Oracle Database
Release and Patching Strategy

Feb, 2024




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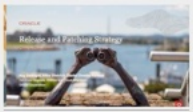
Episode 1

Release and Patching Strategy

105 minutes – Feb 4, 2021



Episode 2

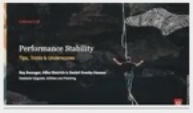
AutoUpgrade to Oracle Database 19c

115 minutes – Feb 20, 2021

Episode 3

Performance Stability, Tips and Tricks and Underscores

120 minutes – Mar 4, 2021



Episode 4

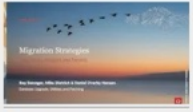
Migration to Oracle Multitenant

120 minutes – Mar 16. 2021

Episode 5

Migration Strategies – Insights, Tips and Secrets

120 minutes – Mar 25, 2021



Episode 6

Move to the Cloud – Not only for techies

115 minutes – Apr 8, 2021

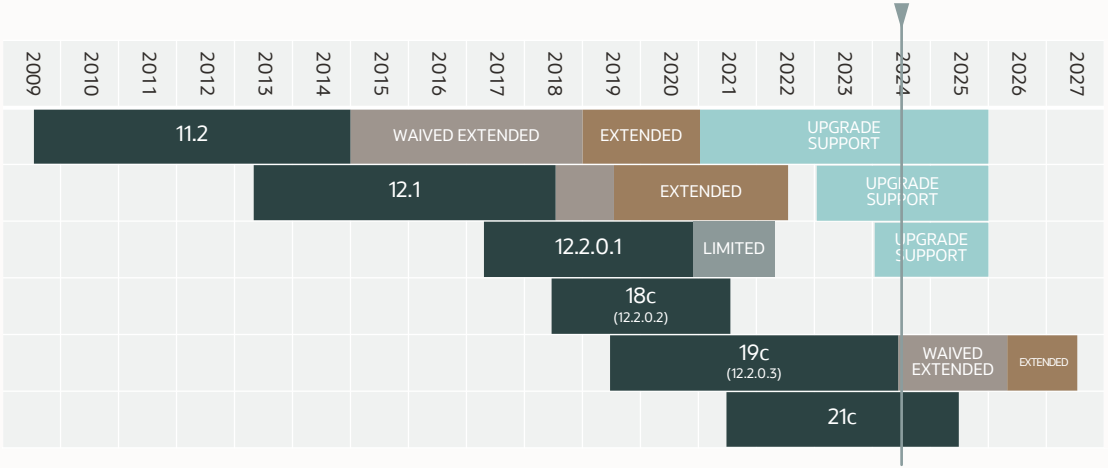
Recorded Web Seminars

https://MikeDietrichDE.com/videos

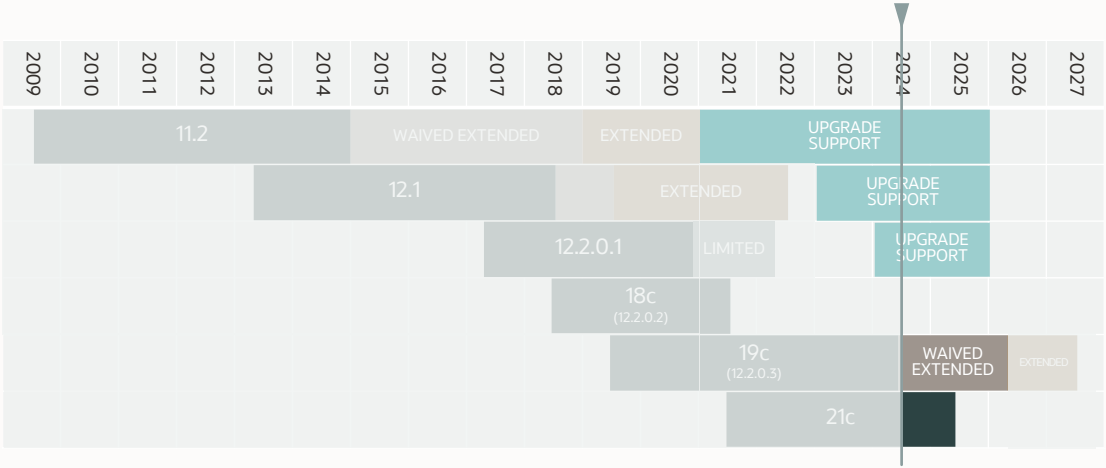
More than 35 hours of technical content, on-demand, anytime, anywhere

Release Strategy

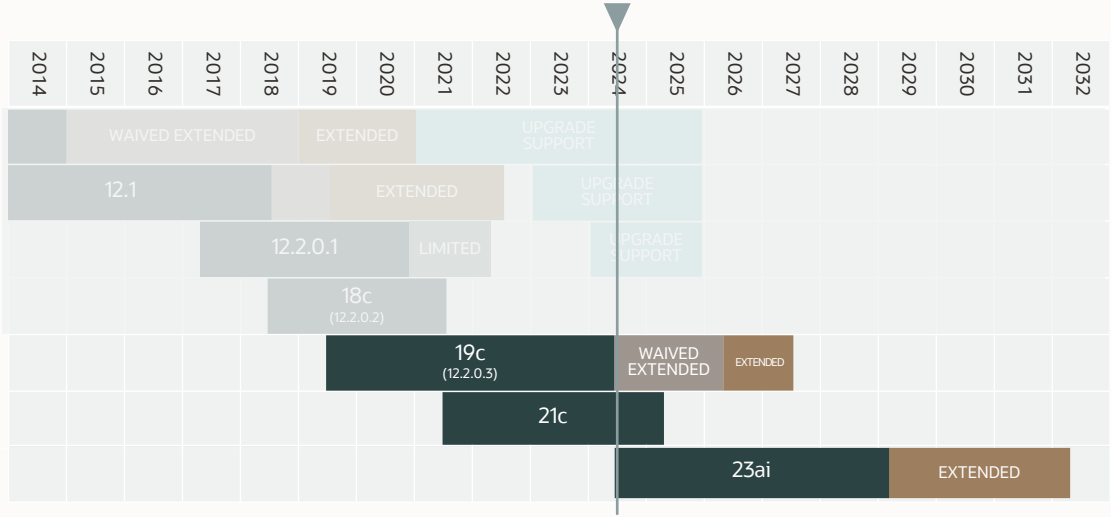
Lifetime Support Policy



Lifetime Support Policy



Lifetime Support Policy



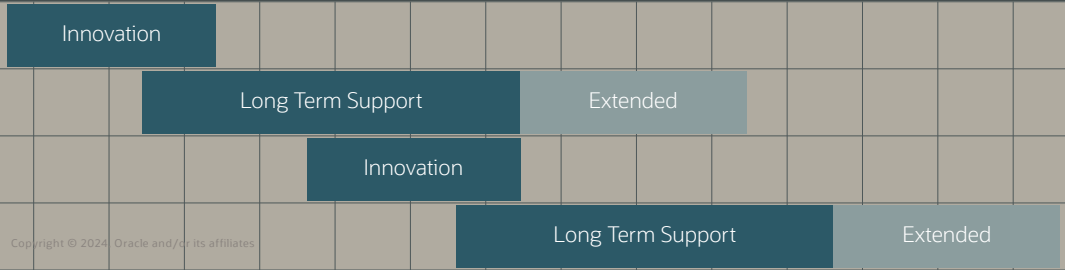
Release Types

LONG TERM SUPPORT

5+ years of Premier Support followed by
3+ years of Extended Support

INNOVATION

2 years of Premier Support
No Extended Support



Move production databases from one Long Term Support release to the next

- Release Schedule of Current Database Releases (Doc ID 742060.1)

Next Long Term Support release

Oracle Database 23ai

Upgrade possible only from:

- Oracle Database 19c
- Oracle Database 21c

Do you want to upgrade?

Oracle Database 11.2.0.4
Oracle Database 12.1.0.2
Oracle Database 12.2.0.1
Oracle Database 18c

Oracle Database 11.2.0.4
Oracle Database 12.1.0.2
Oracle Database 12.2.0.1
Oracle Database 18c

Oracle Database 19c

Oracle Database 23ai

Oracle Database 23ai supports the multitenant architecture only

- You must convert your database to a PDB

```
--Use up to 3 user-created PDBs
--without a license for Multitenant option.
--Applies to Oracle Database 19c and newer, including SE2

alter system set max_pdbs=3;
```


Have at least a few environments in Oracle Database 19c using Oracle Multitenant

Quaterly Patching

My database is not facing the internet

Photo by Ben White on Unsplash

Photo by Clint Patterson on Unsplash

Finding the Right Patches | Quarterly

https://www.oracle.com/security-alerts/

Do I need to apply this bundle?

How to evaluate the risk

Photo by Kuba Winar on Unsplash

Critical Patch Alert July 2022 | Risk Matrix

CVE#	Component	Package and/or Privilege Required	Protocol	Remote Exploit without Auth.?	CVSS VERSION 3.1 RISK (see Risk Matrix Definitions)								Supported Versions Affected	Notes
					Base Score	Attack Vector	Attack Complex	Privs Req'd	User Interact	Scope	Confid-entiality	Inte-grity	Avail-ability	
CVE-2020-35169	Oracle Database - Enterprise Edition	None	TCPS	Yes	9.1	Network	Low	None	None	Un-changed	High	High	None	12.1.0.2, 19c, 21c	
CVE-2022-21510	Oracle Database - Enterprise Edition Sharding	Local Logon	None	No	8.8		Low	Low	None	Changed	High	High	High	None	See Note 1
CVE-2022-21511	Oracle Database - Enterprise Edition Recovery	EXECUTE ON DBMS_IR.EXECUTESQLSCRIPT	Oracle Net	No	7.2	Network	Low	High	None	Un-changed	High	High	High	None	See Note 1
CVE-2022-21565	Java VM	Create Procedure	Oracle Net	No	6.5	Network	Low	Low	None	Un-changed	None	High	None	12.1.0.2, 19c, 21c	
CVE-2022-24729	Oracle Application Express (CKEditor)	User Account	HTTP	No	5.7	Network	Low	Low	Required	Un-changed	None	None	High	Prior to 22.1.1	
CVE-2021-41184	Oracle Application Express (jQueryUI)	User Account	HTTP	No	5.4	Network	Low	Low	Required	Changed	Low	Low	None	Prior to 22.1.1	
CVE-2022-0839	Oracle SQLcl (Liquibase)	Local Logon	None	No	5.0	Local	Low	Low	Required	Un-changed	High	None	None	19c	
CVE-2021-45943	Oracle Spatial and Graph (GDAL)	Create Session	Oracle Net	No	4.3	Network	Low	Low	None	Un-changed	None	None	Low	19c, 21c	
CVE-2022-21432	Oracle Database - Enterprise Edition RDBMS Security	DBA role	Oracle Net	No	2.7	Network	Low	High	None	Un-changed	None	None	Low	12.1.0.2, 19c, 21c	

Your path to successful database upgrades / migrations

1

- Install Oracle Home including RU and MRP

- MOS Note: 2118136.2
- MOS Note: 555.1
- MOS Note: 2781612.2

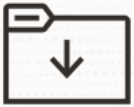
2

- Download and deploy the most recent AutoUpgrade

- MOS Note: 2485457.1

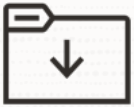
3

- Collect performance information from current source and test thoroughly



Until Oracle Database 19c, you always start with the base release

- Oracle Database 19.3.0

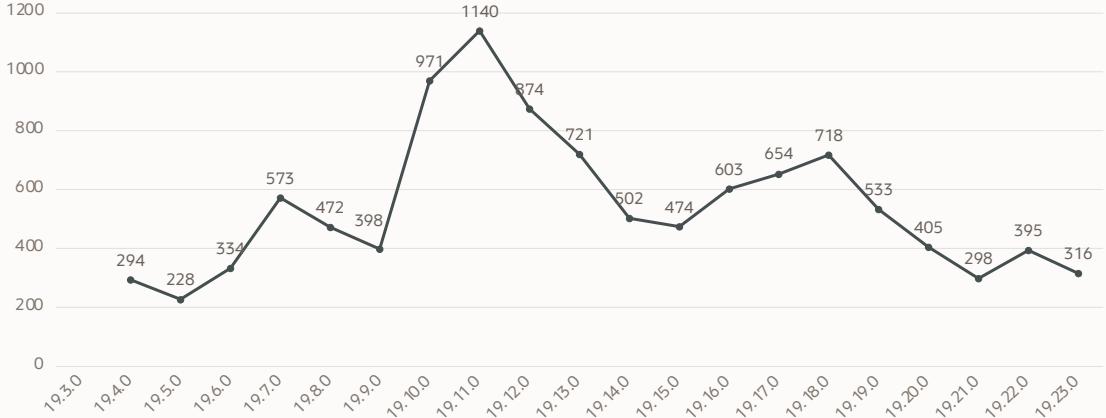


From Oracle Database 23ai onwards,
you will download a Gold Image containing
the most recent Release Update already

Always apply the most recent RU

Use the Patch Download Assistant MOS Note: 2118136.2

Release Update Contents



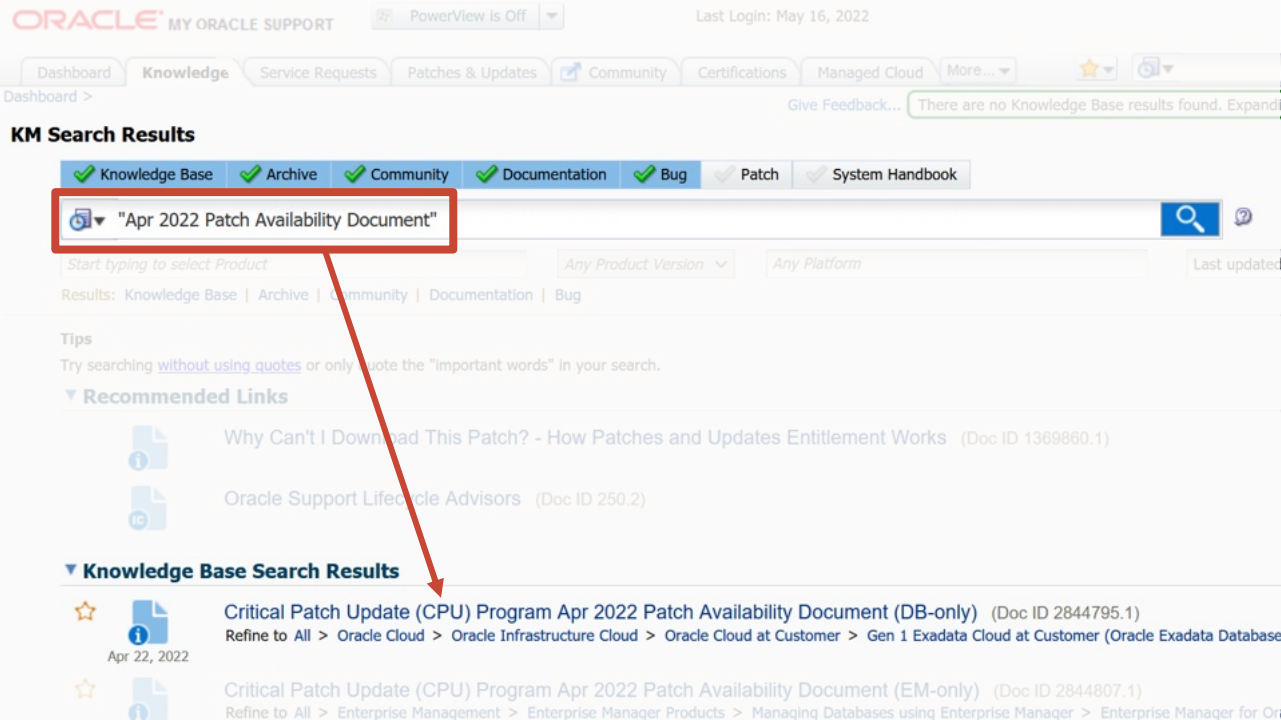
Database 19 Release Updates and Revisions Bugs Fixed Lists (Doc ID 2523220.1)

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

- Almost 11k fixes with 19.23.0
- Almost 300 security fixes

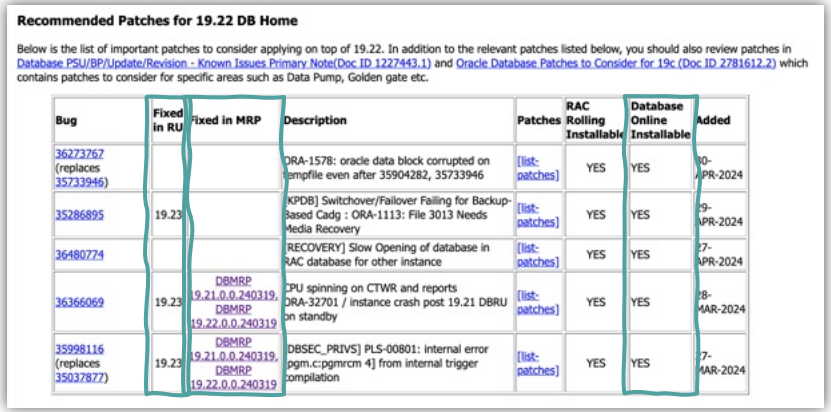
Release Updates might be delayed

- Each quarter a Patch Availability Document is released with information on delayed patches
- Search for *Jul 2023 Patch Availability Document*


ORACLE MY ORACLE SUPPORT
PowerView is Off
Last Login: May 16, 2022
Dashboard
Knowledge
Service Requests
Patches & Updates
Community
Certifications
Managed Cloud
More...
Dashboard >
Give Feedback...
There are no Knowledge Base results found. Expandi
KM Search Results
Knowledge Base
Archive
Community
Documentation
Bug
Patch
System Handbook
"Apr 2022 Patch Availability Document"
Start typing to select Product
Any Product Version
Any Platform
Last updated
Results: Knowledge Base | Archive | Community | Documentation | Bug
Tips
Try searching without using quotes or only quote the "important words" in your search.
Recommended Links
Why Can't I Download This Patch? - How Patches and Updates Entitlement Works (Doc ID 1369860.1)
Oracle Support Lifecycle Advisors (Doc ID 250.2)
Knowledge Base Search Results
Critical Patch Update (CPU) Program Apr 2022 Patch Availability Document (DB-only) (Doc ID 2844795.1)
Refine to All > Oracle Cloud > Oracle Infrastructure Cloud > Oracle Cloud at Customer > Gen 1 Exadata Cloud at Customer (Oracle Exadata Database
Apr 22, 2022
Critical Patch Update (CPU) Program Apr 2022 Patch Availability Document (EM-only) (Doc ID 2844807.1)
Refine to All > Enterprise Management > Enterprise Manager Products > Managing Databases using Enterprise Manager > Enterprise Manager for Ora

Apply the Most Important Patches

Always use Important Recommended One-Off Patches: MOS Note: 555.1



Recommended Patches for 19.22 DB Home

Below is the list of important patches to consider applying on top of 19.22. 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.

Bug	Fixed in RU	Fixed in MRP	Description	Patches	RAC Rolling Installable	Database Online Installable	Added
36273767 (replaces 35733946)			ORA-1578: oracle data block corrupted on tempfile even after 35904282, 35733946	[list-patches]	YES	YES	30-APR-2024
35286895	19.23		[KPDB] Switchover/Failover Failing for Backup-Based Cadg : ORA-1113: File 3013 Needs Media Recovery	[list-patches]	YES	YES	29-APR-2024
36480774			[RECOVERY] Slow Opening of database in RAC database for other instance	[list-patches]	YES	YES	27-APR-2024
36366069	19.23	DBMRP 19.21.0.0.240319, DBMRP 19.22.0.0.240319	CPU spinning on CTWR and reports ORA-32701 / instance crash post 19.21 DBRU on standby	[list-patches]	YES	YES	28-MAR-2024
35998116 (replaces 35037877)	19.23	DBMRP 19.21.0.0.240319, DBMRP 19.22.0.0.240319	[DBSEC_PRIVS] PLS-00801: internal error [pgm.c:pgmrcm 4] from internal trigger compilation	[list-patches]	YES	YES	27-MAR-2024

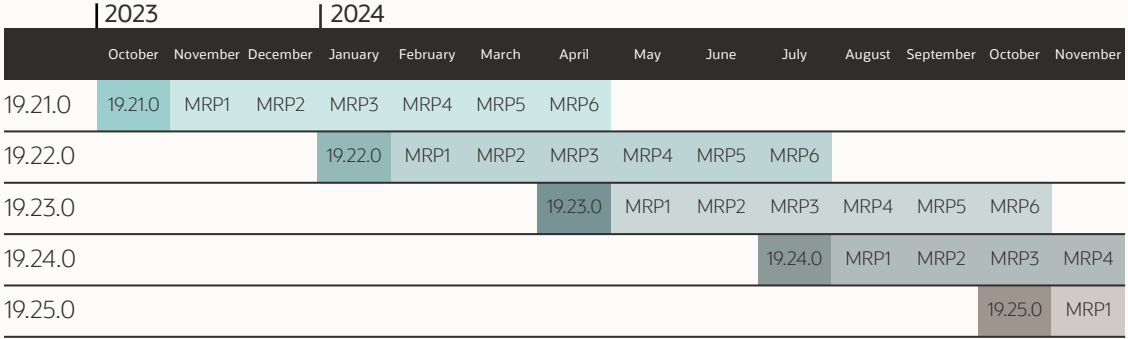
Monthly Recommended Patches

A collection of recommended one-off fixes
provided at monthly intervals
via a single downloadable patch

Quarterly Release Updates

	2023				2024				2025				2026		
	January	April	July	October	January	April	July	October	January	April	July	October	January	April	July
19c	19.18.0	19.19.0	19.20.0	19.21.0	19.22.0	19.23.0	19.24.0	19.25.0	19.26.0	19.27.0	19.28.0	19.29.0	19.30.0	19.31.0	19.232.0
21c	21.10.0	21.11.0	21.12.0	21.13.0	21.14.0	21.15.0	21.16.0	21.17.0	21.18.0	21.19.0					
23ai							23.5.0	23.6.0	23.7.0	23.8.0	23.9.0	23.10.0	23.11.0	23.12.0	23.13.0

Monthly Recommended Patches



MRP Facts | Contents

Monthly Recommended Patches get sourced mostly from MOS Note 555.1

Recommended Patches for 19.22 DB Home

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An MRP is an optional collection of several important one-off patches

- Delivered as a merge patch

An MRP does not change the release number

- Like `v$instance.version_full`

MRPs are cumulative but only within one MRP line

- Example: 19.21.0 MRP6 contains all previous MRPs done for Oracle 19.21.0

MRPs are Linux only

MRPs can contain security fixes

- Release Updates remain the primary security fix delivery mechanism

In OCI, include MRPs
by creating a *Database Software Image*

But there is more to talk about …

Apply Additional Important Fixes and Bundles

Oracle Database Patches to Consider for 19c (Doc ID 2781612.2)

To Bottom

Visibility: EXTERNAL

(7)

Getting Started | Performance | GoldenGate | Oracle Text | Platform Specific | HA | DNFS | Data Pump | Partitioning | Multitenant | General | Oracle Spatial

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When applying Database patches, Oracle recommends that you take a 3-tiered step-by-step approach.

LEVEL 1: Apply latest quarterly patches:

- Apply latest quarterly updates using Master Note for Database Proactive Patch Program (Doc ID 888.1)

LEVEL 2: Apply Critical/Recommended patches:

-
  - For Exadata environments: Exadata Critical Issues (Doc ID 1270094.1)
  - For Database environments:
    - Customers on Linux x86-64 - Apply the latest Monthly Recommended Patches - MRP(Doc ID 2898740.1) for the specific RU
    - For customers on other platforms, apply critical patches using Oracle Database 19c Important Recommended One-off Patches (Doc ID 555.1)

LEVEL 3: Apply additional patches based on features or focus areas:

- Use the tabs in this document for quick access to additional feature based patches

… and a few more for Exadata

- Exadata Database Machine and Exadata Storage Server Supported Versions (Doc ID 888828.1)

Release Updates contain PERL patches

- As of Oracle 19.18.0

Release Updates contain patches for JDK in Oracle Home

- JDK patches are from *last* quarter
- If required, find up-to-date patches in JDK and PERL Patches for Oracle Database Home and Grid Home (Doc ID 2584628.1)

Release Updates contain time zone patches

- Be aware when you create a new database
- Time zone file is not upgraded

Release Updates contain optimizer fixes - but they are off by default

- Enable using `DBMS_OPTIM_BUNDLE`
- Check MOS Doc ID 2147007.1

Apply the Data Pump Bundle Patch

- Data Pump Recommended Proactive Patches For 19.10 and Above (Doc ID 2819284.1)

Data Pump Bundle Patch

Fewer Bugs

Includes important patches.

Monitor for bugs that affect many customers.

Faster Patching

The bundle patch changes the way Data Pump is patched. Subsequent patches apply faster.

186 fixes

Data Pump Bundle Patch for 19.23.0

MOS Note: 2819284.1

Bug	Description
Bug 28318139	ORA-31003 ERROR WHEN IMPORTING FULL DATABASE IN PARALLEL
Bug 28357349	SCHEMA LEVEL EXPORT/IMPORT CHANGES VIRTUAL COLUMN DEFINITION
Bug 28555193	DBMS_METADATA.GET_DDL CAPTURE INCORRECT STORAGE OPTIONS OF THE XML COLUMN ON GTT
Bug 28771564	DATAPUMP EXPORT INVOKED BY A PRIVILEGE USER EXECUTES A QUERY FOR V$OPEN_CURSOR
Bug 28990738	12.2 DBMS_METADATA.GET_DDL IS SLOW DUE TO SLOW ACCESS ON DICTIONARY VIEWS
Bug 29276889	ATP-D: DATA PUMP IMPORT FROM ATP-D INSTANCE TO A LOCAL DB INSTANCE FAILS
Bug 29543605	18.4 ADWC - ORA-39242: UNABLE TO EXPORT/IMPORT "LONG RAW" DATA TYPE
Bug 29613245	ORA-31684 ORA-39112 WITH FIX 28539085 AND VERSION=11.2
Bug 29959025	EXPDP RUNNING LONG TIME QUERYING KU$_SUBPARTITION_EST_VIEW WHEN PROCESSING TABLE_DATA
Bug 30155338	POSSIBLE DEADLOCK/TIMEOUT ERRORS DURING PARALLEL IMPORT WITH TABLE_EXISTS_ACTION=REPLACE
Bug 30157766	ORA-21560 DBMS_METADATA.FETCH_DDL IN 19C NOT IN 12.2
Bug 30430932	DBMS_METADATA NOT DISPLAYING THE SEMICOLON AND SLASH FOR TYPE SPECIFICATIONS
Bug 30582819	REMAP TABLESPACE IS NOT CONSIDERED FOR LOCAL TEMPORARY TABLESPACE DURING IMPDP
Bug 30662417	IMPDP WORKER TERMINATED WITH ORA-39029 AFTER MULTIPLE ORA-01775
Bug 30763851	IMPDP 11.2 TO 18C OR HIGHER HITS ORA-904 WHEN TABLES HAVE EXTENDED STATISTICS
Bug 30822078	IMPDP VERY SLOW DUE TO PROCESS REORDERING
Bug 30858671	18C DBMS_METADATA.GET_DDL FAILED WITH ORA-16000 IN READ ONLY MODE
Bug 30928455	DATA PUMP EXPORT | HITTING ORA-31637 WHILE RUNNING DATA PUMP-DPLOAD CONCURRENCY TEST IN SAME PDB
Bug 30944402	SELECT FROM MASTER TABLE RUNS SLOW DURING TABLE_DATA EXPORT WHEN THERE ARE MANY SUBPARTITIONS
Bug 30978304	ORA-20000 DURING IMPDP WITH STATS AND THE UNIQUE INDEX FOR THE PK IS NOT CREATED
Bug 31050896	PARALLEL DATAPUMP SLOW ON CONSTRAINTS
Bug 31174337	DBMS_METADATA.GET_DDL GENERATES NO KEYWORDS FOR NOT COMPRESSED INDEXES
Bug 31191614	TTS EXPDP QUERIES V$ENCRYPTED_TABLESPACES FOR EVERY TBS SLOWING DOWN PERFORMANCE
Bug 31200854	ADB-D: IMPORT PERFORMANCE OF PACKAGE_BODY
Bug 31393386	SPIN-OFF OF BUG# 31317961 FOR PARTIAL BACKOUT OF BUG# 27403988 FROM MAIN LABEL
Bug 31402031	DBMS_METADATA_UTIL THROWS AN INVALID CURSOR EXCEPTION.
Bug 31412130	ADBD:: COMPLETE FIX FOR 29543605 WHICH INCLUDES ALL THE MISSING FILES
Bug 31424070	APPSST19C: XTTS PDB - TABLE IMPORT/CREATION FAILED WITH ORA-39083 ORA-14334
Bug 31711479	ADB-S: ORA39126 AND ORA01031 WHILE IMPORT USING FA FULL DUMP INTO ADB-S
Bug 31725941	TOTAL ESTIMATION USING BLOCKS METHOD IS MISSING STARTING WITH 12.2
Bug 31830685	ZDM : IMPORT ADW-S DB LINK MIGRATION THROWS INTERNAL ERROR
Bug 32096059	IMPDP TO 19C USING EXPORT DUMP OF 11.2.0.4 HANGS WITH ENQ: TM - CONTENTION
Bug 32370367	EXPDP IN 19.7 THREE TIMES SLOWER THAN IT WAS IN 11.2.0.4
Bug 32452792	DBMS_METADATA.GET_DDL GETS WRONG OUTPUT FROM 12.2.0.1. TESTED TILL 19.3.0.0
Bug 32512780	PRODDBJ PLSQL SCRIPTS ARE NOT EXCLUDED ON IMPORT WITH EXCLUDE=TAG
Bug 32647307	ADB-D:: PACKAGE BODIES IMPORT SLOWER AFTER AUTONOMOUS REFRESH TO 19.10DBRU
Bug 32731035	ATPD MIGRATION:ORA-04021: TIMEOUT OCCURRED WHILE WAITING TO LOCK OBJECT
Bug 33163877	ATPD MIGRATION:IMPDP HITS TABLE OR VIEW DOES NOT EXIST ON SOME DATAPUMP RELATED TABLES
Bug 33204663	TCH19C :: ORA-39139: DATA PUMP DOES NOT SUPPORT XMLTYPE OBJECTS WHEN DOING XTTS WITH BINARY XML STORAGE
Bug 33297599	UNUSED XMLTYPE/CLOB COLUMNS CAUSE IMPORT FAILURE
Bug 33346378	REWRITE DATA PUMP PATCH LOCKING TEST: TKDPATCHRAC.TSC
Bug 33448450	TCH19C :: ORA-01647: TABLESPACE 'APPS_TS_TX_DATA' IS READ-ONLY, CANNOT ALLOCATE SPACE
Bug 33470563	METADATA API FAILS TO RECOGNIZE TAB CHARACTER AS DELIMITER WHEN PARSING SOURCE LINES OF TYPE OBJECT
Bug 33498804	DATAPUMP IMPORT IGNORES EXCLUDE AND INCLUDE VALUES FOR TAGS FOR IMPORT CALLOUTS
Bug 33660169	CONSOLIDATED BUG FOR DATA PUMP AQ FIXES 31338354, 31844376, 31868443 FOR 19.10 AND LATER
Bug 33720650	TCH19C :: OCI-21500: INTERNAL ERROR CODE [QMCKDGETQNAMEINFO2], [14003] IN XMLTYPE CLOUMN TYPE
Bug 33735435	TRACKING BUG FOR COMBO OF 32759991 32878145 32919937 32984678 (REPLACEMENT FOR MINI MLR 33407604)
Bug 34052641	END_PLUGTS_BLK OBJECT TYPE MISSING FROM FULL TTS EXPORT WHEN INCLUDE SPECIFIED
Bug 34525626	TRACKING BUG TO MERGE 33599275 AND 33498804 SO CAN BE BACKPORTED TOGETHER TO 19.16

Why aren't these fixes included in an RU?

Data Pump Bundle Patch is not
RAC Rolling and Standby-First Installable

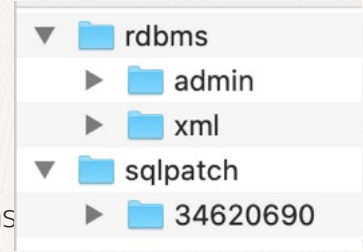
But … it's much easier than it looks like

Data Pump Bundle Patch Contents

Bundle Patch contains only:

- SQL
- PL/SQL
- XML

But it does not contain any files
which require a compilation/make of rdbms



It can be applied online

```
OPatch continues with these patches:   34620690

Do you want to proceed? [y|n]
y
User Responded with: Y
All checks passed.a
Backing up files...
Applying interim patch '34620690' to OH '/u01/app/oracle/product/19'

Patching component oracle.rdbms, 19.0.0.0.0...

Patching component oracle.rdbms.dbscripts, 19.0.0.0.0...
Patch 34620690 successfully applied.
```


When you run **`datapatch`**, ensure that there are no active Data Pump jobs

Non-Binary Online Patching Safeguards

Installing the Data Pump Bundle Patch when Data Pump is in use:

Built-in 3-minute timeout before signaling an error

```
BEGIN ku$_dpload.initial_phase; END;
*
ERROR at line 1:
ORA-20000: Retry dpload.sql script later when
Data Pump and Metadata API are not in use; current users are:
pid:11720, user:SYS, machine:<Machine>, sid:263,
module:sqlplus@<ConnectString> (TNS V1-
ORA-06512: at "SYS.KU$_DPLOAD", line 1042
ORA-06512: at line 1
```

Non-Binary Online Patching Safeguards

Attempting to run Data Pump while patching is in progress:

```
Connected to: Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 - Production
ORA-31626: job does not exist
ORA-31637: cannot create job SYS_EXPORT_FULL_01 for user SYSTEM
ORA-06512: at "SYS.KUPV$FT", line 1142
ORA-06512: at "SYS.DBMS_SYS_ERROR", line 95
ORA-06512: at "SYS.KUPV$FT", line 1751
ORA-39062: error creating master process DM00
ORA-39107: Master process DM00 violated startup protocol. Master error:
…
```

Note:
With the 19.14 (or later) Data Pump Bundle Patch installed you will see a much better error message:

```
ORA-39442: Data Pump software update in progress
```

Non-Binary Online Patching Safeguards

Since Data Pump Bundle Patch 19.14.0 you'll receive:

```
Connected to: Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 - Production
ORA-31626: job does not exist
```

Before, you would see:

```
Connected to: Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 - Production
ORA-31626: job does not exist
ORA-31637: cannot create job SYS_EXPORT_FULL_01 for user SYSTEM
ORA-06512: at "SYS.KUPV$FT", line 1142
ORA-06512: at "SYS.DBMS_SYS_ERROR", line 95
ORA-06512: at "SYS.KUPV$FT", line 1751
ORA-39062: error creating master process DM00
ORA-39107: Master process DM00 violated startup protocol. Master error:
…
```

Once applied, Data Pump Bundle Patch speeds up future patching significantly

Importing a complete application with data goes from almost 2,5 hours to 48 minutes – by just applying the Data Pump Bundle Patch

Global provider of financial services

Always use the latest OPatch

- Patch 6880880

Upgrade and Patching

AutoUpgrade automates your migration to Multitenant completely

Including Transparent Data Encryption
with AutoUpgrade's new keystore functionality

AutoUpgrade | Overview

ONE BUTTON APPROACH

But giving you all the control you want

Always use the latest version of AutoUpgrade

Download from My Oracle Support (2485457.1)

```
$ java -jar autoupgrade.jar –version

build.version 24.3.240419
build.date 2024/04/19 15:45:58 -0400
build.hash a1ea950cc
build.hash_date 2024/04/19 15:05:29 -0400
build.supported_target_versions 12.2,18,19,21,23
build.type production
build.label (HEAD, origin/devel)
```

We made upgrading easy.
Now we make patching just as easy.

AutoUpgrade functionality extended to patching

Patching

1

Install Oracle Home including Release Update and additional patches (MOS Doc ID 555.1)

2

Create a simple configuration file

3

Start AutoUpgrade in deploy mode

```
$ cat DB19.cfg

patch1.source_home=/u01/app/oracle/product/19/dbhome_19_22_0
patch1.target_home=/u01/app/oracle/product/19/dbhome_19_23_0
patch1.sid=DB19


$ java -jar autoupgrade.jar -config DB19.cfg -mode deploy
```


Patching

USE

Familiar interface

Console

Logging

ANALYZE

Prechecks

Summary report

PROTECT

Resumable

Restoration

Restore point

Fallback

AUTOMATE

`srvctl`

`/etc/oratab`

Files

Datapatch

Patching

Encryption

Hot clone

Refreshable clone

RAC

Proactive fixups

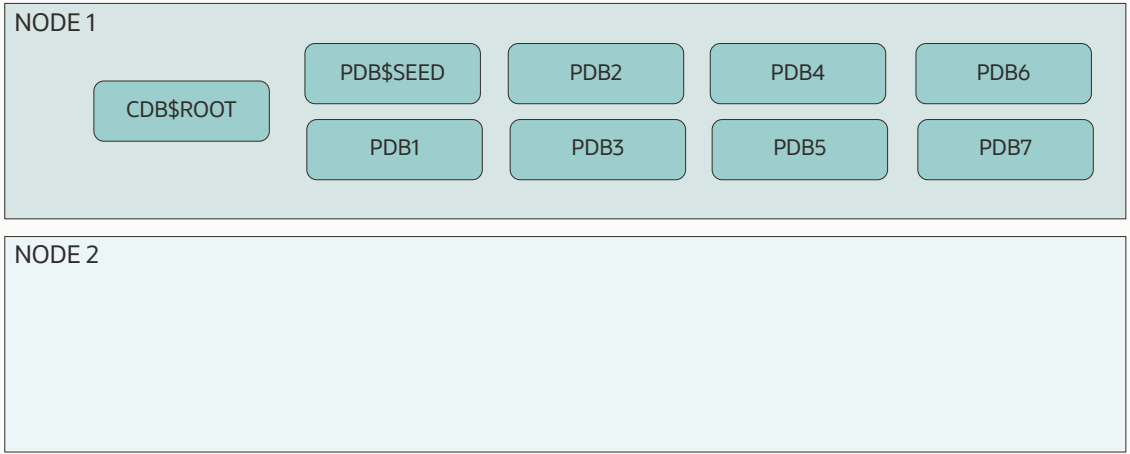
Distributed upgrade

...

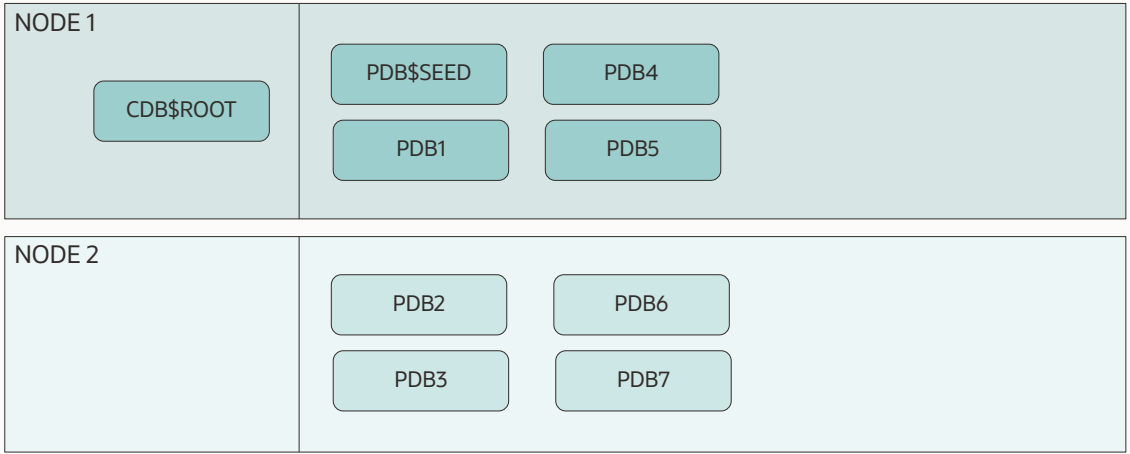
Significantly speed up patching using AutoUpgrade

- Applies to multitenant databases on RAC only

Distributed Patching



Distributed Patching



Distributed Patching

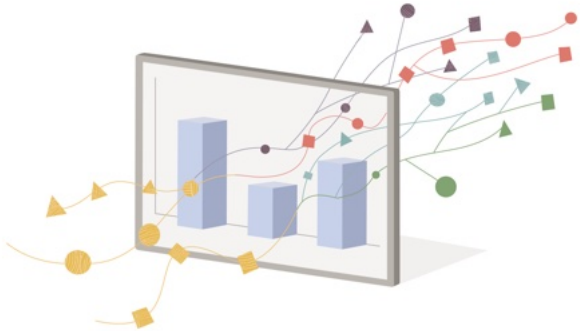
To enable distributed patching

```
$ cat RACCDB.cfg

upg1.source_home=/u01/app/oracle/product/19/dbhome_19_18
upg1.target_home=/u01/app/oracle/product/19/dbhome_19_19
upg1.sid=RACCDB
upg1.tune_setting=distributed_upgrade=true


$ java -jar autoupgrade.jar -config RACCDB.cfg -mode deploy
```

41%

In benchmark, time saved
by using distributed PDB patching

- 2 node RAC database
- 4 CPUs each
- CDB with 8 PDBs



By default,
AutoUpgrade uses two nodes

Distributed Patching

Leverage more nodes

```
$ cat RACCDB.cfg

upg1.source_home=/u01/app/oracle/product/19/dbhome_19_18
upg1.target_home=/u01/app/oracle/product/19/dbhome_19_19
upg1.sid=RACCDB
upg1.tune_setting=distributed_upgrade=true,active_nodes_limit=n


$ java -jar autoupgrade.jar -config RACCDB.cfg -mode deploy
```

Patching

Out-of-place patching support only right now

Further enhancements coming soon

Patching

What's missing

Windows
RAC rolling
Data Guard standby-first

Fleet Patching

AutoUpgrade

Automate your patching process and benefit from the familiar AutoUpgrade

Fleet Patching and Provisioning

Go fleet scale with FPP and benefit from additional functionality like deployment of Oracle Home

Patching Basic

Basic Facts | Patch Types

One-off

Single bug fix on top of the base release or a patch bundle
Sometimes called interim-patch

Backport

Fix made for a newer code line, now created on top of the base release or a patch bundle

Merge

Multiple one-off fixes combined into a single fix
Required to resolve conflicts

Bundle

Many fixes together on top of the base release or another bundle
Usually available on a quarterly schedule
Cumulative
Always RAC Rolling and Standby-First
PSU, BP, RU, RUR

Basic Facts | Patch Types

One-off

Quarterly proactive patches(1) (RU/BP) released during the first 3 years of a Database Release's GA date(2) will be eligible for new interim fixes for 12 months from that RU/BP's release date

Backport

Quarterly proactive patches(1) (RU/BP) released more than 3 years after a Database Release's GA date (2) will be eligible for new interim fixes for 24 months from that RU/BP's release date

Source: Database, FMW, Enterprise Manager, TimesTen In-Memory Database, and OCS Software Error Correction Support Policy (Doc ID 209768.1)

Basic Facts | Patch Types on Windows

One-off	Rarely created
Backport	Rarely created, preferably delivered in bundle patches
Merge	Rarely created
Bundle	Still called Bundle Patch (BP) and not RU Quarterly, usually with delay RAC Rolling and Standby-First Cumulative

What Can Be in a Patch?

FILES

New or changed executables, libs or files

```
bin/oracle
bin/srvctl
oracore/zoneinfo/timezone_34.dat
```

Apply and rollback scripts

```
sqlpatch/.../nnn_apply.sql
sqlpatch/.../nnn_rollback.sql
```

SQL
PL/SQL

New or changed objects

```
alter table sys.tab$ ...
create index sys.i_tab1 ...
create or replace package sys.dbms_scheduler ...
```

Basic Facts | How to Apply a Patch

$ORACLE_HOME/OPatch

```
[oracle@hol ~]$ cd $ORACLE_HOME/OPatch
[oracle@hol OPatch]$ ls -l
total 164
drwxr-x---. 6 oracle dba     68 Apr 22  2020 auto
drwxr-x---. 2 oracle dba     31 Apr 22  2020 config
-rwxr-x---. 1 oracle dba    589 Apr 22  2020 datapatch
-rwxr-x---. 1 oracle dba    627 Apr 22  2020 datapatch.bat
drwxr-x---. 2 oracle dba     90 Apr 22  2020 docs
-rwxr-x---. 1 oracle dba  23550 Apr 22  2020 emdpatch.pl
drwxr-x---. 2 oracle dba   4096 Apr 22  2020 jlib
drwxr-x---. 5 oracle dba   4096 Mar 26  2020 jre
drwxr-x---. 9 oracle dba   4096 Apr 22  2020 modules
drwxr-x---. 5 oracle dba     58 Apr 22  2020 ocm
-rwxr-x---. 1 oracle dba  49462 Apr 22  2020 opatch
-rwxr-x---. 1 oracle dba   1442 Apr 22  2020 opatchauto
-rwxr-x---. 1 oracle dba    393 Apr 22  2020 opatchauto.cmd
-rwxr-x---. 1 oracle dba  16412 Apr 22  2020 opatch.bat
-rwxr-x---. 1 oracle dba   4290 Apr 22  2020 opatch_env.sh
-rw-r-----. 1 oracle dba   2551 Apr 22  2020 opatch.pl
drwxr-x---. 4 oracle dba     62 Apr 22  2020 opatchprereqs
-rwxr-x---. 1 oracle dba   3159 Apr 22  2020 operr
-rwxr-x---. 1 oracle dba   4218 Apr 22  2020 operr.bat
-rw-r-----. 1 oracle dba   3177 Apr 22  2020 operr_readme.txt
drwxr-x---. 2 oracle dba     19 Apr 22  2020 oplan
drwxr-x---. 3 oracle dba     21 Apr 22  2020 oracle_common
drwxr-x---. 3 oracle dba     24 Apr 22  2020 plugins
-rw-r-----. 1 oracle dba   2980 Apr 22  2020 README.txt
drwxr-x---. 2 oracle dba   4096 Apr 22  2020 scripts
-rw-r-----. 1 oracle dba     27 Apr 22  2020 version.txt
```

How to Apply a Patch?

`opatch`		Applies binaries to an Oracle Home		All instances using this Oracle Home are down
`datapatch`		Applies SQL and PL/SQL changes to a database		Database is up

What is installed?

In the Oracle Home?

```
$ opatch lsinventory
$ opatch lspatches
```

```
SQL> select
xmltransform(dbms_qopatch.get_opatch_lsinventory,
dbms_qopatch.get_opatch_xslt) from dual;
```

- Oracle Database 12.1 : FAQ on Queryable Patch Inventory (Doc ID 1530108.1)

In the database / PDB?

```
SQL> select * from cdb_registry_sqlpatch;
```

What Is Installed?

In the Oracle Home?

```
$ opatch lsinventory
$ opatch lspatches
```

```
SQL> select
xmltransform(dbms_qopatch.get_opatch_lsinventory,
dbms_qopatch.get_opatch_xslt) from dual;
```

- Oracle Database 12.1 : FAQ on Queryable Patch Inventory (Doc ID 1530108.1)

In the database / PDB?

```
SQL> select * from cdb_registry_sqlpatch;
```

Basic Facts | Platform

Generic

A patch that works for all platforms

Changes files that are platform independent

Example: scripts in `rdbms/admin` and other PL/SQL

Port Specific

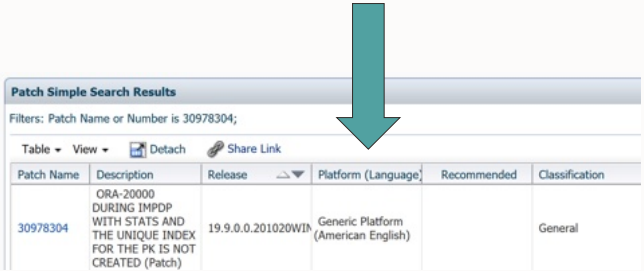
A patch that works for one specific platform

Changes port-specific files

Example: `oracle.exe` on Windows

Basic Facts | Platform

Generic



Patch Simple Search Results

Filters: Patch Name or Number is 30978304;

Table ▾ View ▾ Detach Share Link

Patch Name	Description	Release	Platform (Language)	Recommended	Classification
30978304	ORA-20000 DURING IMPDP WITH STATS AND THE UNIQUE INDEX FOR THE PK IS NOT CREATED (Patch)	19.9.0.0.201020WIN	Generic Platform (American English)		General

Port Specific

Patch Simple Search Results

Filters: Patch Name or Number is 32164034;

Table ▾ View ▾ Detach Share Link

Patch Name	Description	Release	Platform (Language)	Recommended	Classification
32164034	INTRODUCE UNDERSCORE PARAMETER TO DISABLE RECORDING OF LAST SUCCESSFUL LOGIN TIME (LSLT) (Patch)	19.9.0.0.0DBRU	HP-UX Itanium (American English)		General

Hot Patches

Potentially contains changes to Oracle binaries

If so,

- A hot patch replaces a *page* of Oracle binaries while they are in use
- The affected code page is replaced with the patched code
- Use with care and plan to replace hot patch with proper patch at earliest possible occasion, no later than next instance restart

- Don't run with a hot patch for an extended period

Online Patches

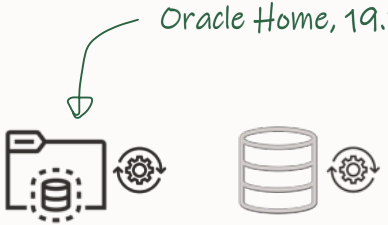
You can apply an online patch while the database is up and running

An online patch:

- Typically, changes regular files in the Oracle home, like
  - Time zone files
  - Scripts in `rdbms/admin`
- Does not change binaries

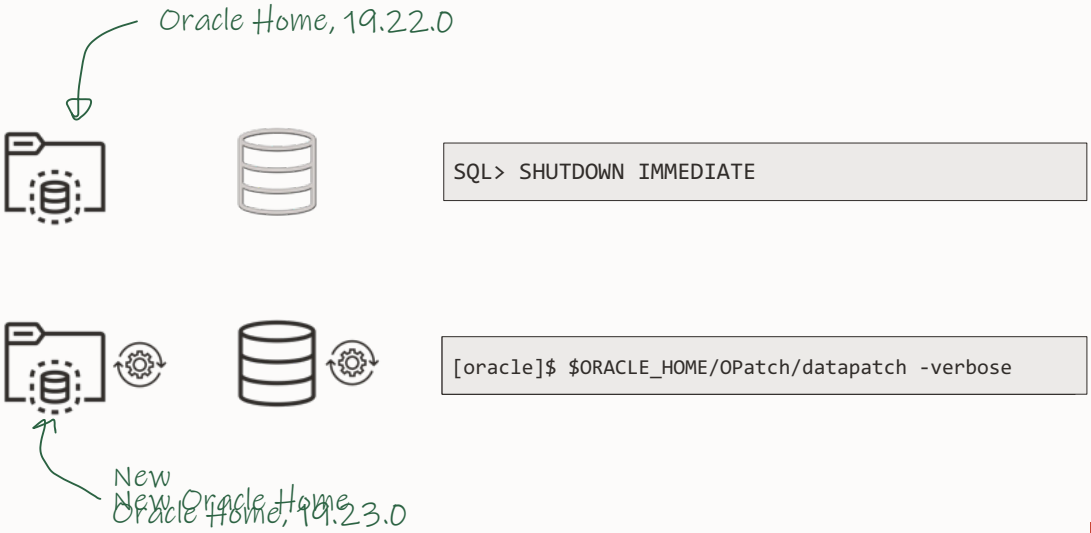
Patching Methods

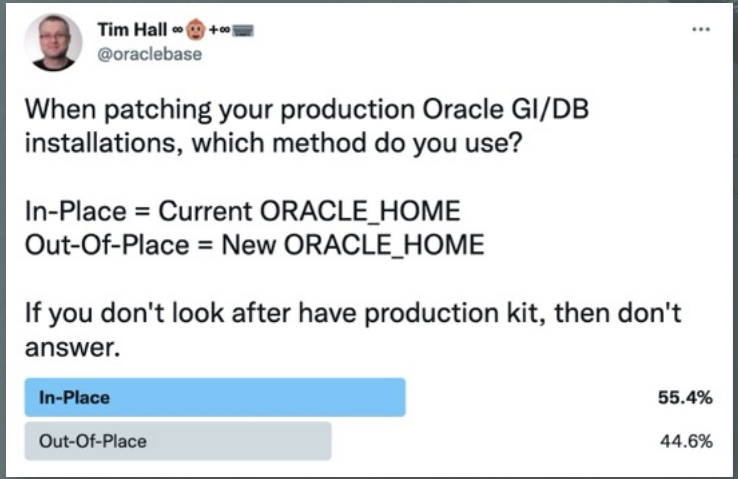
In-Place Patching




```
$ORACLE_HOME/OPatch/opatch rollback -id ...
```

Out-of-Place Patching





Always patch Out-of-Place

- Don't argue with us ☺

Patching Oracle home is faster when you use a brand new home

- Avoid cloned Oracle Homes and In-Place Patching
- Use `./opatch util deleteinactivepatches`

Installation Tip

```
/home/oracle/stage
├── DPBP
│   ├── 35261302
│   └── PatchSearch.xml
├── MRP
│   ├── 35333937
│   │   ├── 34340632
│   │   ├── 35012562
│   │   ├── 35037877
│   │   ├── 35116995
│   │   └── 35225526
│   └── PatchSearch.xml
├── OJVM
│   ├── 35050341
│   └── PatchSearch.xml
└── RU
    ├── 35042068
    └── PatchSearch.xml
```

ONE SINGLE COMMAND

```
./runInstaller \
  -applyRU /home/oracle/stage/RU/35042068 \
  -applyOneOffs /home/oracle/stage/DPBP/35261302,
                /home/oracle/stage/OJVM/35050341,
                /home/oracle/stage/MRP/34340632,
                ...
                /home/oracle/stage/MRP/35225526
```

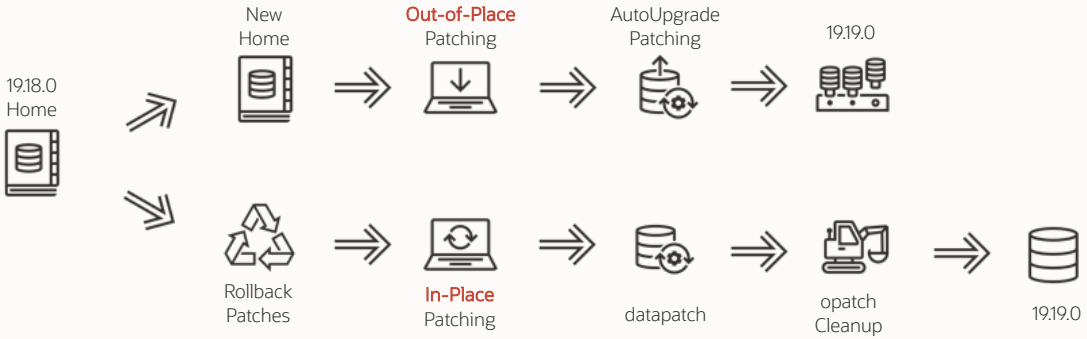
Be sure to copy all configuration files to the new Oracle Home

- AutoUpgrade does it for you
- Additional details in blog post

Exercise Patching?

Use our brand new Patch Me If You Can LiveLabs

- https://apexapps.oracle.com/pls/apex/dbpm/r/livelabs/view-workshop?wid=3740



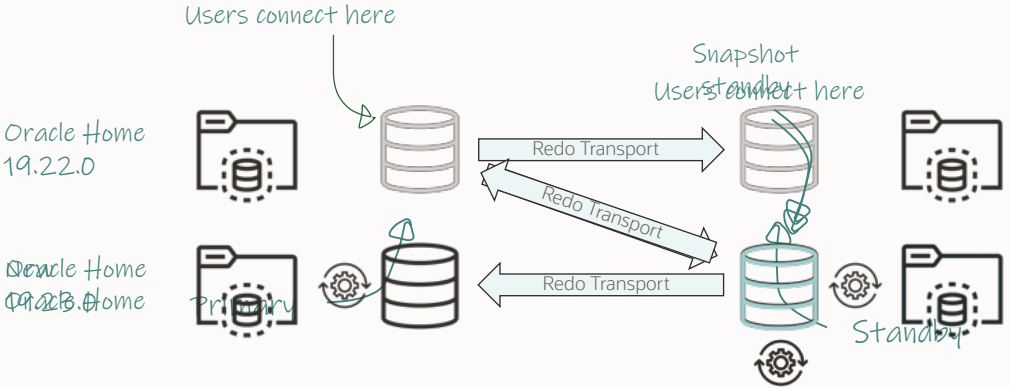
Reduce downtime to the time it takes to perform a switchover

- Data Guard Standby-First Patch Apply (Doc ID 1265700.1)

Safely test and verify patches with Standby-First Patch Apply

- Data Guard Standby-First Patch Apply (Doc ID 1265700.1)

Standby-First Patching




```
[oracle]$ $ORACLE_HOME/OPatch/datapatch -verbose
```

Patch must Standby-First installable

- Check the patch readme

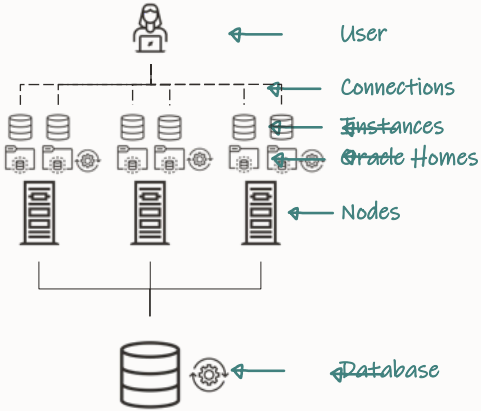
Execute datapatch on the primary database

- Only execute datapatch when all homes are on the new patch

Find additional restrictions in Data Guard Standby-First Patch Apply (Doc ID 1265700.1)

Avoid database downtime with RAC Rolling Patch Apply

RAC Rolling Patching



- New Oracle Home
- Patch Oracle Home
- Move to new Oracle Home
- Execute datapatch

RAC Rolling Patching | Best Practices

If draining is a problem, patch

- Node by node
- In node groups

Patch the standby cluster first

- Combine Standby First and RAC Rolling for premium protection
- Allows you to test on the standby cluster (functionality and rollback)

RAC Rolling Patching | Best Practices

Execute datapatch immediately after the last node has been patched

Execute datapatch on one node only

RAC Rolling Patching | Best Practices

Keep GI and DB patch level in sync

- This is what we test
- This is how we run our cloud

Supported, but not recommended, combinations

- Grid Infrastructure home = 19.14.0
- Database home = 19.16.0

- Grid Infrastructure home = 19.18.0
- Database home = 19.14.0

- Node 1 – Grid Infrastructure home = 19.14.0
- Node 2 – Grid Infrastructure home = 19.17.0

- Patching node 1 on Monday, then patching node 2 on another day

- Operating a cluster with different Oracle versions of either Grid Infrastructure and/or Database homes on each of the nodes

Can I delay or omit applying patches to a subset of instances/nodes in an Oracle RAC cluster?

No. All patching operations should be completed on all Oracle Real Application Clusters (RAC) instances as quickly as possible. When applying patches to an Oracle Grid Infrastructure or Oracle Database home, these patches must be made effective as soon as possible, ideally within 24 hours. Rolling patching of RAC clusters with the draining of connections is a recommended and well-tested process. However, running mixed patch levels inherently brings more risk, and testing any given patches in a mixed manner will be less robust than trying a uniform set of patches across the cluster. Running with a mix of patches across a cluster for an extended time increases the risk of exposure to untested corner cases impacting system stability, scalability, and potential availability. Additionally, some functionality is restricted during rolling patching.

RAC: Frequently Asked Questions (RAC FAQ) (Doc ID 220970.1)

RAC Rolling Patching | Best Practices

Potential risk when patching with delay

- Some cluster features may operate with limitations
- Some ASM operations may be limited or not possible

Oracle strongly recommends patching as quickly as possible

Future versions of Oracle Grid Infrastructure may lift some limitations

Rolling patch rollback technically works but users have to proceed cautiously

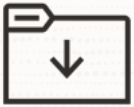
- Certain patches could be tricky to rollback

Release updates are **always**:

Standby-First installable

RAC Rolling installable

Grid Infrastructure Patching



You always start with the base release

- Oracle Grid Infrastructure 19.3.0

Most Recent Release Update

Use the Patch Download Assistant MOS Note: 2118136.2

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

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

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

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 `gridSetup`

Grid Infrastructure Patching Methods

1 In-place

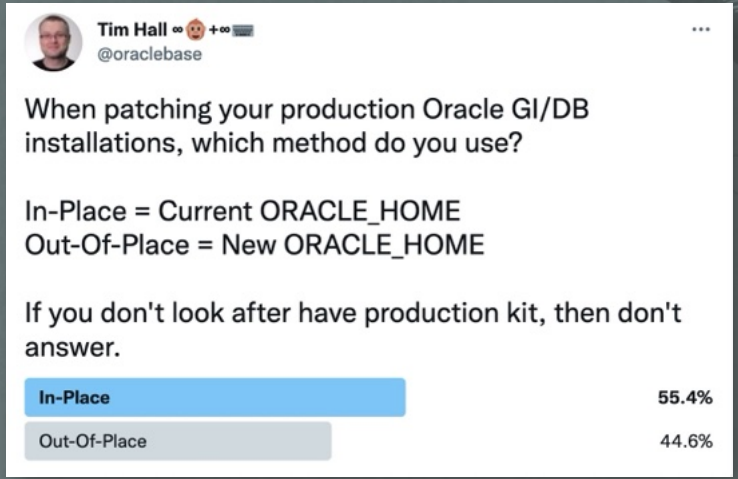
Replaces existing Oracle Home

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

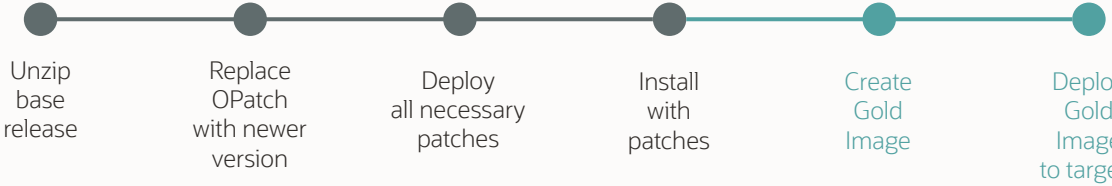
23ai GI home disk space greatly reduced to 3 GB

- 12 GB in 19c

Use golden images

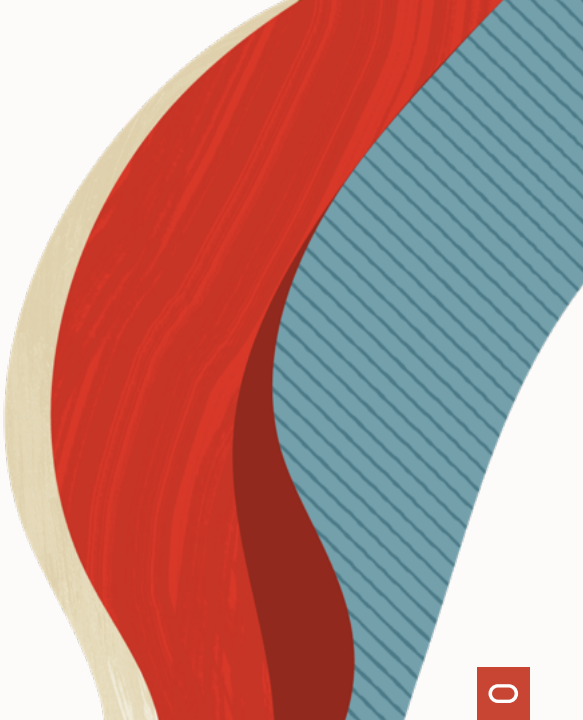
- Blog post

Golden Images



Demo

Install GI home
Apply Release Update
Create golden image



Watch on YouTube

```
--Unzip base release and update OPatch

unzip -oq LINUX.X64_193000_grid_home.zip
mv OPatch OPatch_old
unzip p6880880...zip
```


```
--Install the Oracle Home and apply Release Update and one-offs
--Specify multiple one-offs using comma-separated list

./gridSetup.sh -silent -applyRU <patch_dir> \
                       -applyOneOffs <patch_dir> \
                       ...
```


```
--Always create your golden image from a "fresh" home
--Never use a production home

./gridSetup.sh -createGoldImage \
               -destinationLocation $GOLDIMAGEDIR \
               -silent
```


```
--Deploy golden image throughout your environment
--Just unzip and attach on node 1, installer copies to other nodes

unzip -oq my_golden_image.zip
./gridSetup.sh -silent \
               oracle.install.db.CLUSTER_NODES=node1,node2 \
               ...
```


Works for database homes as well

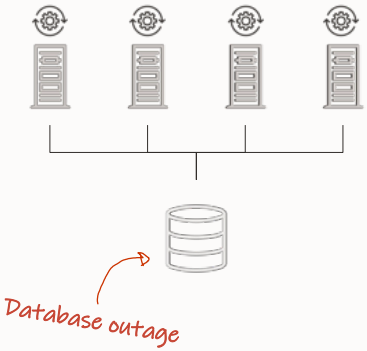
- Use `runInstaller` instead

Patching a cluster requires passwordless SSH connection between the nodes

- You can disable it after patching

The following patching concepts
apply to Oracle Database patching as well

Grid Infrastructure Patching Concepts

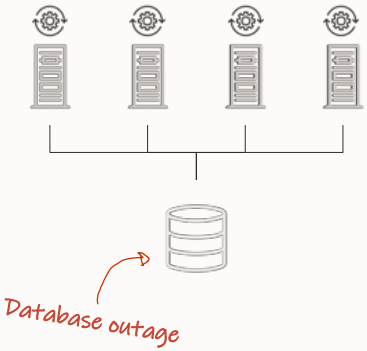


ALL NODE

- All nodes patched at one time
- One long database outage
- Works for all patches, including non-rolling
- Cluster at full capacity except for outage

Rolling Patch - OPatch Support for RAC (Doc ID 244241.1)

Grid Infrastructure Patching Concepts

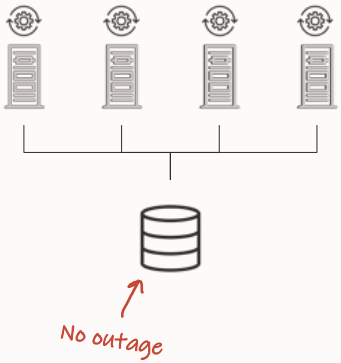


MINIMUM DOWNTIME

- Nodes patched in two batches
- One short database outage
- Works for all patches, including non-rolling
- Other nodes must handle workload while another batch is patched

Rolling Patch - OPatch Support for RAC (Doc ID 244241.1)

Grid Infrastructure Patching Concepts

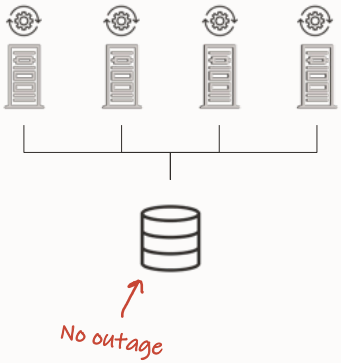


ROLLING

- Each node patched separately
- No database outage
- Patch must be RAC rolling installable
- Other nodes must handle workload while one node is patched

Rolling Patch - OPatch Support for RAC (Doc ID 244241.1)

Grid Infrastructure Patching Concepts

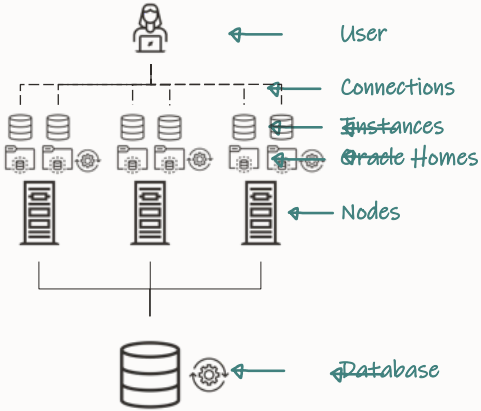


ROLLING IN GROUPS

- Patch a subset together
- Useful when draining is a problem
- No database outage
- Patch must be RAC rolling installable
- Other nodes must handle workload while one node is patched

Rolling Patch - OPatch Support for RAC (Doc ID 244241.1)

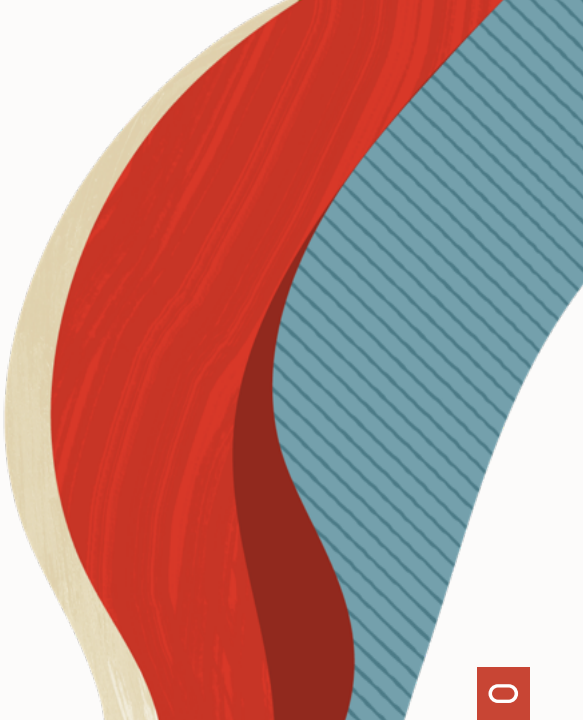
RAC Rolling Patching



- Clone Oracle Home
- Patch Oracle Home
- Move to new Oracle Home
- Execute datapatch

Demo

Patch a 2-node RAC system
GI and database



Watch on YouTube

Complete a rolling patching operation always as quickly as possible

- RAC: Frequently Asked Questions (Doc ID 220970.1)

All patching operations should be completed on all Oracle Real Application Clusters (RAC) instances as quickly as possible.

...

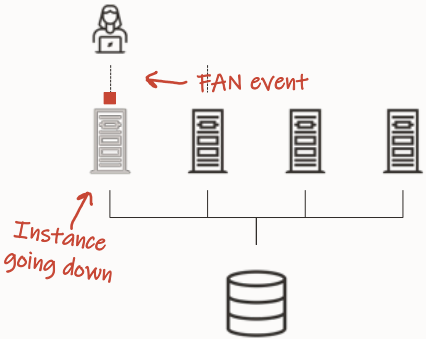
ideally within 24 hours

RAC: Frequently Asked Questions (RAC FAQ) (Doc ID 220970.1)

Rolling patching requires efficient draining

- Optionally, consider a *batched* approach

Draining Connections



DRAINING

- Allows users to finish their work and reconnect to another instance
- New sessions connect to other instances
- Sessions that don't drain in time are forcefully terminated
- Controlled by **`drain_timeout`** parameter in `srvctl` and `DBMS_SERVICE`

Drain Timeout

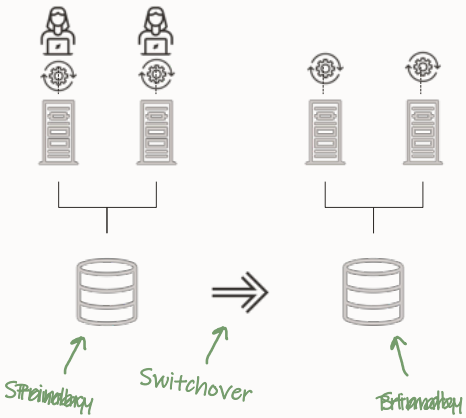
Setting `drain_timeout` very low?

- This may cause login storms
  - Be cautions on databases with many connections

Setting `drain_timeout` very high?

- Load is spread on fewer instances
  - Cluster is in rolling patch mode for an extended period of time

Grid Infrastructure | Data Guard



ALTERNATIVE

- If draining is a problem
- Downtime limited to a switchover
- Test your Data Guard configuration

Data Guard | Additional Information

INTERVIEW WITH LUDOVICO CALDERA

Ludovico is Data Guard Product Manager and
he shares his top tips for patching Oracle Grid Infrastructure and Data Guard

PATCHING ORACLE GRID INFRASTRUCTURE AND ORACLE DATA GUARD

Blog post with additional details plus instructions on
how to patch GI and database at the same time when you have Data Guard

Safely test and verify patches with Standby-First Patch Apply

- Data Guard Standby-First Patch Apply (Doc ID 1265700.1)

Patch must Standby-First installable

- Check the patch readme

Execute datapatch on the primary database

- Only execute datapatch when all homes are on the new patch

Find additional restrictions in Data Guard Standby-First Patch Apply (Doc ID 1265700.1)

Comply with Maximum Availability Architecture (MAA) principles

- Continuous Availability - MAA Checklist for Applications for the Oracle Database

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 19.16.0 and DB 19.20.0
- Node 1 with GI 19.16.0, node 2 with GI 19.18.0
- Patching node 1 on Monday, node 2 on Tuesday …
- Mix of GI and DB versions on various nodes

Complete a rolling patching operation always as quickly as possible

- RAC: Frequently Asked Questions (Doc ID 220970.1)

top tips

PATCHING SUCCESS

Cluster Verification Utility

Patch Level

Application Continuity

OPatch

Use CVU before and after patching

Preferably through EXAchk or ORAchk

Identifies potential issues

Light-weight, non-intrusive

Always use the latest version

```
$ 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.
```


top tips

PATCHING SUCCESS

Cluster Verification Utility

Patch Level

Application Continuity

OPatch

- Apply patches regularly
- Apply recent Release Updates
- Apply MRPs
- Keep GI and DB patch levels in sync

top tips

PATCHING SUCCESS

Cluster Verification Utility

Patch Level

Application Continuity

OPatch

- Completely hide interruptions from users
- Hides planned and unplanned events
- Comply with MAA guidelines
- See also Transparent Application Continuity

top tips

PATCHING SUCCESS

Cluster Verification Utility

Patch Level

Application Continuity

OPatch

Always use the latest version of OPatch

Use in GI and DB homes

You don't need to apply OJVM patches to GI Homes

- Details in blog post

Do not set a custom SSH banner

- How To Configure SSH for a RAC Installation (Doc ID 300548.1)

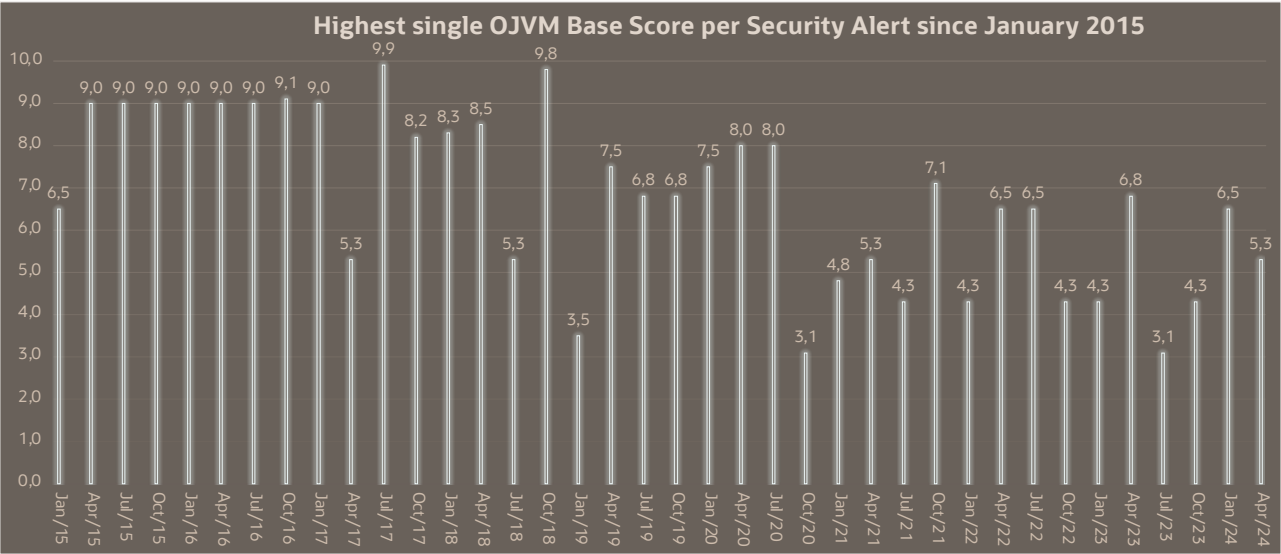
Oracle Fleet Patching & Provisioning

Oracle Fleet Patching & Provisioning (formerly known as Oracle Rapid Home Provisioning) is the recommended solution for performing lifecycle operations (provisioning, patching & upgrades) across entire Oracle Grid Infrastructure and Oracle RAC Database fleets and the default solution used for Oracle Database Cloud services.

https://www.oracle.com/database/technologies/rac/fpp.html

OJVM

Oracle Java Virtual Machine | OJVM



Check | OJVM

Is OJVM installed?

```
select comp_id, comp_name, version_full from dba_registry order by 1;
```

COMP_ID	COMP_NAME	VERSION_FULL
CATALOG	Oracle Database Catalog Views	19.19.0.0.0
CATJAVA	Oracle Database Java Packages	19.19.0.0.0
CATPROC	Oracle Database Packages and Types	19.19.0.0.0
JAVAVM	JServer JAVA Virtual Machine	19.19.0.0.0
OLS	Oracle Label Security	19.19.0.0.0
ORDIM	Oracle Multimedia	19.19.0.0.0
OWM	Oracle Workspace Manager	19.19.0.0.0
XDB	Oracle XML Database	19.19.0.0.0
XML	Oracle XDK	19.19.0.0.0

Is OJVM in use

- Check blog post for details

OJVM Patching | Option 1

Patch
Disable
Remove

PATCH QUARTERLY

- OJVM bundle patch is a separate download until Oracle 19c
- From Oracle 21c onward, OJVM is part of the RU

OJVM Patching | Option 1

- Patch
- Disable
- Remove

Single instance

- Database is down

Real Application Cluster

- Database stays up
- Each instance must go down in a rolling manner
- See MOS Doc ID 2217053.1 for details

Data Guard

- Not standby-first installable

OJVM Patching | Option 1

- Patch
- Disable
- Remove

Oracle Database 21c / 23ai

Fully RAC Rolling installable

No interruption during `datapatch`

Oracle Database 19c

RAC Rolling installable

No `datapatch` downtime but:

- Java subsystem is patched which requires ~10 second outage
- Connected clients using OJVM will receive `ORA-29548`

OJVM Patching | Option 2

Patch
Disable
Remove

DISABLE OJVM

using mitigation patch

- Disables the Java subsystem
- Java subsystem must be re-enabled during patching and upgrade
- Can be used on PDB level

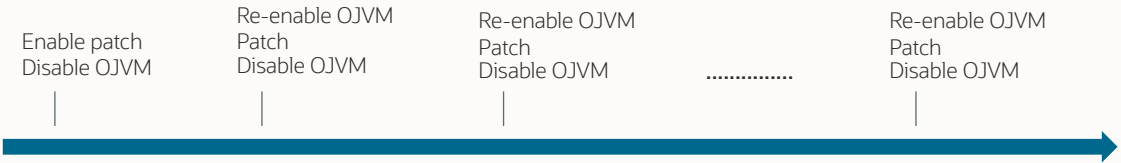
OJVM Patching | Option 2

Patch
Disable
Remove

How do you use the **Mitigation Patch**?

- Enable patch `@?/rdbms/admin/dbmsjdev.sql`
- Disable OJVM `exec DBMS_JAVA_DEV.DISABLE`
- Re-enable OJVM, `exec DBMS_JAVA_DEV.ENABLE`
  e.g. before database patching
- Important note:
  Disable OJVM with the Mitigation Patch in PDB$SEED to prevent new PDBs being provisioned with an enabled OJVM – see Blog Post

OJVM Patching | Option 2



@?/rdbms/admin/ exec DBMS_JAVA_ @?/rdbms/admin/	exec DBMS_JAVA_DI Patch exec DBMS_JAVA_DI	exec DBMS_ Patch exec DBMS_	exec DBMS_JAVA_DEV.ENABLE Patch exec DBMS_JAVA_DEV.DISABLE

AutoUpgrade detects the use of the mitigation patch and acts accordingly

- No additional configuration needed

OJVM Patching | Option 2

Patch
Disable
Remove

Mitigation patch present in all Oracle Homes since 2018

Further Information

- MOS Note: 1929745.1
- OJVM and the Mitigation Patch – Things to Know
- Do you need the Mitigation Patch in CDB$ROOT and all PDBs?

OJVM Patching | Option 3

Patch
Disable
Remove

REMOVE OJVM

Exercise caution in an existing database

Conduct thorough testing

Non-CDB	MOS Note: 2314363.1
CDB	MOS Note: 22629191.1
See also	JAVAVM and XML Cleanup in the database

No `STARTUP UPGRADE` for datapatch
Not even when you patch OJVM

- Even if the readme says so
- See blog post for details
- If needed, use `./datapatch -skip_upgrade_check`

You don't need to apply OJVM patches to GI Homes

- Details in blog post

Datapatch

Patching a database

1

Start database in new Oracle Home

Start in normal open
Open all PDBs

2

Complete patching with `datapatch`

Found in `$ORACLE_HOME/OPatch`
One database per invocation
Multiple datapatch sessions in parallel
Datapatch User Guide (Doc ID 2680521.1)

Patch multiple databases simultaneously by starting multiple instances of Datapatch

- Each Datapatch works on one database
- Be careful about resource consumption
- AutoUpgrade handles it for you

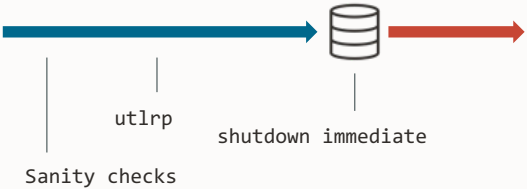
Analyze the database for patching readiness using Datapatch Sanity Checks

- Datapatch User Guide (Doc ID 2680521.1)
- Executed by AutoUpgrade in analyze mode

```
$ ./datapatch -sanity_checks

...

Check: DB Components status - OK
Check: PDB Violations - OK
Check: System invalid objects - OK
Check: Tablespace Status - OK
Check: Backup jobs - OK
Check: Temp Datafile exists - OK
Check: Datapump running - OK
Check: Container status - OK
Check: Encryption wallet - OK
Check: Dictionary statistics gathering - OK
Check: Scheduled Jobs - NOT OK (WARNING)
  Message: There are current running or scheduled jobs set to run on the next hour.
  Scheduled jobs may have an impact when run during patching.
  :
    JOB_NAME,NEXT_RUN_DATE,SCHEMA_NAME,STATE
    CLEANUP_TRANSIENT_PKG,23-MAY-23 11.08.53.000000 AM +01:00,APPUSER,SCHEDULED
```

Recompile invalid objects
before invoking **`datapatch`**

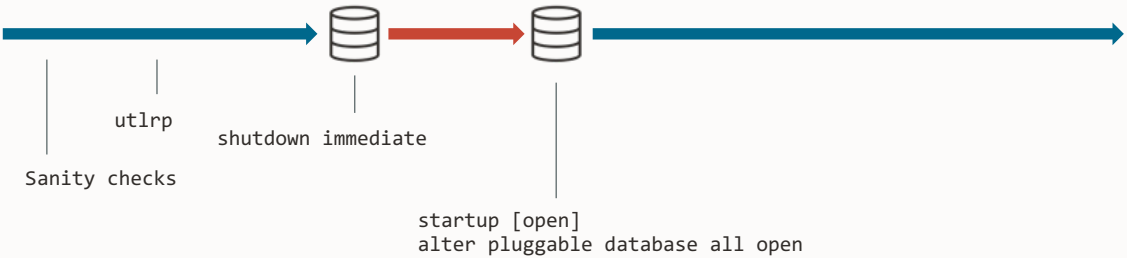
Patching Timeline



The database must be open
Only open PDBs are patched

- Upgrade mode or restricted session is not needed

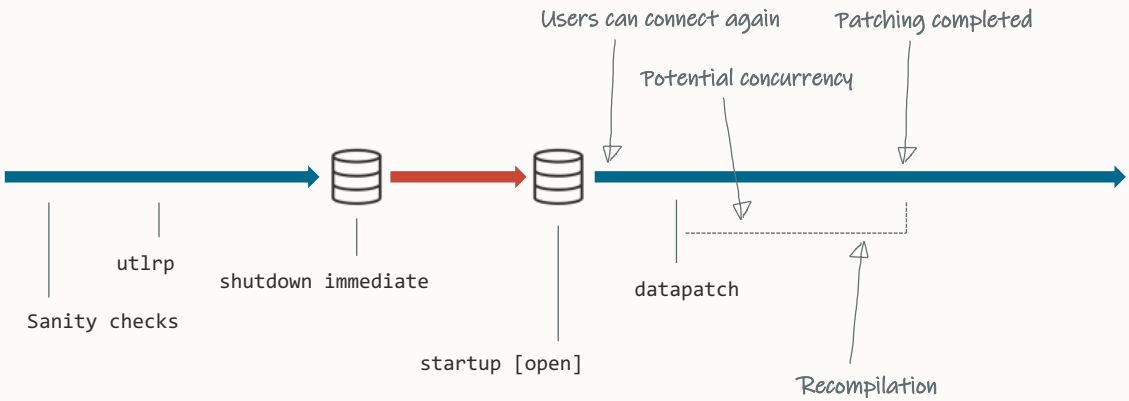
Patching Timeline



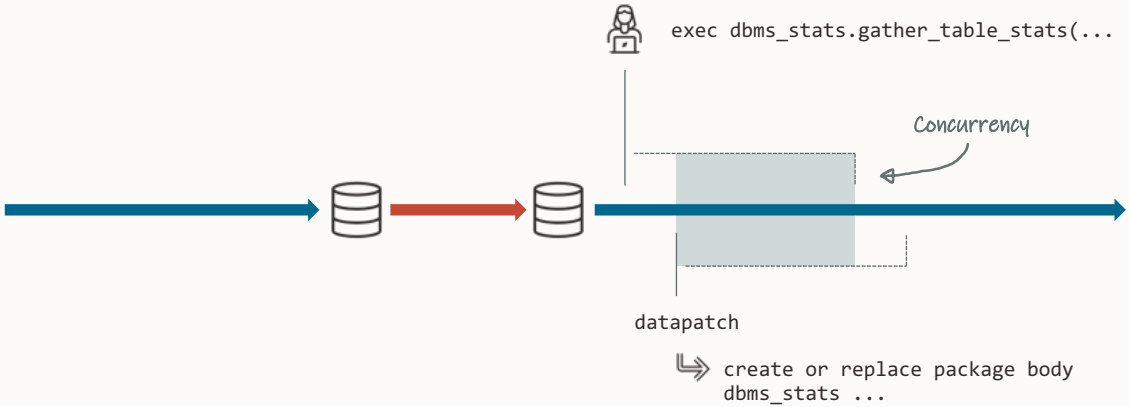
You can run `datapatch` while users are connected to the database

- Details in blog post

Patching Timeline



Patching Timeline



Concurrency

- Datapatch waits 15 min to acquire a lock
  - On timeout, `ORA-04021 timeout occurred while waiting to lock object`
- Optionally, find blocking session and kill it
- Increase timeout using `-ddl_lock_timeout` *`<time-in-seconds>`*

Disable the database scheduler (`job_queue_processes=0`)

- Also disables refresh of materialized views

Postpone RMAN backups

Stop Oracle GoldenGate while you are running datapatch

Get a fix for bug 29245570

- Reduces invalidation of dependent objects
- Pending Release Update inclusion

Concurrency

In Autonomous Database Serverless the grace period is set to 5 minutes after which your session is killed by a script.

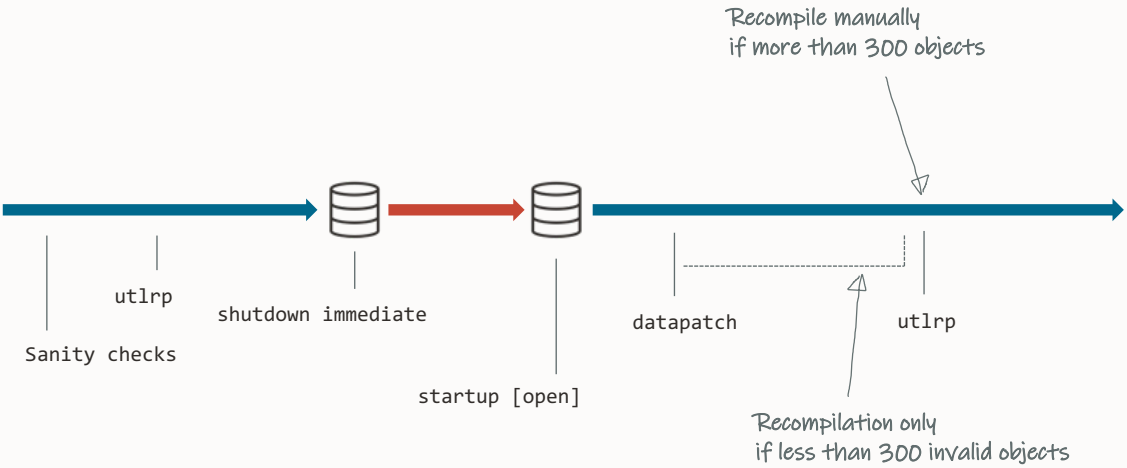
Concurrency | PL/SQL

Some times it might not be obvious why a shared library cache pin is held of a PL/SQL package.

If package A calls package B, then a shared library cache pin is held on both packages for the entire duration of package A. In other words, the pin on package B is not released until the pin on package A is released. This is a PL/SQL optimization which has a drawback in this scenario.

Often, this issue is seen with short-running but often called procedures, like DBMS_ASSERT which might be used by many other programs, and although it often runs very fast (e.g. to check a SQL name is a proper identifier), the calling function might run for many minutes. In the entire period, a pin is held on DBMS_ASSERT.

Patching Timeline



Recompilation

Datapatch recompiles objects invalidated during patching

If more than 300 objects are invalidated no recompilation takes places

- Recompile manually
- Or, objects will be recompiled on usage

Adjust the threshold

```
datapatch ... -recomp_threshold 300
```

Consider recompiling invalid objects after patching

```
$ ./datapatch -verbose
SQL Patching tool version 19.19.0.0.0 Production on Sun Jun 25 07:12:19 2023

.
.
.
.

Automatic recompilation incomplete; run utlrp.sql to revalidate.
  PDBs: PDB1 PDB$SEED

SQL Patching tool complete on Sun Jun 25 07:12:19 2023
```


```
$ pwd
/u01/app/oracle/cfgtoollogs/sqlpatch/sqlpatch_485_2022_01_19_22_13_40

$ grep "recomp_threshold" *catcon* -A1

[CDB$ROOT] Invalid ORACLE_MAINTAINED objects: before patching=0, after patching=0, recomp_threshold=300
[CDB$ROOT] All ORACLE_MAINTAINED objects are VALID, recompilation not needed.
[PDB$SEED] Invalid ORACLE_MAINTAINED objects: before patching=0, after patching=0, recomp_threshold=300
[PDB$SEED] All ORACLE_MAINTAINED objects are VALID, recompilation not needed.
```


```
$ pwd
/u01/app/oracle/cfgtoollogs/sqlpatch/sqlpatch_485_2022_01_19_22_13_40
```

```
$ grep "recomp_threshold" *catcon* -A1

[CDB$ROOT] Invalid ORACLE_MAINTAINED objects: before patching=0, after patching=0, recomp_threshold=300
[CDB$ROOT] All ORACLE_MAINTAINED objects are VALID, recompilation not needed.
[PDB$SEED] Invalid ORACLE_MAINTAINED objects: before patching=0, after patching=0, recomp_threshold=300
[PDB$SEED] All ORACLE_MAINTAINED objects are VALID, recompilation not needed.
```


Datapatch uses **REGISTRY$SQLPATCH_RU_INFO** to control the patching operations

```
$ ./datapatch -prereq
SQL Patching tool version 21.10.0.0.0 Production on Tue Jun 11 13:49:54 2024
Copyright (c) 2012, 2023, Oracle.  All rights reserved.

...

Adding patches to installation queue and performing prereq checks...done
Installation queue:
  For the following PDBs: CDB$ROOT PDB$SEED
    No interim patches need to be rolled back
    No release update patches need to be installed
    No interim patches need to be applied
  For the following PDBs: PDB1
    No interim patches need to be rolled back
    Patch 35134934 (Database Release Update : 21.10.0.0.230418 (35134934)):
      Apply from 21.1.0.0.0 Feature Release to 21.10.0.0.0 Release_Update 230321093909
    No interim patches need to be applied
```

If in doubt run `datapatch` again

- Datapatch only does what is needed
- You can run `datapatch` as many times as you like

$ORACLE_HOME/OPatch/datapatch

$ORACLE_HOME/sqlpatch/sqlpatch

$ORACLE_HOME/sqlpatch/sqlpatch.pl

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

use sqlpatch.pm
```


Datapatch Workflow

- Connect with SYSDBA privilege
- Using local connection

Datapatch Workflow

- Check Datapatch infrastructure (tables/view/packages)
- *Patches Datapatch*

Datapatch Workflow

- Uses queryable inventory (`DBMS_QOPATCH`)
- Checks all nodes in a cluster
- May use local inventory

Datapatch Workflow

- Checks tables to learn which patches are present
  - `REGISTRY$SQLPATCH_RU_INFO`
  - `REGISTRY$SQLPATCH`

Datapatch Workflow

- Compare binary and SQL inventory
- Check patch metadata
- Build plan
- Check Oracle home for apply/rollback scripts

Datapatch Workflow

Patch	Node 1	Node 2	SQL inv.	Action
Patch 1	Not present	Not present	Present	Rollback
Patch 2	Present	Present	Not present	Apply
Patch 3	Present	Present	Present	No action
Patch 4	Present	Not present	Not present	No action

Datapatch Workflow

- Performs actions according to plan
- Errors in this phase are most likely a *bad patch*

Datapatch Workflow

- Check the log files
- Looks for specific patterns
- Updates the result of the actions to the Datapatch tables

Datapatch | Patch Apply Sequence

`datapatch` ⇒

1.  Java patches
2.  Bundle patches
3.  One-off patches

Datapatch | Patch Rollback and Apply Queue

Binary Registry after `opatch`:

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

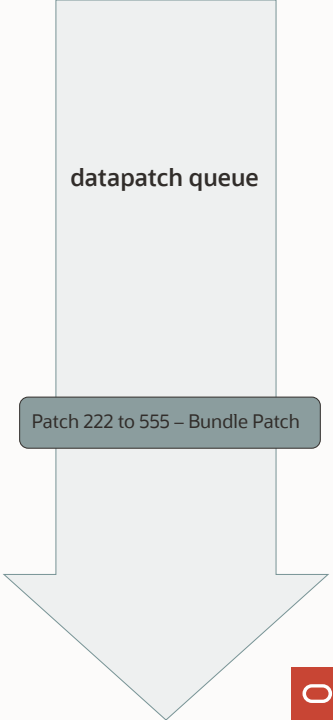
Oracle Home

SQL Registry before `datapatch`:

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

Database

```
$ ./datapatch
```



Datapatch Rollback Scripts

Apply/rollback scripts:

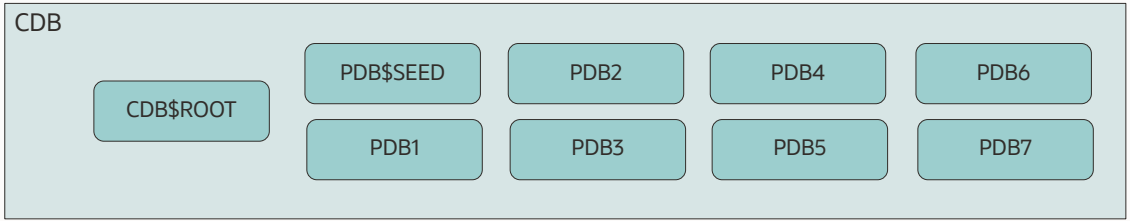
```
$ORACLE_HOME/sqlpatch/.../nnn_apply.sql
$ORACLE_HOME/sqlpatch/.../nnn_rollback.sql
```

Rollback scripts (zipped as BLOB):

```
SELECT  PATCH_DIRECTORY
FROM    REGISTRY$SQLPATCH_RU_INFO
```

(*) Datapatch stores rollback scripts for one-offs in `REGISTRY$SQLPATCH`

Multitenant



- Datapatch patches CDB$ROOT and PDB$SEED automatically
- 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`

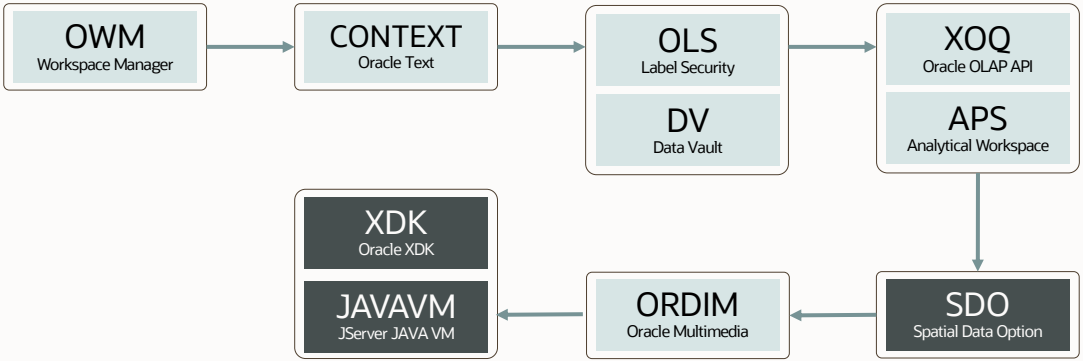
Unpatched PDBs will open in `RESTRICTED` mode only

- Database reports a missing patch apply as plug-in violation

Less installed components lead to faster patching

- Typical candidates: JAVAVM, SDO

Highest Impact



Update database directories using
`rdbms/admin/utlfixdirs.sql`

Patching in OCI

https://otube.oracle.com/media/DB%20Coffee%20Talk%20-%20BaseDB%20OS_GI_DB%20Maintenance%20(08-13-24)/1_w5g4hi3c

Summary

Upgrade to Oracle Database 19c

Always patch out-of-place

Apply Data Pump Bundle Patch

Keep DB and GI patch level in sync

Remove OJVM if not in use

Apply patches regularly

Use out-of-place patching with a brand-new Oracle Home

Less components, faster patching

Avoid downtime with RAC Rolling Patching

Significantly speed up patching using Distributed Patching

Apply Release Updates and MRPs

Always use the latest OPatch

Complete a rolling patch as soon as possible

Use Fleet Patching & Provisioning

Use OPatch to remove inactive patches

`STARTUP UPGRADE` not needed for patching

Comply with Maximum Availability Architecture

Recompile invalid objects before invoking datapatch

Thank You