ORACLE®

Consolidate and Prepare for Cloud Efficiencies

Oracle Database 12c – Oracle Multitenant Option

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Master Principal Sales Consultant
Oracle Public Sector
27 September 2016

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Agenda

1. Rethinking Architecture for the Database Cloud
2. Multitenant Architecture
3. Capabilities Enabled
4. Managing Multitenant Environment
5. Upgrading to Multitenant
6. Use Cases

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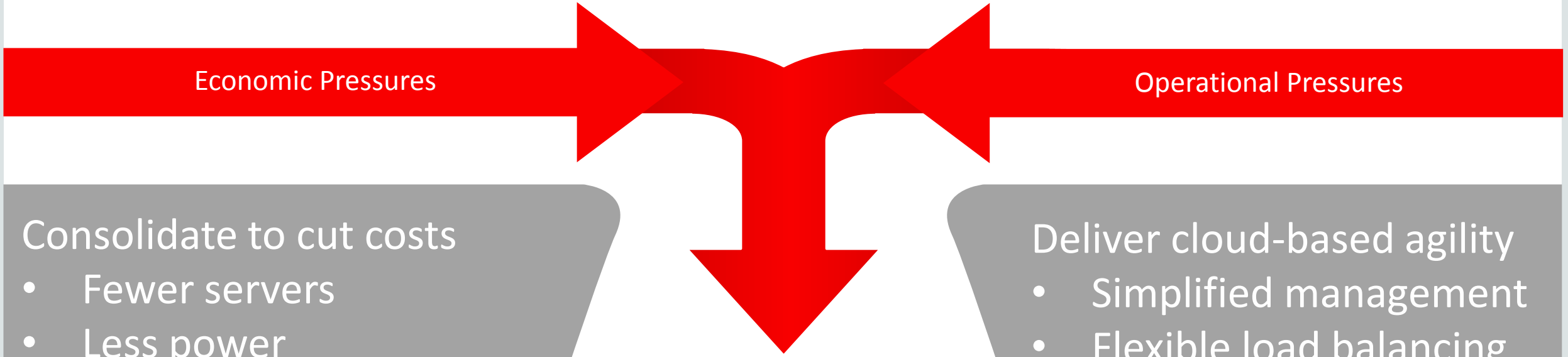
Business Drivers

Customers face great pressure to consolidate databases in cloud



Consolidate to cut costs

- Fewer servers
- Less power
- Less floor space
- Lower license costs

Requirements

- **Tenant isolation**
- **Easy adoption**
- **Manage many as one**
- **Retain granular control**

Deliver cloud-based agility

- Simplified management
- Flexible load balancing
- Rapid self-service provisioning

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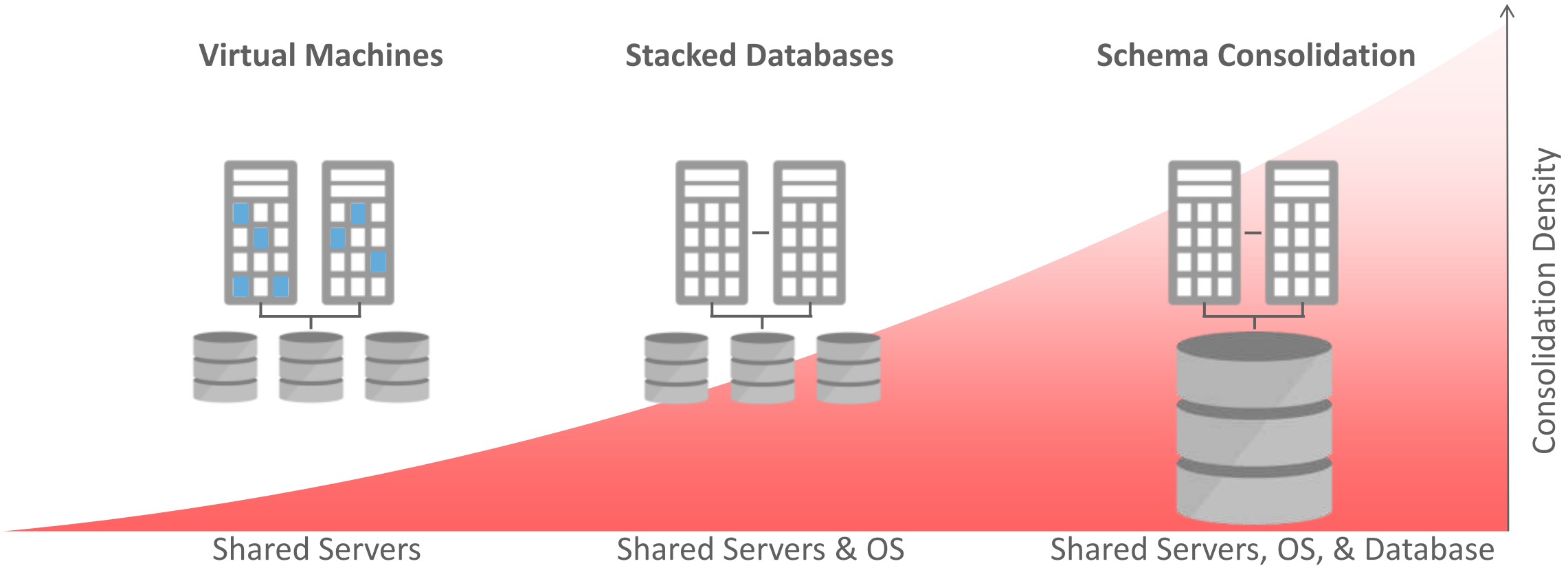
Database Consolidation on Clouds

Traditional consolidation methods



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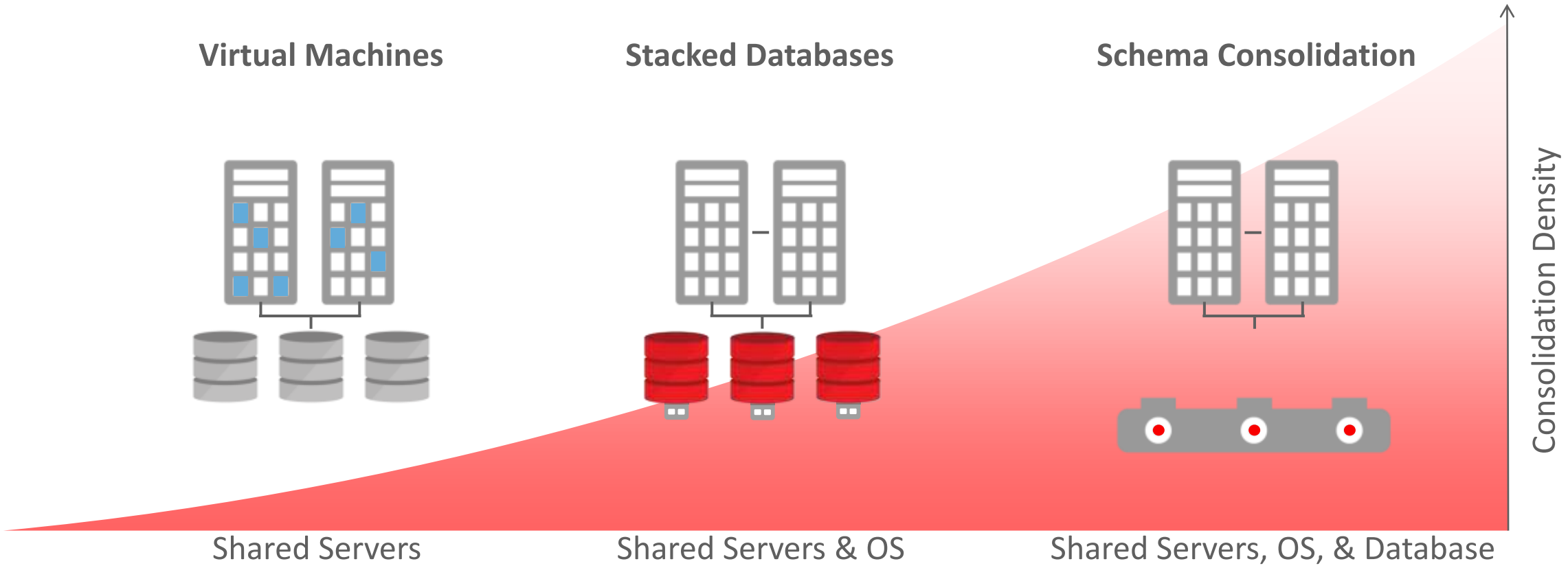
Cloud Database Design Goal: Efficiency

CapEx and OpEx reduction comparable to schema consolidation, with no downsides



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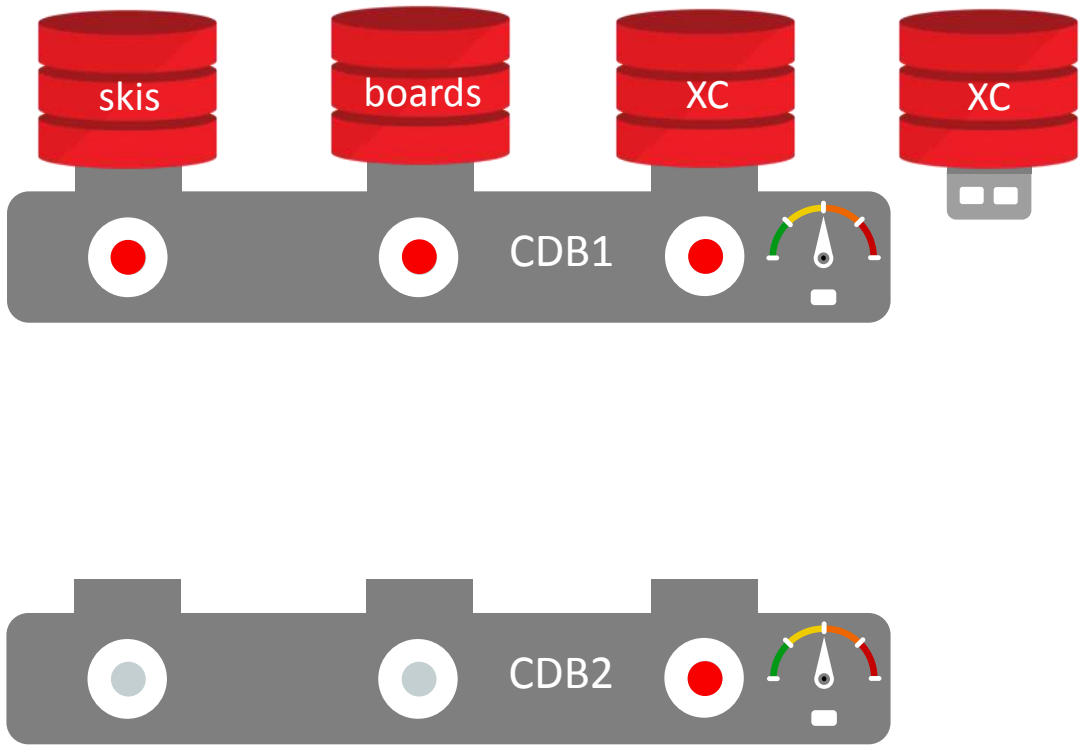
Cloud Database Design Goal: Portability



- A pluggable database is a portable database
- Simply unplug from the old CDB…
- …and plug it into the new CDB
- With shared storage, moving between CDBs is a simple case of moving a PDB's metadata
- An unplugged PDB carries with it lineage, opatch, encryption key info etc.

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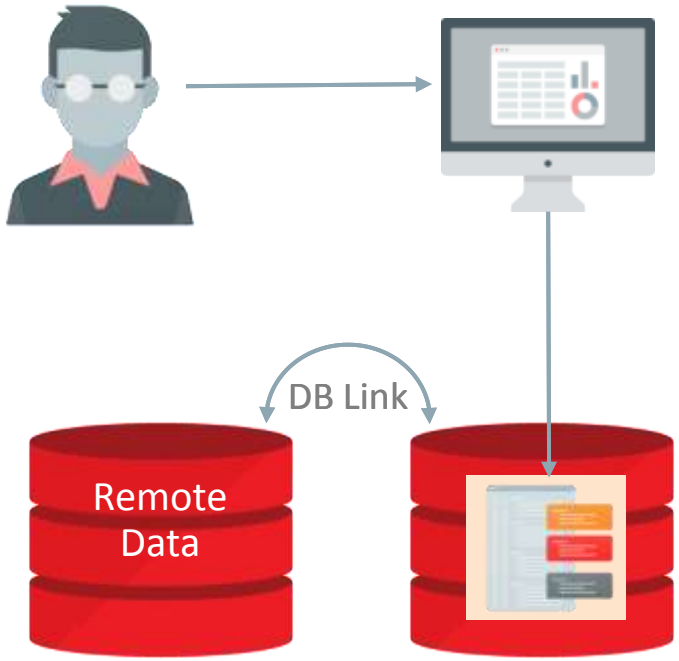
Cloud Database Design Goal: Compatibility

Legacy non-CDB Architecture



- PDB / non-CDB compatibility guarantee:

  You cannot tell, from the viewpoint of a connected client, if you're using a PDB or a non-CDB

Multitenant Architecture

- **Applications run unchanged**

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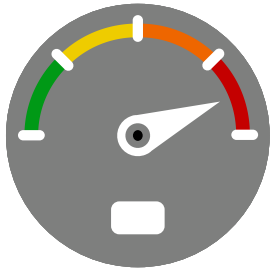
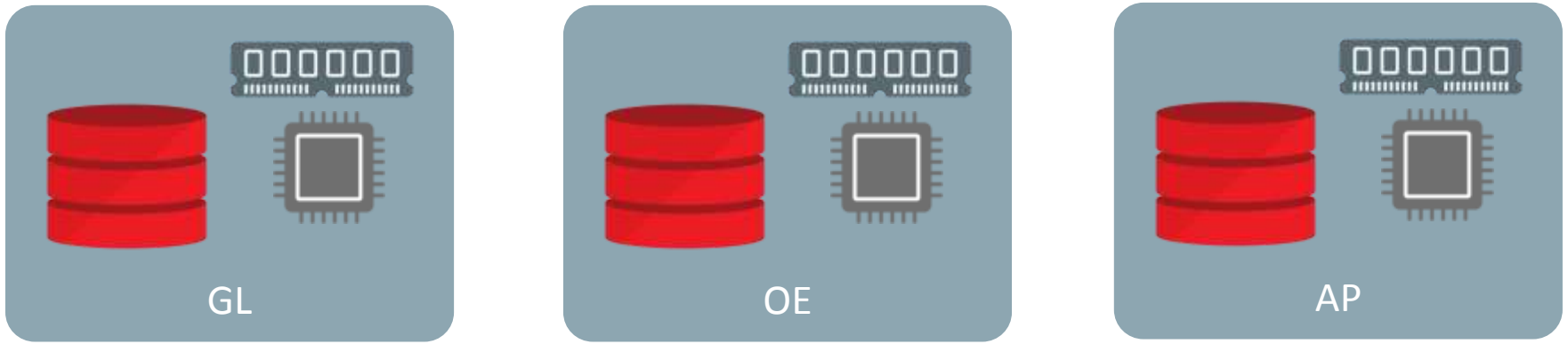
Oracle Database Architecture

Requires memory, processes and database files



System Resources



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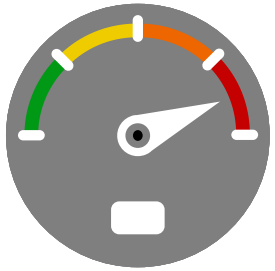
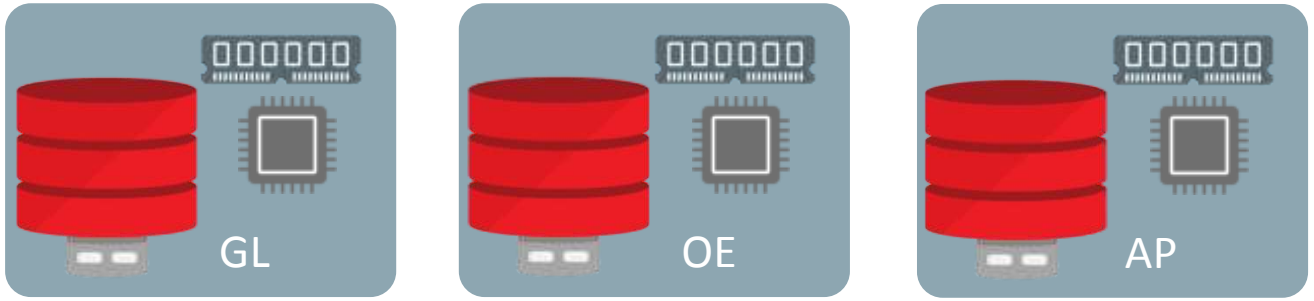
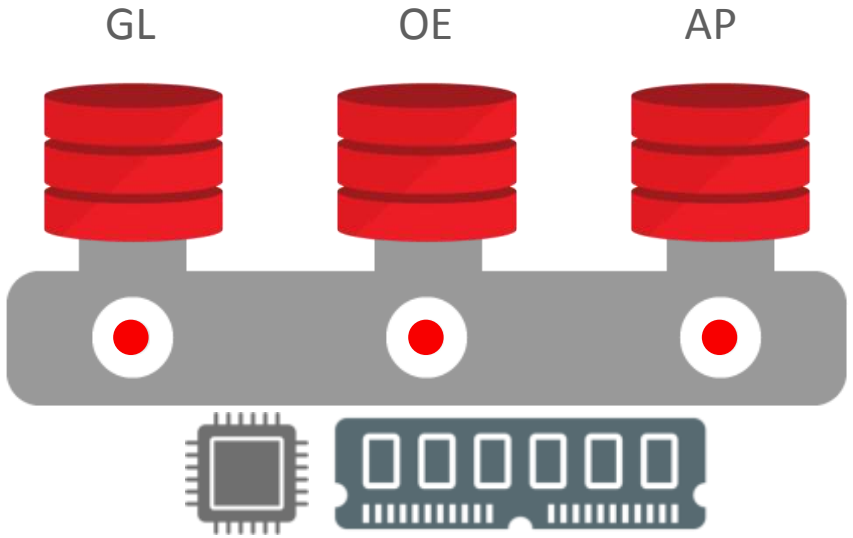
New Multitenant Architecture

Memory and processes required at container level only



System Resources





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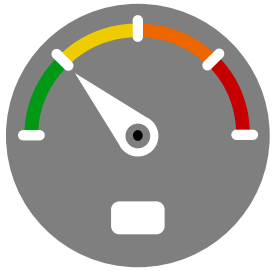
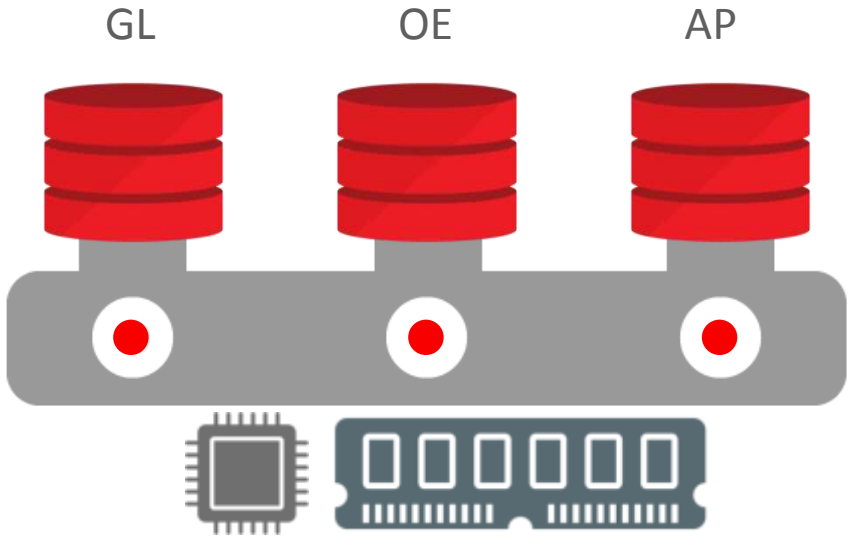
New Multitenant Architecture

More efficient utilization of system resources



System Resources



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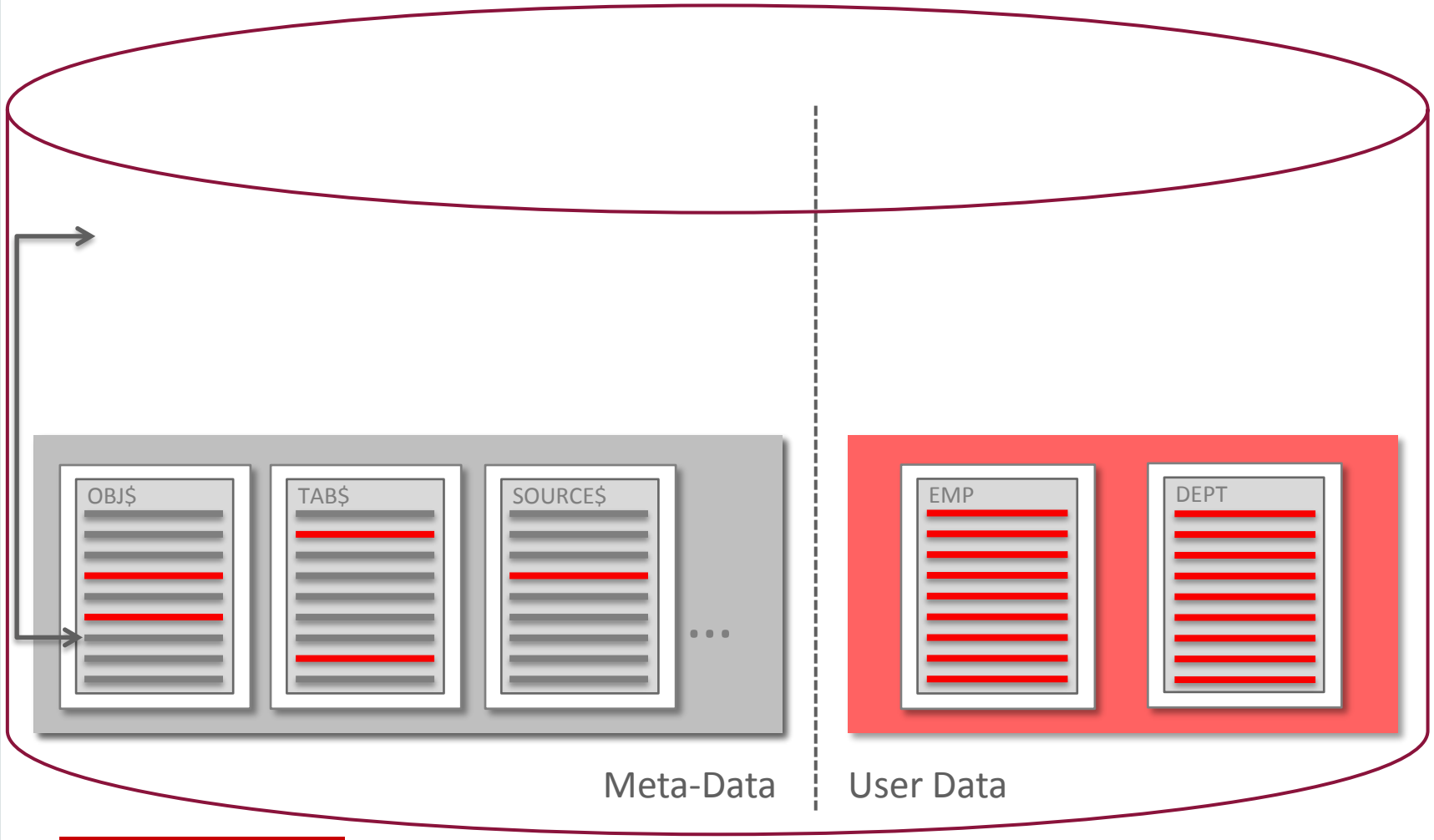
Oracle Data and User Data

Before 12.1: Oracle and user data intermingle over time



- New database contains Oracle meta-data only
- Populate database with user data
  - Oracle and customer meta-data intermingled
  - Portability challenge!
- Multitenant fix: *Horizontally-partitioned data dictionary*
  - Only Oracle-supplied meta-data remains in root

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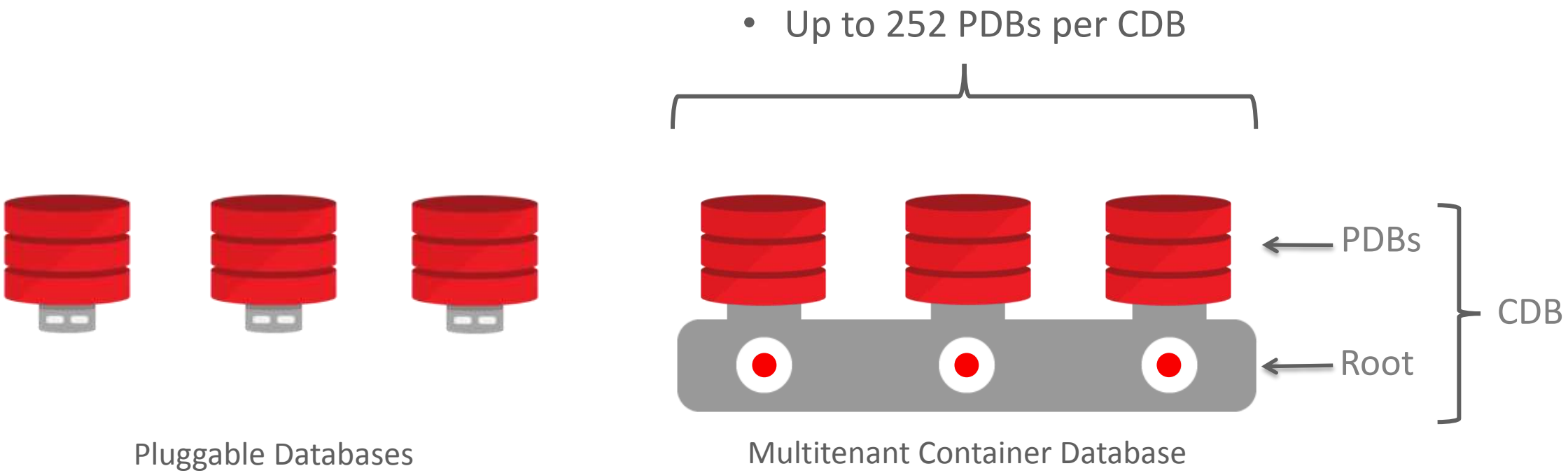
Multitenant Architecture

Components of a Multitenant Container Database (CDB)



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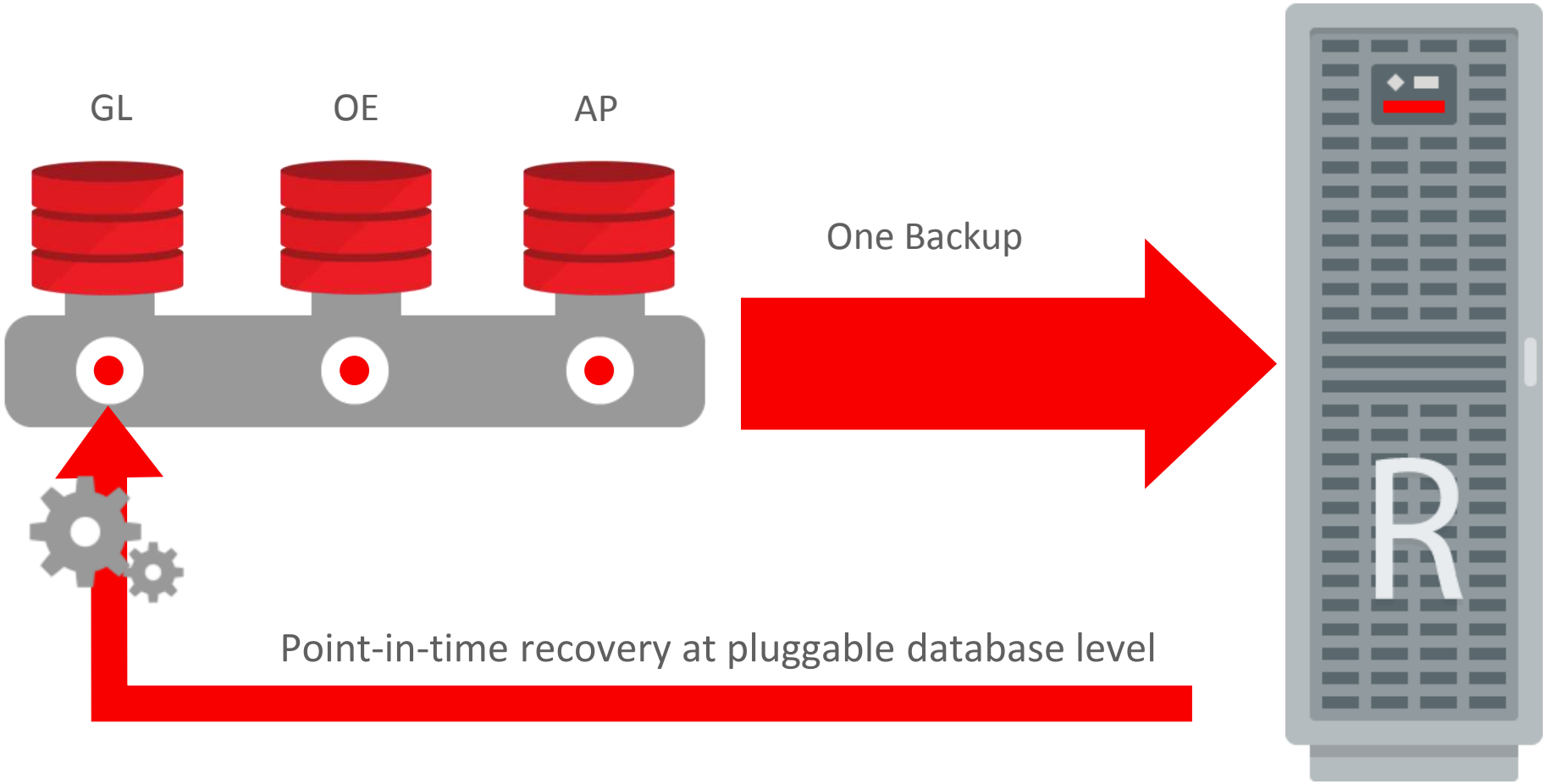
Manage Many Databases as One

Backup databases as one; recover at pluggable database Level



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Manage Many Databases as One with Multitenant

One standby database covers all pluggable databases

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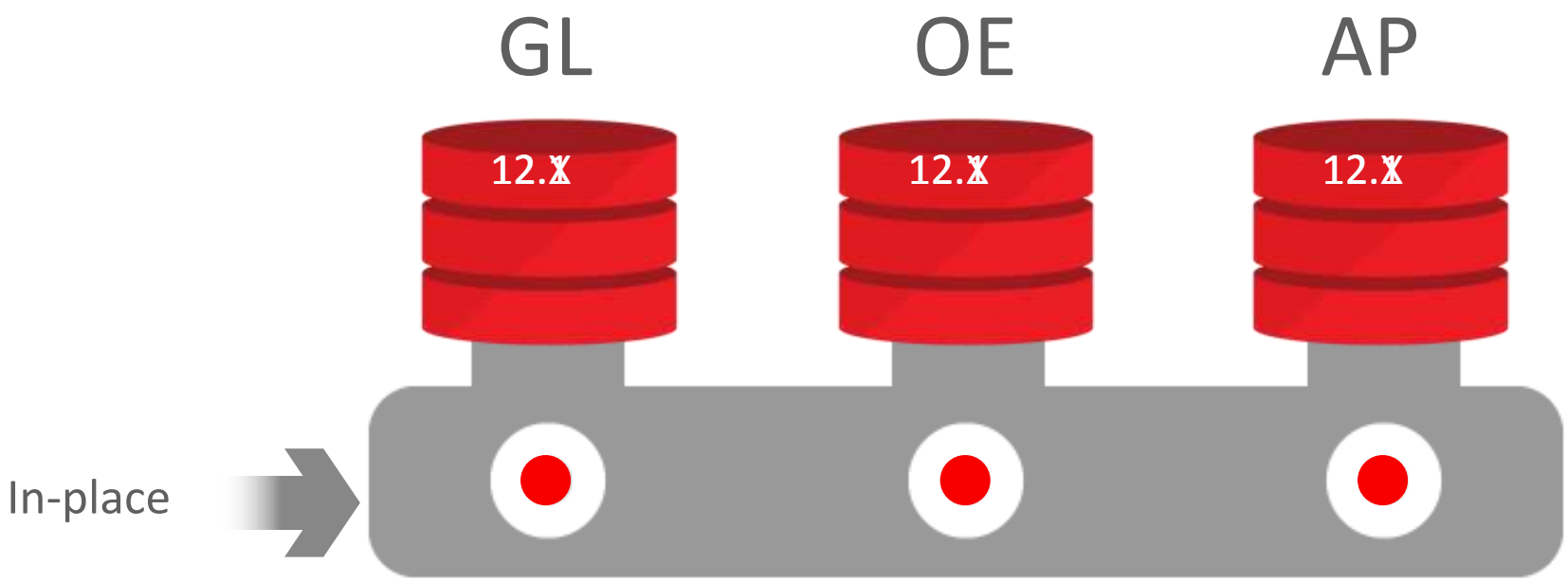
Simplified Patching and Upgrades

Apply changes once, all pluggable databases updated



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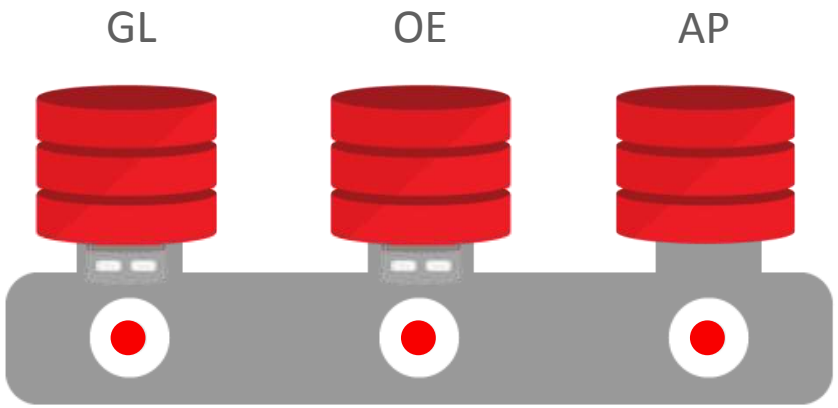
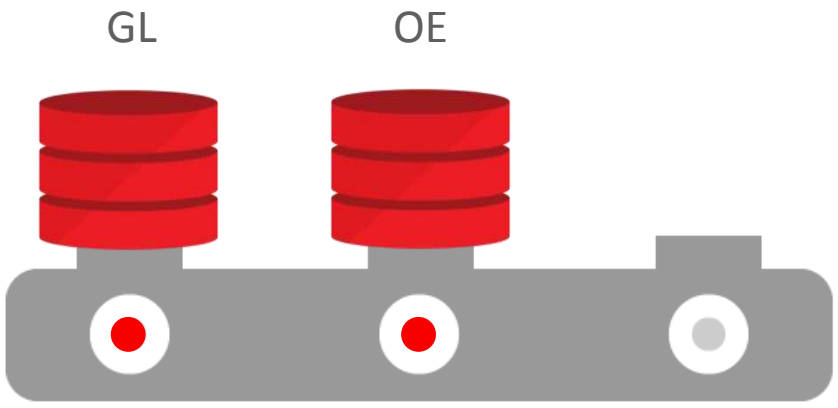
Simplified Patching and Upgrades

Flexible choice when patching & upgrading databases



Original Container Database 12.1



Upgraded Container Database 12.x

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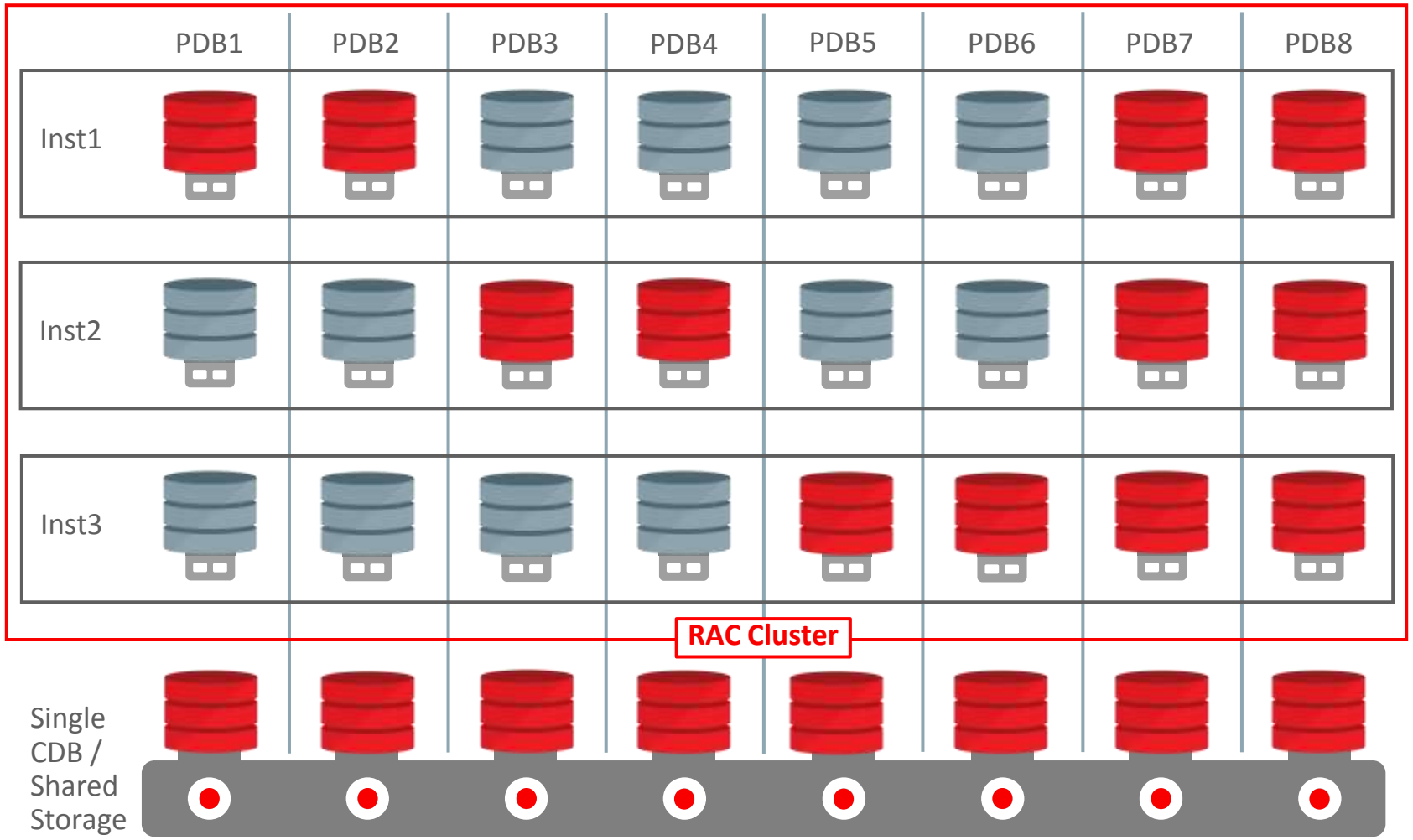
Multitenant and RAC: Agility, Availability & Scalability



- Single CDB
- Single instance per node
- PDBs may be configured with “singleton” affinity to a specific node
  - Present in “mounted” state in other nodes
- PDBs may be uniformly available in all nodes

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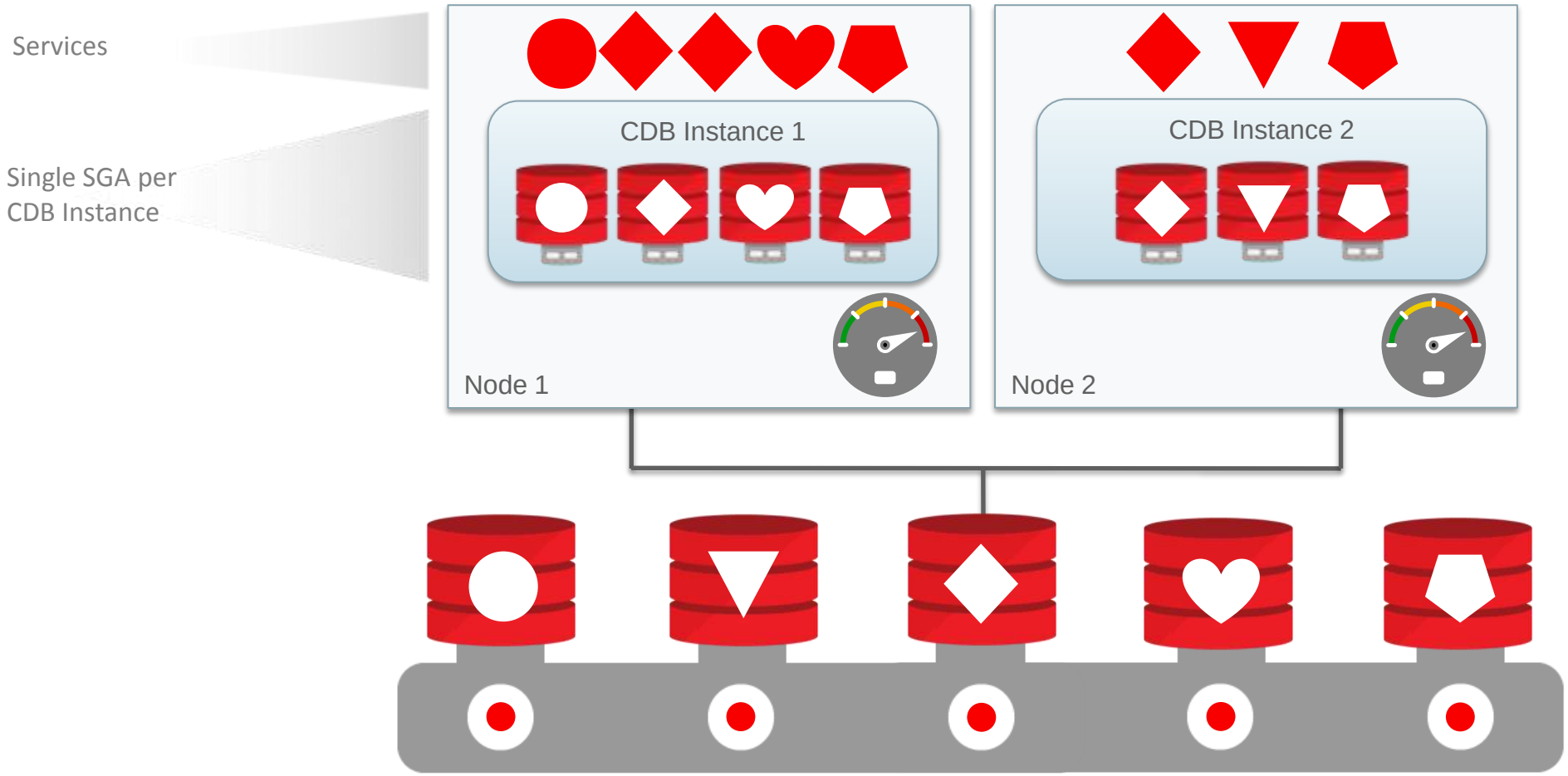
Improved Agility With Changing Workloads

Expand cluster to support flexible consolidation model



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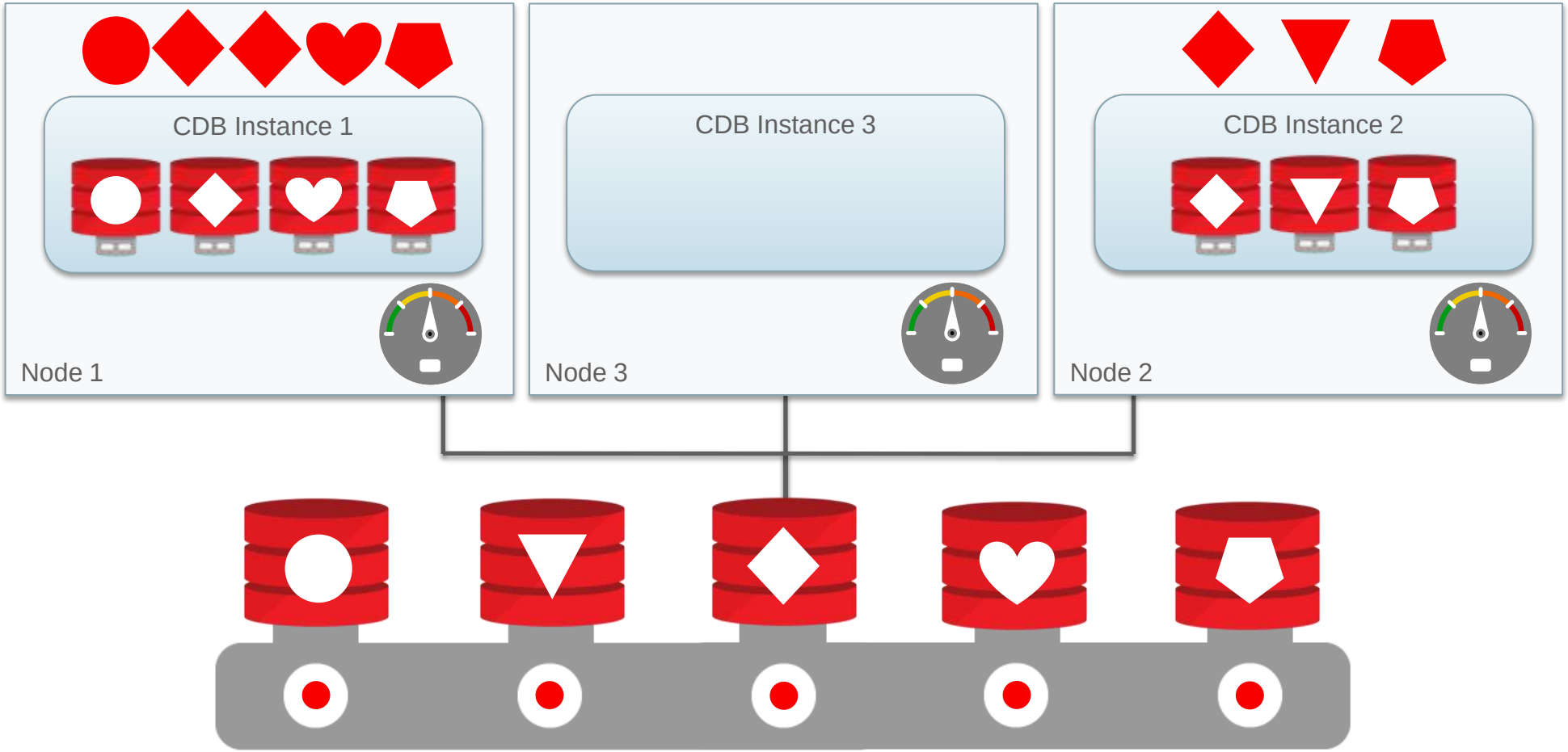
Expand cluster to support flexible consolidation model



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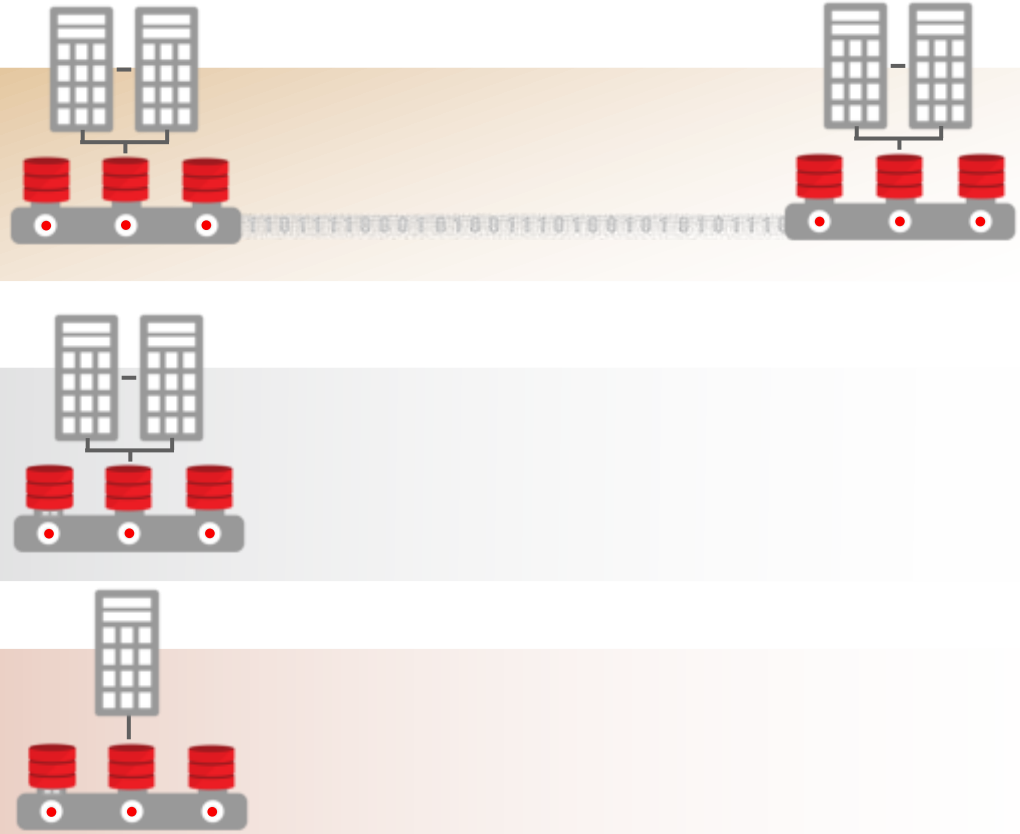
Unprecedented Agility with Portable Pluggability

PDB migrates through SLAs as it becomes more mission critical

GOLD RAC, Data Guard

SILVER RAC

BRONZE Backups



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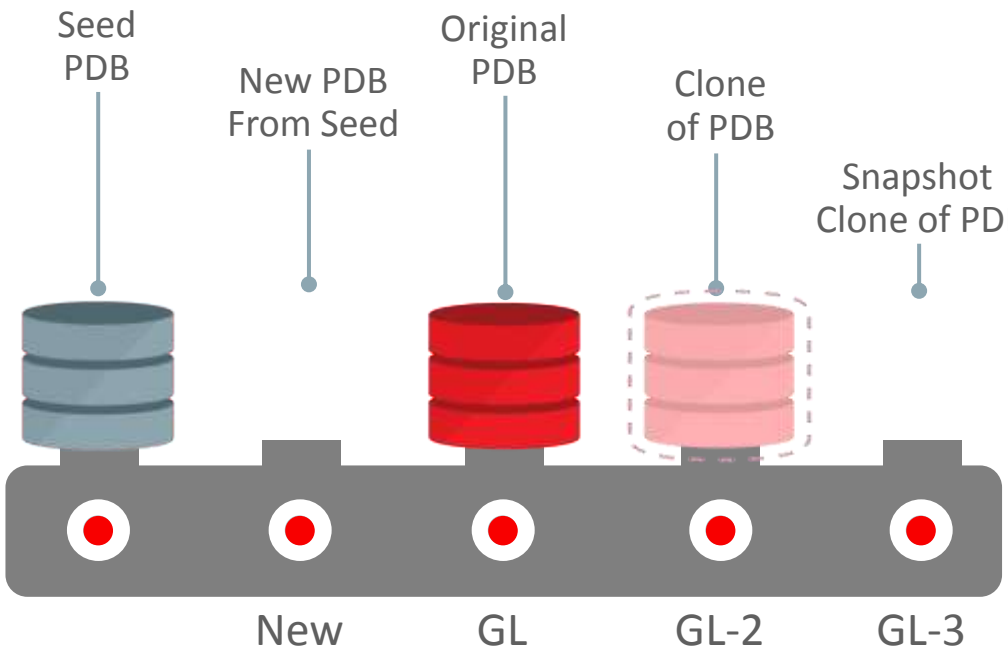
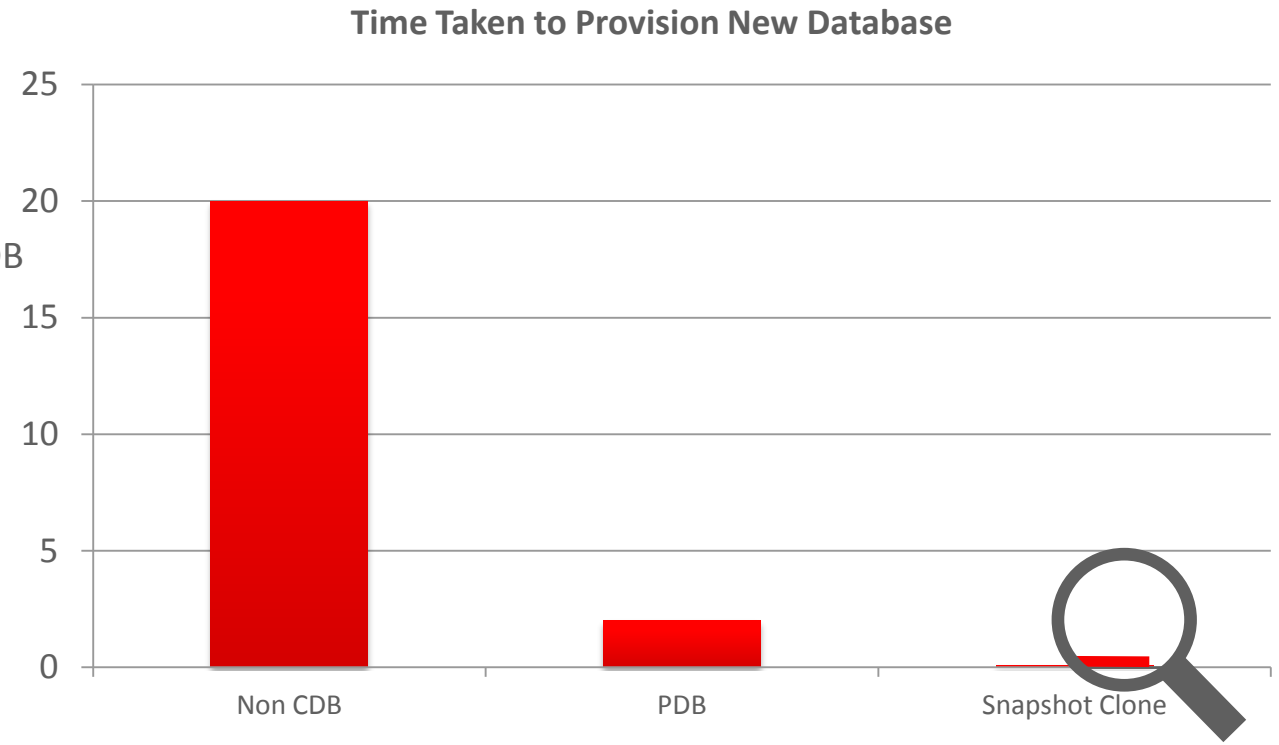
Multitenant Provides Agility for New Projects

Fast Provisioning, Snapshot Clones





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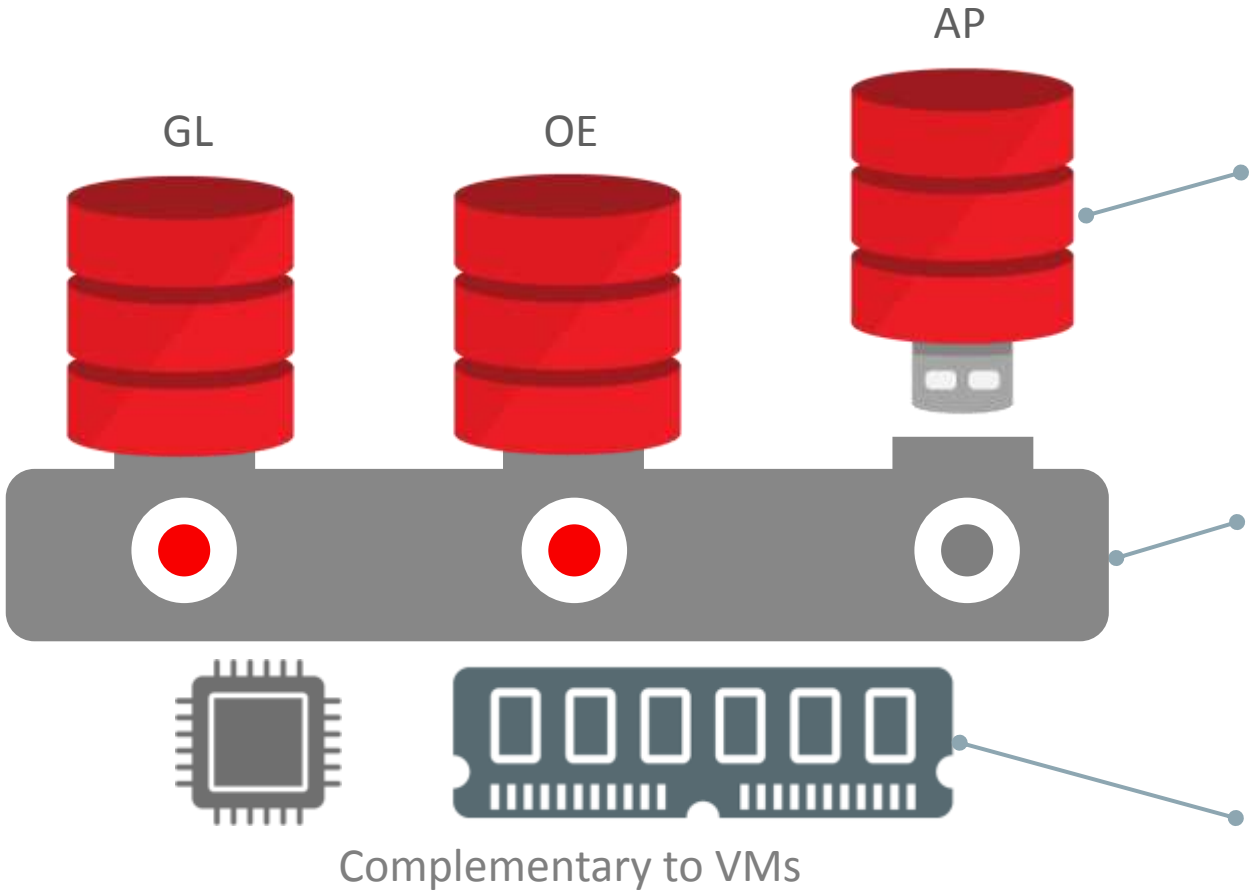
Advantages of Multitenant Architecture

Reduced CapEx & OpEx, Increased Agility, Easy to Adopt and Use



Self-contained PDB for each application

- Applications run unchanged
- Rapid provisioning (via clones)
- Portability (via pluggability)

Common operations performed at CDB level

- Manage many as one
  (patch, upgrade, HA, backup)
- Granular control when appropriate

Shared memory and background processes

- More applications per server

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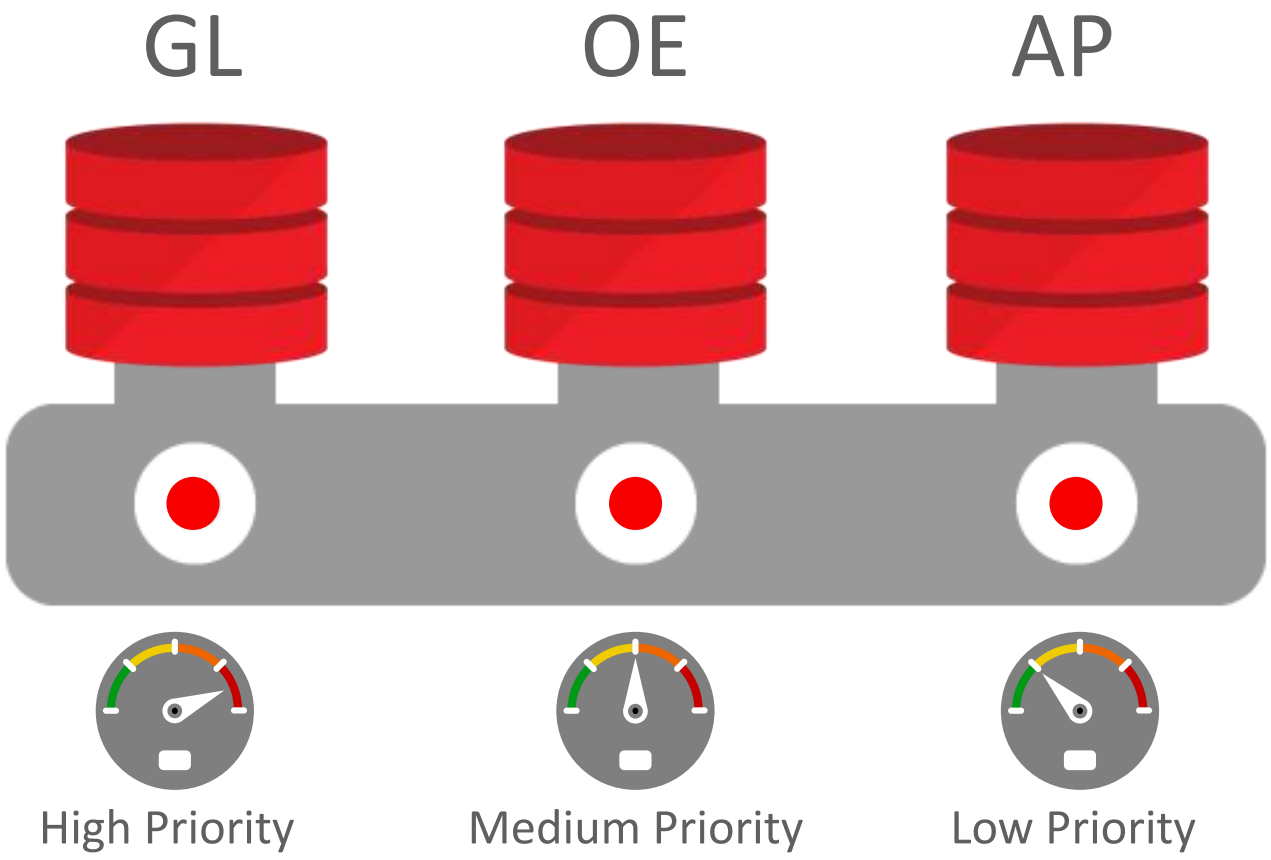
Managing Shared Resources

Resource management in a multitenant environment



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Managing Resources Between PDBs

- Using Resource Manager, you can control
  - CPU
  - Exadata I/O
  - Sessions
  - Parallel execution servers
- Simple-yet-powerful policies configured in terms of:
  - A number of shares allocated to each PDB
  - A “cap” (a.k.a. maximum utilization limit) may be applied to each PDB

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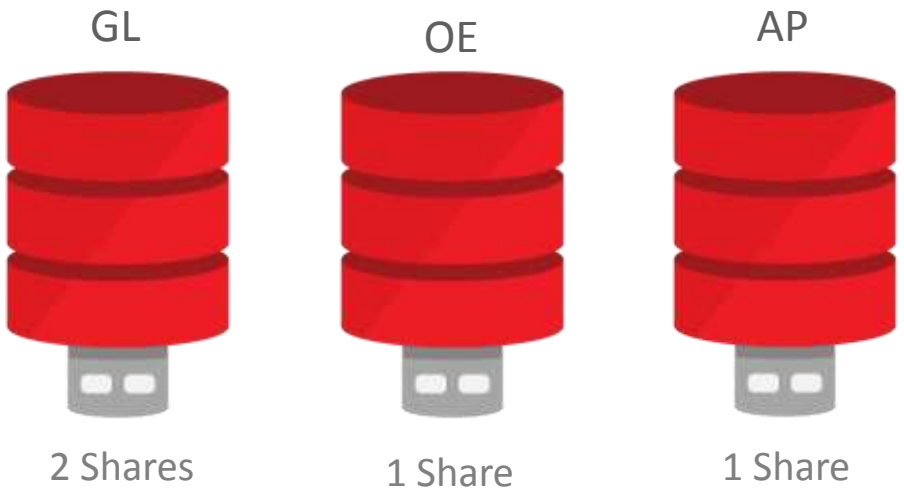
Manage CPU

A CDB Resource Plan uses *shares* to specify how CPU is distributed between PDBs



Pluggable Database	Shares	Guaranteed CPU	Maximum CPU
GL	2	2/4 = 50%	100%
OE	1	1/4 = 25%	100%
AP	1	1/4 = 25%	100%

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Upgrading to Multitenant

Step 1. Upgrade databases in place

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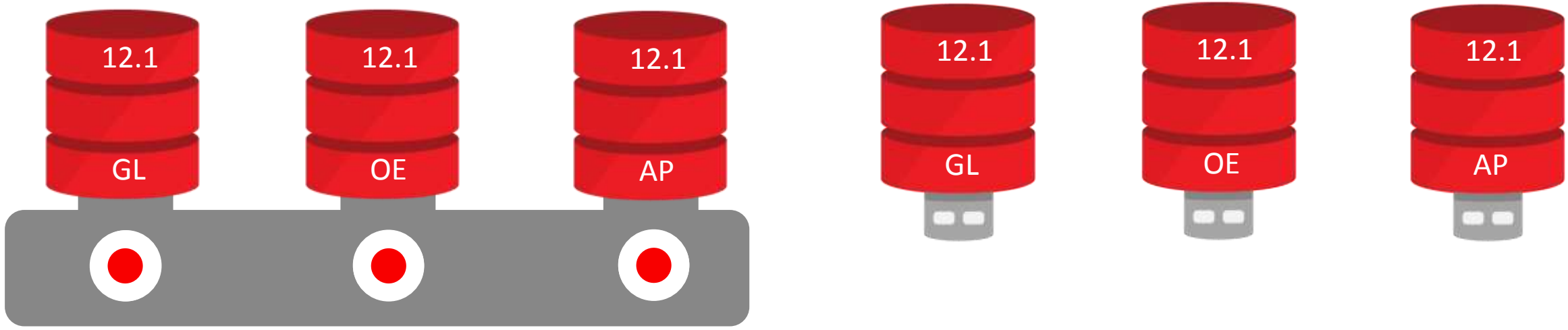
Upgrading to Multitenant

Step 2. Plug in upgraded databases



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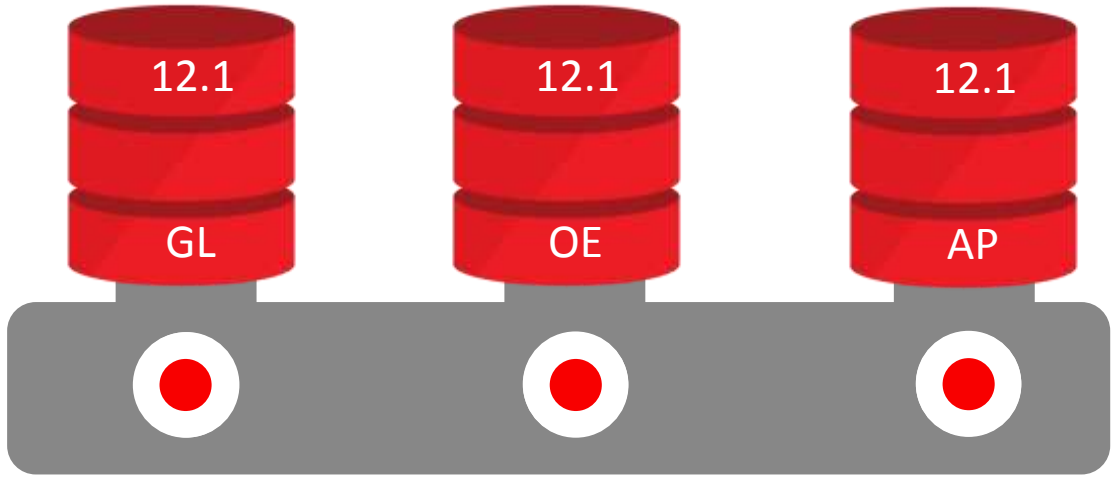
Upgrading to Multitenant

~~**Step 3. Change applications to work with Multitenant**~~

- No application changes required!



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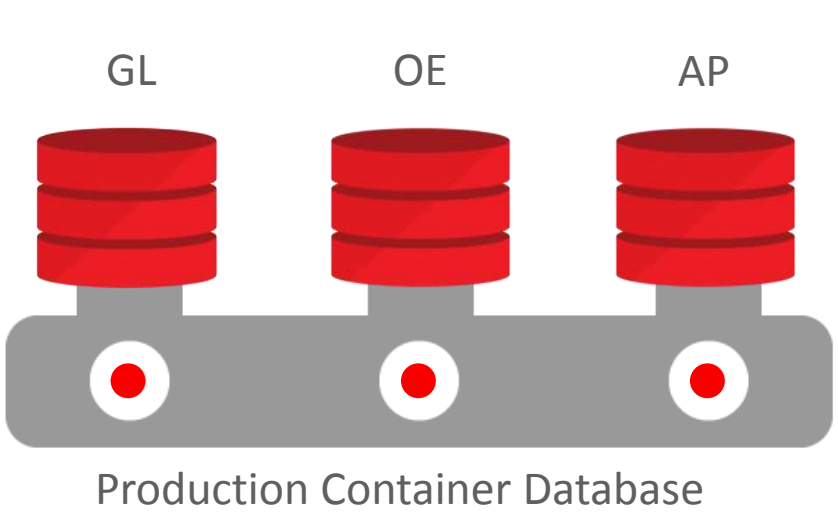
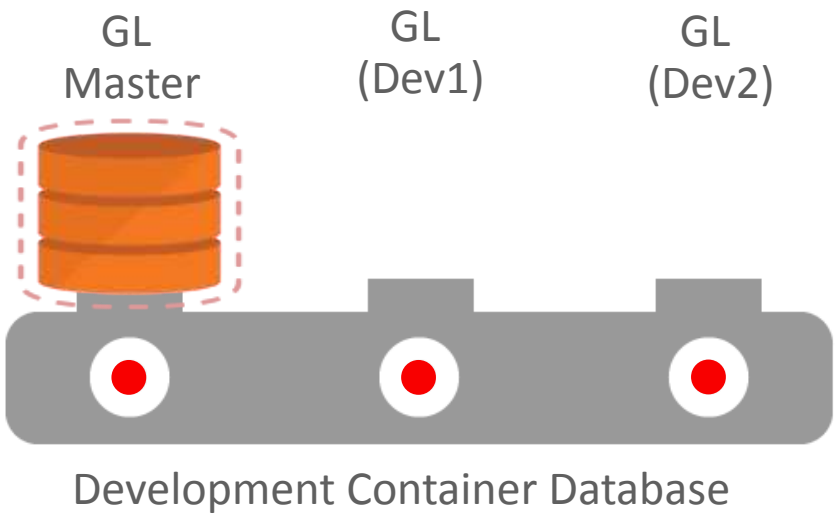
Multitenant for Development and Testing

Fast, flexible copy and snapshot of pluggable databases





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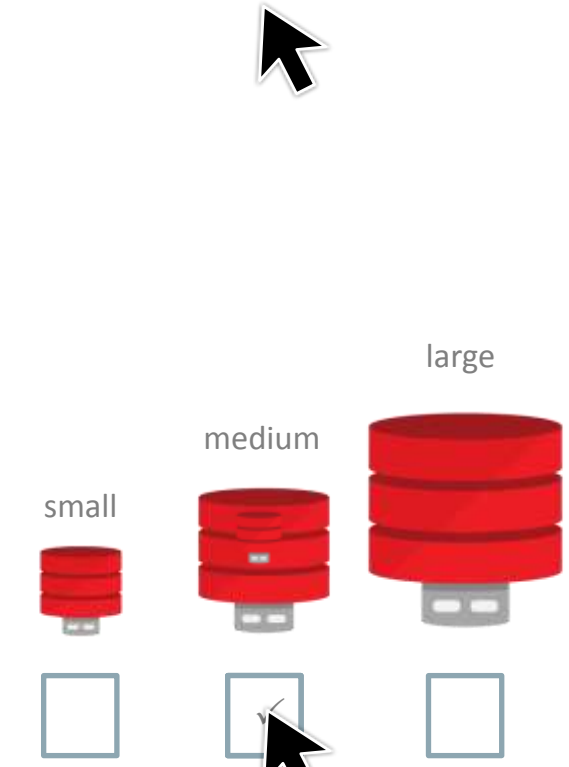
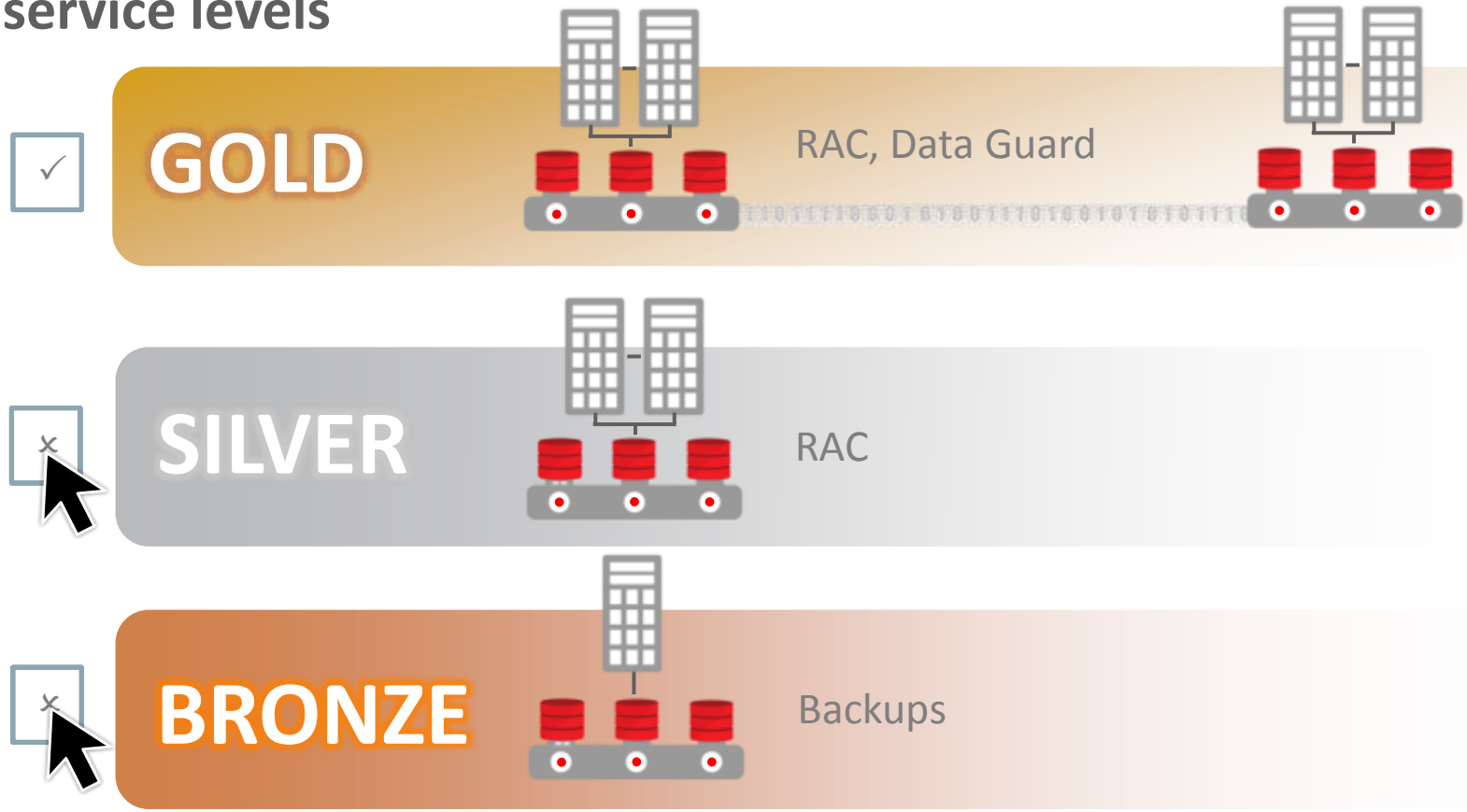
Oracle Multitenant for Database as a Service

Pick from standard sizes and service levels





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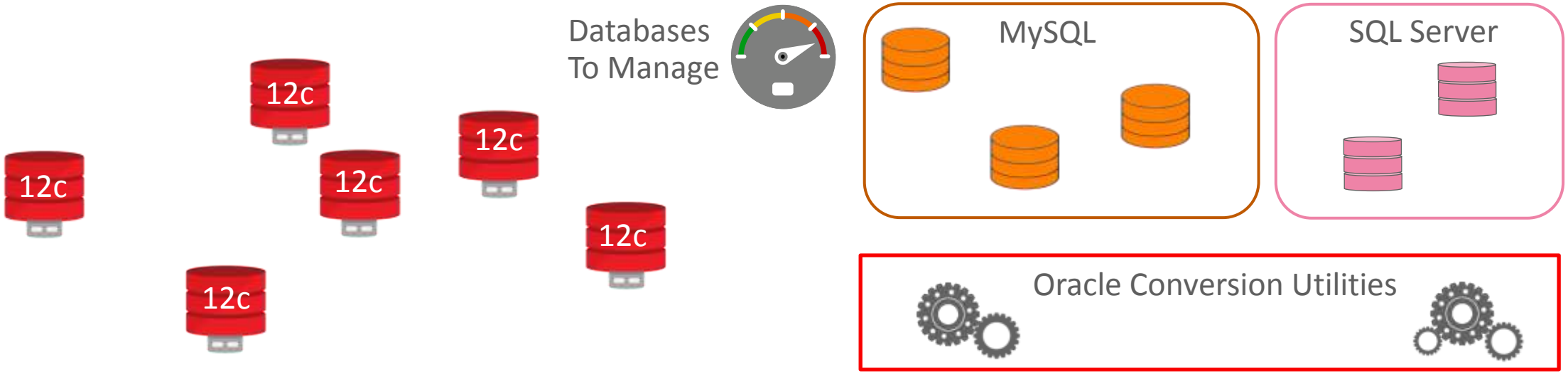
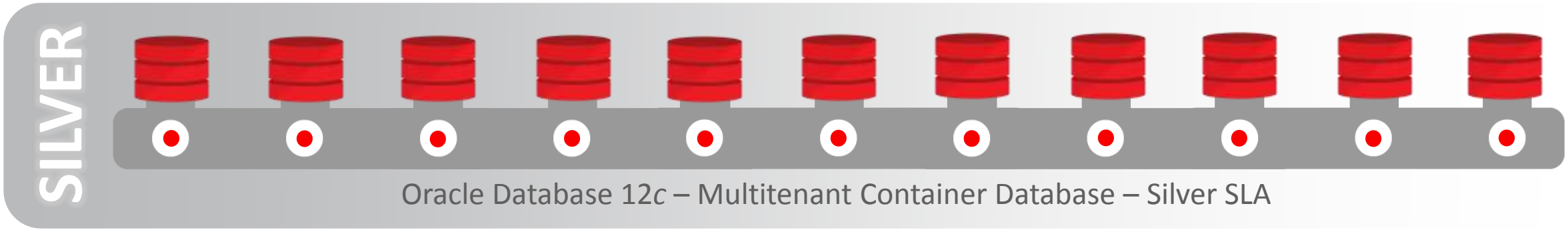
Consolidation of Disparate Applications

Simplify, standardize, reduce risk, lower costs and upgrade SLAs with Multitenant





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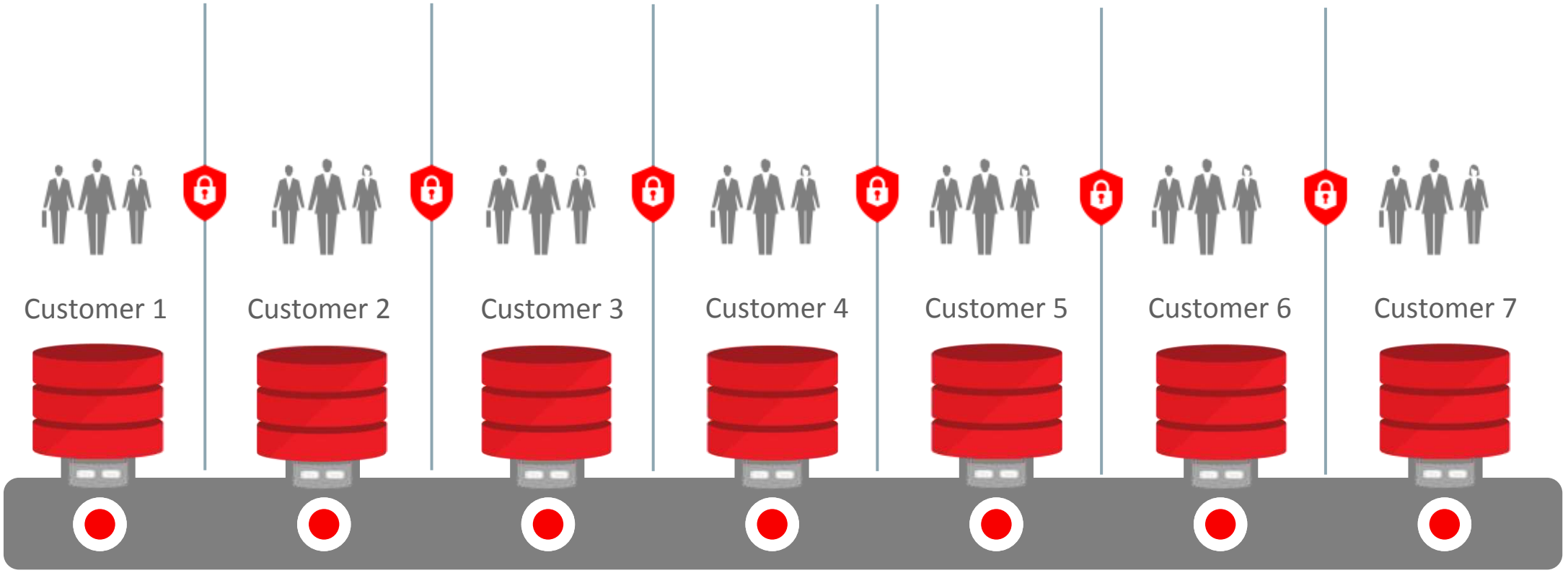
Oracle Multitenant for Software as a Service

Multitenancy implemented by the Database, not the Application



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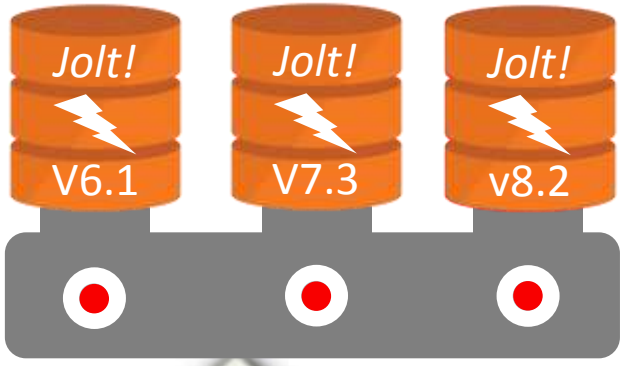
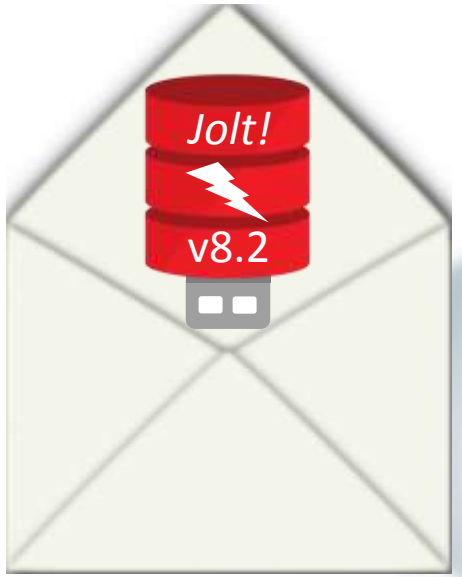
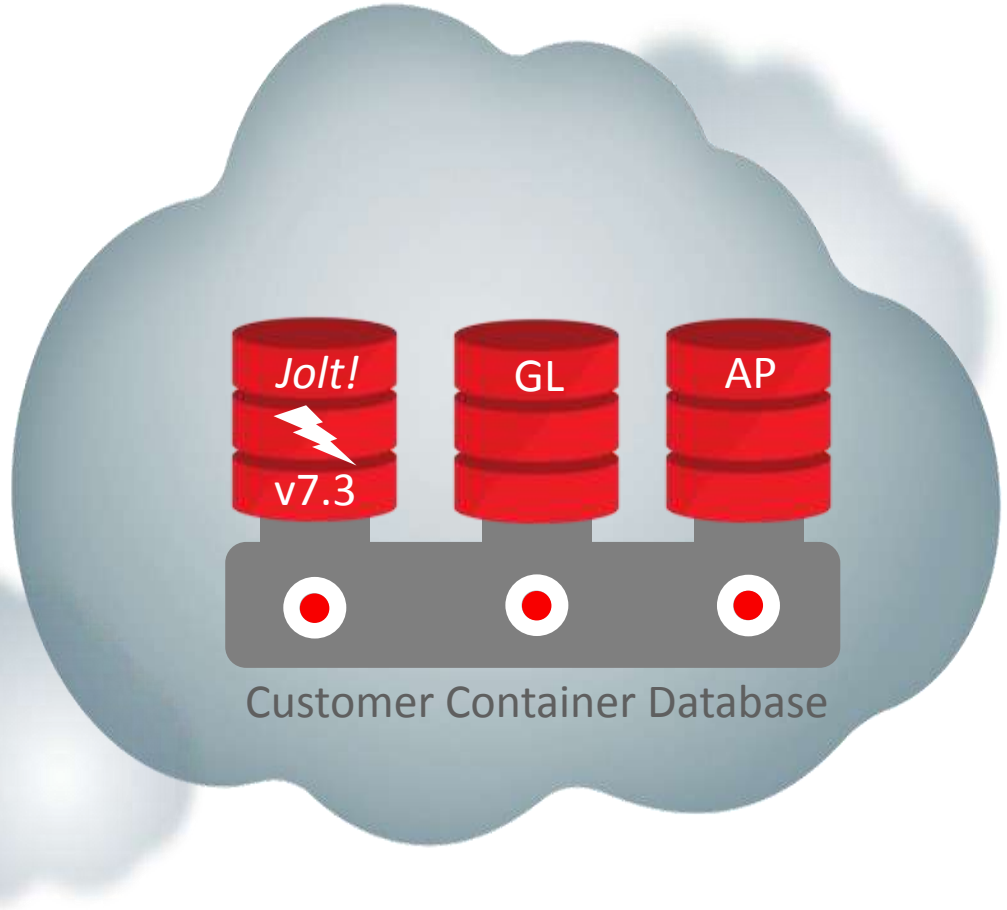
Multitenant. Perfect for ISVs

Packaged apps and reference data are easily distributed



Jolt! Applications Corporation
Development Container Database





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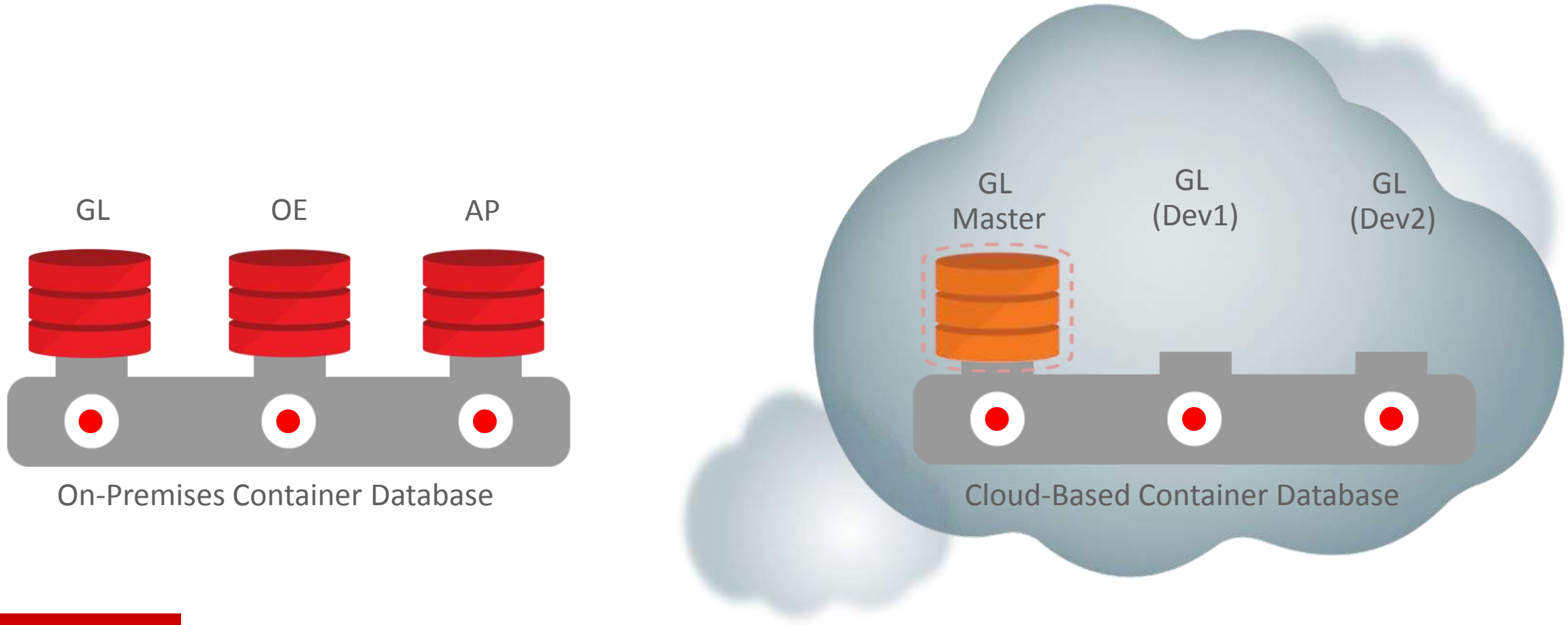
Plug Into the Cloud with Oracle Multitenant

A pluggable database is a portable database – easy to migrate to the cloud



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Use Cases

1. Development / Testing – *start here!*
2. Database as a Service (DBaaS)
3. Consolidation of Disparate Applications
4. Software as a Service (SaaS)
5. Distribution of Packaged Apps and Data
6. Migration of Databases to the Cloud
7. …many others!

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Key Benefits

Benefit	Capability Enabled
Minimize CapEx	• More applications per server
Minimize OpEx	• Manage many as one (reduced patching!) • Standardized procedures & service levels • Enable self-service provisioning
Maximize Agility	• Snapshot cloning for development and testing • Portability through “pluggability” • Scalability with RAC
Easy	• To Adopt: Applications run unchanged • To Use: Interface is SQL

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Integrated Cloud

Applications & Platform Services

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