PATCHING ORACLE

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Accenture Enkitec Group

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#DOAGDB17

ORACLE PATCHING AN OVERVIEW

Patching does not need to be scary

Knowing what to do and testing should provide enough confidence to rise to the challenge.

After attending this sessions you should be better prepared to patch your Oracle system

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WHOAMI
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- I work for Accenture Enkitec Group
  - Opinions are strictly my own
- Authoring
  - Co-author of Pro Oracle RAC 11g on Linux
  - Expert Consolidation in Oracle Database 12c
  - Lead author of Expert Oracle Exadata 2nd edition

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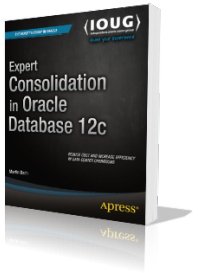

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AGENDA
WHAT TO EXPECT

- An overview of Oracle Patching
- Reducing Risk
- Patching the Oracle Binaries
- Patching the Oracle Database
- MOS notes and References

This talk does not take the announcements from today's keynote into account

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ORACLE PATCHING- AN OVERVIEW

We do not use patching without testing. Period.

And our test environment matches production.

SOME TERMINOLGY FIRST
PATCHING VS UPGRADING

Patching

- Stay on the same point release
- Many reasons
  - Some obvious
  - Some not so much
- Should be done bi-annually

Upgrading

- Going from one release to another
- Since 11.2.0.2 each release is a full release
  - Exactly: 11.2.0.3 to 11.2.0.4 is a full release!
  - And 11.2.0.4 seems closer to 12.1.0.1 than to 11.2.0.3
- Most stringent testing requirements
- Not upgrading can become *technological debt*

This short presentation is about patching "build your own" systems only

BE AWARE OF END-OF-PATCHING-SUPPORT!
MOS DOC ID 742060.1

You may find yourself out of patching support

- Prominent examples
  - 12.1.0.1
  - 11.2.0.3
- Free extended support for 11.2.0.4 waived again
- Same for 12.1.0.2
- Get ready for the upgrade to 12c!
  - We are glad you are here
  - Wait for 12.2 or go 12.1?
  - Mike?

Release	Patching Ends	Notes and Exceptions*
12.2.0.1	TBD	Base release - patching end date will be determined once the first patch set is released.
12.1.0.2	**31-Jul-2021**	Extended Support fees waived through July 31, 2019. Beginning Aug 1, 2019 an ES service contract is required.
12.1.0.1	**31-Aug-2016**	
11.2.0.4	**31-Dec-2020**	Extended Support fees waived until Dec 31, 2018. An ES service contract is required starting 1-Jan-2019.
11.2.0.3	**27-Aug-2015**	
11.2.0.2	**31-Oct-2013**	End date extended beyond normal.
11.2.0.1	**13-Sep-2011**	Patch end date for Exadata is 30-Apr-2012
11.1.0.7	**31-Aug-2015**[Z]	**HP-UX Itanium - Patching ends Dec 2015.** Beginning Sep 1, 2015 Sev 1 fixes only (no PSU or CPU will be produced). **Extended Support** required starting 1-Sep-2012
11.1.0.6	**18-Sep-2009**	
10.2.0.5	**31-Jul-2015**[Z]	**All platforms - standard Extended Support ended 31-Jul-2013.** After that, additional support

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WHICH PATCH TYPES EXIST (1)
MOS DOC ID 1962125.1

Security Patch Update (SPU)

- Security fixes
- Part of the Critical Patch Update programme
- Not available for 12.1+ (Doc ID 1581950.1)
- Provided quarterly

Bundle Patch (BP)

- Typically an Exadata thing; also for Windows
- Can include more content than a PSU
- Also commonly spans all components
- Can also change the optimiser!

Patch Set Update (PSU)

- Fix important bugs
- Includes the security patches
- Can span the entire stack
- NO optimiser patches included
- Quarterly release

Database Proactive Bundle Patch (DBBP)

- Merge of Exadata and In-Memory Patch
- Now preferred patching method for 12c
- Exadata and non-Exadata alike

WHICH PATCH TYPES EXIST (2)
MOS DOC ID 1962125.1

Oracle Java VM (OJVM) patch

- A really difficult topic
- Usually not RAC-rolling
- See Doc ID 1929745.1 and 2217053.1
- Mitigation Patch?
- Full Patch?

Interim or One-Off patch

- Fix a specific problem
- Might get merged into PSU/DBBP
- Might have to be ”carried forward”

Quarterly Full Stack Download (QFSD)

- A.K.A Combo Patch
- Usually for Engineered Systems
- HUUUGE

WHICH PATCHING METHOD SHOULD WE USE?
MOS DOC ID 1962125.1

Database Release	Target					
	Exadata	Exadata (when excluding cells)	Database Appliance	RAC (not an Engineered System)	Oracle Restart/ SIHA	RDBMS without ASM
12.1.0.2	Use the Quarterly Full Stack Download (MOS 888828.1)	Database Proactive Bundle Patch (MOS 888828.1)	Tied to ODA release (MOS 888888.1)	Database Proactive Bundle Patch	Database Proactive Bundle Patch	Database PSU
11.2.0.4		Database Patch for Exadata		GI PSU	GI PSU	Database PSU

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WHERE CAN I FIND THESE PATCH NUMBERS? THERE HAS TO BE A LIST

My Oracle Support Resources

- Oracle Recommended Patches -- Oracle Database (Doc ID 756671.1)
- Quick Reference to Patch Numbers for Database/GI PSU, SPU(CPU), Bundle Patches and Patchsets (Doc ID 1454618.1)
- Oracle Recommended Patches -- "Oracle JavaVM Component Database PSU" (OJVM PSU) Patches (Doc ID 1929745.1)
- Be aware patch numbers changed
  - Oracle Database, Enterprise Manager and Middleware - Change to Patch Numbering from Nov 2015 onwards (Doc ID 2061926.1)

Where to start?

- 756671.1 is a useful starting point
- 1454618.1 allows you to quickly search for
  - Base Releases
  - Patchsets
  - Each PSU/SPU(CPU), and bundle patch, …

Oracle recommends you install the OJVM PSU as well

REDUCING RISK

REDUCING RISK
FIND A TEST STRATEGY

You cannot afford *not to test*

- The better you are prepared, the lower the risk
- Your test effort depends on the patch type
  - MOS Doc ID 1962125.1 lists some
  - I do not necessarily agree with these
- With PSUs/DBBP it can be worth waiting a little bit to let others find the most obvious bugs

Test \ Patch	One-Off			Patch Set
Installation and Rollback	Mandatory	andatory	ory	Mandatory
Bug Fix Verification	Where possible evant			
Minimum required DBA activities	Not required	Basic	Basic	Full
Functional testing of the application	Not required	Core applica	Core and non-core applications	Full
Application performance testing	Not required	Not required	Not required	Full

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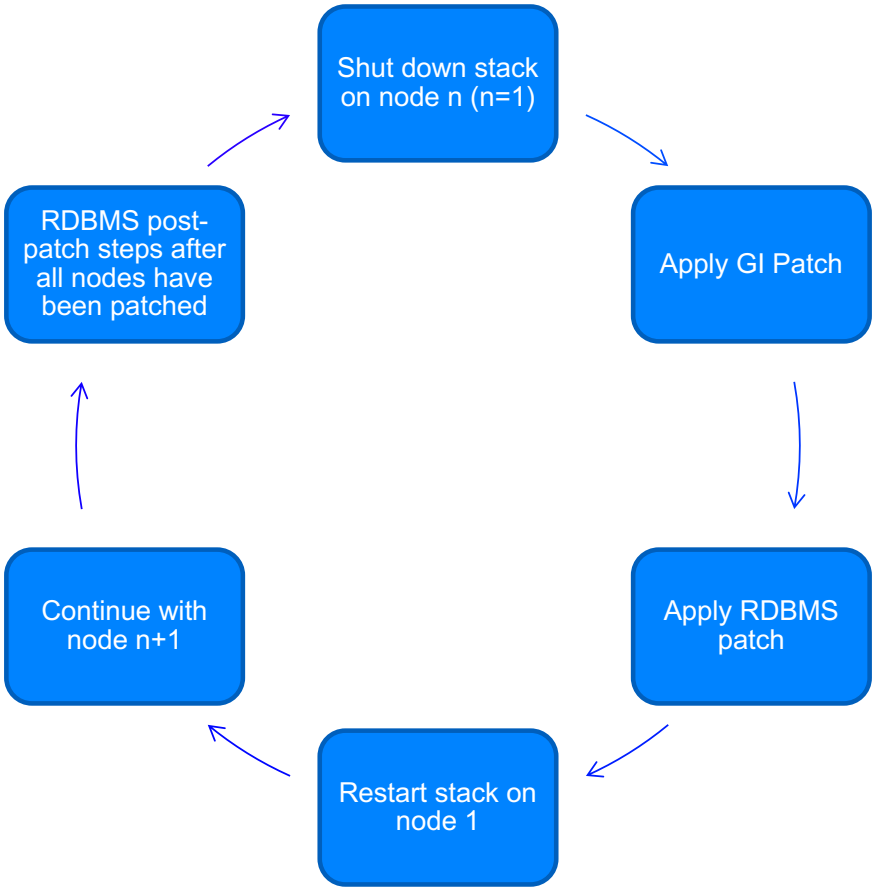
RISK MITIGATION
ROLLING PATCHING

A much underused RAC feature

- If the application is written properly you can greatly reduce the outage
- Requires that the patch is RAC rolling installable
  - Different for each patch
  - Whether it's possible can be found near the top
- You patch one node at a time
  - Complete shut down of the stack
  - All other nodes remain up and running
  - Patch is applied on just one node
- I have never seen this done right in production
- OJVM patches are *not RAC rolling*



RISK MITIGATION
DATA GUARD STANDBY FIRST

Use one of your Data Guard systems for testing

- Requires the patch to support the method
- Standby-first patching …
  - Requires a Data Guard setup
  - Support for different database home between primary and standby
- Maybe time to think about a second physical standby?
- There are restrictions: see DOC ID 1265700.1

Process

- Step 1: Patch the standby binaries only
- Step 2: Test the patch
  - Snapshot standby!
  - Perform post database patch activity
  - Test, test, test …
  - Convert flashback standby to regular standby database
- Step 3: Finish
  - Within 31 days!
  - Apply patch to primary *or*
  - Switch over and apply patch to the then-standby *or*
  - Abort by rolling the patch back

RISK MITIGATION
OUT OF PLACE PATCHING

PATCHING THE ORACLE BINARIES

Before you perform any patching –

ENSURE THERE ARE BACKUPS!

And more importantly: make sure you have a proven, tested and documented procedure to revert back

PATCHING THE ORACLE BINARIES
OPATCH AND OPATCHAUTO

You surely know opatch …

- Does anyone remember the patch number by heart?
- You will, because you have to update it frequently
  - Especially with RAC …
  - I wish we had dcli on every Oracle cluster
- OPatch version numbers are a bit funny (MOS 1486109.1)

Automatic opatch

- Supposed to help with patching
  - Oracle Restart
  - Oracle Real Application Clusters
- Was a bit unreliable at first
- Very unreliable lately
- I don’t use it anymore

PATCHING THE ORACLE BINARIES
HOW TO PATCH (1)

Patching *just* the RDBMS

- Always test first!
- What about these backups?
- Patching a single RDBMS home is the easiest case
- Follow instructions in the Patch Read Me
  - Did you update OPatch?
  - Are there conflicts?
  - Is the inventory consistent and intact?
  - Are all required tools (perl!) in your path?

Usually it works like this:

- Download and unzip the patch
- Enter the patch directory
- Execute opatch apply
- If needed, install SQL part using datapatch
- Hand the system over
- Test
- Sign off

PATCHING THE ORACLE BINARIES
HOW TO PATCH (2)

Patching Grid Infrastructure

- More tricky
- Therefore more testing needed :)
- Usually done in conjunction with the RDBMS
- Choice between
  - Manually applying the patch (1591616.1)
  - OPatch automation
- Follow instructions in readme

Grid Infrastructure and RDBMS dependencies

- Reference: MOS Doc ID 337737.1
- GI version must be >= RDBMS version
  - Detail: up to 4th digit only
  - Apparently DBBP does not matter
  - I would strongly recommend ensuring DBBP match as well
- Great post by Mike Dietrich on his blog
- It is possible to use a RDBMS release < GI release

APPLY A PATCH MANUALLY ON RAC 12C R1
I DON'T TRUST OPATCHAUTO ANYMORE

You can (should?) apply Bundle Patches manually

- Most GI/RDBMS patches are divided into 4 sub-patches
  - Database Part
  - Clusterware part
  - ACFS part
  - Workload Management Part
- Each patch readme lists these numbers
- Follow the process as per Step 5 in MOS 1591616.1
- Post-patch steps can be completed once all nodes have been patched

```
[oracle@rac12sec1 ~]$ /u01/app/12.1.0.2/grid/OPatch/opatch apply \
> -oh /u01/app/12.1.0.2/grid -local \
> /u01/stage/24433148/24007012 -silent
Oracle Interim Patch Installer version 12.2.0.1.8
Copyright (c) 2017, Oracle Corporation.  All rights reserved.


Oracle Home       : /u01/app/12.1.0.2/grid
Central Inventory : /u01/app/oraInventory
   from           : /u01/app/12.1.0.2/grid/oraInst.loc
OPatch version    : 12.2.0.1.8
OUI version       : 12.1.0.2.0
Log file location : /u01/app/12.1.0.2/grid/cfgtoollogs/opatch/opatch2017-01-13_04-04-47AM_1.log

Verifying environment and performing prerequisite checks...
OPatch continues with these patches:   24007012

Do you want to proceed? [y|n]
Y (auto-answered by -silent)
User Responded with: Y
All checks passed.

Please shutdown Oracle instances running out of this ORACLE_HOME on the local system.
(Oracle Home = '/u01/app/12.1.0.2/grid')


Is the local system ready for patching? [y|n]
Y (auto-answered by -silent)
User Responded with: Y
Backing up files...
Applying interim patch '24007012' to OH '/u01/app/12.1.0.2/grid'
```

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APPLY A PATCH MANUALLY ON RAC 11.2
I DON'T TRUST OPATCH AUTO EITHER

You can (should?) apply Bundle Patches manually

- Procedure for 11.2 is very similar to 12c
- No counterpart to Doc ID 1591616.1
- Steps are embedded in the patch Readme for Exadata for example
  - Example to the right is for OCT2016 - 11.2.0.4.1601018 patch
- Generic GI PSU readme files refer to Doc ID 1641136.1

Steps for Applying the Patch

Execute the following on each node of the cluster in non-shared (local) GI and DB home environment to apply the patch.

Note:

- The steps 2, 3, and 7 are not required if you are applying the "Database Patch For Exadata (OCT2016

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1. Stop the GI managed resources running from DB homes.

   As the database home owner execute:

   ```
   % $ORACLE_HOME/bin/srvctl stop home -o $ORACLE_HOME -s <status file location> -n <node name>
   ```

2. Run the pre root script.

   As the root user execute:

   ```
   # <GI_HOME>/crs/install/rootcrs.pl -unlock
   ```

3. Apply the Database Patch For Exadata (OCT2016 - 11.2.0.4.1601018) patch to GI Home :

   As the GI home owner execute:

   ```
   % <GI_HOME>/OPatch/opatch napply -oh <GI_HOME> -local <PATH_TO_PATCH_DIRECTORY>/24340671
   % <GI_HOME>/OPatch/opatch napply -oh <GI_HOME> -local <PATH_TO_PATCH_DIRECTORY>/23054319
   % <GI_HOME>/OPatch/opatch napply -oh <GI_HOME> -local <PATH_TO_PATCH_DIRECTORY>/22502505
   ```


PATCHING THE DATABASE

PATCHING THE RDBMS GOODBYE CATBUNDLE.SQL HELLO DATAPATCH!

Final step in the patch procedure

- After all nodes have been patched it's time to perform the post-installation actions
- Oracle 11.2 required you to run catbundle.sql
- Oracle 12c changes this
  - New tool named datapatch
  - If you are patching a CDB: open all PDBs
- The database must be started with *.cluster_database=false
- You must start it in upgrade mode if you applied the OJVM patch

- Example for 11.2

```
[oracle@rac11node1 ~]$ cd $ORACLE_HOME/rdbms/admin
[oracle@rac11node1 ~]$ sqlplus /nolog
SQL> CONNECT / AS SYSDBA
SQL> STARTUP [upgrade]
SQL> @catbundle.sql psu|exa apply
SQL> QUIT
```

- Example for 12c R1

```
[oracle@rac12node1 ~]$ cd $ORACLE_HOME/OPatch
[oracle@rac12node1 ~]$ sqlplus /nolog
SQL> CONNECT / AS SYSDBA
SQL> STARTUP [upgrade]
SQL> [alter pluggable database all open]
SQL> QUIT
[oracle@rac12node1 ~]$ ./datapatch -verbose
```


You must also run datapatch for all databases created by `dbca`

Only for 12.1.0.x
12.2.0.1 seems to fix this

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REFERENCE

REFERENCES (1)

- Release Schedule of Current Database Releases (Doc ID 742060.1)
- Database Security Patching from 12.1.0.1 onwards (Doc ID 1581950.1)
- Oracle Recommended Patches -- "Oracle JavaVM Component Database PSU" (OJVM PSU) Patches (Doc ID 1929745.1)
- Oracle Database Appliance - 12.1.2 and 2.X Supported ODA Versions & Known Issues (Doc ID 888888.1)
- Exadata Database Machine and Exadata Storage Server Supported Versions (Doc ID 888828.1)
- Oracle Database - Overview of Database Patch Delivery Methods (Doc ID 1962125.1)

REFERENCES (2)

- Quick Reference to Patch Numbers for Database/GI PSU, SPU(CPU), Bundle Patches and Patchsets (Doc ID 1454618.1)
- Oracle Database, Enterprise Manager and Middleware - Change to Patch Numbering from Nov 2015 onwards (Doc ID 2061926.1)
- Oracle Patch Assurance - Data Guard Standby-First Patch Apply (Doc ID 1265700.1)
- Oracle Grid Infrastructure 11.2.0.4.x Patch Set Update SUPPLEMENTAL README (Doc ID 1641136.1)
- Supplemental Readme - Patch Installation and Deinstallation for 12.1.0.x.x GI PSU and Database Proactive Bundle Patch (Doc ID 1591616.1)

