ORACLE

AutoUpgrade Deep Dive

Upgrade to Oracle Database 19c

Mike Dietrich

Distinguished Product Manager

Database Upgrade and Migrations

Daniel Overby Hansen

Senior Principal Product Manager

Database Cloud Migrations

Photo by M K on Unsplash

Mike Dietrich

Distinguished Product Manager
Database Upgrade and Migrations

https://MikeDietrichDE.com
MikeDietrich
@MikeDietrichDE

Daniel Overby Hansen

Senior Principal Product Manager
Database Cloud Migrations

https://dohdatabase.com
dohdatabase
@dohdatabase

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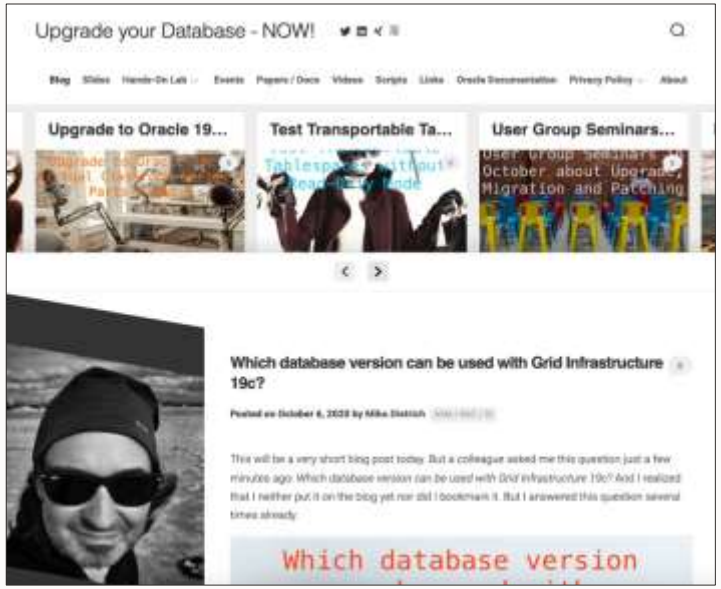
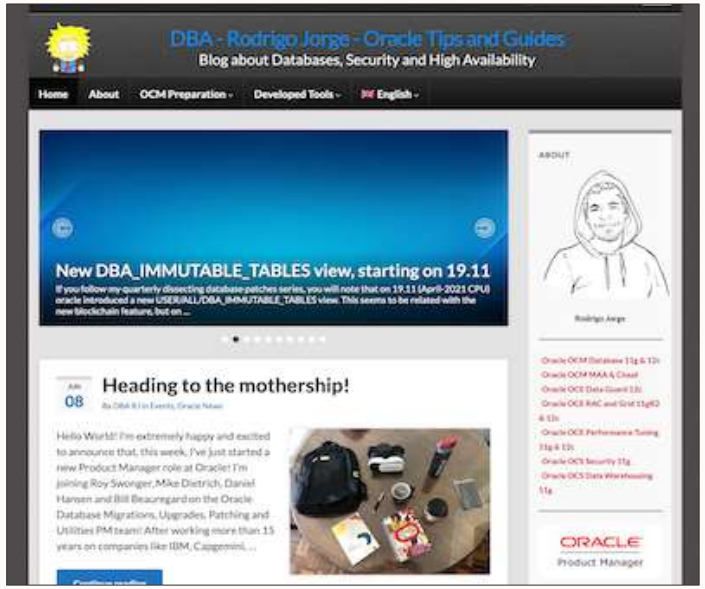


https://www.dbarj.com.br/en



https://DOHdatabase.com

NEW Episode 1

Release and Patching Strategy

105 minutes – Feb 4, 2021

NEW Episode 2

AutoUpgrade to Oracle Database 19c

115 minutes – Feb 20, 2021

NEW Episode 3

Performance Stability, Tips and Tricks and Underscores

120 minutes – Mar 4, 2021

NEW Episode 4

Migration to Oracle Multitenant

120 minutes – Mar 16, 2021

NEW Seminar 5

Migration Strategies – Insights, Tips and Secrets

120 minutes – Mar 25, 2021

NEW Seminar 6

Move to the Cloud – Not only for techies

115 minutes – Apr 8, 2021

NEW Episode 7

Cool Features – Not only for DBAs

110 minutes – Jan 14, 2021

NEW Episode 8

Database Upgrade Internals – and so much more

Recorded Web Seminars

https://MikeDietrichDE.com/videos/

https://dohdatabase.com/webinars/

Chapter 1
Release and Patching Strategy

Photo by Reid Naaykens on Unsplash

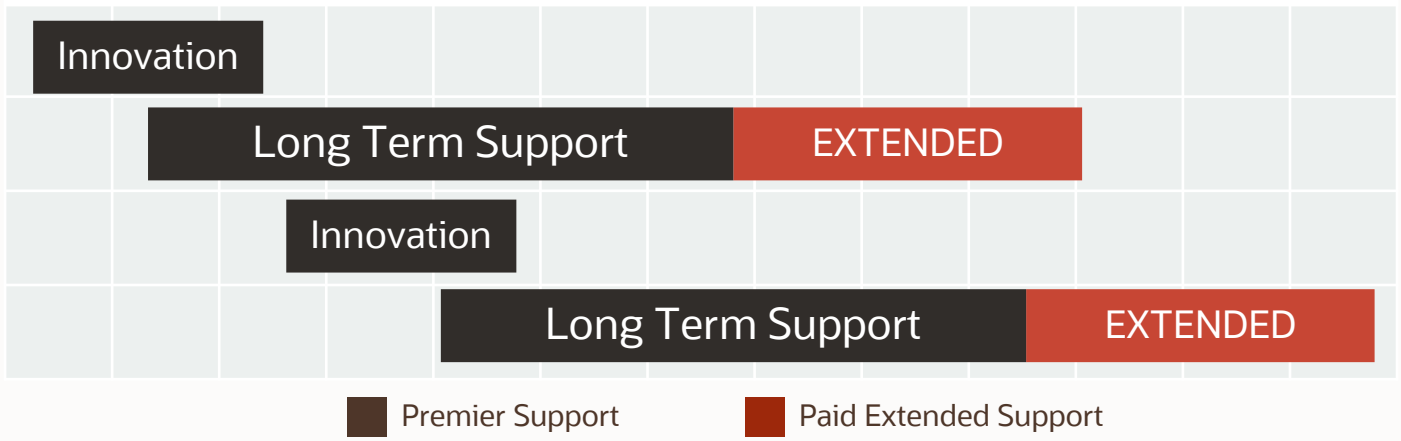
Release Types | Long Term Support vs Innovation Releases

Long Term Support Release

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

Innovation Release

- 2 years of Premier Support, but there is no Extended Support

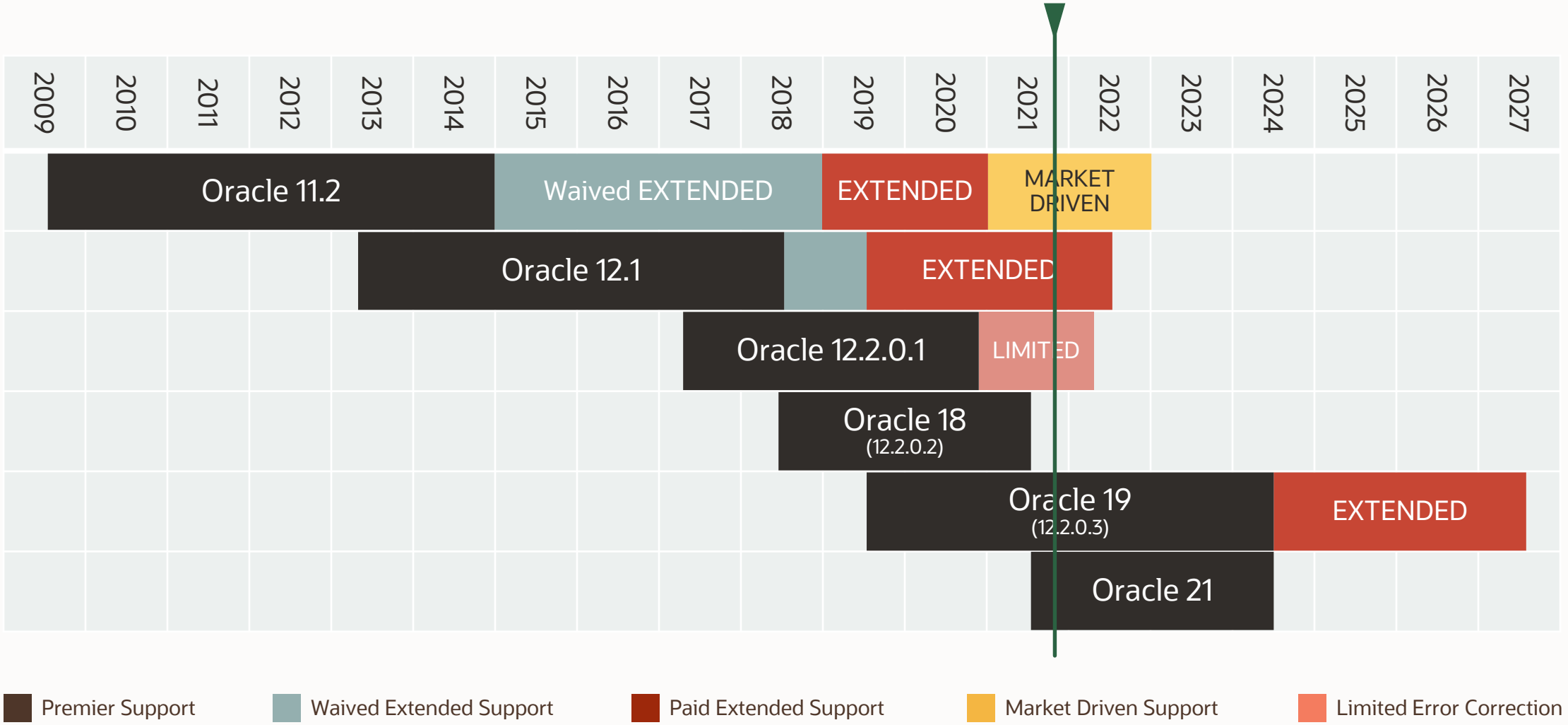


Recommendation: Production environments should go from LTS to LTS

Release Types | Long Term vs Innovation

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

Lifetime Support Policy

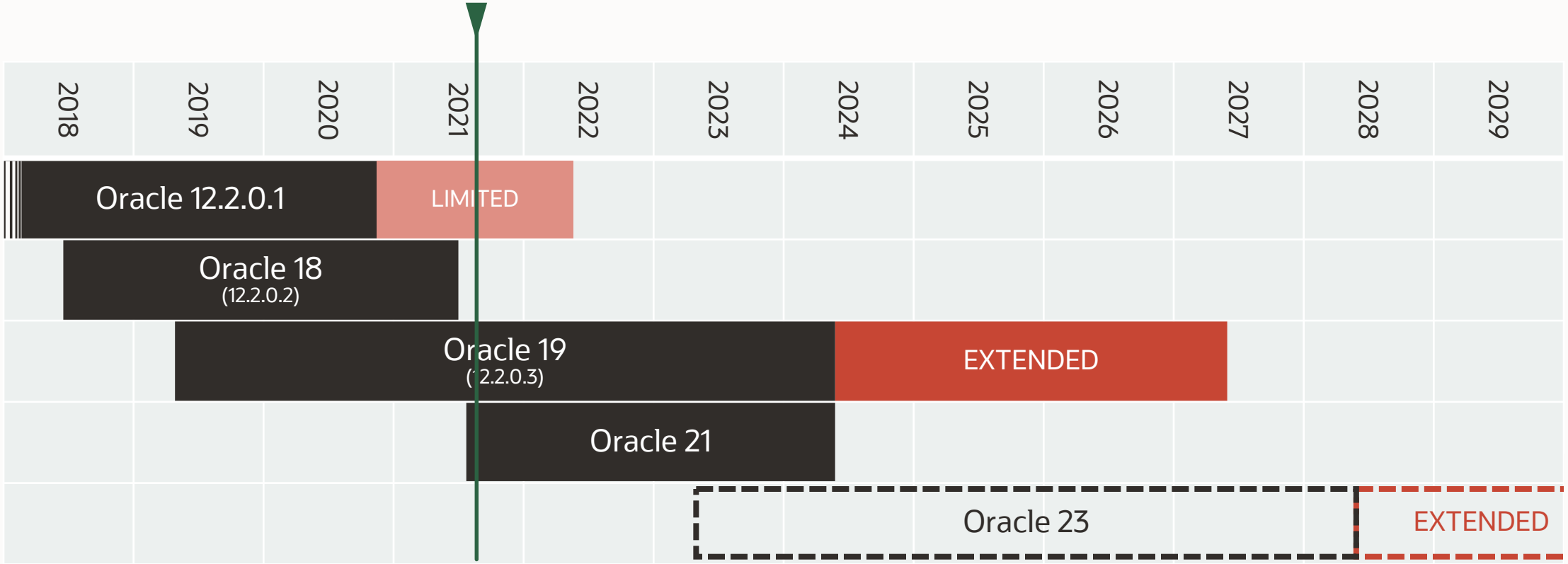


Lifetime Support Policy

Different Support Periods

Premier Support	Bug fixing support regardless of severity
Paid Extended Support	Extra cost extension, 10% / 20% extra cost Included in ULA/PULA contracts
Waived Extended Support	Extended support gets waived to everybody having a valid Support contract for the product
Market Driven Support	Extra cost extension after Extended Support Fixes done only for critical and security issues
Limited Error Correction	Extension for Oracle 12.2.0.1 at no extra cost Only applicable for Sev.1 and security issues
Sustaining Support	Oracle Support assists as long as the customer is using the product – but no new fixes will be delivered

Oracle Database 12.2 and beyond



- MOS Note:742060.1 - The Single Source of Truth
- MOS Note:161818.1 - Releases Support Status Summary

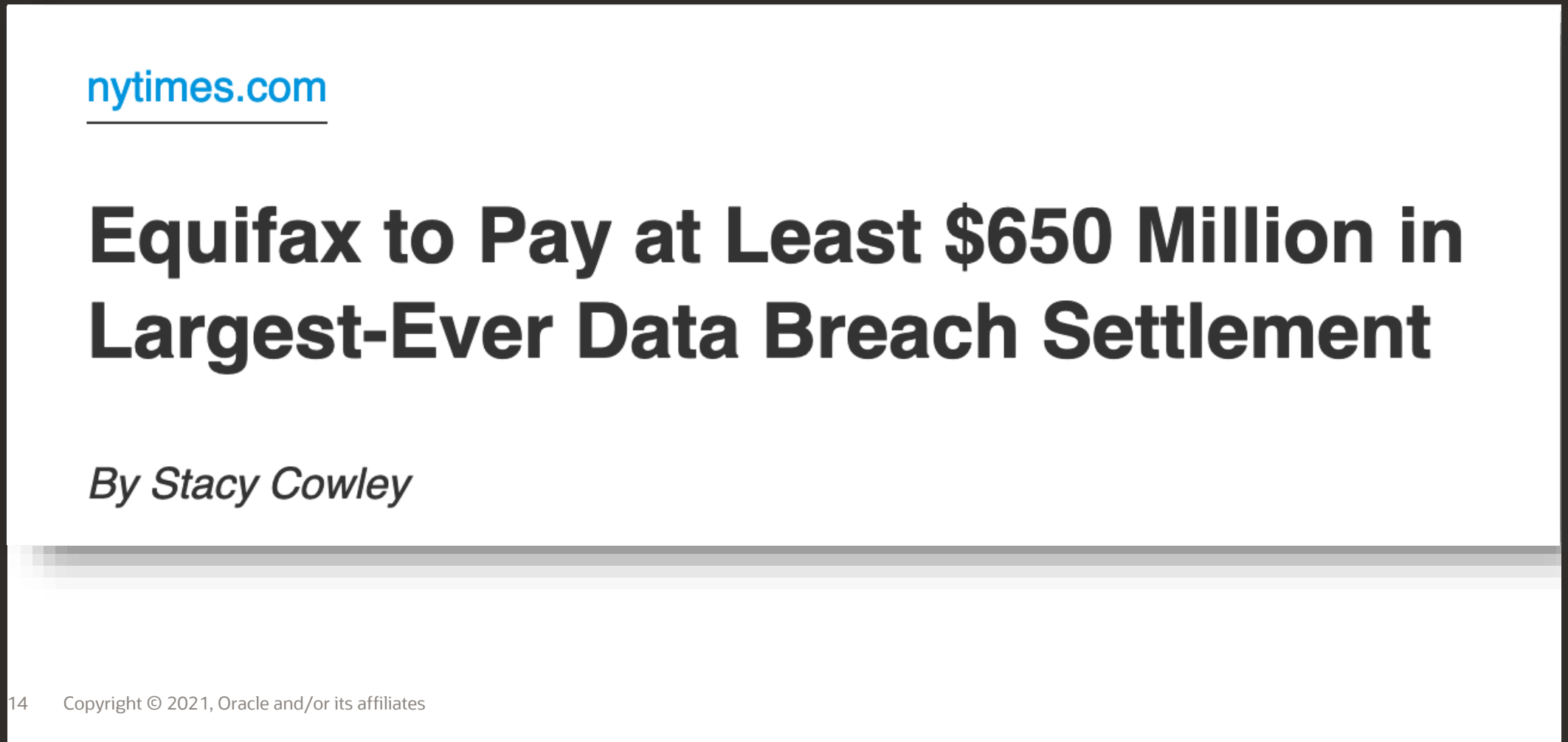
Photo by Jose Fontano on Unsplash

Security

The most important reason to upgrade and patch

Security | Do We Really Need To Say This?

Source: https://www.nytimes.com/2019/07/22/business/equifax-settlement.html?module=inline



"My database is not facing the internet"

Photo by Ben White on Unsplash

92%

of malware gets
delivered via email

Photo by Clint Patterson on Unsplash

Check | OJVM

Is OJVM installed?

```
Select comp_id, comp_name, version from DBA_REGISTRY order by 1;
```

COMP_ID	COMP_NAME	VERSION
CATALOG	Oracle Database Catalog Views	19.13.0.0.0
CATJAVA	Oracle Database Java Packages	19.13.0.0.0
CATPROC	Oracle Database Packages and Types	19.13.0.0.0
JAVAVM	JServer JAVA Virtual Machine	19.13.0.0.0
OLS	Oracle Label Security	19.13.0.0.0
ORDIM	Oracle Multimedia	19.13.0.0.0
OWM	Oracle Workspace Manager	19.13.0.0.0
XDB	Oracle XML Database	19.13.0.0.0
XML	Oracle XDK	19.13.0.0.0

Oracle Java Virtual Machine | OJVM

OJVM Security Fixes in Quarterly Patches: ⌀ 7.9

Chapter 2
Upgrade to Oracle Database 19c

Photo by SpaceX on Unsplash

your key to

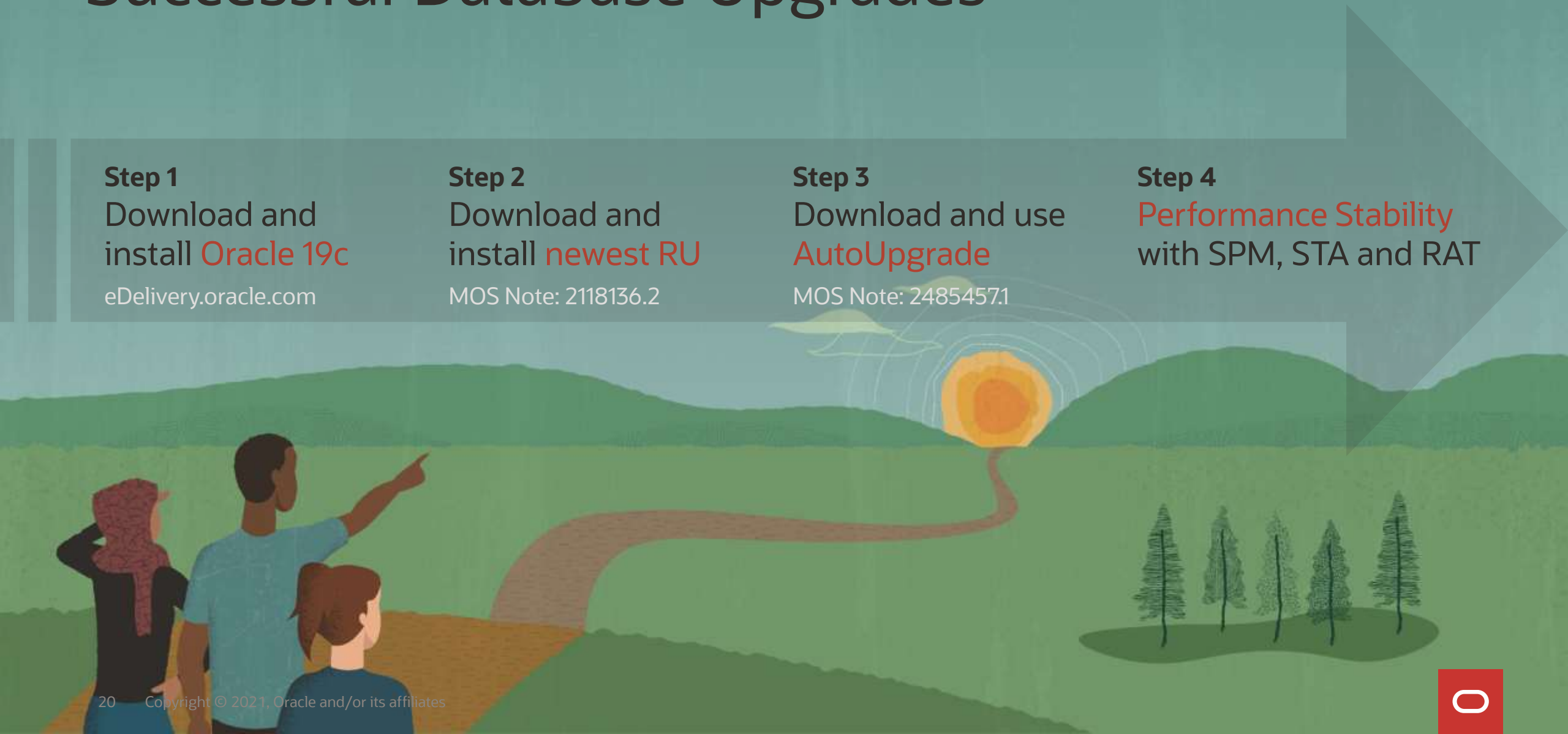
Successful Database Upgrades

Step 1
Download and install Oracle 19c
eDelivery.oracle.com

Step 2
Download and install newest RU
MOS Note: 2118136.2

Step 3
Download and use AutoUpgrade
MOS Note: 24854571

Step 4
Performance Stability with SPM, STA and RAT



your key to

Successful Database Upgrades

Step 4

Performance Stability

with SPM, STA and RAT

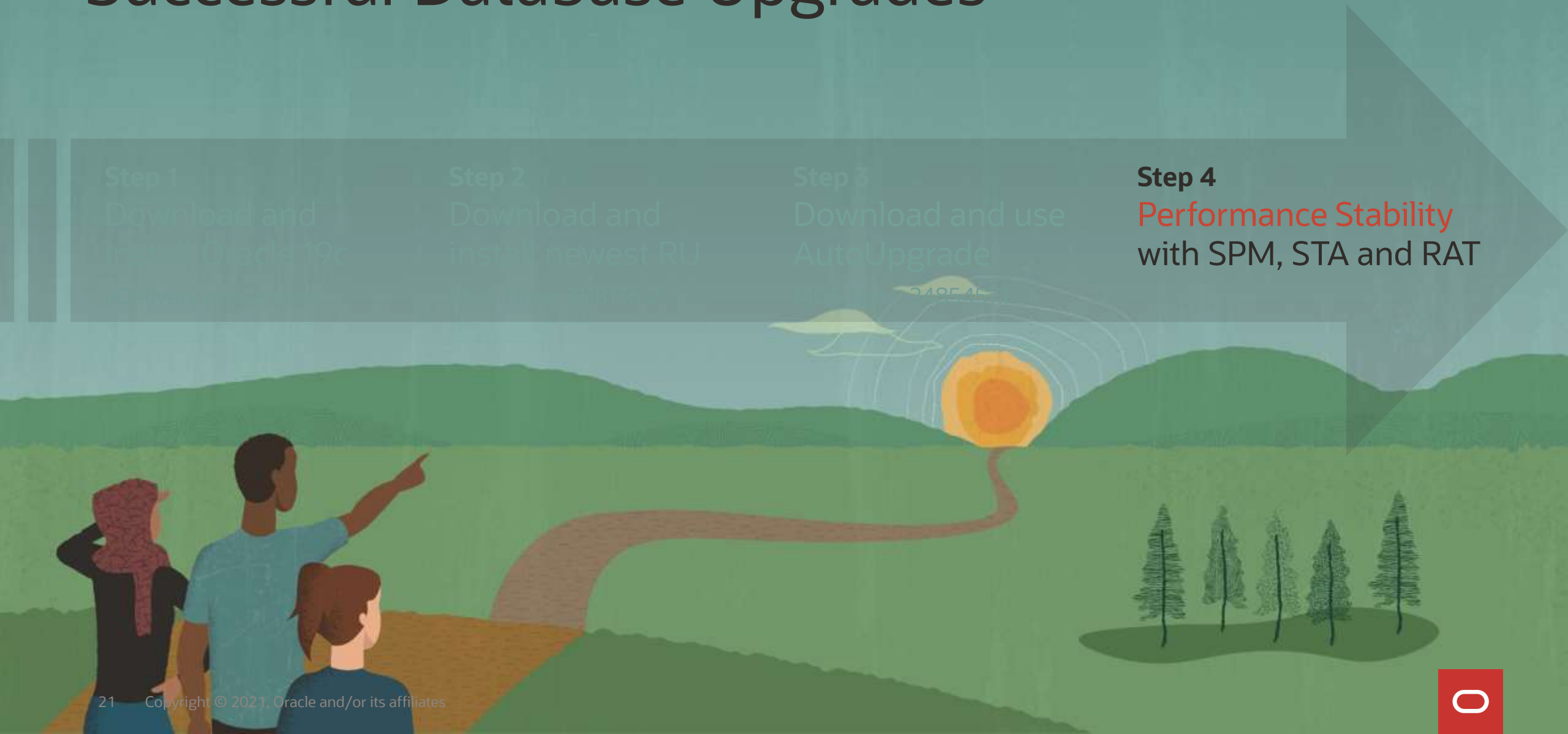
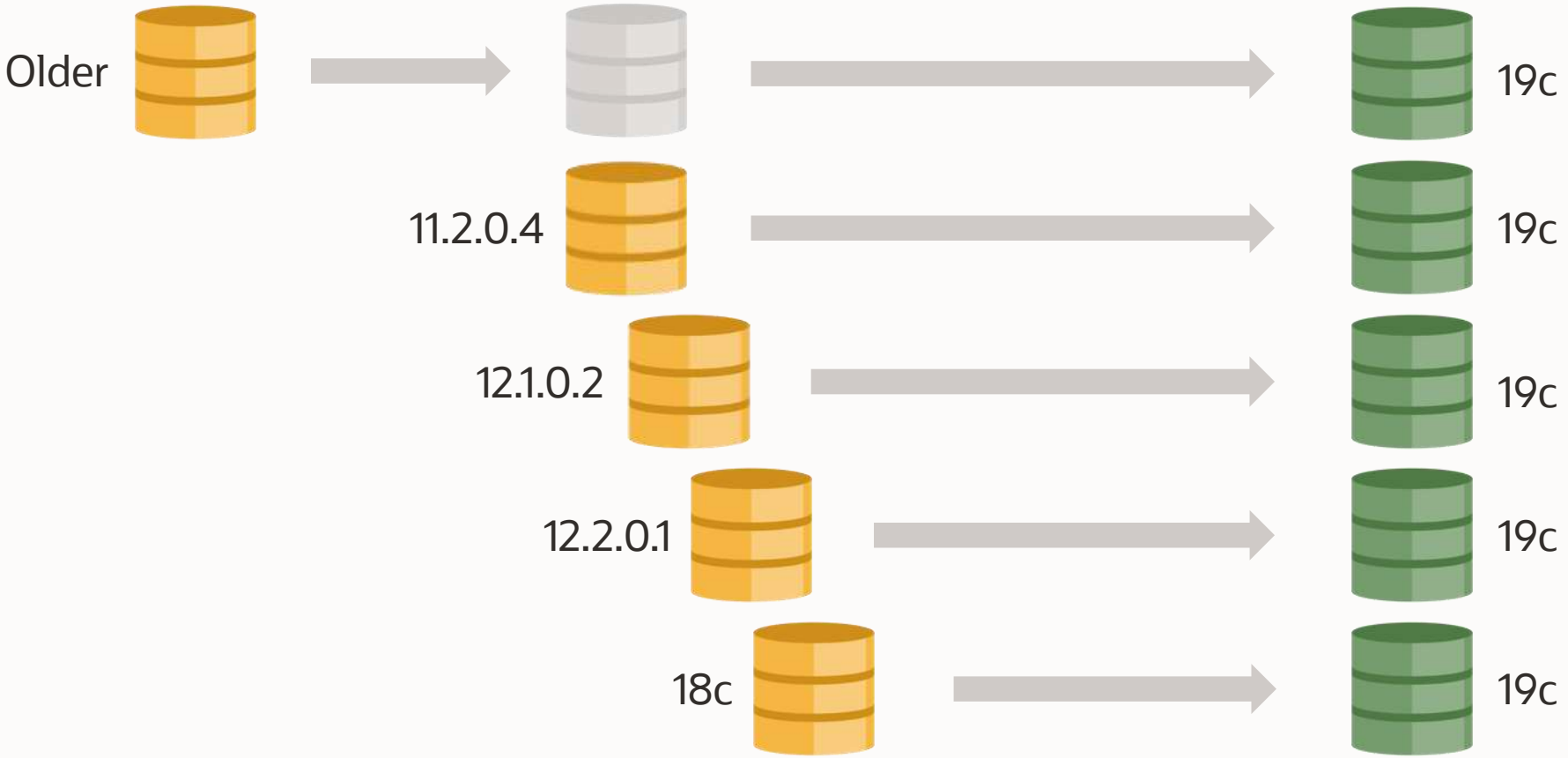


Photo by Diego PH on Unsplash

Check

Before Upgrade

Database Upgrade | Supported Releases



Upgrade 19c | Speed it up

Save time by gathering statistics in advance

Upgrade 19c | Speed it up

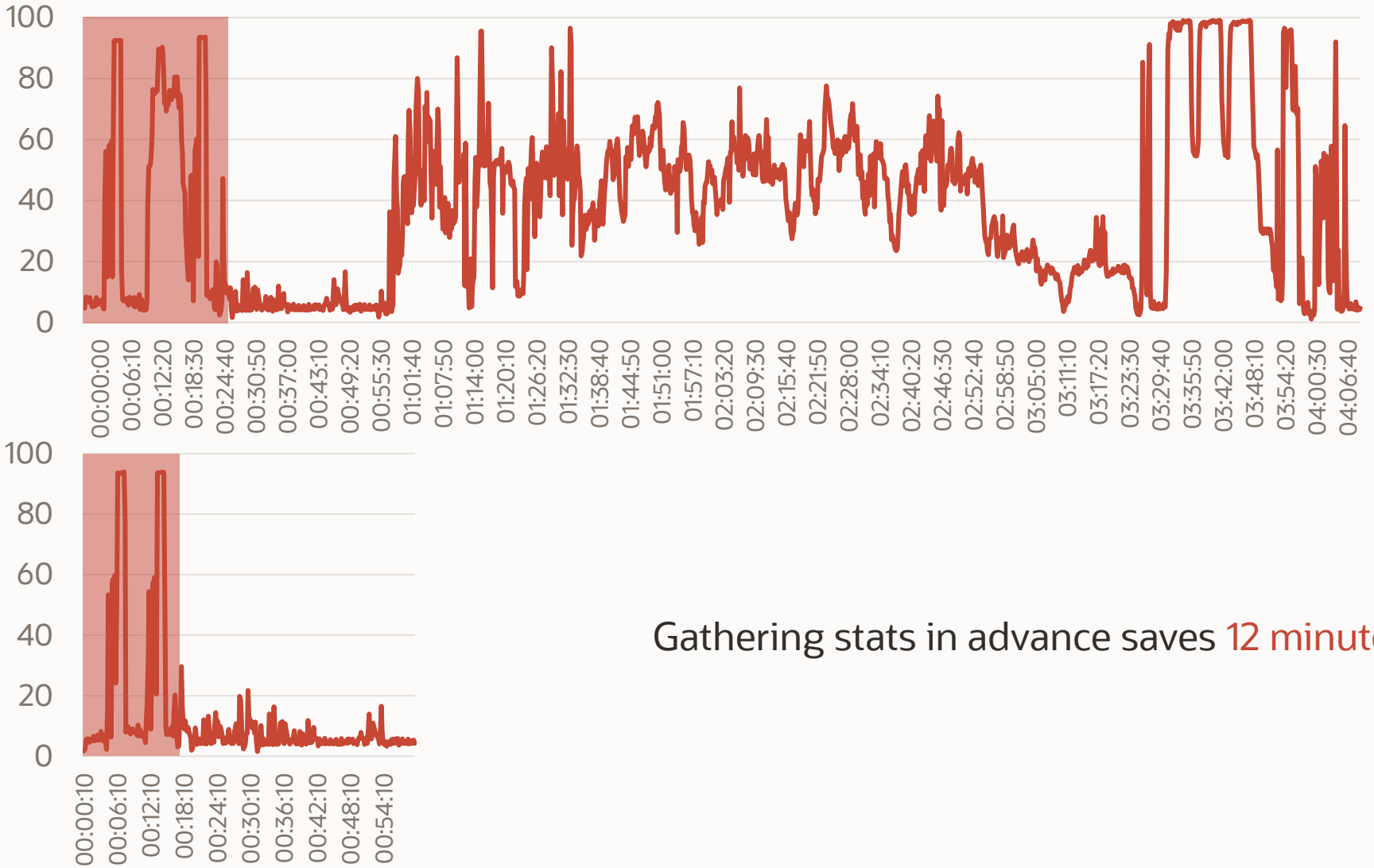
Non-CDB or PDB

```
SQL> begin
        dbms_stats.gather_schema_stats('SYS');
        dbms_stats.gather_schema_stats('SYSTEM');
end;
/
```

Entire CDB

```
$ORACLE_HOME/perl/bin/perl $ORACLE_HOME/rdbms/admin/catcon.pl \
  -l /tmp \
  -b gatherstats -- \
  --x"begin dbms_stats.gather_schema_stats('SYS');
dbms_stats.gather_schema_stats('SYSTEM'); end;"
```


Upgrade 19c | Gather Stats In Advance



Gathering stats in advance saves 12 minutes

Health Check | hcheck.sql

If your database is highly important, do a health check

- Lightweight, non-intrusive script
- Checks consistency of selected dictionary relationships
- [hcheck.sql - Script to Check for Known Problems (Doc ID 136697.1)]

```
SQL> @/tmp/hcheck
H.Check Version 4.4 on 01-MAR-2018 23:46:27
----------------------------------------
Catalog Version 11.2.0.4.0 (1102000400)
db_name: UPGR

                                Catalog       Fixed
Procedure Name                  Version    Vs Release    Timestamp
Result
------------------------------ ... ---------- -- ---------- --------------
------
.- LobNotInObj                 ... 1102000400 <=  *All Rel* 03/01 23:46:27 PASS
.- MissingOIDOnObjCol          ... 1102000400 <=  *All Rel* 03/01 23:46:27 PASS
.- SourceNotInObj              ... 1102000400 <=  *All Rel* 03/01 23:46:27 FAIL

HCKE-0003: SOURCE$ for OBJ# not in OBJ$ (Doc ID 1360233.1)
SOURCE$ has 4 rows for 1 OBJ# values not in OBJ$

.- OversizedFiles              ... 1102000400 <=  *All Rel* 03/01 23:46:27 PASS
```

Photo by Joshua Sortino on Unsplash

AutoUpgrade

The ONLY recommended way to upgrade databases

AutoUpgrade Essentials

Photo by Daniel Cheung on Unsplash

AutoUpgrade | Essentials

Download

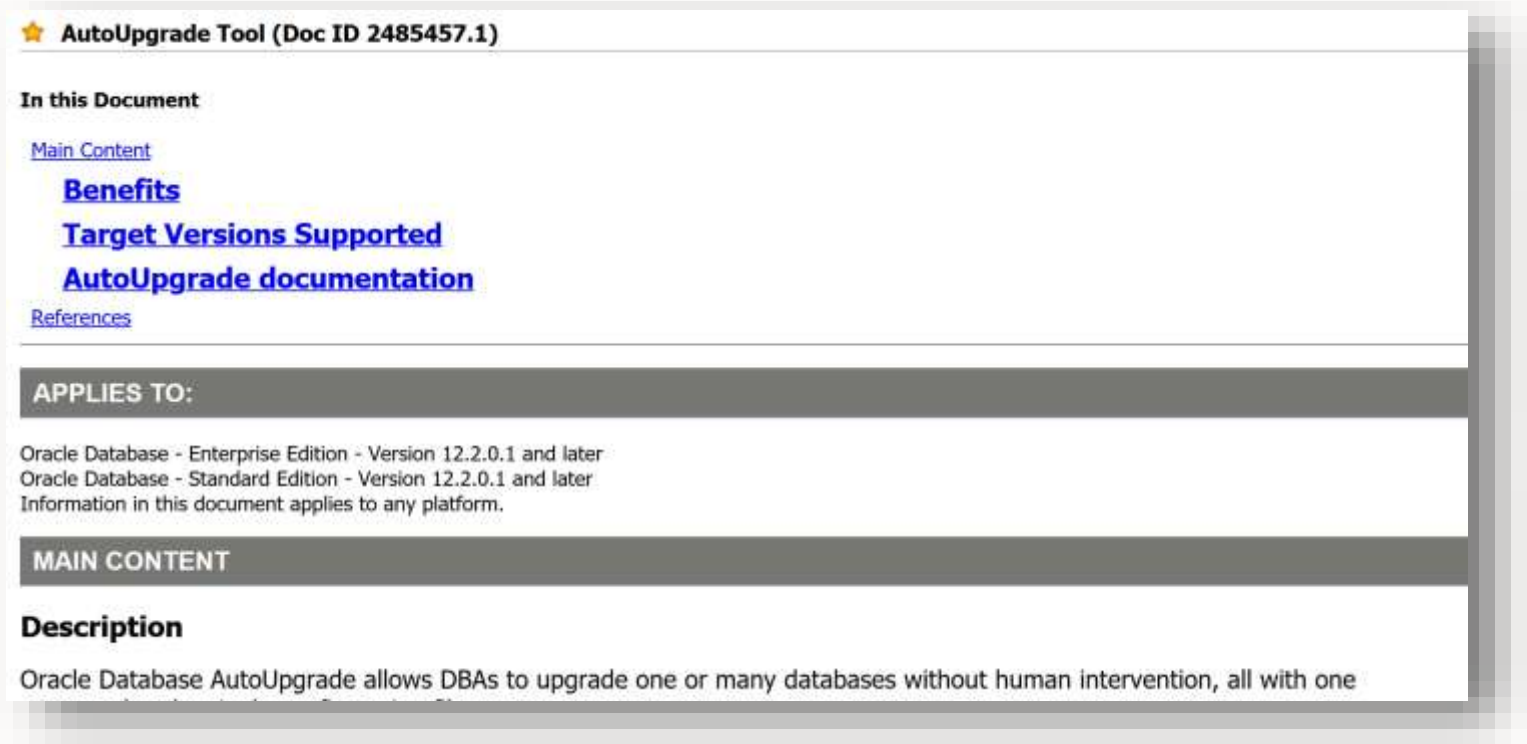
Configure

Analyze

Check

Upgrade

Always download latest version from MOS



AutoUpgrade Tool (Doc ID 2485457.1)

In this Document

Main Content

Benefits

Target Versions Supported

AutoUpgrade documentation

References

APPLIES TO:

Oracle Database - Enterprise Edition - Version 12.2.0.1 and later
Oracle Database - Standard Edition - Version 12.2.0.1 and later
Information in this document applies to any platform.

MAIN CONTENT

Description

Oracle Database AutoUpgrade allows DBAs to upgrade one or many databases without human intervention, all with one

AutoUpgrade | Essentials

Download
Configure
Analyze
Check
Upgrade

Check your version

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

build.version 21.2.210721
build.hash 680914c
build.date 2021/07/21 11:14:54
build.max_target_version 21
build.supported_target_versions 12.2,18,19,21
build.type production
```

Compare to latest version on MOS

Download

The most recent version of AutoUpgrade can be downloaded via this link: version 20210721.

AutoUpgrade | Essentials

Download

Configure

Analyze

Check

Upgrade

AutoUpgrade handles older releases as well

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

build.version 21.2.210721
build.hash 680914c
build.date 2021/07/21 11:14:54
build.max_target_version 21
build.supported_target_versions 12.2,18,19,21
```

AutoUpgrade | Essentials

- Download
- **Configure**
- Analyze
- Check
- Upgrade

Shortest possible config file version

```
upg1.source_home=/u01/app/oracle/product/12.2.0.1
upg1.target_home=/u01/app/oracle/product/19
upg1.sid=CDB1
```

Or, generate a sample config file

```
$ java -jar autoupgrade.jar -create_sample_file config

Created sample configuration file /home/oracle/sample_config.cfg
```

Pro tip: *upg1* is a prefix that you decide. Use it to define multiple databases

AutoUpgrade | Essentials

- Download
- Configure
- **Analyze**
- Check
- Upgrade

Analyze your database

```
$ java -jar autoupgrade.jar -config CDB1.cfg -mode analyze

...

upg> Job 100 completed

Please check the summary report at:
/u01/app/oracle/cfgtoollogs/autoupgrade/cfgtoollogs/upgrade/auto/status/status.html
/u01/app/oracle/cfgtoollogs/autoupgrade/cfgtoollogs/upgrade/auto/status/status.log
```

Pro tip: Analyze is similar to running `preupgrade.jar`

AutoUpgrade | Essentials

- Download
- Configure
- Analyze
- **Check**
- Upgrade

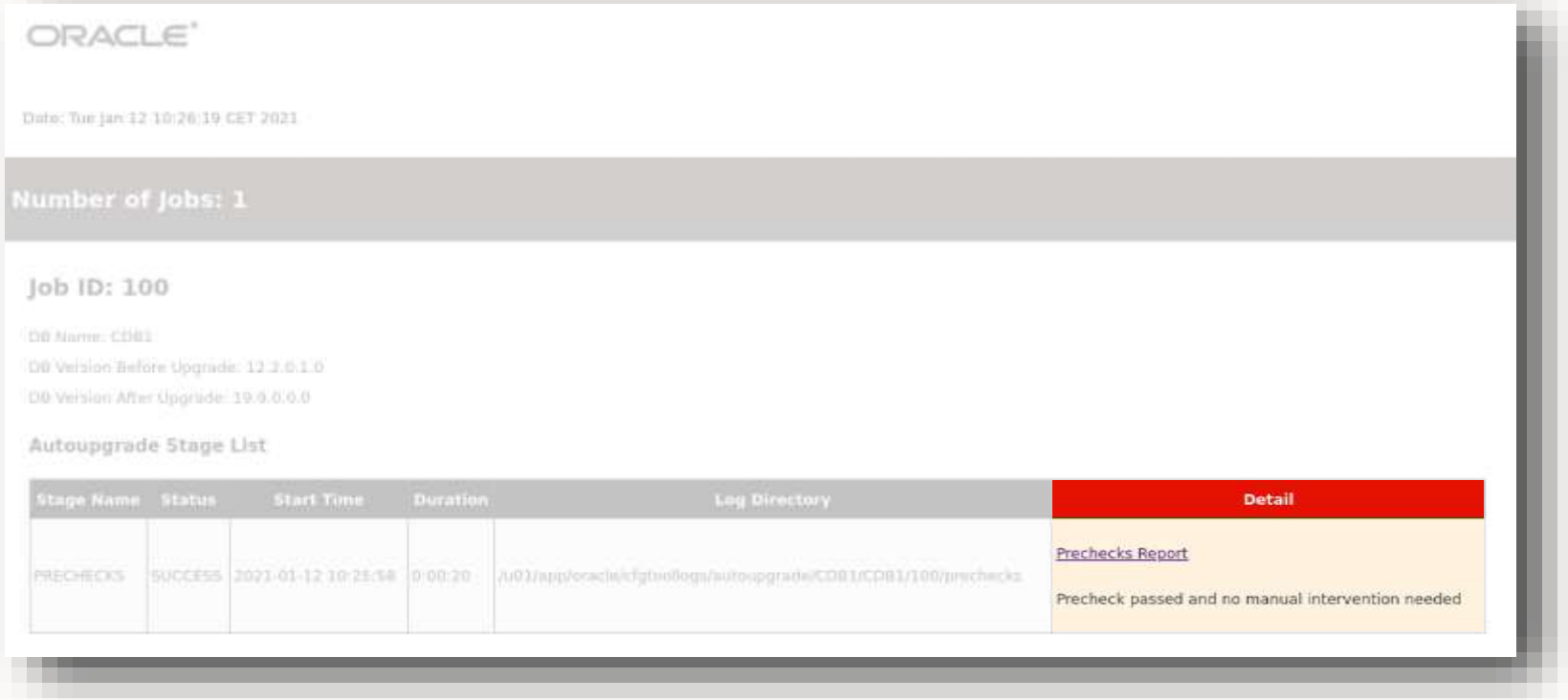
Summary report - text

```
=============================================
          Autoupgrade Summary Report
=============================================
[Date]           Tue Jan 12 10:26:19 CET 2021
[Number of Jobs] 1
=============================================
[Job ID] 100
=============================================
[DB Name]                   CDB1
[Version Before Upgrade]  12.2.0.1.0
[Version After Upgrade]   19.9.0.0.0
---------------------------------------------
[Stage Name]    PRECHECKS
[Status]        SUCCESS
[Start Time]    2021-01-12 10:25:58
[Duration]      0:00:20
[Log Directory] /u01/app/oracle/upg/CDB1/100/prechecks
[Detail]        /u01/app/oracle/upg/CDB1/100/prechecks/cdb1_preupgrade.log
                Precheck passed and no manual intervention needed
---------------------------------------------
```

AutoUpgrade | Essentials

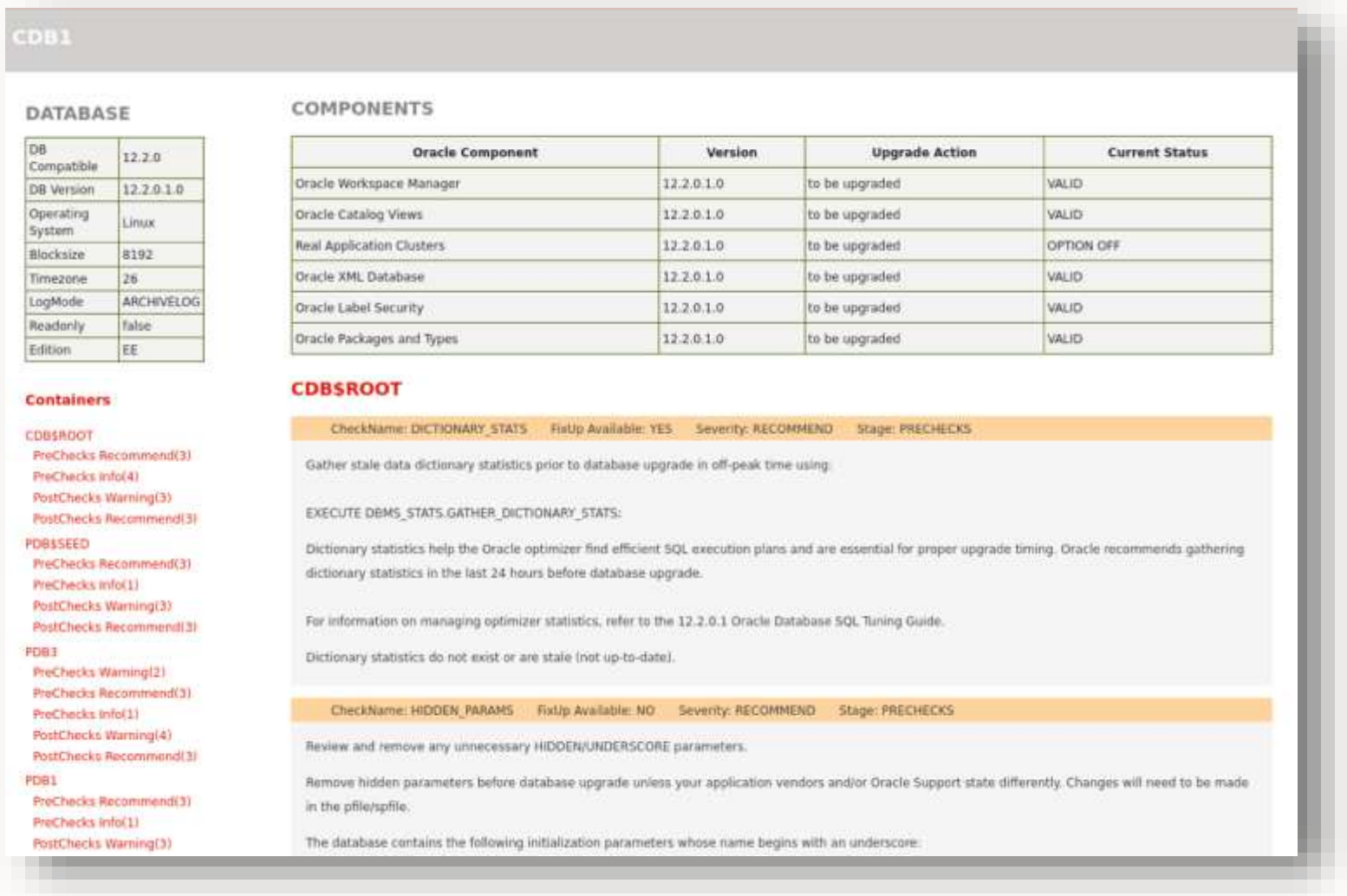
- Download
- Configure
- Analyze
- **Check**
- Upgrade

Summary report - HTML



AutoUpgrade | Essentials

- Download
- Configure
- Analyze
- **Check**
- Upgrade



CDB1

DATABASE

DB Compatible	12.2.0
DB Version	12.2.0.1.0
Operating System	Linux
Blocksize	8192
Timezone	26
LogMode	ARCHIVELOG
Readonly	false
Edition	EE

Containers

CDB$ROOT
PreChecks Recommend(3)
PreChecks Info(4)
PostChecks Warning(3)
PostChecks Recommend(3)
PDB$SEED
PreChecks Recommend(3)
PreChecks Info(1)
PostChecks Warning(3)
PostChecks Recommend(3)
PDB3
PreChecks Warning(2)
PreChecks Recommend(3)
PreChecks Info(1)
PostChecks Warning(4)
PostChecks Recommend(3)
PDB1
PreChecks Recommend(3)
PreChecks Info(1)
PostChecks Warning(3)

COMPONENTS

Oracle Component	Version	Upgrade Action	Current Status
Oracle Workspace Manager	12.2.0.1.0	to be upgraded	VALID
Oracle Catalog Views	12.2.0.1.0	to be upgraded	VALID
Real Application Clusters	12.2.0.1.0	to be upgraded	OPTION OFF
Oracle XML Database	12.2.0.1.0	to be upgraded	VALID
Oracle Label Security	12.2.0.1.0	to be upgraded	VALID
Oracle Packages and Types	12.2.0.1.0	to be upgraded	VALID

CDB$ROOT

CheckName: DICTIONARY_STATS FixUp Available: YES Severity: RECOMMEND Stage: PRECHECKS

Gather stale data dictionary statistics prior to database upgrade in off-peak time using:

EXECUTE DBMS_STATS.GATHER_DICTIONARY_STATS;

Dictionary statistics help the Oracle optimizer find efficient SQL execution plans and are essential for proper upgrade timing. Oracle recommends gathering dictionary statistics in the last 24 hours before database upgrade.

For information on managing optimizer statistics, refer to the 12.2.0.1 Oracle Database SQL Tuning Guide.

Dictionary statistics do not exist or are stale (not up-to-date).

CheckName: HIDDEN_PARAMS FixUp Available: NO Severity: RECOMMEND Stage: PRECHECKS

Review and remove any unnecessary HIDDEN/UNDERSCORE parameters.

Remove hidden parameters before database upgrade unless your application vendors and/or Oracle Support state differently. Changes will need to be made in the pfile/spfile.

The database contains the following initialization parameters whose name begins with an underscore:

AutoUpgrade | Essentials

Download
Configure
Analyze
Check
Upgrade

Preupgrade report comes in:

- HTML
- Text
- JSON

AutoUpgrade | Essentials

- Download
- Configure
- Analyze
- Check
- **Upgrade**

Upgrade

```
$ java -jar autoupgrade.jar -config CDB1.cfg -mode deploy
```

Have a cup of coffee and wait, or ...

AutoUpgrade | Essentials

- Download
- Configure
- Analyze
- Check
- **Upgrade**

Monitor

```
upg> lsj

+----+-------+---------+---------+-------+--------------+--------+---------------+
|Job#|DB_NAME|    STAGE|OPERATION| STATUS|    START_TIME| UPDATED|        MESSAGE|
+----+-------+---------+---------+-------+--------------+--------+---------------+
| 101|   CDB1|PREFIXUPS|EXECUTING|RUNNING|20/11/24 13:38|13:39:26|Remaining 12/13|
+----+-------+---------+---------+-------+--------------+--------+---------------+
```

AutoUpgrade | Essentials

- Download
- Configure
- Analyze
- Check
- **Upgrade**

All the details

```
upg> status -job 101

Progress
-----------------------------------
Start time:      20/11/24 13:38
Elapsed (min):   13
Last update:     2020-11-24T13:48:52.139
Stage:           DBUPGRADE
Operation:       EXECUTING
Status:          RUNNING
Stage summary:
    SETUP             <1 min
    GRP               <1 min
    PREUPGRADE        <1 min
    PRECHECKS         <1 min
    PREFIXUPS         8 min
    DRAIN             <1 min
    DBUPGRADE         3 min (IN PROGRESS)

Job Logs Locations
-----------------------------------
Logs Base:    /home/oracle/autoupg_default/CDB1/CDB1
Job logs:     /home/oracle/autoupg_default/CDB1/CDB1/101
Stage logs:   /home/oracle/autoupg_default/CDB1/CDB1/101/dbupgrade
TimeZone:     /home/oracle/autoupg_default/CDB1/CDB1/temp
```

AutoUpgrade | Essentials

- Download
- Configure
- Analyze
- Check
- **Upgrade**

All the details - continued

```
...

Additional information
----------------------------------
Details:
[Upgrading] is [0%] completed for [cdb1-cdb$root]
                 +---------+---------------+
                 |CONTAINER|     PERCENTAGE|
                 +---------+---------------+
                 | CDB$ROOT|   UPGRADE[12%]|
                 | PDB$SEED|UPGRADE PENDING|
                 |     PDB3|UPGRADE PENDING|
                 +---------+---------------+

Error Details:
None
```

AutoUpgrade | Essentials

- Download
- Configure
- Analyze
- Check
- **Upgrade**

Success

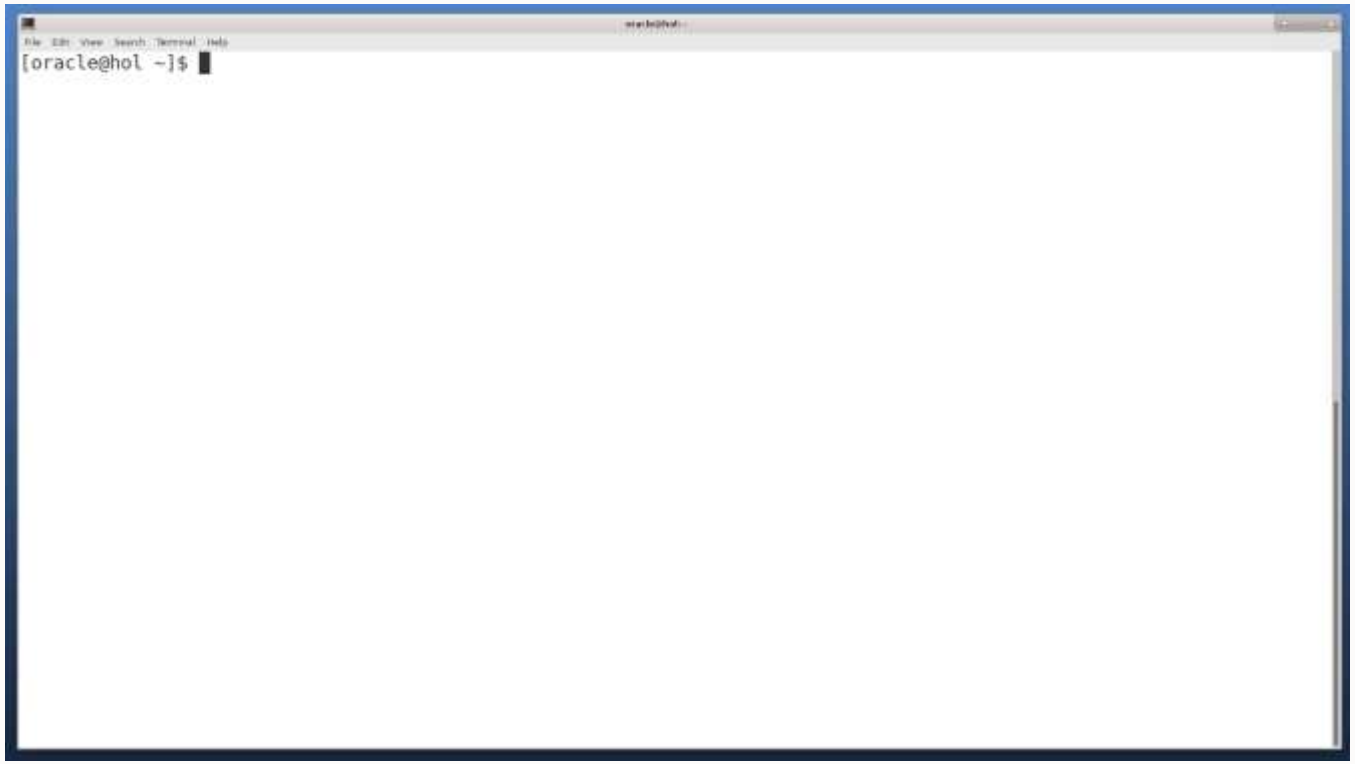
```
upg> Job 101 completed
------------------- Final Summary --------------------
Number of databases            [ 1 ]

Jobs finished successfully     [1]
Jobs failed                    [0]
Jobs pending                   [0]
------------- JOBS FINISHED SUCCESSFULLY -------------
Job 101 for CDB1

---- Drop GRP at your convenience once you consider it is no longer needed ----
Drop GRP from CDB1: drop restore point AUTOUPGRADE_9212_CDB1122010
```

And it includes:

- Recompilation (utlrp.sql)
- Time zone file upgrade
- Postupgrade fixups
- … and so much more

AutoUpgrade | Essentials

- Download
- Configure
- Analyze
- Check
- **Upgrade**



Watch on YouTube

AutoUpgrade | Essentials

One-liner using environment variables

```
export ORACLE_SID=CDB1
export ORACLE_HOME=/u01/app/oracle/12.2
export ORACLE_TARGET_HOME=/u01/app/oracle/19

java -jar autoupgrade.jar -config_values -mode analyze
```

One-liner using config_values

```
java -jar autoupgrade.jar \
   -config_values
"sid=CDB1,source_home=/u01/app/oracle/12.2,target_home=/u01/app/oracle/19" \
   -mode analyze
```

AutoUpgrade Advanced Options

Photo by Ciprian Boiciuc on Unsplash

AutoUpgrade | Advanced Options

Many Databases

- Different Servers
- PFILE
- Shell Scripts
- Restore Point
- Underscores
- Recompilation
- Time Zone
- Parallel
- Monitoring

Upgrade one or many databases

One

```
upg1.source_home=/u01/app/oracle/product/12.2.0.1
upg1.target_home=/u01/app/oracle/product/19
upg1.sid=CDB1
```

Many

```
upg1.source_home=/u01/app/oracle/product/12.2.0.1
upg1.target_home=/u01/app/oracle/product/19
upg1.sid=CDB1

upg2.source_home=/u01/app/oracle/product/11.2.0.4
upg2.target_home=/u01/app/oracle/product/19
upg2.sid=DB11204

...

upgn.source_home=/u01/app/oracle/product/12.1.0.2
upgn.target_home=/u01/app/oracle/product/19
upgn.sid=HR
```

Pro tip: You can also start multiple instances of AutoUpgrade at the same time

AutoUpgrade | Advanced Options

- Many Databases
- **Different Servers**
- PFILE
- Shell Scripts
- Restore Point
- Underscores
- Recompilation
- Time Zone
- Parallel
- Monitoring

Upgrade only when `upgrade_node` matches hostname

```
upg1.source_home=/u01/app/oracle/product/12.2.0.1
upg1.target_home=/u01/app/oracle/product/19
upg1.upgrade_node=test_server01.mycorp.net
upg1.sid=CDB1

upg2.source_home=/u01/app/oracle/product/12.2.0.1
upg2.target_home=/u01/app/oracle/product/19
upg2.upgrade_node=prod_server01.mycorp.net
upg2.sid=CDB2
```

- Database `upg1` will only be upgraded when AutoUpgrade gets executed on server `test_server01.mycorp.net`

AutoUpgrade | Advanced Options

Many Databases
Different Servers
PFILE
Shell Scripts
Restore Point
Underscores
Recompilation
Time Zone
Parallel
Monitoring

Update initialization parameters as part of the upgrade

You can:

- Add or remove parameters
- Before, during or after upgrade
- For a single or every database

AutoUpgrade | Advanced Options

- Many Databases
- Different Servers
- **PFILE**
- Shell Scripts
- Restore Point
- Underscores
- Recompilation
- Time Zone
- Parallel
- Monitoring

Remove a parameter during a specific upgrade

```
upg1.del_during_upgrade_pfile=/home/oracle/global_del_during.ora
```

```
# Example: global_del_during.ora

optimizer_features_enable
```

Add parameters to all databases after upgrade

```
global.add_after_upgrade_pfile=/home/oracle/global_add_after.ora
```

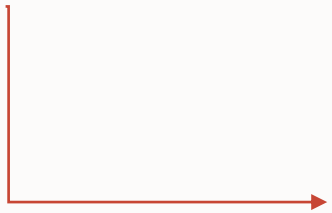
```
# Example: global_add_after.ora

deferred_segment_creation=false
_cursor_obsolete_threshold=1024
_sql_plan_directive_mgmt_control=0
_use_single_log_writer=true
```

AutoUpgrade | Advanced Options

- Many Databases
- Different Servers
- **PFILE**
- Shell Scripts
- Restore Point
- Underscores
- Recompilation
- Time Zone
- Parallel
- Monitoring

Batch-update parameters

```
global.del_during_upgrade_pfile=/home/oracle/global_del_during.ora
global.add_during_upgrade_pfile=/home/oracle/global_add_during.ora
global.del_after_upgrade_pfile=/home/oracle/global_del_during.ora
global.add_after_upgrade_pfile=/home/oracle/global_add_after.ora

upg1.source_home=/u01/app/oracle/product/12.2.0.1
upg1.target_home=/u01/app/oracle/product/19
upg1.sid=CDB1
upg1.add_after_upgrade_pfile=/home/oracle/upg1_add_after.ora

upg2.source_home=/u01/app/oracle/product/12.2.0.1
upg2.target_home=/u01/app/oracle/product/19
upg2.sid=CDB2
upg2.add_after_upgrade_pfile=/home/oracle/upg2_add_after.ora
```



```
# Example: global_add_after.ora

deferred_segment_creation=false
_cursor_obsolete_threshold=1024
_sql_plan_directive_mgmt_control=0
_use_single_log_writer=true
```

AutoUpgrade | Advanced Options

- Many Databases
- Different Servers
- PFILE
- **Shell Scripts**
- Restore Point
- Underscores
- Recompilation
- Time Zone
- Parallel
- Monitoring

Execute your own scripts as part of the upgrade

You can:

- Before and after upgrade
- Halt or continue on error
- For a single or every database

Ideas:

- Enterprise Manager configuration
- Backup configuration
- Interact with apps using the database

AutoUpgrade | Advanced Options

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Shell script execution

```
global.before_action=/database/scripts/set_blackout.sh

upg1.source_home=/u01/app/oracle/product/12.2.0.1
upg1.target_home=/u01/app/oracle/product/19
upg1.sid=CDB1
upg1.after_action=/database/scripts/start_level0.sh
```

- Permitted extension options:
  - Unix shell (.sh)
  - Microsoft Windows batch (.bat, .cmd)
  - Microsoft Windows PowerShell (.ps1)

Pro tip: If you want script execution for all upgrades use `global.before_action` and `global.after_action`

AutoUpgrade | Advanced Options

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Shell script execution

Default - AutoUpgrade does not react on return code

```
upg1.before_action=/database/scripts/run_this_on_UPG1_before.sh
```

Optionally - AutoUpgrade halts on non-zero return code

```
upg1.before_action=/database/scripts/run_this_on_UPG1_before.sh Y
```

AutoUpgrade | Advanced Options

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Guaranteed Restore Points

```
upg1.source_home=/u01/app/oracle/product/12.2.0.1
upg1.target_home=/u01/app/oracle/product/19
upg1.sid=CDB1
upg1.restoration=no

upg2.source_home=/u01/app/oracle/product/12.2.0.1
upg2.target_home=/u01/app/oracle/product/19
upg2.sid=CDB2
upg2.drop_grp_after_upgrade=yes
```

- Default behavior:
  - AutoUpgrade creates GRP except for
    - Standard Edition 2
    - `restoration=no`
  - GRP will be kept
  - GRP needs to be removed manually except for
    - `drop_grp_after_upgrade=yes` will only remove it when upgrade completed successfully

AutoUpgrade | Advanced Options

- Many Databases
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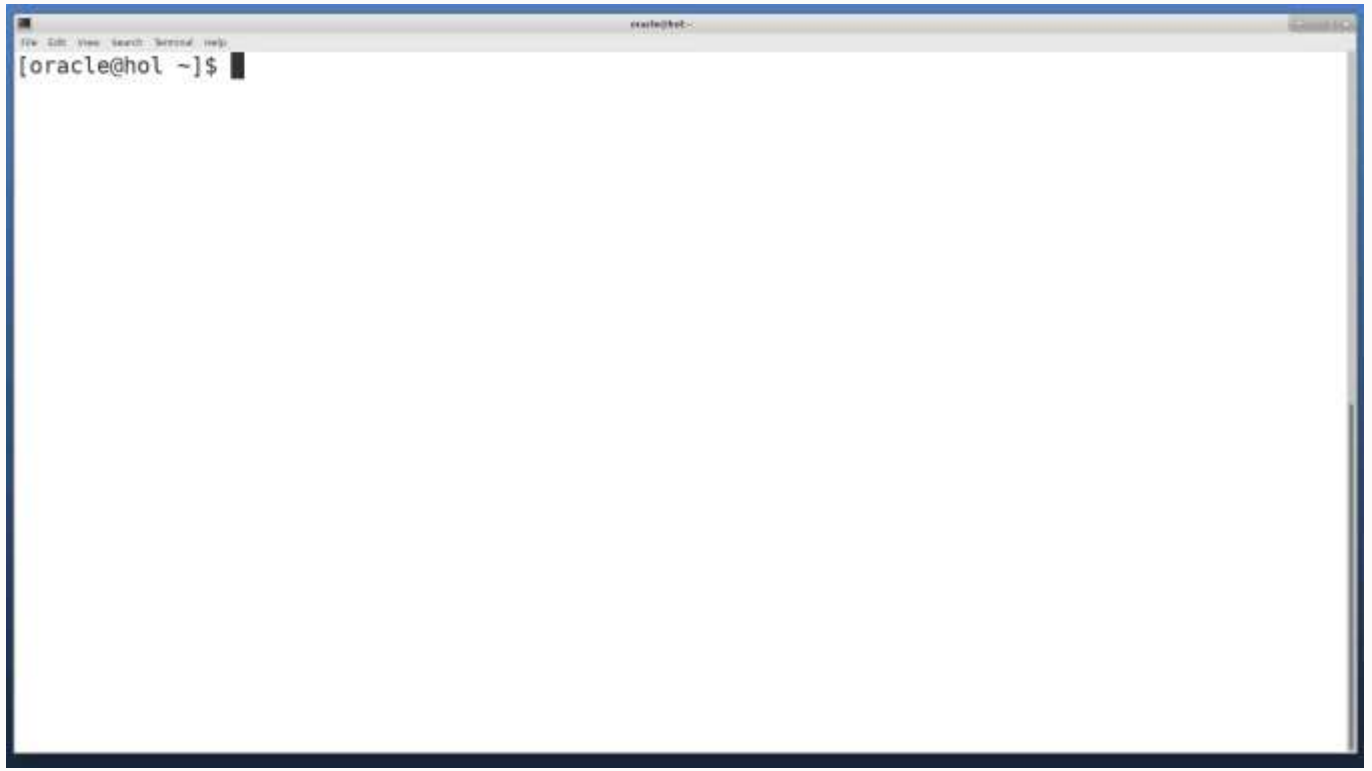

AutoUpgrade | Advanced Options

- Many Databases
- Different Servers
- PFILE
- Shell Scripts
- Restore Point
- **Underscores**
- Recompilation
- Time Zone
- Parallel
- Monitoring

Underscore parameters and events

```
upg1.source_home=/u01/app/oracle/product/12.2.0.1
upg1.target_home=/u01/app/oracle/product/19
upg1.sid=CDB1
upg1.remove_underscore_parameters=yes
```

- Default behavior:
  - Underscores and events will be kept

AutoUpgrade | Advanced Options

- Many Databases
- Different Servers
- PFILE
- Shell Scripts
- Restore Point
- Underscores
- **Recompilation**
- Time Zone
- Parallel
- Monitoring

Postpone recompilation

```
upg1.source_home=/u01/app/oracle/product/12.2.0.1
upg1.target_home=/u01/app/oracle/product/19
upg1.sid=CDB1
upg1.run_utlrp=no
```

- Default behavior:
  - Recompilation happens after the upgrade

AutoUpgrade | Advanced Options

- Many Databases
- Different Servers
- PFILE
- Shell Scripts
- Restore Point
- Underscores
- Recompilation
- **Time Zone**
- Parallel
- Monitoring

Skip time zone upgrade

```
upg1.source_home=/u01/app/oracle/product/12.2.0.1
upg1.target_home=/u01/app/oracle/product/19
upg1.sid=CDB1
upg1.timezone_upg=no
```

- Default behavior:
  - Time zone adjustment happens post upgrade
  - Database will be restarted several times
  - Important when you use "Downgrade" as fallback strategy as time zone can't be downgraded

AutoUpgrade | Advanced Options

- Many Databases
- Different Servers
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- **Parallel**
- Monitoring

CDB

```
upg1.catctl_options=-n 64 -N 8
```

-n	Total number of parallel processes (min 4, max unlimited, default `CPU_COUNT`)
-N	Number of parallel processes per PDB (min 1, max 8, default 2)

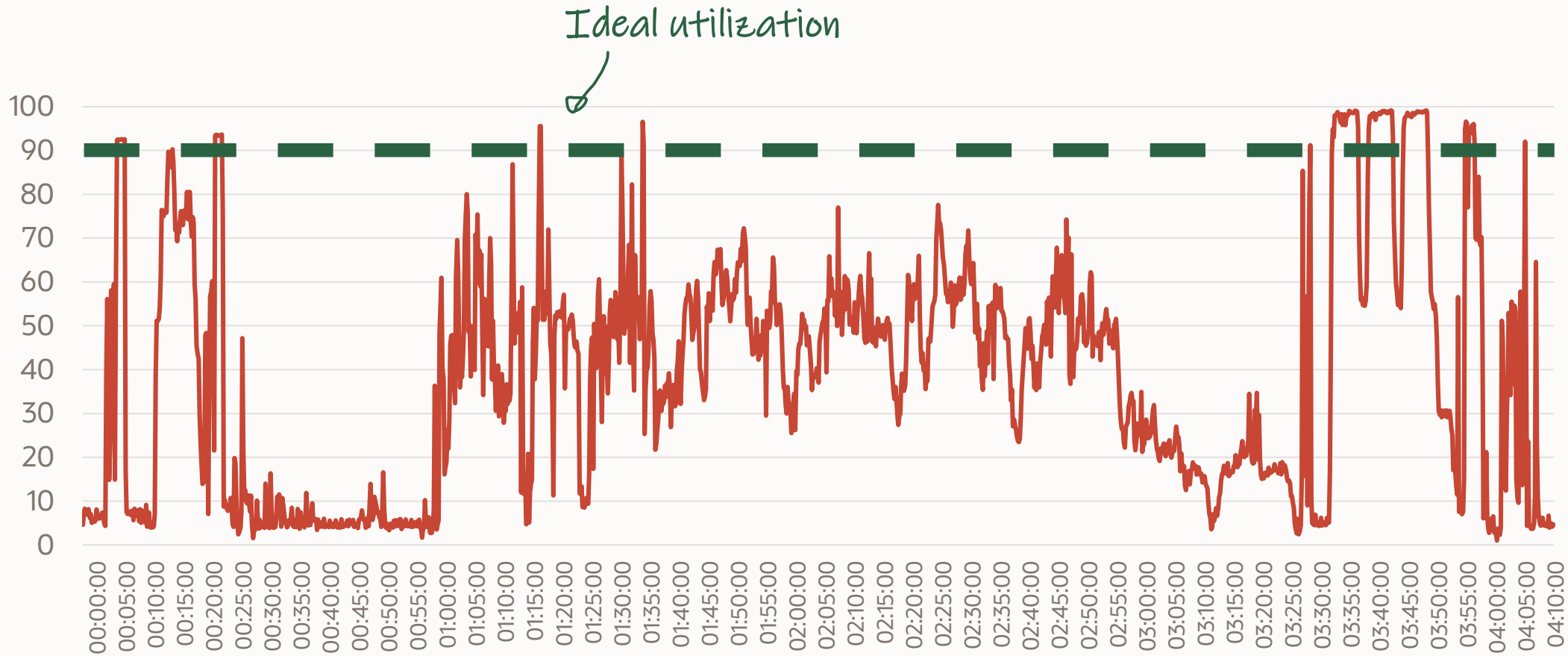
Concurrent PDB upgrades: n / N

AutoUpgrade | Parallel

- OCI Bare Metal host
  - 16 OPCUs
  - 768 GB memory
  - NVMe disks
- CDB with 52 PDBs
  - `CPU_COUNT` = 32
  - `SGA_TARGET` = 80G
  - `PGA_AGGREGATE_TARGET` = 20G
- Many database components (17 in total)

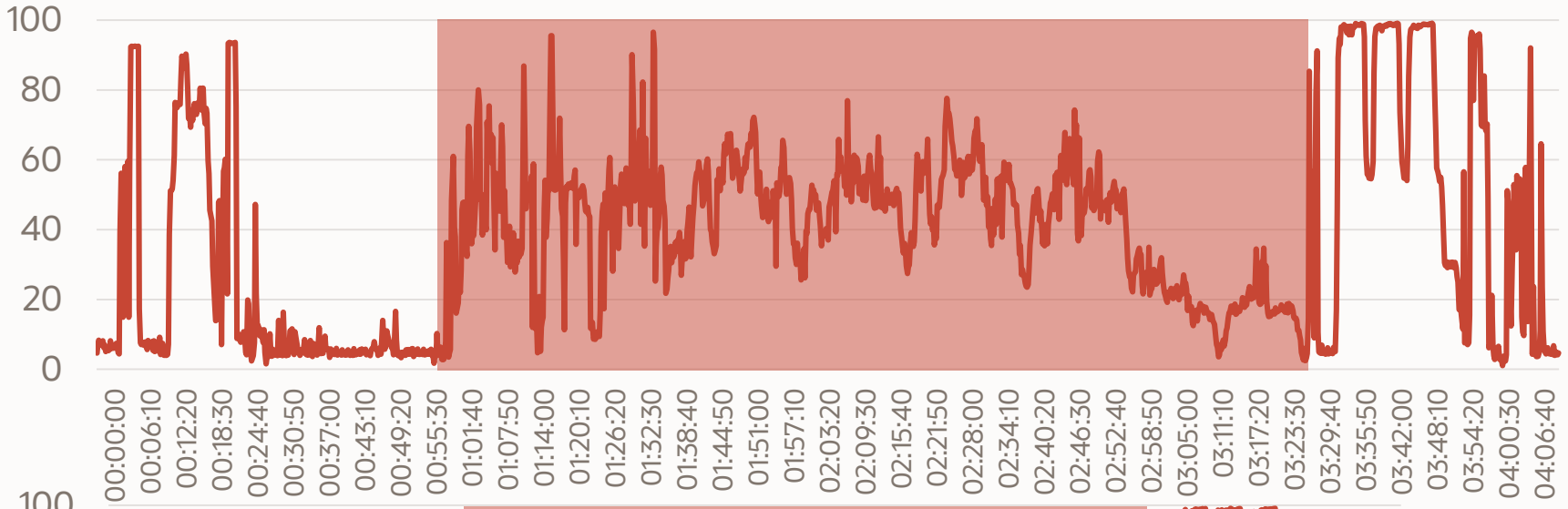
- **Upgrade from 12.1.0.2 to 19**

AutoUpgrade | Parallel

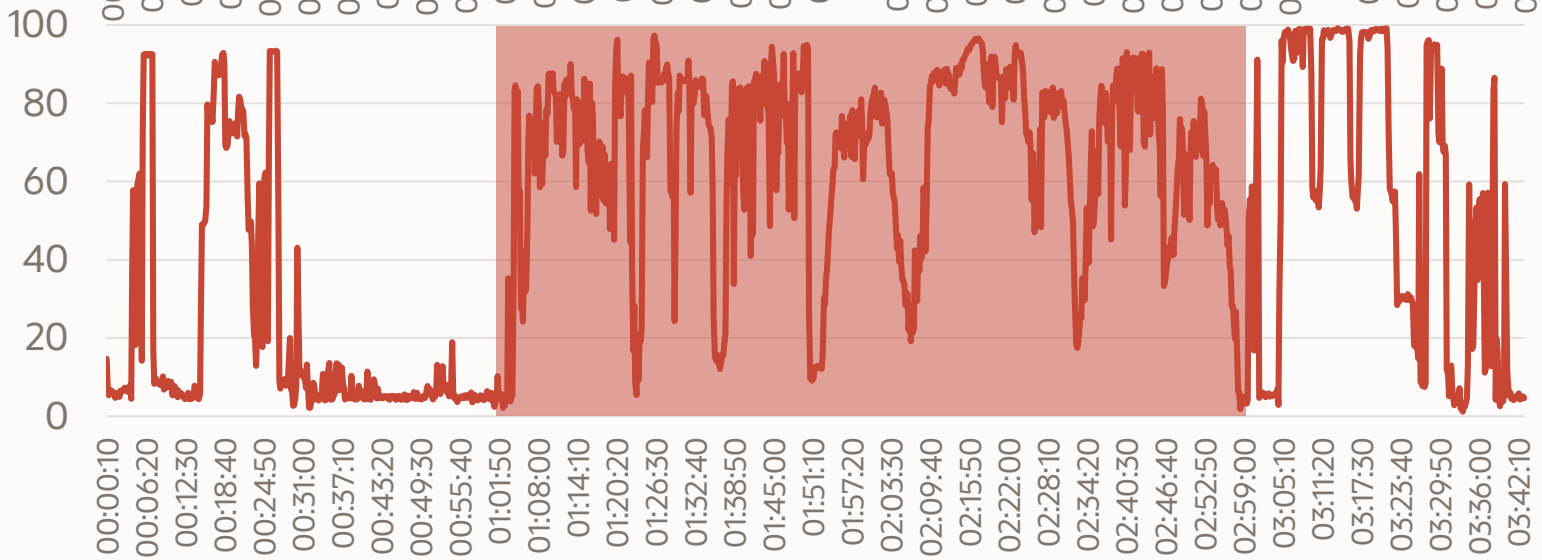


Total upgrade time: 4 hours 8 minutes

AutoUpgrade | Parallel



32 parallel processes



54 parallel processes

```
upg1.catctl_options=-n 54
```

26 minutes faster

AutoUpgrade | Advanced Options

- Many Databases
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- Shell Scripts
- Restore Point
- Underscores
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- Parallel
- **Monitoring**

Open your browser:

- `http://<log_dir>/cfgtoollogs/upgrade/auto/state.html`

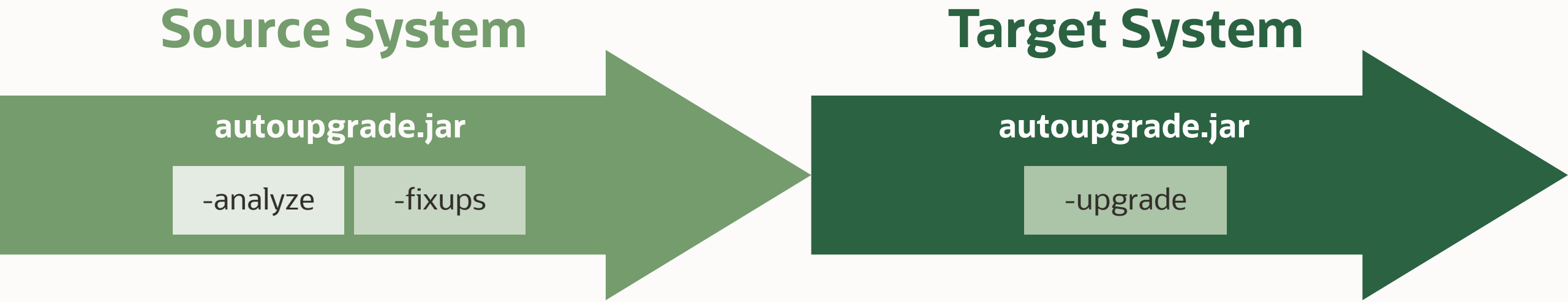
- AutoUpgrade: Refresh Status Information Automatically

Case by Case

Photo by Will Porada on Unsplash

AutoUpgrade to a New Server

Upgrade to a new server | Overview




```
$ java -jar autoupgrade.jar -mode analyze ...
```

```
$ java -jar autoupgrade.jar -mode fixups ...
```

```
$ java -jar autoupgrade.jar -mode upgrade ...
```

Upgrade to a new server | Details

Source Server

```
upg1.source_home=/u01/app/oracle/product/12
upg1.target_home=/u01/app/oracle/product/19
upg1.sid=DB12
```

- `-mode analyze`
- `-mode fixups`
- `shutdown immediate`

Copy database including redo logs, control files, SPFILE, password file

Target Server

- Update `/etc/oratab`
- Prepare `?/network/admin` files

- `STARTUP UPGRADE`

```
upg1.source_home=/tmp
upg1.target_home=/u01/app/oracle/product/19
upg1.sid=DB12
```

- `-mode upgrade`

Pro tip: Find more details in blog post
Oracle AutoUpgrade between two servers

Photo by Danilo Alvesd on Unsplash

Unplug – Plug – Upgrade … and even more

Unplug-Plug | Refreshable Clone PDB

COMING SOON!
Upgrade via refreshable clone PDB

Unplug-Plug | Refreshable Clone PDB

Clone User

```
CREATE USER c##borg
IDENTIFIED BY oracle
DEFAULT TABLESPACE users
TEMPORARY TABLESPACE temp
CONTAINER=ALL;
```

```
GRANT
CREATE SESSION,
CREATE PLUGGABLE DATABASE,
SELECT_ANY_CATALOG
TO c##borg
CONTAINER = ALL;
```

Unplug-Plug | Refreshable Clone PDB

Database link into source PDB

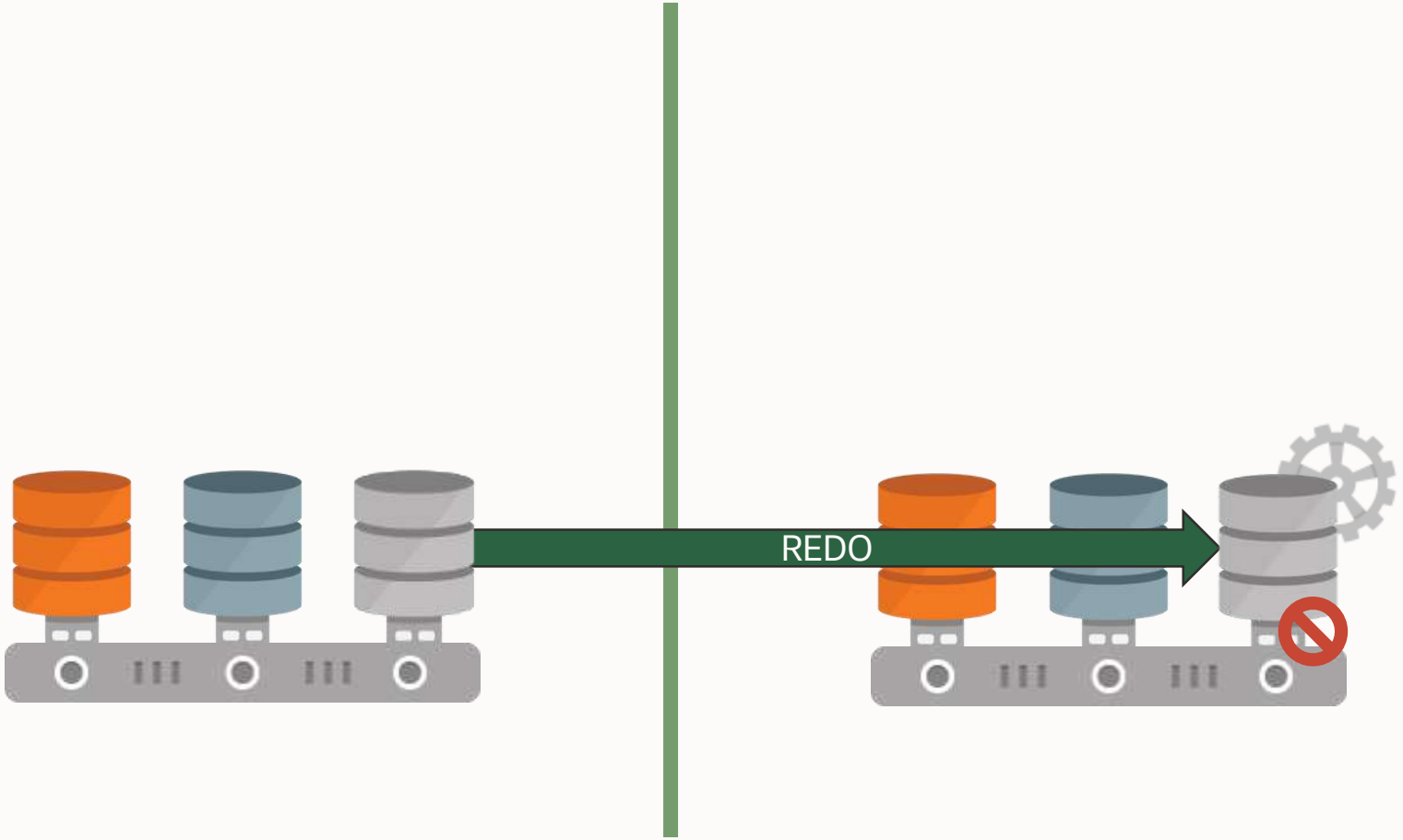
```
CREATE DATABASE LINK clonePDB1
CONNECT TO c##borg
IDENTIFIED BY oracle
USING 'tns-or-ezconnect';
```

Unplug-Plug | Refreshable Clone PDB

Fully automated relocation with upgrade

```
upg1.source_home=/u01/app/oracle/product/12.2
upg1.target_home=/u01/app/oracle/product/19
upg1.sid=CDB1
upg1.pdbs=PDB1
upg1.target_cdb=CDB2
upg1.source_dblink.PDB1=clonePDB1 600
```

Unplug-Plug | Refreshable Clone PDB



Unplug-Plug | Refreshable Clone PDB

AutoUpgrade uses
`CREATE PLUGGABLE DATABASE` statement
which automatically adjusts parallel degree

Photo by Philipp Katzenberger on Unsplash

Grid Infrastructure, Upgrade and Patching

AutoUpgrade | RAC

How to upgrade a RAC database

1. Upgrade Grid Infrastructure
   - Not covered by AutoUpgrade
   - Recommended to upgrade in advance

2. Upgrade Database
   - Upgrade with AutoUpgrade
   - Everything handled by AutoUpgrade

Recommendation: Keep GI and database patch level in sync

Photo by Chris Briggs on Unsplash

What if ...

Tips and Tricks and Workarounds

AutoUpgrade | What if … AutoUpgrade fails

1. Create zip file

```
$ java -jar autoupgrade.jar -config config.cfg -zip
```

2. Optionally, add `opatch lsinventory`

```
$ $ORACLE_HOME/OPatch/opatch lsinventory > opatch.txt
$ zip -r AUPG_210419_0735_461.zip opatch.txt
```

3. Upload it to My Oracle Support

"We upgraded 735 databases to 19c, and the task was mostly relatively relaxed.
Start the AutoUpgrade tool and monitor the progress from time to time.

Sitting in front of the screen the whole time is not necessary."

Alain Fuhrer
(Former) Head IT Database Services
La Mobilière
Bern, Switzerland

THANK YOU

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THANK YOU

AUTOUPGRADE DEEP DIVE

LVOUG (Thursday 28 October)

THANK YOU