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Database Self Service Patching
using EM 13c Fleet Maintenance
CON5186: Achieve Enterprise Scale for Database Patching: Customer Case Study

Sep 16, 2019

Sujit Dhawalkar – Principal Solutions Architect
Amit Patel – Principal Solutions Architect
Agenda

- Company Overview
- Evolution of Oracle Enterprise Manager at Comcast
- Traditional Database Patching Strategy and need for automation
- EM13c DB Patching Orchestration overview
- Automated Database Patching Strategy using fleet maintenance
- Overview of Comcast’s homegrown self service portal
Comcast’s Level-4 HA-DR OEM Architecture
OEM Evolution at Comcast: One Tool, Many Usage

#1 Performance Troubleshooting tool for troubleshooting Oracle database performance issues

Monitoring and Alerting of 12,000 targets using monitoring templates, metric extensions and notifications

Analytics & Reporting ability of OEM helps in compliance, capacity management and problem management

DBaaS self service portal is used to provision pluggable databases on private cloud

Automation capability of OEM simplifies some of the complex activities such as patch management, agent deployment etc.
Why do we need Database Patching?

- Compliant with Rules & Regulations
- Legal consequences = Loss Revenue
- Unauthorized access blocked
- Data Breach = Loss Revenue
- Business Continuity
- DB Outages = Loss Revenue
Traditional Database Patching Strategy

Non Production DB Patching Cycle

New Patch Released → Request Downtime → App team Approval → Review DB Config → Download Patch → Stage Patch → Patch Pre-requisites → Apply Patch → Certify Patch

Day 2 - 3

Production DB Patching Cycle

Review DB Config → Download Patch → Stage Patch → Patch Pre-requisites → Request to Promote Patch → Business Approval → Schedule Maintenance → Patch Standby → Patch Prod

More meetings & follow ups for production downtime

Week 3 - 4

Time consuming manual efforts
Dedicated DBA Resources
Why do we need Database Patching Automation?

Configuration Pollution
- 10.2.0.4.6
- 11.2.0.3.5
- 11.2.0.3.2
- Multiple DB Versions
- 11.2.0.4.6
- 12.1.0.2.0
- 12.2.0.2.0

Growing Inventory
- 2400+ DBs
- Real Application Clusters
- Multitenant (PDBs)
- Database Cloud (DBaaS)
- Standalone Databases
- Data Guard
- Exadata

Quarterly Patching
- PSU
- One-offs
- SPU
- 90 Day

Configuration Pollution + Growing Inventory = Struggle catching up quarterly patching cycle
DB Patching Automation Considerations

POSSIBLE SOLUTION

CONS:
1. NOT RAC AWARE.
2. EXTENSIVE SCRIPTING.
3. CODE MAINTENANCE.
EM13c DB Patching Orchestration – Fleet Maintenance

STEP 1: Create Gold Image
- Identify standard Configurations: SI, GI, RAC, Standby etc.
- Prepare reference environment and apply desired patches to each standard configuration
- Create GI image for each standard configuration

STEP 2: Subscribe Targets to GI
- Subscription based model
- Subscribe multiple targets of same configuration for mass deployment

STEP 3: Push GI to Targets
- Shadow home or Inactive home will be provisioned using specific Gold Image on desired target host(s).
- Databases will be still running from the Active Oracle home which will remain un-affected

STEP 4: Switch Home
- Switch associated targets from Active Oracle Home to Newly Provisioned Oracle Home
- Requires minimum downtime

STEP 5: Cleanup Inactive Home
- Cleanup old oracle home once the database is switched to newly provisioned oracle home
Automated Database Patching Strategy

**Non Production DB Patching Cycle**
- New Patch Released
- Test & Certify patch for specific config
- Create Gold Image
- Subscribe Targets to GI
- Push GI to Targets
- Patch Ready Status
- Schedule Downtime
- Switch Home

![Hour 1-2](image)

**Production DB Patching Cycle**
- Subscribe Prod Targets to GI
- Push GI to Prod Targets
- Patch ready status
- Business Approval
- Schedule Maintenance
- Switch Home Standby
- Switch Home Prod

![Hour 1-2](image)

App teams can manage their own patch schedule
Prerequisites for fleet – Inventory Standardization

Reality

Solve
Configuration Pollution

Expectations

Enforce
DB Version Standards
Prerequisites for fleet – Infrastructure Readiness

- OEM Readiness
  - Duplicate Target Cleanup

- OEM Readiness
  - SSH Credentials

- Target Readiness
  - Storage Provisioning
90 Days (N-1) Database Patching Strategy

<table>
<thead>
<tr>
<th>RDBMS Version</th>
<th>Current Certified Patch</th>
<th>Gold Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.2.0.1</td>
<td>12.2.0.1.190115</td>
<td>SI - 668F6E182338E28ECE0539C181BACB2D4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GI - 68F36396E3E553DAE0539F181BAC5A78</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RAC - 68F27AE0B1F2924E0539F181BAC06D2</td>
</tr>
<tr>
<td>12.1.0.2</td>
<td>12.2.0.1.190115</td>
<td>SI - 66A59726EFDB18B8E0539F181BAC2E0B</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GI - 632F80A1A5057FAE0539F181BAC48F9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RAC - 69027A4A5263F3F7E053A5181BAC789</td>
</tr>
<tr>
<td>11.2.0.4</td>
<td>12.2.0.1.190115</td>
<td>SI - 66A487C027C8621E053A5181BAC3C88</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GI - 6258863DD10C1B89E0539F181BAC5F78</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RAC - 69010FD22DEB158E0539C181BAC7019</td>
</tr>
</tbody>
</table>

5 BENEFITS
1. LESS DOWNTIME
2. RAC AWARE
3. EASY MAINTENANCE
4. ROBUST PATCH MECHANISM

Switch Home
Rollback (if required)
Cleanup

Subscribe & Provision

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Extending Self Service functionality to DevOps Team

Empower 300+ Application team to manage their own patching schedule

Self service functionality extended to Application teams using common interface/tools to maintain familiar user experience

Push button functionality to submit database patching requests

Role based access to submit patching request

60 Days window to switch home to newly provisioned oracle home to satisfy our 90 Day (N-1) patching standard
Patching Workflow for Self Service Portal

1. Retrieve App Names
2. Display App Names
3. Selects App
4. Query OEM for SCAN/Host Names
5. Displays SCAN/Host
6. Selects Host
7. One Portal
8. Displays Cluster/HAS/DB
9. Selects Cluster/HAS/DB
10. One Portal

OEM Repo
- DB should be displayed but greyed if Cluster/HAS is not patched

OEM Fleet Validate job
OEM Fleet Switch job

Allow only one job per cluster at any time
Self Service Portal – How Patch Status is determined?

1. Database record Patch - API
2. All Target Patch version is Up to Date?
   - Yes: Patch status: Already applied (GREEN smiley)
   - No
   - Is Target Type is rac_database?
     - Yes: Cluster Patched?
       - Yes: Patch status: Not Ready for Patching (GREY smiley)
       - No: Patch status
     - No: Target Type is oracle_database
3. Is Database have Standby?
   - Yes: Patch status: Ready for Patching (RED smiley)
   - No
4. Is Standby DB Patch?
   - Yes: Patch status: Not Ready for Patching (GREY smiley)
   - No
Self Service Portal – Patch Status Example

API WORKFLOW

<table>
<thead>
<tr>
<th>APPLICATION</th>
<th>TARGET_NAME</th>
<th>PATCH_VERSION</th>
<th>DATABASE_ROLE</th>
<th>STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DBA Tools and Automation</td>
<td>OEMPGYZCS2</td>
<td>11.2.0.4.0</td>
<td>PHYSICAL STANDBY</td>
<td>Ready for Patching</td>
</tr>
<tr>
<td>DBA Tools and Automation</td>
<td>TEST</td>
<td>12.2.0.1.180717</td>
<td>PRIMARY</td>
<td>Patch version is up to Date</td>
</tr>
<tr>
<td>DBA Tools and Automation</td>
<td>TESTRAC51</td>
<td>12.2.0.1.180717</td>
<td>PRIMARY</td>
<td>Patch version is up to Date</td>
</tr>
<tr>
<td>DBA Tools and Automation</td>
<td>ciedbhoasgrd</td>
<td>12.2.0.1.180717</td>
<td>PRIMARY</td>
<td>Patch version is up to Date</td>
</tr>
<tr>
<td>DBA Tools and Automation</td>
<td>orclirmpy</td>
<td>12.2.0.1.171017</td>
<td>PRIMARY</td>
<td>Ready for Patching</td>
</tr>
</tbody>
</table>

API SERVICE

EXEC_TASK                  | START_TIME     | END_TIME     | STATUS       | COMPLETE_PERC
---------------------------|----------------|--------------|--------------|----------------|
SOFT DEPLOY INIT STEP      | 1/24/2019 6:17:29 PM | 1/24/2019 6:17:35 PM | Succeeded     |                  |
INITIALIZE UPDATE DB       | 1/24/2019 6:17:44 PM | 1/24/2019 6:17:46 PM | Succeeded     |                  |
START DB FROM DEST HOME    | 1/24/2019 6:20:41 PM | 1/24/2019 6:20:58 PM | Succeeded     |                  |
MIGRATE DB FROM SRC HOME   | 1/24/2019 6:20:26 PM | 1/24/2019 6:20:35 PM | Succeeded     |                  |
STOP DB FROM SRC HOME      | 1/24/2019 6:19:51 PM | 1/24/2019 6:20:14 PM | Succeeded     |                  |
## Self Service Portal – Patch Status Example

**Database Patcher**

- **Database Flavor:** Oracle
- **ITRC Component:** DBA Tools and Automation

### Table: Database Patcher

<table>
<thead>
<tr>
<th>Application</th>
<th>Target Name</th>
<th>Target Type</th>
<th>Role</th>
<th>FQDN</th>
<th>Patch Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>11496</td>
<td>OEMPGYZCS1</td>
<td>oracle_database</td>
<td>PRIMARY</td>
<td>dbatest-dcl.test.net</td>
<td></td>
</tr>
<tr>
<td>11496</td>
<td>OEMPGYZCS2</td>
<td>oracle_database</td>
<td>PHYSICAL STANDBY</td>
<td>dbatest-dcl.test.net</td>
<td></td>
</tr>
<tr>
<td>11496</td>
<td>TEST</td>
<td>rac_database</td>
<td>PRIMARY</td>
<td>dbatest-dcl.test.net</td>
<td></td>
</tr>
<tr>
<td>11496</td>
<td>TESTRACCS1</td>
<td>oracle_database</td>
<td>PRIMARY</td>
<td>dbatest-dcl.test.net</td>
<td></td>
</tr>
<tr>
<td>11496</td>
<td>ciecdbhcoasgrd</td>
<td>cluster</td>
<td></td>
<td>dbatest-dcl.test.net</td>
<td></td>
</tr>
<tr>
<td>11496</td>
<td>orclipmy</td>
<td>rac_database</td>
<td>PRIMARY</td>
<td>dbatest-dcl.test.net</td>
<td></td>
</tr>
</tbody>
</table>
## Database Patcher

<table>
<thead>
<tr>
<th>Database Flavor</th>
<th>Oracle</th>
</tr>
</thead>
</table>

### Target Name | Progress | Last Operation | Last Operation Status | Jira Ticket |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>orclprmy</td>
<td>17%</td>
<td>COPY FILES</td>
<td>Running</td>
<td></td>
</tr>
</tbody>
</table>

### DB Patching Jobs

<table>
<thead>
<tr>
<th>Job Id</th>
<th>User</th>
<th>Job Start Time</th>
<th>Status</th>
<th>Job Finish Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>5c6459ec2d1b4edc9eb4838</td>
<td>appuser100</td>
<td>Wed Feb 13 2019 11:54:51 GMT-0600 (Central Standard Time)</td>
<td>RUNNING</td>
<td>---</td>
</tr>
</tbody>
</table>
## Database Patcher

**Database Flavor**: Oracle

<table>
<thead>
<tr>
<th>Target Name</th>
<th>Progress</th>
<th>Last Operation</th>
<th>Last Operation Status</th>
<th>Jira Ticket</th>
</tr>
</thead>
<tbody>
<tr>
<td>orclprmy</td>
<td>62%</td>
<td>START BLACKOUT ROLLING</td>
<td>Running</td>
<td></td>
</tr>
</tbody>
</table>

### DB Patching Jobs

<table>
<thead>
<tr>
<th>Job Id</th>
<th>User</th>
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<th>Status</th>
<th>Job Finish Time</th>
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<td>RUNNING</td>
<td>---</td>
</tr>
</tbody>
</table>

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Self Service Portal – Patch Status Example
Self Service Portal – Patch Status Example

Database Patcher

Database Flavor: Oracle

Target Name: OEMPGYZCS2
Progress: 100%
Last Operation: MASSDBPROVPOSTPROCESSINGSTEP
Last Operation Status: Succeeded

Job Id: 5c6c391e2d1b4edc9fa4e39
User: appuser100
Job Start Time: Tue Feb 19 2019 11:13:01 GMT-0600 (Central Standard Time)
Status: COMPLETED
Job Finish Time: Tue Feb 19 2019 11:28:06 GMT-0600 (Central Standard Time)
Benefits of Self Service Database Patching portal

- 2000 + databases getting patched every quarter
- 80% Reduced resource overhead for patching activities
- Total database downtime requirement for patching reduced drastically
- Push button automation empowered App teams to manage their own patching schedule
- Complete database patching orchestration reduced the human error
- Inventory standardization
Why this matters

Secure data and application ensures business integrity and continuity.
Our Goal

Database Patching is critical, our goal is to enable all DB DevOps to incorporate patching as a cyclic automated activity.
Recommendations for adoption

- Focus on Standardization
- Onboarding needs PoC/Testing
- Fleet Maintenance Pre/Post scripts for customizations and automation
- Ask for help – Oracle Support & Product Management

High Returns for efforts
What's Ahead

### Monday

**10:00 - 10:45**  
Patch and Upgrade Oracle Multitenant with Fleet Maintenance [Room 205]

**1:45 - 2:30**  
Achieving Database Patching Success: Fleet Maintenance Best Practices[Room 212]

**2:30 - 3:30**  
HOL5264: Stay Protected, Patch Often with Oracle Enterprise Manager Fleet Maintenance[West 3022A]

### Thursday

**9:00 - 10:00**  
HOL5264: Stay Protected, Patch Often with Oracle Enterprise Manager Fleet Maintenance

**Demo Grounds**: OMC-002 - Database Lifecycle Management, DBaaS, and Snap Cloning with Oracle Enterprise Manager 13c
Thank You

Product Management Team

Oracle Enterprise Manager
Database Lifecycle Management & Cloud Management Pack