Oracle Database Exadata Cloud at Customer

Technical Deep Dive

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CIO

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October 1–5, 2017
SAN FRANCISCO, CA
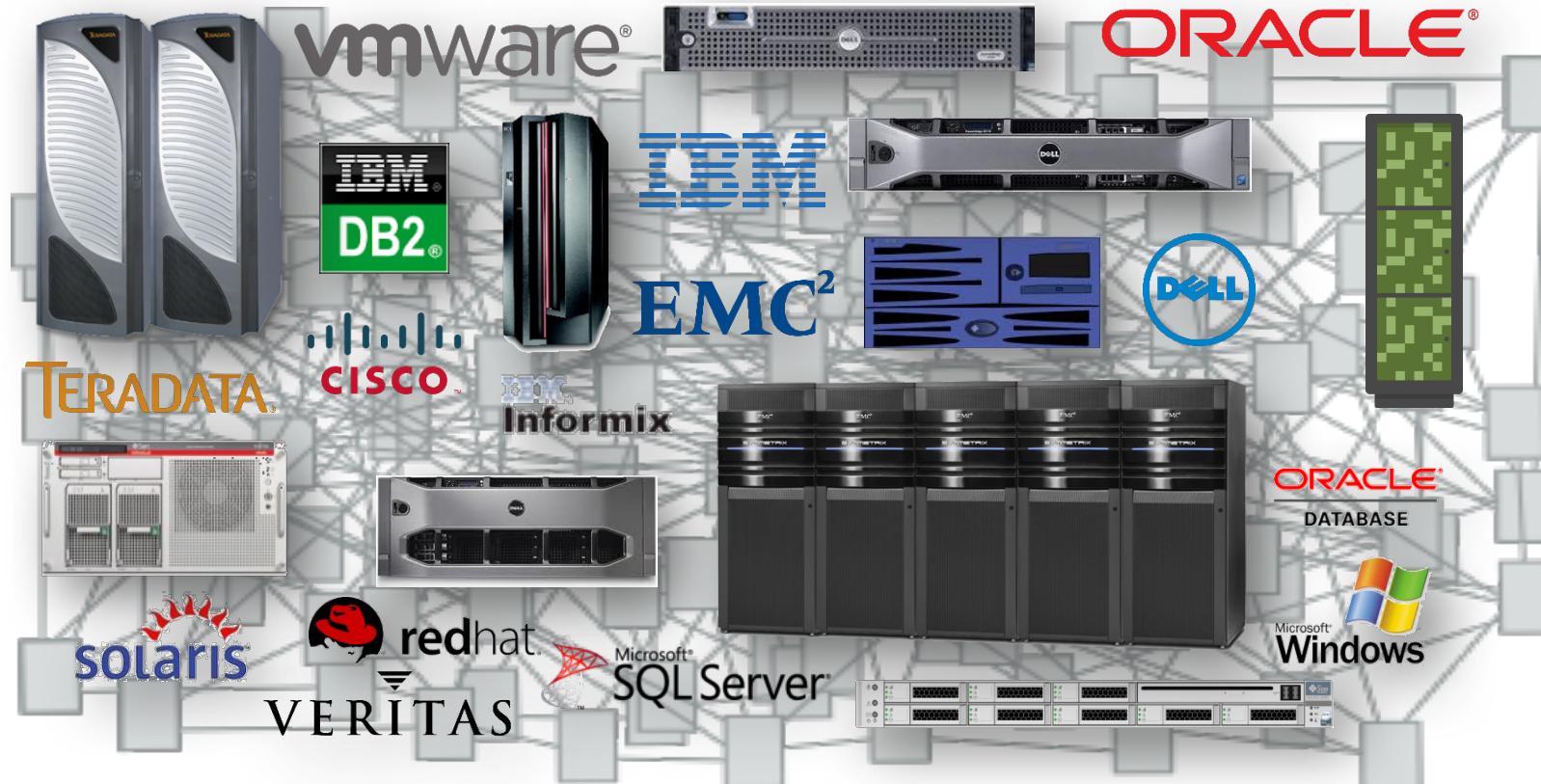
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Safe Harbor Statement

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Agenda

1 Introduction

2 Service Details

3 Cloud Automation

4 Operational Aspects

5 Security

6 Deployment

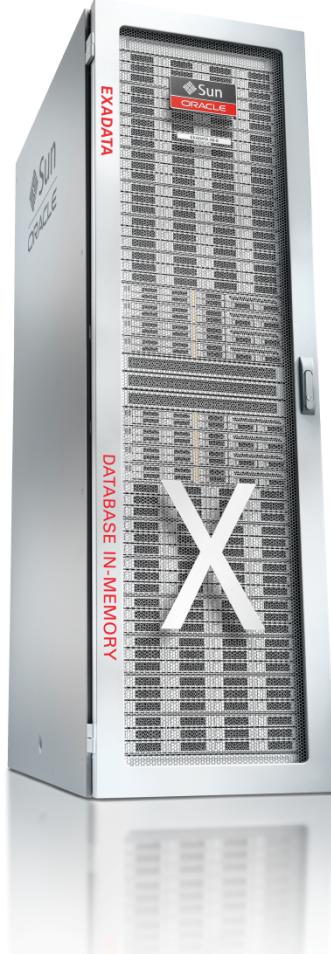**7** Why Oracle Cloud at Customer - Kingold

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Enterprise Database IT … with Time

Chaos, Lack of Accountability, Operational Inefficiencies

Exadata Database Machine
Performance, Availability and Security

Best Platform for Oracle Databases on-premises and in the Cloud

Enabled by:

- **Single-vendor accountability**
- **Exclusive focus on databases**
- **Deep hardware and software integration**
- **Revolutionary approach to storage**
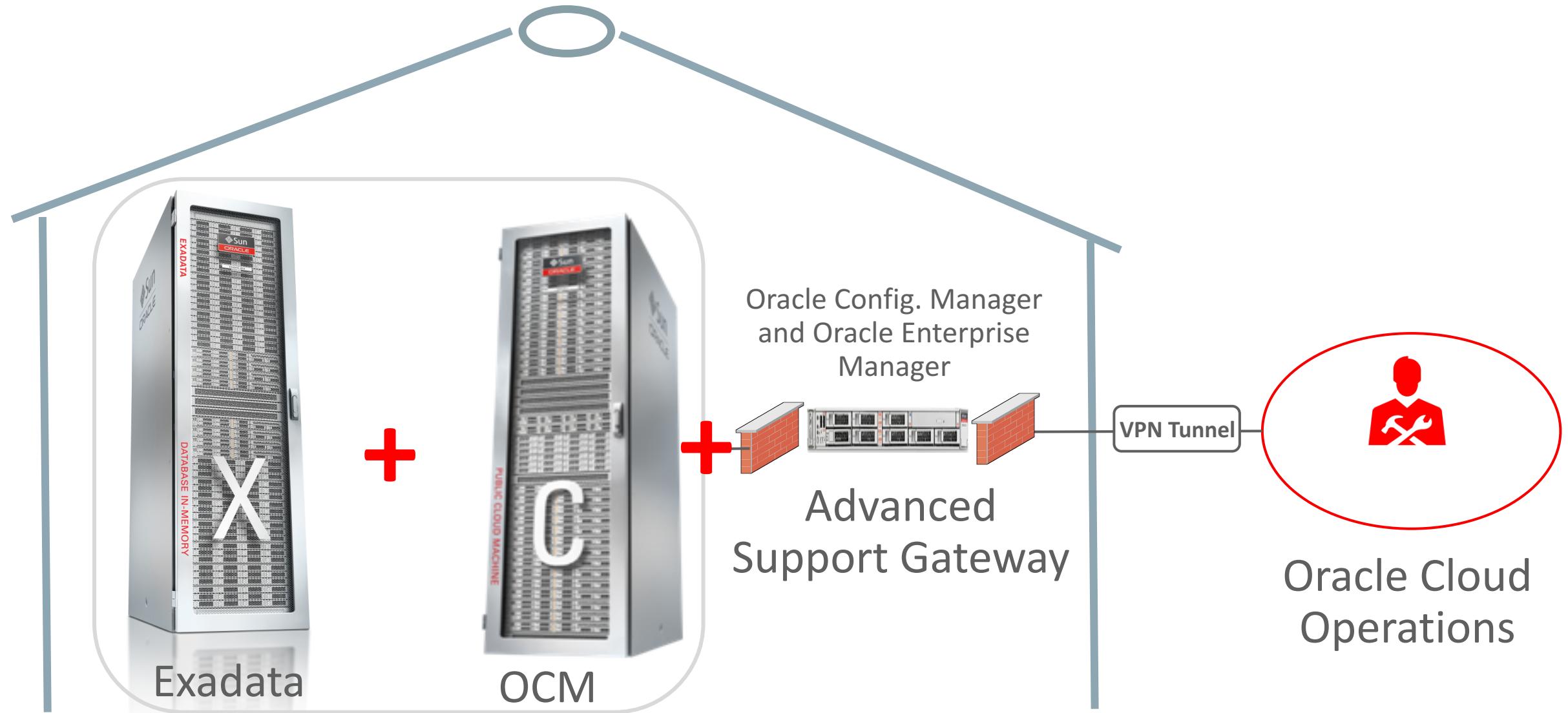
Proven at Thousands of Critical Deployments since 2008

OLTP – Analytics – Data Warehousing – Mixed Workloads

4 OF THE TOP 5
BANKS, TELCOS, RETAILERS RUN EXADATA

- **Petabyte Warehouses**
- **Online Financial Trading**
- **Business Applications**
  - SAP, Oracle, Siebel, PSFT, …
- **Massive DB Consolidation**
- **Public SaaS Clouds**
  - Oracle Fusion Apps, Salesforce, SAS, …

Exadata Cloud at Customer

Oracle Config. Manager
and Oracle Enterprise
Manager

VPN Tunnel

Advanced
Support Gateway

Exadata

OCM

Oracle Cloud
Operations

Agenda

1 ▶ Introduction

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7 ▶ Use Case – Why Oracle Cloud at Customer - Kingold

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Oracle Database Exadata Cloud at Customer (ExaCC)

**Database Cloud Service at Customer Data Center**

- Exadata Cloud Service, infrastructure managed by Oracle

- Ideal customer profile
  - Customers with systems too complex to move to public cloud
  - Customers who require compliance with data sovereignty laws
  - Customers with apps that are sensitive to WAN network latency
  - Customers who want cloud benefits but not ready for public cloud

Exadata Cloud at Customer

Full Oracle Database Options Included In Your Subscription

	Multitenant
	In-Memory DB
	Real Application Clusters
	Active Data Guard
	Partitioning
	Advanced Compression
	Advanced Security, Label Security, DB Vault
	Real Application Testing
	Advanced Analytics, Spatial and Graph
	Management Packs for Oracle Database

All Oracle Database Innovations

EXADATA
PUBLIC CLOUD MACHINE
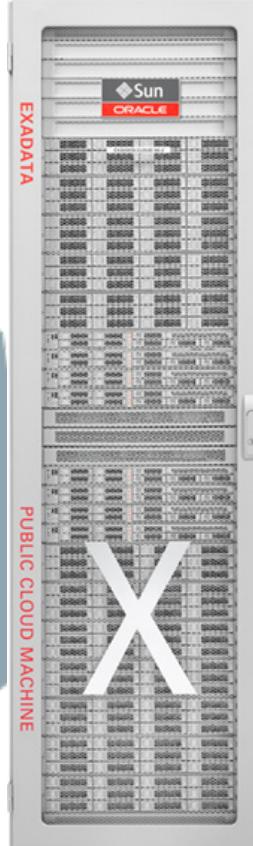
All Exadata DB Machine Innovations

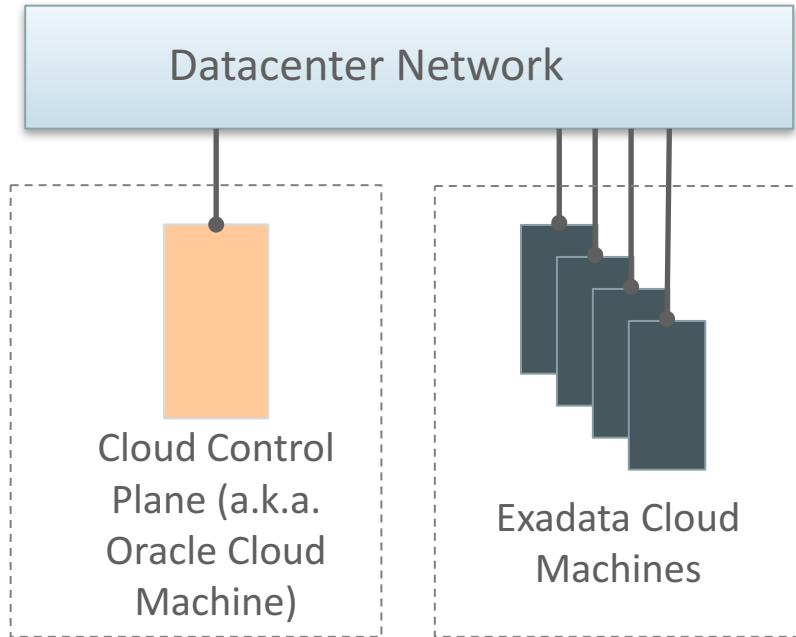|	
Offload SQL to Storage	
InfiniBand Fabric	40 Gb/s
Smart Flash Cache, Log	PCI Flash
Storage Indexes	
Columnar Flash Cache	
Hybrid Columnar Compression	HCC 10:1
I/O Resource Management	I/O I/O I/O
Network Resource Management	PRIORITY LANE
In-Memory Fault Tolerance	
Exafusion Direct-to-Wire Protocol	

Service Details

- Same Services as Exadata on Public Cloud
  - Includes Exadata HW (X6) & SW, Database SW
  - Oracle Database 12.2.0.1, 12.1.0.2 and 11.2.0.4 with Grid Infrastructure 12.2.0.1

- Start with minimal cores within a rack, scale as needed
  - Quarter Rack: 22 cores, enable additional cores on demand
  - Access to full 85 TB of storage and 1440 GB Memory
  - Can expand to 100s of cores, 100s of TB storage, Millions of IOPs

- One VM per Database Server
  - Oracle has ownership of Dom0
  - Customer has administrative privileges for DomU: deployment of databases, agents, scripts

11

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Service Details (… continued)

- Oracle manages Exadata infrastructure
  - Servers, storage, storage software, networking, firmware, hypervisor, etc.
- Customers control and manage software that directly affects their application
  - Database, Grid Infrastructure, VM Guest (DomU) OS
- Customers can configure and run databases as they like
  - Customers initiate automated database update script when it is convenient for them
  - Can be run rolling across nodes to avoid database downtime
  - Databases can be backed up to existing data center infrastructure (e.g. Recovery Appliance)
  - Usual MAA best practices apply (e.g. DR with Data Guard to a another compatible standby platform)

Oracle Cloud Control Plane (OCM)

Datacenter Network

Cloud Control Plane (a.k.a. Oracle Cloud Machine)

Exadata Cloud Machines

One Control Plane Manages Multiple ExaCMs in same Metro Region
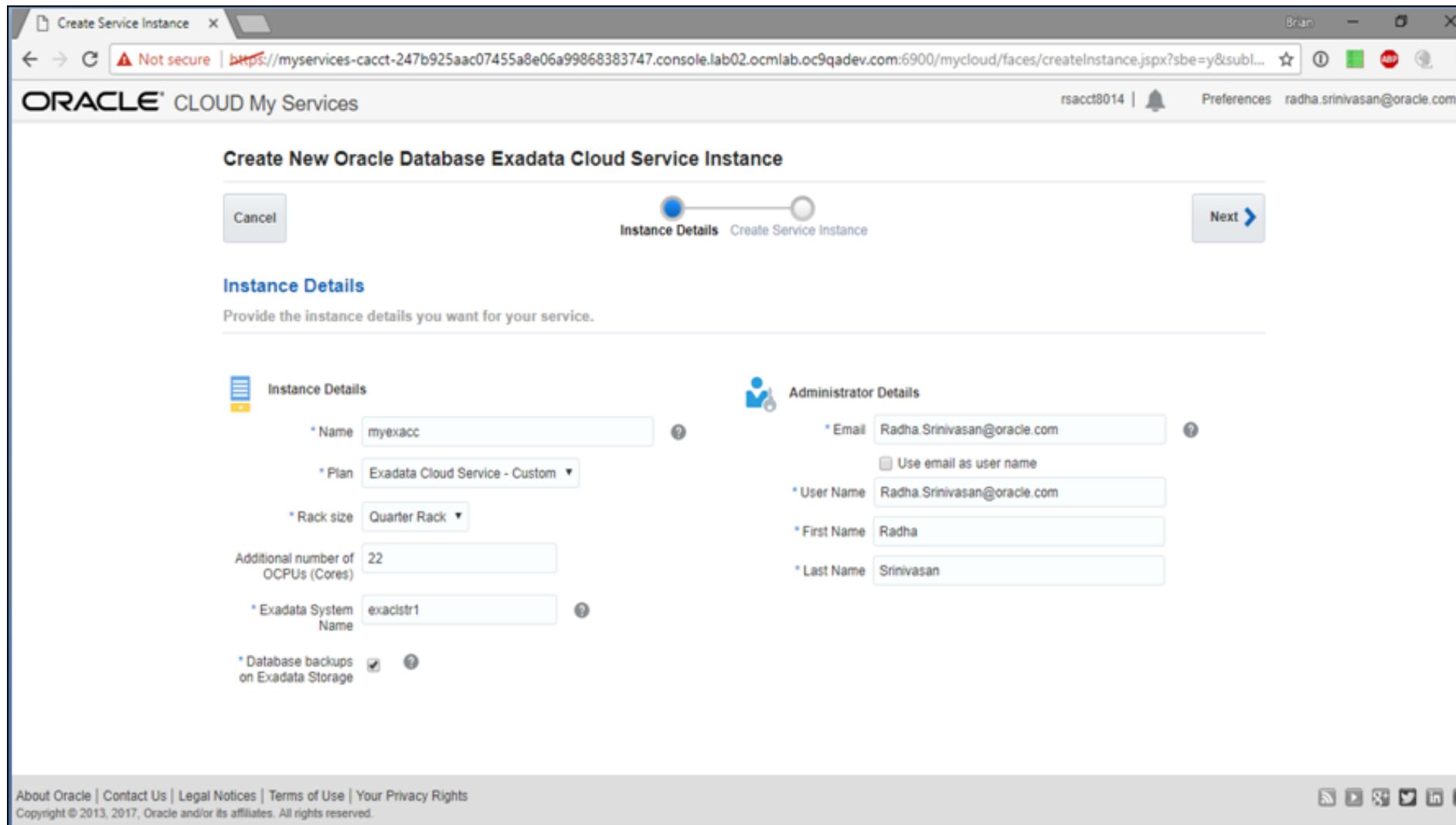
- A Control Plane is required for any Exadata Cloud Machine deployment
  - Foundation for additional IaaS and PaaS
  - Cloud Automation Software
  - Rest Services
  - Networking Services

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Fully Automated Database Provisioning

Self-service to apply Quarterly Updates
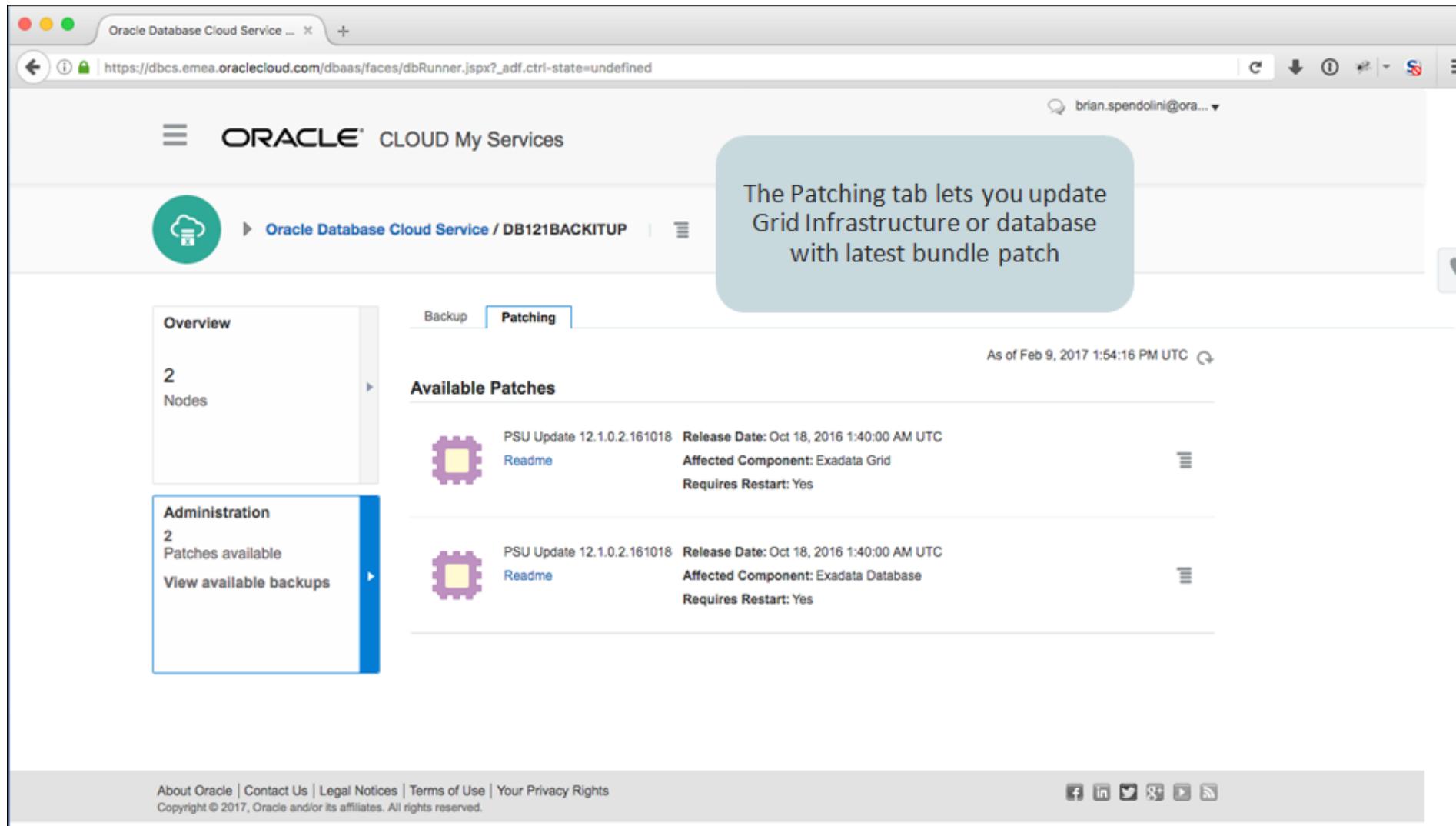
Configure backup policy - Weekly full, daily incremental
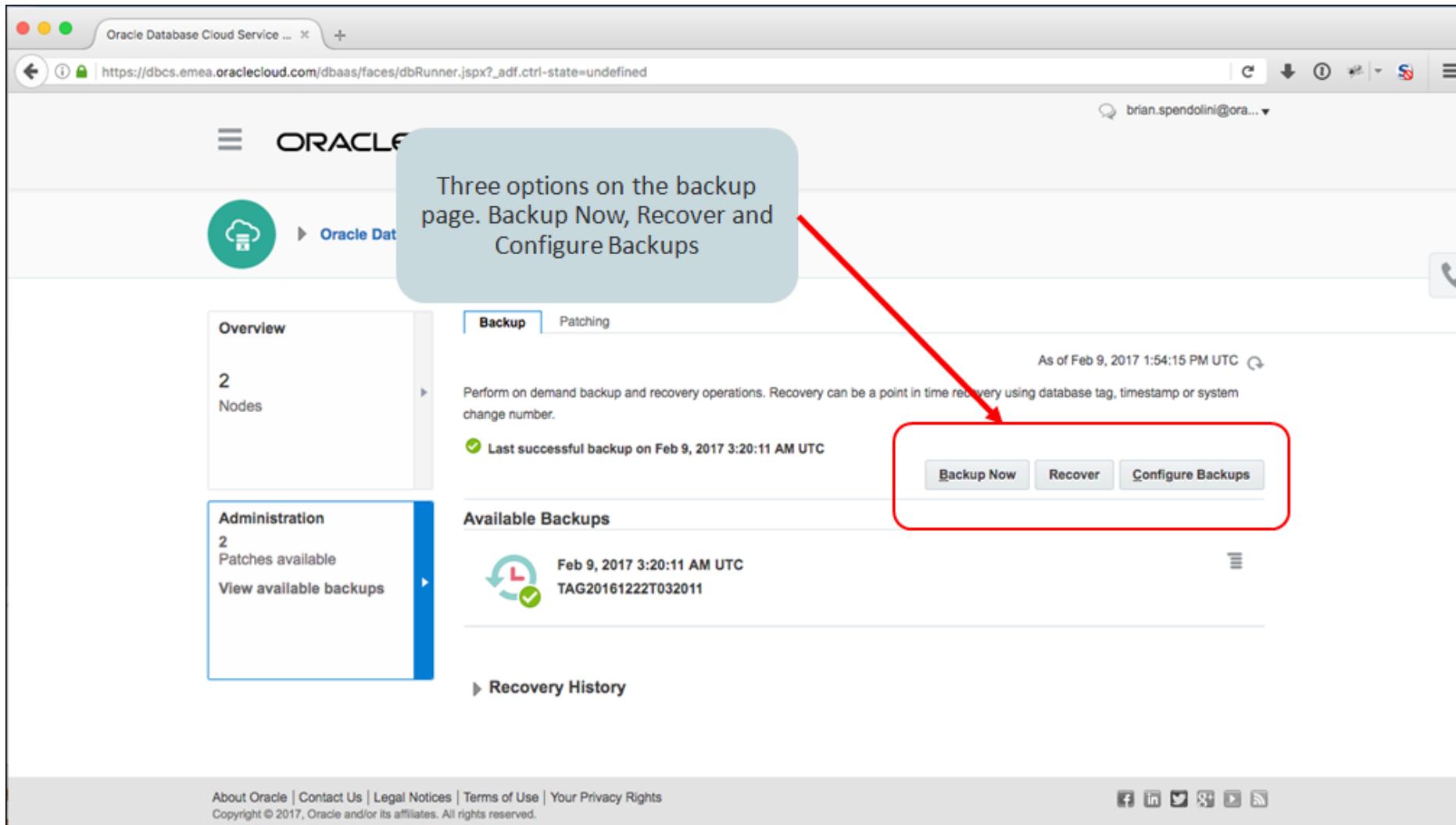
I/O Resource management - Prioritize I/O resources among multiple databases

Default Share: 1

Share Value Range: 1-32

Set the share value for each database, click Save!

OCPU Scale Up v/s Bursting

Customer Subscribes to Quarter Rack with 22 OCPUs. Max OCPU: 84. Term = 4 Yrs

- Scale Up – Permanently increase CPU capacity for the remaining term.
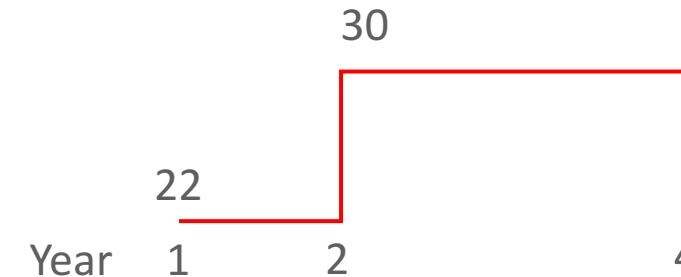
  Longer Term, Lower cost

- Bursting – temporarily increase CPU capacity in as small as hourly increment

  Shorter Term, Higher cost
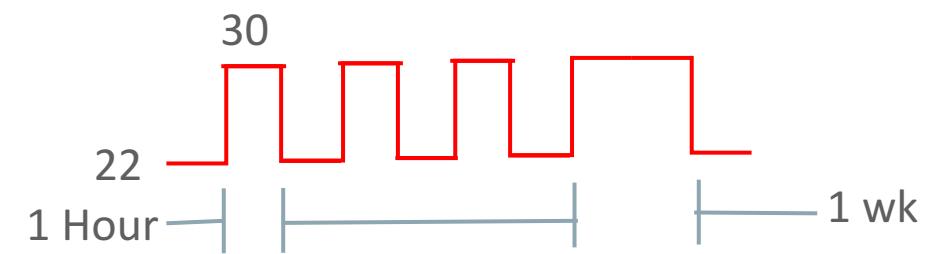
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yif0906 | Preferences ▾ | yifan.ding@oracle.com ▾

Modify Oracle Database Exadata Cloud Service Instance

Cancel

● ──── ○
Instance Details   Modify

Next ❯

Instance Details

To modify the Exadata Instance characteristics, please specify the attributes and their values. In some cases, the values will be additive, e.g. when you add OCPUs (cores) to your existing Exadata Service.

ⓘ You are permitted to use resources above your subscription rate at additional cost. Details

Instance Details

* Name exadatacloud02

○ Subscription
● Burst

Increase the number of cores in your Exadata service to higher than the subscription allocation. You can burst to maximum 8 per Compute Node.

Changes reflected in this slider are applied symmetrically over all compute nodes.

OCPUs (Cores) per Compute Node

— ... **+**

8   9   10   11   12   13   14   15   16
                                      16

Reset

Choose max number of burst OCPUs

Current Configuration:
Rack size: Quarter Rack
Compute Nodes: 2
Total OCPUs (Cores) per Compute Node: 8
  Subscription OCPUs (Cores) per Compute Node: 8
  Burst OCPUs (Cores) per Compute Node: 0

Total OCPUs (Cores): 16

Configuration after Update:
Total OCPUs (Cores) per Compute Node: 16
  Subscription OCPUs (Cores) per Compute Node: 8
  Burst OCPUs (Cores) per Compute Node: 8

Total OCPUs (Cores): 32

Additional number of Burst OCPUs (Cores) Hourly: 16

REST APIs

- Database Instance Control
  - Create
  - Delete

- Compute Node Control
  - Stop
  - Start
  - Restart

- View Details
  - Single Database
  - All Databases
  - Compute Nodes
  - Status of an Operation

Visit http://docs.oracle.com/cloud/latest/exadatacs/EXARS/index.html for details

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High Availability and Backup & Recovery

- Integrated Exadata Maximum Availability Architecture features and practices
  - Full data protection, consistency, transactional isolation
  - Fully active RAC cluster with high redundancy ASM
  - Redundant InfiniBand and Ethernet networks
  - Data Guard to any platform-compatible standby database at any desired location (ExaCM standby recommended)

- Leverage existing backup infrastructure
  - Zero Data Loss Recovery Appliance, Oracle Database Backup Cloud Service
  - NFS Server such as ZFS Backup Appliance
  - Any other 3rd party backup solution (tape, disk, cloud)

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Operational Components and Responsibility Division
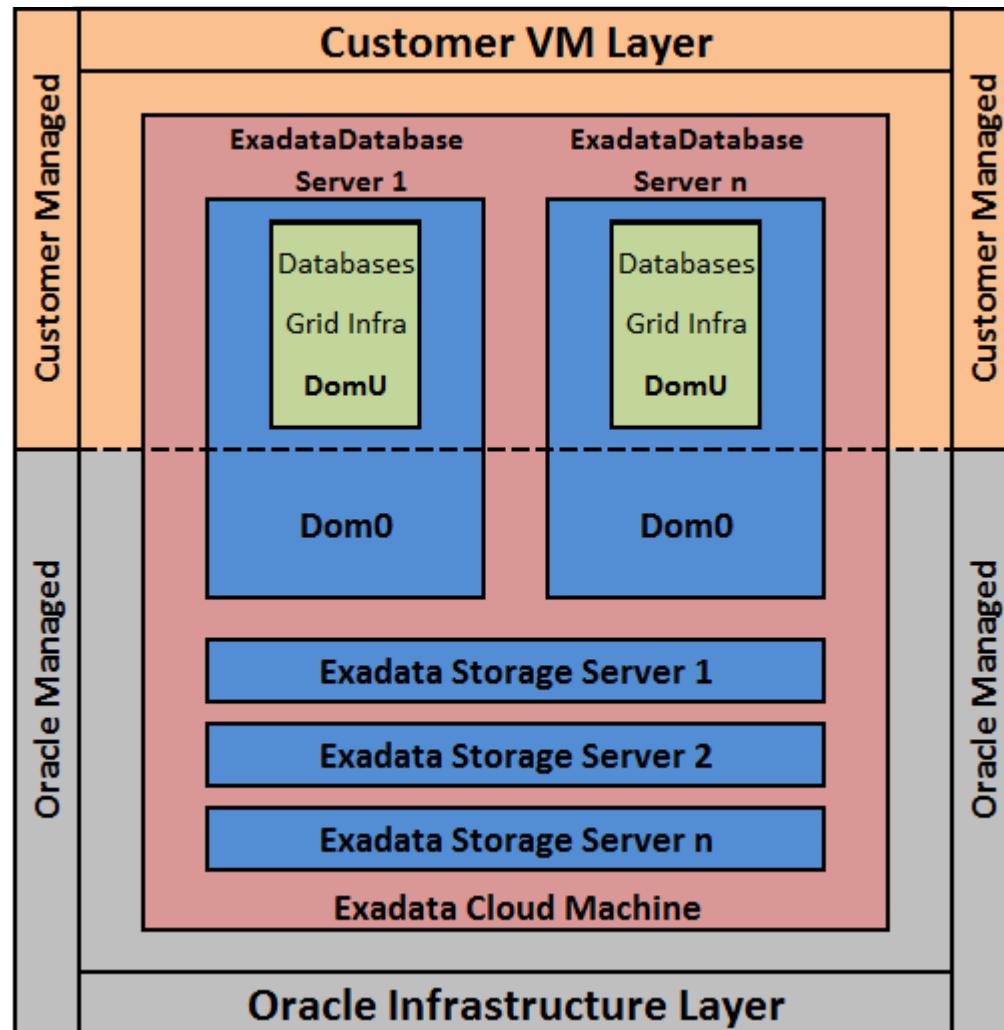
- Virtual machine (VM) operating systems running the Exadata compute node software
- Grid Infrastructure on the compute node
- Database software on the compute node

Responsibility Division

- Ethernet switches
- InfiniBand switches
- Power supplies
- Exadata Compute and Storage Server Hardware
- Hypervisor running on the physical servers

Cloud Operations

Outstanding Global Capability with Local Service Affinity

3,000+ senior delivery professionals with 15+ years experience	24 x7 Service delivered through Multiple Global Operations Centers	Advanced Support Platform Unique IP for rapid, secure and low risk delivery
• Expertise in Oracle technologies paired with deep understanding of customer infrastructure and needs • Delivering tailored services to **4000+ customers globally**, in all lines of business for more than 20 years • Services to support customers entire lifecycle with Oracle	• Fully redundant ensuring BCP/DR for all Advanced Support Cloud Services functions • Provide support for Customers **in more than 45 countries** • Certificates ISO 27001:2013 and SSAE16/SOC 1 Type II for multiple services	• Oracle Advanced Support Platform is utilized to deliver Cloud Operations for ExaCM. • This is the same platform utilized over the last 10 years to deliver 24 x 7 **monitoring and management to more than 100,000 targets**, managing infrastructure, database, middleware and applications

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Oracle Cloud Operations Service Access

Service Prerequisite – Oracle Advanced Support Gateway

- Advanced Support Gateway connects customer DC with Oracle
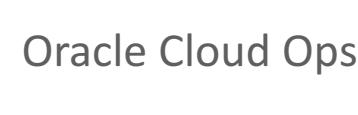
- ExaCM + OCM ⟷ OASG ⟷ Oracle Cloud Ops

  Network connectivity is required for Oracle to manage the environment
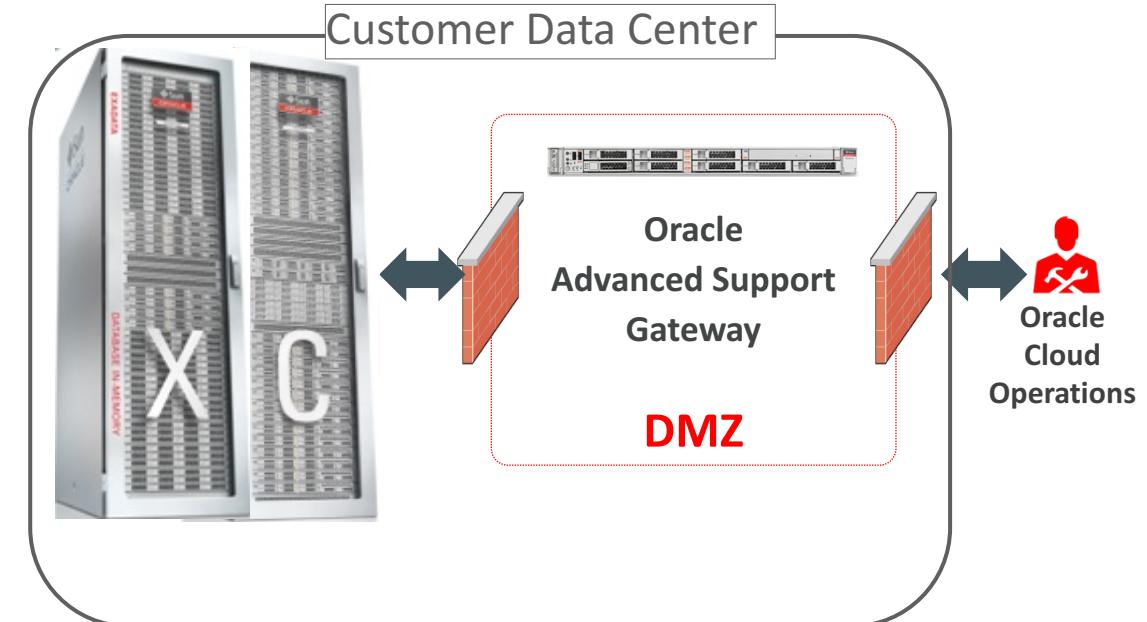
Customer Data Center

Oracle Advanced Support Gateway

DMZ

Oracle Cloud Operations

Oracle Cloud Operations Service Access

Service Prerequisite – Oracle Advanced Support Gateway

Customer Data Center

Firewall

SSL
SNMP

SSL

X C

SSL
SSH
SNMP

DMZ

Oracle and Exadata Cloud Machines

Oracle Advanced Support Gateway

SSL VPN tunnel/HTTPs

Two-factor authentication

Oracle Advanced Support Platform

SSL

SSH

Analysis, Reporting

Configuration Management

Oracle Advanced Support Portal
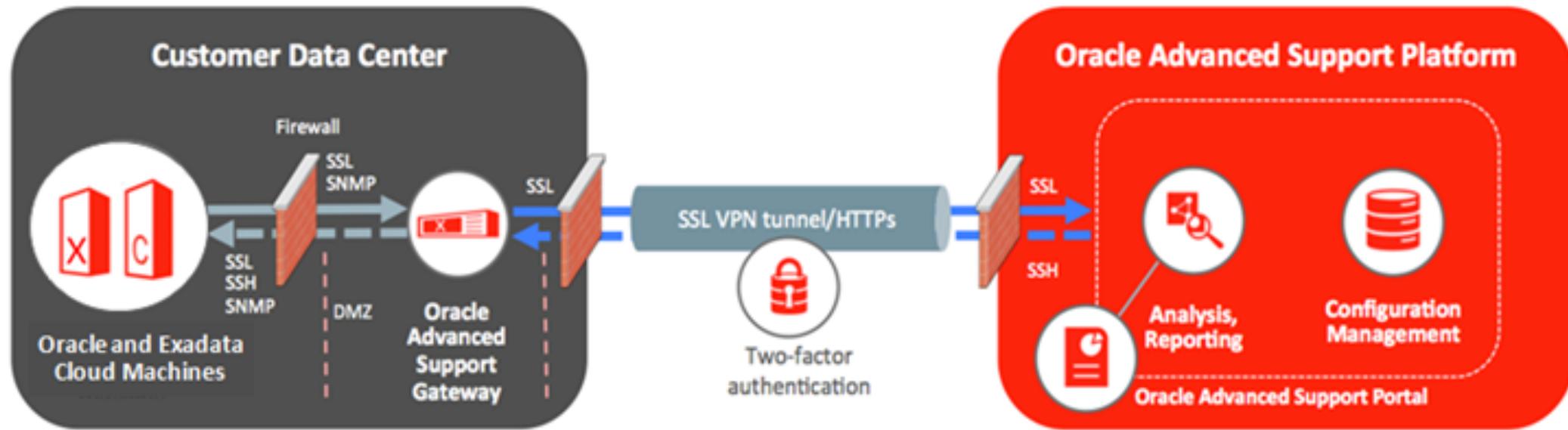
Oracle Advanced Support Gateway is the central enabling technology in our ability to deliver cloud operations, remote monitoring, remote response and restoration, and patch deployment services

Oracle Advanced Support Platform is the remote service delivery system by Oracle, based on the ITIL framework

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Oracle Cloud at Customer Deployment

Self-service Tenants

Customer Data Center

Oracle Cloud Control Plane   **Exadata Cloud Machine**

SSH
SNMP
TLS (https)

DMZ

Oracle Advanced Support Gateway

TLS (https)

VPN Tunnel (SSH, TLS)

Oracle Cloud Operations Infrastructure

Cloud Operations and Support

Installation and Configuration

Cloud Administration

Oracle Advanced Support Portal
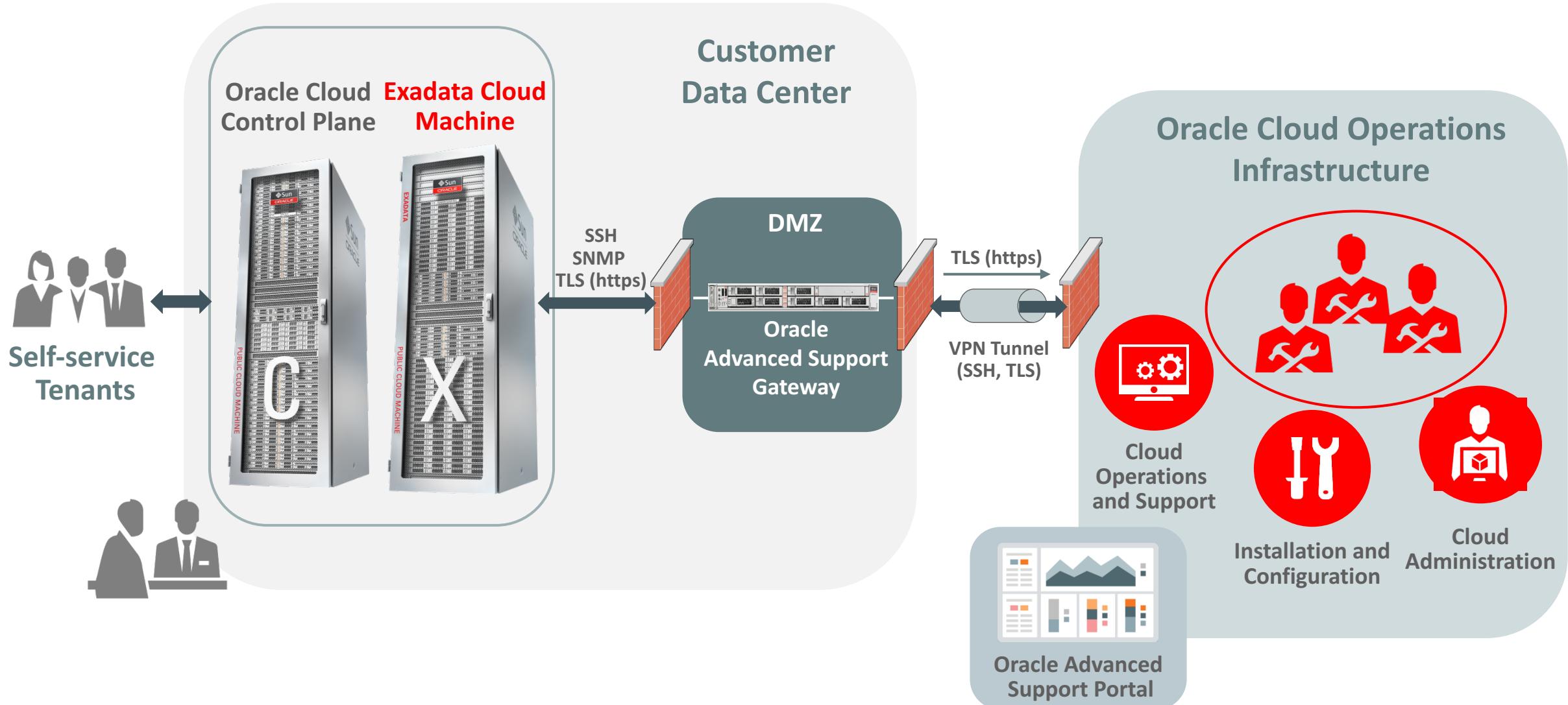
Oracle Cloud at Customer Deployment

Key Customer Deliverables

- Data Center location

- Oracle Advanced Support Gateway - SIW
  - Gathers the information for deploying the Monitoring Solution (OASG)

- Oracle Cloud Machine – PCMA
  - Gathers the information for deploying Oracle Cloud Machine, Exadata Cloud Machine

- Exadata Cloud Machine – OEDA
  - Gathers the information for deploying Exadata Cloud Machine
  - Limited input needed

Typical Deployment
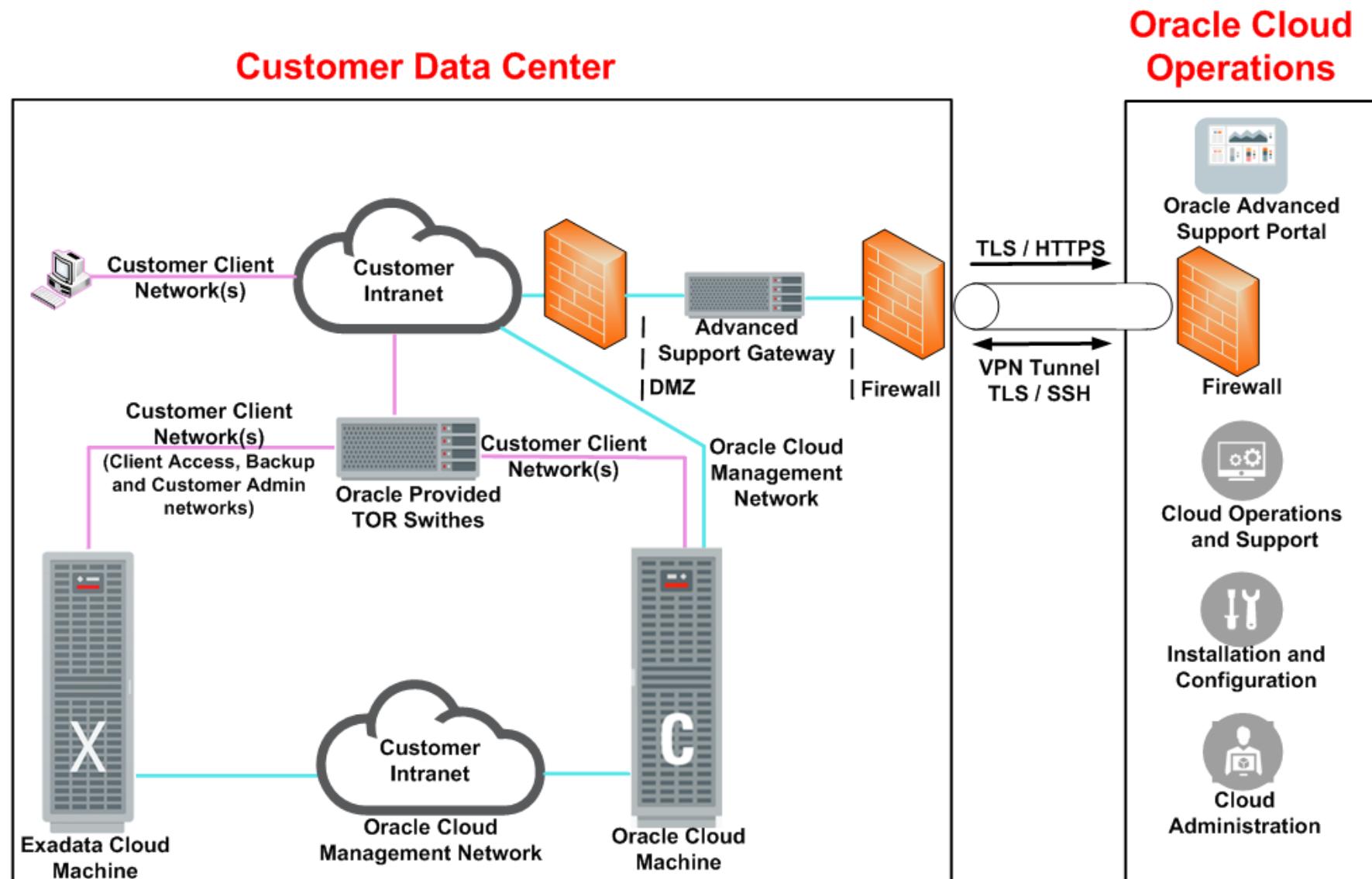
Customer Use Case 1: ExaCM Full Rack with Control Plane
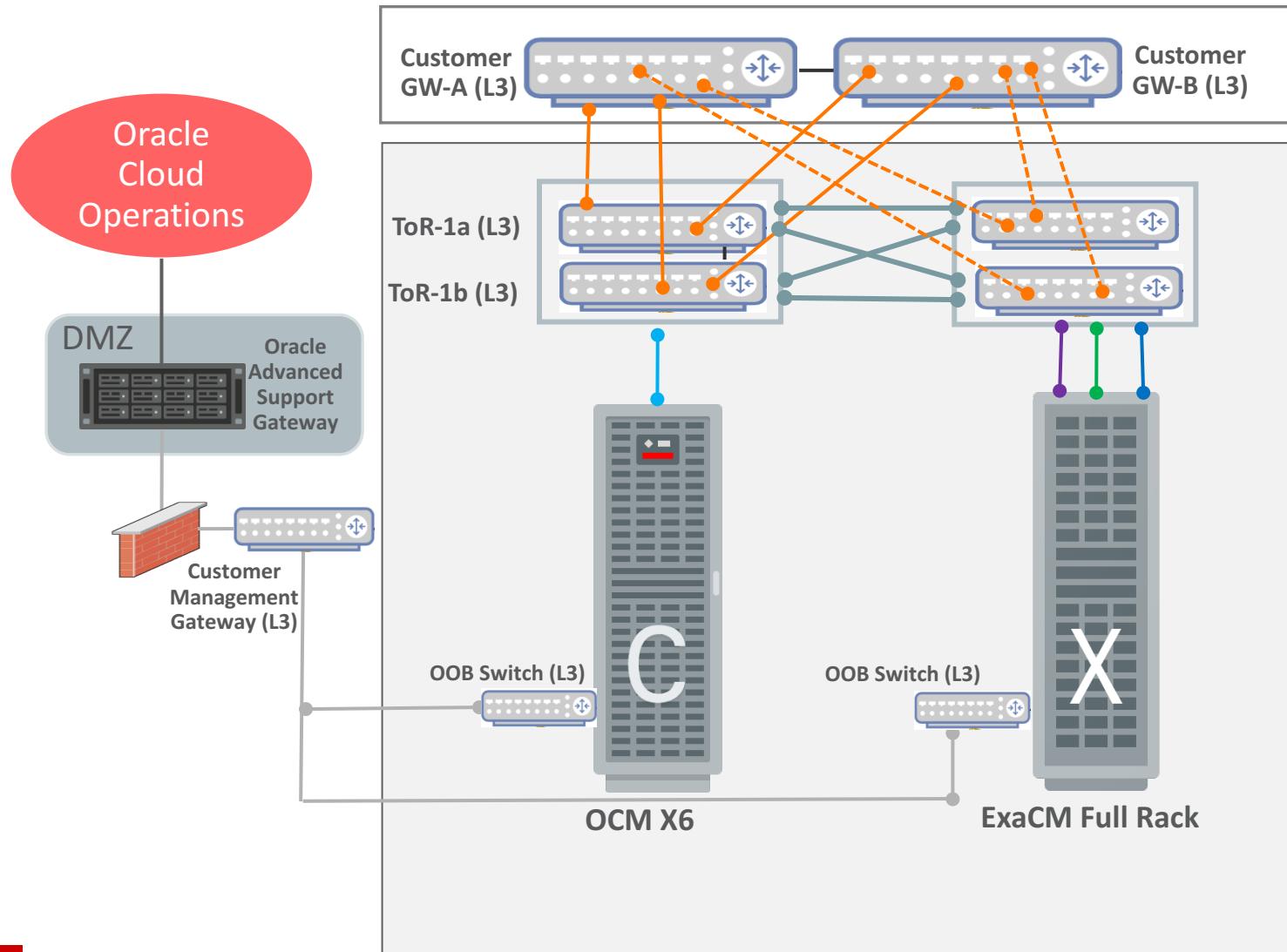
Customer Use Case 2: One Full and one Half ExaCM with Control Plane
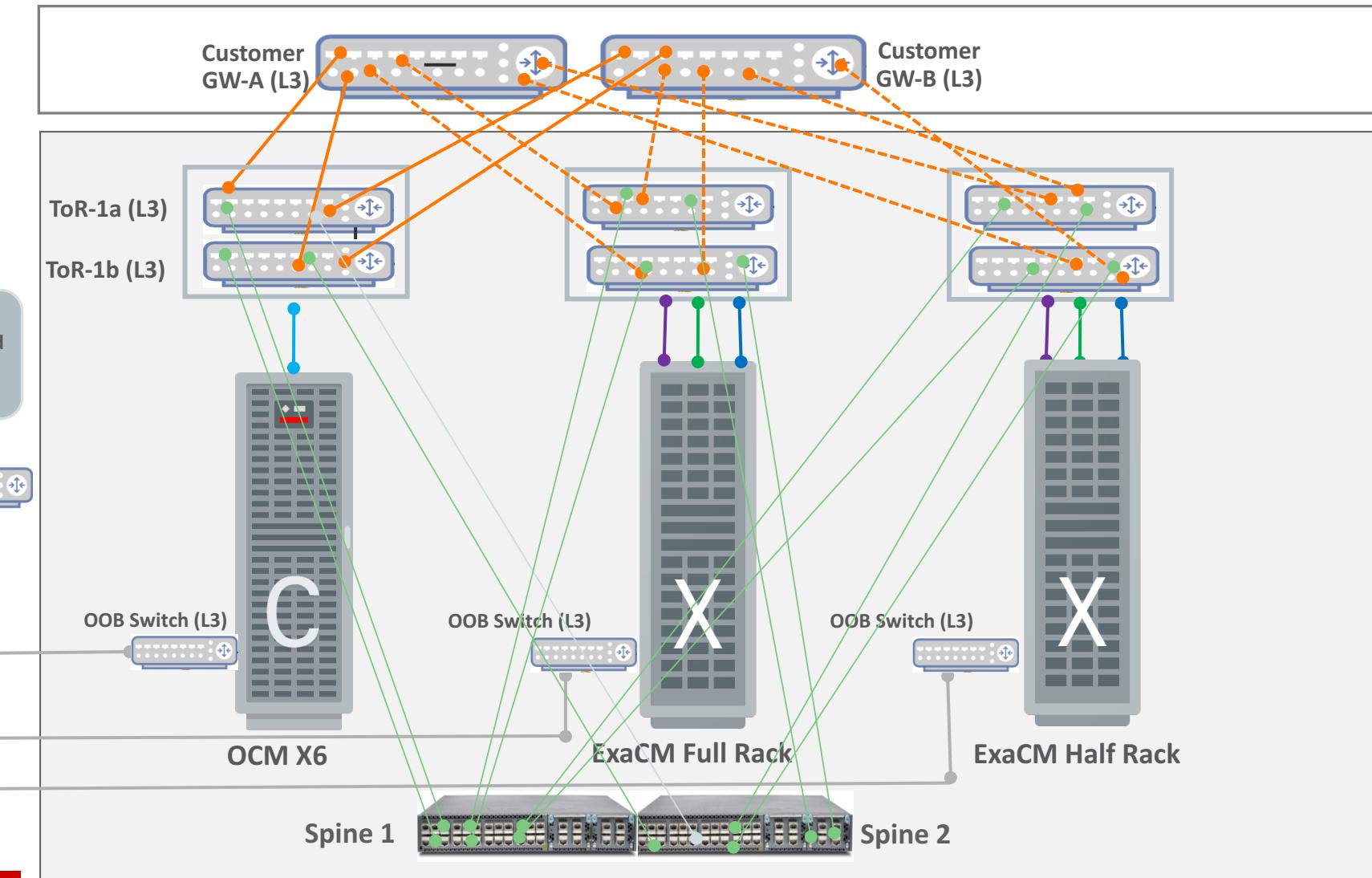
Where does Cloud At Customer connect in the Datacenter Network?

Core

Distribution

Customer L3
Access switches

Oracle ToR switches
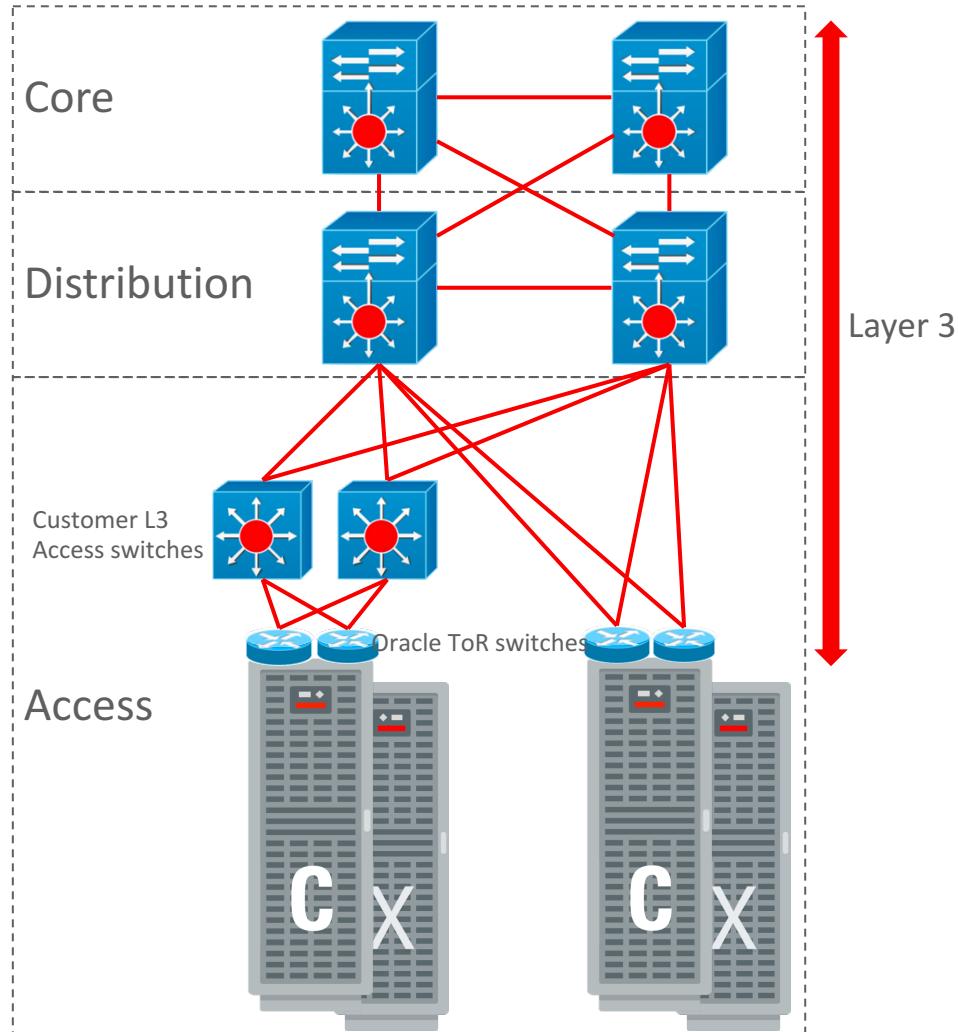
Access

Layer 3

- OCM and ExaCM connects to Access or Distribution switches at Layer 3*

- Access switch acts as a Layer 3 routing gateway

- Benefits of connecting ExaCM and OCM to Layer 3:
  1. Simplify OCM integration with Customer network
     - Eliminates IP conflicts with Customer network
     - Eliminates VLAN conflicts
     - Reduces the amount of information needed from the customer
  2. No need to worry about Spanning Tree, potential loops
  3. Required by SDN in Cloud At Customer
     - virtual networks are implemented as overlay networks
     - L3 gateway acts as egress/ingress for virtual networks

*Layer 3: Network layer responsible for packet forwarding including routing
*Layer 2: Data link layer transferring packets within a same LAN or WAN

Starting Point for Handoff
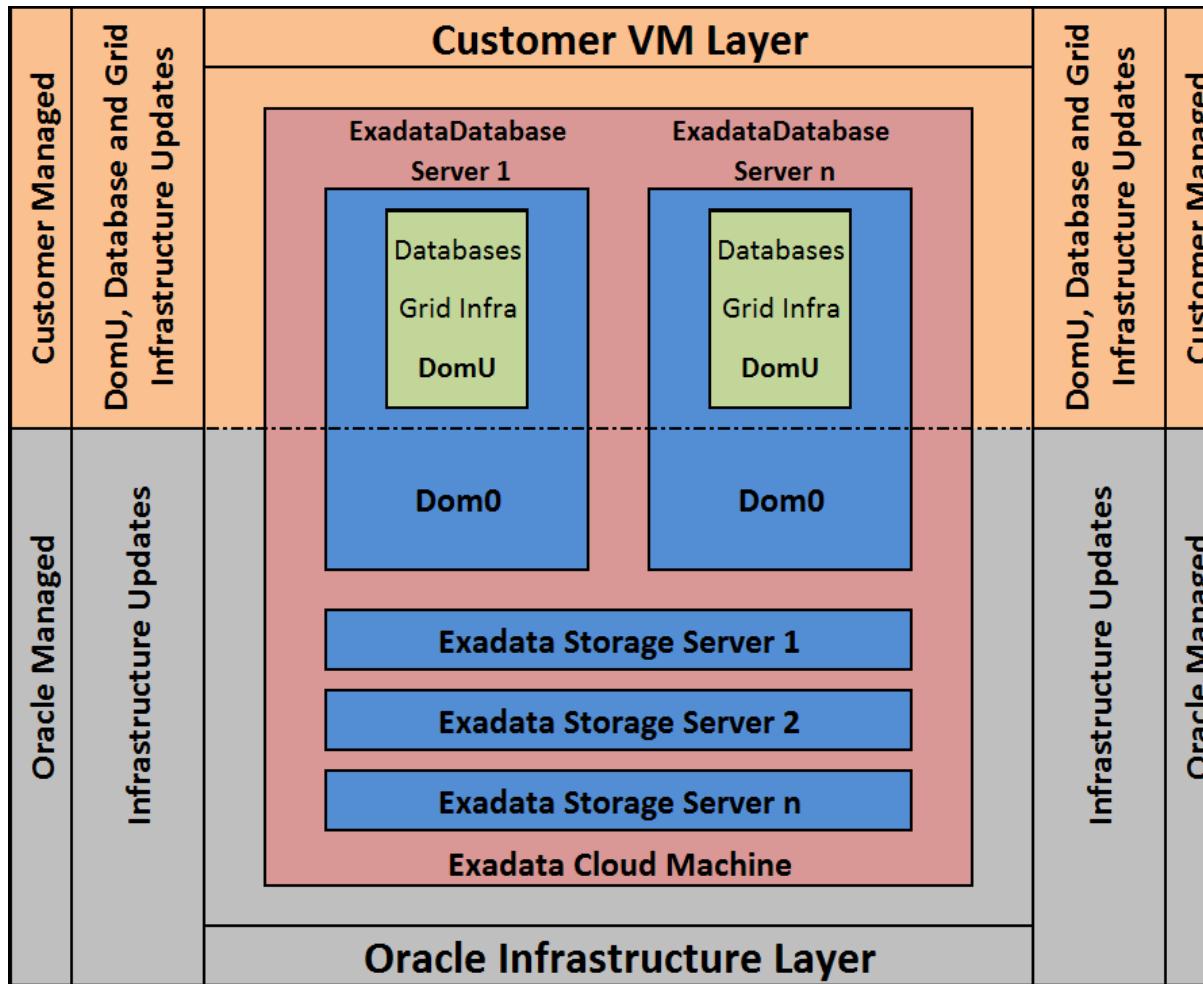
- Virtual machine (VM) operating systems running the Exadata compute node software
- Grid Infrastructure on the compute node
- Database software on the compute node

- Ethernet switches
- InfiniBand switches
- Power supplies
- Exadata Storage Servers
- Hypervisor running on the physical servers

Network Requirement Considerations for Exadata Cloud Machine

IP Pool Requirements
- What is the Size of your rack (Qtr/Half/Full)
- How many racks deployed?
- What are the CIDRs, Gateways, IP ranges, etc?

Bandwidth Provisioning
- What throughput is required?
- Planning to provision for peak usage?

Physical Connectivity
- Existing 10GbE Infrastructure
- Cable Length, number of ports available?

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ExaCM IP Requirements

Rack Size	Eighth Rack Minimum IP Range	Quarter Rack Minimum IP Range	Half Rack Minimum IP Range	Full Rack Minimum IP Range
Full Rack Minimum IP Range Recommended for Smaller Rack Sizes (Eighth, Quarter, Half) to allow for future upgrades up to Full Rack without having to reconfigure!				
	# Of IP Needed CIDR	# Of IP Needed CIDR	# Of IP Needed CIDR	# Of IP Needed CIDR
Oracle Cloud Management IP Pool	16	16	26	46
	x.x.x.x/27	x.x.x.x/27	x.x.x.x/27	x.x.x.x/26
ExaCM Client Access Network	7	7	11	19
	x.x.x.x/28	x.x.x.x/28	x.x.x.x/28	x.x.x.x/27
ExaCM Backup Network	2	2	4	8
	x.x.x.x/30	x.x.x.x/30	x.x.x.x/29	x.x.x.x/28
Customer Admin Network	2	2	4	8
	x.x.x.x/30	x.x.x.x/30	x.x.x.x/29	x.x.x.x/28

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ExaCM / OCM Access Map

OCM CLI access

Tenant User
First, login to CLI VM with whatever credentials that give access to that VM

Linux platform
CLI VM

ExaCM Tenant Admin
Administer ExaCM DBCS Users via "oracle-compute"

ExaCM Administrator
Configures Exadata (e.g. bursting), admin user admin, machine instance management. "Admin" URL provided on activation

Exadata database clients connecting as normal across client network

OCM Control Plane

Tenant: NSSB01

OCM Tenant User
Access to tenant administration via "oracle-compute"

Admin UI

ExaCM ID: a15812

Service Console

ExaCM

DB1   DB1

Dom U VM1   Dom U VM2

OEM Agent   OEM Agent

VM user access

VM User
IP Address on client net Credentials will be Username/pwd or ssh

Guest VMs

OEM user associated with tenant user for Self-serv-portal within OEM

OEM access

OEM User

Cust OEM
Self service portal

Manage guest VMs

Allows database mgmt. "Service Console" URL provided on activation

ExaCM DBCS User

Manage Databases

DBA

IP Address on client net. Access by ssh, keys generated on first Db creation. Additional keys can be generated

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Migrating Databases to Cloud

- 100% Oracle Database compatibility makes migration easy and low risk

- Local network connectivity to Exadata Cloud Machine provides fast migration

- Logical Migration: allows reorganization and optimization
  - Data Pump, GoldenGate Replication

- Physical Migration: simplest, byte-to-byte copy
  - RMAN backup, Transportable technologies, Data Guard
  - Restore from backup

- MAA Migration Best Practices "Best Practices for Migrating to Exadata Database Machine"
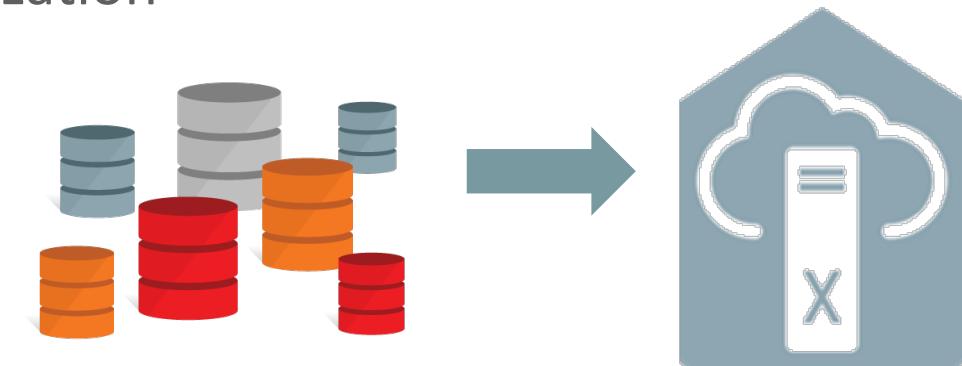
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3 ▶ Provisioning And Life Cycle Management

4 ▶ Operational Aspects and Cloud Operations

5 ▶ Security

6 ▶ Deployment

7 ▶ Why Oracle Cloud at Customer - Kingold

THE BAYVIEW

THE BAYVIEW

DR.CHAU CHAK WING BUILDING

IMPERIAL SPRINGS

KINGOLD CENTURY

"

We are committed to providing exceptional lifestyle choices to people who lead exceptional lives. We are guided by the belief that everything Kingold does should meet the highest possible standards.

"

20 %
~~RENAISSANCE INNOVATION~~
BUSINESS & NEW MODEL

80 %
MAINTENANCE

Media
Education
Real Estate
Banking
Wellness
Investments
Hospitality
Hotel

KINGOLD
僑鑫
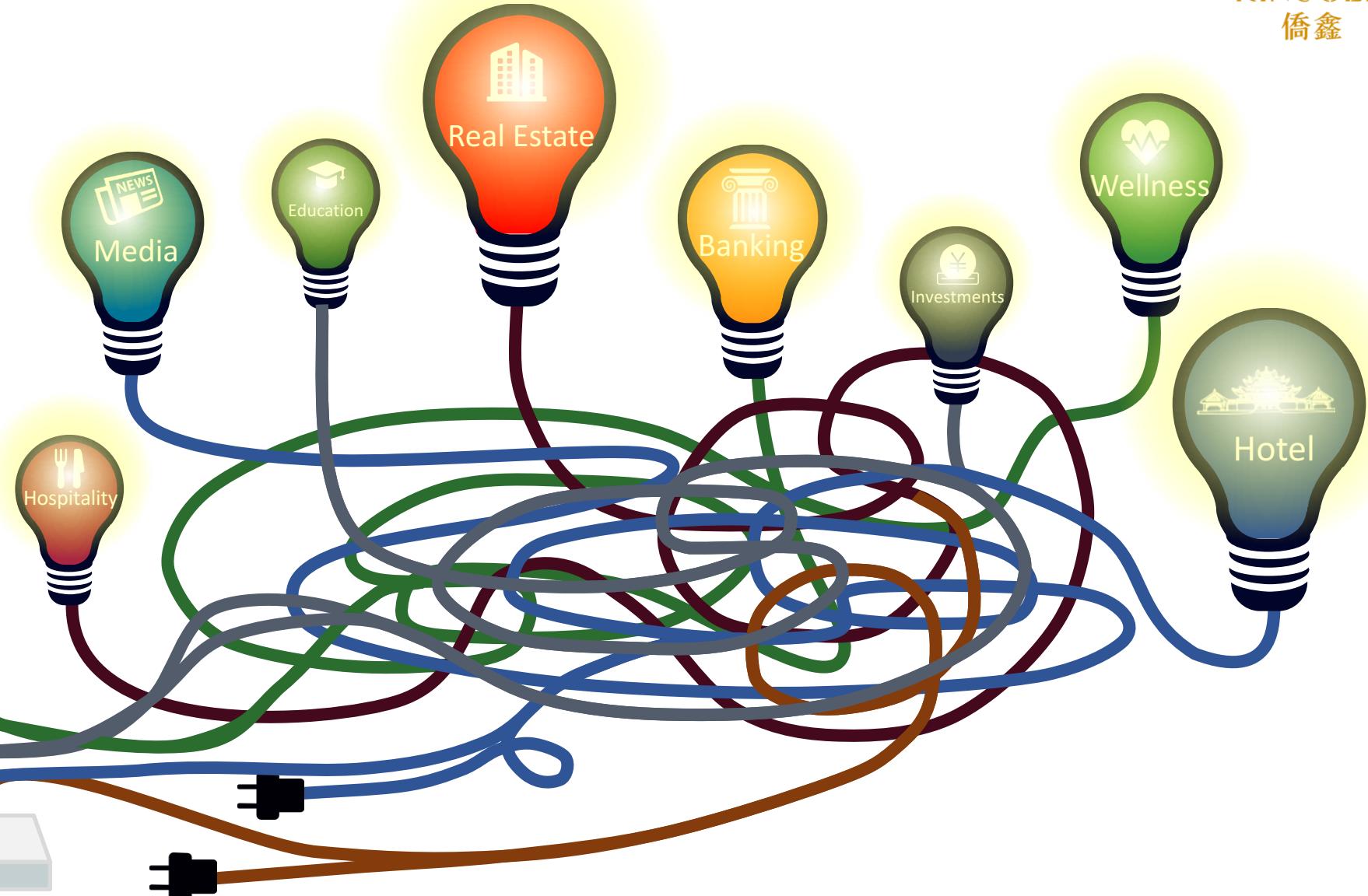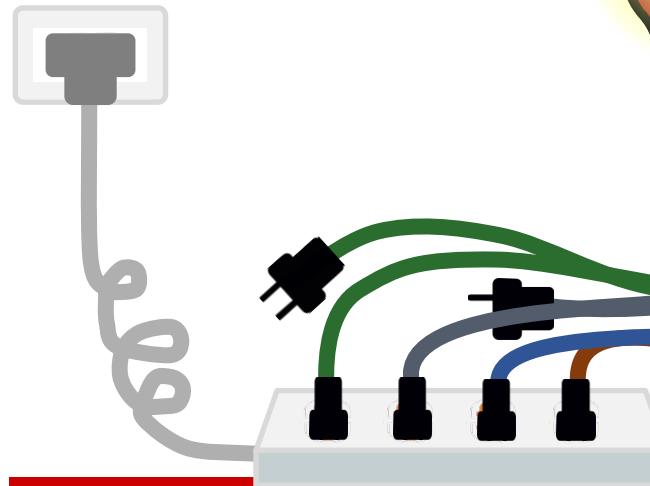
Rearchitecting from legacy architecture to
CLOUD ARCHITECTURE

WHY

&

HOW

Microsoft Azure

Hewlett Packard Enterprise — HPE Cloud System

Hewlett Packard Enterprise — HPE Hyper Converged 250 for VMware vSphere

2016

Simplification ✓	All Data Management	Enterprise Grade ✓ ✓ ✓
All Stack Solution H/W to S/W On-Prem to Cloud	Seamless Experience ✓	Data Security & Sovereignty ✓
OpEX	Turn-key Hybrid Platform	Justifiable ROI

2017

Simplification	All Data Management	Enterprise Grade
All Stack Solution H/W to S/W On-Prem to Cloud	Seamless Experience	Data Security & Sovereignty
OpEX	Turn-key Hybrid Platform	Justifiable ROI

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2017

KINGOLD

Cloud Strategy
&
Data Strategy

80 %
BUSINESS & INNOVATION

20 %
MAINTENANCE OPTIMIZATION

Q&A

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Stay Informed During and After OpenWorld

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Follow #CloudReady

LinkedIn: Oracle IT Infrastructure– Oracle Showcase Page
Oracle Big Data – Oracle Showcase Page

Converged Infrastructure Forum
Tuesday, Oct 3 from 6:30-9pm
SF MOMA
RSVP Required:
https://www.oracle.com/goto/Openworld/CIEventOct3

Oracle Database Development: High Availability, Exadata, and Cloud Services

Monday 2 October

CON6672 High Availability and Sharding Deep Dive with Next Generation Oracle Database
11:00am – Moscone West 3006

CON6713 Oracle's New, Scale Out, OLTP Optimized, In-Memory RDBMS
11:00am – Moscone West 3014

CON6569 GoldenGate : Deep Dive into Automating GoldenGate using the new Microservices
1:15pm – Moscone West 3010

CON6661 Oracle Exadata: Disruptive New Memory and Cloud Technologies
2:15pm – Moscone West 3014

CON6667 Recovery Manager (RMAN) Tips and Tricks for On-Premises and Cloud Databases
3:15pm – Moscone West 3006

CON6663 Oracle Exadata Technical Deep Dive: Architecture and Internals
3:15pm – Moscone West 3014

CON6583 Memory Without Bounds-Policy Based Automation of In-Memory Column Store Content
3:15pm – Moscone West 3010

CON6581 Database Consolidation: Resource Management Best Practices
4:45pm – Moscone West 3010

CON6678 Zero Data Loss Recovery Appliance: The World's Best Database Protection
4:45pm – Moscone West 3006

CON6665 Deploying Oracle Databases in the Cloud with Exadata: Strategies, Best Practices
5:45pm – Moscone West 3006

Tuesday 3 October

CON6666 Oracle Database Exadata Cloud Service: Technical Deep Dive
11:30am – Moscone West 3006

CON6584 Oracle Database In-Memory Deep Dive: Past, Present and Future
11:30am – Moscone West 3014

CON6682 Revolutionize Analytics with Oracle Database In-Memory
12:45pm – Moscone West 3014

CON6668 Oracle Database Exadata Cloud at Customer: Technical Deep Dive
3:45pm – Moscone West 3006

CON6894 Accelerate Cloud Onboarding Using Oracle GoldenGate Cloud Service
3:45pm – Moscone West 3024

CON6745 Implement a Business Continuity Solution for Your Open Cloud Infrastructure
3:45pm – Marriott Marquis Yerba Buena 13

CON6716 Accelerate OLTP Performance with an Application-Tier In-Memory Database
4:45pm – Moscone West 3008

CON6570 GoldenGate: Maximize Availability for Oracle GoldenGate Microservices
4:45pm – Moscone West 3014

CON6674 Maximum Availability Architecture Best Practices: Oracle Database 12c Rel. 2
5:45pm – Moscone West 3006

Wednesday 4 October

CON6715 Oracle TimeTen in the Cloud
11:00am – Moscone West 3004

CON6675 Maximum Availability Architecture Best Practices and Techniques for Oracle Cloud
11:00am – Moscone West 3006

CON6680 Exadata: Achieving Memory Level Performance: Secrets Beyond Shared Flash Storage
12:00pm – Moscone West 3008

CON6577 Get the Best Out of Oracle Compression
12:00pm – Moscone West 3006

CON6568 GoldenGate: Best Practices & Deep Dive on GoldenGate 12.3 Microservices at Cloud
12:00pm – Moscone West 3003

CON6589 Quick Start Your Oracle Database In-Memory Deployment – Step-By-Step Guide
1:00pm – Moscone West 3004

CON6679 Zero Data Loss Recovery Appliance: Deep Dive and Best Practices from Development
1:00pm – Moscone West 3006

CON6673 Oracle Sharding: Linear Scalability, Extreme Availability and Geo-distribution
2:00pm – Moscone West 3006

CON8173 Preview of Oracle Autonomous Database
3:30pm – Moscone West 3014

CON6664 Oracle Exadata: Maximum Availability Best Practices and New Recommendations
3:30pm – Moscone West 3008

CON6590 Oracle Sharding: Linear Scalability, Extreme Availability and Geo-distribution
3:30pm – Moscone West 3004

CON5966 Orchestrating and Automating Business Continuity with Engineered Systems
4:30pm – Marriott Marquis Yerba Buena 11

CON6671 Oracle Exadata Security Best Practices
5:30pm – Moscone West 3008

CON6676 Oracle Active Data Guard: New Features in the Next Generation Oracle Database
5:30pm – Moscone West 3

Demos: Monday 10:15a-6:00p **- Tuesday** 11:00a-5:15p **- Wednesday** 10:15a-4:30p

1988 Oracle Maximum Availability Architecture for Cloud and On-premises

1982 Oracle Backup and Recovery Solutions

1493 Sharding with Oracle Database 12c

1986 Oracle Active Data Guard

Integrated Cloud
Applications & Platform Services

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Exadata Cloud Machine Quick Reference Card

SERVICE METRICS	Eighth	Quarter	Half	Full
Number of Database Servers	**2**	**2**	**4**	**8**
Number of OCPUs	16 – 68	22 – 84	44 – 168	88 – 336
Total Memory (GB)	480 GB	1,440 GB	2,880 GB	5,760 GB
Number of Storage Servers	3	3	6[1]	12[1]
Total Flash Capacity	19.2 TB	38.4 TB	76.8 TB	153.6 TB
Total Usable Disk Capacity	42.7 TB	85.4 TB	170.9 TB	341.7 TB
Max Total of all DB Size Supported (local backup)	17.1 TB	34.2 TB	68.4 TB	136.7 TB
Max Total Of All DB Size Supported (no local backup)	34.2 TB	68.3 TB	136.7 TB	273.4 TB
Max SQL Flash Bandwidth	32 GB/sec	64 GB/sec	129 GB/sec	257 GB/sec
Max SQL Flash Red IOPs	450 K	900 K	1.8 M	3.6 M
Max SQL Flash Write IOPs	250 K	500 K	1 M	2 M
Max SQL Disk Bandwidth	2.7 GB/sec	5.4 GB/sec	11.0 GB/sec	21.5 GB/sec
Max SQL Disk IOPs	3,900	7,800	16,000	31,000
Max Data Load Rate	2.5 TB/hr	5.0 TB/hr	10.0 TB/hr	20.0 TB/hr

Value Proposition

1. Ideal solution for systems that are too complex to move to the cloud
2. On prem deployment helps achieve compliance with data sovereignty, regulatory laws
3. Local connectivity eliminates public cloud network latency issues
4. Solution is 100% compatible with on-premises: hybrid cloud plus no application changes
5. All workloads (OLTP, DW, consolidation, etc.) are supported by one unified service
6. Best infrastructure for the best enterprise database: proven at thousands of sites

Database Features

- Supports Databases 11.2.0.4, 12.1.0.2, and 12.2.0.1
- Requires Grid Infrastructure 12.1.0.2 or 12.2.0.1
- Includes all Database Options and EM Packs

Management & Security

- Oracle: HW & Infrastructure SW, Dom0
- Customer: Database & Clusterware, DomU
- Security & Isolation: VPN, SSH, SSL, Transparent Data Encryption (TDE), InfiniBand Partitioning, Oracle VM

Additional Components	Purpose	Required or Recommended
Cloud Control Plane	**Infrastructure and Platform to support cloud automation**	**Required**
Object Storage	**Add-on infrastructure to Cloud Control Plane to store database backups**	**Strongly Recommended**
Compute	**Add on infrastructure to Cloud Control Plane to run additional PaaS services**	**Recommended**

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