Achieving Database Patching Success/Enterprise Manager Fleet Maintenance Best Practices

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AGENDA

• Intro -- Nationwide
• Why Patch?
• Patching Alternatives
• Our Configuration
• Our Scheduling
• Our Results
• How We Do It
• Best Practices
• Summary
• Questions
Nationwide

Insurance and Financial Services Company

Fortune 100 Company

Founded in 1925

43 Billion in Revenues*

214 Billion in Assets*

30,472 Employees*

#57 on Fortune’s "Best Companies to Work For"

#44 in Computer World’s "Best Places to Work in IT."

*Fortune 500

Center for Internet Security (CIS)

1 Oracle Database Installation and Patching Requirements One of the best ways to ensure secure Oracle security is to implement Critical Patch Updates (CPUs) as they come out, along with any applicable OS patches that will not interfere with system operations.

1.1 Ensure the Appropriate Version/Patches for Oracle Software Is Installed Profile Applicability:

- Level 1 - ...The Oracle installation version and patches should be the most recent that are compatible with the organization’s operational needs.

Rationale: Using the most recent Oracle database software, along with all applicable patches can help limit the possibilities for vulnerabilities in the software, the installation version and/or patches applied during setup should be established according to the needs of the organization. **Ensure you are using a release that is covered by a level of support that includes the generation of Critical Patch Updates.**

- [https://workbench.cisecurity.org/files2121/download/2346/](https://workbench.cisecurity.org/files2121/download/2346/)

General Data Protection Regulation
Patching Alternatives

**Opatch**
- In place
- Challenging error recovery
- Longer Outage window
- All databases in the Home have to be patched together
- Rollback challenging
- Requires less storage than out of place options
- *no extra licensing*

**Multi-tenancy**
- Out of Place
- Unplug from old and plug into updated/patched
- May require double the memory resources
- *Multi-Tenant license required*

**Fleet Patching and Provisioning:**
- Out of Place
- Gold Image Homes/Standardization
- Minimal Outage window
- *LifeCycle License Required?*

**EM Fleet Maintenance**
- Out of Place
- Version 1: Switch
- Version 2: Db software maintenance
- Gold Image Homes / Standardization
- Minimal Outage window
- Utilizes EM’s deployment job system
- Scalable
- *LifeCycle License Required*
- **Deployment Procedures**

**Cloud DBaaS**
- Cloud Provider applies Patches
2014 Clustering Technologies vs DB Versions

**Clustering**
- Non-Clustered: 34%
- Veritas: 32%
- RAC - MultiNode: 17%
- RAC 1 Node: 17%

**DB Versions**
- 11.2.0.3: 36%
- 11.2.0.2: 30%
- 11.2.0.4: 1%
- 12.1.0.2: 1%
- 10.2.0.5: 12%
- 11.1.0.7: 19%
- 9.2.0.7: 1%
- 11.2.0.5: 1%
2019 Clustering Technologies vs DB Versions

RAC - MultiNode: 12%
RAC 1 Node: 72%
Virtual: 11%
Non-Clustered: 3%
DBaaS: 2%

DB Versions:
- 12.1.0.2: 88%
- 12.2.0.1: 2%
- 19.3.0.0: 4%
- 11.2.0.4: 6%
Progress – Crawl, Walk, Run … Fly

2014  Gold Image Provision of Database Homes

2015  RAC Clusterware Upgrade from 11.2 to 12.1 (60)
      Some Database upgrades 11.2.0.2/3 to 11.2.0.4

2016  Q1 & Q2 Mandate ALL DB homes EM provisioned
      Mandate ALL RAC Clusters built with EM
      Continue upgrades 11.2.0.4 to 12.1.0.2
      Q3 & Q4 Patch 1033 databases using Switch Database

2017  2365 databases patched

2018  3376 databases patched
      All databases patched in 2nd quarter
      3rd Quarter moved from Switch to DB_Software_Maintenance

2019  1744 databases patched (so far)
      More Automation for clusterware (subscribe & deploy)
      Planned upgrade of 12.1 clusterware to 19.3 clusterware
Quarterly Patching Windows

Each Quarter, we patch databases with the most recent PSU, Bundle Patch or Release Update available.

Non-Production Databases are scheduled during Wednesday Windows.

Production Databases are patched during IRW (Infrastructure Release Weekend) Window.

3 Person Team:
- DBA – Scheduler / Database Patching
- DBA – EM Tester / Clusterware Patching
- EM – Administrator / Developer

- Download Patches
- Create new Oracle Homes on our “Gold Image” servers
- Create Software Images of the new Oracle Homes
- Make the new “version” Current within the Gold Image
- Test & Validate Fleet processes in Sandbox Environment

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<td>27 28 29 30 31</td>
<td>29 30 31</td>
<td>29 30 31</td>
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Stuff Happens

Running command /u01/app/oracle/12.1.0.2.171017/bin/sqlplus / as sysdba @/u01/home/oracle/agent/stage/1516806715732/prepatch.sql

SQL*Plus: Release 12.1.0.2.0 Production on Wed Jan 24 10:13:18 2018
Copyright (c) 1982, 2014. Oracle. All rights reserved.

Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.2.0 - 64bit Production
With the Partitioning, Automatic Storage Management, OLAP, Advanced Analytics
and Real Application Testing options

ORACLE instance shut down.
ORA-32004: obsolete or deprecated parameter(s) specified for RDBMS instance

ORACLE instance started.
Total System Global Area 2835349504 bytes
Fixed Size 2920440 bytes
Variable Size 2187815496 bytes
Database Buffers 620756992 bytes
Redo Buffers 13848576 bytes
Database mounted.
Database opened.
Disconnected from Oracle Database 12c Enterprise Edition Release 12.1.0.2.0 - 64bit Production
With the Partitioning, Automatic Storage Management, OLAP, Advanced Analytics
and Real Application Testing options

Error code is -1 [ERROR] - Error occurred while executing /u01/home/oracle/agent/stage/1516806715732/prepatch.sql
Deleted temporary destination directory /u01/home/oracle/agent/stage/JOB_638510C2BD91355CE0533EB718AC13R7
Process returned : 1.
Software Standardization Advisor

Targets ➔ Databases ➔ Administration ➔ Software Standardization Advisor

Analysis of your Enterprise

- Software Installations: 656
- Collections Completed: 654
- Collection Errors: 2

Current Unique Software Configurations (29)

Recommended Software Configurations (5)

Criteria Used: Product, Release, Platform
DB Software Maintenance

- Create Gold Image/Version
  - createSoftwareImage
  - Prior Quarter
- Associate Target to Corresponding Image
  - subscribeTarget
  - One time (two weeks prior)
- When the old home is no longer used.. Remove it.
  - CLEANUP_SOFTWARE
- Patch Database moving it from the old to the new patched home
  - UPDATE_RACDB
- Deploy new Oracle Home
  - DEPLOY_RAC_SOFTWARE
  - Two Weeks prior

Db_Software_Maintenance

- createSoftwareImage
- subscribeTarget
- checkApplicability
- performOperation
  - DEPLOY_GI_SOFTWARE
  - UPDATE_GI
  - DEPLOY_DB_SOFTWARE
  - UPDATE_DB
  - DEPLOY_RAC_SOFTWARE
  - UPDATE_RACDB
  - DEPLOY_CDB
  - ATTACH_CDB
  - ROLLBACK_DB ..RACDB ..GI
  - CLEANUP_SOFTWARE
Gold Image Version – LINEAGE/Swim Lanes

12.1 DB Standard RAC
12.1 DB Standard Stand-Alone
12.1 DB One-Off RAC
12.1 DB One-Off Stand-Alone
11.2 DB Standard RAC
11.2 DB Standard Stand-Alone
12.1 Grid RAC
12.1 Restart Stand-Alone
19c Grid RAC
19c Restart Stand-Alone

Ver 1 190115
Ver 2 190416
Ver 3 190716
Ver 1 190115
Ver 2 190416
Ver 3 190716
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Ver 2 190416
Ver 3 190716
Procedure Activity Monitoring

Provisioning

Provision Activity > Fleet_UPDATE_dp0ad03p_08_14_2019_20_40_55_534_PM

Procedure Activity: Fleet_UPDATE_dp0ad03p_08_14_2019_20_40_55_534_PM

✓ Elapsed Time: 8 minutes, 40 seconds

Procedure Steps

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<tr>
<th>Select Name</th>
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<th>Elapsed Time</th>
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<tr>
<td>Initialize Patch DB Deployment Procedure</td>
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<td>4 seconds</td>
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<tr>
<td>Blackout listeners and affected databases</td>
<td>✔</td>
<td>3 seconds</td>
</tr>
<tr>
<td>Update cluster resources</td>
<td>✔</td>
<td>11 seconds</td>
</tr>
<tr>
<td>Copy configuration and stop database</td>
<td>✔</td>
<td>1 minute, 15 seconds</td>
</tr>
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<td>Copy config on non-master cluster homes</td>
<td>✔</td>
<td>31 seconds</td>
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<tr>
<td>Start database from the destination Oracle</td>
<td>✔</td>
<td>50 seconds</td>
</tr>
<tr>
<td>For all hosts: Steps for destination Oracle</td>
<td>✔</td>
<td>4 minutes, 46 seconds</td>
</tr>
<tr>
<td><strong>Server A</strong></td>
<td>✔</td>
<td>4 minutes, 46 seconds</td>
</tr>
<tr>
<td>Rollback Patches</td>
<td></td>
<td>0 seconds</td>
</tr>
<tr>
<td>Apply PSU/Patches on the database</td>
<td>✔</td>
<td>4 minutes, 46 seconds</td>
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<tr>
<td>Update Oracle home property</td>
<td>✔</td>
<td>4 seconds</td>
</tr>
<tr>
<td>Update properties</td>
<td>✔</td>
<td>18 seconds</td>
</tr>
<tr>
<td>Dataguard Broker Configuration</td>
<td>✔</td>
<td>0 seconds</td>
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</table>

Applying PSU/Patches on the database

Error code is 0
SQL Script /u01/app/oracle/agent/stage/295009514/05027/140502969070/prepatch.sql Completed
STD received is dp0ad0p_2
final command is /bin/sh -c /u01/app/oracle/12.1.0.2.190416/OPatch/databatch+ /u01/app/oracle/12.1.0.2.190416/applypat
SQL Paching tool version 12.1.0.2.0 Production on Wed Aug 14 20:47:49 2019
Copyright (c) 2010, 2017, Oracle. All rights reserved.

Connecting to database... done
Bootstrapping registry and package to current versions... done
Determining current state... done
Adding patches to installation queue and performing prestep checks... done
Installation gear...
The following patches will be installed:
295009514 (Database PSU 12.1.0.2.190416, Oracle JavaBeans Component (JBCI2019))
The following patches will be applied:
295009514 (Database PSU 12.1.0.2.190416, Oracle JavaBeans Component (JBCI2019))
20531241 (Database PSU 15.1.0.2.190416, Oracle JavaBeans Component (ARAB2019))
20531241 (Database preinstall patch 15.1.0.2.190416)

Installing patches...
Patch installation complete. Total patches installed: 2

Validating logfiles... done
SQL Patching tool complete on Wed Aug 14 20:47:49 2019
exit status is 0
SQL Script Completed
Running patch.sql...
SID is dp0ad0p_2
OSID is /u01/app/oracle/12.1.0.2.190416
Our Automation Leveraging Db Software Maintenance
Best Helpful Practices – Part 1

• Create Global Credentials (Sys, Oracle, Privileged Account)
  • A Private role can be given access to these credentials ... Then the role granted to DBA's
• Set the preferred credentials on accounts doing provisioning and patching
• Change your staging location (emStageDir) from /tmp (Doc ID 1610321.1)
• Ensure your oraInst.loc are correct .. Especially in the Home and /etc
• Ensure your cluster/has/database EM target properties are correct
• Clean up your EM Oracle Home Targets.... Add missing, delete decommed
• Grant access to all DBA’s to look at the procedure activity of others.
  • EM Resource Privileges --> Job System -->Edit any procedure configuration
• Ensure your Oracle base can hold at least 3 homes (current, future, unzip)
Best Helpful Practices – Part 2

• Study/Use the gold agent provisioning ...
• EMCLI commands: Switch_database, Switch_GI, → Db_Software_Maintenance
• Establish a clearly defined cycle
  • A cycle ends/begins when the next version is made current
• Pick a model for subscribes and deploys
  • Mass operation at beginning of cycle or Just-in-Time. Each has pros and cons.
• Have a directory naming convention to make versions obvious
  • ...../12.1.0.2.190416
  • ...../12.1.0.2.190416-oneoff
  • ...../19.3.0.0.190416
• EM Book Keeping ... Associations ... Oracle Home to Target .. “Installed At”
  • Keep track of errors as you encounter them ... You may be hitting them each cycle.
Best Helpful Practices – Part 3

• Clean up Software ... (default 3 homes) Set to 1.
  • emctl set property -name oracle.sysman.emInternalSDK.db.gis.lineageLength
  • NEW .. Ability to delete home by home name.

• Have a development EM install .... Test out new Patches... Stay current.
  • Base Product patch (quarterly)
  • Plugin Bundle patch (monthly)
  • Agent Patch
  • Weblogic (quarterly)

• New Ability to move Gold Images between EM systems.

• Lineage:  Rare but occasional problems (Doc ID 2346150.1)
db_software_maintenance -subscribeTarget

Creates new target or modifies the target subscription.

Format

emcli db_software_maintenance
  -target <target_name>
  -target_type <target_type>
  -image <image_id>

(Configuration)

[Report01]
instance=dbxyz
user=useridxyz
password=@{oracle/useridxyz}@
sql= select target_name, target_type, oem_patchng.get_instance_image_id(seq_id) ....
     where window_start_date > sysdate and window_start_date < sysdate +14
     minus
     select target_name, target_type, image_id from GP_DB_GL_SUBSCRIPTIONS
     .... order by 1
format=./emcli db_software_maintenance -subscribeTarget -target_name="%s" -target_type=%s -image_id=%s