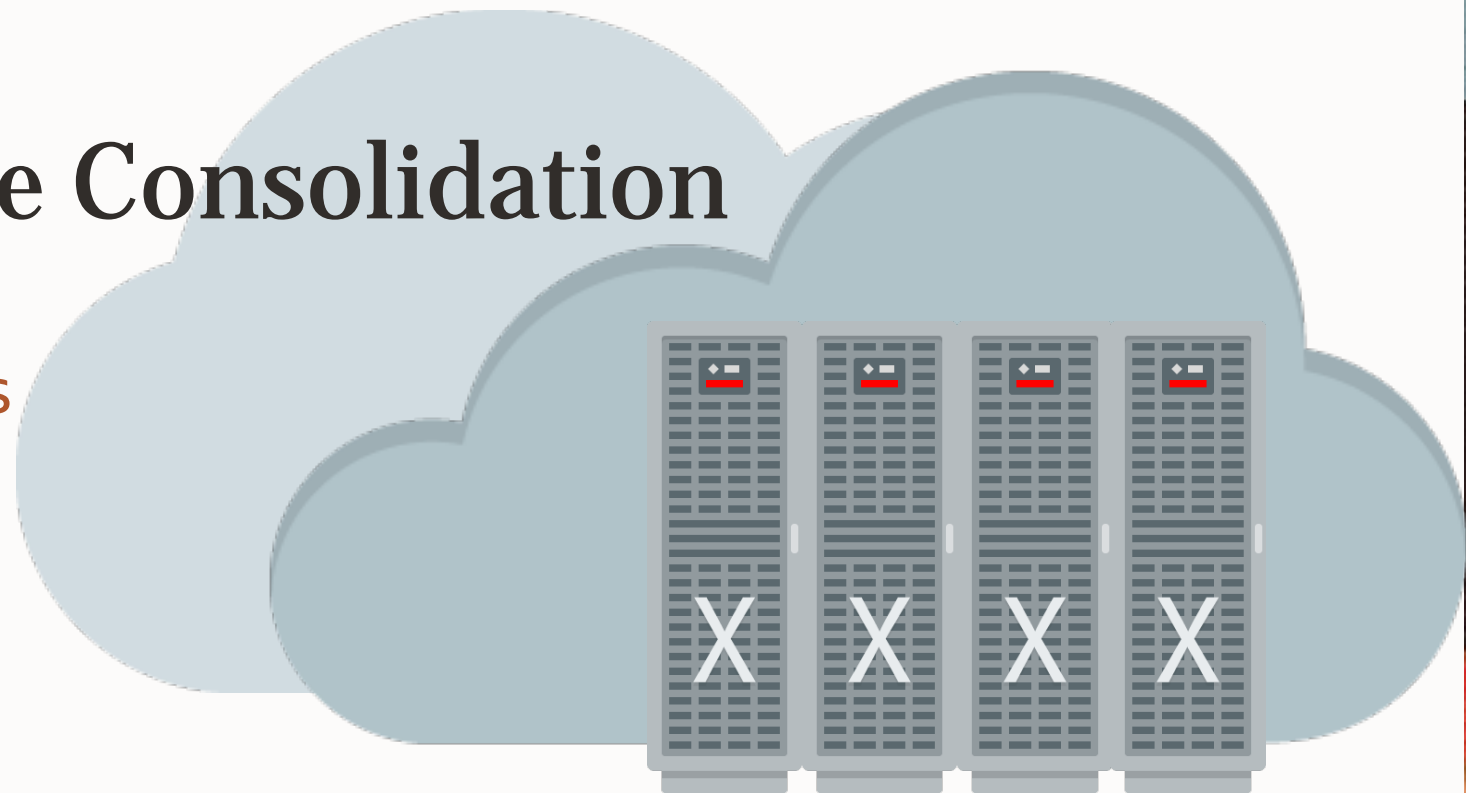


ORACLE

Oracle Database Consolidation Best Practices

For Cloud & On-Premises

—
July 2020



Safe harbor statement

The following is intended to outline our general product direction. It is intended for information purposes only, and may not be incorporated into any contract. It is not a commitment to deliver any material, code, or functionality, and should not be relied upon in making purchasing decisions. The development, release, timing, and pricing of any features or functionality described for Oracle's products may change and remains at the sole discretion of Oracle Corporation.



Agenda

- **Business Goals of Consolidation**
- **Technical Challenges with Consolidation**
- **Providing Isolation in a Consolidated Environment**
- **Exadata Cloud & On-Premises**
- **Why Consolidate on Exadata?**
- **Implementing Consolidation**

Database Consolidation Business Goals



- **Reduce Costs**

- Combine Multiple Smaller Systems Into Fewer Larger Systems
- Take Advantage of More Powerful Computer Systems
- Share Excess Capacity Between Business Applications

- **Simplify Operations**

- Fewer Systems to Operate & Maintain
- Standardize on a Common Platform for All Databases

- **Improve Security**

- One Standardized Platform with Common Security Practices
- Fewer Systems to Secure

Database Consolidation Challenges



- **Availability**

- Fewer Systems Results in Higher Risk
- Greater Impact of Potential Failures
- Requirement to Align Maintenance Schedules

- **Performance**

- Greater Risk of Databases Impacting Performance of Each Other
- Higher Demand on System Resources (CPU, I/O, etc.)
- Increased Demand for Capacity Planning
- Requirement to manage the “Noisy Neighbor” Problem

Why is Isolation Required?



Physical Location	PROD vs. DR Sites, Location of Users, Integration, Network Bandwidth, etc.
Administrative Separation	Multiple DBA Teams
Security Separation	Quarantine Networks, highly sensitive data (such as PCI, PII), etc.
Maintenance	Database Version Requirements, Upgrade Schedules
Blast Radius	Scope of Failure Impact
Resource Management	Control Noisy Neighbors

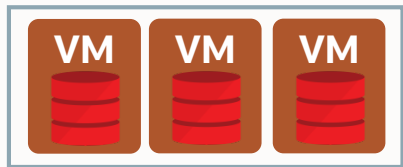


Methods for Isolation

Physical DB Servers



Virtual Machines



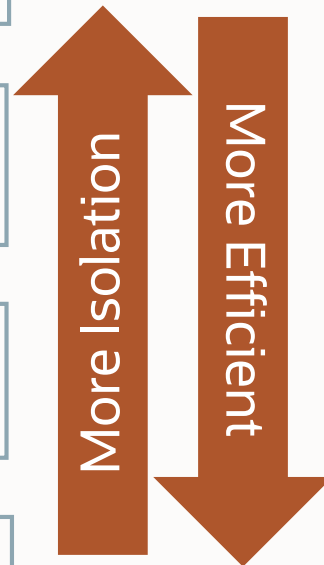
Many DBs in one Server



Database 19c Multitenant



Oracle Resource Manager



VMs have good isolation but poor efficiency and high management

- VMs have separate OS, memory, CPUs, and patching
- Isolation without need to trust DBA, System Admin

Database consolidation in a single OS is highly efficient but less isolated

- DB Resource manager isolation adds no overhead
- Resources can be shared much more dynamically
- But, must trust admins to configure systems correctly

Best strategy is to combine VMs with database native consolidation

- Multiple trusted DBs or Pluggable DBs in a VM
- Few VMs per server to limit overhead of fragmenting CPUs/memory/patching etc.

Control Noisy Neighbors with Resource Manger

- Controls the entire resource stack from CPU to I/O



Isolate Workload using Resource Management

CPU, Memory, Processes, Storage Network, Flash Storage, I/O

ANY



ANY



ANY



Without Exadata Resource Management, any database can slow down others.

Exadata Allows Control over which Databases Run Faster.

FAST



MEDIUM



SLOW



Exadata: Full Choice of Deployment Models

On-Premises

Cloud@Customer

Public Cloud

Exadata Database Machine

Exadata Cloud at Customer

Exadata Cloud Service

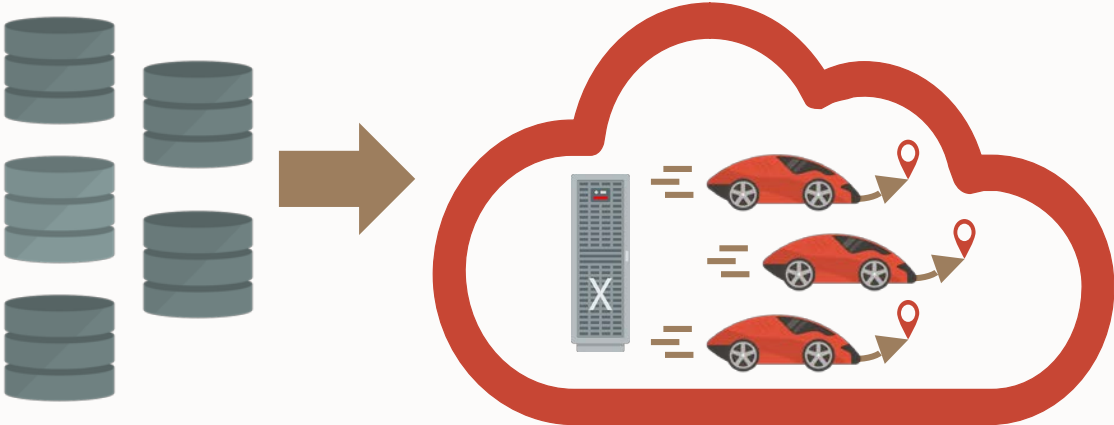


Database Consolidation Applies in all Deployment Models
Cloud Provides Additional Automation & Standardization

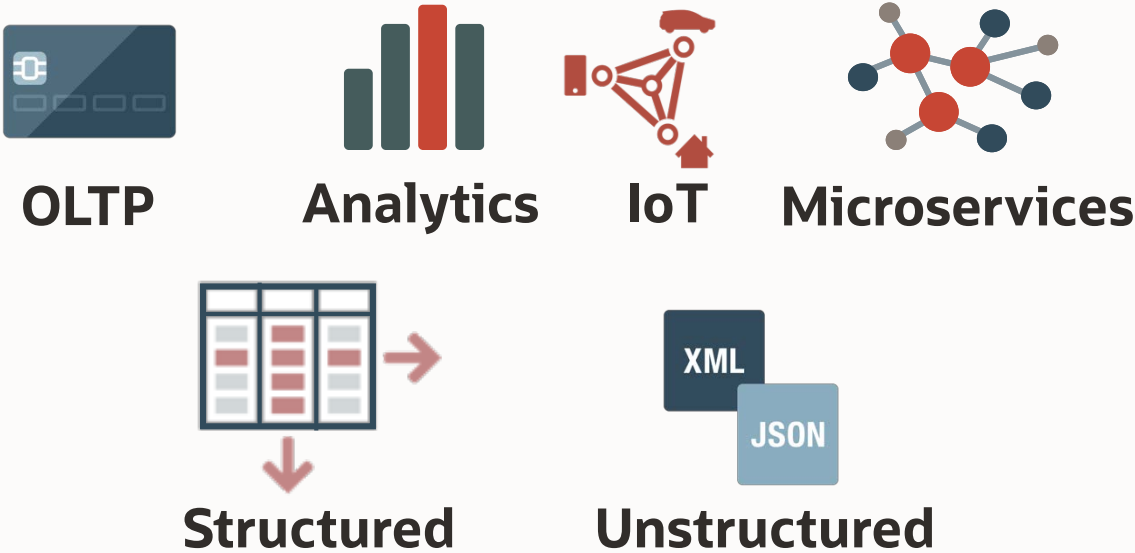
Oracle Autonomous Database – Dedicated & Cloud@Customer

The Ultimate Database Consolidation Platform

Consolidation, Cloud Transformation,
Database as a Service



Any Workload or Mix of Workloads
Any Scale



Exadata – Continuous Innovation

Dramatically Better Performance and Cost

Smart Software

- Smart Scan
- InfiniBand Scale-Out
- Database Aware Flash Cache
- Storage Indexes
- Columnar Compression
- IO Priorities
- Data Mining Offload
- Offload Decrypt on Scans

Smart Hardware

- Scale-Out Servers
- Scale-Out Storage
- DB Processors in Storage
- Unified InfiniBand
- PCIe NVMe Flash
- Tiered Disk/ Flash
- Software-in-Silicon
- 3D V-NAND Flash
- Hot Swappable Flash
- 25 GigE Client Network
- Instant failure detection
- JSON and XML offload
- Direct-to-wire Protocol
- In-Memory Fault Tolerance
- Network Resource Management
- Multitenant Aware Resource Mgmt
- Prioritized File Recovery
- Exadata Cloud Service
- Smart Fusion Block Transfer
- In-Memory OLTP Acceleration
- Exadata Cloud at Customer

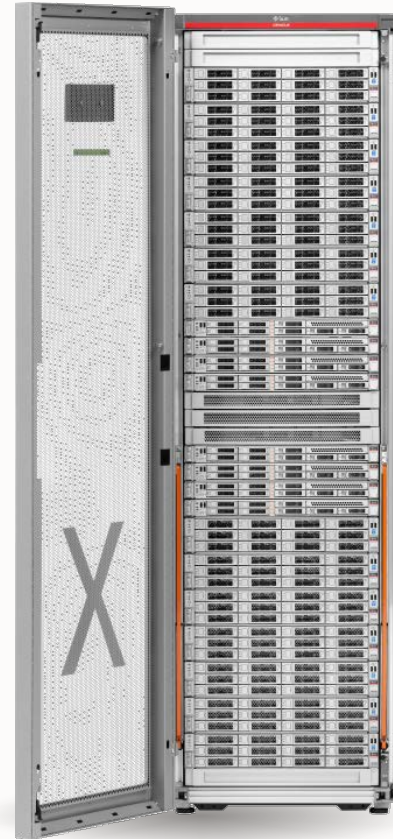
Exadata Vision: Dramatically Better Database Platform

Ideal Database Hardware

Leading edge enterprise-grade components for maximum performance and value

Smart System Software

Database-aware algorithms vastly improve the effectiveness of ALL workloads

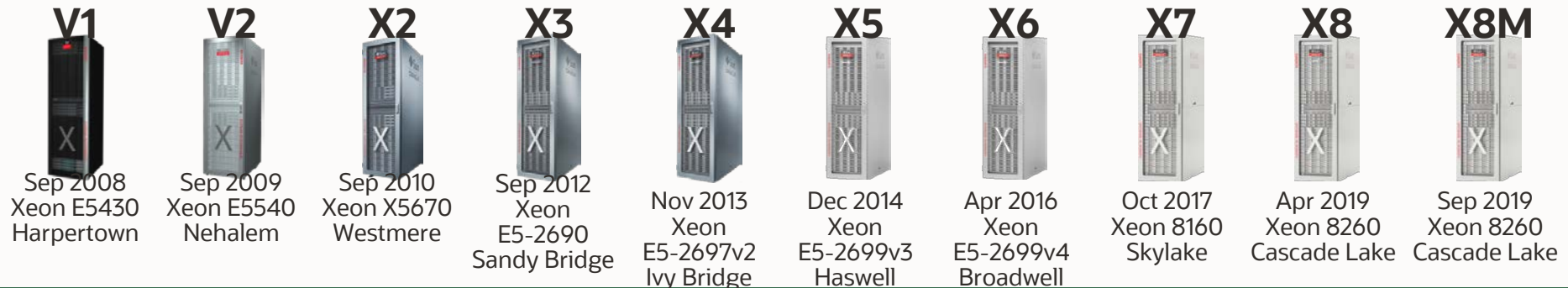


Automation

Automated infrastructure integrated with Oracle Autonomous Database

Identical On-Premises and Cloud

Database Platform Leadership Since 2008



	V1	V2	X2	X3	X4	X5	X6	X7	X8	X8M	V1 - X8M Growth
Storage (TB)	168	336	504	504	672	1344	1344	1.68	2.35	2.3 PB	14 X
Flash Cache (TB)	0	5.3	5.3	22.4	44.8	89.6	179.2	358	358	358 TB	64 X
CPU (cores)	64	64	96	128	192	288	352	384	384	384	6 X
Max Mem (GB)	256	576	1152	2048	4096	6144	12288	12288	12	12 TB	48 X
Internal Network Fabric (GB/s)	20	40	40	40	80	80	80	80	80	200 Gb/s	10x
Ethernet (Gb/s)	8	24	184	400	400	400	400	800	800	800 Gb/s	100 X
Scan Rate (GB/s)	14	50	75	100	100	263	301	350	560	560 GB/s	40 X
Read IOPS (M)	.05	1	1.5	1.5	2.66	4.14	5.6	5.97	6.57	16 M	320 X



Why Consolidate Databases onto Exadata?

- **Cost**
- **Simplicity**
- **Security**
- **Availability**
- **Performance**

Why Consolidate Databases onto Exadata?

- **Cost**
- **Simplicity**
- **Security**
- **Availability**
- **Performance**

Target Consolidates Over 350 Systems onto Exadata

\$1.33M
reduction in
acquisition cost

10x
faster backup
time

250%
improvement in Order Flow



CUSTOMER PERSPECTIVE

“ We have consolidated over 350 systems onto Exadata infrastructure. This has delivered greater flexibility. This improves speed. This also greatly improves our operational framework, where we are able to respond to incidence quicker and it improves overall stability.

— Tony Kadlec, Senior VP, Infrastructure and Operations, Target



NTT docomo : MoBills (Mobile Billing System)

Benefits

"MoBills is a very important position as a mission-critical system to promote efforts toward the realization of "+d". Oracle Exadata is running very stable as a expected performance. We will continue to use the "Oracle Exadata" and we would like to establish a further advantage for our business."

- Shimamura, Manager, Information System Department, NTT docomo

Faster
Billing Processing

10X speedup



Maximum
Availability

Local & Remote
Standby



Reduced
Operational Cost

50%



Reduced
Introduction Cost

25%



Data Center
Cost Savings

90% Space
Reduction



Business Objectives

- Real-Time Billing Platform for 66 million customer
- Dramatically improve performance and availability
- Reduce cost and complexity

Solution

- Oracle Exadata : 30 racks
- Oracle MAA (RAC / Active Data Guard - Local & Remote Standby database)

Pre-Exadata



- Real-Time Billing Processing
 - High-end SMP Server
 - + High-end Storage : 350 racks
 - Storage Mirror Backup
 - Storage Mirror Replication
- Oracle 9i Database Release 2

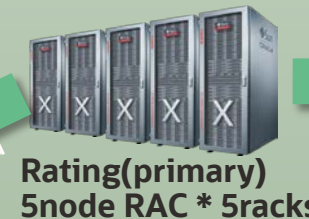
Exadata MAA

30 racks / Local & Remote Standby / RMAN backup

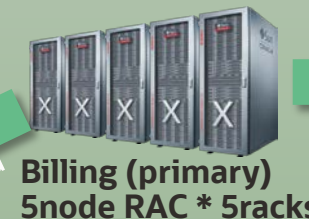
Tokyo



Data Guard



Data Guard



Data

Osaka



Data



Exadata Cost Drivers

Elastic Configurations

- Match Compute vs. Storage to Customer Needs
- More Flexibility than Standard Fractional Configurations
- Enables Customers to Control Costs by Choosing the Right Configuration

Flexible Storage Options

- High Capacity, Extreme Flash, Extended Storage
- Enable use of the Specific Type of Storage for Each Use-Case

High Consolidation Density

- Exadata Supports Higher Consolidation Density than Other Platforms
- Hundreds or Thousands of Databases Per Rack
- Enables The Maximum Number of Databases to be Run in the Smallest Configuration

Why Consolidate Databases onto Exadata?

- Cost
- **Simplicity**
- Security
- Availability
- Performance

Thousands of Critical Deployments Since 2008

Financial Services, Telecoms, Healthcare, Retail, Public Sector, Travel, Manufacturing, Professional Services, Consumer Goods, Education, Utilities, ...

Best for ALL workloads

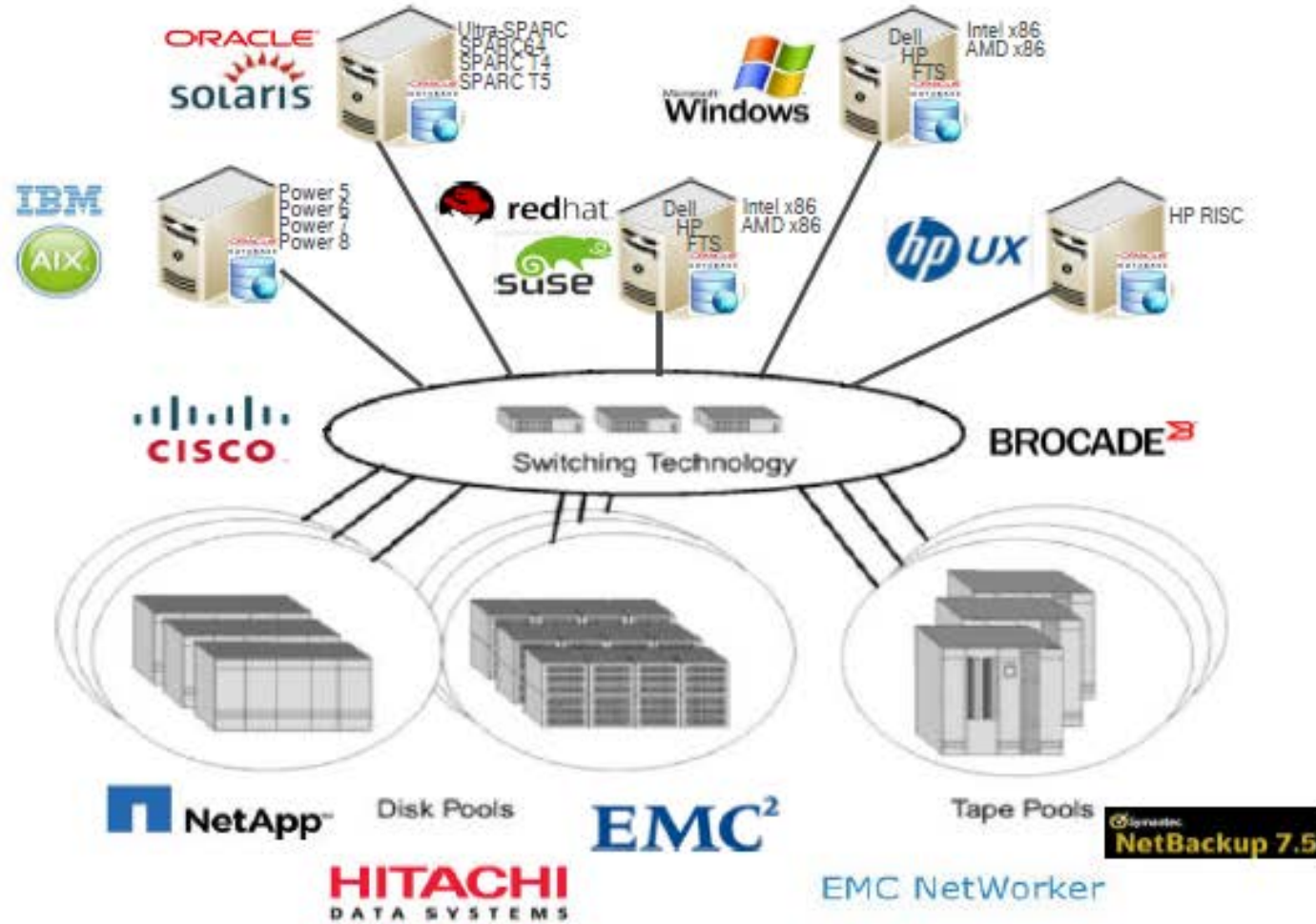
- Petabyte Warehouses
- Super Critical Systems
 - Financial Trading
 - Process manufacturing
 - E-commerce
- Packaged Applications
 - SAP, Oracle, Siebel, PSFT, ...
- Database Consolidation

86% of Fortune Global 100 Run Exadata



YESTERDAY'S SOLUTIONS DON'T MEET THE MARK

FROM 300+ DIFFERENT DATA BASE STACKS TO...



... DATA BASE AS A SERVICE



LIFE IS FOR SHARING.

Goals of Standardization

Any Workload

- One Standard Platform for ANY workload including DW, OLTP, and Mixed Workloads

Any Scale

- One Standard Platform for ANY scale of data and user concurrency from large to small

Any Availability Requirement

- One Standard Platform for all MAA References Architectures (Bronze, Silver, Gold, Platinum)

Simplicity with Exadata

One Standardized Platform and Operational Practices

- Single configuration runs databases of any size, complexity, or workload
- RAC, non-RAC, DW, OLTP, Critical, non-Critical, High Performance & Low
- Thousands of customers with same configuration and practices

Complete & Integrated

- VM, O/S, Storage S/W, Clusterware, Volume Manager, DBMS
- Delivered as a single bundle for install, patch, upgrade, etc.

Automated Management & Operations

- Built-in configuration checker
- Integrated Management UI (Oracle Enterprise Manager) for full stack

Even Simpler with Exadata Cloud Service & Cloud@Customer

ORACLE Cloud US Dev West (Seattle) ▾ 🔔 ? 💬 🌐 👤

Create Database [Help](#)

Configure Backups ⓘ

Backup Destination Type
Recovery Appliance ▾

Backup Destinations in ExaCC_Demo [\(Change Compartment\)](#)
Backup_Destination_RA_01 ▾

VPC User
backup_user_01 ▾

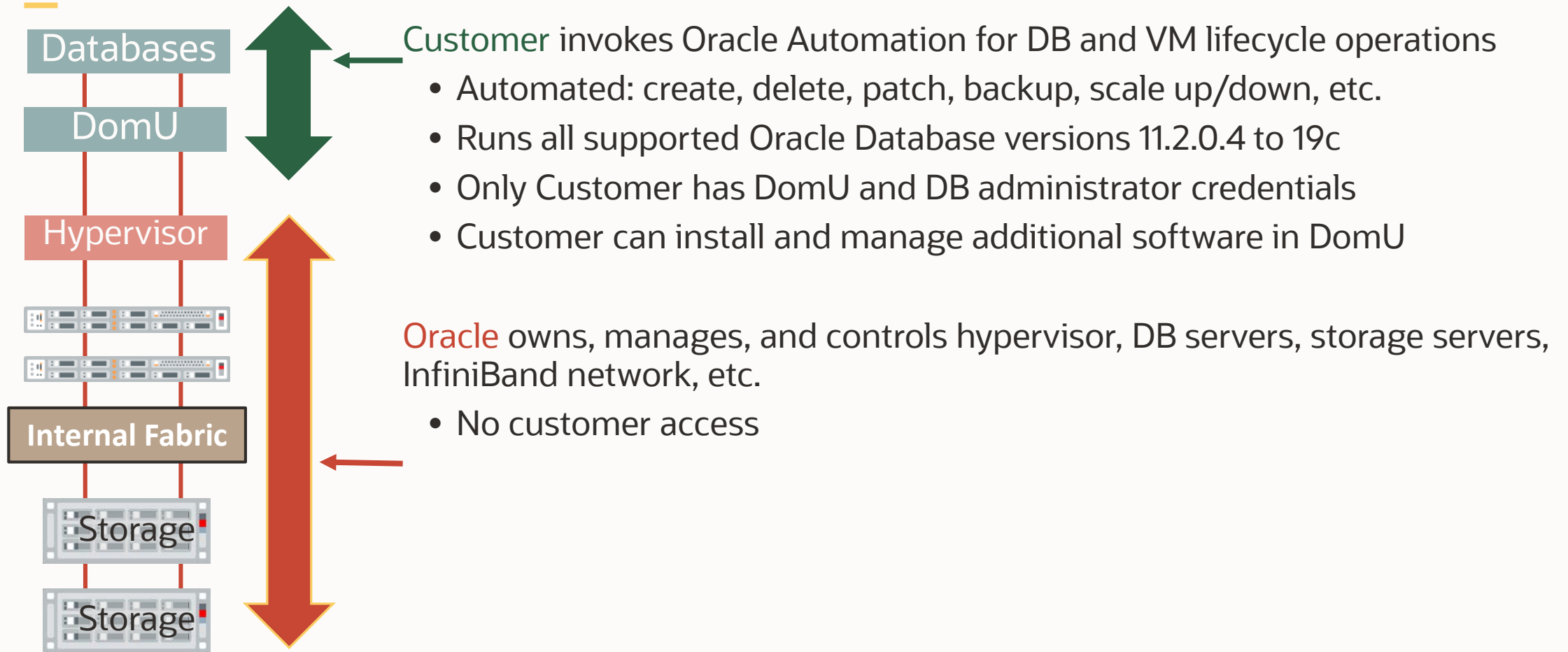
Password
.....

Enable automatic backups
Automatic backups are performed daily if enabled.

[Create Database](#) [Cancel](#)



Cloud Management Model

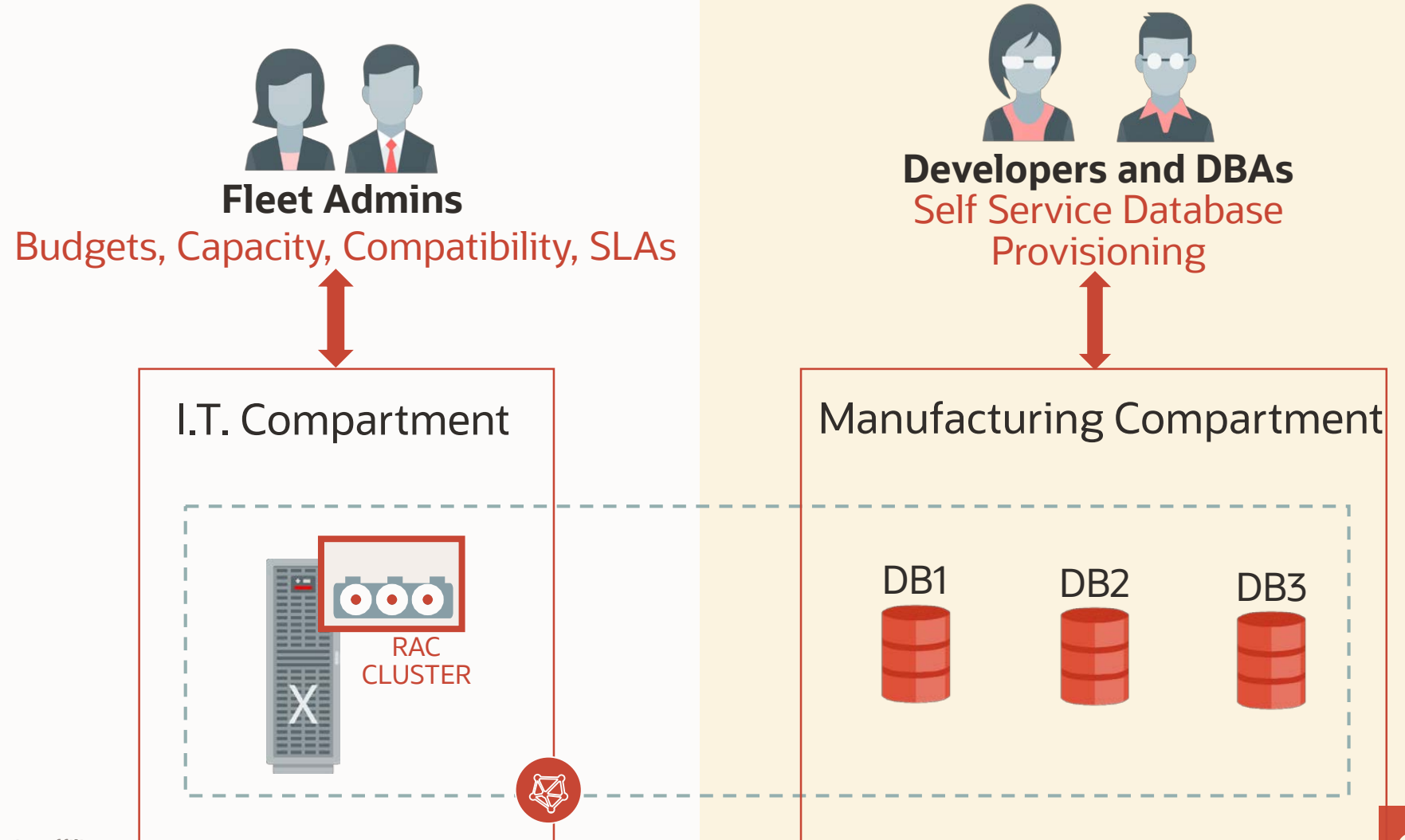


Oracle Cloud Infrastructure Global Footprint

July 2020: 24 Regions Live, 12 Planned



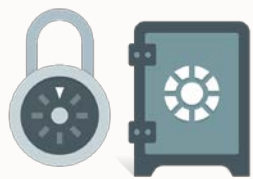
Autonomous Database Dedicated – Roles



Why Consolidate Databases onto Exadata?

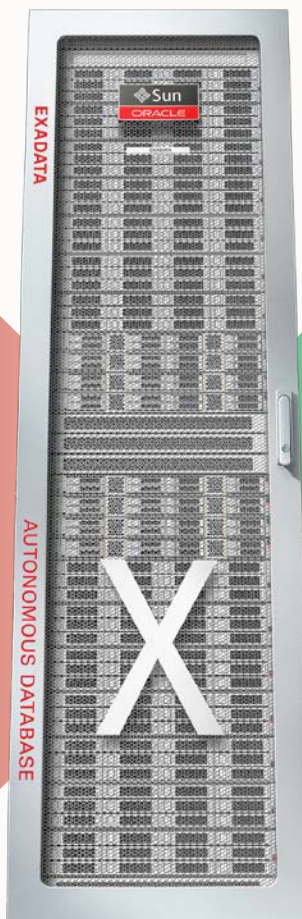
- Cost
- Simplicity
- **Security**
- Availability
- Performance

Security



Exadata Database Machine Security

- Industry policing: Banks, Government, Retail, Telcos
- Advanced Intrusion Detection Environment (AIDE)
- Regular security scans
- FIPS 140-2 certification
- PCI-DSS compliance
- Data and network encryption
- Linux minimal distribution
- Secure erase
- System lockdown
- Live kernel patching



Oracle Database Maximum Security Architecture

- Identity Management
- Transparent Data Encryption
- Network Encryption
- Database Vault
- Audit Vault
- Key Vault
- Database Firewall
- Virtual Private Database
- Label Security
- Data Redaction
- Data Masking & Subsetting



Enhanced Security Posture with **Exadata**

Minimize Attack Surface

- Exadata installation only uses required system components
- Exadata includes the full-stack (VM, OS, Drivers, Storage S/W, Clusterware, and DBMS)

Security Scans & Fixes

- Pre-Scanned Prior to Shipment (base install & software updates)
- Scanned with industry-leading security scanners
- Integrated Security Fixes

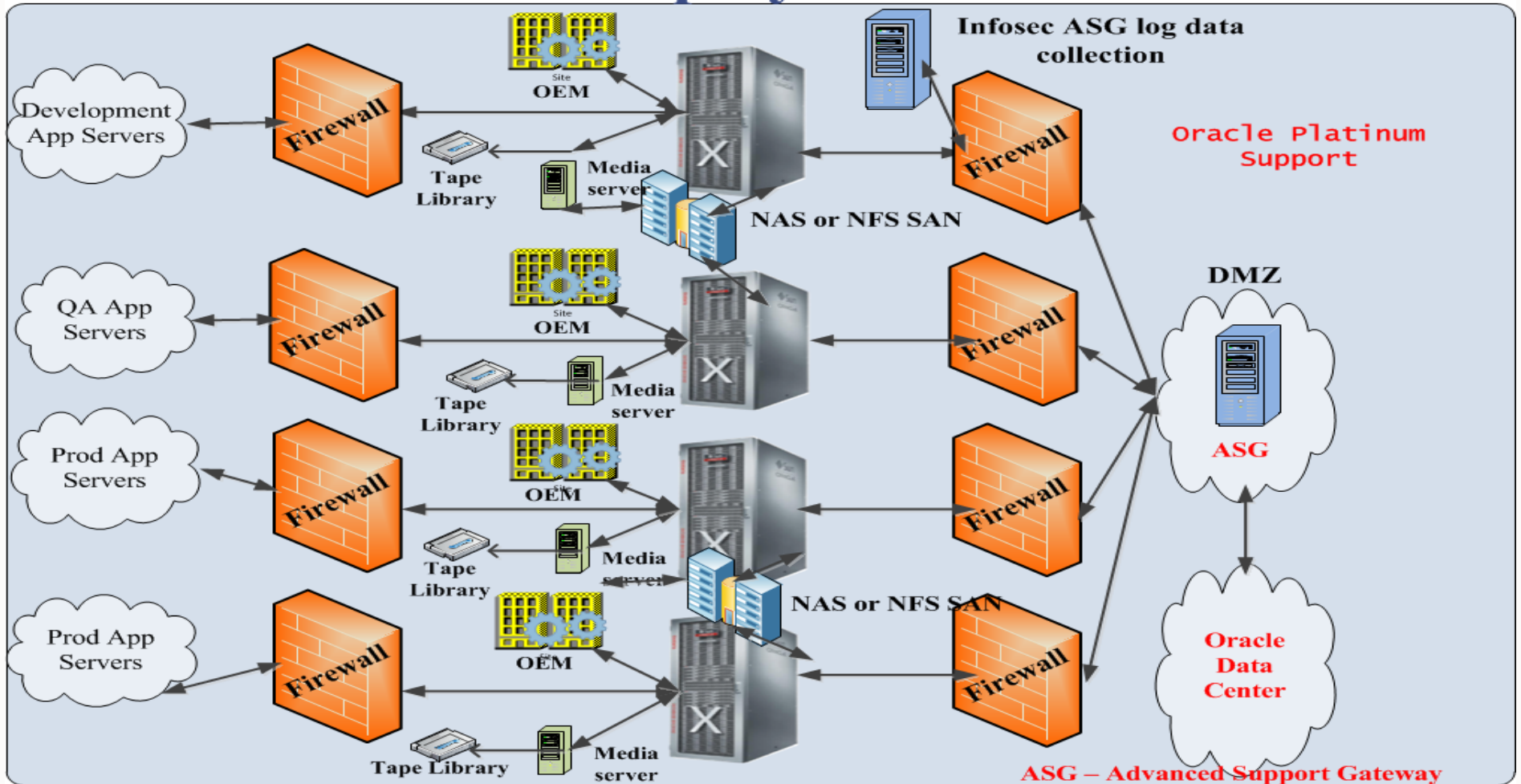
Intrusion Detection

- Advanced Intrusion Detection Environment (A.I.D.E.)
- SHA256 hash signatures applied and validated on critical system objects

Exadata Security In Action at NYSE



EXADATA Deployment Architecture



Why Consolidate Databases onto Exadata?

- Cost
- Simplicity
- Security
- **Availability**
- Performance

High Availability for Maximum Application Uptime



“Exadata achieved AL4 fault tolerance in a **Maximum Availability Architecture configuration**”



Only other AL4 Systems

- IBM - z Systems
- HPE - Integrity NonStop & Superdome
- Fujitsu – GS & BS2000
- NEC – FT Server/320 Series
- Stratus ftServer & V Series
- Unisys – Dorado



Downtime is Prevalent and Businesses are at Risk



40%

of businesses fail to reopen after experiencing a disaster

Source: <https://informationprotected.com/study-40-percent-businesses-fail-reopen-disaster/>



91%

of companies have experienced unplanned data center outages in the past 24 months

Source: <https://www.healthitoutcomes.com/doc/beware-the-high-cost-of-data-center-outages-0001>



75%

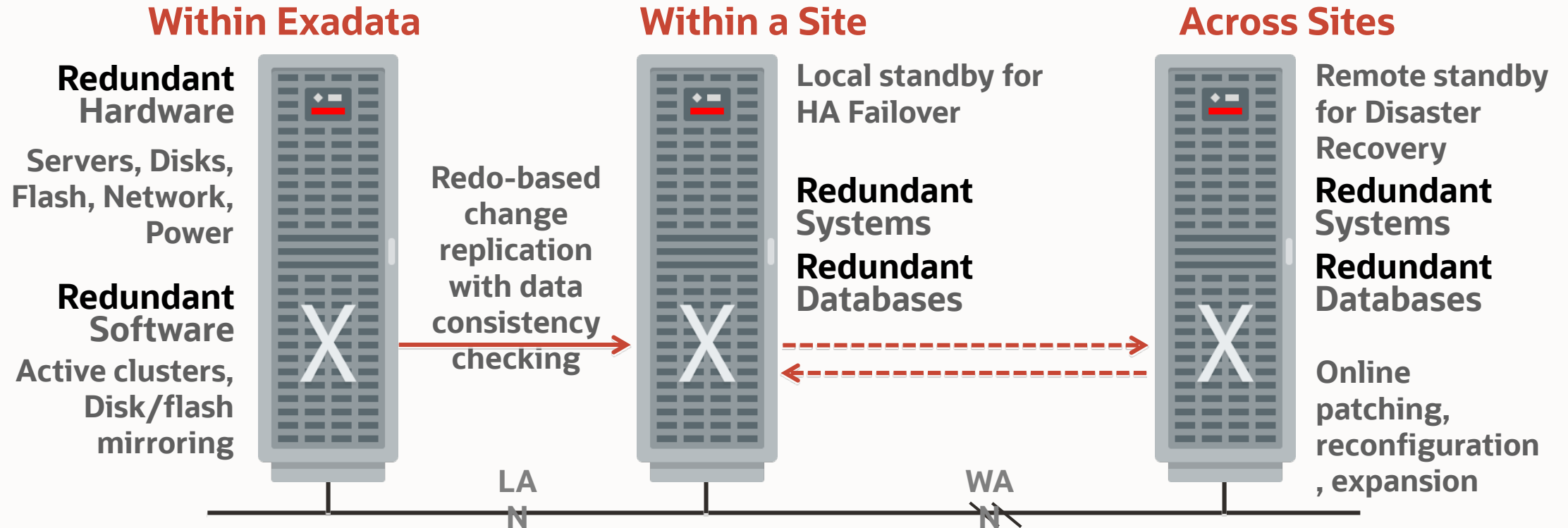
of small to medium sized business don't have a disaster recovery plan in place

Source: <http://gazette.com/7-shocking-disaster-recovery-stats-for-small-business-owners/article/1590436>

Oracle Maximum Availability Architecture(MAA) Solution Options



Exadata Maximum Availability Architecture (MAA) Blueprint for HA: Designed and Tested to Handle All Failure Scenarios



Fastest RAC Instance and Node Failure Recovery | Fastest Backup - RMAN Offload to Storage
Deep ASM Mirroring Integration | Fastest Data Guard Redo Apply | Complete Failure Testing with
Lowest Brownouts





Oracle Maximum Availability Architecture (MAA) High Availability, Disaster Recovery and Data Protection

Applying **25+ years** of lessons learned in solving toughest HA problems around the world

Solutions to reduce downtime for **planned & unplanned outages** for Enterprise customers with most demanding workloads and requirements

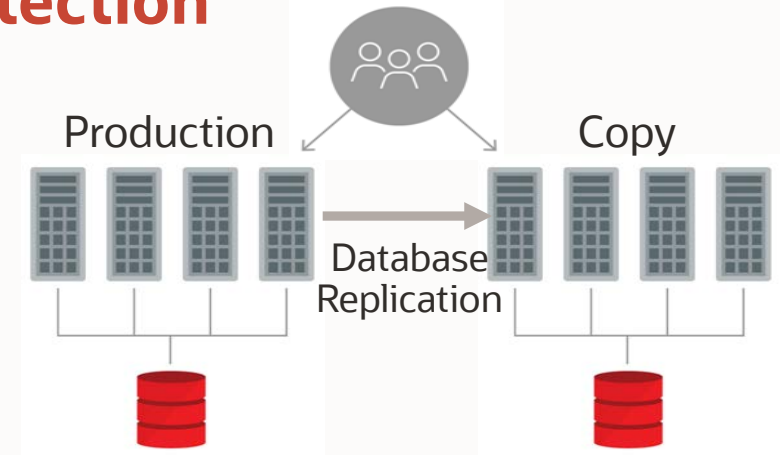
Service level oriented architectures

Books, white papers, blueprints

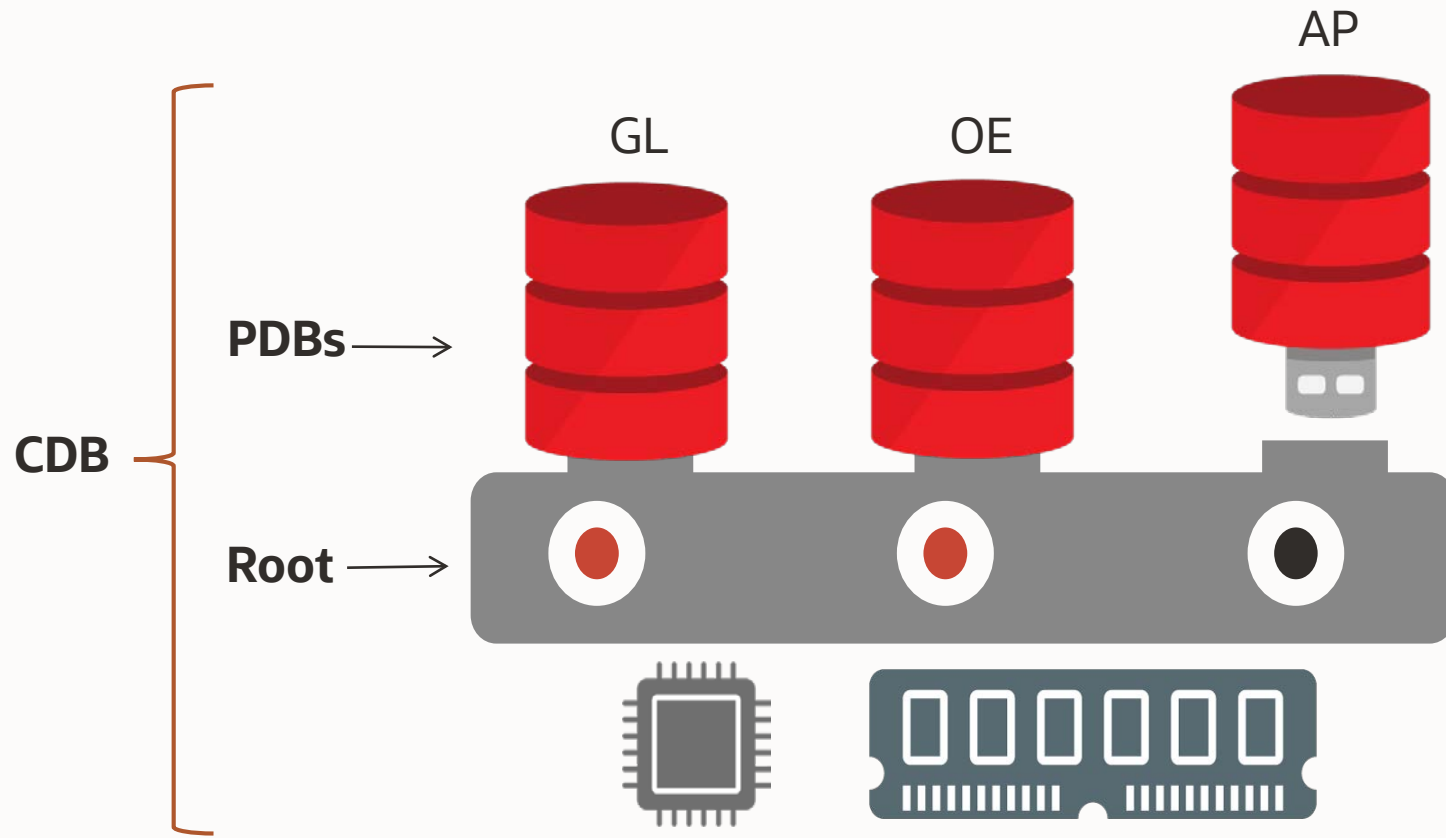
MAA integrated Engineered Systems

Continuous feedback into products

<https://oracle.com/goto/maa>



Oracle Multitenant Highest Density Database Consolidation



Self-contained PDB for each application

- Portability (via pluggability)
- Rapid provisioning (via clones)
- Applications run unchanged
- PDB upgrades via plug/unplug

Common operations performed at CDB level

- Manage many as one (upgrade, backups, HA)
- Granular control when appropriate
- Simple DR

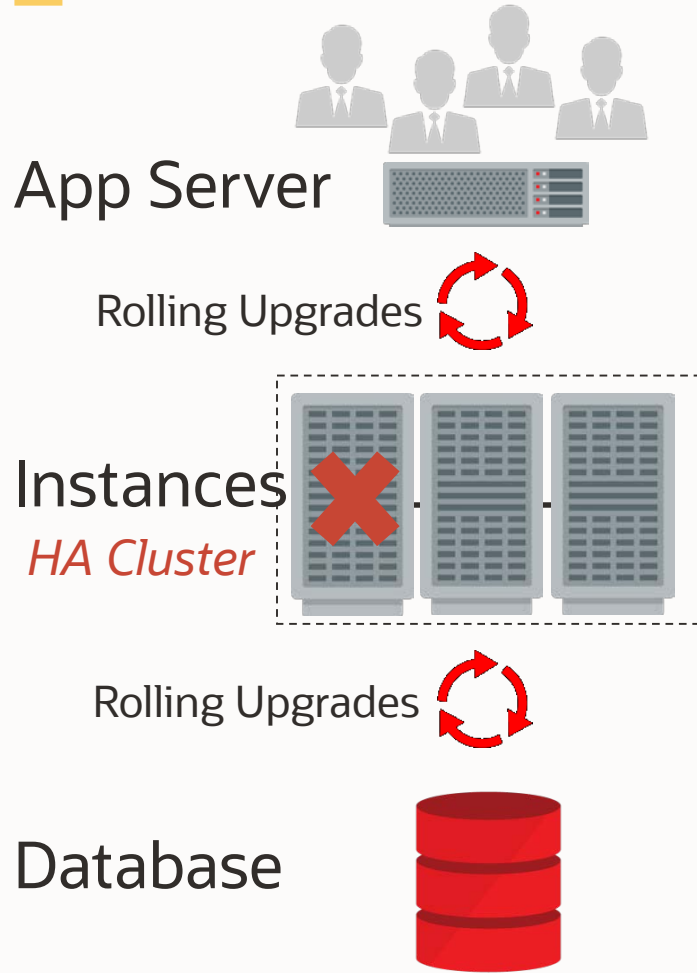
Shared memory and background processes

- More applications per server

MAA and Multitenant

- Solutions for planned / unplanned outages

Oracle Real Application Clusters (Oracle RAC)



Enables shared access by two or more database instances to a single Oracle Database

Very Scalable

- All instances active
- Add capacity online
- Ideal for database consolidation

Highly Available

- Auto-failover of services to an already running instance
- Outage is transparent to user, in-flight transactions succeed
- Zero downtime rolling maintenance



Transparent Application Continuity

Preserving and Replaying Database Requests Across Interruptions

Failures in the database stack & connectivity lead to

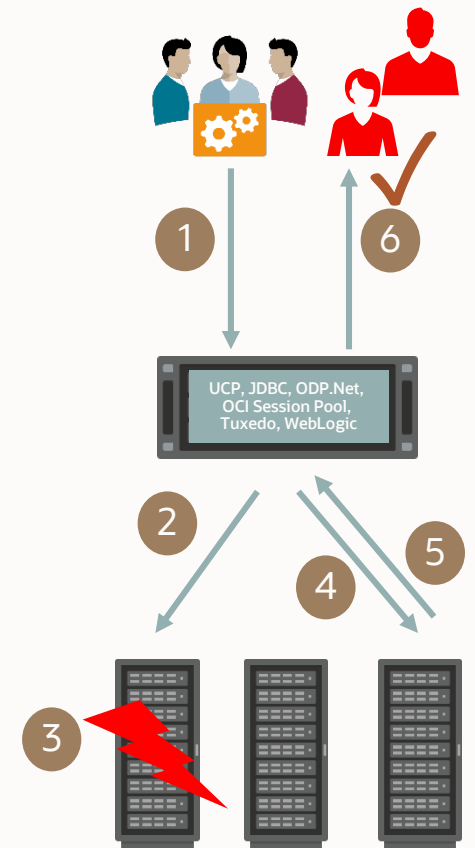
- Interruptions in user sessions
- Unknown state of transactions

Application Continuity masks errors from applications by recovering session state and replaying in-flight requests

- Replay performed on a surviving RAC instance or Data Guard standby
 - If transaction already committed: no action;
 - if replay successful: app continues;
 - if request non-recoverable: app handles errors usual way
- Eliminates the need to create custom exception code

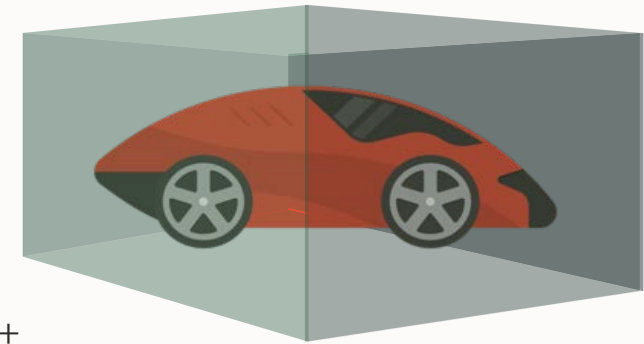
Application Continuity extends Oracle's HA capabilities

- end-to-end – from bottom to top, without code changes.



Autonomous Database is **Highly Available**

- Automatically protects from **all** types of downtime:
 - Failures – Exadata⁺, RAC⁺, App Continuity⁺
 - Site Outages – Autonomous Data Guard⁺
 - Maintenance – RAC Rolling Updates⁺
 - Changes – Online Indexing, Edition Based Redefinition⁺
 - User Errors – Flashback Database⁺, Table⁺, Query⁺



No ridiculous exclusions to availability in fine print

- Amazon excludes planned downtime, database bugs, regional outages, etc.

+ Unique to Oracle

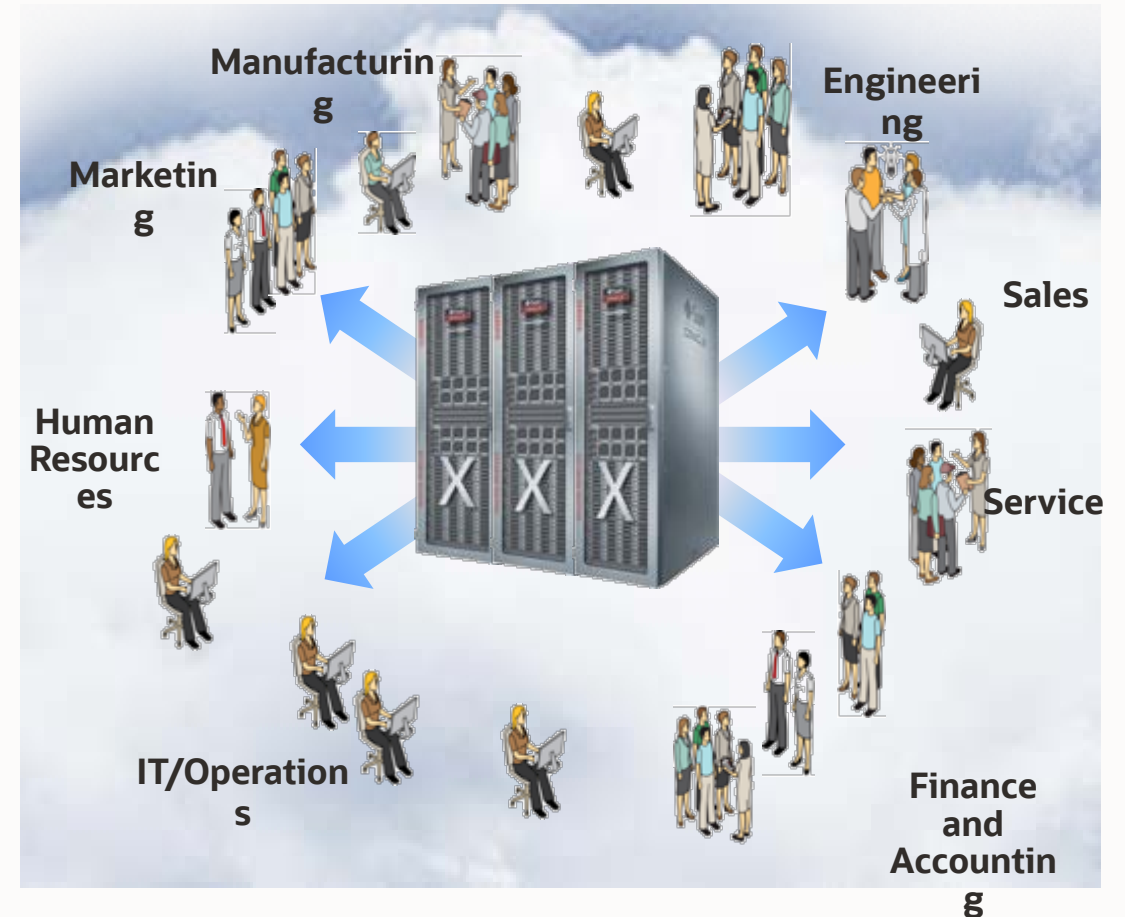
Why Consolidate Databases onto Exadata?

- Cost
- Simplicity
- Security
- Availability
- **Performance**

Exadata for Consolidation and Database as a Service

Best Mixed Workload **Performance**, No Bottlenecks, Performance Isolation, Availability

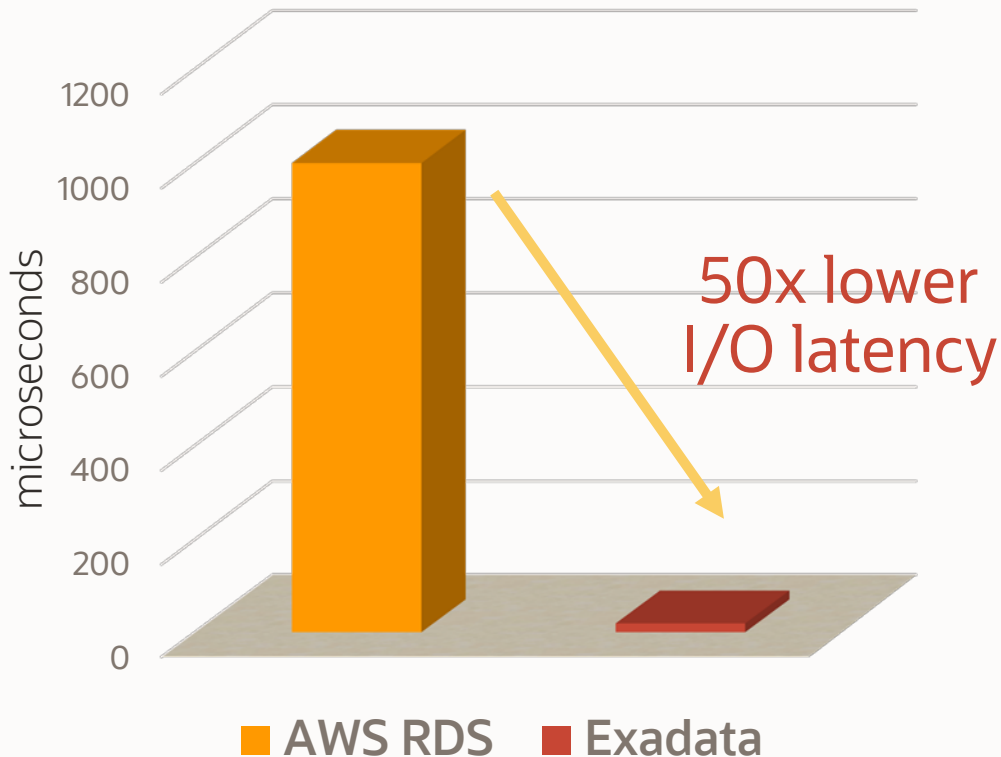
- Any bottleneck on consolidated system can stall all workloads. Exadata **eliminates bottlenecks**
 - Highest network bandwidth, storage offload
 - Millions of I/Os per second, unique log optimizations
- Exadata **uniquely** prioritizes I/O by pluggable database, job, user, service, etc.
- Exadata **uniquely** prioritizes critical DB network messages through entire fabric
- Exadata **uniquely** unifies CPU prioritization with I/O prioritization for end-to-end assurance



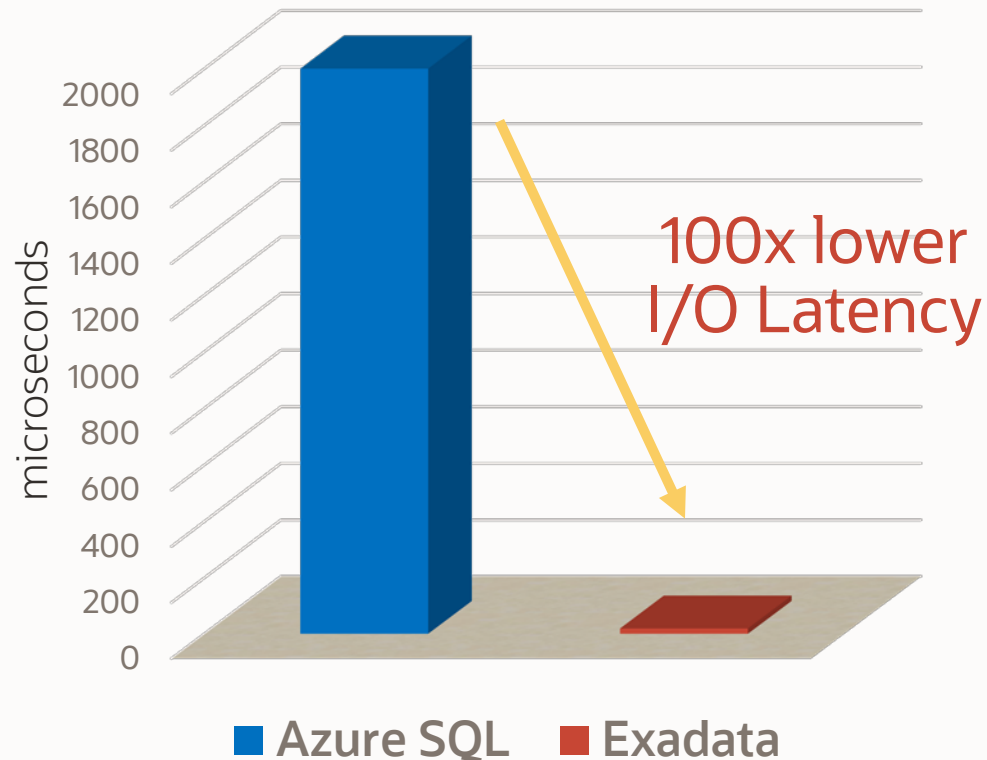
Exadata X8M Storage Performance

>50x faster than Flash Block Storage on AWS or Azure

Flash Storage on AWS vs. Exadata



Flash Storage on Azure vs. Exadata

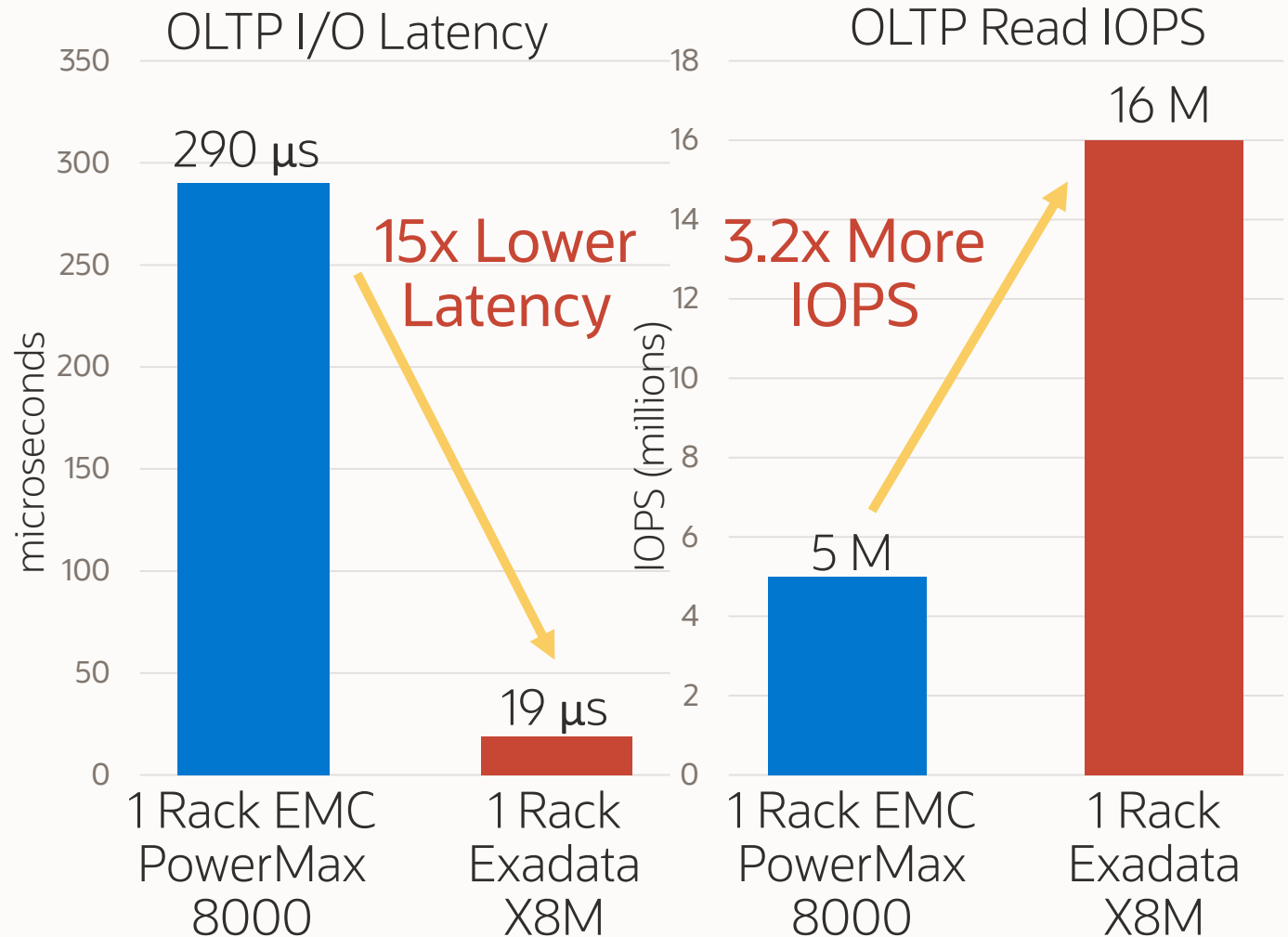


Many Times Faster than All-Flash EMC

Single rack Exadata X8M beats the fastest EMC PowerMax all-flash array

- 7.4x higher throughput
- 3.2x more IOPS
- 15x lower latency

Exadata performance scales as more racks are added



Exadata X8 Performance Improvements

Performance Scales Linearly as More Racks are Added

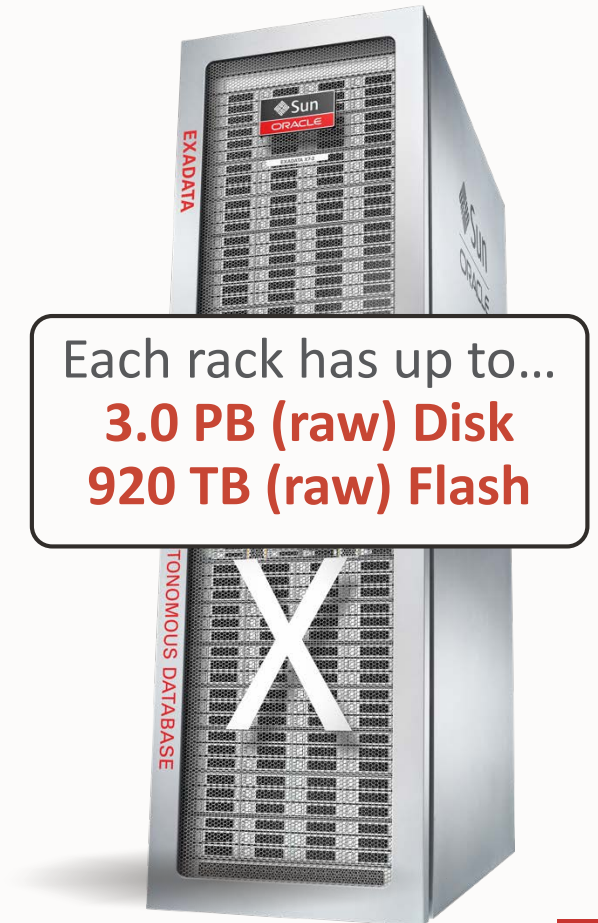


560 GB/sec Analytics

- 60% more for all-Flash storage vs X7
- Scan a Terabyte in under 2 seconds!*

6.57 Million OLTP Read IOPS

- 25% more per storage server vs X7
- 3.5 million IOPS under 1/4 millisecond



Smart System Software Highlights

Smart Analytics

Move **queries to storage**, not storage to queries

Automatically **offload and parallelize** queries across all storage servers

100X faster analytics



Smart Storage

Hybrid Columnar Compression reduces space usage by **10X**

Database-aware **Flash Caching** gives speed of flash with capacity of disk



Smart OLTP

Special InfiniBand protocol enables highest speed, lowest latency OLTP

Ultra-fast transactions using DB optimized **flash logging** algorithms

Fault-tolerant In-Memory DB by mirroring memory across servers



Smart Consolidation

Workload prioritization from CPU to network to storage ensures QoS

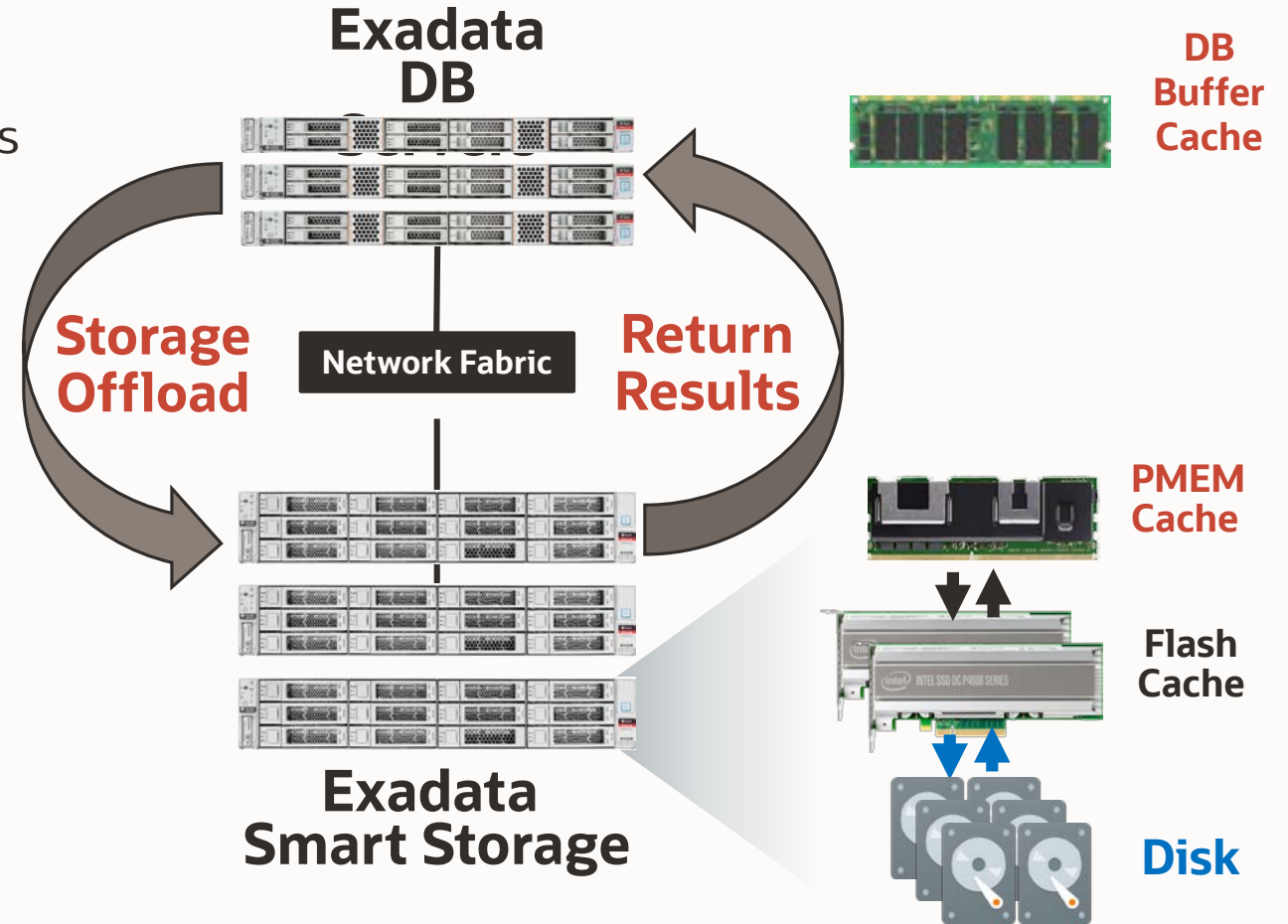
4X more Databases in same hardware



Exadata Performance & Consolidation

Fundamental Architectural Differences

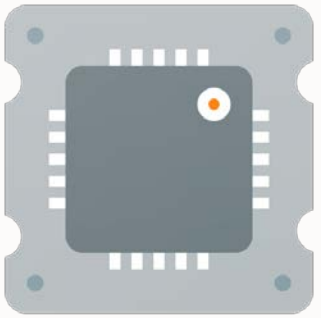
Unlike traditional compute & storage architectures
Database Functions are performed **in** storage
Database Aware Storage
I/O Prioritization based on Database Needs
Caching of data, not storage tiering



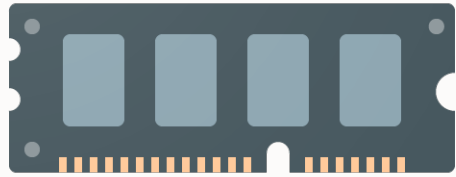
Implementing Consolidation on Exadata

1. Inventory Databases to be Consolidated
2. Gather Resource Utilization & Growth Metrics
3. Map Resource Requirements to New Platform
4. Determine Database Isolation Requirements & Methods
5. Select Consolidation Method for Databases
6. Group Databases into HA Tiers
7. Perform Bin-Packing of Databases into Resource Shapes
8. Create Resource Plans for Databases

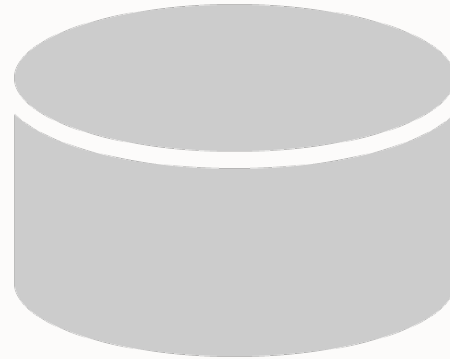
The 4 Dimensions of Sizing



CPU



Memory



Storage



I/O

Map Resource Utilization to New Platform

Applies to both Cloud and On-Premises Deployments

CPU Power varies by generation

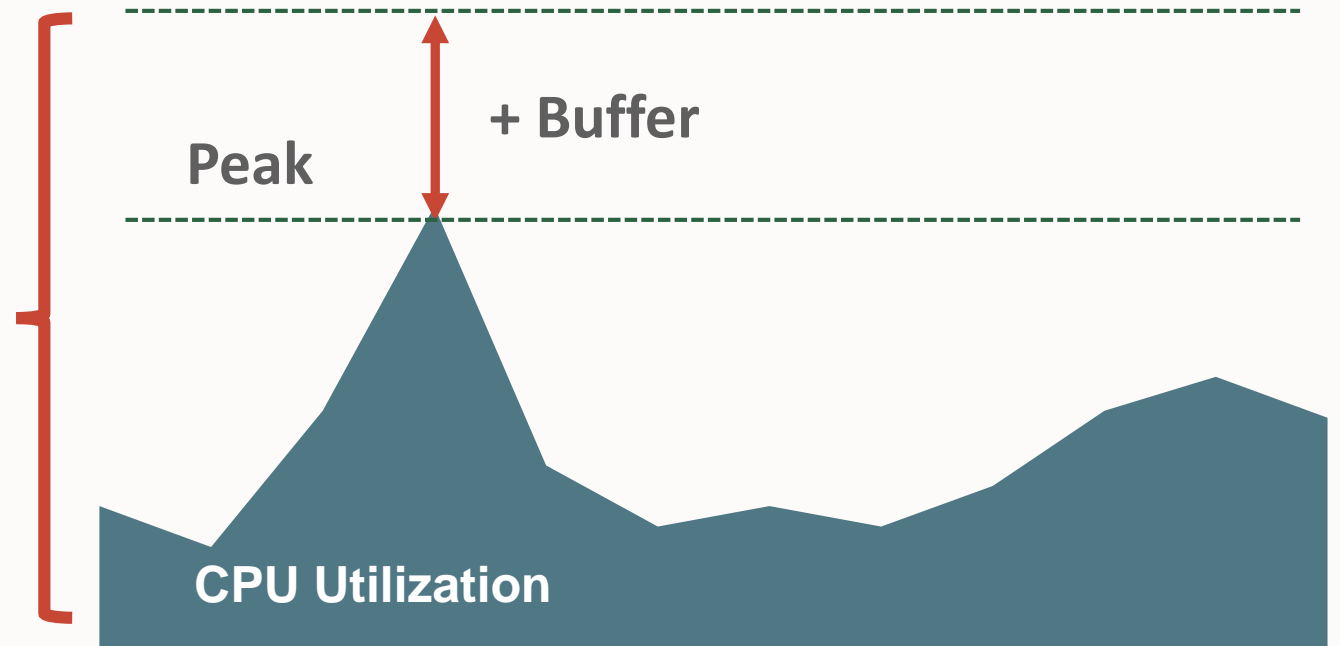
- Use Oracle M-Values to normalize
- Use AWR and EMCC to track history

Peak CPU Utilization

- Size for peak processing
- Varies depending on business cycle
- Use Auto-Scale in Autonomous Database

Buffer of Capacity

- Needed for Contingency
- 10-30% buffer is desirable
- No need to consume OCPU for Buffer in Cloud



Exadata System Shapes

Isolation by Virtual or Physical Clusters

- Isolate to meet business requirements (ex: Data Governance)
- Isolate by environment (DEV, TEST, QA, DR, etc.)
- Isolate by maintenance/upgrade schedules
- Storage Allocated to Each Cluster

Examples:

- 1 Physical (On-Premise Bare Metal) Cluster in 1 Rack
- 2 Physical (On-Premise Bare Metal) Clusters in 1 Rack
- 1 Virtual Cluster in 1 Rack
- 2 Virtual Clusters in 1 Rack
- 8 Virtual Clusters in 1 Rack
- 7 Virtual Clusters (varying sizes of clusters)

*Note: Not all system shape variations are available in all deployment models & versions.

1 Physical (Bare Metal) Cluster

Exadata DB Nodes

Node 1

Node 2

Node 3

Node 4

Node 5

Node 6

Node 7

Node 8

Bare Metal Cluster

Exadata Storage Servers

1

2

3

4

5

6

7

8

9

10

11

12

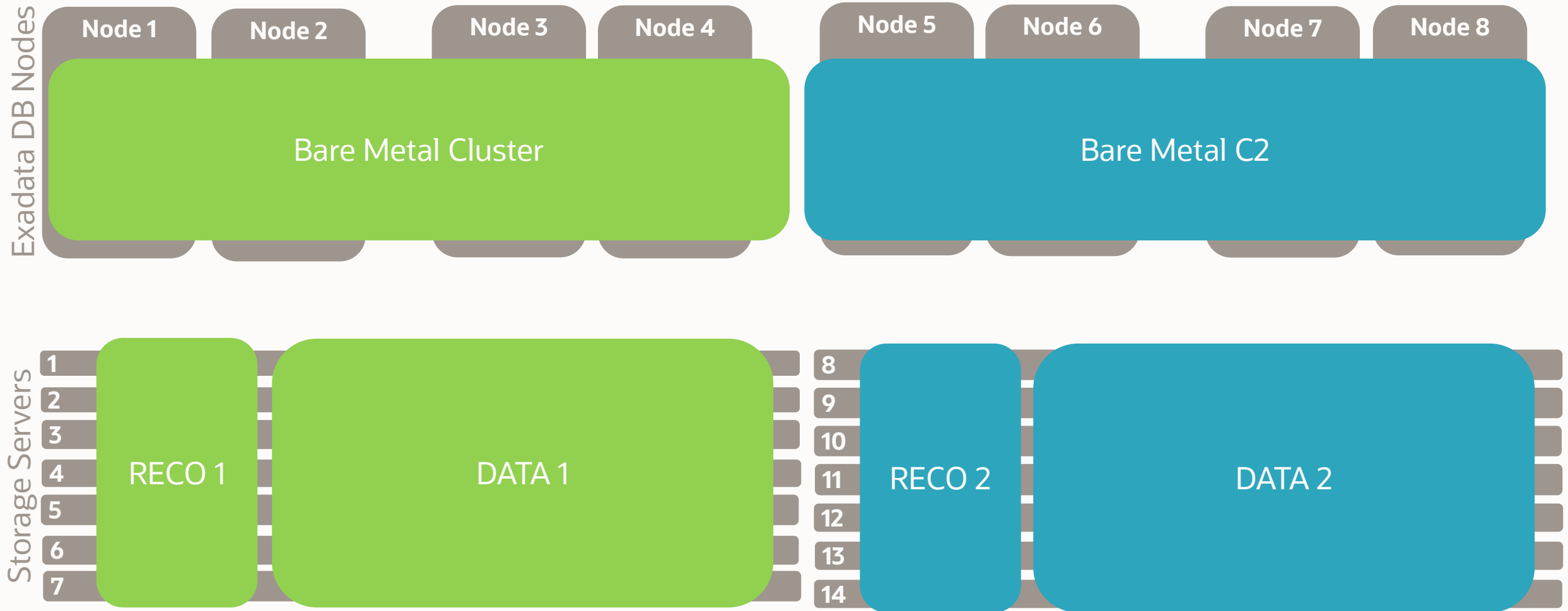
13

14

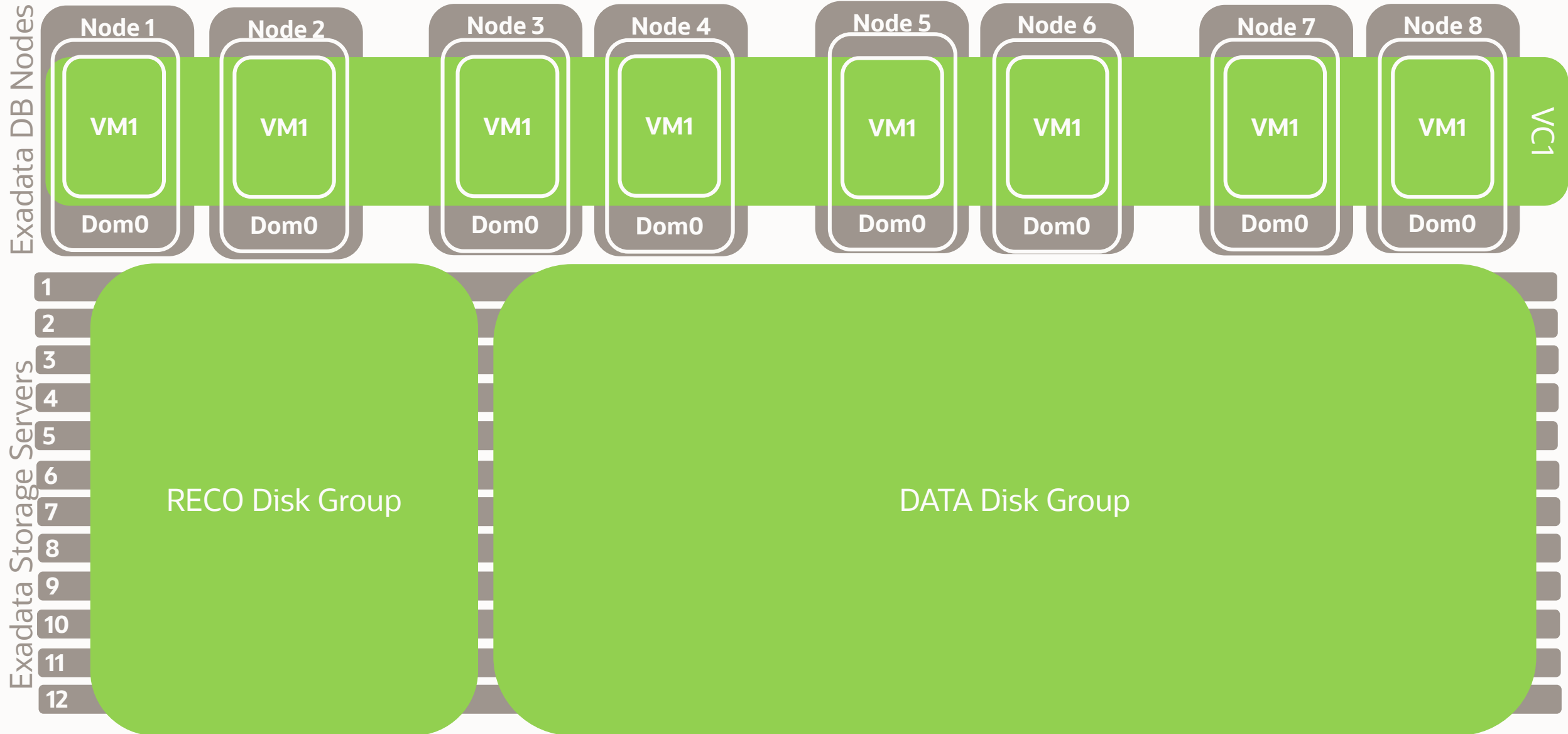
RECO Disk Group

DATA Disk Group

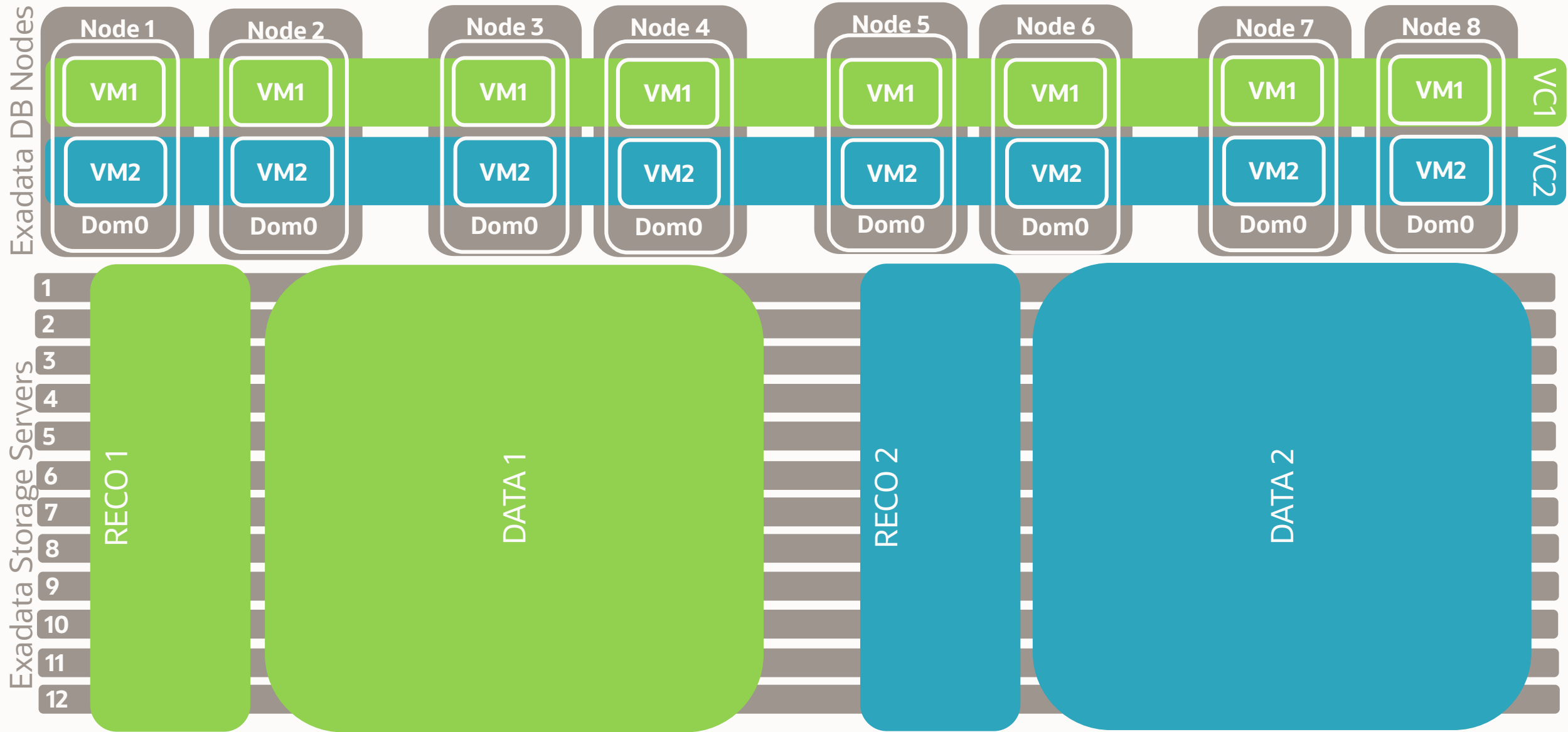
2 Physical (Bare Metal) Clusters



1 Virtual Cluster

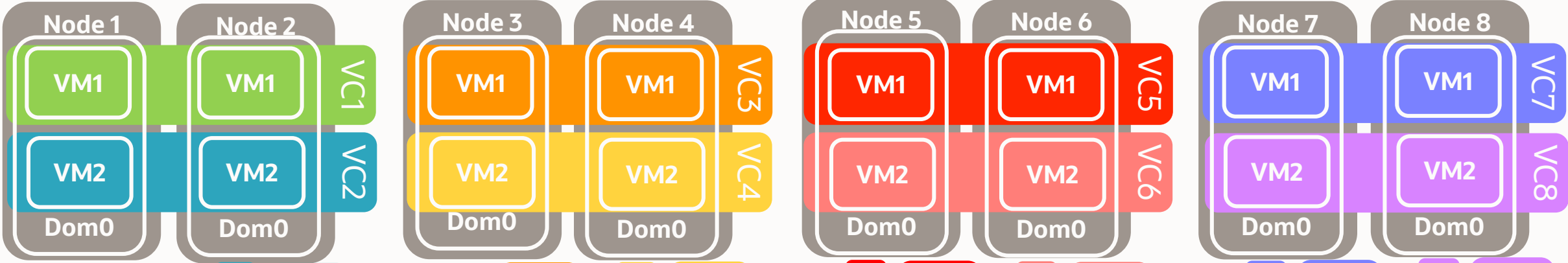


2 Virtual Clusters

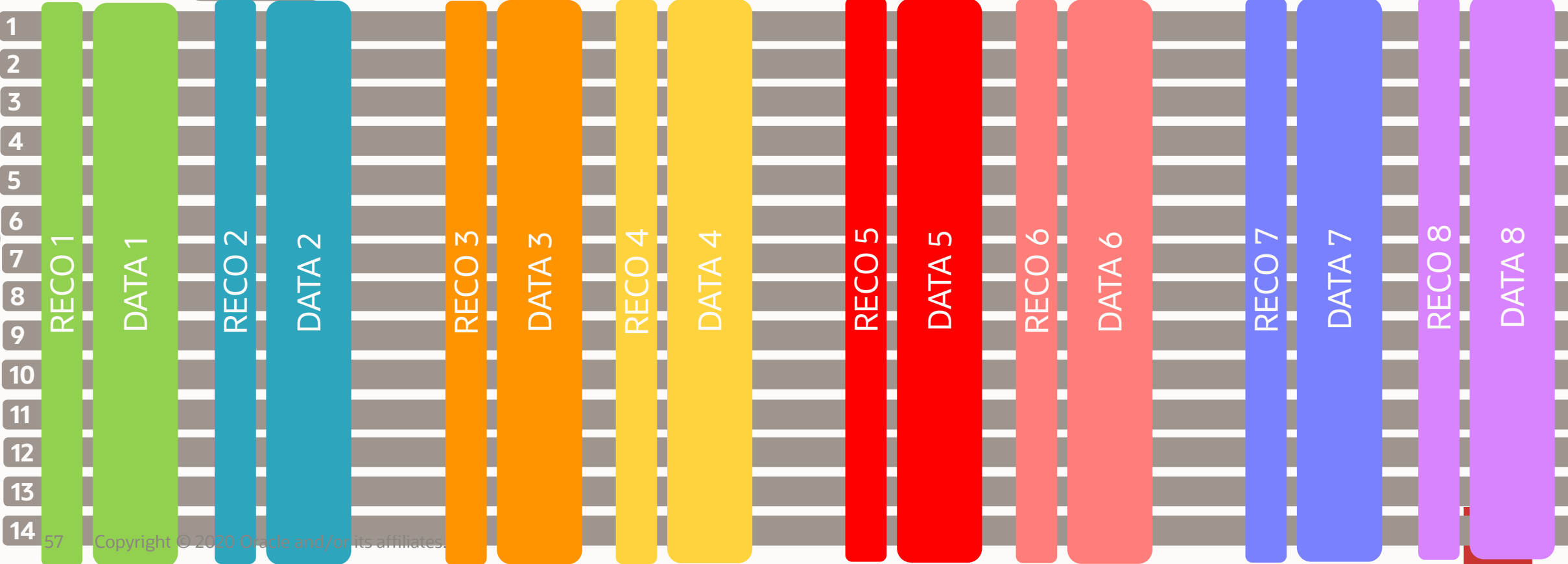


8 Virtual Clusters

Exadata DB Nodes

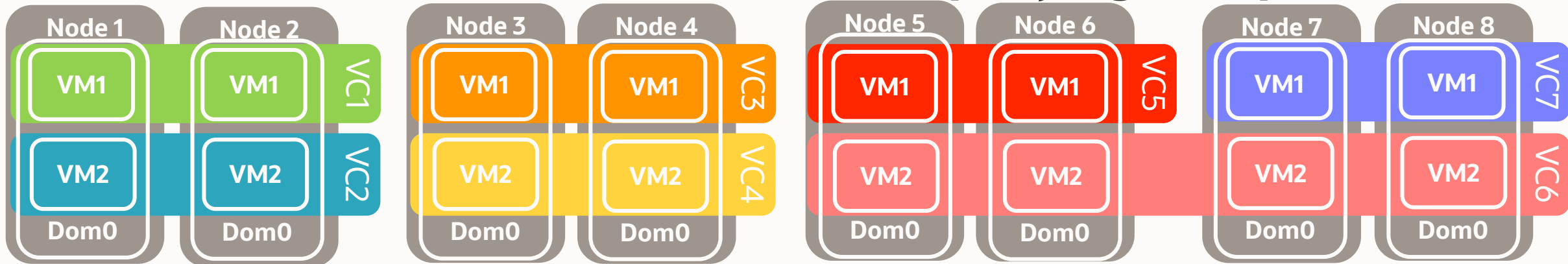


Exadata Storage Servers

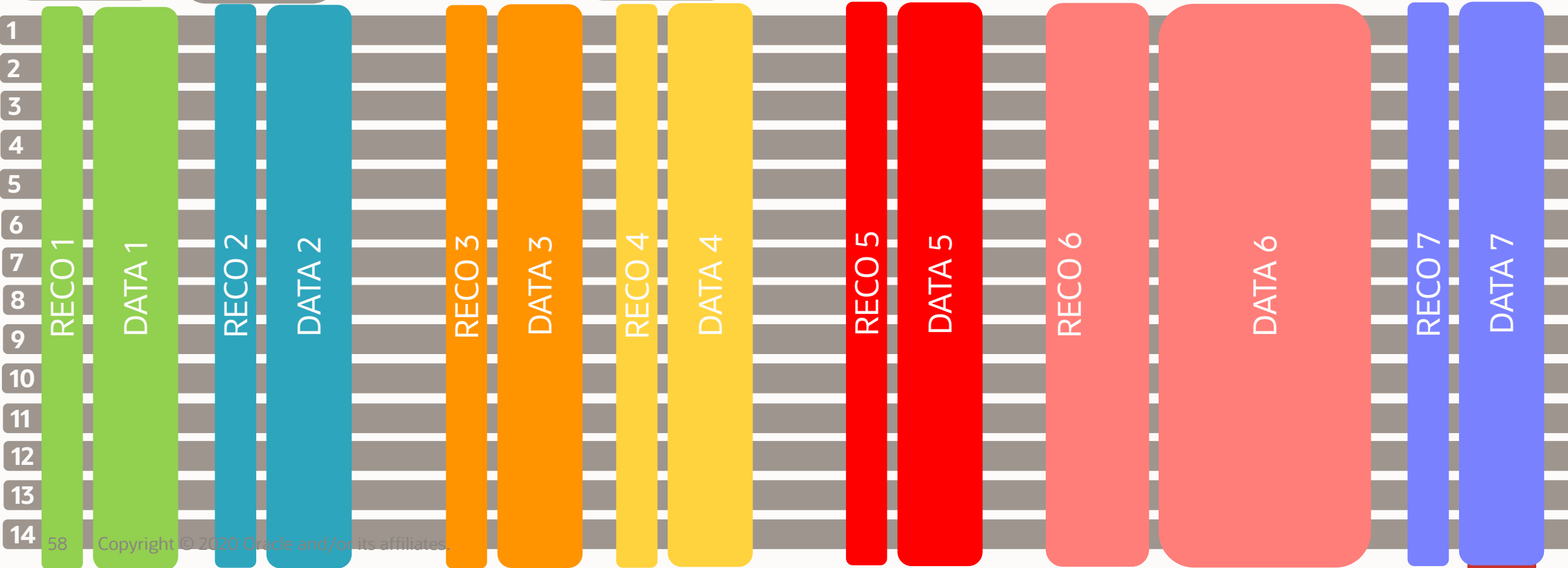


Virtualized Exadata – 7 Virtual Clusters (varying sizes)

Exadata DB Nodes



Exadata Storage Servers



Database Resource Shapes & Plans

Resources Allocated to Databases by Resource Manager

- Easier to meet business objectives
- More flexible than Virtual Machines
- Simpler to Change
- Does not add Admin Overhead like Virtual Machines
- OLTP vs. DW Shapes

Layered Into Exadata System Shapes

- System Shapes provide ISOLATION
- DB Resource Shapes facilitate Resource Management

OLTP DB Resource Shapes

Layered into Exadata System Shapes

Shape	CPU			Memory				Processes		IORM		
	CPU_COUNT	Nodes	Total	DB Memory	SGA	PGA Target	PGA Limit	Sessions	PQ Processes	Share	Limit %	FlashCache Limit
OLTP Small 2V	4	VM 2	8	30 GB	15 GB	7.5 GB	15 GB	128	4	8	5%	3.7 TB
OLTP Medium 2V	8	VM 2	16	60 GB	30 GB	22 GB	30 GB	256	8	16	5%	7.4 TB
OLTP Large 2V	16	VM 2	32	120 GB	60 GB	30 GB	60 GB	512	16	32	5%	14.9 TB
OLTP 2X Large 2V	32	VM 2	64	240 GB	120 GB	60 GB	120 GB	1024	32	64	8%	29.8 TB
OLTP 3X Large 2V	48	VM 2	96	360 GB	180 GB	90 GB	180 GB	1536	48	96	12%	44.8 TB
OLTP 3X Large 4V	48	VM 4	192	360 GB	180 GB	90 GB	180 GB	1536	48	192	25%	89.6 TB
OLTP 6X Large 2V	96	VM 2	192	720 GB	360 GB	180 GB	360 GB	3072	96	192	25%	89.6 TB
OLTP 6X Large 2B	96	BM 2	192	1.5 TB	768 GB	384 GB	768 GB	3072	96	192	25%	89.6 TB
OLTP 12X Large 4B	96	BM 4	384	1.5 TB	768 GB	384 GB	768 GB	3072	96	384	50%	179.2 TB
OLTP 24X Large 8B	96	BM 8	768	1.5 TB	768 GB	384 GB	768 GB	3072	96	768	100%	358.4 TB



DW DB Resource Shapes

Layered into Exadata System Shapes

Shape	CPU_COUNT Nodes Total			Memory				Processes		IORM		
				DB Memory	SGA	PGA Target	PGA Limit	Sessions	PQ Processes	Share	Limit %	FlashCache Limit
DW Small 2V	4	VM 2	8	30 GB	10 GB	10 GB	20 GB	32	16	8	5%	3.7 TB
DW Medium 2V	8	VM 2	16	60 GB	20 GB	20 GB	40 GB	64	32	16	5%	7.4 TB
DW Large 2V	16	VM 2	32	120 GB	40 GB	40 GB	80 GB	128	64	32	5%	14.9 TB
DW 2X Large 2V	32	VM 2	64	240 GB	80 GB	80 GB	160 GB	256	128	64	8%	29.8 TB
DW 3X Large 2V	48	VM 2	96	360 GB	120 GB	120 GB	240 GB	384	192	96	12%	44.8 TB
DW 3X Large 4V	48	VM 4	192	360 GB	120 GB	120 GB	240 GB	384	192	96	25%	89.6 TB
DW 6X Large 2V	96	VM 2	192	720 GB	240 GB	240 GB	480 GB	768	384	192	25%	89.6 TB
DW 6X Large 2B	96	BM 2	192	1.5 TB	360 GB	588 GB	1176 GB	768	384	192	25%	89.6 TB
DW 12X Large 4B	96	BM 4	384	1.5 TB	360 GB	588 GB	1176 GB	768	384	384	50%	179.2 TB
DW 24X Large 8B	96	BM 8	768	1.5 TB	360 GB	588 GB	1176 GB	768	384	768	100%	358.4 TB



Implementing Consolidation on Exadata

1. Inventory Databases to be Consolidated
2. Gather Resource Utilization & Growth Metrics
3. Map Resource Requirements to New Platform
4. Determine Database Isolation Requirements & Methods
5. Select Consolidation Method for Databases
6. Group Databases into HA Tiers
7. Perform Bin-Packing of Databases into Resource Shapes
8. Create Resource Plans for Databases

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see data in new ways, discover insights,
unlock endless possibilities.

