Databases to Oracle Exadata: The Saga Continues for Oracle Enterprise Manager–Based Patching

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Session Info

Databases to Oracle Exadata: The Saga Continues for Oracle Enterprise Manager–Based Patching [CON8121]

Applying PSUs, CPUs, or one-off patches and performing upgrades are among the most time-consuming and challenging activities in maintaining databases. Enterprises without a smart way to maintain database software configuration standards centrally end up with the problem of configuration pollution. This session introduces you to the new simplified automation process of managing patching and upgrading your Oracle Database. Learn how enterprises use the Oracle Enterprise Manager 12c database lifecycle management solution to keep their databases up to date and prevent configuration sprawl. And, finally, the session also introduces the new feature in patch orchestration that provide easy, centralized method of managing the complete Database fleet.
Program Agenda

1. Datacenter Evolution & Dynamics of Maintenance
2. EM12c Patch Automation Solution
3. Customer Stories - Deloitte & Walgreens
4. Introduction to new method of DB patch maintenance
5. Demo
6. Q&A
Evolution of Datacenter
Changing Dynamics of Database Maintenance

Challenges
- Lengthy process,
- Error prone, mostly manual
- Single target level operations

Grid, Clustering, Virtualization
2008, ...

Challenges
- Need mass automation
- Time consuming
- Downtime management
- Complex process
EM12c Patch Management Solution
End to End Patch Automation Solution for Oracle Databases

- Patches, Upgrades complete Database product family including Data Guard, DBs on ODA and Exadata
- Provides proactive Oracle recommendations (CPUs, PSUs,..)
- Simplified patching flow using Patch Plans
- Comprehensive pre-flight checks and conflict resolution
- Support Out of Place, Rolling options for reduced/zero downtime and rollback/switch back
- Mass automation - multiple targets with multiple patches in a single downtime

Extensible framework, Patch Reports and “EMCLI” scripting option
Patch automation using Enterprise Manager 12c

Kenneth “Dee” Hicks
Manager, Database Management
Deloitte Services LP
October 1, 2014
Agenda

Typical patch cycle
EM 12c cloud environment
Patching solution
Results achieved
Typical patch cycle

- Patch available

- Patch production servers
  - Create procedure
  - Create documentation
  - Patch test servers
  - Verify procedure
  - Verify documentation
  - Patch tool servers

- Patch staging servers

- Patch development servers
**Typical patch cycle (cont.)**

**Typical DB Environment**
- 221 Databases on 112 Hosts
- Target DB versions: 11g and 12c
- Target platforms: AIX, LINUX, Windows

**Business Challenges include:**
- Streamline the patch process
- Compliance with security policies
- 6 Week Patch Cycle
- Limited resources
- 24/7/365 international systems
- Patch primary and standby databases
**Goals include:**

- Repeatable processes
- Reusable procedures
- Reusable documentation
- Minimize downtime for patching
- Complete patch cycle in 6 weeks
- Use EM12c deployment procedures for:
  - Applying quarterly Patch Set Updates
  - Applying one-off patches
  - Patching primary and standby DBs
  - Proactive patch information
  - Notification and reports
EM 12c environment
Deloitte’s history with Enterprise Manager

Long history with EM: Grid Control to Cloud Control

• EM 9i used for database administration (2008)
• EM 10g added monitoring and alerting
• EM 11g added deployment procedures
• EM 12c currently running EM12c Cloud Control R3
  − 221 Databases on 112 Hosts
  − Target DB versions: 11g and 12c
  − Target DB Platform LINUX, AIX and Windows
Deloitte’s EM 12c Architecture

• Multiple Oracle Management Servers
• OMS’s and Agents Version 12.1.0.3
• 11G EM Repository DB with Standby
• 221 Databases on 112 Hosts
• Target DB versions: 11g and 12c
• Target platforms: AIX, LINUX, Windows
Deloitte’s EM 12c Cloud Control network
Patching Solution
6 week patch cycle solution

Use EM 12c Cloud Control to:

• Comply with local security policies and guidelines
  – Apply security fixes within mandated timelines
  – Provides reporting for patch management team

• Maintain existing and new systems with current resources
  – Existing infrastructure uses Cloud Control
  – Procedures are reusable
  – Documentation is reusable
  – Patching is scheduled and can be unattended
  – Minimize the risk of errors by automating the process
  – Ability to restart failed procedures from point of failure

• Maintain disaster recovery setup
  – Patches Primary and Standby Databases concurrently
  – Standby Database started in managed recovery
Create a patch plan

Create Plan - OOW_DEMO_PLAN

Step 3 : Deployment Options

Where to Stage
Stage Patches: Yes (to location) □ No (already staged)
Stage Location: [Enter new Stage Location]
Shared Location? □ Yes

Oracle Home Credentials
Oracle Home Preferred Credentials: Use □ Override
Specify For: All Home □
Normal Oracle Home Credentials: HOST_ORAOEM
Privileged Oracle Home Credentials: HOST_ORADEM_ROOT
Validation will be enabled when all credential fields are selected

Customization
The selected procedure has the steps needed to run the patch process. Typically you do not need to customize this.
Procedure: Deloitte Patch Oracle Databases □ Customize...
Conflicts: Stop at Conflicts □
### Reusable customized patch procedure

A representative diagram of the patch automation using EM12c patch procedures is shown. The diagram outlines various steps involved in the customization process, including:

- **Pre-App Copy Host Command Step**: Custom step to run user commands.
- **Run dbclean**: Host Command that runs dbclean on all platforms.
- **Rollback Patches**: Directive to roll back the patches from Oracle homes.
- **Apply Patches**: Directive to apply the staged patches to Oracle homes.
- **Run PostPatch Script**: Directive to run PostPatch script after applying a one-off/interim patch.
- **Start CSS diemmn**: Directive to start the CSS diemmn on the node.
- **Start Database Instance in Upgrade Mode**: Directive to start the Oracle Database instances in an Oracle home in upgrade mode.
- **Stop Database Instance in Upgrade Mode**: Directive to stop the Oracle Database instances in an Oracle home in upgrade mode.
- **Start Database Instance in Normal Mode**: Directive to start the Oracle Database instances in an Oracle home in normal mode.
- **Post-ShutDown Custom Direct Step**: Custom step to run user specific scripts.
- **Rollback-Patch SQL to Database Instance in Normal Mode**: Directive to rollback patches SQL.
- **Apply SQL Script to Database Instance in Normal Mode**: Directive to apply a SQL script in Normal Mode. This step will be skipped if applied patch is a patchset.
- **Apply SQL Script to Database Instance in Normal Mode**: Directive to apply a SQL script to recompile invalid objects in the database in Normal Mode. This step will be skipped if applied patch is a patchset.

**Host Command**: Custom step to run user commands.

**Oracle Home Credentials**: Inherit (Stop On Error) or Oracle Home Credentials with root permissions.
Post-apply SQL custom host command step

**Edit Host Command Step: Enter Command**

Specify the command or script to be run on the target and the privilege to run it.

**Command Type**: Script

```
ORACLE_SID=sh
exec "export PATH="/usr/local/oracle/admin/
$ORACLE_SID/rman/rmanConnect.sh" /
chmod 777 /tmp/grid_rmanConnect.$.ORACLE_SID.sh
exec
exec "Upgrading RMAN catalog for "$ORACLE_SID"." 
EOF
EOF
EOF
Enter Script of 4000 bytes or less. Example: use File::Copy; copy("$(${target嘌AHome}/example.bat)","$(${target嘌AHome}/example.bat.bak"); chmod 6777, 
$(${target嘌AHome}/example.bat);.
```

**Interpreter**: sh

If you change the interpreter to be used on the host instead of the default, it is recommended you provide the full path (Example: /usr/bin/perl)

**Credential Usage**: Oracle Home Credentials

Credential Usage in the Target List to be applied for this step.

**Target Properties**

Target properties can be used in parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>%valid_root%</td>
<td>location of Agent</td>
</tr>
<tr>
<td>%validbinary%</td>
<td>location of Perl binary used by Agent</td>
</tr>
<tr>
<td>%TargetName%</td>
<td>target name</td>
</tr>
<tr>
<td>%TargetType%</td>
<td>target type</td>
</tr>
<tr>
<td>%osd_gtp_os%</td>
<td>Operating System</td>
</tr>
<tr>
<td>%osd_gtp_cpi%</td>
<td>Customer Support Identifier</td>
</tr>
<tr>
<td>%osd_gtp_comment%</td>
<td>Comment</td>
</tr>
<tr>
<td>%osd_gtp_contact%</td>
<td>Contact</td>
</tr>
<tr>
<td>%osd_gtp_locations%</td>
<td>Location</td>
</tr>
<tr>
<td>%osd_gtp_platform%</td>
<td>Platform</td>
</tr>
<tr>
<td>%osd_gtp_department%</td>
<td>Department</td>
</tr>
<tr>
<td>%osd_gtp_cost_center%</td>
<td>Cost Center</td>
</tr>
<tr>
<td>%osd_gtp_line_of_bus%</td>
<td>Line of Business</td>
</tr>
<tr>
<td>%osd_gtp_target_version%</td>
<td>Target Version</td>
</tr>
<tr>
<td>%osd_gtp_deployment_type%</td>
<td>Deployment Type</td>
</tr>
<tr>
<td>%osd_gtp_lifecycle_status%</td>
<td>Lifecycle Status</td>
</tr>
<tr>
<td>%RMAN//hostname%</td>
<td>RMAN Hostname</td>
</tr>
<tr>
<td>%Timeout%</td>
<td></td>
</tr>
<tr>
<td>%WBSPort%</td>
<td></td>
</tr>
<tr>
<td>%LIMIT_TO%</td>
<td></td>
</tr>
<tr>
<td>%RMAN_SUPPORT_LOG%</td>
<td></td>
</tr>
<tr>
<td>%RMAN_USE_PSEUDO_REPMAN%</td>
<td></td>
</tr>
</tbody>
</table>

TIP: Property names are case sensitive. To escape `%`, use `%\%`.

**Procedure Variables**

Procedure variables can be used in parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>${target嘌AHome}</td>
<td></td>
</tr>
<tr>
<td>${target嘌instances}</td>
<td></td>
</tr>
<tr>
<td>${target嘌patchIDs}</td>
<td></td>
</tr>
</tbody>
</table>

No items were found.
## Reusable patch procedure documentation

<table>
<thead>
<tr>
<th>Patch</th>
<th>Type</th>
<th>Database Version</th>
<th>Platform/Architecture</th>
</tr>
</thead>
<tbody>
<tr>
<td>18031726</td>
<td>Database</td>
<td>10.2.0.5</td>
<td>Linux x86-64/AIX (Only if we have Extended Support)</td>
</tr>
<tr>
<td>N/A</td>
<td>Database</td>
<td>11.1.0.7</td>
<td>Linux x86-64/AIX (Only if we have Extended Support)</td>
</tr>
<tr>
<td>N/A</td>
<td>Database</td>
<td>11.2.0.1</td>
<td>Linux x86-64/AIX (64-bit)</td>
</tr>
<tr>
<td>18522512</td>
<td>Database</td>
<td>11.2.0.3</td>
<td>Linux x86-64/AIX</td>
</tr>
<tr>
<td>18940194</td>
<td>Database/Grid Infra Structure</td>
<td>11.2.0.3</td>
<td>Windows – 64 bit</td>
</tr>
</tbody>
</table>

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ORA_Apply_July_2014_PSU

Printed copy is uncontrolled. Check IDR for most up-to-date version.

<table>
<thead>
<tr>
<th>Patch</th>
<th>Type</th>
<th>Database Version</th>
<th>Platform</th>
</tr>
</thead>
<tbody>
<tr>
<td>18522509</td>
<td>Database</td>
<td>11.2.0.4</td>
<td>Linux x86-64/AIX</td>
</tr>
<tr>
<td>18842982</td>
<td>Database</td>
<td>11.2.0.4</td>
<td>Windows – 64 bit</td>
</tr>
</tbody>
</table>

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Results achieved
Results

- **Compliance** with security policies by timely application of security patches
- **Less than one hour** maintenance windows for multi-instance systems
- Reduced custom procedure creation time from **10 days to 30 minutes**
- Reduced document creation time from **1 week to 30 minutes**
- Primary and standby databases can be patched concurrently & intelligently
- Patch in parallel across all selected targets
- **Patch cycle reduced from 12 weeks to 6 weeks**
- Entire patch cycle can be executed by **one team member**
Oracle Enterprise Manager-Based Patching

CON8121

Brian Bong
OOW 2014
The contents of this presentation represent the views of the presenters, and are not intended to represent the official viewpoints or policies of Walgreens.
Walgreens

- $72 billion in annual revenue
- 8,300+ locations, including 8,200+ drugstores with 248,000+ employees
- No. 37 on the Fortune 500 list
- Strategic alliances and investments in the drug distribution business

**eBusiness presence**

- Walgreens.com
- drugstore.com
- beauty.com
- visiondirect.com

Planning to be global – Walgreens Boots Alliance

- Will be 300,000+ employees in 26+ countries
Who am I?

Director of Database and Analytics Architecture

At Walgreens for 5 years

Responsible for:

- Database Architecture & Administration
- Oracle Engineered Systems
- Data Design
- Analytics Technology Architecture & Administration
  - Big Data (Hadoop), Teradata, Netezza
  - BI (Cognos, BO, OBIEE, SAS)
Management Expectations

Security
- Patch automation, patch recommendations, data masking

Compliance
- SOX, HIPAA, PHI, PCI, STIG

High Availability/Stability
- Patch automation

Provisioning Agility
- DBaaS facilities (provisioning, patching, change management)

Operational Efficiency
- Keep up with provisioning, maintenance and patching for a constantly growing database portfolio with a stable staff base. Change management. Automated performance tuning.
The Challenge – Walgreens Patching Portfolio

- 5,200 EM12c targets
- 1,000 Database instances
- 400 database hosts/EM12c agents
- 210 cluster databases
- 90 RAC clusters
- 1,200 Oracle DB Homes
- 250 non-RAC Grid Homes
- ≈40 Oracle Staff providing 24/7 support

Engineered Systems:
- 90 ODAs
- 10 Exadata(s)
- 6 Exalytics

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Patching Strategy Requirements

- Set patching requirement standards
- Standardize on PSU patching – standardize and keep environments in sync
- OEM patch automation for traditional Unix platforms
- ODA - patch automation using oakcli toolkit
- Exadata - Platinum Services
- Standardize on OFA for file system standards
- Out of place patching to minimize downtime
- Keep OEM updated
- Staff specialization where it makes sense
- Keep track of the numbers
How did
Oracle Enterprise Manager 12c Help?
EM12c : Delivered our Database Patching Goals

Before:
• Very difficult to keep up with maintaining a large DB portfolio with manual patching methods.
• Operations were mostly at a single target level, it may look faster for the patch operation but all additional tasks surrounding it takes time and effort.

After:
• Patch automation creates a level playing field from a staffing standpoint
**Provisioning Service**

- Automated DB Provisioning for application requests
  - Orchestration between all tiers
  - Pre-deploy Infrastructure
  - Use DBaaS for all DB instance and schema requests
  - Legacy migrations / Consolidation

**Operations**

- OEM Plug-in expansion
- Platinum Services Expansion
- Data Masking expansion
- Patch Automation
- Keep OEM up-to-date
  - Many new 12.1.0.4 enhancements
- Training and process
- Change Management to deploy and sync schema changes
EM12c benefits

- $x saved
- Maintaining to standards with same resources in half the time
- Reduced stress…Quality of Life.
Appendix
### Drill Down into “Manual vs Automated”

<table>
<thead>
<tr>
<th>Manual – One host at a time method</th>
<th>Automated – option for multiple targets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Download the grid and DB patches and transfer it to an central server</td>
<td>Add the patch to the OEM software library</td>
</tr>
<tr>
<td>Request an NFS mount from each target server to the patch server</td>
<td>Check the recommended patches for the target(s)</td>
</tr>
<tr>
<td>Blackout OEM</td>
<td>Develop a patch plan</td>
</tr>
<tr>
<td>Analyze the patch, check for conflicts, apply the patches to the grid and Oracle software homes</td>
<td>Select one or more targets to patch</td>
</tr>
<tr>
<td>Instance outage</td>
<td>Select the deployment option</td>
</tr>
<tr>
<td>Apply the DB sql patch to each instance</td>
<td>Analyze the patch plan against the targets</td>
</tr>
<tr>
<td>Validate the results</td>
<td>Deploy / Apply the patch</td>
</tr>
<tr>
<td></td>
<td>Validate the results</td>
</tr>
</tbody>
</table>
OEM solves the patching challenges

<table>
<thead>
<tr>
<th>Manual patching</th>
<th>Automated patching</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patches transferred to each host</td>
<td>Patches stored in software library for shared reuse</td>
</tr>
<tr>
<td>All patching steps manual</td>
<td>All patching steps automated</td>
</tr>
<tr>
<td>All patches applied to one host at a time</td>
<td>Option to patch multiple targets at the same time</td>
</tr>
<tr>
<td>Checklists and troubleshooting steps need to be created</td>
<td>Patch automation</td>
</tr>
</tbody>
</table>
Patching Results

- Very difficult to keep up with maintaining a large DB portfolio with manual patching methods
- Patch automation creates a level playing field from a staffing standpoint
EM12c: Across our overall strategy

• Automated provisioning for DB environments on demand
  – OEM DBaaS API supports orchestration
  – Pre-deploy infrastructure
• OEM provisioning for all other DBA created instances
  – Instance Creation
    » EM12c - Exadata template
    » ODA default templates
    » Standard instance templates for all other DBs
  – Data Management
  – Change Management
Thank you
EM12c Patch Management Solution
End to End Patch Automation Solution for Oracle Databases

- Patches, Upgrades complete Database product family including Data Guard, DBs on ODA and Exadata
- Provides proactive Oracle recommendations (CPUs, PSUs,..)
- Simplified patching flow using Patch Plans
- Comprehensive pre-flight checks and conflict resolution
- Support Out of Place, Rolling options for reduced/zero downtime and rollback/switch back
- Mass automation - multiple targets with multiple patches in a single downtime

Extensible framework, Patch Reports and “EMCLI” scripting option
Evolution of Datacenter
Changing Dynamics of Database Maintenance

Challenges
• Lengthy process, mostly manual
• Lack of scalability
• Operations are at single target level

Goals
• Higher Agility - Self Service, Elasticity
• Lower cost - Shared Resources, Automation
• Reduced Risk – High Availability

Maintenance Challenges
• Scale
• Isolation
• Minimum Downtime

Internet 2003
Grid, Clustering, Virtualization 2008, ....
RAC

Cloud & Consolidation 2014

Volume
Complexity

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Introducing !!!

Database **Fleet** Maintenance

Standardization at Scale
Database Fleet Maintenance

New! Simplified software configuration standardization at scale

Detect “Configuration Pollution”
Advisor scans the fleet for configuration variations provides recommendations to standardize.

Welcome to Database Fleet Maintenance
You can use images to manage your database software.

- Reduce the number of different software versions and patches across enterprise
- Streamline and automate software upgrades and patching
- Keep current with software versions and patches available from Oracle

Analysis of your Enterprise (2693 database installations).

Analysis of your Enterprise (1968 database installations).

Current Software Configurations (295)

Recommended Software Configurations (45)

To get started, use Database Image Advisor. The database image advisor helps you group database and define an image for each group.
Database Fleet Maintenance

**New!** Simplified software configuration standardization at scale

2. **Create Images & Subscribe**

Define end states for software as Images. Subscribe targets/groups/pools to the images.

Software “End State”

*Gold Image*

Image represents the End-state Definition for Oracle Database 11.2.0.3 on Linux x86_64 + OCT 2013 PSU patch +5 one-off patches

Subscribes to

Target(s)
Database Fleet Maintenance

New! Simplified software configuration standardization at scale

3 Centralize changes and propagate with ease

Make changes at Image level.
Schedule the propagation to the subscribed members.

Software “End State”
Image - Versioning

JUL 2014 - Jul PSU + couple more patches*
DEC 2013 - Add 5 more patches
OCT 2013 - OCT PSU + 2 patches

* Current / Latest version
Database Fleet Maintenance

Manage Exceptions and Emergencies

- Allows emergency, ad-hoc patching.
- Ad-hoc is more an exception than a norm, its tracked as ‘Rogue’
- Reconcile the rouge targets either by rolling the changes to a new version of the image or override it with the latest version.
Database **Fleet Maintenance**

**Self service maintenance for Database Cloud**

**Process**

1. Pools subscribe to DB and GI images
2. New images automatically get deployed to servers in the pool
3. Self Service users or Admin can choose to migrate DBs over to the new home

**Benefits:**

- **Scale:** Subscription based, automated deployment and at mass scale
- **Reduced Downtime:** Out of place patching and upgrade
- **Isolation & Flexibility:** Users to move to new software version on their terms

Track real time compliance
Database Fleet Maintenance
Automated, self service maintenance for Database Cloud

1. ADMIN Creates – V1 of Gold Image
2. Deploy Oracle Homes (OH)
3. Added PSU and created new version
4. Deploys V2 Oracle Homes
5. Activates the new OHs. Send alerts to Users.

END USERS
Update Databases - Switches to the new Image version.

100% Compliance
0% Compliance
30% Compliance

Gold Image: Ver. 1
DB 1
DB 2
DB 3
DB 4
DB 5
DB 6
DB 7
DB 8
DB 9
DB 10

Gold Image: Ver. 2
DB 1
DB 2
DB 3
DB 4
DB 5
DB 6
DB 7
DB 8
DB 9
DB 10

Update Databases - Switches to the new Image version.

100% Compliance
0% Compliance
30% Compliance
### Maintenance

With Pool Maintenance, you can use the image and their versions to automate upgrades and patching to the software and the service instances associated with the pool.

### Image Subscriptions

![Image Subscriptions](chart)

- **Oracle Database**
  - **Name**: 11204DB_CloudGOLDImage
  - **Compliance**: 20%
  - **Database Targets**: 10

### Updates to Image Version

- **Show History**: 
- **Database - Update to V2(Jul_PSU)**: 
  - **Action required**: 
  - **Steps Completed**: 0 of 3

### Unused Oracle Homes

- **Old Oracle Homes no longer used**: 5
  - **Space Consumed**: 9 GB

### Note

- **New Current Version**: V2(Jul_PSU)
- **Started Not Yet**
- **Pending Update for 8 Databases**
Database Fleet Maintenance
Database **Fleet Maintenance**

Simplified software configuration standardization at scale

1. **Detect the Configuration Pollution**
   Advisor scans the fleet for configuration variations, provides recommendations to standardize.

2. **Create Images & Subscribe**
   Define end states for software as Images. Subscribe databases /groups/pools to the images.

3. **Centralize Changes & Propagate with Ease**
   Make changes at Image level and schedule the propagation to the subscribers. Replace with updated software.

**Reduced Downtime**
Abstraction between software and configuration. Replacing updated software for changes reduces or removes downtime.

**Automation at Scale**
Make changes at mass scale. Deploy updated software (minor and major updates) images to the entire pool.

**Flexible**
Maintenance as a Self service option. End users can update during their comfortable time periods.

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## EM12c - Database Fleet Maintenance

Simplified software configuration standardization at scale

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete Automation</td>
<td>- End to end, covers Patching &amp; Upgrades</td>
</tr>
<tr>
<td>Easy to Scale</td>
<td>- Mass deployment, reduced downtime</td>
</tr>
<tr>
<td>Total Control</td>
<td>- Centralized Maintenance, dashboards</td>
</tr>
<tr>
<td>Full Support</td>
<td>- Support all DBs (Multitenant &amp; Cloud Ready)</td>
</tr>
</tbody>
</table>

*Current support available for Databases only.*

**DBaaS on-premise / private cloud.**

*ORACLE ENTERPRISE MANAGER 12c*

- **Standalone Databases**
- **Real Application Clusters**
- **Data Guard**
- **Multitenant (PDBs)**
- **Database Appliance (ODA)**
- **Exadata**
- **Database Cloud (DBaaS)**

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