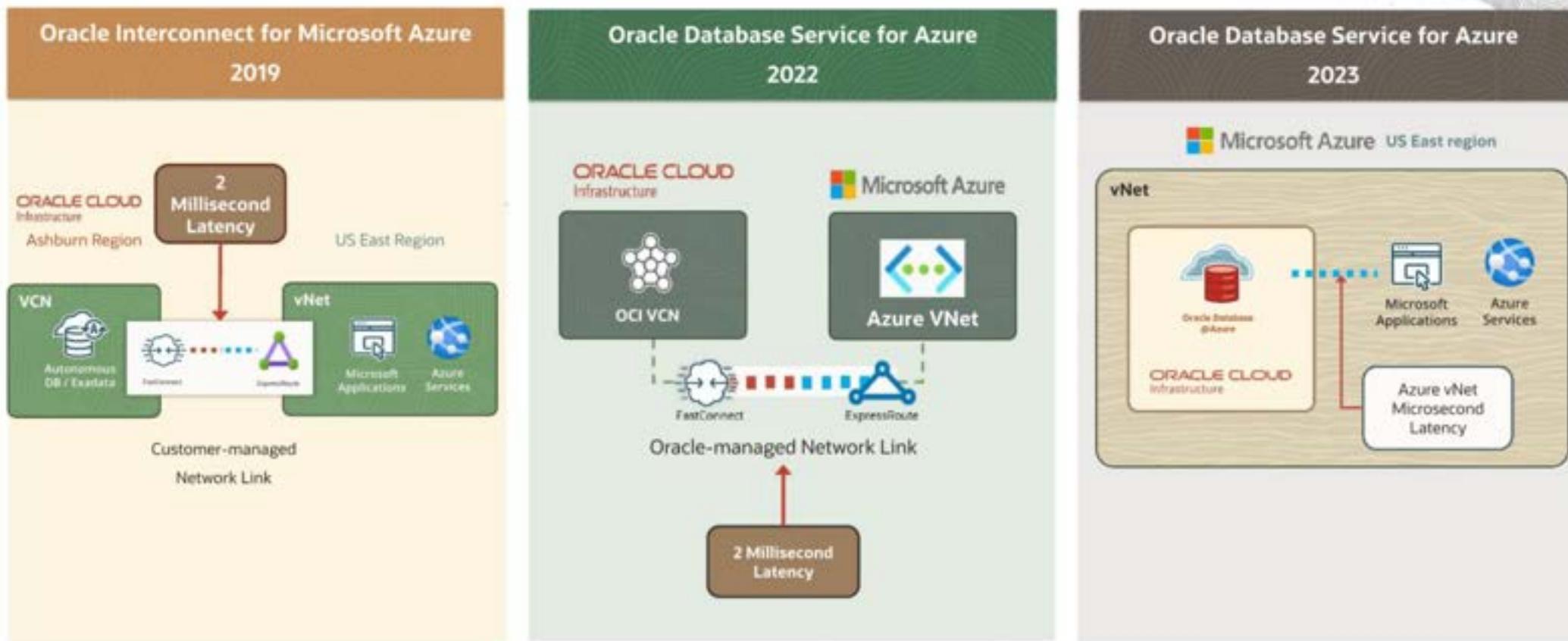
Single Cloud Deployment



Multicloud Deployment

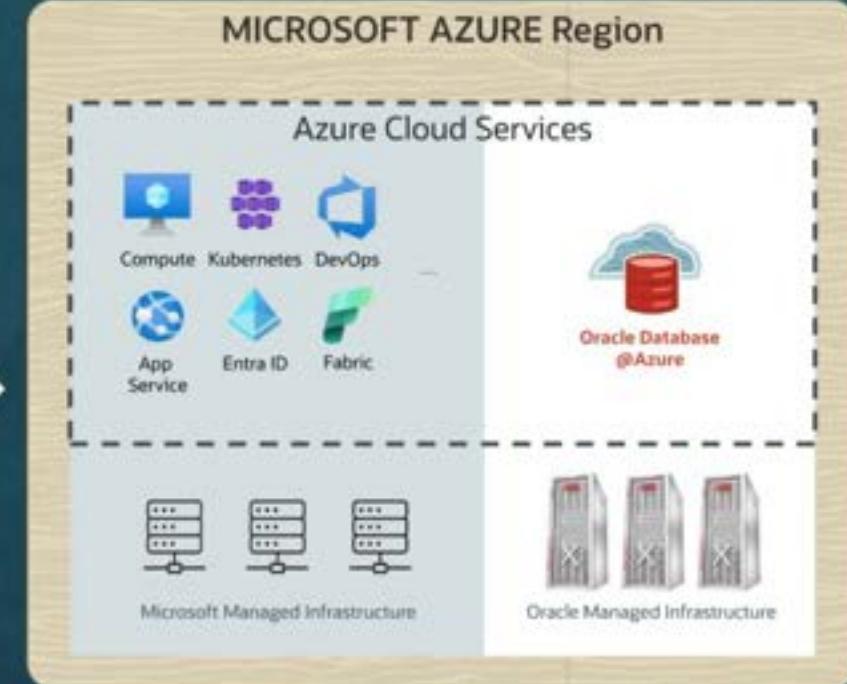


OCI- Azure Interoperability



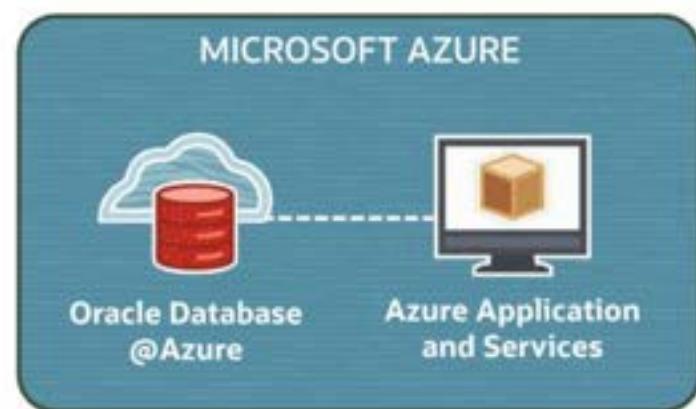
Oracle Database@Azure

*Oracle and Microsoft deliver
Oracle database services on OCI
in Microsoft Azure datacenters*



Oracle Database@Azure Service Overview

- Colocated with Microsoft Azure Data Center
- Native Integration between Azure and OCI resources
- No manual configuration of private interconnect between the providers
- Get Microseconds Latency
- OCI native Exadata Database Service
- Gain the highest level of oracle database performance, scalability, security and availability
- Collaborative technical support from Microsoft and Oracle

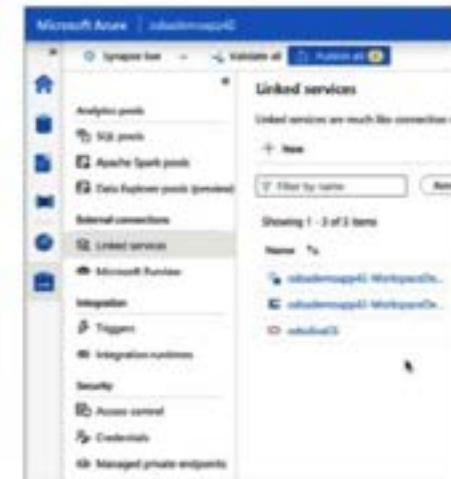
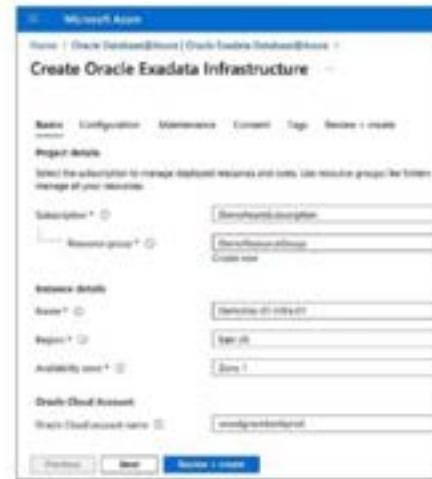
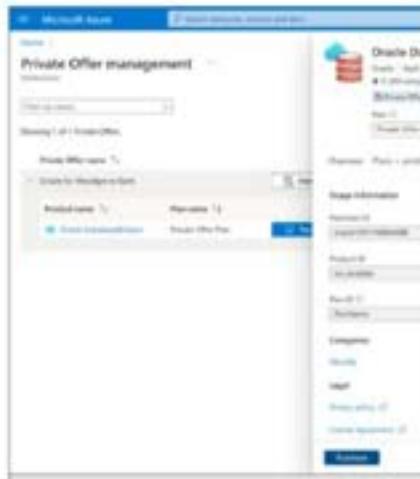


Oracle Database@Azure Easy Adoption

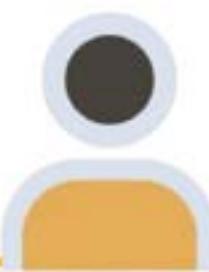
Purchase in Azure Marketplace
and parity with OCI

Deploy, manage, and monitor
through Azure Portal and APIs

Combine with your
choice of Azure services



Oracle Database@Azure Operational Responsibilities



Oracle

- ⇒ Manage Exadata Database Service Infrastructure running in Azure
- ⇒ Service Software Updates
- ⇒ Service Infrastructure updates
- ⇒ Support Oracle Database@Azure Issues



Azure Customers

- ⇒ Provision Exadata Database Service Infrastructure
- ⇒ Manage the Provisioned Databases in the service
- ⇒ Operate and Monitor Infrastructure and Database

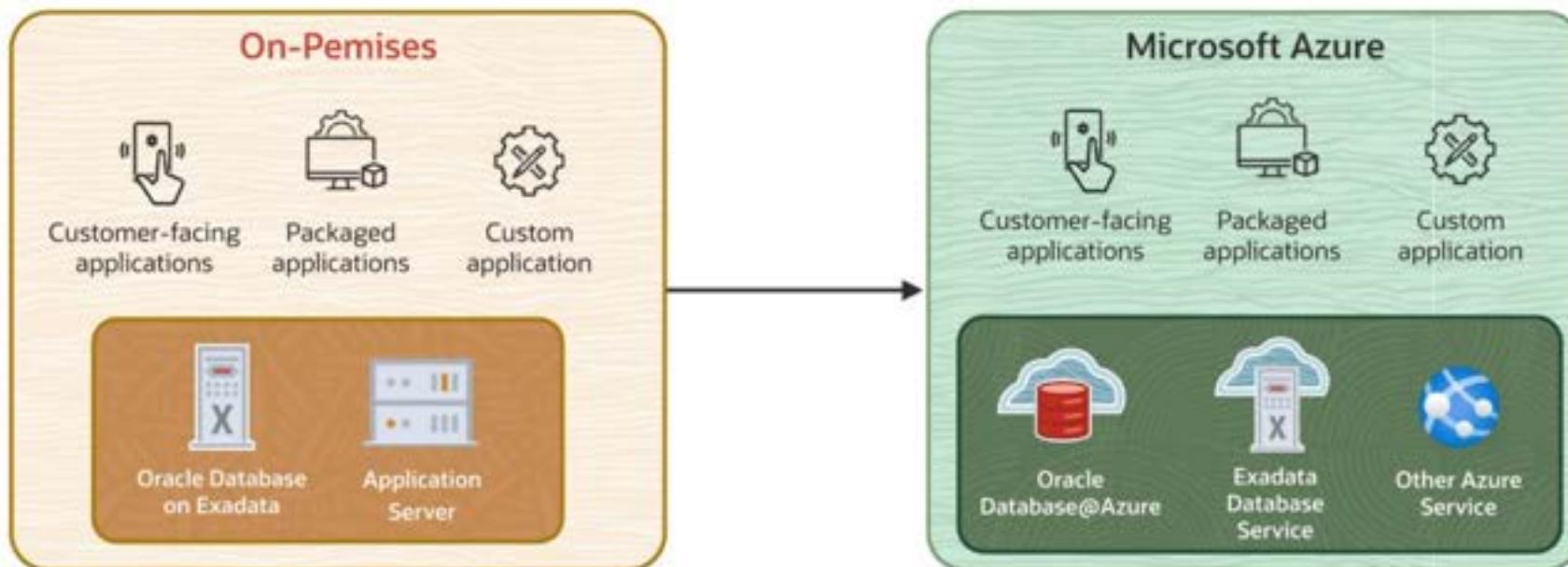


Oracle Cloud Infrastructure

Oracle Database@Azure – Use Case Scenarios

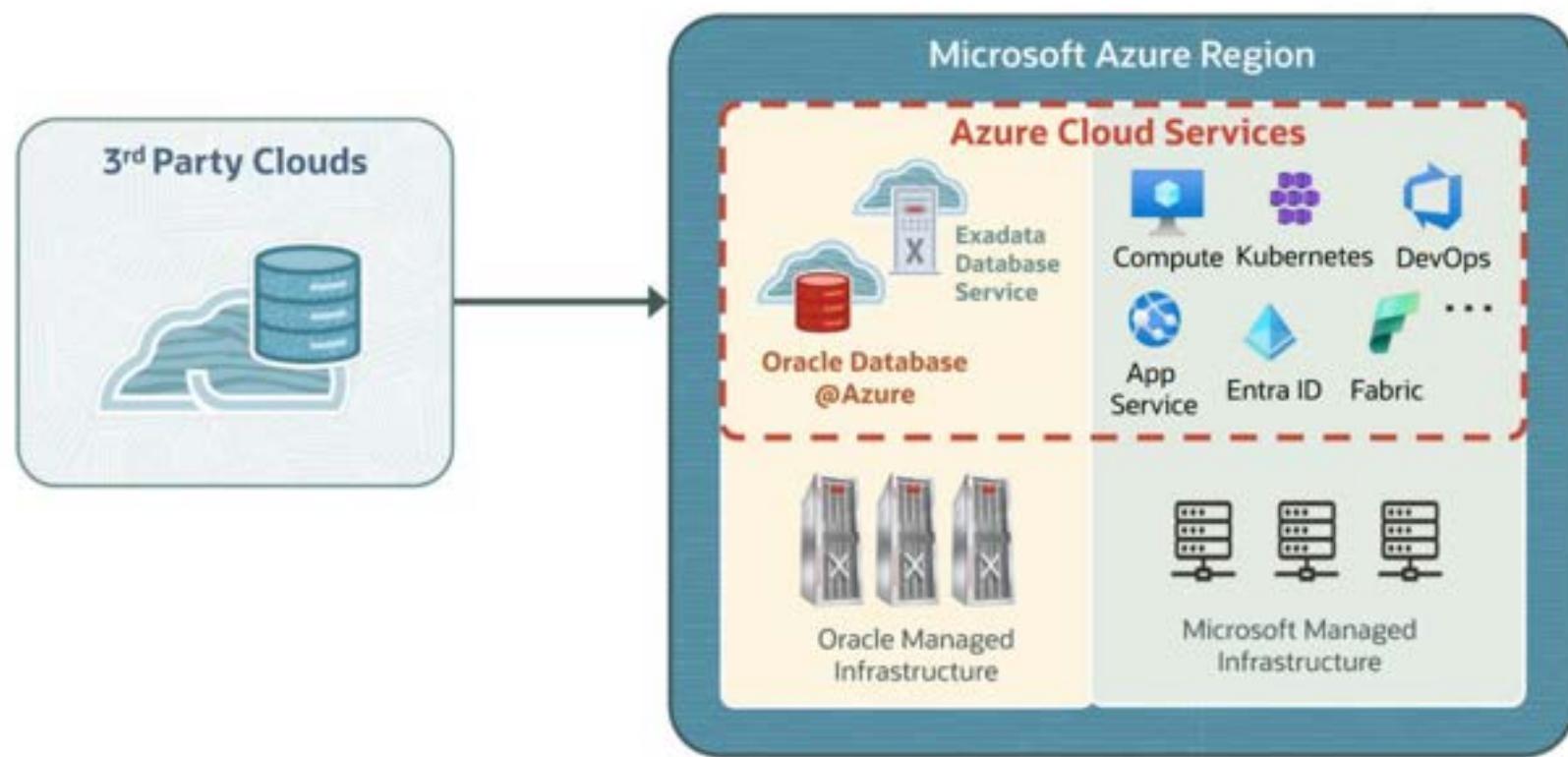
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Migrate Workloads from On-Premises



1. Deploy Exadata Database Service in your Vnet
2. Provision and migrate databases to Exadata Database Service
3. Migrate business applications and connect to databases on Exadata Database Service

Migrate Database Workloads from Non-Oracle Cloud



Oracle Cloud Infrastructure

Oracle Database@Azure - Architecture

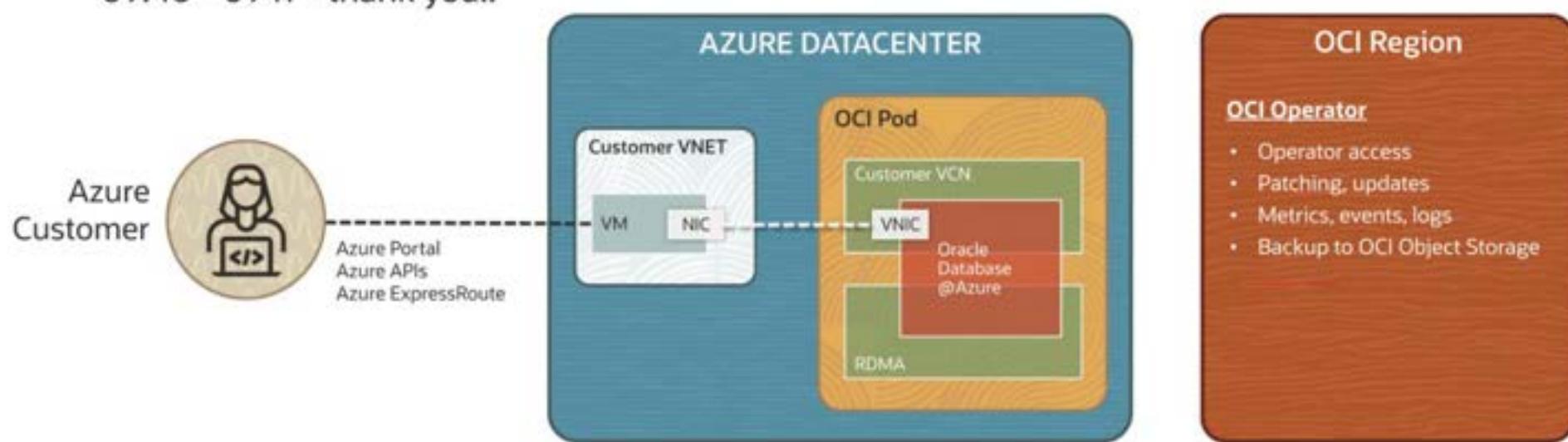
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Physical Data Center Level Architecture

Video Content to be replaced from below Link:

<https://blogs.oracle.com/cloud-infrastructure/post/first-principles-powering-applications-with-oracle-database-at-azure>

Time: 04:08 - 08:34 -- architecture
09:40 - 0941 – thank you..



Oracle Cloud Infrastructure

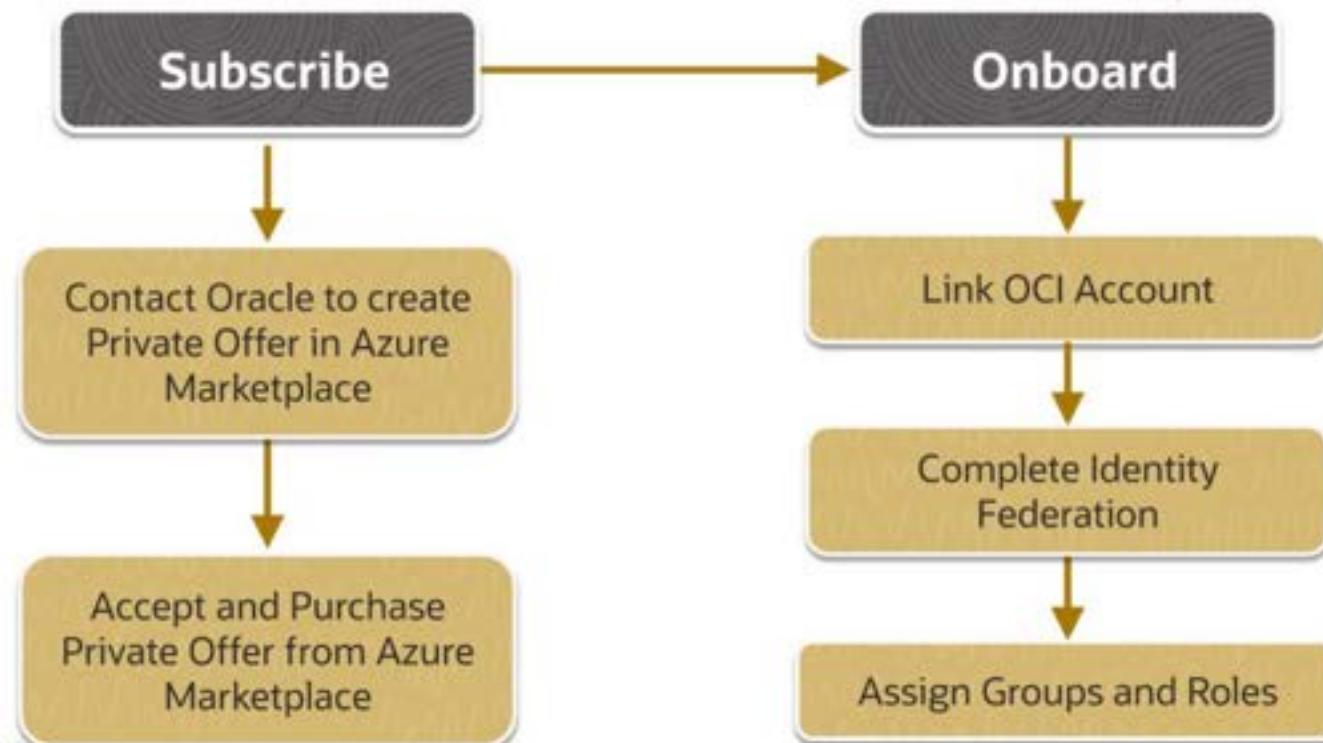
Oracle Database@Azure - Onboarding

Oracle University

Subscribe and Onboard Oracle Database@Azure



Requires Active Azure Subscription



Subscribe To Oracle Database@Azure

Subscribe

Contact Oracle to create
Private Offer in Azure
Marketplace

Accept and Purchase
Private Offer from Azure
Marketplace

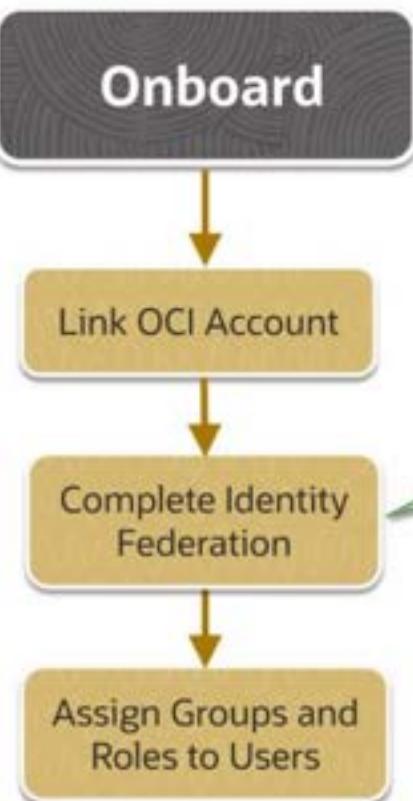
The screenshot shows the Microsoft Azure Private Offer management interface. On the left, there's a search bar and a sidebar with 'Home' and 'Marketplace'. The main area displays a single private offer: 'Oracle Database@Azure' (Plan: Oracle | SaaS, Rating: ★ 5 (100 ratings), Status: Private Offer, Azure benefit eligible). It shows a 'Subscription' dropdown set to 'WoodgroveSub'. Below this, there are tabs for 'Overview', 'Plans + pricing' (selected), 'Usage Information + Support', and 'Reviews'. A table lists plans: 'PlanName' (PlanName: Oracle Database@Azure, Plan: Private Offer, Description: Private plan, Price + Payment options: \$10/2000GB/1 year, Billing term: 3-year). A 'Purchase' button is at the bottom. A callout box on the right details the benefits:

- › Billing And Payment is via Azure
- › Use Microsoft Azure Consumption Commitment
- › Existing Oracle Customers can use BYOL/ULA
- › Get Oracle Support Rewards for every dollar spent on Oracle Database@Azure

Oracle Database@Azure Resource

The screenshot shows the Microsoft Azure portal interface. At the top, there's a search bar labeled "Search resources, services, and zones (0+)" and a user profile for "Wendy Howard". Below the header, the "Azure services" section includes icons for creating a resource, Oracle Database@Azure, Virtual machines, Shared dashboards, Azure Active Directory, All resources, App Services, Quickstart Center, Storage accounts, and More services. The main area is titled "Resources" with tabs for "Recent" and "Favorite". It displays a message: "No resources have been selected. Favorite resources to quickly navigate to them from the home page." A button labeled "Select resources to favorite" is present. Below this, the "Navigate" section offers links to Subscriptions, Resource groups, AI Resources, and DevTestLab. The "Tools" section includes Microsoft Learn, Azure Monitor, Microsoft Defender for Cloud, and Cost Management. The "Useful links" section provides links to Technical Documentation, Azure Services, Recent Azure Updates, and the Quickstart Center. The "Azure mobile app" section shows download links for the App Store and Google Play.

Onboard Oracle Database@Azure



- ✓ Provision And Manage Database
- ✓ Get Exadata Database Service infrastructure and software updates

The screenshot shows the "myService | Oracle Cloud Account" creation interface. The left sidebar includes "Search", "Overview", "Activity log", "Access control (IAM)", "Tags", and "Settings" (selected). Under "Settings", there are tabs for "Oracle Cloud Account" (selected) and "Support + Troubleshooting". The main area displays the following fields:

- No Oracle Cloud Account information is available.** (Learn more)
- Copy and share the link if you prefer someone else to set up the Oracle Cloud Account information.**
- Configuration link:** <https://ms.portal.azure.com/t23taje>
- Oracle Cloud Account information**
- Account type ***:
 Create a new OCI account
 Link an existing OCI account
- Email address**: [Text input field]
- First name ***: [Text input field]
- Last name ***: [Text input field]
- New password ***: [Text input field]
- Confirm password ***: [Text input field]

At the bottom are "Apply" and "Cancel" buttons, and a "Give feedback" link.



Oracle Cloud Infrastructure

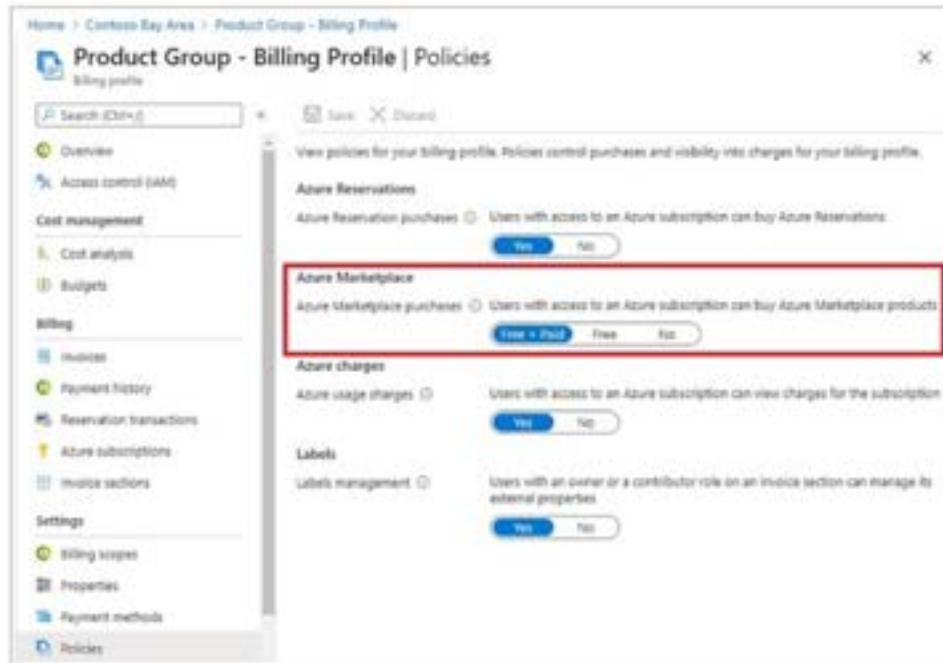
Oracle Database@Azure Identity

—
Oracle Database@Azure

Identity – Azure Roles

Azure permissions that allows to accept "Free + Paid" offers in Azure Marketplace

Agreement type	Permissions to accept offer	Permissions to purchase or subscribe
Microsoft Customer Agreement (MCA)	Billing account owner or contributor	Subscription owner or subscription contributor
Enterprise Agreement (EA)	Enterprise administrator	Subscription owner or subscription contributor



Groups and Roles in Azure

Group name	Azure role assigned	Description
odbaa-exa-infra-administrators	Light to medium	Manage all Oracle Exadata Database Service resources in Azure
odbaa-vm-cluster-administrators	Single or multiple (at a small scale)	Administer VM cluster resources in Azure
odbaa-db-family-administrators	Not applicable	This group is replicated in OCI during the optional identity federation process
odbaa-db-family-readers	Not applicable	This group is replicated in OCI during the optional identity federation process.
odbaa-exa-cdb-administrators	Not applicable	This group is replicated in OCI during the optional identity federation process.
odbaa-exa-pdb-administrators	Not applicable	This group is replicated in OCI during the optional identity federation process

Groups and Roles in OCI

Group name	Description
odbaa-db-family-administrators	Manage DB family actions
odbaa-db-family-readers	Read DB family actions
odbaa-exa-cdb-administrators	Manage Oracle Container Database (CDB) actions
odbaa-exa-pdb-administrators	Manage Oracle Pluggable Database (PDB) actions

Oracle Cloud Infrastructure

Oracle Database@Azure Networking

—
Oracle Database@Azure

Oracle Database@Azure network requirements

An Azure Virtual Network to create Oracle Exadata VM Clusters

Two Subnets – For database client and database backup

Enable subnet delegation for the subnets to Oracle database@Azure

IP addresses 100.106.0.0/16 and 100.107.0.0/16 are reserved
for the interconnect

Client Subnet IP address requirements

Each VM needs 4 IP addresses

VM Cluster with 2 virtual machines require 8 IP addresses

Each VM cluster requires 3 IP addresses for
Single Client Access Names (SCANs)

13 IP addresses are reserved for networking services



Backup Subnet IP address requirements

Each VM needs 3 IP addresses

VM Cluster with 2 virtual machines require 6 IP addresses

3 IP addresses are reserved for networking services

Usable IPs for Client & Backup subnets by CIDR size

Subnet CIDR	Reserved Networking IPs for Client Subnet	Usable IPs for Client Subnet (Virtual Machines and SCANs)	Reserved Networking IPs for Backup Subnet	Usable IPs for Backup Subnet (Virtual Machines and SCANs)
28	13	3 ($2^4 - 13$)	3	13 ($2^4 - 3$)
/27	13	19 ($2^5 - 13$)	3	29 ($2^5 - 3$)
/26	13	51 ($2^6 - 13$)	3	61 ($2^6 - 3$)
/25	13	115 ($2^7 - 13$)	3	125 ($2^7 - 3$)
/24	13	243 ($2^8 - 13$)	3	253 ($2^8 - 3$)
/23	13	499 ($2^9 - 13$)	3	509 ($2^9 - 3$)
/22	13	1011 ($2^{10} - 13$)	3	1021 ($2^{10} - 3$)

Subnet Delegation in Azure VNet



Enable Subnet Delegation for Client and Backup Subnets to Oracle Database@Azure

Oracle.Database/networkAttachments

Subnet Delegation Benefits



Simplified network management



Improves network security

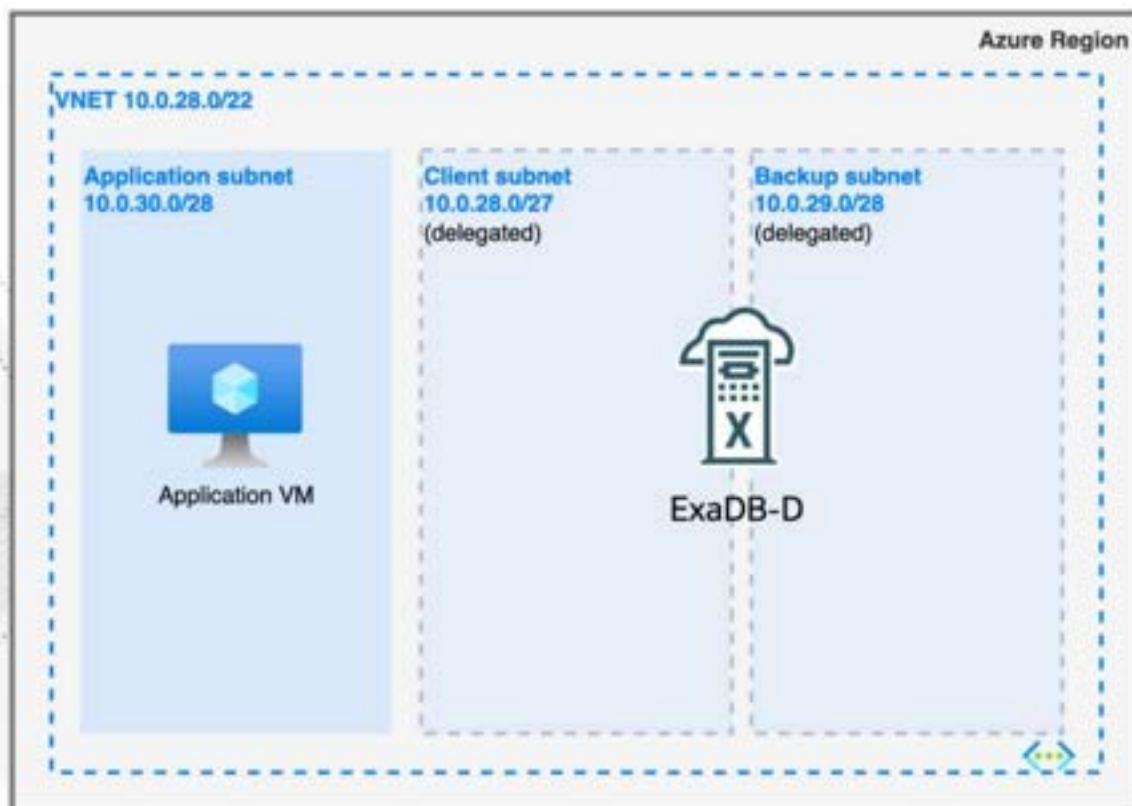


Increases flexibility



Enhances performance

Local VNet Topology

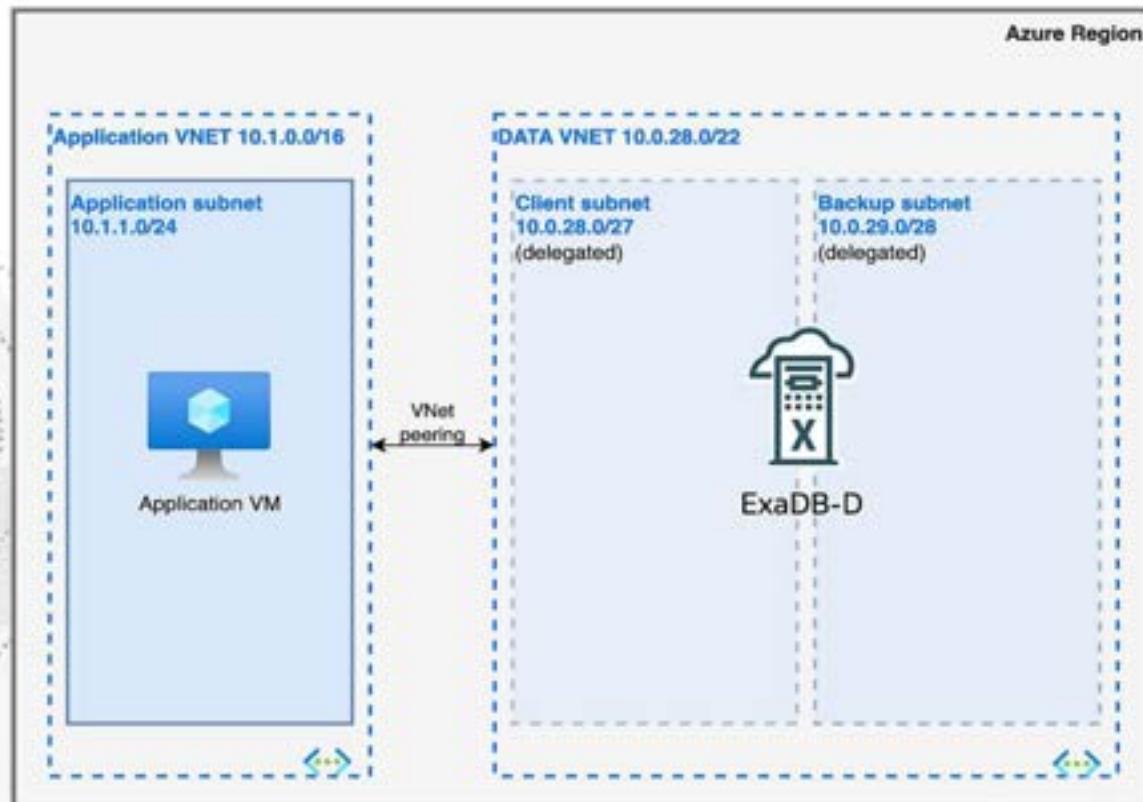


Apps connect to Database
in the same VNet

Lowest network latency

No ingress/egress costs

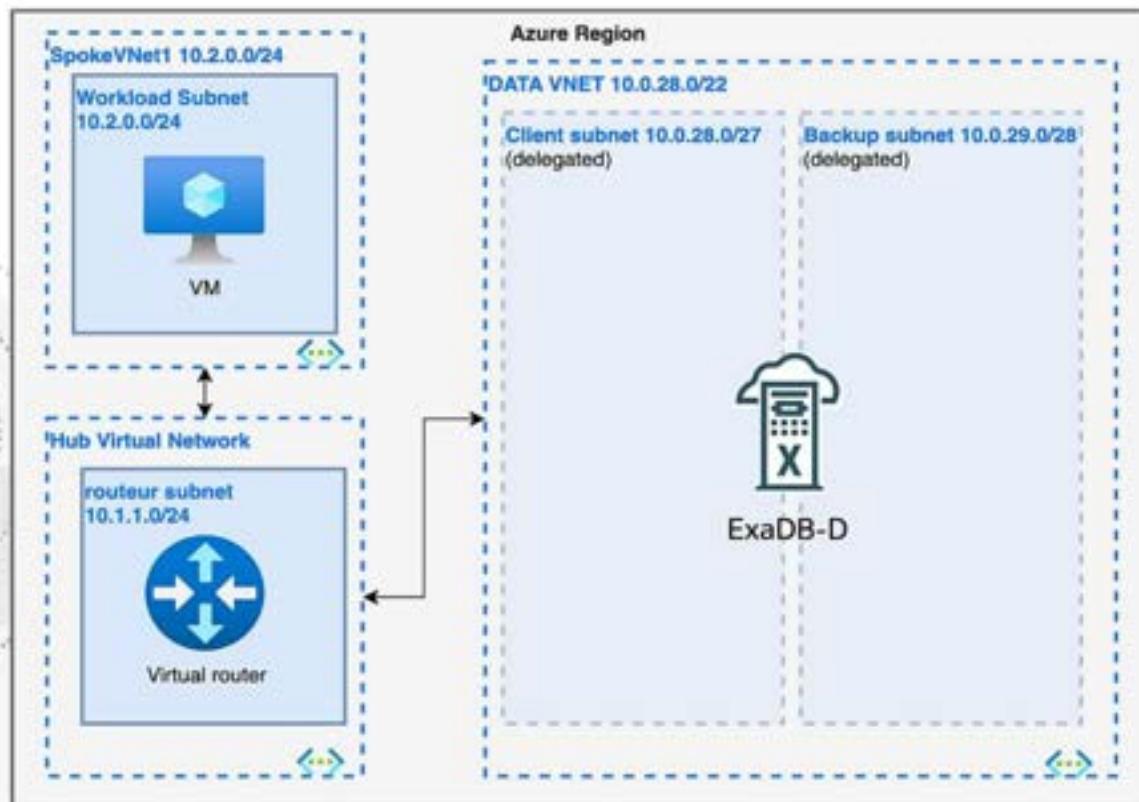
VNet Peering Topology



Use local VNet peering to connect apps in a VNet to database VNet in the same region

Incurs ingress/egress costs

Hub-spoke VNet Peering topology



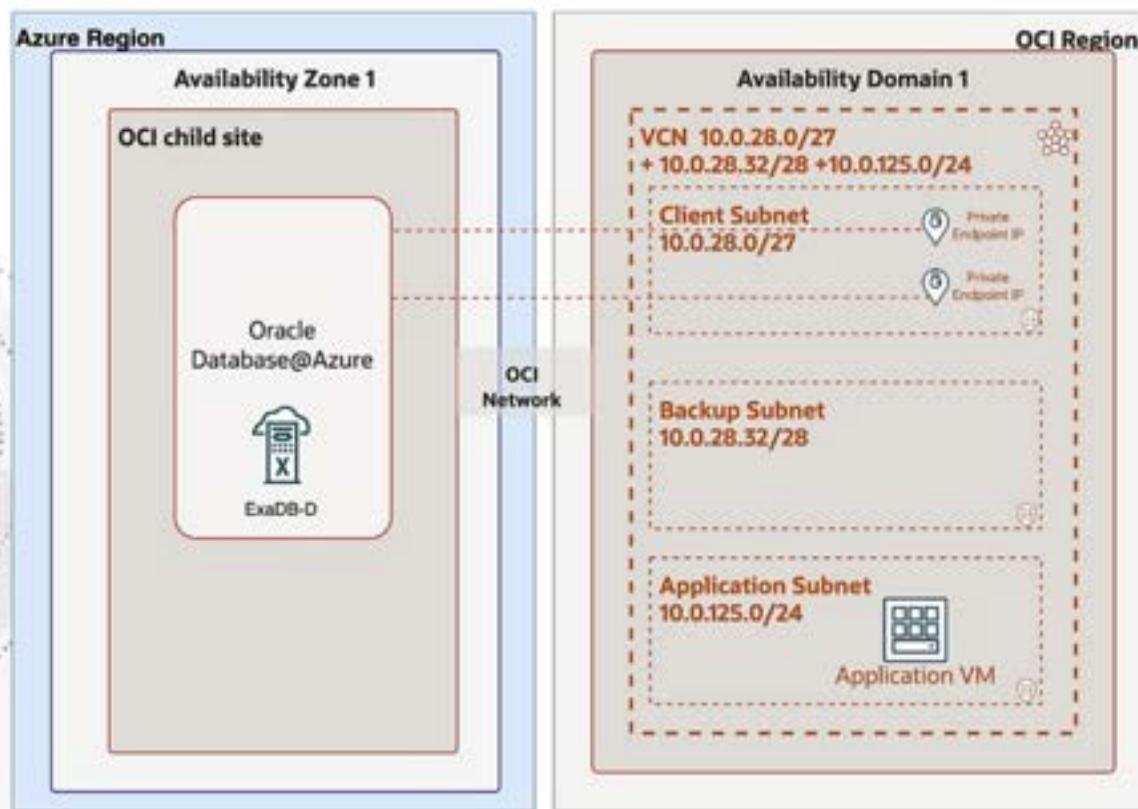
The hub VNet is a central point of connectivity between apps and database

The spoke VNets peer with the hub

Incurs ingress/egress costs

Not recommended for latency sensitive apps

Connect OCI application or service in same VCN



Create an additional subnet
in the OCI shadow VCN

Deploy the application or service
in the new subnet

Connect the application or service to
the private endpoint of the database

Oracle Cloud Infrastructure

Oracle Database@Azure - Provisioning

Oracle University

Operational Interfaces



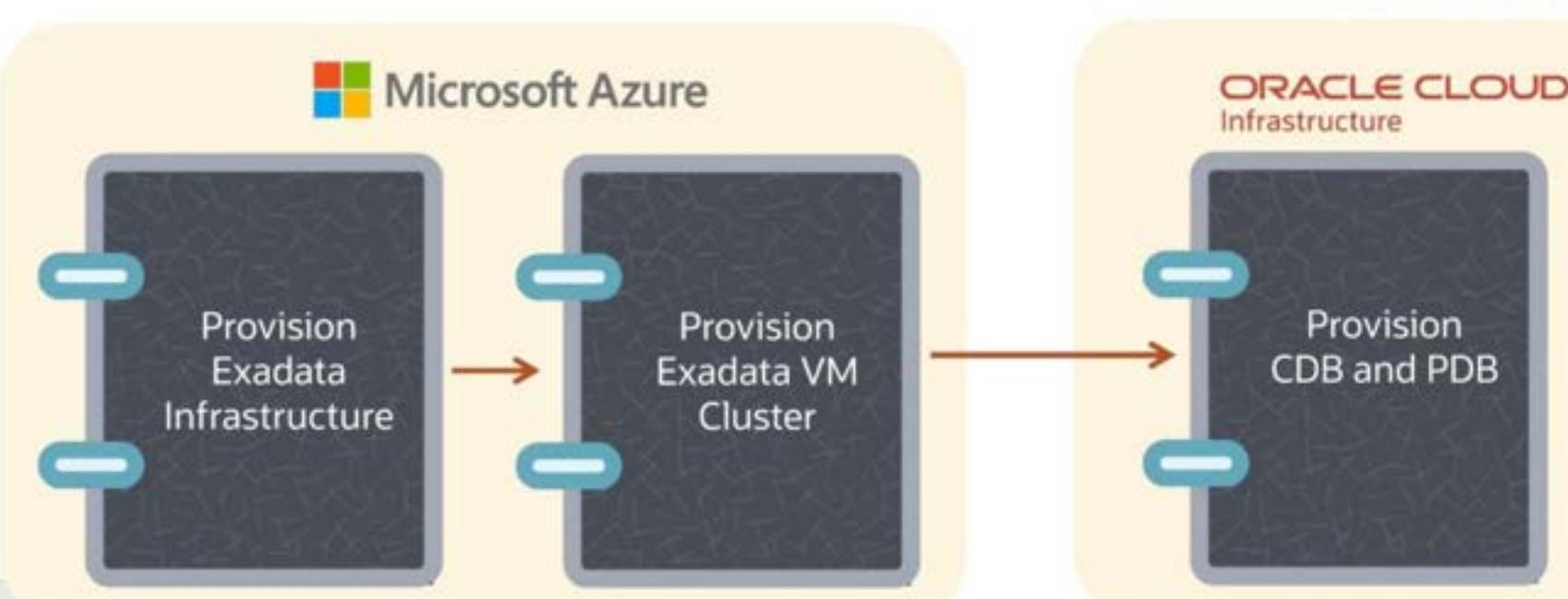
Microsoft Azure

- Provision Exadata Infrastructure and Exadata VM cluster using Azure portal, Azure APIs, SDKs and Terraform.
- Manage the provisioned Oracle Exadata Database Service resources (scale Servers, OCPUs, maintenance)
- Monitor infrastructure and database metrics, events and logs

ORACLE CLOUD Infrastructure

- Provision Database Homes
- Provision Container and pluggable databases
- Manage the databases (Data Guard, Automatic Backup configuration, updates to GI, OS, Databases)
- Migrate to the provisioned databases in Exadata Database Service

Provision Oracle Database@Azure Resources



Provision Oracle Exadata Infrastructure

User must be member of Oracle Database@Azure Infrastructure admin group

Creating Oracle Exadata Infrastructure Resource:

- Azure Subscription and Resource Group name
- Instance Name, Region, AZ, OCI account name
- Infrastructure model name
- Number of Database Servers
- Number of Storage Servers
- Maintenance method and Select Schedule

The screenshot shows two side-by-side Azure portal pages. The left page is titled 'Oracle Database@Azure | Oracle Exadata Database@Azure' and displays a search bar and a message: 'No Oracle Exadata Infrastructure to display'. The right page is titled 'Create Oracle Exadata Infrastructure' and is a configuration form. It includes tabs for 'Basics', 'Configuration', 'Maintenance', 'Consent', 'Tags', and 'Review + create'. Under 'Project details', it shows 'Subscription' set to 'DemoAzureSubscription' and 'Resource group' set to 'DemoResourceGroup'. Under 'Instance details', it shows 'Name' as 'Demofax-01-Infra-01', 'Region' as 'East US', and 'Availability zone' as 'Zone 1'. Under 'Oracle Cloud Account', it shows 'Oracle Cloud account name' as 'woodgrovebankprod'. At the bottom are 'Previous', 'Next', and 'Review + create' buttons.

Provision Oracle Exadata VM Cluster

User must be member of Oracle Database@Azure VM Cluster admin group

Create an Azure VNet with two Delegated Subnets

Creating Oracle Exadata VM Cluster: Basic tab

- Azure Subscription and Resource Group name
- Name, Region, Cluster Name, License Type
- Grid Infrastructure version, SSH public Key, TZ

Microsoft Azure (?) Search resources, services, and docs (Q x)

Home > Oracle Database@Azure | Oracle Exadata Database@Azure > DemoExaInfa | Exadata VM clusters > Create Oracle Exadata VM Cluster ...

Basics Configuration Networking Diagnostics Collection Consent Tags Review + create

Project details

Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription * (?) omcpm: dropdown

Resource group * (?) rg_demo_infa dropdown
Create new

VM Cluster details

Name * (?) DemoVMCI dropdown

Region * (?) East US dropdown

Cluster name (?) DemoVMCI dropdown

Exadata Infrastructure * (?) DemoExaInfa dropdown

License type * (?) License included dropdown

Time zone * (?) UTC dropdown

Grid Infrastructure Version * (?) 19.8.0.0 dropdown

Security

SSH public key source (?) Use existing key stored in Azure dropdown

Shared Keys * (?) AzureVMCluster dropdown

Previous Next Review + create

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Provision Oracle Exadata VM Cluster

Creating Oracle Exadata VM Cluster: Configuration & Networking Tabs

- VM Cluster configuration (Compute count, shape, OCPU/VM, memory/VM, local storage/VM, Exadata Storage)
- Optionally, enable sparse snapshots, local backups and distribution
- Provide delegated subnets for client and backup

Microsoft Azure

Create Oracle Exadata VM Cluster

Networking

Virtual network *

Client subnet *

DNS

Use private DNS service

Host name prefix *

Microsoft Azure

Create Oracle Exadata VM Cluster

Configuration

VM cluster allocation

Select the resources for the VM cluster:

Compute count 2

Disk system image Exadata X8

OCPU count per VM * 1

Total requested OCPU count 2

Memory per VM * 8GB

Total requested memory 16 GB

Local storage per VM * 80

Total local storage 160 GB

Exadata storage

Usable Exadata Storage(TB) * 1

The following storage configuration options cannot be changed after VM cluster creation.

Use Exadata sparse snapshots

Use local backups

Usable storage allocation Data 80%, Recov 20%, Spare 0%

Provision Oracle Exadata Database

User must be member of Oracle Database@Azure CDB or PDB admin group

Click on Go To OCI under OCI Database URL in Exadata VM Cluster Overview page

In OCI Console, provision database home and databases (CDB and PDB)

The screenshot shows the Oracle Cloud Infrastructure (OCI) console with the following details:

- Left Sidebar:** Shows 'Compute' and 'Networking' sections.
- Resources:** Lists 'Databases' (0), 'Database homes' (0), 'Virtual IP address' (0), 'Virtual Machines' (0), 'Blocks', and 'Host requests' (0).
- Databases:** A table with columns 'Name', 'Status', and 'Details'. It shows three entries: 'db1119' (Available), 'db1120' (Available), and 'db1121' (Available).
- Create database:** Wizard step.
 - Basic information for the database:**
 - Provide the database name: DB1119
 - Provide a unique name for the database (optional): db1119
 - Select a database version: 19c
 - Provide a PDB name (optional): db1119_pdb
 - Specify a database home:**
 - Database Home source:
 - Use an existing Database Home
 - Create a new Database Home
 - Database Home display name: Select a Database Home for the new database.
 - Create administrator credentials:**
 - Username: db1119
 - Password: (Input field)
 - Confirm password: (Input field)
- Buttons at the bottom:** 'Create database' and 'Cancel'.



Oracle Cloud Infrastructure

Oracle Database@Azure - Operations

Oracle University

Operational Resources

	Azure	OCI
Resource & Lifecycle Management	Exadata instance management (Infra. & VM cluster) scaling, maintenance	DB management DB CRUD, backup, keys, Database connection string information
Observability	Infrastructure logs, metrics, & events database logs and metrics	Database logs and metrics
Billing, Costs & Usage	Invoice cost management	Detailed usage reporting

Monitoring Resources in Azure

Oracle Database@Azure is natively integrated into Azure Monitor

Monitor Exadata VM Metrics

Monitor Database Metrics, Logs and Events



High Availability & Disaster Recovery with Oracle Database@Azure

Objectives

A stylized illustration of a person climbing a green mountain. The mountain has a grid pattern and is covered in binary code (0s and 1s). In the background, there are white clouds and a dark, textured mountain peak.

Automatic Backup with Oracle Database@Azure

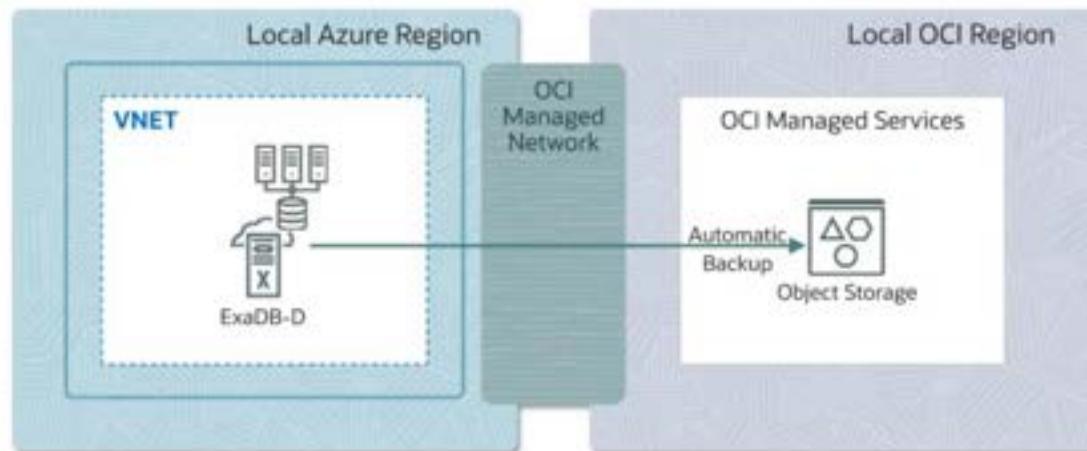
Disaster Recovery Configurations

Automatic Data Guard Deployments

Hybrid Data Guard with Oracle Database @Azure

Automatic Backup to OCI Object Storage

- › Automated one-click setup
- › Built-in MAA best practices and backup validation
- › Backup runs independently of node availability
- › Backup on primary and/or standby
- › Three-way mirrored backup
- › Network traffic through the backup subnet



Configure Automatic Backup in OCI Console

- Backup stored in Oracle-managed Standard Bucket
- Provides the option to choose weekday for full backups
- Provides the option to change backup time
- Runs automatic archivelog backup
 - Via cron job every 30 minutes
- Backup retention for 7, 15, 30, or 60 days
- Restores CDB capabilities:
 - Restores PDB via dbaascli commands
- Charging only for Object Storage space
 - Not for the number of requests or the backup module

Configure automatic backups

Enable automatic backups ⓘ

ⓘ Important: For automatic backups to function, all prerequisites must be met.

Backup destination ⓘ
Object Storage
Autonomous Recovery Service has the lowest operational cost and highest performance.

ⓘ Contact your tenancy administrator to review and perform all prerequisites for using Autonomous Recovery Service.

Backup retention period
30 days
You can change the backup retention period after provisioning.

Deletion options after database termination ⓘ
 Retain backups per backup retention period
 Retain backups for 72 hours, then delete

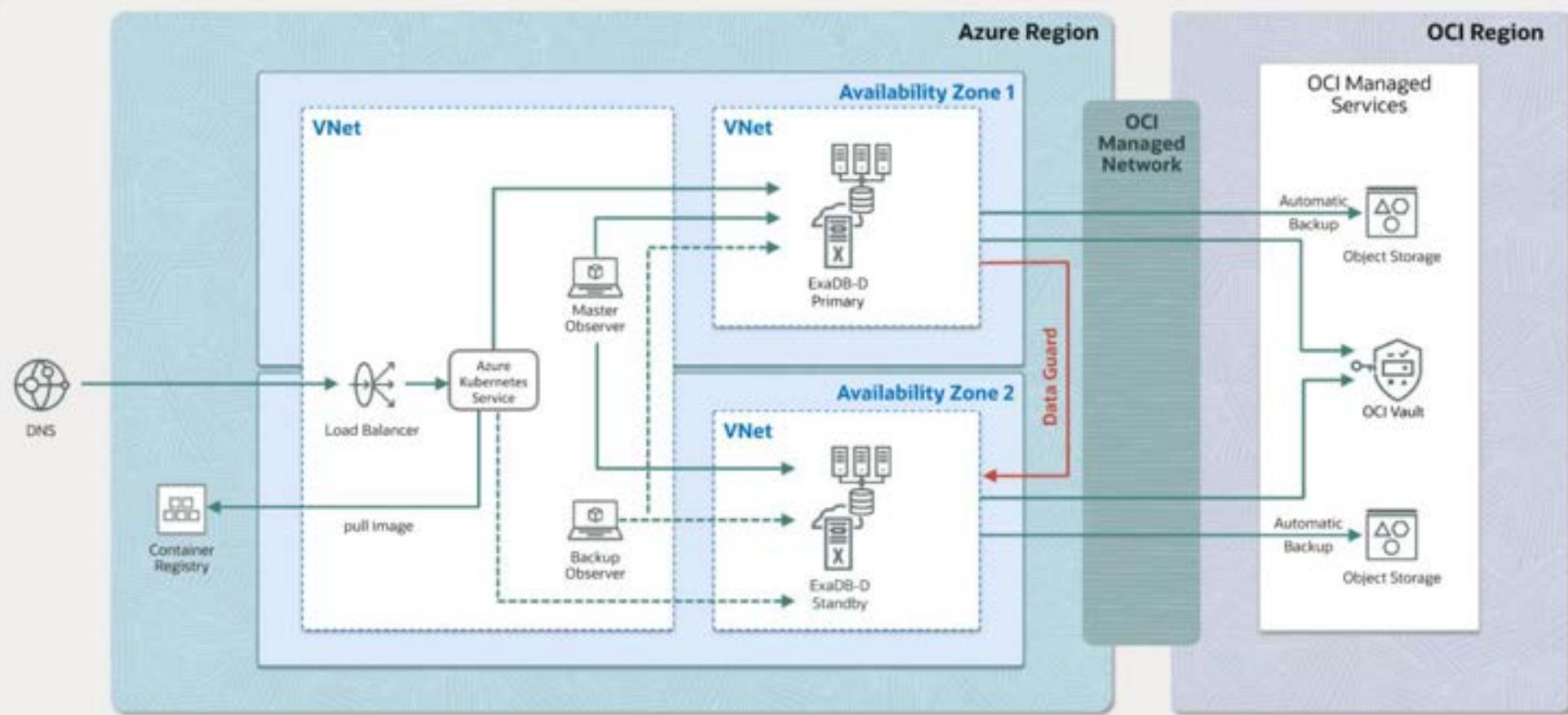
Scheduled day for full backup ⓘ
 Sunday Monday Tuesday Wednesday Thursday Friday Saturday

Scheduled time for full backup (UTC) ⓘ
2:00AM - 4:00AM

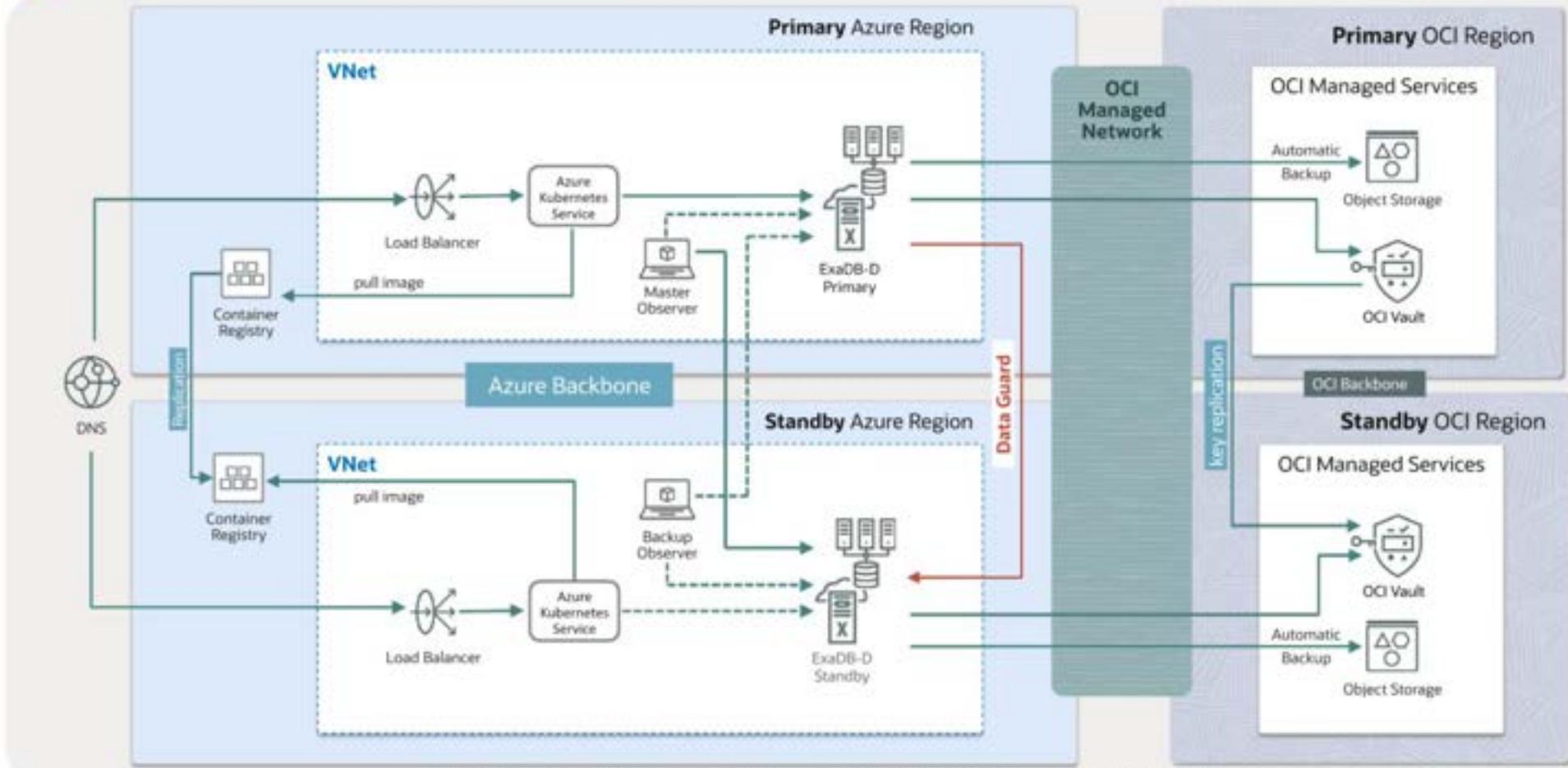
Scheduled time for incremental backup (UTC) ⓘ
2:00AM - 4:00AM

Take the first backup immediately ⓘ

Disaster Recovery - Configuring Local Standby

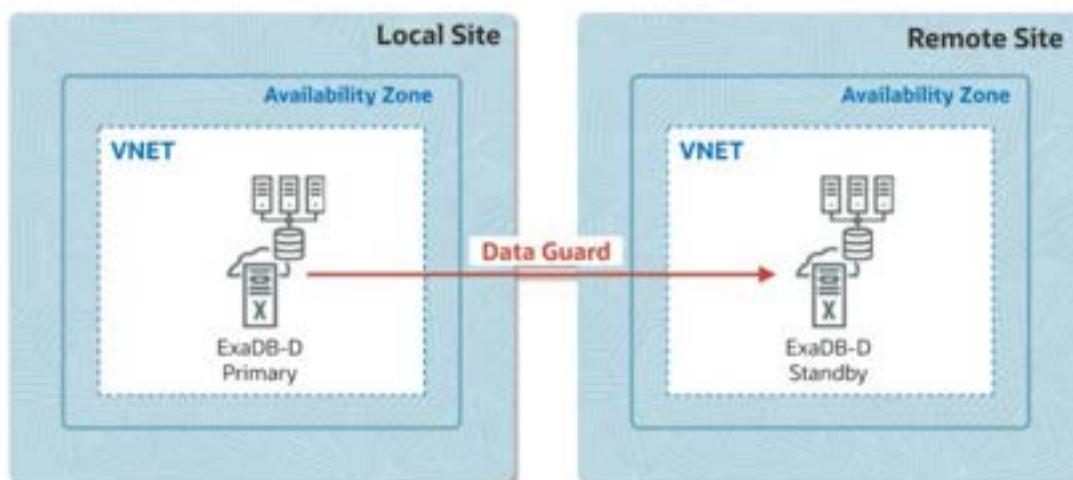


Disaster Recovery - Configuring Remote Standby



Automated Data Guard Deployment

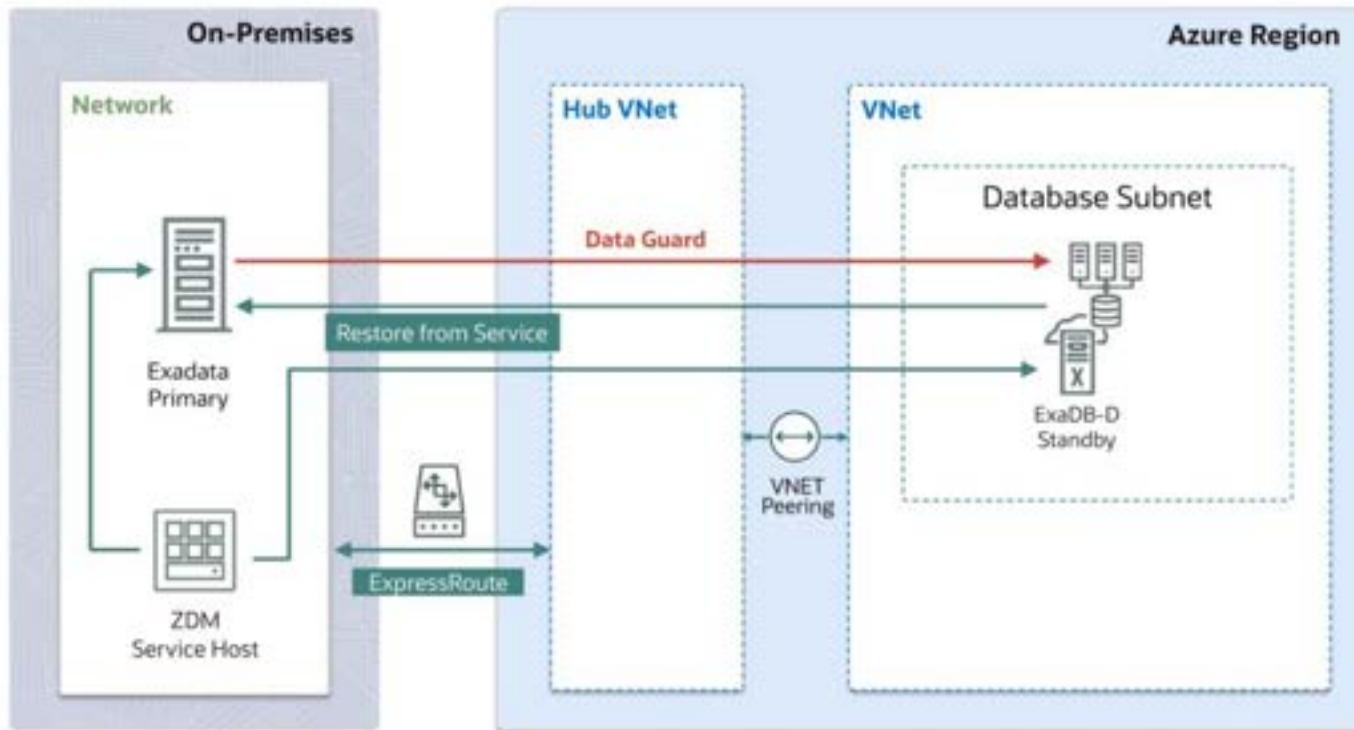
- › Involves an automated one-click setup
- › Cross-AZs or cross-region configuration
- › MAA best practices incorporated by default
- › Supports failover and switchover operations
- › Creates one standby database:
 - Multiple standby databases can be created manually.
- › Choose Active Data Guard (open read-only) for additional data protection and read-only benefits.
- › Alternatively, choose Data Guard (mounted standby).



Configure Data Guard or Active Data Guard in OCI Console

Resources	Enable Data Guard
Metrics	
Backups (0)	
Data Guard Associations	<p>Select peer VM Cluster</p> <p>Peer region: Germany Central (Frankfurt) Primary database is in region Germany Central (Frankfurt)</p> <p>Select availability domain: vPhy EU-FRANKFURT-1-AD-1 Primary database is in availability domain vPhy EU-FRANKFURT-1-AD-1</p> <p>Select Exadata infrastructure in FieldDemo (Change compartment) Select an infrastructure</p> <p>Select a VM cluster in FieldDemo (Change compartment) First select Exadata infrastructure</p>
Pluggable Databases (1)	<p>Data Guard association details</p> <p>Data Guard Type: Active Data Guard</p> <p>Active Data Guard is a licensed option to the Oracle Database Enterprise capabilities that extend the basic Data Guard functionality. These capabilities include Offload, Automatic Block Repair, Standby Block Change Tracking, Far Sy Application Continuity. Learn more</p>
	<p>Protection mode: Select protection mode</p> <p>Transport type: First select protection mode</p> <p>Choose Database Home:</p> <p><input checked="" type="radio"/> Select an existing Database Home <input type="radio"/> Create a new Database Home</p> <p>Database Home display name: First select a peer resource</p> <p>Only Database Homes compatible with the source database's Oracle Database version and patch level are listed.</p> <p>Configure standby database:</p> <p>Database unique name: Optional</p> <p>Specify a value for the DB_UNIQUE_NAME database parameter. This value must be unique across the primary and standby cloud VM clusters. Enter up to 30 characters</p> <p>Database password: The standby database admin password must be the same as the primary database admin password.</p> <p>Show advanced options</p> <p>Enable Data Guard Cancel</p>

Configure Hybrid Data Guard with Oracle Database@Azure



- › Physical online migration without downtime
- › Automated target encryption
- › MAA compliant
- › Simple and free
- › Extensive pre- and post-checks
- › Customizable workflow
- › Jobs framework
- › Resumable
- › And more ...



Oracle Cloud Infrastructure Introduction to Oracle Database@Google Cloud

Oracle And Google Cloud Partnership



Extends customers multi-cloud strategy

Eases integration of technologies across both providers

Saves on cost

Collaborative Support Model

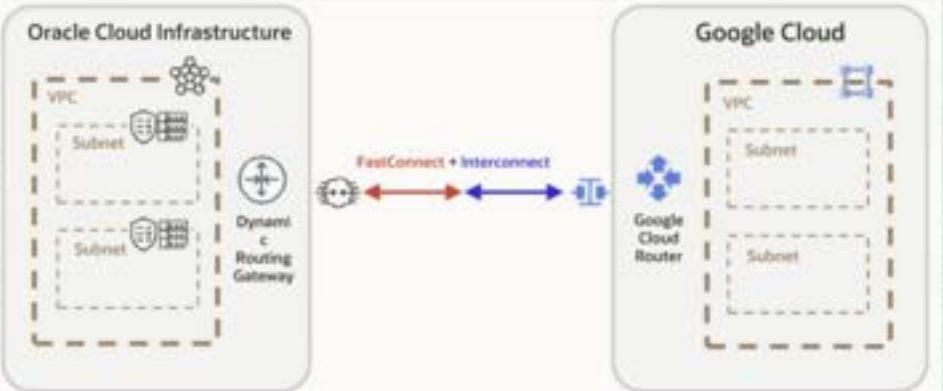
Enables business continuity

Oracle and Google Cloud Partnership Offering



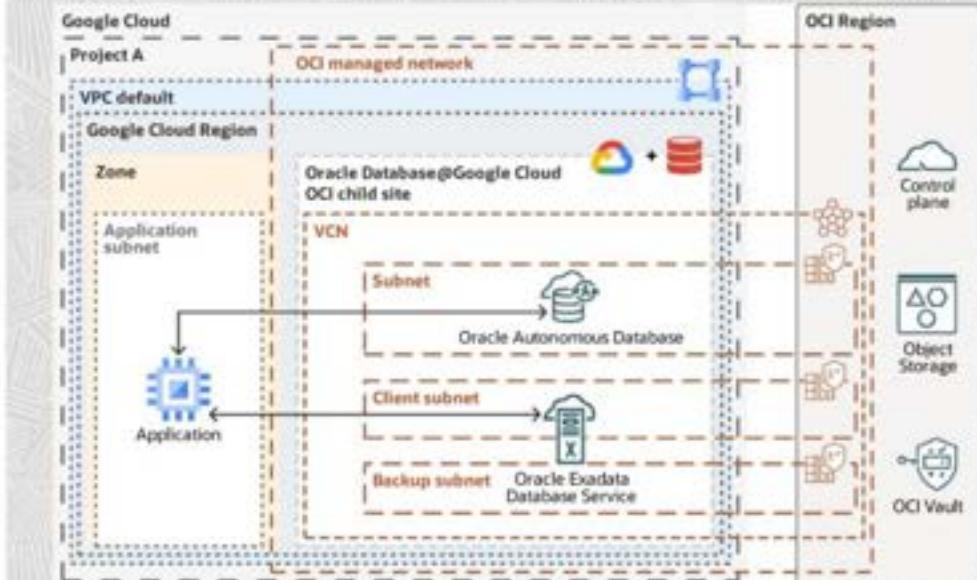
Oracle Interconnect For Google Cloud

June 2024



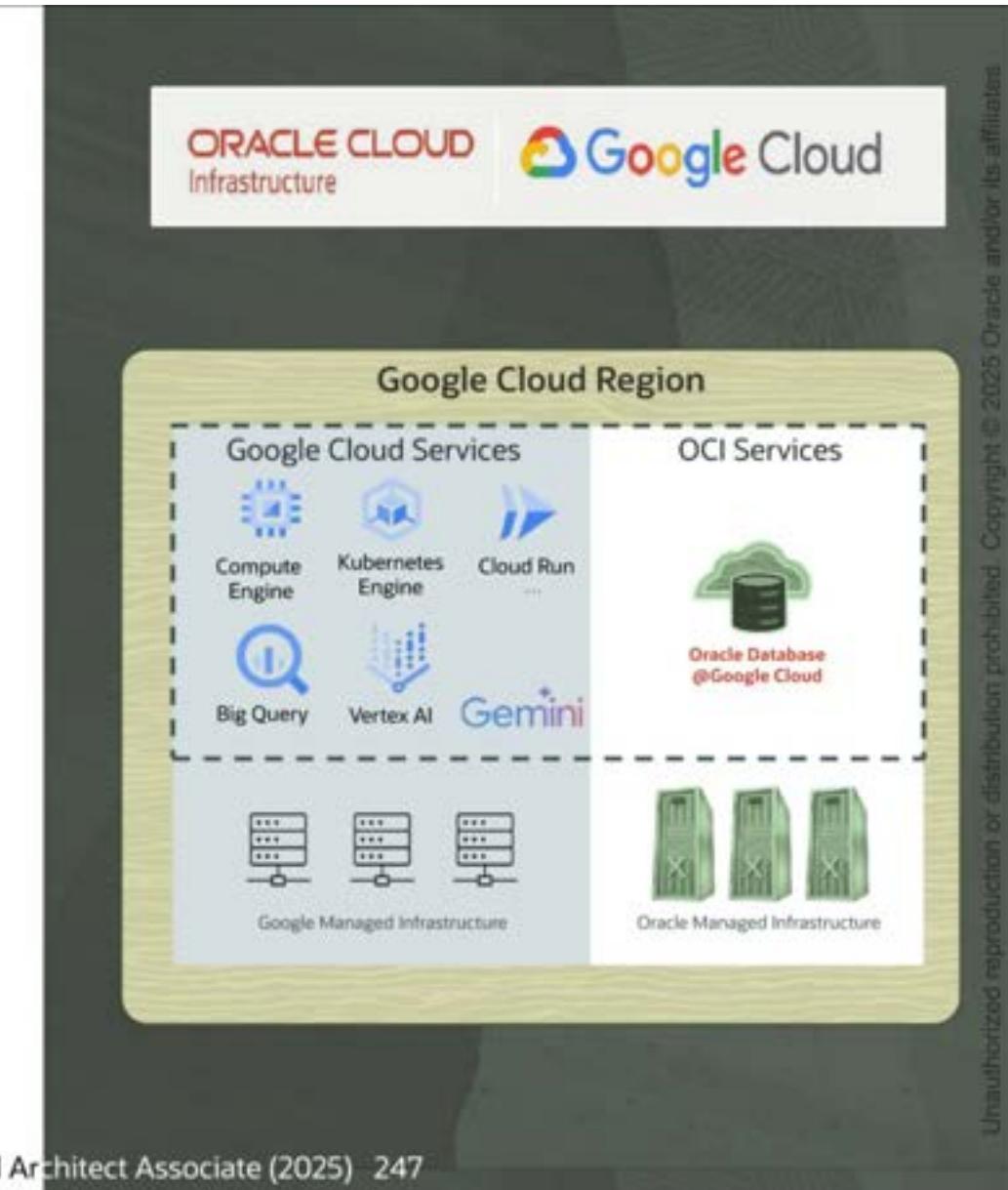
Oracle Database@Google Cloud

2024



Oracle Database@Google Cloud

- OCI native oracle database services running in Google cloud datacenter
- Runs on OCI Infrastructure managed by Oracle Cloud operation experts
- Simple, secured and low latency operating environment
- High performance, scalability and availability
- Manage using Google cloud console or the tools
- Integrated with Google networking
- Simplified purchasing and operations
- Collaborative Support from Oracle and Google



Oracle Database@Google Cloud Easy Adoption



Purchase in Google Cloud Marketplace

The screenshot shows the Oracle Database@Google Cloud product page in the Google Cloud Marketplace. It includes sections for Overview, Additional details, Machine configuration, and Managed services.

Deploy, manage, and monitor through Google Cloud Console and APIs

The screenshot shows the Oracle Database instance creation process in the Google Cloud Console. It also displays a Cloud VM Cluster - Resource Utilization chart showing CPU usage over time.

Combine with your choice of Google Cloud services

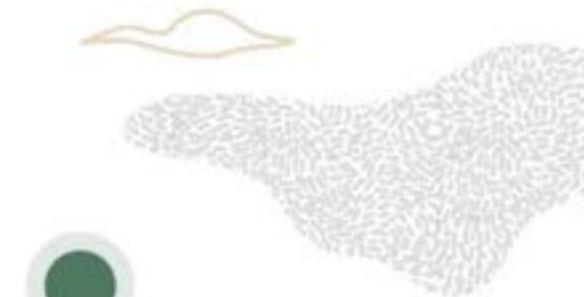
The screenshot shows the Google Cloud console sidebar with the Oracle Database service highlighted under the Fanned Products section.

Operational Responsibilities



Oracle

- › Manage Database Service Infrastructure running in Google Cloud
- › Service Software Updates
- › Service Infrastructure updates
- › Support customer's database service Issues



Google Cloud Customers

- › Provision Database Service
- › Manage the provisioned databases from google and oracle cloud console
- › Operate and Monitor Infrastructure and Database

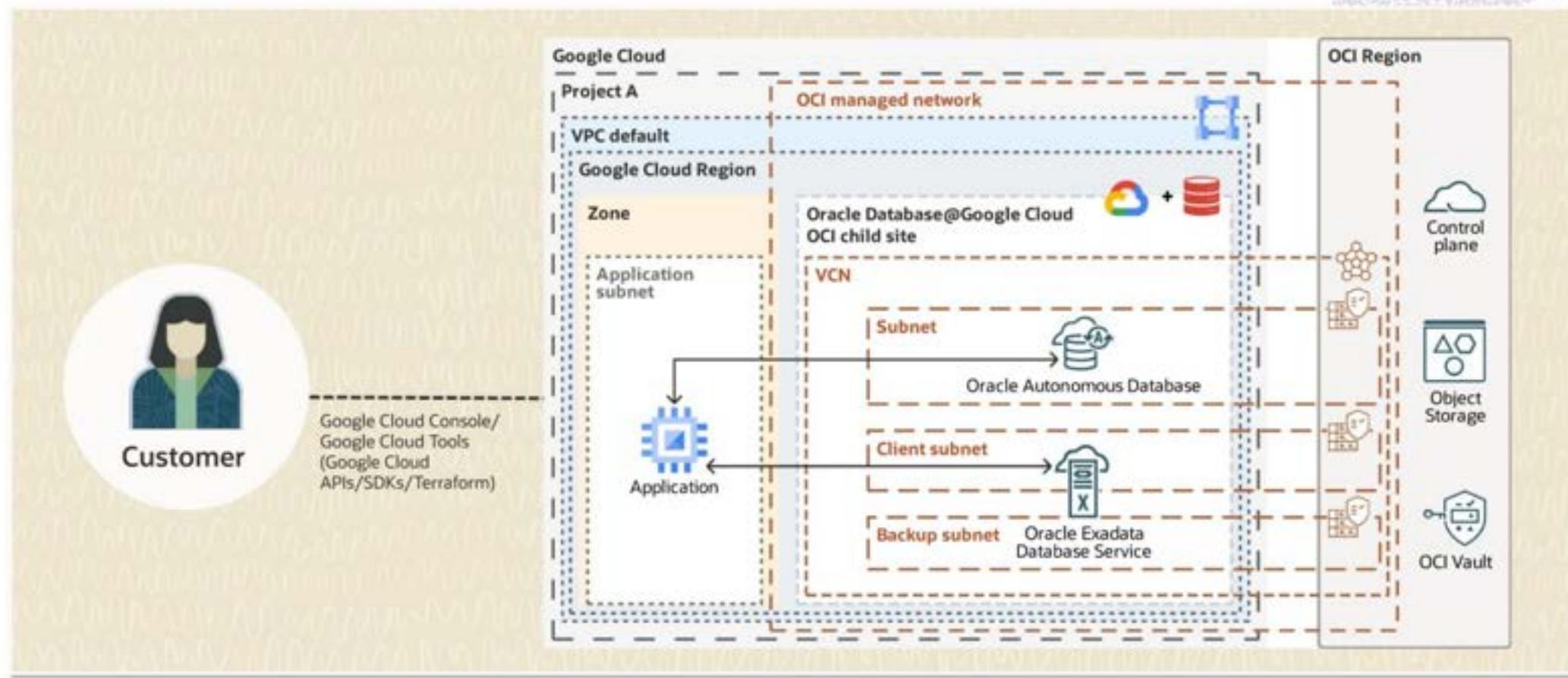


Oracle Cloud Infrastructure

Oracle Database@Google Cloud – Architecture

—
Oracle University

Deployment Architecture in Google Cloud Zone

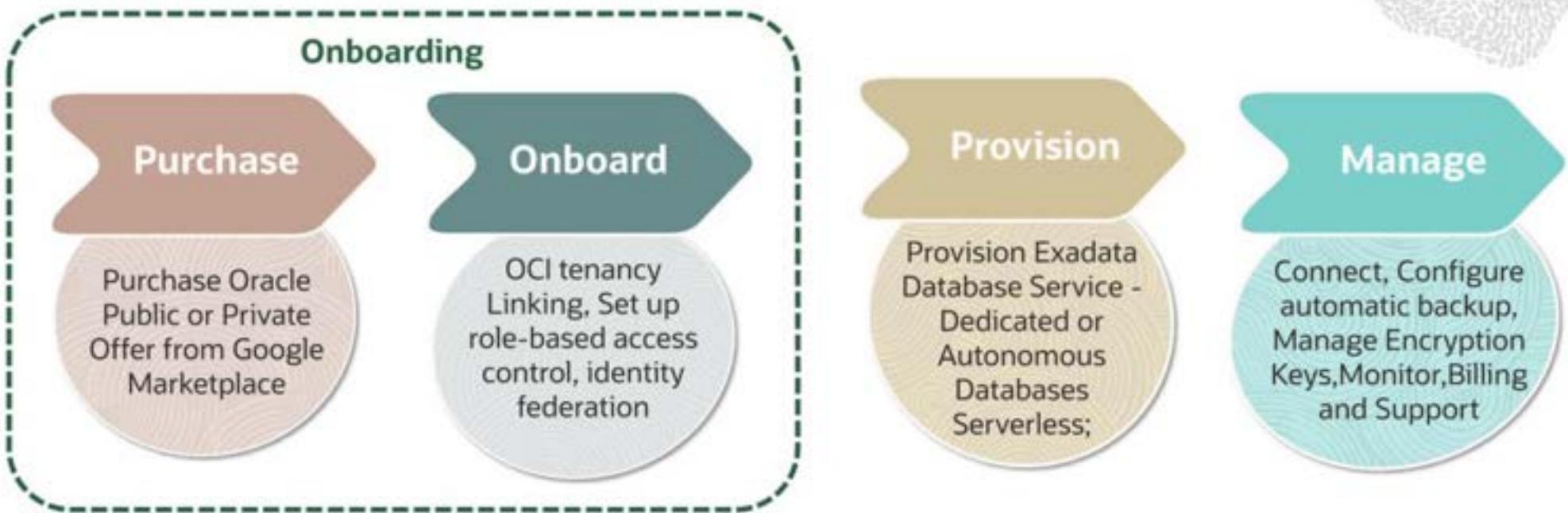




Oracle Cloud Infrastructure

Oracle Database@Google Cloud - User Journey

User Journey

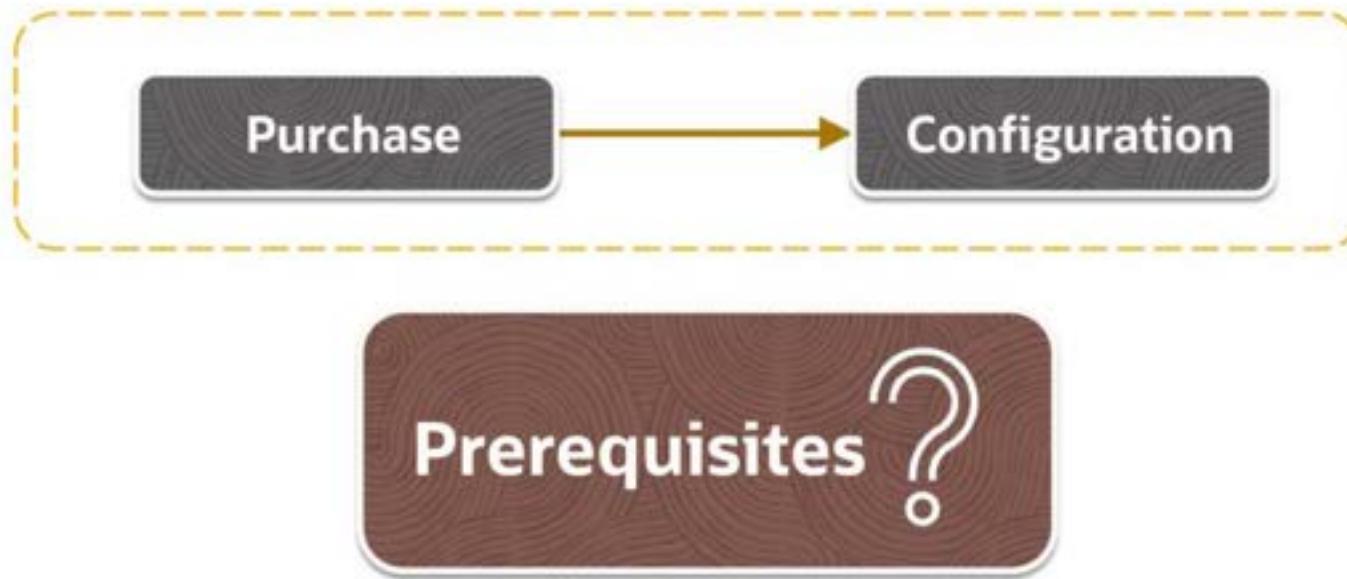




Oracle Cloud Infrastructure

Oracle Database@Google Cloud – Onboarding

Onboarding Oracle Database@Google Cloud



Onboarding Prerequisites

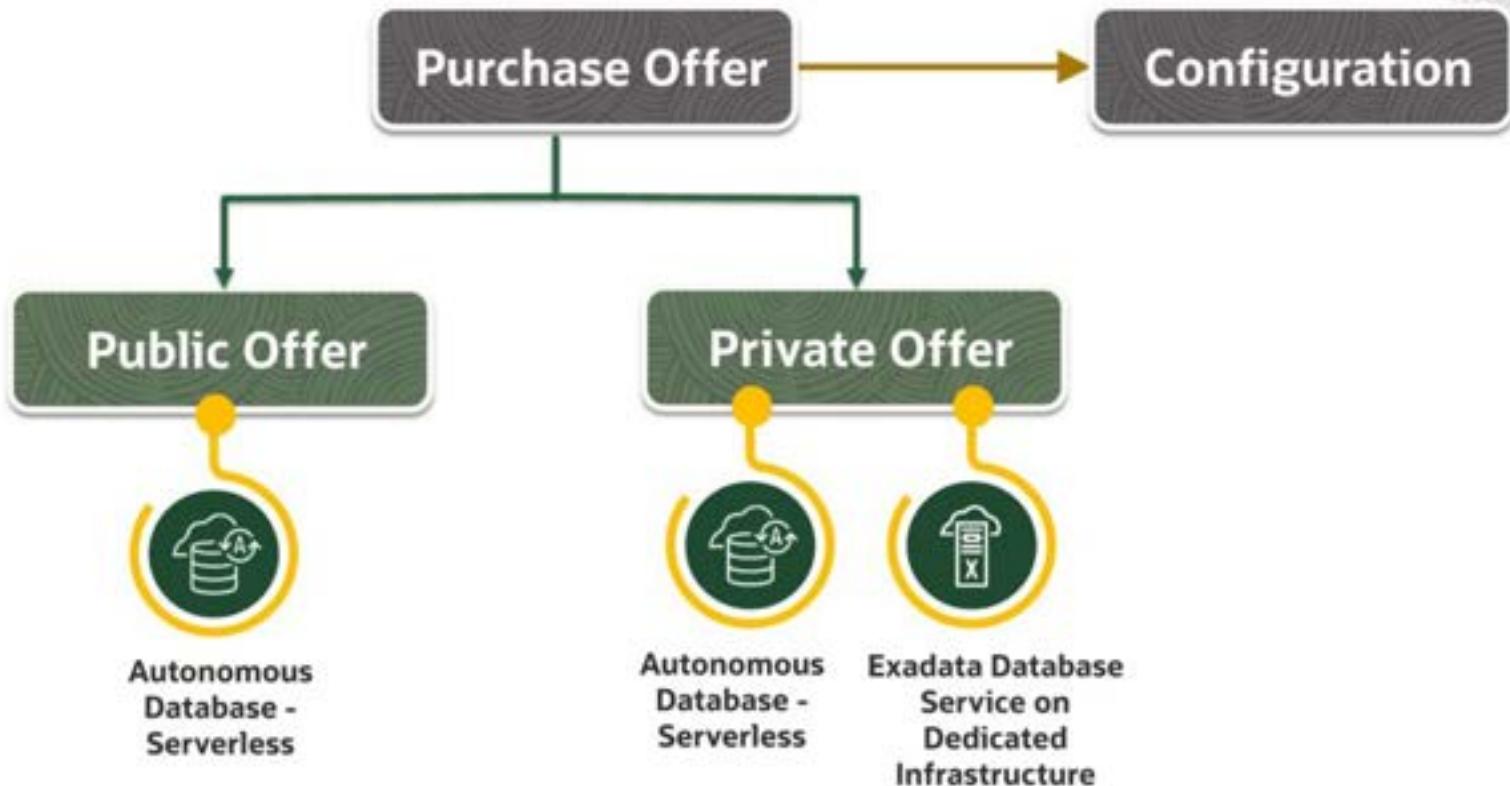
▶ Permissions for Onboarding task

▶ Google Cloud Project & Google Billing Account

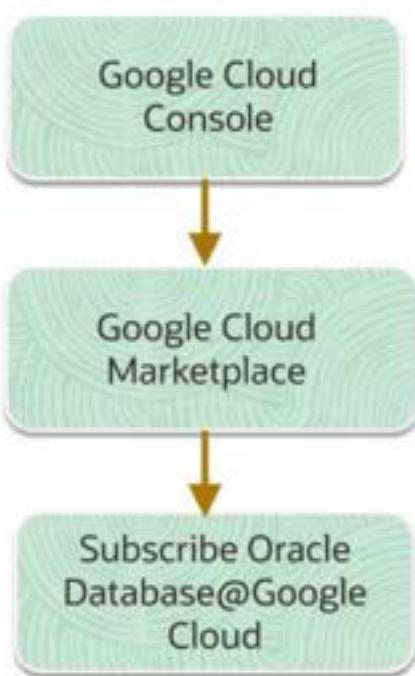
▶ OCI account for linking

Cloud Env	Task	Permission
Google Cloud	Private Offer Purchase	Project Owner or Contributor
Google Cloud	Public Offer Purchase	Billing Account Owner, Contributor
OCI and Google Cloud	Account Linking	OCI Administrator, OCI Account Owner, GCP: Project Owner or Editor
Google Cloud	Identity Federation	External Identity Provider Administrator, Groups Administrator, User Administrator
OCI	Identity Federation	OCI Identity Domain Administrator
OCI	Register with My Oracle Support	OCI Support Owner

Onboarding Oracle Database@Google Cloud



Purchase - Public Offer



The screenshot illustrates the purchase process for Oracle Database@Google Cloud. It shows the search results for "Oracle Database" on the Google Cloud Marketplace. The top result is "Oracle Database@Google Cloud" by Oracle, with a price of \$625.47/mo. Below it is a product from FlashGrid Inc. named "FlashGrid Cluster for Oracle RAC / SI Database (RH7)". The Oracle listing includes a "Buy Now" button. To the right, a green callout box lists six benefits:

- > No need to contact Oracle Sales
- > Select Pay As You Go Plan
- > Provide Billing Account Details
- > Payment counts towards Google Cloud Commitments
- > Existing Oracle Customers can use BYOL/ULA
- > Get Oracle Support Rewards for every dollar spent on Oracle Database@Google Cloud

Below the main search area, there are filters for Category (Analytics, Big Data, Databases, Machine Learning, Development tools) and Type (Google Cloud Platform, Oracle Database). The Oracle listing has a "Buy Now" button, and the FlashGrid listing also has a "Buy Now" button. The bottom right shows a progress bar indicating the order has been sent to Oracle.

Purchase - Private Offer

Contact Oracle Sales to create Private Offer in Google Cloud Marketplace



Review and accept private offer in Google Cloud Marketplace

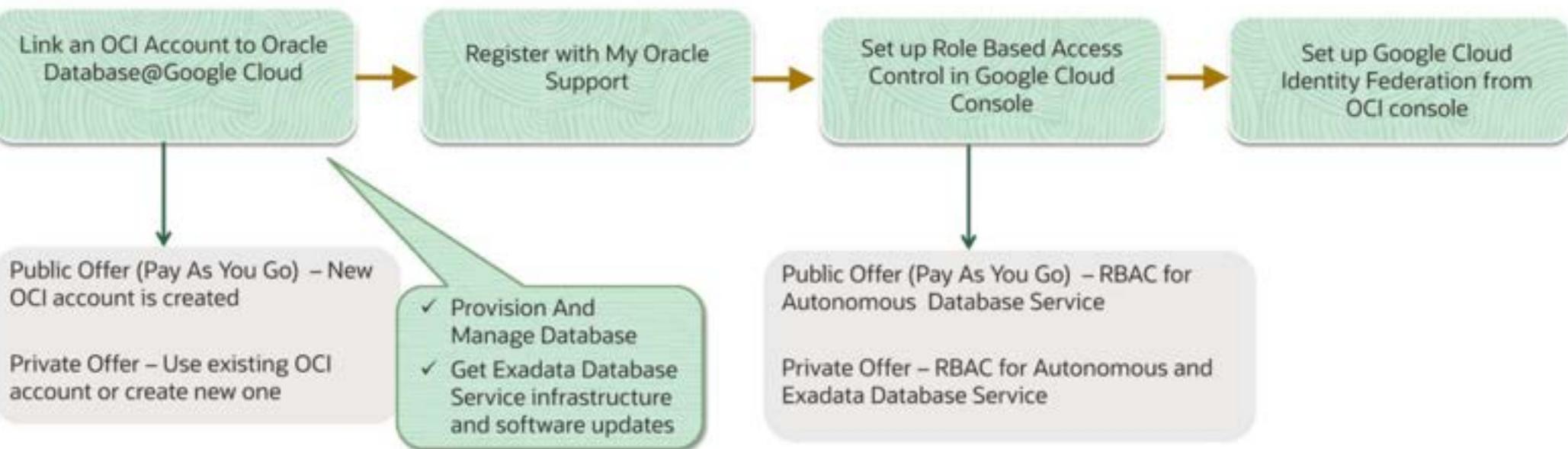
The screenshot shows a Google Cloud Marketplace page for a private offer from Oracle. The offer is for "Oracle Database@Google Cloud Dev". A blue button labeled "Review offer" is visible. A note below the button states: "Your private offer for Oracle Database@Google Cloud Dev is ready. Please review and accept the offer by Aug 31, 2024, 11:40 PM UTC".

Below this, there is a list of orders for the same product. The table has columns: Status, Order number, Order date, Provider, Product, Plan, Start plan, Auto-renew, Purchase date, Start date, End date, and Payment schedule. One row is shown:

Status	Order number	Order date	Provider	Product	Plan	Start plan	Auto-renew	Purchase date	Start date	End date	Payment schedule
Active	1234567890	Offer for Demo	Oracle	Oracle Database@Google Cloud Dev	Oracle Database@Google Cloud Private Offer Monthly Subscription	N/A	N/A	01/01/2024	01/01/2024	01/01/2024	Annual

- Provide Billing Account Details
- Payment counts towards Google Cloud Commitments
- Existing Oracle Customers can use BYOL/ULA
- Get Oracle Support Rewards for every dollar spent on Oracle Database@Google Cloud

Configuration

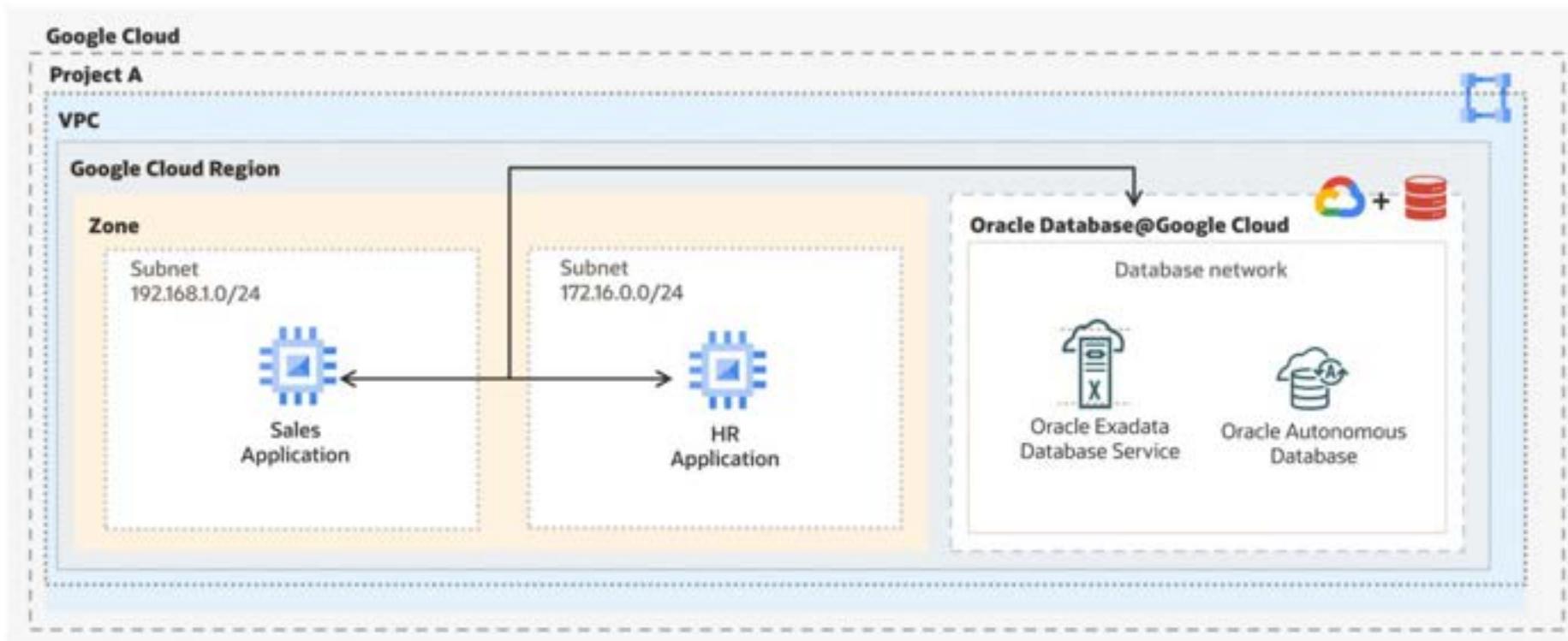


Oracle Cloud Infrastructure

Oracle Database@Google Cloud - Networking Topologies

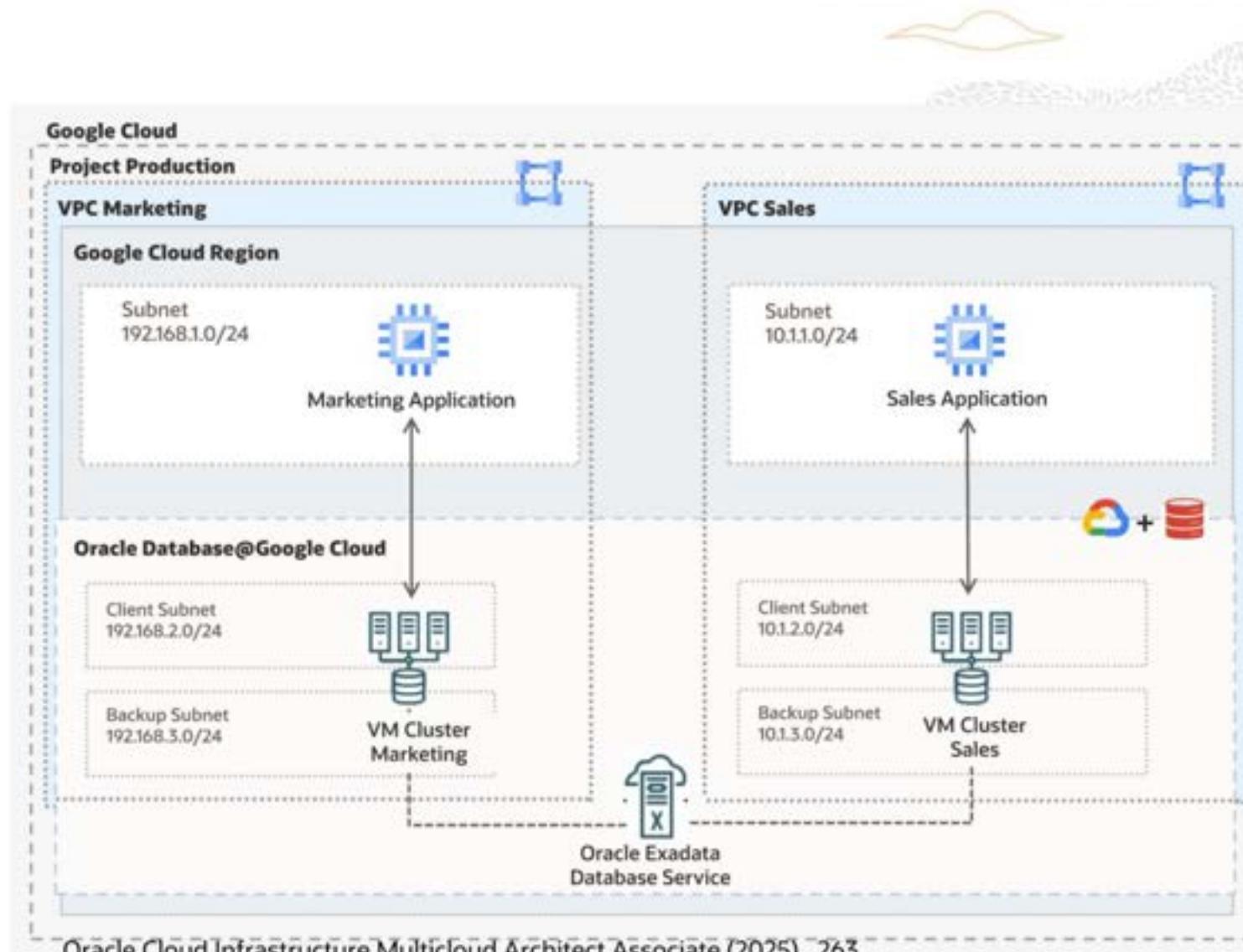
Single VPC - Multiples Subnets

- › Oracle Databases subnets and application subnets are part of the same Google Cloud Region, VPC, Project
- › Subnets in the same VPC has access to the ExaDB-D and ADB-S
- › Firewall rules are defined at the OCI Network Security Group (NSG)



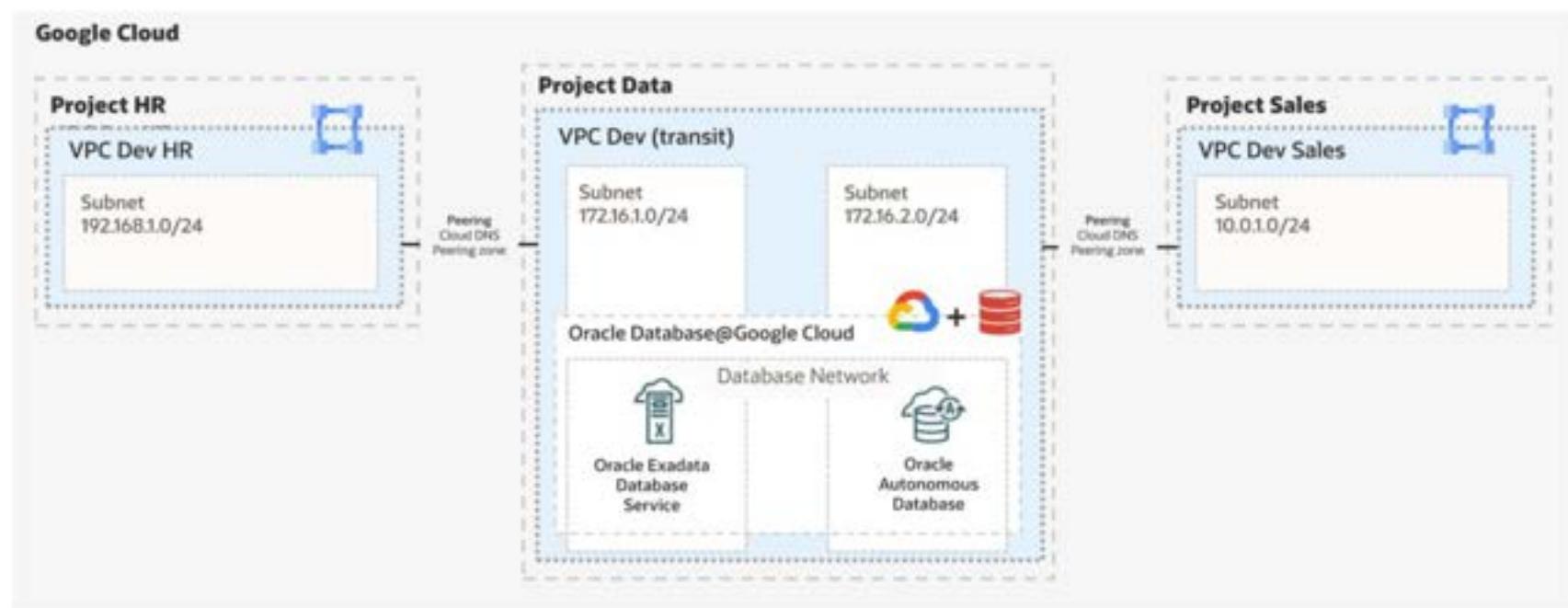
Multiple VPC

- Each VM Cluster is connected to a different VPC
- Multiple VM Cluster share the same Exadata Infrastructure
- Exadata Infra and VM Cluster are part of the same project



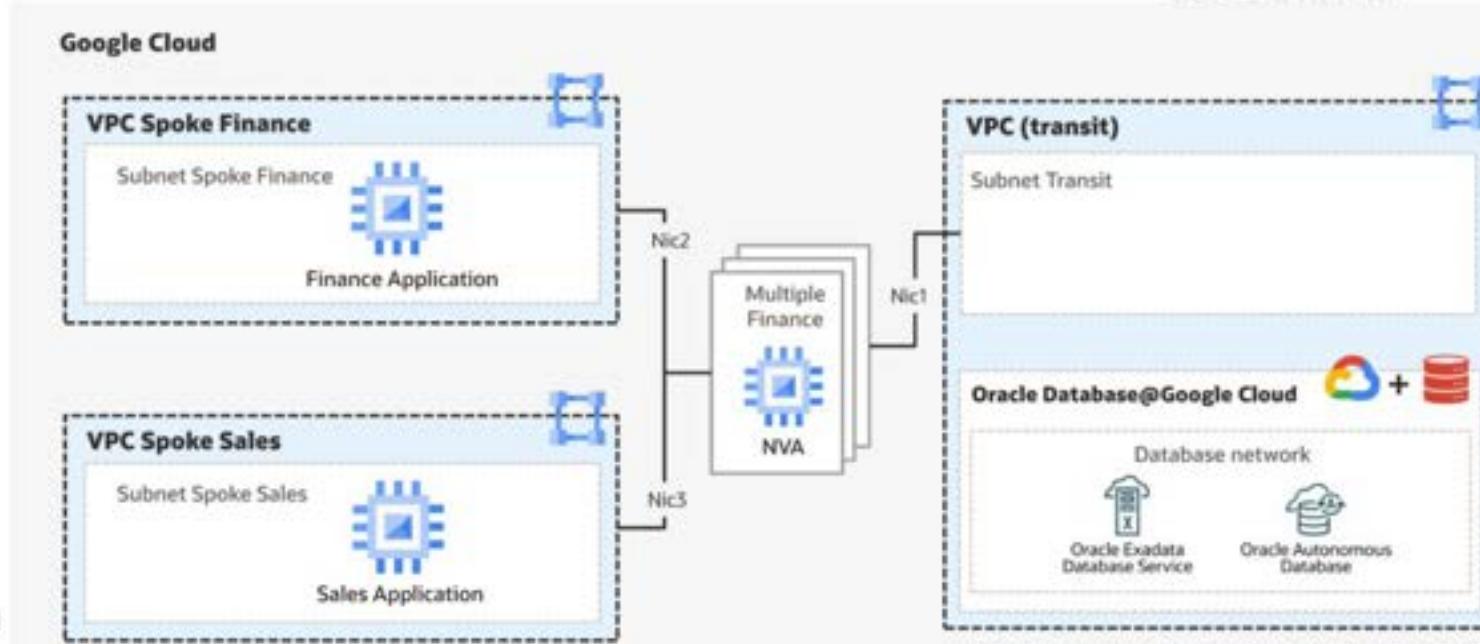
VPC Peering

- › Oracle Database@Google Cloud created in the VPC transit.
- › The DB is accessible from multiple VPC by peering.
- › VPC transit is peered with other VPC of the same or different projects and or organizations.



Hub-and-Spoke network virtual appliance (NVA)

- › Hub NVA has multiple VNICs in each spoke subnet.
- › Hub NVA support routing.
- › VNIC for Oracle Database@GoogleCloud is created in transit subnet
- › Oracle Database@GoogleCloud, as a spoke to the NVA by the Partner Interconnect.



ORACLE
University

Oracle Cloud Infrastructure

Oracle Database@Google Cloud – Provisioning

Role Based Access Grants for OD@GCP

Control user access to Oracle Database@ Google Cloud with role based access control

Google Cloud Groups and Roles for Autonomous Database – Serverless (ADB-S)

Group Name	Role Name	Purpose of Group
odbg-adbs-db-administrators	Oracle Database@Google Cloud Autonomous Database Admin	Manages all ADB resources in Google Cloud
odbg-db-family-administrators	Oracle Database@Google Cloud admin	Manage all oracle database resources in OCI; replicated to OCI during Identify Federation
odbg-network-administrators	-	Manages network resources in OCI; replicated to OCI during Identify Federation

Google Cloud Groups and Roles for Exadata Service – Dedicated (ExaDB –D)

Group Name	Role Name	Purpose of Group
odbg-exa-infra-administrators	Oracle Database@Google Cloud Exadata Infrastructure Admin	Manages all Exadata database service resources in Google Cloud
odbg-vm-cluster-administrators	Oracle Database@Google Cloud VM Cluster Admin	Manage VM cluster resources in Google Cloud
odbg-network-administrators	-	Manages network resources in OCI; replicated to OCI during Identify Federation
odbg-exa-cdb-administrators		Manage all CDB resources in OCI; replicated to OCI during Identify Federation
odbg-exa-pdb-administrators		Manage all PDB resources in OCI; replicated to OCI during Identify Federation

Network Requirement for Database Service in OD@GCP

Autonomous Database :
Minimum CIDR size is /27
(non-overlapping)

Exadata Database Service :

Minimum CIDR size : /27 (non-overlapping)
Interconnect IPs for Exadata X9M :100.106.0.0/16 and
100.107.0.0/16

Client Subnet:

4 IPs address for each VM in cluster
3 IPs per cluster for SCAN
Reserved IPs per cluster with minimum size of 2 VMs = 11

Backup Subnet:

3 IPs per VM
Reserved IPs per cluster with minimum size of 2 VMs = 6

Provision Oracle ADB-S in OD@GCP

Prerequisite

- › Google Cloud Project
- › Google Virtual Cloud Network (VPC)

The screenshot shows the Oracle Database @ Google Cloud interface. At the top, there's a navigation bar with the Google Cloud logo, a search bar, and various icons. Below the navigation bar, the main title is "Oracle Database @ Go... Autonomous Database". On the left, there's a sidebar with three items: "Overview", "Exadata Database", and "Autonomous Database", with "Autonomous Database" being the active tab. The main content area has a heading "Autonomous Databases" with "CREATE" and "REFRESH" buttons. Below this, there's a table header with columns: "Display Name", "Database ID", "Status", "Compute", "Storage", "Workload type", and "Location".

Provision Oracle ADB-S in OD@GCP

Configuration Parameters

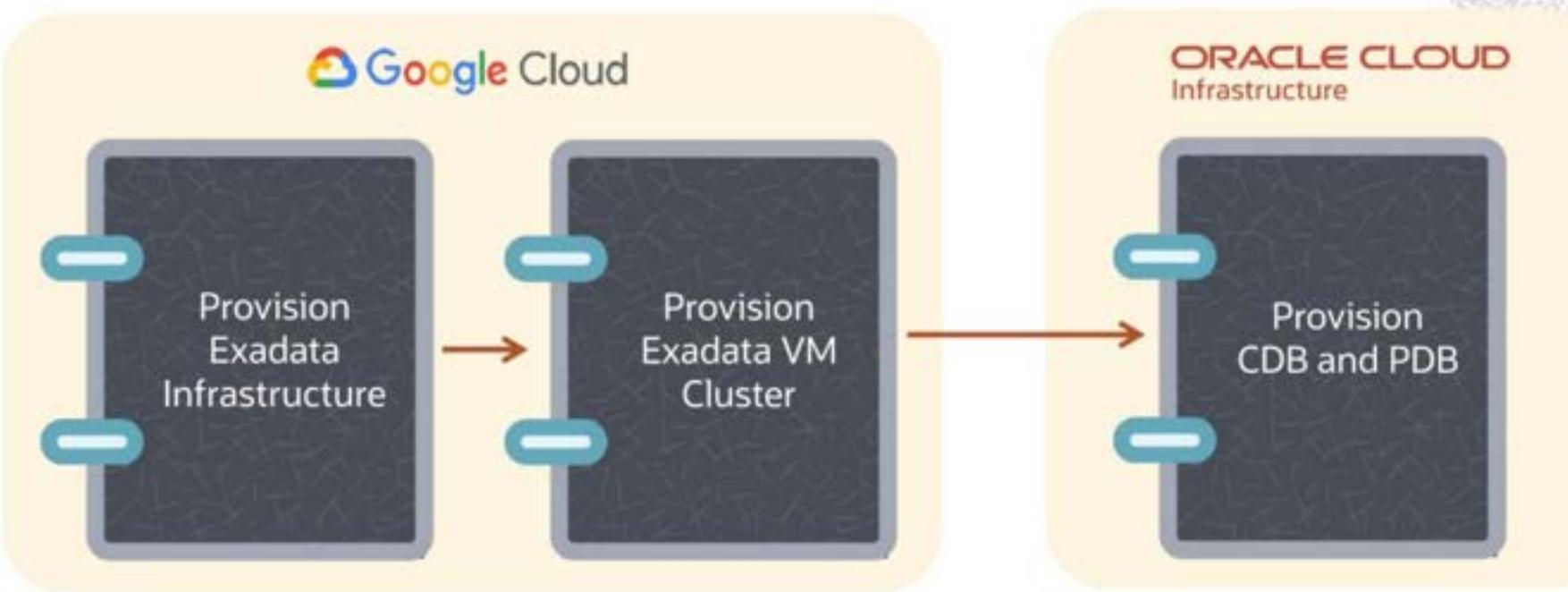
- › Instance Details: ID, Name, Display Name, Region
- › Workload type – ATP, ADW, JSON, APEX
- › License Type – License Included or BYOL
- › Compute – ECPU and Storage size and optionally enable auto scale
- › Networking – Provide VPC, non overlapping Subnet CIDR, private IP and TLS option
- › Others – Backup retention period, admin credentials, character set, contacts for notification, patch apply preference, etc.

The screenshot shows the 'Autonomous Database Details' page for an instance named ADB01. The page has tabs for DETAILS, CONNECTIONS, DISASTER RECOVERY, and OPERATIONS. The DETAILS tab is selected, displaying the following information:

Setting	Value
Status	Available
Database ID	ADB01
Display Name	100M (24AUG2025THUR)
Database Name	ADB01
Region	US-ASHES
Workload type	Transaction Processing
Oracle Cloud account	Included
License Type	Included
Database Version	19c
Character set	AL32UTF8
National character set	AL16UTF16
Auto start/stop schedule	Disabled
Mode	ReadWrite

Below the main table, there are sections for Resource allocation, Disaster recovery, and Backup.

Provision ExaDB -D in OD@GCP

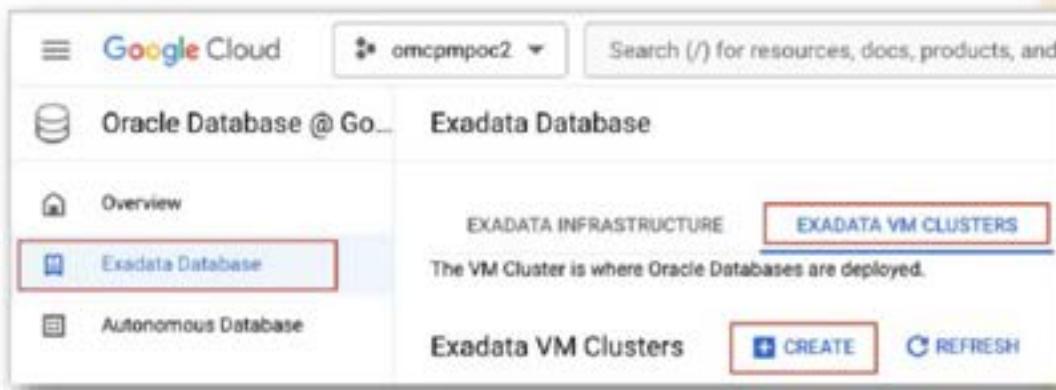


Provision Oracle Exadata Infrastructure

The screenshot shows the Oracle Cloud Infrastructure (OCI) console interface. On the left, there's a sidebar with 'Google Cloud' at the top, followed by 'Oracle Database @ G...', 'Exadata Database', 'Exadata Infrastructure' (which is selected and highlighted with a red box), and 'Autonomous Database'. Below this is a 'Search (1) for resources, docs, products, and more' bar and a 'Search' button. In the main content area, there are two tabs: 'EXADATA INFRASTRUCTURE' (selected) and 'EXADATA VM CLUSTERS'. A message states: 'The Exadata cloud infrastructure is the top-level resource of an Exadata system. This resource determines the number of storage and compute servers available to the VM clusters running on the system.' Below this is a 'Create Exadata Infrastructure' dialog box. It has sections for 'Instance details' (Infrastructure display name, Infrastructure ID, Region - us-phoenix-2, Oracle Cloud account - us-phoenix-2), 'Machine configuration' (Exadata Infrastructure model - Exadata X8M, Database servers - 3, Storage servers - 3), and a 'Next Step' button.

- Exadata Infrastructure ID, Display name, region; linked OCI account
- Infrastructure model, number of DB servers and storage servers
- Maintenance method and schedule, contacts

Provision Oracle Exadata VM Cluster



- VM Cluster name, Cluster ID and Grid Infrastructure version
- Cluster VM OCPU (min 2), Memory (min 30GB) and Local storage (min 60GB)
- Exadata Storage (min 2 TB) – opt for sparse snapshots and local backups
- Networking range for client and backup IP (192.168.16.16/28 reserved for interconnect)
- Optionally enable diagnostic collection for events, health metrics, incident logs and trace
- SSH keys, License type, timezone, SCAN listener port

Provision Oracle Exadata Database

Click on MANAGE IN OCI link in Exadata VM Cluster Overview page to switch from Google Cloud to OCI console

Create Database Home and provision Container and pluggable database in OCI console

Manage operations not enabled with Oracle Database@Google Cloud service

Name	State	Database unique name	Database version	Data Guard role	Created
DB0821	Available	DB0821_cxt_1ed	23.8.0.24.07	—	Thu, Aug 22, 2024, 01:14:25 UTC
DB0820	Available	DB0820_207_1ed	23.8.0.24.07	—	Tue, Aug 20, 2024, 21:18:52 UTC
DB0819a	Available	DB0819a_qhf_1ed	23.8.0.24.07	—	Mon, Aug 19, 2024, 19:57:50 UTC



Oracle Cloud Infrastructure

Oracle Database@Google Cloud - Manage

Operations And Interfaces

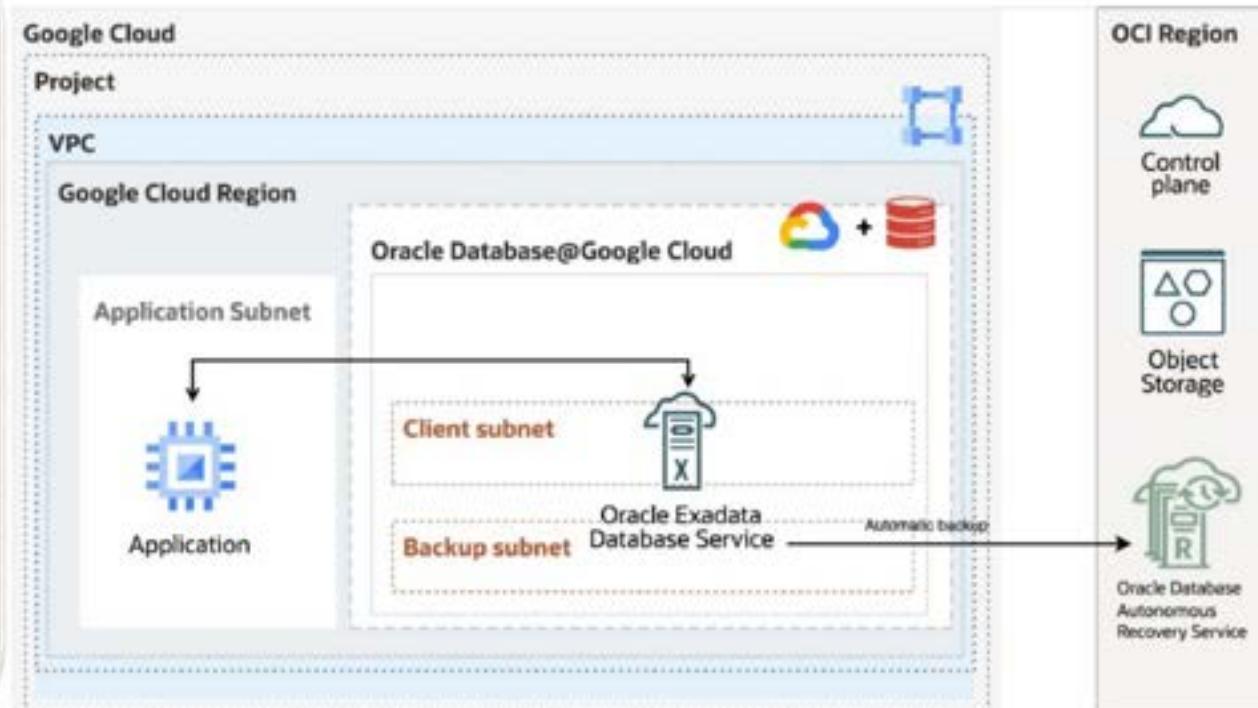
	Google Cloud Console	OCI Console
Resource & Lifecycle Management	Provision and Delete Autonomous Database Service, Exadata Database Service resource (Infra. & VM cluster)	Create and manage CDB, PBD of ExaDB Service, DB backup, Encryption keys, Database connection string and test connection
Observability	Infrastructure logs, metrics, & events database logs and metrics	Database logs and metrics
Billing, Costs & Usage	Invoice cost management and payment	Detailed usage reporting

Google Cloud APIs, SDKs and Terraform can also be used for performing operations on Oracle Database@Google Cloud

Configure Backup for Exadata Database Service

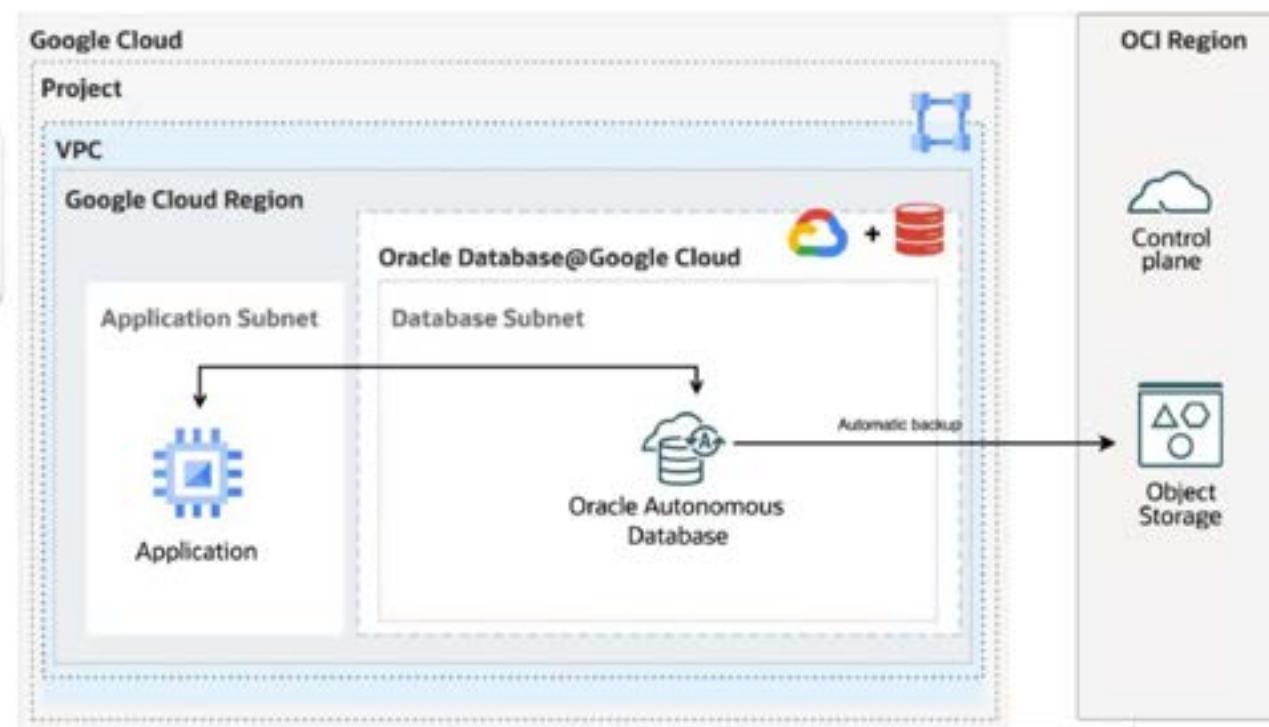
- OCI Object Storage (default)
- Autonomous Recovery Service - RCV (recommended)

- ✓ Automated one-click setup
- ✓ Option for real-time data protection
- ✓ Backup immutability
- ✓ Mandatory and automatic encryption
- ✓ Incremental forever backups
- ✓ Higher operational efficiency
- ✓ Faster recovery
- ✓ Backup on primary and/or standby
- ✓ MAA Backup/Restore Practices and Performance Observations
- ✓ RCV can run in OCI or Google Cloud



Configure Backup for Autonomous Database Service

- ▶ OCI Object Storage
- ▶ Automated and Manual



Monitoring Resources in Google Cloud

Simplified Monitoring Using Google Cloud Monitor

Monitor Exadata VM Metrics

Monitor Database Metrics, Logs and Events

