



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
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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

Why Patch? Security..Security..Security

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:

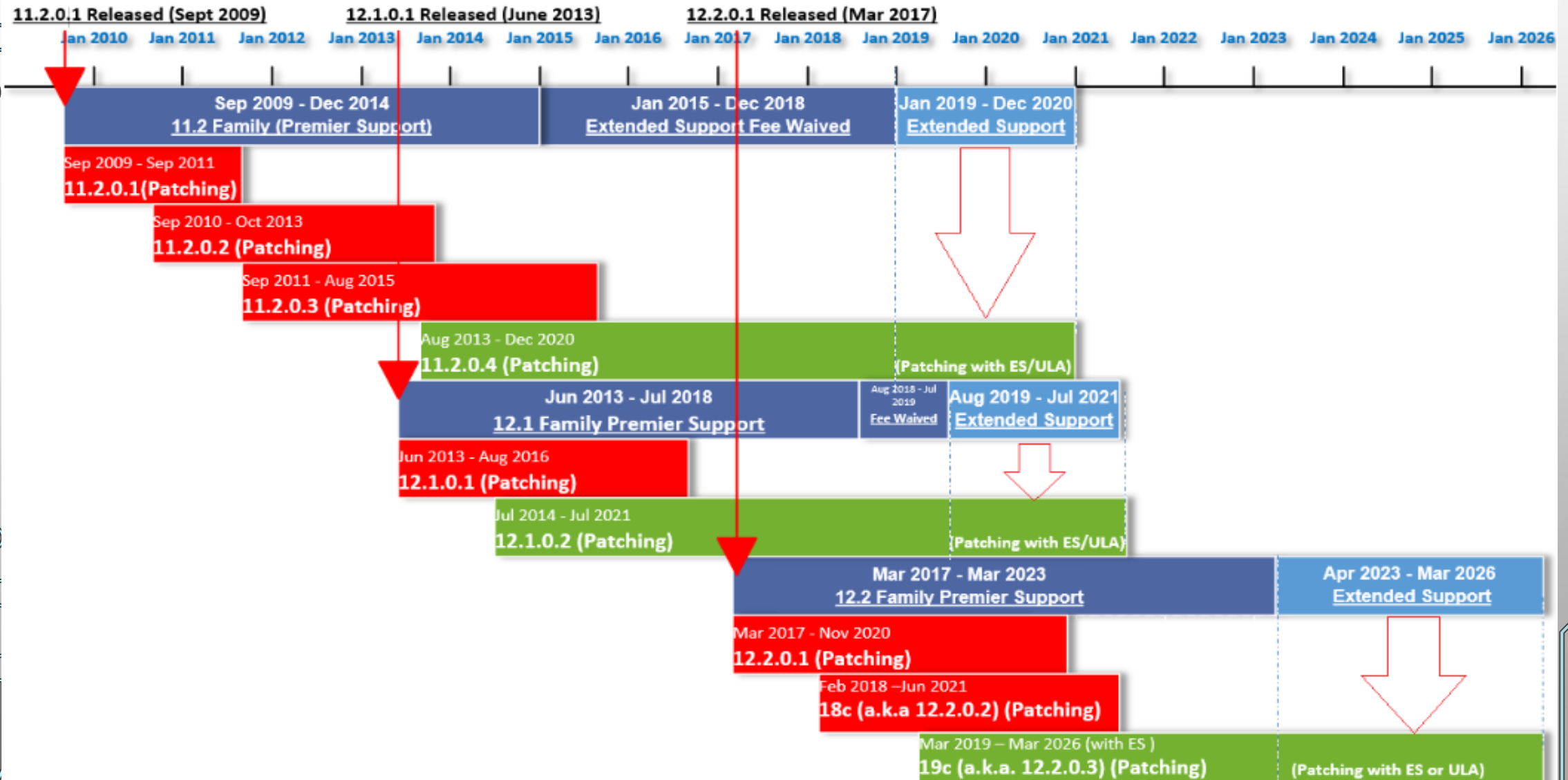
- Level 1 - ...The Oracle installation version and patches should be the most recent that are compatible with the organization's operational needs.

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/>

General Data Protection Regulation

Oracle's Annual Release Roadmap Doc ID 742060.1



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..RHP

- Out of Place
- Gold Image Homes/Standardization
- Minimal Outage window
- *LifeCycle License Required?

EM Fleet Maintenance

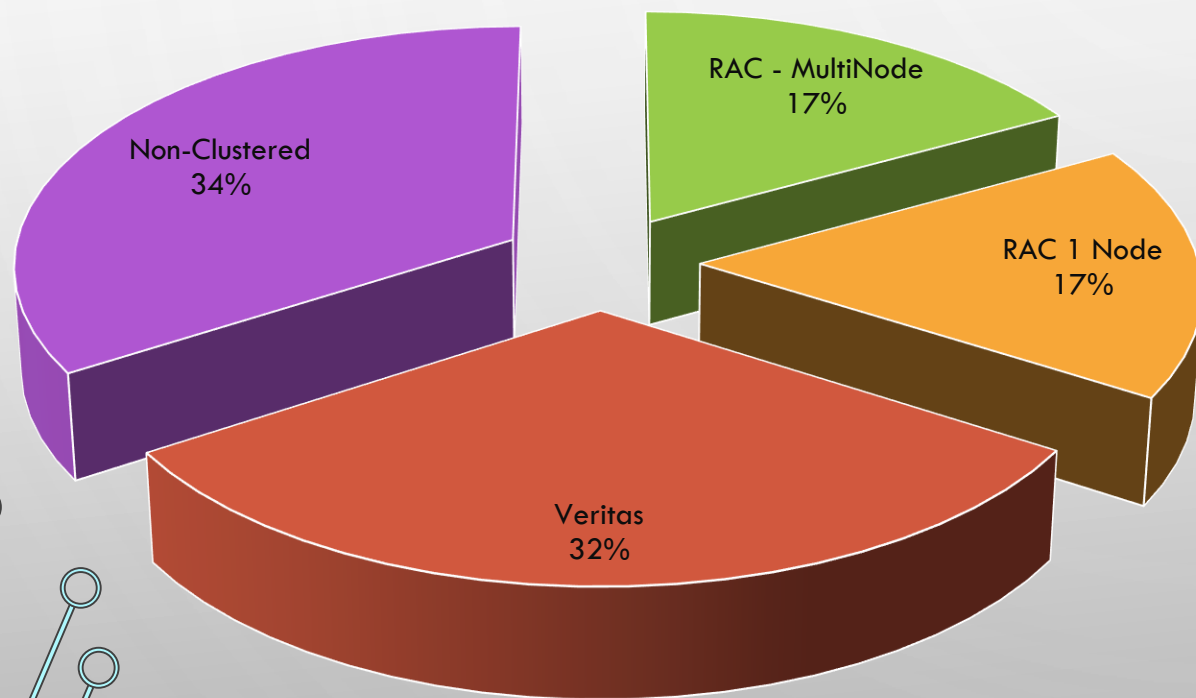
- Out of Place
- Version 1: Switch
- Version 2: Db software maintenance
- Gold Image Homes / Standardization
- Minimal Outage window
- Utilizes EM's deployment job system
- Scalable
- *LifeCycle License Required
- ** Deployment Procedures

Cloud DBaaS

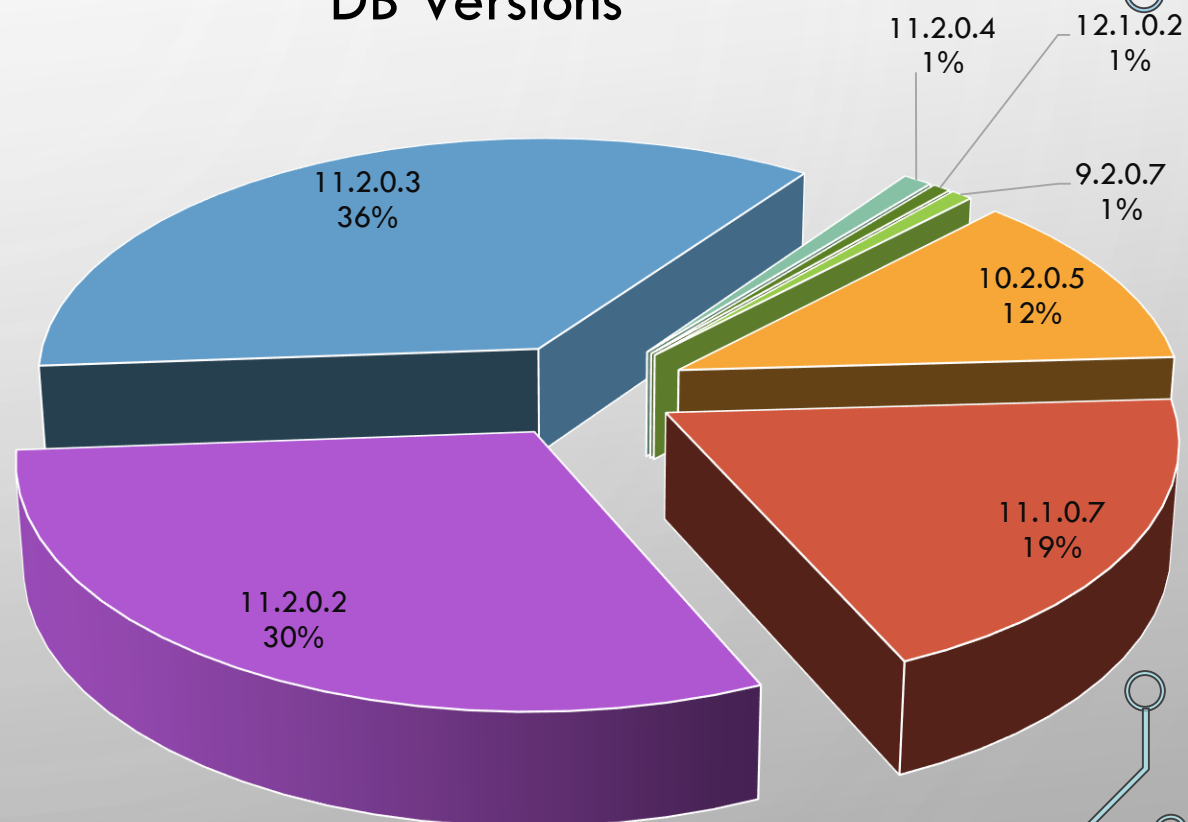
- Cloud Provider applies Patches

2014 Clustering Technologies vs DB Versions

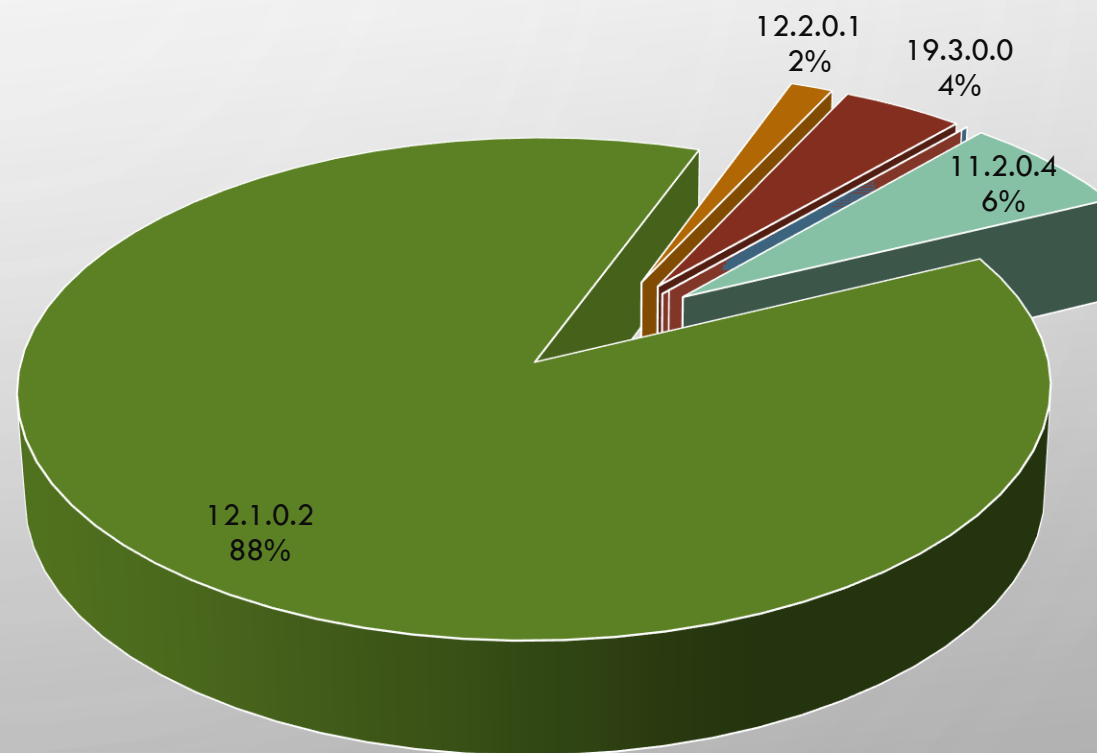
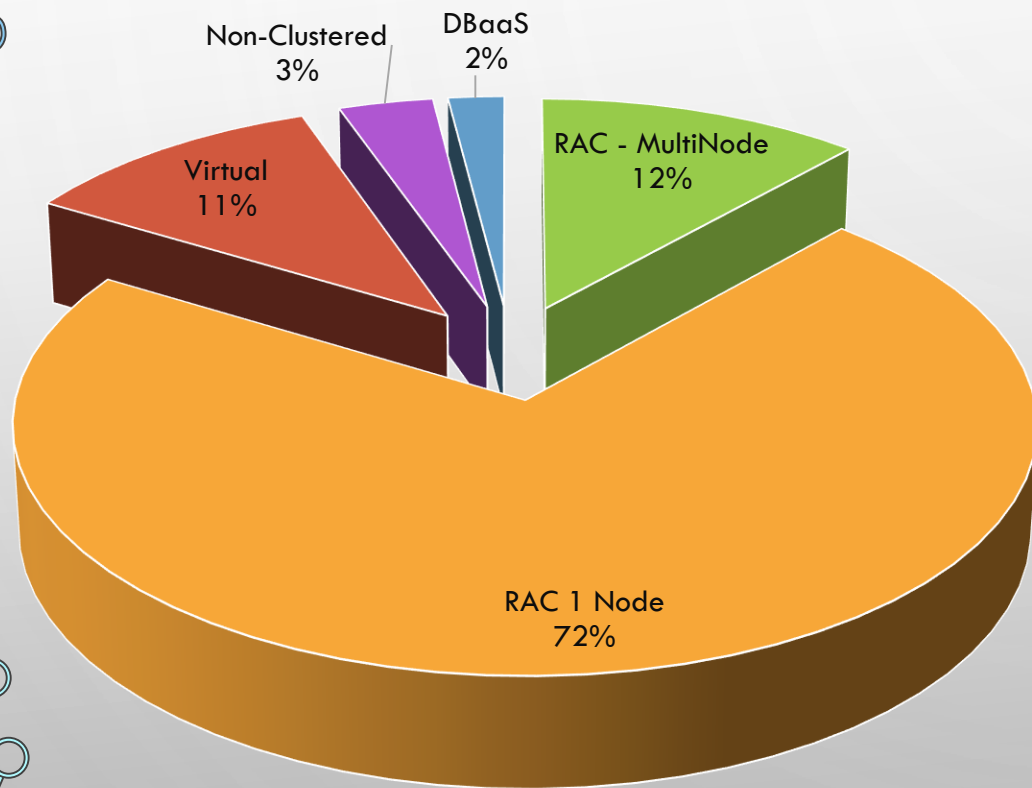
Clustering



DB Versions



2019 Clustering Technologies vs DB Versions



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

JULY							AUGUST							SEPTEMBER						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
	1	2	3	4	5	6								1	2	3	4	5	6	7
7	8	9	10	11	12	13								8	9	10	11	12	13	14
14	15	16	17	18	19	20								15	16	17	18	19	20	21
21	22	23	24	25	26	27								22	23	24	25	26	27	28
28	29	30	31				25	26	27	28	29	30	31	29	30					

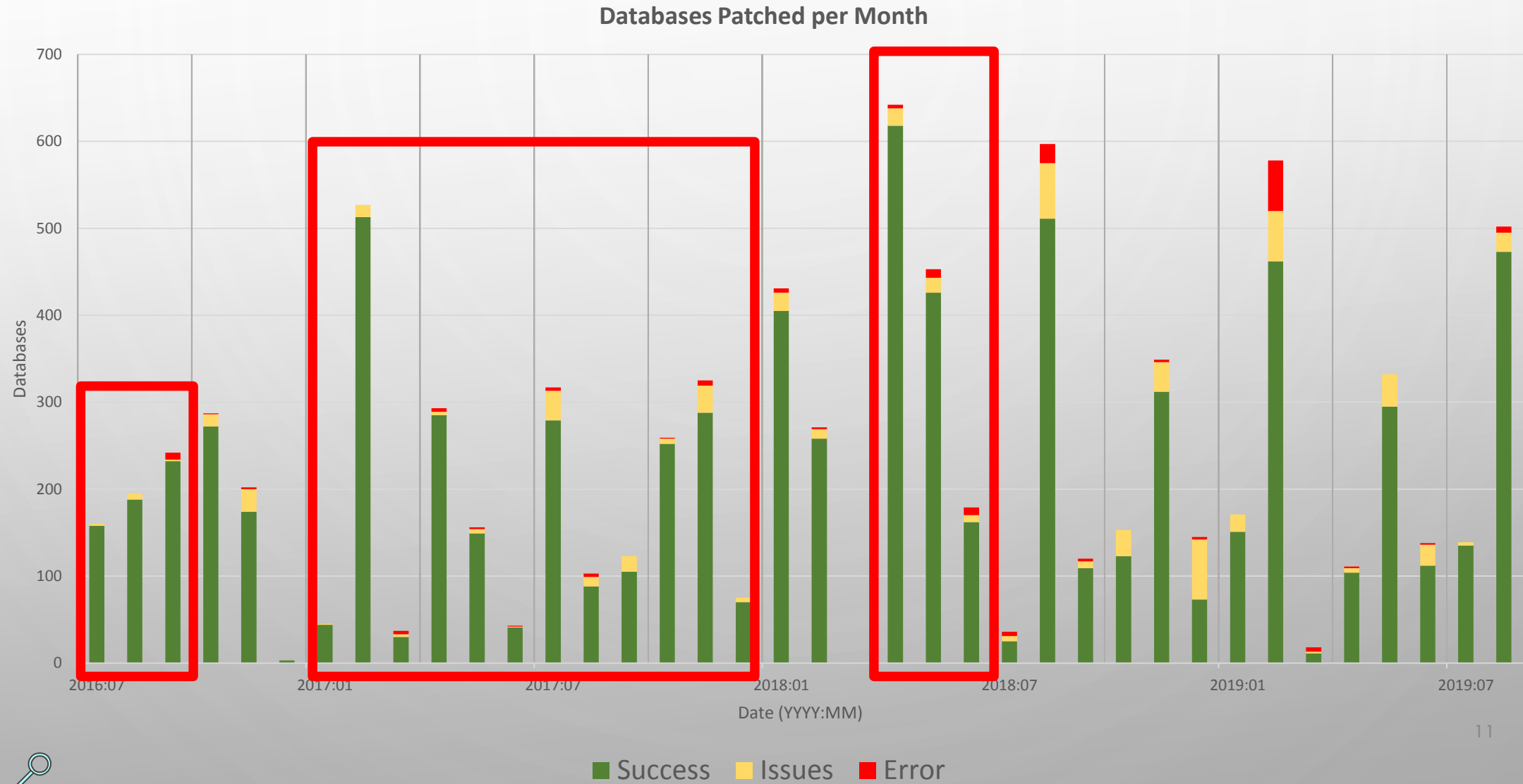
- Download Patches
- Create new Oracle Homes on our "Gold Image" servers
- Create Software Images of the new Oracle Homes
- Make the new "version" Current within the Gold Image
- Test & Validate Fleet processes in Sandbox Environment

OCTOBER							NOVEMBER							DECEMBER						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
		1	2	3	4	5						1	2	1	2	3	4	5	6	7
6	7	8	9	10	11	12	3	4	5	6	7	8	9	8	9	10	11	12	13	14
13	14	15	16	17	18	19	10	11	12	13	14	15	16	15	16	17	18	19	20	21
20	21	22	23	24	25	26	17	18	19	20	21	22	23	22	23	24	25	26	27	28
27	28	29	30	31			24	25	26	27	28	29	30	29	30	31				

3 Person Team:

- DBA – Scheduler / Database Patching
- DBA – EM Tester / Clusterware Patching
- EM – Administrator / Developer

PATCHING RESULTS



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 2928440 bytes
Variable Size 2197815496 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_638810C2BD91358CE053AEB718AC13A7
Process returned : 1.
```

Software Standardization Advisor

Targets → Databases → Administration → Software Standardization Advisor

Database

Grid Infrastructure

Analysis of your Enterprise

Software Installations: 656

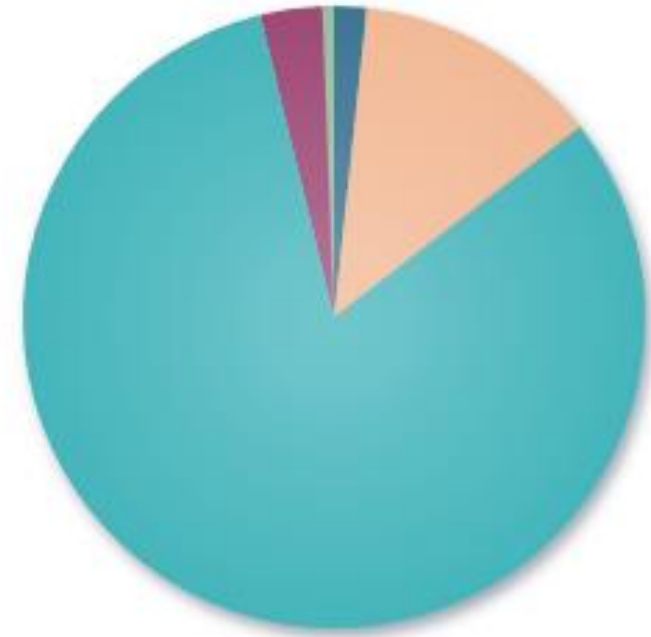
✓ Collections Completed: 654

⚠ Collection Errors: 2

Current Unique Software Configurations (29)

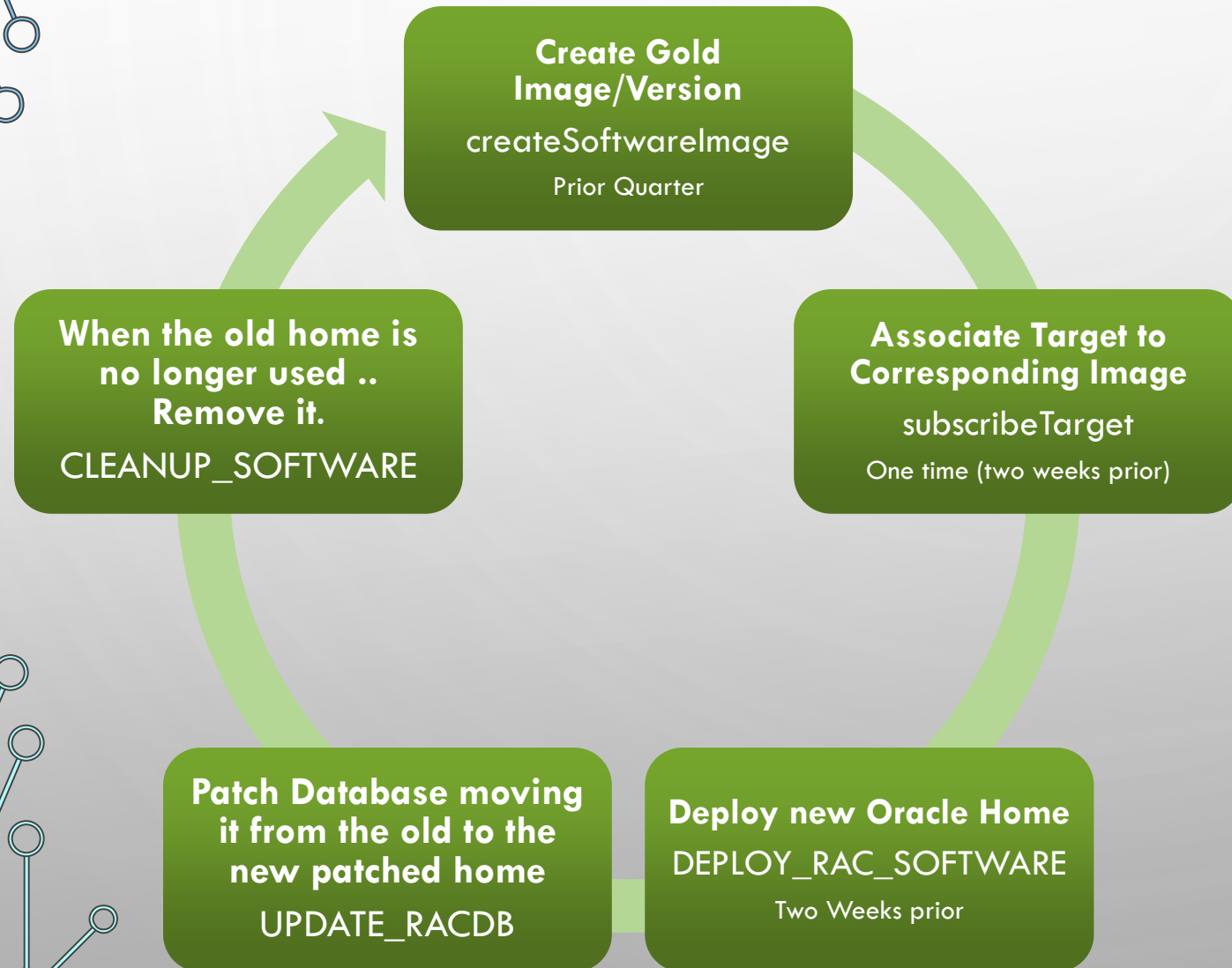


Recommended Software Configurations (5)



Criteria Used: Product, Release, Platform

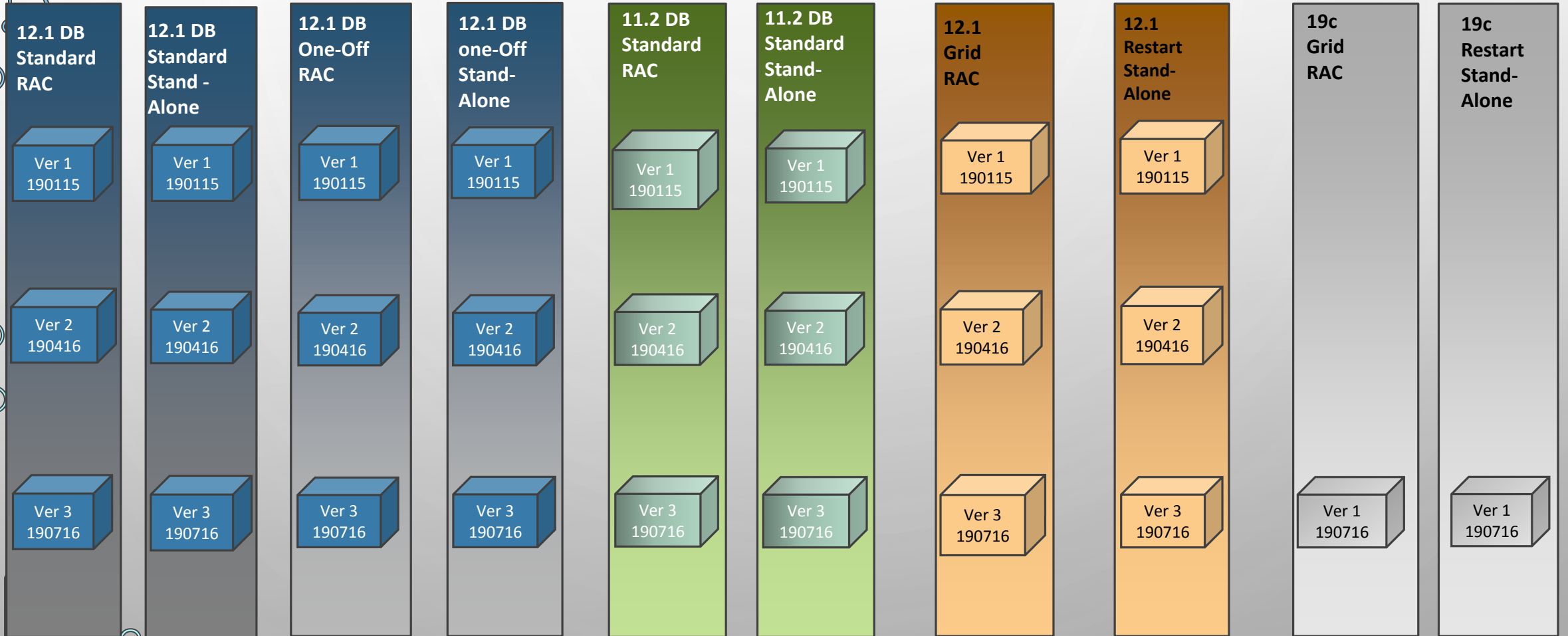
DB Software Maintenance



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



Procedure Activity Monitoring

Provisioning

Procedure Activity > Fleet_UPDATE_dpado3p_08_14_2019_20_40_55_534_PM

Procedure Activity: Fleet_UPDATE_dpado3p_08_14_2019_20_40_55_534_PM

Switch to Classic View

View Data Real Time: Manual Refresh

Procedure Actions

Switch to Stack View

Elapsed Time: 8 minutes, 40 seconds

Procedure Steps

View	Show	All Steps
Select	Name	Status Elapsed Time
<input type="checkbox"/>	Initialize Patch DB Deployment Procedure	✓ 4 seconds
<input type="checkbox"/>	Blackout listeners and affected databases	✓ 3 seconds
<input type="checkbox"/>	▶ Update cluster resources	✓ 11 seconds
<input type="checkbox"/>	▶ Copy configuration and stop database	✓ 1 minutes, 15 seconds
<input type="checkbox"/>	▶ Copy config on non-master cluster homes fr	✓ 31 seconds
<input type="checkbox"/>	▶ Start database from the destination Oracle I	✓ 50 seconds
<input type="checkbox"/>	▲ For all hosts : Steps for destination Oracle t	✓ 4 minutes, 46 seconds
<input type="checkbox"/>	▲ Server A	✓ 4 minutes, 46 seconds
<input type="checkbox"/>	Rollback Patches	🔄 0 seconds
<input checked="" type="checkbox"/>	Apply PSU/Patches on the databa:	✓ 4 minutes, 46 seconds
<input type="checkbox"/>	▶ Update Oracle home property	✓ 4 seconds
<input type="checkbox"/>	▶ Update properties	✓ 18 seconds
<input type="checkbox"/>	Dataguard Broker Configuration	🔄 0 seconds

Apply PSU/Patches on the database

✓ Apply PSU/Patches on the database

Job Summary Download Actions

```
Error code is 0
SQL Script /u01/home/oracle/agent/stage/2950095141053274/1565829684070/prepatch.sql Completed
SID received is dpado3p_2
final command is /bin/sh -x /u01/app/oracle/12.1.0.2.190416/OPatch/datapatch+ /u01/app/oracle/12.1.0.2.190416/sqlpat
SQL Patching tool version 12.1.0.2.0 Production on Wed Aug 14 20:45:47 2019
Copyright (c) 2012, 2017, Oracle. All rights reserved.
```

```
Connecting to database...OK
Bootstrapping registry and package to current versions...done
Determining current state...done
Adding patches to installation queue and performing prereq checks...done
Installation queue:
```

```
The following patches will be rolled back:
28440711 (Database PSU 12.1.0.2.181016, Oracle JavaVM Component (OCT2018))
The following patches will be applied:
29251241 (Database PSU 12.1.0.2.190416, Oracle JavaVM Component (APR2019))
29141038 (DATABASE BUNDLE PATCH 12.1.0.2.190416)
```

```
Installing patches...
Patch installation complete. Total patches installed: 3
```

```
Validating logfiles...done
SQL Patching tool complete on Wed Aug 14 20:47:56 2019
```

```
exit status is 0
Patching Script Completed
Running patch sqls..
SID is dpado3p_2
ORACLE HOME is /u01/app/oracle/12.1.0.2.190416
```

Our Automation Leveraging Db Software Maintenance

Patch Scheduling

Welcome: NORMANJ8 Logout

Sits Instances

Patching Cycles

Patch Windows

Patches

Automation Console

Patch Window

* Cycle: 2019_Q3

Seq Id: 492

* Name: Q3_IRW3

* Start Date: 22-SEP-2019 00:00

* Duration: 6

* Type: INFRASTRUCTURE-InfraStructure Patching Windows

RFC:

Launch Status: Completed

Comments:

Q-

Go

Actions

Refresh

Seq Id	Type	Instance Name	Availability	Status	New Directory	Predecessor	Pred Req	Start	End	Command	Inst Name	Target Type	Execution Name
17241	SWITCH	DIOPT1P	Target Up	Succeeded	/u01/app/oracle/12.1.0.2.190416	-	-	22-SEP-2019 00:19	22-SEP-2019 00:26	./emcli db_software_maintenance -performOperation -name=Fleet_diopt1p.nsc.net.17241-purpose=UPDATE_RACDB -target_type=rac_database -target_list=diopt1p.nsc.net -normal_credential=ORACLE_UNIX_ACCOUNT:SYSMAN -privilege_credential=ORACLE_PRIVILEGE_UNIX_ACCOUNT:SYSMAN -rolling=false	diopt1p.nsc.net	rac_database	Fleet_UPDATE_diopt1p_09_22_2019_00_19_53_865_AM 7682E
17242	SWITCH	DPM01P	Target Up	Succeeded	/u01/app/oracle/12.1.0.2.190416	17241	O	22-SEP-2019 00:33	22-SEP-2019 00:36	./emcli db_software_maintenance -performOperation -name=Fleet_dpm01r.nsc.net.17242-dataguard_role=standby -purpose=UPDATE_RACDB -target_list=dpm01r.nsc.net -target_type=rac_database -normal_credential=ORACLE_UNIX_ACCOUNT:SYSMAN -privilege_credential=ORACLE_PRIVILEGE_UNIX_ACCOUNT:SYSMAN -startupAfterSwitch=false -rolling=false -input_file=/data/vol/dbabin/oem/patching/StandbyDisableDGB	dpm01r.nsc.net	rac_database	Fleet_UPDATE_dpm01r_09_22_2019_00_33_08_936_AM 7682E
17243	SWITCH	DPM01P	Target Up	Succeeded	/u01/app/oracle/12.1.0.2.190416	17242	M	22-SEP-2019 00:36	22-SEP-2019 00:43	./emcli db_software_maintenance -performOperation -name=Fleet_dpm01p.nsc.net.17243-dataguard_role=primary -purpose=UPDATE_RACDB -target_list=dpm01p.nsc.net -target_type=rac_database -normal_credential=ORACLE_UNIX_ACCOUNT:SYSMAN -privilege_credential=ORACLE_PRIVILEGE_UNIX_ACCOUNT:SYSMAN -rolling=false	dpm01p.nsc.net	rac_database	Fleet_UPDATE_dpm01p_09_22_2019_00_36_21_313_AM 76821
										./emcli db_software_maintenance -performOperation -name=Fleet_dpm01r.nsc.net.13547-dataguard_role=standby -purpose=UPDATE_RACDB -target_type=rac_database			

Best Helpful Practices – Part 1

- “Oracle Database Fleet Maintenance” Reference Manual: <https://bit.ly/2S4FZsz>
- 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.emlInternalSDK.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)

EMCLI

`db_software_maintenance -subscribeTarget`

Creates new target or modifies the target subscription.

Format

`emcli db_soft [Configuration]`

`-target`

`-target [Report01]`

`-instance=dbxyz`

`-image`

`user=useridxyz`

`password=@{oracle/useridxyz}@|`

`sql= select target_name, target_type, oem_patching.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_GI_SUBSCRIPTIONS`

`..... order by 1`

`format= ./emcli db_software_maintenance -subscribeTarget -target_name="%s" -target_type=%s -image_id=%s`

Questions ???