ORACLE

Patch your database like a hero

Cool features, internals, secrets and more

Photo by Ashim D'Silva on Unsplash

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DBAs
run the world

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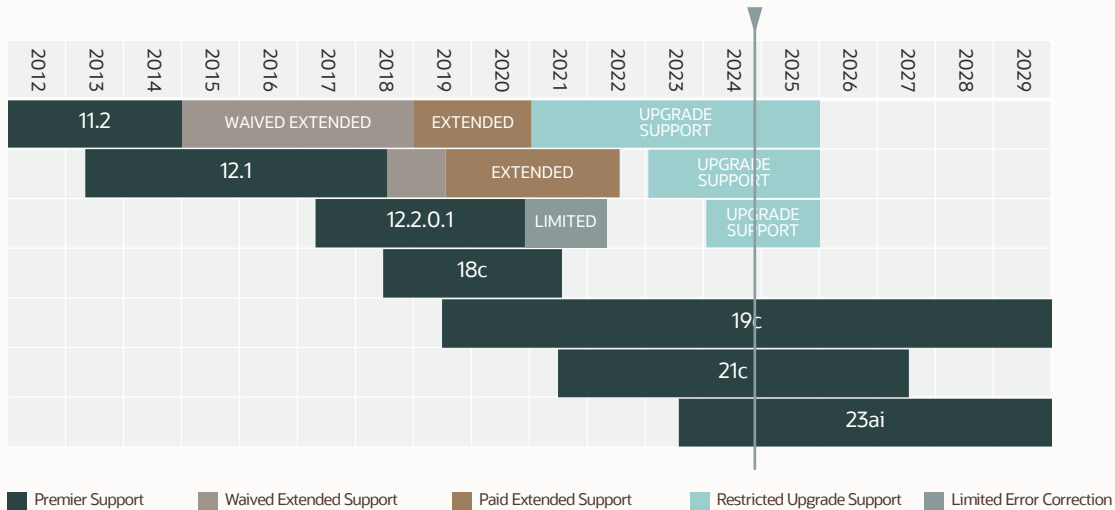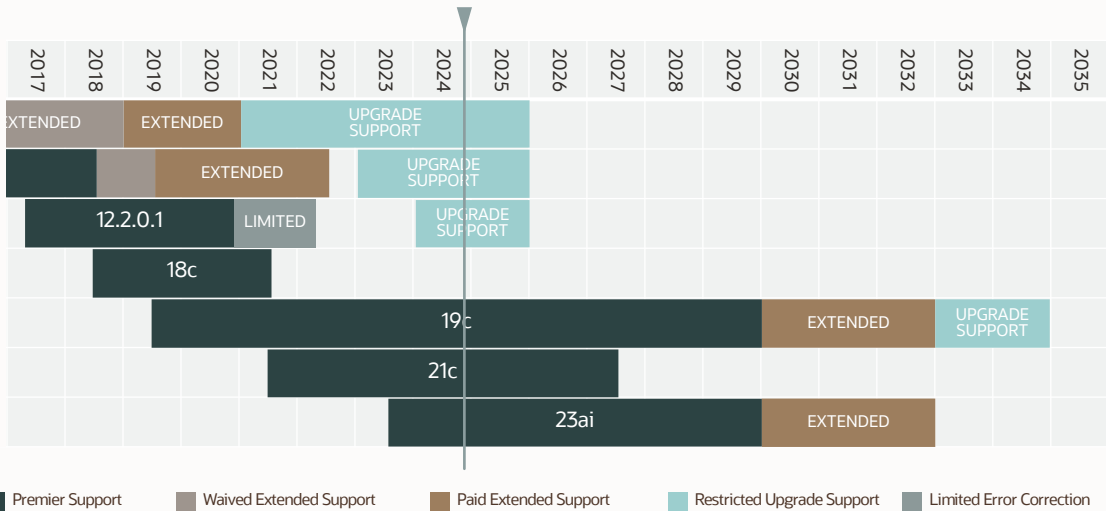Database Upgrade, Migrations & Patching

dohdatabase

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Lifetime Support Policy

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
11.2	Premier Support			Waived Extended			Paid Extended		Restricted Upgrade Support									
12.1		Premier Support					Waived Ext.	Paid Extended			Restricted Upgrade Support							
12.2.0.1				Premier Support				Limited			Restricted Upgrade Support							
18c						Premier Support												
19c								Premier Support										
21c									Premier Support									
23ai											Premier Support							

Legend:
- Premier Support
- Waived Extended Support
- Paid Extended Support
- Restricted Upgrade Support
- Limited Error Correction

Lifetime Support Policy

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
	EXTENDED	EXTENDED	EXTENDED		UPGRADE SUPPORT														
					EXTENDED			UPGRADE SUPPORT											
		12.2.0.1			LIMITED			UPGRADE SUPPORT											
		18c																	
		19c											EXTENDED			UPGRADE SUPPORT		
			21c																
				23ai							EXTENDED								

Legend:
- Premier Support
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Question

How often do you patch your Oracle environments?

- ☐ Every quarter
- ☐ Twice per year
- ☐ Once per year
- ☐ Never

Just as easy as patching your smart phone

AutoUpgrade's mission for patching Oracle Database

AutoUpgrade and Patching

1 Download

- Find the right patch numbers
- For the right platform
- Get latest OPatch

2 Install

- Install brand-new Oracle home
- Update OPatch
- Apply all patches

3 Patch

- Datapatch Sanity Check
- Move instances and files
- Datapatch
- Recompilation
- Post-tasks

```
$ cat just_patch.cfg

patch1.source_home=/u01/app/oracle/product/19/dbhome_19_24_0
patch1.target_home=/u01/app/oracle/product/19/dbhome_19_25_0
patch1.sid=DB19
```

AutoUpgrade and Patching

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- Apply all patches

3 Patch

- Datapatch Sanity Check
- Move instances and files
- Datapatch
- Recompilation
- Post-tasks

```
$ cat do_it_all.cfg

global.keystore=/home/oracle/autoupgrade-patching/keystore
patch1.source_home=/u01/app/oracle/product/19/dbhome_19_24_0
patch1.target_home=/u01/app/oracle/product/19/dbhome_19_25_0
patch1.sid=DB19
patch1.folder=/home/oracle/autoupgrade-patching/patch
patch1.patch=RU,OPATCH,OJVM,DPBP
```

```
$ cat do_it_all.cfg

global.keystore=/home/oracle/autoupgrade-patching/keystore
patch1.source_home=/u01/app/oracle/product/19/dbhome_19_24_0
patch1.target_home=/u01/app/oracle/product/19/dbhome_19_25_0
patch1.sid=DB19
patch1.folder=/home/oracle/autoupgrade-patching/patch
patch1.patch=RU,OPATCH,OJVM,DPBP

$ java -jar autoupgrade.jar -config do_it_all.cfg –patch -mode deploy
```

Demo

One-Button Patching

- Download patches
- Install Oracle home
- Patch database

Watch on

AutoUpgrade Patching

Download patches   Analyze   Fixups   Create home   Patch database   Postchecks

```
-mode deploy
```

AutoUpgrade Patching

Download patches   Analyze   Fixups   Create home   Patch database   Postchecks
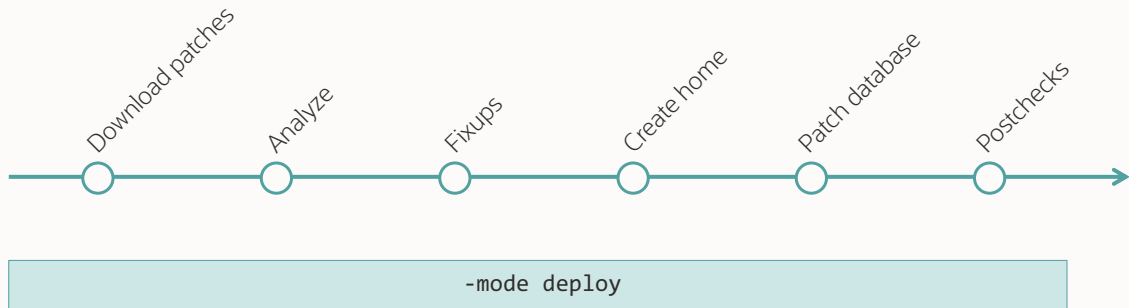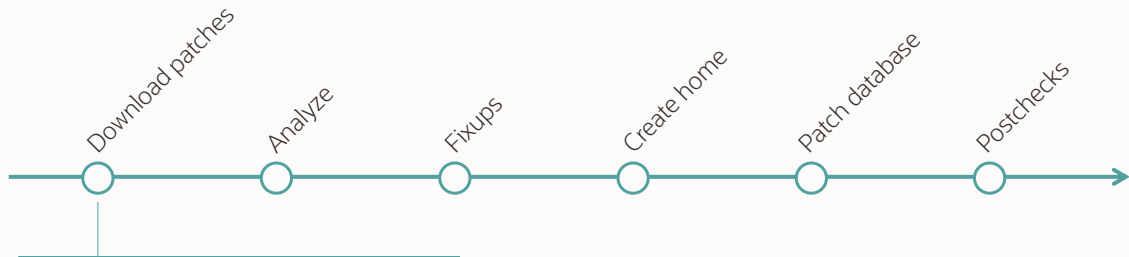
- Finds and downloads patches
- Uses your MOS credentials
- Chooses the right platform
- Stores patches in local repository

AutoUpgrade Patching

Download patches — Analyze — Fixups — Create home — Patch database — Postchecks
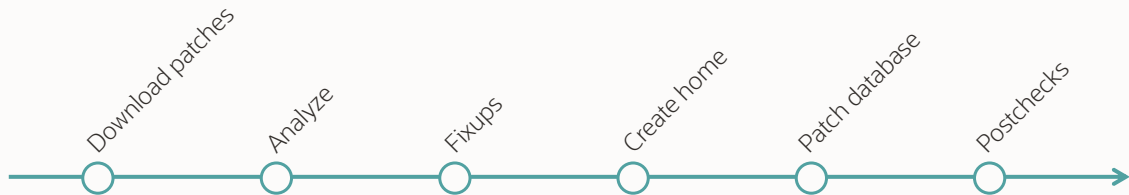
- Analyzes database for patch readiness
- Datapatch Sanity Checks
- Lightweight
- Non-intrusive
- Recommended, not required

AutoUpgrade Patching

Download patches — Analyze — Fixups — Create home — Patch database — Postchecks
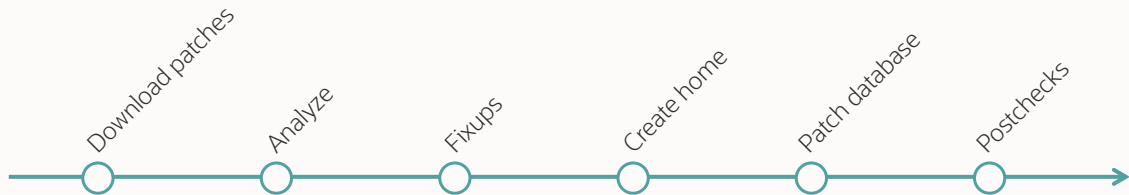
- Gathers dictionary statistics if needed
- Recompiles Oracle-maintained objects if needed
- Executes checks - see Doc ID 2380601.1

AutoUpgrade Patching

Download patches — Analyze — Fixups — Create home — Patch database — Postchecks
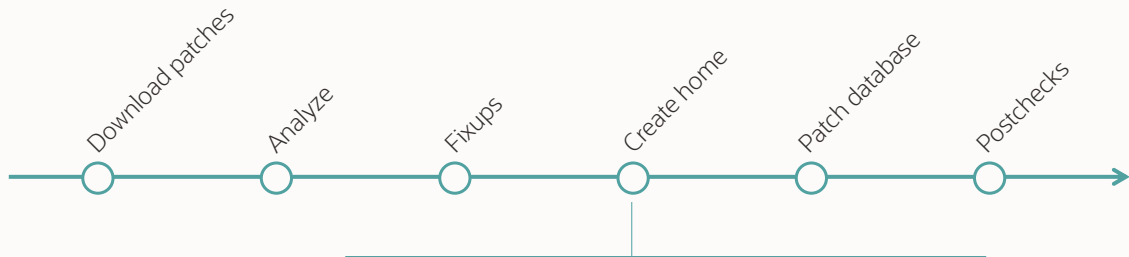
- Out-of-place patching
- Creates a brand-new Oracle home
- Uses *runInstaller settings* from source Oracle home
- Does not execute `root.sh`

```
--You only need to run root.sh if your database uses external procedures
--If the query returns no rows, you can skip root.sh

SELECT *
FROM   CDB_SCHEDULER_JOBS
WHERE  JOB_TYPE IN ('EXTERNAL_SCRIPT','EXECUTABLE','BACKUP_SCRIPT','SQL_SCRIPT');
```
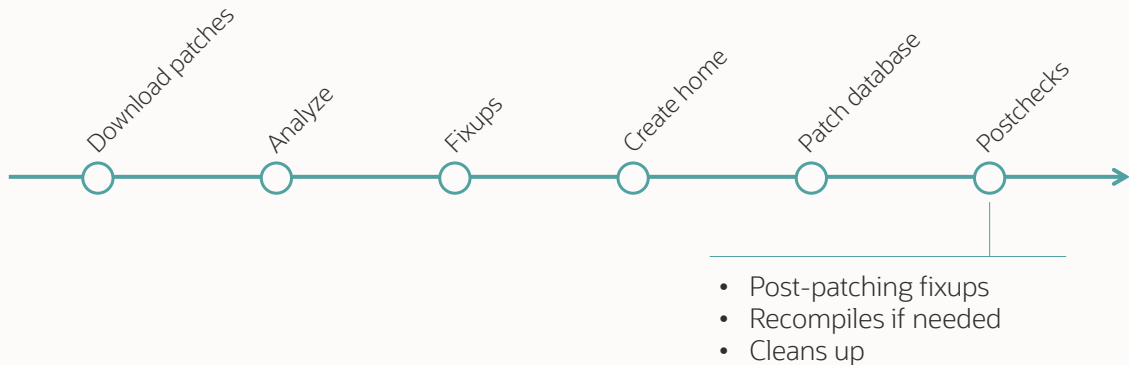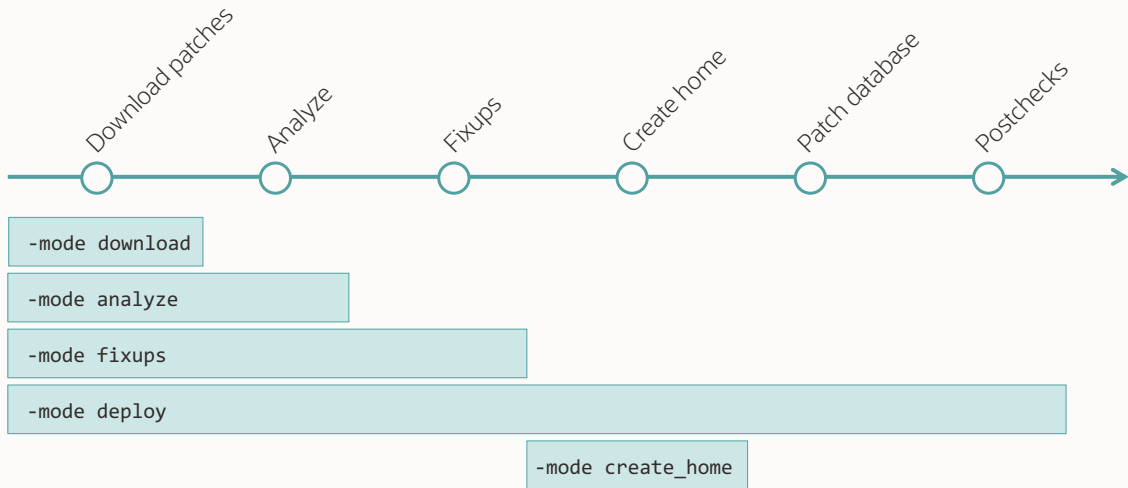
AutoUpgrade Patching
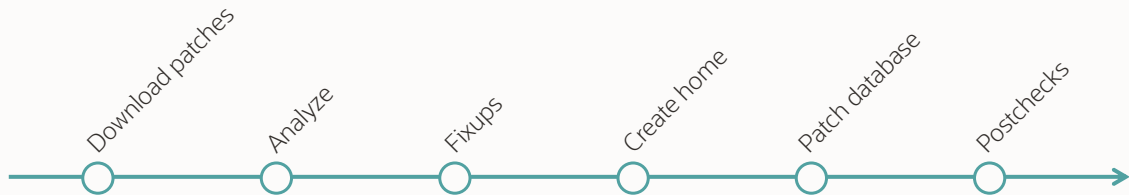
- Moves database instance to new Oracle home
- Moves configuration files
- Executes Datapatch
- Updates system directories (`utlfixdirs.sql`)
- Updates `/etc/oratab`
- Supports read-only Oracle home

AutoUpgrade Patching

Download patches   Analyze   Fixups   Create home   Patch database   Postchecks

- Post-patching fixups
- Recompiles if needed
- Cleans up

Patching Modes

Download patches — Analyze — Fixups — Create home — Patch database — Postchecks

```
-mode download
```

```
-mode analyze
```

```
-mode fixups
```

```
-mode deploy
```

```
-mode create_home
```

Requirements

Current Requirements

Single instance

Linux x64

Oracle Database 19c

Current Requirements

Single instance

Linux x64 / Windows

Oracle Database 19c

Always download
the latest version of AutoUpgrade

- My Oracle Support Doc ID 2485457.1

```
--Download the latest version of AutoUpgrade directly from oracle.com
--No authentication needed

wget https://download.oracle.com/otn-pub/otn_software/autoupgrade.jar
```

Patching

Which patches should you install?

```
global.keystore=/home/oracle/autoupgrade-patching/keystore
patch1.source_home=/u01/app/oracle/product/19/dbhome_19_24_0
patch1.target_home=/u01/app/oracle/product/19/dbhome_19_25_0
patch1.sid=DB19
patch1.folder=/home/oracle/autoupgrade-patching/patch
patch1.patch=RECOMMENDED
```

Recommended Patches

`patch1.patch=``RECOMMENDED`

OPATCH	The latest OPatch
RU	The latest Release Update
OJVM	OJVM bundle matching Release Update
DPBP	Data Pump bundle patch matching RU

You can also add specific one-off fixes

- Get patches from Oracle Database 19c Important Recommended One-off Patches (Doc ID 555.1)

NOTE: This document will be updated once a week on Tuesdays at 9AM EST if any new patch is identified.

Through our review of service requests, we often find that issues encountered are the result of customers being on an older Release Update (RU) or Release Update Revision (RUR). Many issues will have been fixed in the latest updates, which we always recommend.

As noted in the update-specific tables below, fixes for known issues are targeted for inclusion in the first available RU or RUR. You can always find the latest RUs, RURs, other patches, lists of fixed bugs and known issues in Primary Note for Database Proactive Patch Program(Doc ID 888.1). Identifying and installing the latest updates (patches) helps ensure you are using the most current content for security, functional, regression and bug fixes, as well as minor enhancements and any emergency one-offs.

Note:
Beginning with the October 2022 patching cycle, 19c RURs will no longer be provided for 19.17.0 and above. No additional RURs will be delivered on any platform after the delivery of Oracle Database 19c RUR 19.16.2 in January, 2023.
Refer to Sunsetting of 19c RURs and FAQ (Doc ID 2898381.1) for further details.
To provide customers more frequent access to recommended and well-tested collections of patches, Oracle is pleased to introduce Monthly Recommended Patches (MRPs) starting Nov 2022. MRPs are supported only on Linux x86-64 platform.
Refer to Introducing Monthly Recommended Patches (MRPs) and FAQ (Doc ID 2898740.1) for further details.

In addition to the relevant patches listed below, you should apply patches based on the specific RU after reviewing the following My Oracle Support knowledge documents:

1. Database PSU/BP/Update/Revision - Known Issues Primary Note(Doc ID 1227443.1)
2. Oracle Database Patches to Consider for 19c (Doc ID 2781612.2) which contains patches to consider for specific areas such as Data Pump, Golden gate etc.

NOTE: Bug 32781163 is no longer recommended and this note will be updated when a replacement becomes available in the future
NOTE: Bug 31061145 was previously listed in this note but the fix was included in 19.21 in a disabled state. To enable the fix see Note 31061145.8 for instructions.
NOTE: If you are an Applications Unlimited (for example, EBS) customer, you should follow any directions given in your product-specific documentation on applicability of Release Updates (RUs) and Release Update Revisions (RURs).

The information below lists any additional patches (both rolling and non-rolling) that are recommended for installation on top of each RU. Click the relevant link for details.

```
$ cat DB19.cfg

global.keystore=/home/oracle/autoupgrade-patching/keystore
patch1.source_home=/u01/app/oracle/product/19/dbhome_19_24_0
patch1.target_home=/u01/app/oracle/product/19/dbhome_19_25_0
patch1.sid=DB19
patch1.folder=/home/oracle/autoupgrade-patching/patch
patch1.patch=RECOMMENDED,36006910,36908826,35398148,36916250,
36273767,34672698,34774667,29213893
```

Download

How to download patches

Network Connectivity

The download stage requires:

1. Internet access

2. My Oracle Support credentials

Internet Access

AutoUpgrade connects to:

- `https://updates.oracle.com`
- `https://login-ext.identity.oraclecloud.com`
- `https://aru-akam.oracle.com`

URLs are part of a CDN, so expect changing IP addresses

- Use DNS names instead of IP addresses in your firewall

For connections via proxy use environment variables

- `https_proxy`

MOS Credentials

You must have:

- A valid My Oracle Support credential
- Connected to a Customer Support Identifier (CSI)
- Privilege to download patches using that CSI

Failure to meet the requirements:

- `*Connection Failed - You entered an incorrect user name or password.*`

MOS Credentials

For *download patches* privilege contact an MOS administrator in your organization.

- In *User Details*
- Select the appropriate *Support Identifier*
- Set the *Patches* drop-down to *Download*

Keystore

AutoUpgrade stores MOS credentials in a keystore

- Config file parameter: `global.keystore`

- Governs directory of AutoUpgrade keystore

- Password protected software keystore

- Optionally, an auto-open keystore

- No additional license needed

```
$ java -jar autoupgrade.jar ... -patch -load_password
```

```
$ java -jar autoupgrade.jar ... -patch -load_password

...

MOS> add -user <MOS username>
Enter your secret/Password:
Re-enter your secret/Password:
```
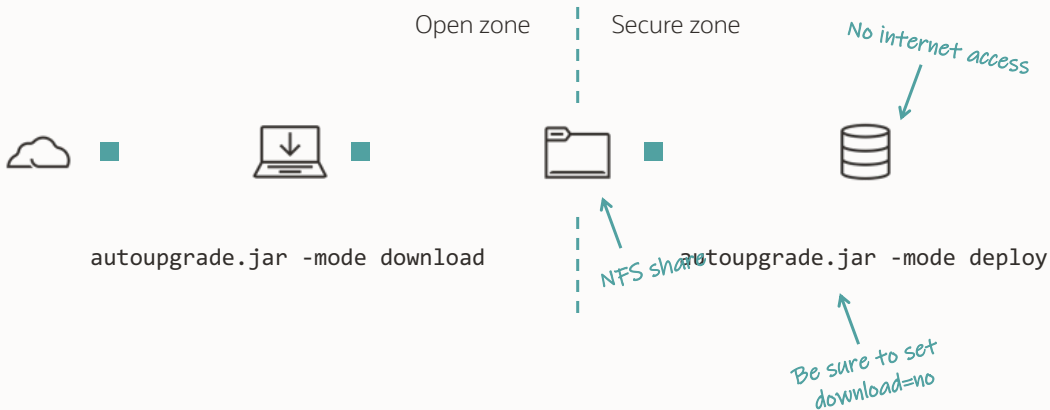
Your database host
doesn't have internet access?

Using Download Mode

Open zone | Secure zone

No internet access

autoupgrade.jar -mode download

NFS share

autoupgrade.jar -mode deploy

Be sure to set
download=no

You can download patches manually and place them in the *patch* folder

- Use a shared folder accessible to all hosts

In The Plans

We're working to support

- All platforms

- Oracle Database 23ai

- Monthly Recommended Patches (MRP)

- Cloning Oracle homes

Datapatch

What is Datapatch?

$ORACLE_HOME/OPatch/datapatch

⮡ $ORACLE_HOME/sqlpatch/sqlpatch

⮡ $ORACLE_HOME/sqlpatch/sqlpatch.pl

```
use strict;
use Getopt::Long;

use sqlpatch.pm
```

Datapatch uses OPatch to determine patches installed in Oracle home

- From the database via `DBMS_QOPATCH`

ORA-20001: Latest xml inventory is not loaded into table

```
--Avoid the use of Queryable Inventory by using OPatch directly
--Safe for single instance databases. In RAC, it's vital you ensure
--all nodes are patched and the inventories on each node is similar.

./datapatch -noqi


./datapatch -local_inventory
```

Patch Apply Sequence

`datapatch` $\Rightarrow$

1 📄 Java patches

2 📄 Bundle patches

3 📄 One-off patches

Patch Rollback and Apply Queue

Binary Registry after opatch:

Patch 444 – Java Patch
Patch 555 – Bundle Patch
Patch 666 – One-off Patch

SQL Registry before datapatch:

Patch 111 – Java Patch
Patch 222 – Bundle Patch
Patch 333 – One-off Patch

```
$ ./datapatch
```

datapatch queue

Rollback:

Apply:

Rollback:

Cumulative: | Patch 222 to 555 – Bundle Patch |

Apply:

Rollback Scripts

Apply/rollback scripts

```
$ORACLE_HOME/sqlpatch/.../nnn_apply.sql
$ORACLE_HOME/sqlpatch/.../nnn_rollback.sql
```

Rollback scripts (zipped as BLOB):

One-off patches:
```
SELECT  PATCH_DIRECTORY
FROM    REGISTRY$SQLPATCH
```

Release Updates:
```
SELECT  PATCH_DIRECTORY
FROM    REGISTRY$SQLPATCH_RU_INFO
```

```
 PATCH_ID  RU_VERSION       RU_BUILD_TS           LOB_SIZE_MB
----------- ---------------  --------------------  -----------
  29517242 19.3.0.0.0       04/10/2019 12:27:20             4
  30125133 19.5.0.0.0       09/09/2019 18:05:49            18
  30557433 19.6.0.0.0       12/17/2019 15:50:04            24
  30869156 19.7.0.0.0       04/04/2020 03:50:18            30
  31281355 19.8.0.0.0       07/03/2020 03:15:01            37
  31771877 19.9.0.0.0       09/30/2020 18:32:49            43
  32218454 19.10.0.0.0      01/08/2021 18:50:17            51
  32545013 19.11.0.0.0      04/13/2021 00:40:09            59
  32904851 19.12.0.0.0      07/16/2021 14:18:10            67
  33192793 19.13.0.0.0      10/04/2021 16:50:50            75
  33515361 19.14.0.0.0      12/25/2021 12:21:23            83
  34133642 19.16.0.0.0      07/03/2022 02:22:23            99
  34419443 19.17.0.0.0      09/24/2022 22:40:51           108
  34765931 19.18.0.0.0      01/11/2023 17:17:38           116
  35643107 19.21.0.0.0      09/30/2023 15:19:51           141

15 rows selected.
```

```
CON_ID LOB_SIZE_MB
------ -----------
     1         953
     2         953
     3         953

   ...         ...

  4098         953
```
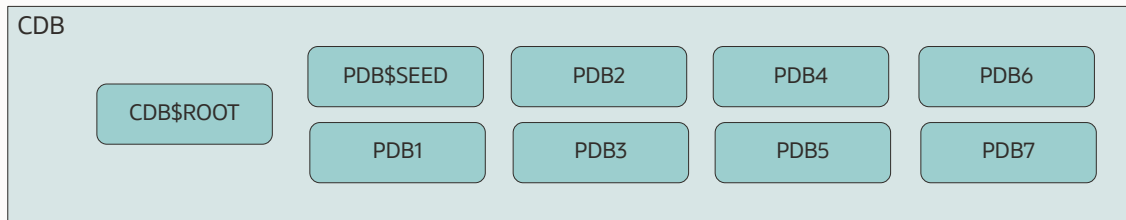
Cleanup

Bug 34674756
PURGE OLD PATCH METADATA ZIP BLOB FROM DATAPATCH INVENTORY, IF NOT NEEDED

- Apply one-off patch or use 19.26.0 or newer
- Run `./datapatch`
- This will execute the cleanup

- Be aware that the cleanup may take a bit in large CDB environments which have been patched frequently

Multitenant

CDB

	PDB$SEED	PDB2	PDB4	PDB6
CDB$ROOT	PDB1	PDB3	PDB5	PDB7

- Datapatch starts with CDB$ROOT

- Datapatch sorts PDBs by *priority* and *con_id*
  - Set priority using `ALTER PLUGGABLE DATABASE ... PRIORITY`

- Datapatch determines parallel degree based on `CPU_COUNT`

Datapatch patches *PDB$SEED* automatically

- New PDBs are ready to go
- No need to execute Datapatch on new PDBs

Datapatch only patches open PDBs

- `READ WRITE`, `READ ONLY`, or `UPGRADE`

Unpatched PDBs will open
in `RESTRICTED` mode

- Applies to failed or incomplete Datapatch runs
- Reported as plug-in violation

```
--Prevent PDBs from opening in restricted mode after a failed/incomplete
--Datapatch run. Quickly resolve the patching issue and re-run Datapatch.
--Use with caution.

alter system set "_pdb_datapatch_violation_restricted"=false;
```

Grid Infrastructure Patching

If you don't apply a recent Release Update, you will miss hundreds of fixes

Most Recent Release Update

Use the Patch Download Assistant <u>MOS Note: 2118136.2</u>

⭐ Assistant: Download Reference for Oracle Database/GI Update, Revision, PSU, SPU(CPU), Bundle Patches, Patchsets and Base Releases (Doc ID 2118136.2)   ⊙ To Bottom

Visibility: EXTERNAL   (98)

Selection(s)

What would you like to download?

○ Oracle Database Base Releases
○ Oracle Database Patchsets
◉ **Oracle Database Release Updates (RUs)**
○ Oracle Database Release Update Revisions (RURs - discontinued since Apr 2023)
○ Oracle Database PSU, SPU(CPU), Bundle Patches (Versions 12.1 & lower)
○ OJVM Update/PSU/Bundle Patches
○ Latest Available Microsoft Windows Patches
○ Monthly Recommended Patches (MRPs)

Solution(s)

Possible Solutions will appear once you make your selection.

Most Important Patches

Oracle Database 19c Important Recommended One-off Patches (Doc ID 555.1)

Recommended Patches for 19.21 GI Home

Below is the list of important patches to consider applying on top of 19.21. In addition to the relevant patches listed below, you should also review patches in Database PSU/BP/Update/Revision - Known Issues Primary Note(Doc ID 1227443.1) and Oracle Database Patches to Consider for 19c (Doc ID 2781612.2) which contains patches to consider for specific areas such as Data Pump, Golden gate etc.
Only one OCW (Oracle Clusterware) patch should be applied to GI homes. Ensure you apply the patch starting with X8M if you are on an X8M system

Bug	Fixed in RU	Fixed in MRP	Description	Patches	NON ROLLING	Added
35739076		Not Applicable	[VOS] Linux: ORA-800 / Set Priority / DB Performance Merge Patch for 19.21 (Requires Root Access) - 34286265 34318125	[list-patches]		20-OCT-2023

Version GI 19.21_555.1: 35739076

Keep GI and DB patch levels in synch

- This is what we test and run in our Cloud

⚠️

Unusual combinations are supported, but we strongly advice against it

- GI 19.21.0 and DB 19.25.0
- Node 1 with GI 19.25.0, node 2 with GI 19.23.0
- Patching node 1 on Monday, node 2 on Tuesday …
- Mix of GI and DB versions on various nodes

```
$ cluvfy stage -pre patch

Performing following verification checks ...

   cluster upgrade state ...PASSED
   OLR Integrity ...PASSED
   Hosts File ...PASSED

   ...

   Check for parameter kernel.shmmni ...PASSED
   /tmp directory free space ...PASSED
   Check for parameter kernel.shmall ...PASSED
   ORAchk checks ...PASSED

Pre-check for Patch Application was successful.
```

Grid Infrastructure Patching Methods

1 In-place
Replaces existing Oracle Home
Uses `opatchauto`

2 Out-of-place
Creates a new Oracle Home
Uses `opatchauto` or `SwitchGridHome`

Use Out-Of-Place Patching

- Minimize downtime
- Minimize risk during outage
- Easier rollback

Grid Infrastructure Patching Methods

1 In-place
Replaces existing Oracle Home
Uses `opatchauto`

2 Out-of-place
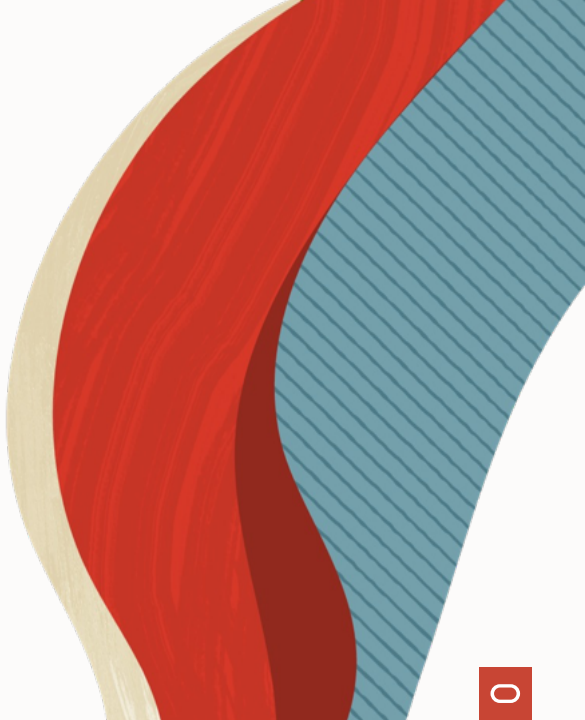Creates a new Oracle Home
Uses `opatchauto` or `SwitchGridHome`

Works for Oracle Restart

- Slightly different method

Demo

Patch an Oracle Restart system
GI and database

Watch on YouTube

23ai GI home disk space greatly reduced to 3 GB

- 12 GB in 19c

Together or separately

... that's the question

Patching Oracle Grid Infrastructure and Oracle Database

Patching GI and DB together?

Option 1
TOGETHER

One maintenance window

Longer, single patching window

Several changes

When draining is a problem

Option 2
SEPARATELY

Two maintenance windows

Shorter window, but longer overall patching

One change at a time

For well-behaving applications

👍 Always patch Out-of-Place

- Don't argue with us ☺

Thank You