AutoUpgrade Patching and Other Cool Features

May Oracle ACE Product Overview

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Oracle

DBAs

run the world

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Find Slides and Much More on Our Blogs

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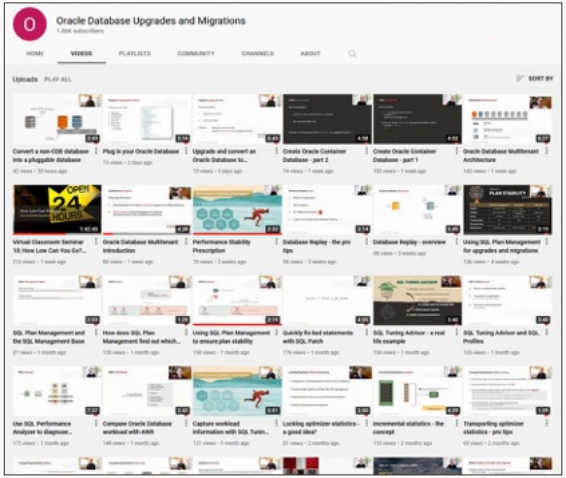
Web Seminar	Slides
Episode 16 (replaces Episode 1 from Feb 2021) Oracle Database Release and Patching Strategy for 19c and 23c *115 minutes – May 10, 2023*	
Episode 17 From SR to Patch – Insights into the Oracle Database Development process *55 minutes – June 22, 2023*	
NEW Episode 18 Cross Platform Migration – Transportable Tablespaces to the Extreme *145 min – February 22, 2024*	
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	

Recorded Web Seminars

https://MikeDietrichDE.com/videos

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

YouTube | Oracle Database Upgrades and Migrations



https://www.youtube.com/@upgradenow

- 300+ videos
- New videos every week
- No marketing
- No buzzword
- All tech

SCAN ME

AutoUpgrade

AutoUpgrade is the only supported tool to upgrade your Oracle Database

- DBUA is desupported

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

build.version 25.2.250427
build.date 2025/04/27 08:43:22 +0000
build.hash 4fe41545e
build.hash_date 2025/04/14 17:13:01 +0000
build.supported_target_versions 12.2,18,19,21,23
build.type production
build.label (HEAD, tag: v25.1)
build.MOS_NOTE 2485457.1
build.MOS_LINK https://support.oracle.com/.../?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
```

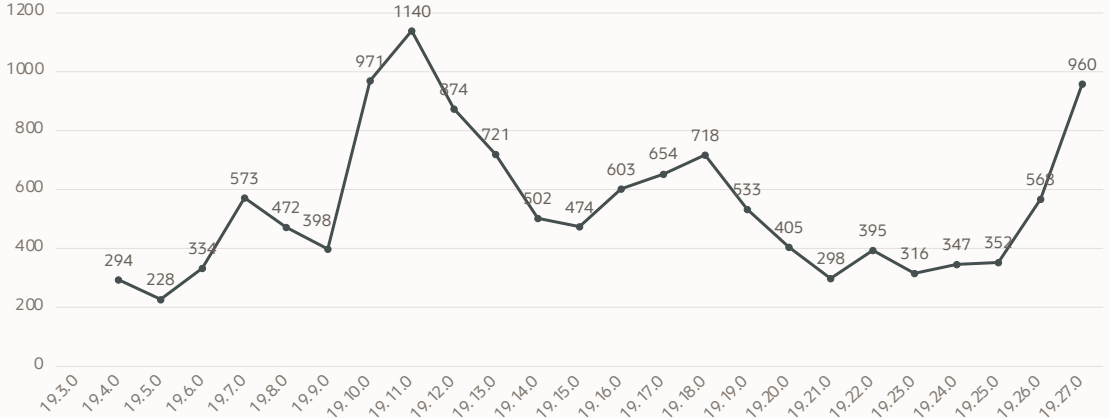

Patching

Question

How often do you patch your Oracle environments?

- [ ] Every quarter
- [ ] Twice per year
- [ ] Once per year
- [ ] Never

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

- More than 13k fixes with 19.27.0
- Almost 700 security fixes

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_26_0
patch1.target_home=/u01/app/oracle/product/19/dbhome_19_27_0
patch1.sid=DB19
```


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

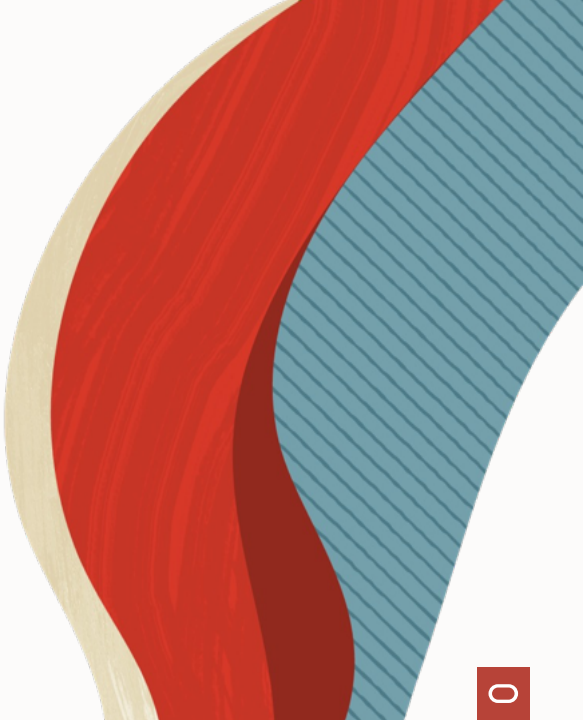
```
$ cat do_it_all.cfg

global.keystore=/home/oracle/autoupgrade-patching/keystore
patch1.source_home=/u01/app/oracle/product/19/dbhome_19_26_0
patch1.target_home=/u01/app/oracle/product/19/dbhome_19_27_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_26_0
patch1.target_home=/u01/app/oracle/product/19/dbhome_19_27_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

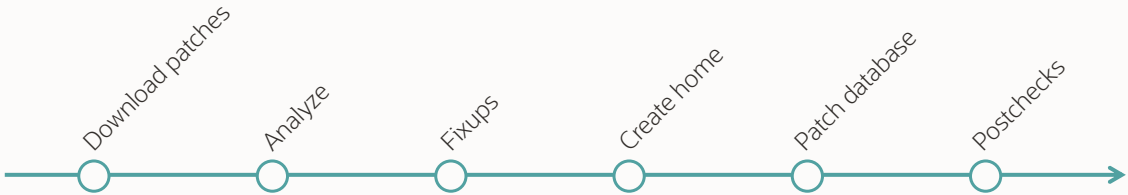
One-Button Patching

- Download patches
- Install Oracle home
- Patch database



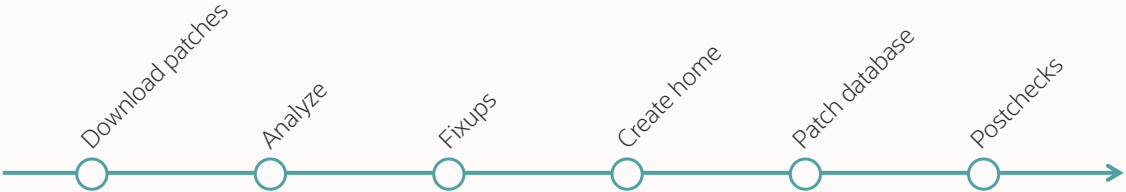
Watch on YouTube

AutoUpgrade Patching




```
-mode deploy
```

AutoUpgrade Patching

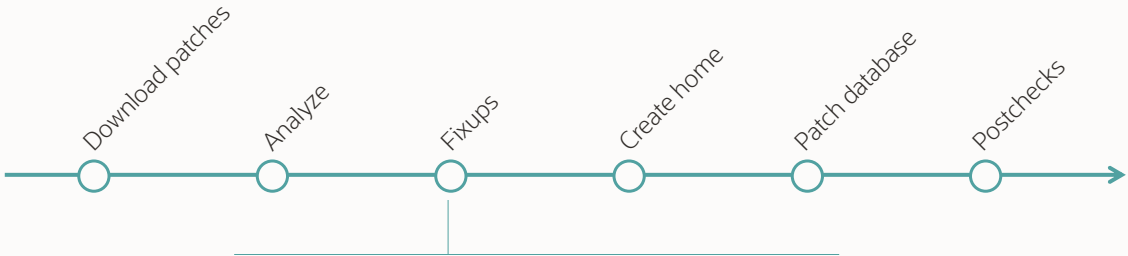


- Finds and downloads patches
- Uses your MOS credentials
- Chooses the right platform
- Stores patches in local repository

AutoUpgrade Patching

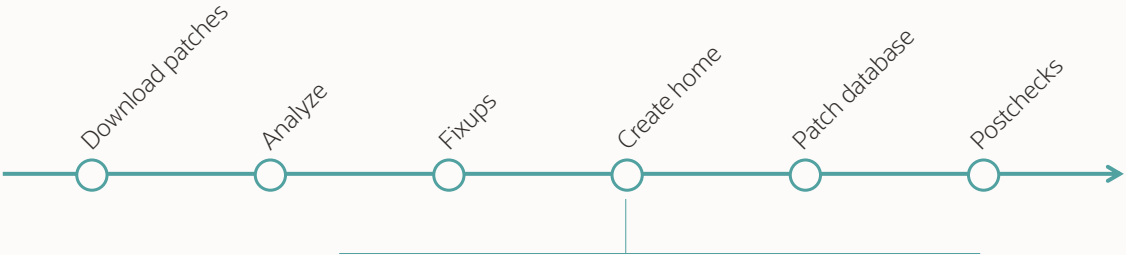
- Analyzes database for patch readiness
- Datapatch Sanity Checks
- Lightweight
- Non-intrusive
- Recommended, not required

AutoUpgrade Patching



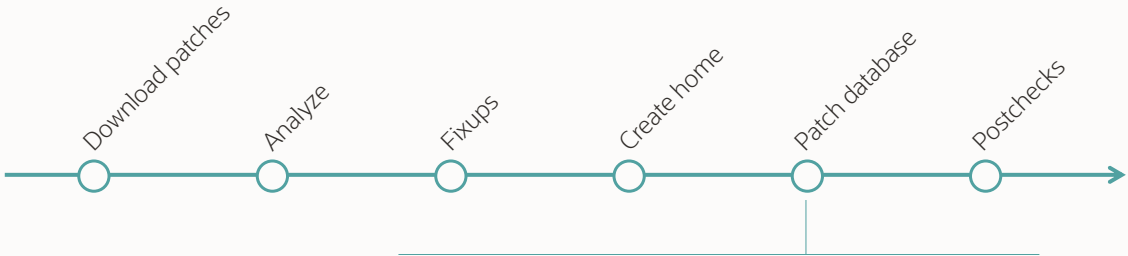
- Gathers dictionary statistics if needed
- Recompiles Oracle-maintained objects if needed
- Executes checks - see Doc ID 2380601.1

AutoUpgrade Patching



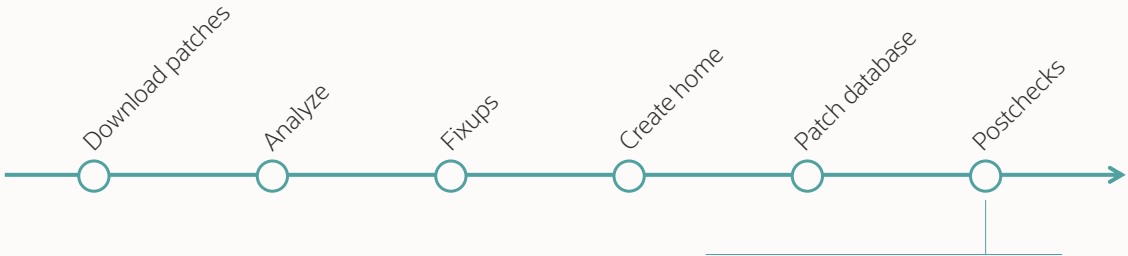
- Out-of-place patching
- Creates a brand-new Oracle home
- Uses *runInstaller settings* and binary options from source Oracle home
- Execute `root.sh` via sudo or stored credentials

AutoUpgrade Patching

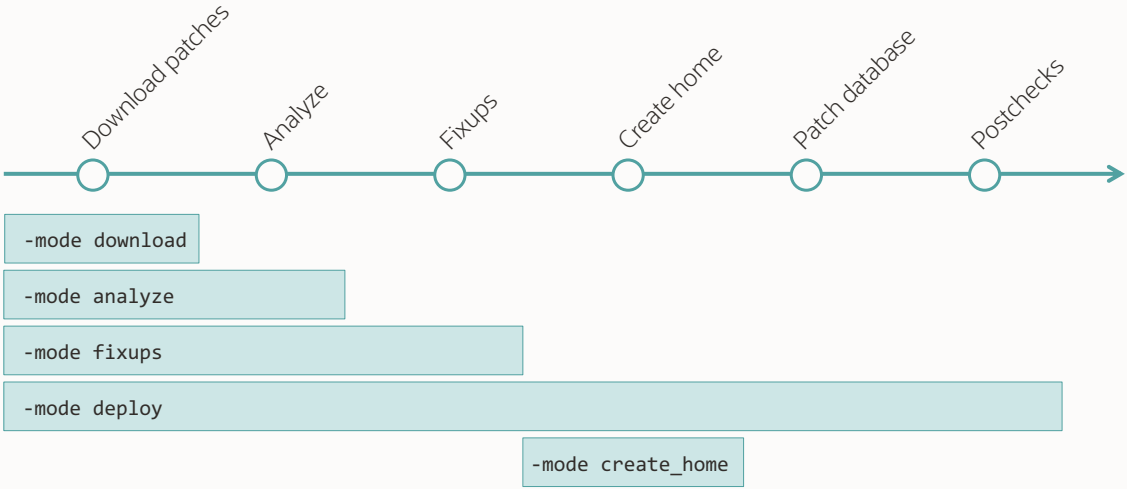


- Moves database instance to new Oracle home
- Moves configuration files
- Executes Datapatch
- Updates system directories (`utlfixdirs.sql`)
- Updates `/etc/oratab`
- Supports read-only Oracle home

AutoUpgrade Patching



Patching Modes



Requirements

Current Requirements

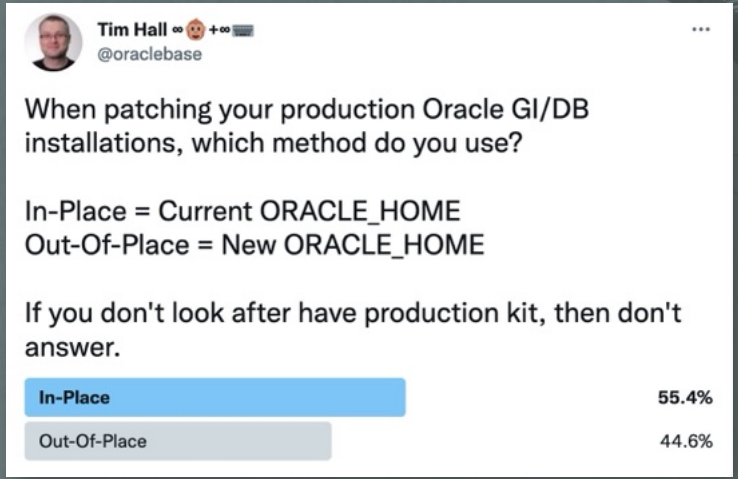
Single instance

Oracle Database 19c

Always download the latest version of AutoUpgrade

- My Oracle Support Doc ID 2485457.1

Patching



AutoUpgrade patches out-of-place

Which patches should you install?

```
global.keystore=/home/oracle/autoupgrade-patching/keystore
patch1.source_home=/u01/app/oracle/product/19/dbhome_19_26_0
patch1.target_home=/u01/app/oracle/product/19/dbhome_19_27_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 MRPs

- Get patch number from Primary Note for Database Quarterly Release Updates (Doc ID 888.1)

Primary Note for Database Quarterly Release Updates (Doc ID 888.1)

APPLIES TO:

Oracle Database - Standard Edition - Version 11.2.0.4 and later
Oracle Cloud Infrastructure - Exadata Cloud Service
Gen 1 Exadata Cloud at Customer (Oracle Exadata Database Cloud Machine)
Gen 2 Exadata Cloud at Customer
Oracle Database Cloud Exadata Service
Information in this document applies to any platform.

PURPOSE

The purpose of this document is to list Database patches for both proactive and reactive maintenance.

SCOPE

This document will be of interest to the DBA and to those responsible for proactive and reactive maintenance of the Oracle Database.

DETAILS

Please note that this document is maintained outside of the standard KM authoring system. Changes made directly to this document may be inadvertently overwritten when the document is next refreshed from outside of the standard KM authoring system. Rather than implementing changes to this document using the standard KM authoring system, please enter a comment as usual, and notify the document owner.[This section is not visible to customers.]

```
$ cat DB19.cfg

global.keystore=/home/oracle/autoupgrade-patching/keystore
patch1.source_home=/u01/app/oracle/product/19/dbhome_19_26_0
patch1.target_home=/u01/app/oracle/product/19/dbhome_19_27_0
patch1.sid=DB19
patch1.folder=/home/oracle/autoupgrade-patching/patch
patch1.patch=RECOMMENDED,37546431
```

```
$ cat DB19.cfg

global.keystore=/home/oracle/autoupgrade-patching/keystore
patch1.source_home=/u01/app/oracle/product/19/dbhome_19_25_0
patch1.target_home=/u01/app/oracle/product/19/dbhome_19_26_0
patch1.sid=DB19
patch1.folder=/home/oracle/autoupgrade-patching/patch
patch1.patch=RECOMMENDED,37546431
patch1.patch=RECOMMENDED,MRP
```

You can also add specific one-off fixes

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

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_26_0
patch1.target_home=/u01/app/oracle/product/19/dbhome_19_27_0
patch1.sid=DB19
patch1.folder=/home/oracle/autoupgrade-patching/patch
patch1.patch=RECOMMENDED,36006910,36908826,35398148,36916250,
36273767,34672698,34774667,29213893
```

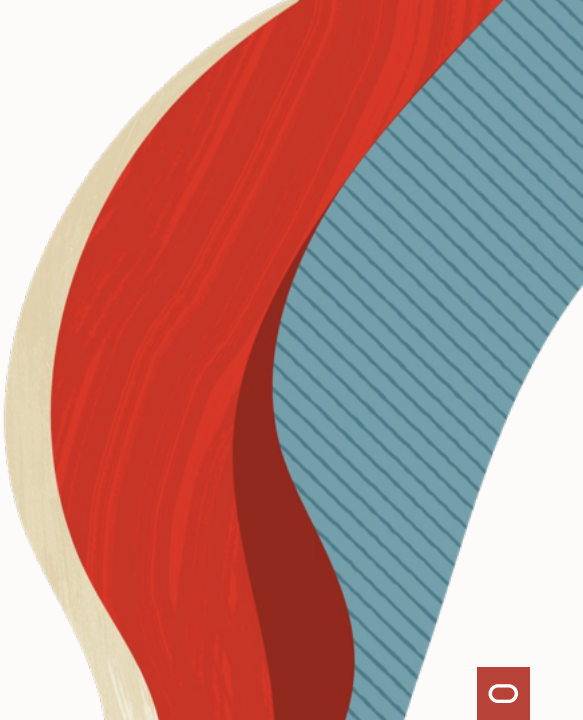
```
$ cat DB19.cfg

global.keystore=/home/oracle/autoupgrade-patching/keystore
patch1.source_home=/u01/app/oracle/product/19/dbhome_19_26_0
patch1.target_home=/u01/app/oracle/product/19/dbhome_19_27_0
patch1.sid=DB19
patch1.folder=/home/oracle/autoupgrade-patching/patch
patch1.patch=RECOMMENDED,OCW
```

Demo

Applying recommended patches

- Specifying patches
- Patch database

Watch on YouTube



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.*`

Keystore

AutoUpgrade stores MOS credentials in a keystore

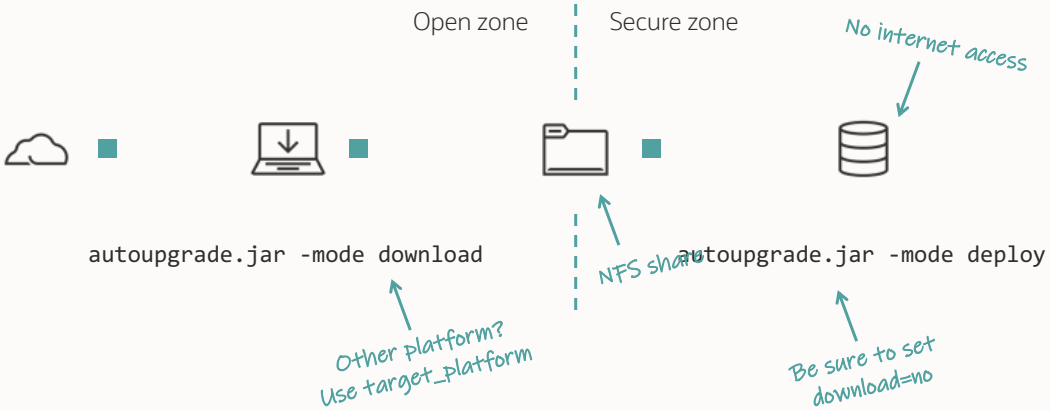
- Config file parameter: `global.keystore`
- Governs directory of AutoUpgrade keystore
- Password protected software keystore
- Optionally, an auto-open keystore
- No additional license needed

```
$ 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



```
$ cat download.cfg

global.keystore=c:\oracle\autoupgrade\keystore
global.patch=RU:19.27,OPATCH,OJVM,DPBP,OCW
```

```
$ cat download.cfg

global.keystore=c:\oracle\autoupgrade\keystore
global.patch=RU:19.27,OPATCH,OJVM,DPBP,OCW

patch1.platform=LINUX.X64
patch1.folder=f:\nfs\oracle\patches
patch1.target_home=c:\tmp\dummy_patch1
```


```
$ cat download.cfg

global.keystore=c:\oracle\autoupgrade\keystore
global.patch=RU:19.27,OPATCH,OJVM,DPBP,OCW

patch1.platform=LINUX.X64
patch1.folder=f:\nfs\oracle\patches
patch1.target_home=c:\tmp\dummy_patch1

patch2.platform=SPARC.x64
patch2.folder=f:\nfs\oracle\patches
patch2.target_home=c:\tmp\dummy_patch2
```

In The Plans

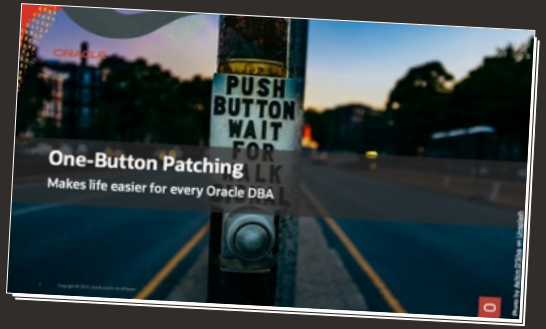
We're working to support

- Oracle Database 23ai
- Cloning Oracle homes
- Gold images
- RAC databases

Webinar

One-Button Patching

Makes life easier for every Oracle DBA



Recording on YouTube
Get the slides

Hands-on Lab

Patch Me If You Can

It's better to fail in our lab, than in production

Access lab on Oracle Live Labs

New Features

```
--Upgrade RMAN catalog after upgrade
--https://dohdatabase.com/autoupgrade-new-features-upgrade-rman-catalog-schema

$ cat CDB1.cfg

upg1.source_home=/u01/app/oracle/product/19/dbhome_19_26_0
upg1.target_home=/u01/app/oracle/product/13/dbhome_23_7_0
upg1.sid=CDB1
upg1.rman_catalog_connect_string=catalogdb
```

```
--Update OEM configuration after upgrade
--https://dohdatabase.com/autoupgrade-new-features-update-enterprise-manager-configuration

$ cat CDB1.cfg

upg1.source_home=/u01/app/oracle/product/19/dbhome_19_26_0
upg1.target_home=/u01/app/oracle/product/13/dbhome_23_7_0
upg1.sid=CDB1
upg1.upg1.emcli_path=/u01/app/oracle/oem
upg1.em_target_name=ORCL_myhost.domain.int
```

Share Your Experiences

1. Are you using AutoUpgrade?
2. Share your recent success
3. What could make it even better?

Data Pump Top Tips

Supercharge data loading/unloading

Speed up imports by using NOVALIDATE constraints

A Constraint Can Be

VALIDATED

All data in the table obeys the constraint.
The database guarantees that data is good.

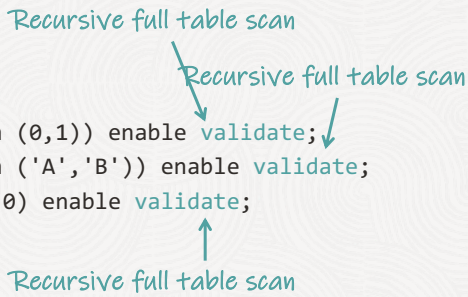
NOT VALIDATED

All data in the table may obey the constraint.
The database does not know if data is good.

Most constraints are VALIDATED

On import, Data Pump creates constraints in the same state as in the source

```
--Example of which commands Data Pump import might execute as part of an import

create table sales ( .... );

insert into sales as select ... ;

alter table sales add constraint c_sales_1 check (c1 in (0,1)) enable validate;
alter table sales add constraint c_sales_2 check (c2 in ('A','B')) enable validate;
alter table sales add constraint c_sales_3 check (c3 > 0) enable validate;
```



```
-- Add constraints with NOVALIDATE keyword regardless of state in source database
-- Significantly speeds up add constraints for larger tables

impdp ... transform=constraint_novalidate
```


```
--Transforming constraints to NOVALIDATE to speed up import

alter table sales add constraint c_sales_1 check (c1 in (0,1)) enable novalidate;
alter table sales add constraint c_sales_2 check (c2 in ('A','B')) enable novalidate;
alter table sales add constraint c_sales_3 check (c3 > 0) enable novalidate;
```

```
--Transforming constraints to NOVALIDATE to speed up import

alter table sales add constraint c_sales_1 check (c1 in (0,1)) enable novalidate;
alter table sales add constraint c_sales_2 check (c2 in ('A','B')) enable novalidate;
alter table sales add constraint c_sales_3 check (c3 > 0) enable novalidate;
```

Database validates new rows

Benchmark, 1 billion rows

Importing VALIDATE constraints

```
10-AUG-24 00:32:28.716: W-1 Processing object type TABLE_EXPORT/TABLE/TABLE_DATA
10-AUG-24 00:36:42.762: W-1 . . imported "FUSION"."hwr_topic_tl" 151.2 GB 1044625000 rows in 254 seconds using external_table
10-AUG-24 00:45:41.226: W-1 Processing object type TABLE_EXPORT/TABLE/CONSTRAINT/CONSTRAINT
10-AUG-24 00:55:35.787: W-1      Completed 7 CONSTRAINT objects in 594 seconds
```

Importing NOVALIDATE constraints

```
10-AUG-24 00:14:56.050: W-1 Processing object type TABLE_EXPORT/TABLE/TABLE_DATA
10-AUG-24 00:19:10.311: W-1 . . imported "FUSION"."hwr_topic_tl" 151.2 GB 1044625000 rows in 254 seconds using external_table
10-AUG-24 00:29:20.841: W-1 Processing object type TABLE_EXPORT/TABLE/CONSTRAINT/CONSTRAINT
10-AUG-24 00:29:21.101: W-1      Completed 7 CONSTRAINT objects in 1 seconds
```

NOVALIDATE constraints prevent the optimizer from certain query rewrites

- Check `QUERY_REWRITE_INTEGRITY`

Validate constraints after import, or even after go-live

- Still requires a full scan of the table
- But can use parallel query
- And no table lock!

Exceptions

Data Pump always validates certain constraints:

1. On `DEFAULT ON NULL` columns
2. Used by a reference partitioned table
3. Used by a reference partitioned child table
4. Table with Primary key OID
5. Used as clustering key on a clustered table

Use with care if
you are transforming data on import

Also available in Oracle Database 19c via 19.23.0 Data Pump Bundle Patch

- Plus patch 37280692 - or be on 19.27

Even faster index imports

Use index size to determine parallel degree on index creation

- Requires 23.8 and Data Pump Bundle Patch

Index Creation

```
impdp ... parallel=16
```

Really good for few big indexes

Before 12.1

Worker 1 `CREATE INDEX .... PARALLEL 16`

Index Creation

```
impdp ... parallel=16
```

From 12.1

Worker 1	`CREATE INDEX .... PARALLEL 1`
Worker 2	`CREATE INDEX .... PARALLEL 1`
...	`CREATE INDEX .... PARALLEL 1`
Worker 16	`CREATE INDEX .... PARALLEL 1`

Index Creation

```
impdp ... parallel=16
```

From 23

The best of both worlds

Worker 1	`CREATE INDEX .... PARALLEL 1`
Worker 2	`CREATE INDEX .... PARALLEL 8`
Worker 3	`CREATE INDEX .... PARALLEL 4`
Worker 4	`CREATE INDEX .... PARALLEL 3`

How Data Pump Create Indexes

1. Calculate the optimal parallel degree
2. Create indexes

How Data Pump Create Indexes

1 Calculate the optimal parallel degree

- Always parallel 1 when a table is less than 150 MB
- Customizable via `INDEX_THRESHOLD`
- Get optimal parallel degree using `EXPLAIN PLAN`

```
SQL> explain plan for create index i1 on t1(c1) parallel;

Explained.
```


```
SQL> explain plan for create index i1 on t1(c1) parallel;

Explained.

SQL> select * from table(dbms_xplan.display(format => 'ALL'));

...

Note
-----
   - automatic DOP: Computed Degree of Parallelism is 4 because of degree limit
   - estimated index size: 655K bytes
```

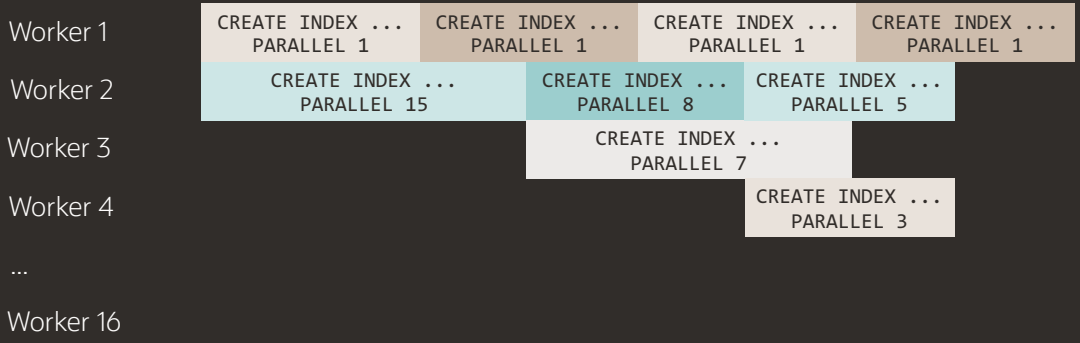

How Data Pump Creates Indexes

2 Create indexes

- One worker creates small indexes (parallel 1) in large batches
- The next worker starts with the biggest index (measured by optimal parallel degree)

How Data Pump Creates Indexes

```
impdp ... parallel=16
```



Benchmark

Importing with former index method

```
10-MAY-25 16:18:55.130: W-12 Processing object type SCHEMA_EXPORT/TABLE/INDEX/INDEX
10-MAY-25 16:36:46.902: W-30      Completed 480 INDEX objects in 1071 seconds
```

Importing with new index method

```
10-MAY-25 15:47:50.267: W-4 Processing object type SCHEMA_EXPORT/TABLE/INDEX/INDEX
10-MAY-25 15:59:17.006: W-3      Completed 480 INDEX objects in 686 seconds
```


Also available in Oracle Database 19c
via 19.26.0 Data Pump Bundle Patch

Share Your Experiences

1. Share your recent success
2. We're looking for Data Pump users
3. Help us improve Data Pump

Thank You