



VISCOSITY

NORTH AMERICA

Oracle Platinum Partner

Charles Kim, CEO  
Oracle ACE Director

Oracle Database 18c & 19c New Features  
For IT Transformation

NoCOUG

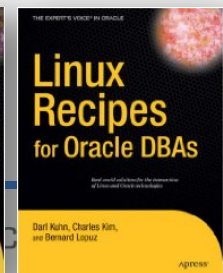
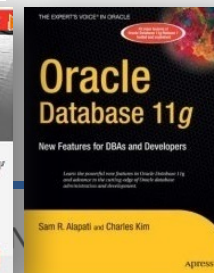
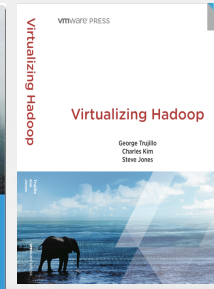
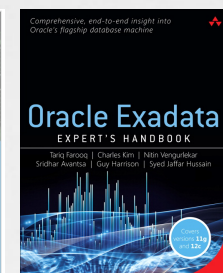
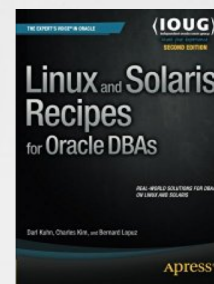
February 2019



# Charles Kim



- Oracle ACE Director
- Founder and CEO of Viscosity
- Over 27 years of Oracle Expertise: Mission Critical Databases, RAC, Data Guard, ASM, RMAN, Shareplex/GoldenGate
- Specialize in “**Complex Data Replication & Integration**” with Shareplex & GG
- President - IOUG Cloud Computing SIG
- Oracle Management Cloud Certified
- Blog Sites: <http://DBAExpert.com/blog>
- Oracle Exadata Certified Implementation Specialist, (2014, 2016)
- Oracle Certified RAC Expert







**ORACLE®**  
ACE Director

# My Core Expertise:

Oracle Exadata Implementation Specialist, 2014, 2016  
Oracle RAC Certified Expert



# The Twelve Days of 12.2

Walk through Oracle Database 12c Release 2  
(12.2) New Features  
with Viscosity Experts & Consultants

*On the Twelfth Day of 12.2  
my DBA gave to me...*

ORACLE

<http://viscosityna.com/resources/dba-resources/twelve-days-12-2/>

## Welcome to the 12 days of 12c | 12.2 – New Features

For 12 days, Viscosity will release a new article about 12.2 new features, written by our Oracle Ace Directors and Consultants. Be sure to check back every day for the newest article!

**On the Twelfth day of 12.2, my DBA gave to me... Pluggable Databases (PDBs)**

Dec 12, Day 1: RAC and Grid Infrastructure	Dec 13, Day 2: Data Guard	Dec 14, Day 3: Partitioning	Dec 15, Day 4: ASM
Dec 16, Day 5: SQL Performance Tuning	Dec 17, Day 6: ACFS	Dec 18, Day 7: DB Security	Dec 19, Day 8: Index
Dec 20, Day 9: In-Memory	Dec 21, Day 10: RMAN	Dec 22, Day 11: Utilities, PL/SQL, & More	Dec 23, Day 12: Pluggable Databases



# DbA 3.0

## Cloud DBA

## Now the Autonomous DBA

# DBA

DONT BOTHER ASKING

The Autonomous Database Cloud @OOW 2017

The Changing Role of the DBA: Q&A with Oracle's Penny Avril

<http://www.dbta.com/BigDataQuarterly/Articles/The-Changing-Role-of-the-DBA-QandA-with-Oracles-Penny-Avril-120343.aspx>

DBA 2.0 Is Dead. Long Live DBA 3.0! By Jim Czuprynski

<https://vimeo.com/204365694>

Oracle, a **Data** Company ....



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# Evolution of the DBA



Kind of DBA	Timeline
CLI DBA	Early 90's DBAs
GUI DBA	Late 90's and Dot Com
Google DBA	Dot Com and 2000's
iDBA	Dot Com, IOUG iDBA Master Curriculum
RAC DBAs (MAA DBAs)	2000+ after 9.2 (but major spike with 10.2) + <b>Data Guard</b>
<b>DMA</b>	<b>2010+ Database Machine Administrator</b>
vDBA / vRAC DBA	2010+ Evolving role of a DBA in the virtual world
Cloud DBA	2011+ Database Consolidation with Private Database Cloud Oracle Database 12c Launches June 2013
Public Cloud DBA	2015+ Oracle Public Cloud with Database Cloud Service, Database Backup Cloud Service, Storage Cloud Service, IaaS Cloud Service
<b>PDBAs</b>	<b>2017+ Multi-Tenant with Oracle Database 12c Release 2 GA – March 2017</b>
<b>Oracle 18c</b>	<b>February 2018 in Oracle Cloud, July 2018 On-Premise</b>

"It is not the strongest or the most intelligent who will survive but those who can best manage [adapt to] change."



# Upgrade Plans

Upgrade On-Premise? Upgrade to the Cloud?

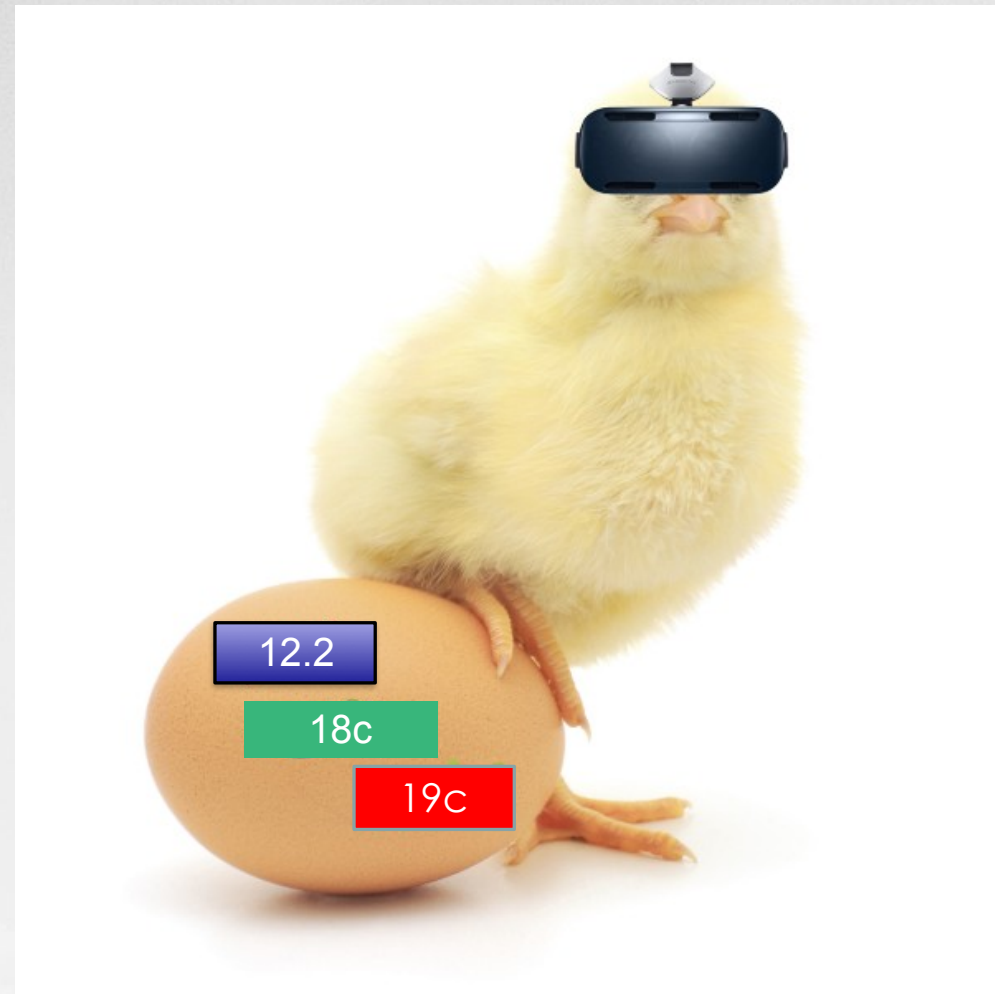
- How many are Terminal Release to Terminal Release customers?
- How many are planning to upgrade in
  - 6 months
  - 12 months
  - 24 months
  - Already There?
- Interesting in doing Zero Downtime and Zero Risk Upgrades?
- Still running legacy versions?



# Upgrade Plans

Upgrade to Oracle 19c? Upgrade to 18c?

- Factoids
  - 19c is the Terminal Release of Oracle 12
  - E-Business Suite Customers are told to wait for Oracle 19c
- So When is Oracle 19c coming out?
- So what is the delimma?







## Why You Should Consider Upgrading to Oracle 12.2 or 18c

11.2 Premier Support Ended - ULA?  
12.1.0.2 Premier Support End  
Even Oracle 19c ?



# Hybrid Cloud

## Journey For The Next 5-7 Years

- Last year at OOW, Hurd said that the Hybrid Cloud will exist for the next 5-7 years
  - Invest in a high throughput from On-Premise to Cloud
  - Consider moving data center to the same region and proximity as the cloud vendor
- Move Disaster Recovery site to the cloud
  - Ask us about our Edge Cloud (Cloud Adjacency)





# Oracle Database 12cR2 introduced on the Cloud 9/18/2016

## Announcing: Exadata Express Cloud Service

Simple to Use, Lowest Cost Database Cloud Service

- Oracle Enterprise Edition including all DB options
- Runs on Exadata in Oracle Public Cloud
- Fully managed by Oracle
- Low cost, starting at \$175 per month



**Rich Niemiec** @RichNiemiec · 18 Sep 2016

Larry announces Exadata Express Cloud Service running 12cR2 for \$175/month with all features. Available now! [pic.twitter.com/3tqJdDuzJe](https://pic.twitter.com/3tqJdDuzJe)



2



21



23



On-Premise Oracle Database 12cR2 released just under 6 months later on 3/1/17

CO

# Oracle Release Dates

Oracle Database 11g Release 1	Aug 2007
Oracle Database 11g Release 2	Sept 2009
Oracle Database 12c Release 1	June 2013
Oracle Database 12c Release 1 (Patchset) - 12.1.0.2	June 2014
Oracle Database 12c Release 2	March 2017
Oracle Database 12c Release 2 First Bundled Patch	May 2017
Oracle Database 12c Release 2 RU (July 18)	July 2017
Oracle 18c - "Cloud First"	February 2018
Oracle 18c – Available on Exadata	February 2018
Oracle 18c – Available on ODA	March 2018
Oracle 18c – On-Premise	July 2018



# Upgrade to 12.2 from 11.2.0.4

- For **Oracle Database 11.2.0.4** – the Terminal (final) Patch Set for Oracle Database 11.2 – **Oracle will waive** (*no extra cost, no action required*) **Extended Support** to every customer with a valid support contract until ~~May 31, 2017~~ until Dec 31, 2018

(see the updated information here:

<https://mikedietrichde.com/2017/01/27/release-dates-oracle-database-12-2-0-1-on-prem-extended-support-waiving-for-oracle-11-2-0-4-12-1-0-2/>

- You can extend the **Extended Support for Oracle Database 11.2.0.4** until 31-DEC-2020 – but then at the usual extra cost.

This information can be found in [MOS Note:742060.1](#).

# Oracle Database Extended Support Fees Waived

## Database 12.1 Extended Support Fee Waived through July 2019

By: [Steven Chan](#) | Senior Director

Oracle's Lifetime Support policy has three phases: Premier Support, Extended Support, and Sustaining Support. For details about coverage during each phase, see:

- [Oracle Lifetime Support Policies](#)

You can purchase a support plan for your licensed products to obtain Premier Support. There is an additional fee for Extended Support.

[Premier Support for Database 12.1](#) runs to July 31, 2018. Extended Support for Database 12.1 runs to July 31, 2021. The Extended Support fee for Oracle Database 12c 12.1 has been waived to July 31, 2019. See:

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

Oracle's Lifetime Support policy has three phases: Premier Support, Extended Support, and Sustaining Support. For details about coverage during each phase, see:

- [Oracle Lifetime Support Policies](#)

You can purchase a support plan for your licensed products to obtain Premier Support. There is an additional fee for Extended Support.

[Extended Support for Database 11.2](#) runs to December 31, 2020. The Extended Support fee for Oracle Database 11gR2 11.2 has been waived to December 31, 2018. See:

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



# End of Patching

Release	Patching Ends	Notes and Exceptions*
12.2.0.1	TBD	Patching for 12.2.0.1 will end two years after Release 18 is available for on-prem platforms (non-Engineered Systems).
12.1.0.2	<b>31-Jul-2021</b>	Extended Support fees waived through July 31, 2019. Beginning Aug 1, 2019 an ES service contract is required.
12.1.0.1	<b>31-Aug-2016</b>	Patching has ended for this release.
11.2.0.4	<b>31-Dec-2020</b>	Extended Support fees waived until Dec 31, 2018. An ES service contract is required starting 1-Jan-2019.

<http://www.oracle.com/us/support/library/oracle-lifetime-support-policy-faq-069234.pdf>

## Q: What is the pricing for the Extended Support option?

A: We've announced a simple and predictable support policy, and our Extended Support pricing will follow that principle. Extended Support will be offered on specific defined releases for a period of 3 years following the end of the Premier Support period, so, years **6 – 8** in the life of the product.

For the first year of the Extended Support period, year 6 in the life of the product, the additional fee will be calculated as 10% of the your current annual support fee. For example, if your annual support fee is \$100, the fee for Extended Support would be \$10 and your total fee for support would be \$110 (\$100 + \$10).

For years two and three, years **7 and 8** in the life of the product, the additional fee will be calculated as 20% of the your current annual support fee. For example, if your annual support fee is \$100, the fee for Extended Support would be \$20 and your total fee for support would be \$120 (\$100 + \$20). When you move into the Sustaining Support period, your annual support fee would continue to be the base fee of \$100.



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# Oracle Database 18.4

## Jan 2019

### Oracle Database 18c

#### (18.4)








 IBM AIX	<a href="#">ZIP (4.1 GB)</a> <a href="#">See All</a>
 HP-UX ia64	<a href="#">ZIP (4.7 GB)</a> <a href="#">See All</a>
 Linux on System z (64-bit)	<a href="#">ZIP (3.3 GB)</a> <a href="#">See All</a>

#### (18.3)

 Microsoft Windows x64 (64-bit)	<a href="#">ZIP (4.4 GB)</a> <a href="#">See All</a>
 Linux x86-64	<a href="#">ZIP (4.3 GB)</a>   <a href="#">RPM (3.3 GB)</a> <a href="#">See All</a>
 Oracle Solaris (SPARC systems, 64-bit)	<a href="#">ZIP (4.1 GB)</a> <a href="#">See All</a>
 Oracle Solaris (x86 systems, 64-bit)	<a href="#">ZIP (3.7 GB)</a> <a href="#">See All</a>

### Oracle Database 12c Release 2

#### (12.2.0.1.0) - Standard Edition 2 and Enterprise Edition

 Microsoft Windows x64 (64-bit)	<a href="#">File 1 (2.8 GB)</a> <a href="#">See All</a>
 Linux x86-64	<a href="#">File 1 (3.2 GB)</a> <a href="#">See All</a>
 Oracle Solaris (SPARC systems, 64-bit)	<a href="#">File 1 (3.1 GB)</a> <a href="#">See All</a>
 Oracle Solaris (x86 systems, 64-bit)	<a href="#">File 1 (2.8 GB)</a> <a href="#">See All</a>
 HP-UX Itanium	<a href="#">File 1 (3.7 GB)</a> <a href="#">See All</a>
 AIX (PPC64)	<a href="#">File 1 (3.1 GB)</a> <a href="#">See All</a>
 Linux on System z (64-bit)	<a href="#">File 1 (2.5 GB)</a> <a href="#">See All</a>



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REL: Oracle Database 11.2.0.2.0

REL: Oracle Database 11.2.0.1.0

REL: Oracle Database 11.1.0.7.0

REL: Oracle Database 9.2.0.1.0

REL: [Oracle Database \(Exadata and SuperCluster\) 18.0.0.0.0](#)

REL: Oracle Database Certified Configuration 11.2.0.2.0

REL: Oracle Database Certified Configuration Client with Framework 11.1.0.7.0

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<input checked="" type="checkbox"/> Oracle Database (Exadata and SuperCluster) 18.0.0.0.0	<input checked="" type="checkbox"/> Oracle Standard Terms and Restrictions	Linux x86-64	3.5 GB	Feb 16, 2018

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# Oracle XE 18c\*

## FREE TO USE

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### XE Summary

-  One instance per server
-  2 concurrent user threads (NO CHANGE)
-  **2 GB RAM** (compared to 1 GB in 11.2 XE)
-  12 GB user data (compared to 11 GB in 11.2 XE)
-  New Features over 11.2 XE
  -  Multi-tenant (**3 user PDBs**)
  -  Advanced compression
  -  Advanced index compression
  -  Prefix compression
  -  Bit-mapped index
  -  Transportable table spaces
  -  Summary management
  -  Sharded queues

-  In-memory column store
-  In-memory aggregation and attribute clustering
-  Oracle Partitioning
-  Advanced Analytics
-  Column Level Encryption and Tablespace encryption
-  Database Vault, Virtual Private Database, Redaction, Real application security, Fine-grained auditing, Advanced Security
-  Java in the Database and all related features
-  Flashback Table and Database
-  Online index rebuild, index-organized table organization
-  Table redefinition
-  Client side Query Cache
-  Query Results Cache
-  PL/SQL Function Result Cache
-  Oracle Spatial
-  Graph and Semantic technologies

# Planning For Upgrading to 18c

## Helpful MOS Notes

To Bottom

Oracle 18c - Complete checklist for **Manual** Upgrade for **Multitenant** Architecture  
Oracle Databases from 12.1.x.x to 18.x.x.x (Doc ID 2422161.1)

Oracle DB 18c - Complete Checklist for **Manual** Upgrades to **Non-CDB** Oracle  
Database 18c (Doc ID 2418045.1)

Oracle 18c - Complete Checklist for **Upgrading** to Oracle Database 18c (18.x) using  
**DBUA** (Doc ID 2418576.1)

- ORAchk - Health Checks for the Oracle Stack
  - MOS 1268927.2



# Oracle Database 18c

## Simplified Version Number Timelines With RUs and RURs

- 3 digit format
  - Year.Update.Revision
- Year is the last 2 digits of year a release is delivered
  - e.g. 18 will be used for the release date ships in late 2017 or early 2018
- Update tracks Release Update (RU)
- Revision tracks the associated RU Revision levels (0,1,2)

# Oracle Database 18c

## Sample Version Number Timelines With RUs and RURs

18c  
Oracle  
Database

Production	April	July	October	January	April	July
18.1.0	18.2.0	18.3.0	18.4.0	18.5.0 & <b>19.1.0</b>	18.6.0 & <b>19.2.0</b>	19.3.0
		18.2.1	18.3.1	18.4.1	18.5.1?	19.2.1
			18.2.2	18.3.2	18.4.2	18.5.2 ?

In 3 years, you may run either:

- 18.12
- 19.5
- 20.1

with additional RU or RUR.

18.1.0  
Production

18.2.0  
First Release  
Update

18.2.1  
First Release  
Update  
Revision

# Oracle Database 19c

## Sample Version Number Timelines With RUs and RURs

19c  
Oracle  
Database

January	April	July	October 2019
<b>19.1.0 &amp; 18.5.0</b>	<b>19.2.0 &amp; 18.6.0</b>	19.3.0 & 18.7.0	19.4.0 & 18.8.0
18.4.1	18.5.1	19.2.1	19.2.2
18.3.2	18.4.2	18.5.2	



# Performance: Preserve Statistics

Gather accurate performance statistics from production

Accurate means: [Starting at least 1 month before the upgrade](#)

Use Automatic Workload Repository (AWR) Snapshots interval [30-60 minutes](#) and retention [~40 days](#)

Extract AWR:

```
SQL> @?/rdbms/admin/awrextr.sql
```

Performance snapshot comparison using AWR DIFF reports:

```
SQL>select * from table(  
DBMS_WORKLOAD_REPOSITORY.AWR_DIFF_REPORT_HTML(<DBID>, 1, 101, 121, <DBID>, 1, 201, 221));
```

[MOS Note:1477599.1](#) Best Practices Around Data Collection For Performance Issues

## Pre-Upgrade/Migrate Considerations

### **Always Consider Minimal or Zero Downtime Approach**



- Set Guaranteed Restore Points accordingly
- Ensure AWR retention is long enough to capture historical data for comparison
- Backup your database statistics, in case an older SQL plan needs restoring
- Definitely consider RAT for real workload testing, instead of synthetic workloads tests
- If upgrading older version of RAC to new version in place, special consideration need to be understood
  - 9i RAC to 12c RAC
  - Upgrade to 12c GI stack first, Flex ASM or not
  - Legacy clients may not support new Net connections

# Oracle Database 12c Release 2

## Upgrade Paths

Minimum Effort Upgrades to Oracle 12c Release 2 (12.2)	
Source Database	Target Database
11.2.0.3 / 11.2.0.4	12.2.x
12.1.0.1 / 12.1.0.2	12.2.x

Intermediate upgrade paths				
Source Database		Intermediate upgrade path		Target database
11.2.0.1 / 11.2.0.2	→	11.2.0.4	→	12.2.x
11.1.0.6 / 11.1.0.7	→	11.2.0.4	→	12.2.x
10.2.0.2/10.2.0.3/10.2.0.4/10.2.0.5	→	11.2.0.4 / 12.1.0.2	→	12.2.x
10.1.0.5	→	11.2.0.4 / 12.1.0.2	→	12.2.x
9.2.0.8	→	11.2.0.3 / 11.2.0.4	→	12.2.x



# Oracle Database 12c Release 2

For Super Old Versions

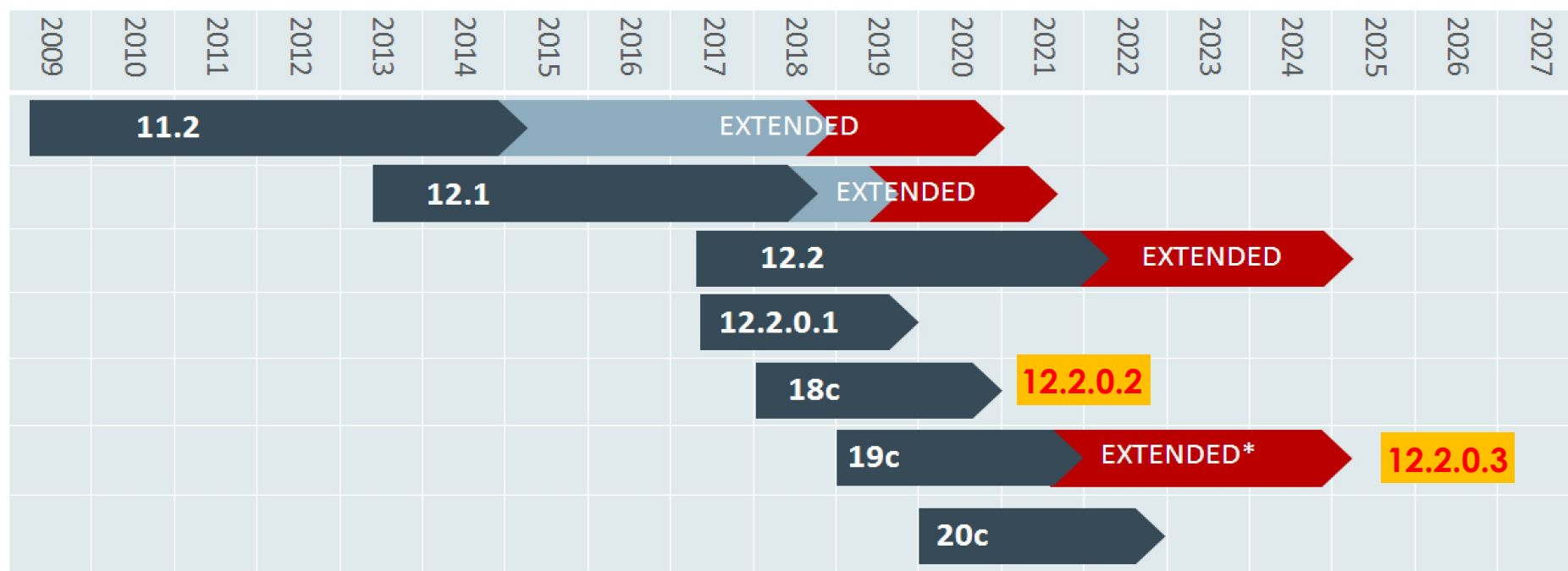
## Intermediate upgrade paths

Source Database		Intermediate upgrade path		Target database
7.3.3 (lower)	→	7.3.4 --> 9.2.0.8 --> 11.2.0.3 or higher	→	12.2.x
8.0.5 ( or lower )	→	8.0.6 --> 9.2.0.8 --> 11.2.0.3 or higher	→	12.2.x
8.1.7 ( or lower )	→	8.1.7 --> 9.2.0.8 --> 11.2.0.3 or higher	→	12.2.x
9.0.1.3 ( or lower )	→	9.0.1.3 --> 9.2.0.8 --> 11.2.0.3 or higher	→	12.2.x
9.2.0.7 ( or lower )	→	9.2.0.7 --> 11.2.0.3 or higher	→	12.2.x
9.2.0.8	→	11.2.0.3 / 11.2.0.4	→	12.2.x

# Oracle Database 19c Extended Support



## Lifetime Support Commitments and Plans

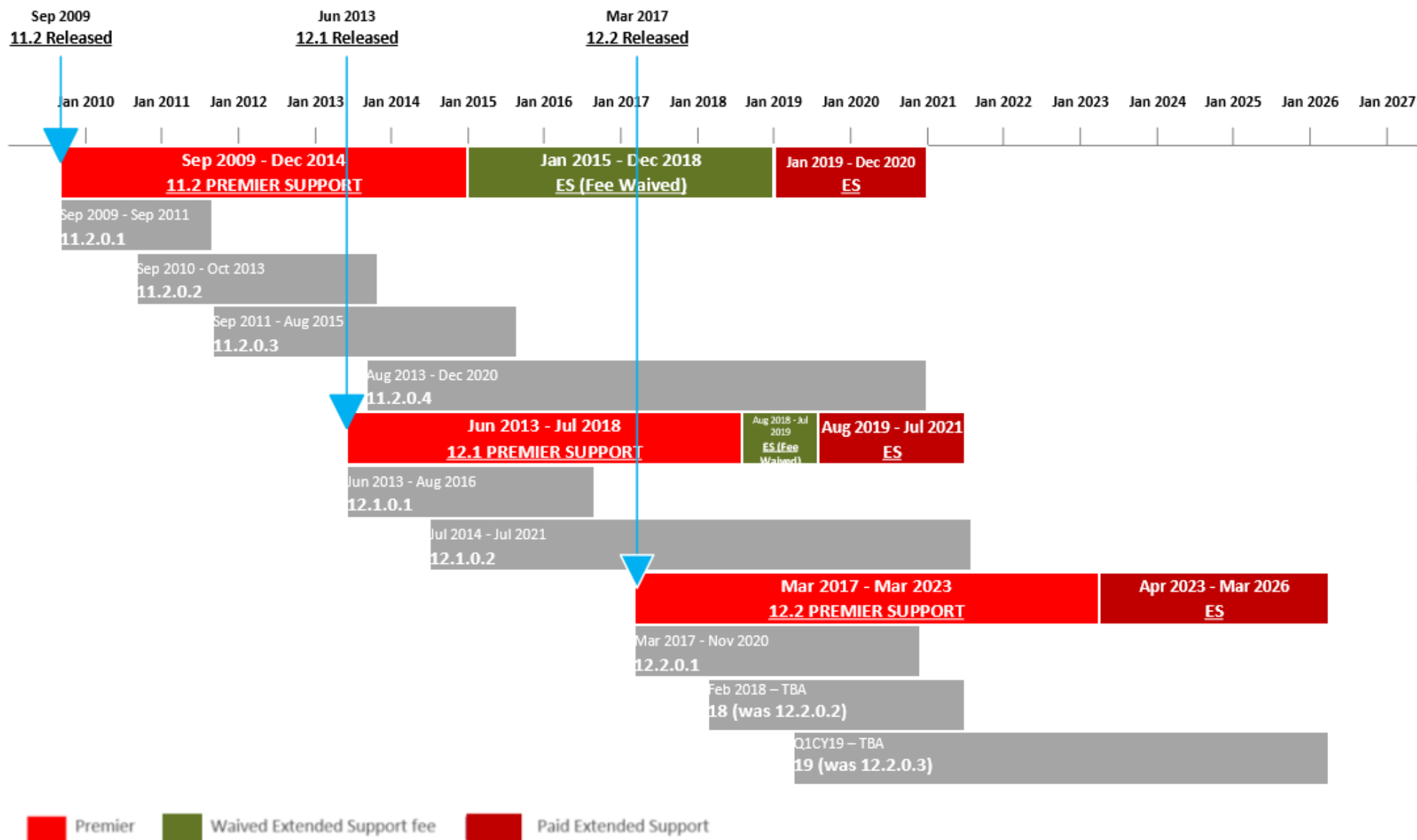


\*Oracle Database 19c is expected to the long term support release.  
Always check MOS Note 742060.1 for the latest schedule.

 Premier

 Waived Extended Support Fee

 Paid Extended Support






# Oracle 19c (LiveSQL Released) - Jan 16, 2019


- <https://blogs.oracle.com/oracle-database/oracle-database-19c-now-available-on-livesql>

•




[ORACLE DATABASE](#) | January 16, 2019

## Oracle Database 19c Now Available on LiveSQL!



**William Hardie**  
VICE PRESIDENT

Heads up all you developers and DBAs out there!  
The latest generation of the world's #1 database,  
Oracle Database 19c, is now available on  
[LiveSQL.oracle.com](#).



**19<sup>c</sup>** **ORACLE<sup>®</sup>**  
Database

oracle-database/oracle-database-2

# Oracle 19c

- Long Term Support
  - EBS will be certified in Oracle 19c
  - Customers are being told to go to Oracle 19c
  - Here's the ISSUE
    - If you are on 11.2.0.4, you are already too late
    - 19c will not come out until Q1 in Oracle Cloud
    - 19c will probably come out summer of 2019
    - Need to wait for the 1st RU before even considering 19c

## Factoid

- As of Q4 2018, about 80% customer databases are on 11.2 and 12.1
- Oracle does not charge for extended support on Oracle Cloud

# Easy Connect Enhancements

- Add support for multiple hosts and ports in the connection strings
  - Designed for easier load-balancing client connections
- Easy Connect Adapter accepts list of name-value Pairs
  - &CONNECT\_TIMEOUT=45
  - &RETRY\_COUNT=3
  - &SDU=



# Automated Testing of Query Plans

- NO DBA INTERVENTION NEEDED
  - Companies no longer need to perform full regression tests ... Hmmm
  - Oracle 19c will “automagically” check built-in execution plans against existing plans
    - Then replace current plan with the faster plan
    - Or keep the existing plan
    - Idea is queries will run just as fast or better



# Automatic Indexing

- NO DBA INTERVENTION NEEDED
  - One of the biggest 19c feature
  - Fully automated
  - Oracle will identify candidate indexes
  - Oracle will first create those indexes as **unusable and invisible (metadata only)**
    - Verify: oracle will ask the optimizer to test if those **candidate indexes** improve the SQL performance
    - Validate & Implement: If the performance is better for all statements when indexed is used, it will become **visible**
- Will have audit reports as part of database system reporting

# Data Guard DML Re-Direction

- **RUN DML on ADG**
- Re-Direct DML statement back to the primary database
- Data changes will happen on the primary database
- Changed blocks will ship to ADG
- ADG will be in sync to maintain redundancy



# Additional 19c New Features

Duplicate a non-CDB — Or an Oracle RAC database with dbca in silent mode	createDuplicateDB command of DBCA in silent mode. Can be duplicated to a remote server with connectivity from the source system (where DBCA is running) to the target remote server.
Relocate a PDB to another CDB using DBCA in silent mode	RelocatePDB command of DBCA in silent mode
Simplified Image Based Oracle Database Client Installation	Starting with Oracle Database 19c, installation and configuration of Oracle Database Client software is an image-based installation. To install Oracle Database Client, create the new Oracle home, extract the image file into the newly-created Oracle home, and run the setup wizard to register the Oracle Database product.
Oracle Clusterware <b>dry-run mode upgrade</b> to check your system's upgrade readiness	Starting with Oracle Grid Infrastructure 19c, the Oracle Grid Infrastructure installation wizard (gridSetup.sh)  The wizard performs all of the system readiness checks as an actual upgrade Enables you to verify if your system is ready for upgrade before you start the upgrade  Does not perform the actual upgrade

# Additional 19c New Features

Hybrid Partitioned tables	<p>Enables partitions to reside in both Oracle Database segments and in external files and sources. T</p> <ul style="list-style-type: none"><li>— Enhances functionality of partitioning for Big Data SQL where large portions of a table can reside in external partitions.</li><li>— Move non-active partitions to external files, such as Oracle Data Pump files, for a cheaper storage solution</li><li>— Move non-active partitions to Big Data</li></ul>
Flashback physical standby when the primary database is flashed back	<p>In previous releases, getting the secondary to the same point in time as the primary requires a manual procedure to flash back standby databases. A new parameter is introduced which enables the standby database to be flashed back automatically when Flashback Database is performed on the primary database.</p>
Propagate restore points to the standby	<p>Restore points and GRP is stored in the control file and not propagated to the standby site</p> <p>With Failover, the standby becomes the new primary and restore point information is LOST</p> <p>Now, the restore points are preserved after a failover</p>
MIRA + In-Memory	<p>ADG</p> <p>It its one or the other before</p> <p>Now you can have best of both</p>

# Additional 19c New Features

## FSFO in "Test" Mode

Configure it to Observe only creating a '**test mode**' to see when a failover or other interaction would have occurred during the normal production processing

- Can tune FSFO for finer granularity
- Can see **IF** FSFO would have actually occurred without production impact
- Improve failover validation

## Flashback physical standby when the primary database is flashed back

In previous releases, getting the secondary to the same point in time as the primary requires a manual procedure to flash back standby databases. A new parameter is introduced which enables the standby database to be flashed back automatically when Flashback Database is performed on the primary database.

## Dynamically Change FSFO target

With 12.2, we can have multiple FSFO targets

With 19c, we can change the targets without FSFO being disabled

## PDB Recovery Catalog

PDBs are now supported as a target database

Can be used with Virtual Private Catalog (VPC)

# Additional 19c New Features

Clear Flashback logs periodically to increase FRA size predictability	<p>Starting in 19c, the management of space in the fast recovery area is simplified</p> <p>Oracle Database monitors flashback logs in the fast recovery area and automatically deletes flashback logs that are beyond the retention period. When the retention target is reduced, flashback logs that are beyond the retention period are deleted immediately.</p>
Flashback physical standby when the primary database is flashed back	<p>In previous releases, getting the secondary to the same point in time as the primary requires a manual procedure to flash back standby databases. A new parameter is introduced which enables the standby database to be flashed back automatically when Flashback Database is performed on the primary database.</p>
New Parameters for Tuning Automatic Outage Resolution	<p>DATA_GUARD_MAX_IO_TIME sets the maximum number of seconds that can elapse before a process is considered hung while performing a regular I/O operation in an Oracle Data Guard environment. Regular I/O operations include read, write, and status operations.</p> <p>DATA_GUARD_MAX_LONGIO_TIME sets the maximum number of seconds that can elapse before a process is considered hung while performing a long I/O operation in an Oracle Data Guard environment. Long I/O operations include open and close operations.</p>



# Additional 19c New Features

RAT at PDB Level	Starting in 19c, capture and replay is supported at PDB level
ASM Parity Protected Files	<b>Single Parity for redundancy</b> Intended for <b>write-once</b> files such as archive logs and backup sets  For Flex Disk Group <b>Not supported for datafiles</b>  Requires 3 regular failure groups in a flex disk group
Fined Grained PDB Patching	Patch individual PDBs in a Multitenant environment Allows bug fixes to be patched only on specific PDBs rather than across the entire CDB


# ZS Storage Appliance Racked System

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Oracle ZFS Storage Appliance Racked System configurations are:

- fully tested
- preassembled storage systems
- include replication, cloning, and encryption licenses at no extra charge

## **Benefits**

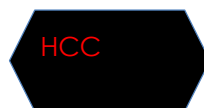
- dramatically shorten deployment and implementation time
  - optimize performance and availability
  - reduce risk and TCO
  - Platinum Services are available used to back up Oracle Engineered Systems such as Oracle Exadata
- 

# Why ZFS ZS7-2

The first ZFS Storage Appliance was released in January 2009

- Extreme Performance

- HCC (10x - 50x compression)



- OISP2 + ADO with 12c+

- Infiniband – 40gigE



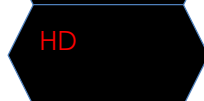
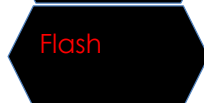
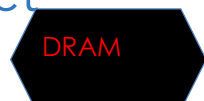
- 32gigE HBAs



- 10 & 40 gigE Ethernet

2.5x increase in 10GbE

- Hybrid Storage



- Per Controller

- Up to 3.8 PB of all-flash capacity
  - 11.5 PB of disk capacity, or a mixture of the two

● Raw Performance gain of 48% from previous release

- Unified storage: file, block, and object protocols

- Two Xeon processors per controller with up to 24 cores per processor

- Up to 1.5TB of memory per controller



**Mission Critical**

**Zero Downtime Upgrades and Migrations**

**Zero Risk With Reverse Replication**

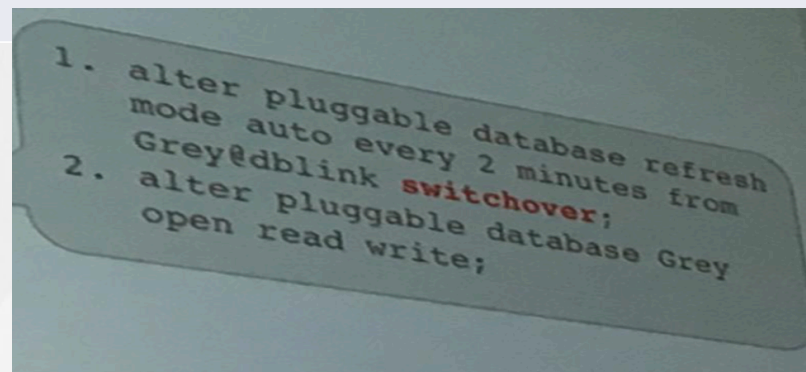




# Oracle Database 18c

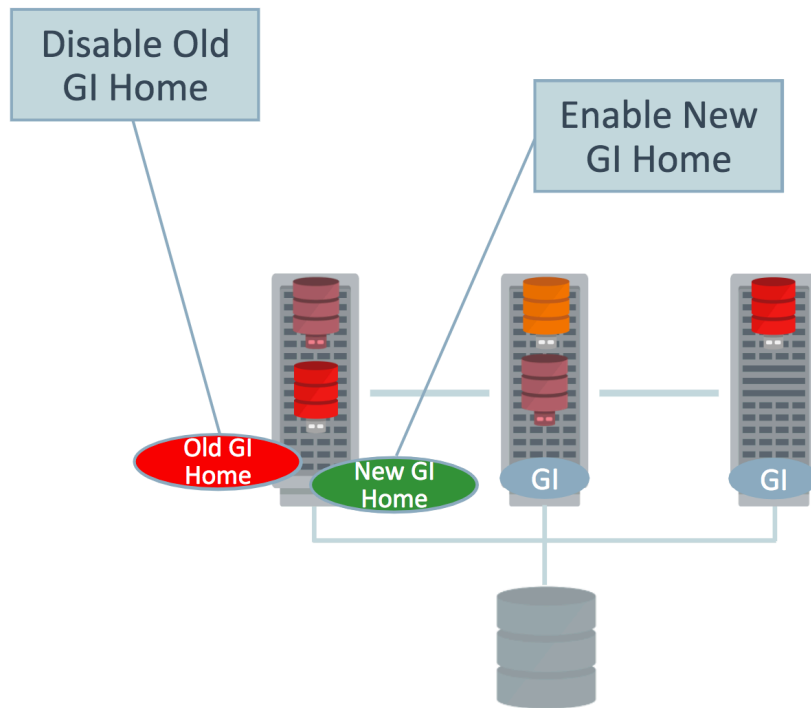
## New Features

Zero Impact Grid Infrastructure Patching	Per-PDB Switchover
Sharded RAC Logically partition data across instances in RAC User Defined Sharding	



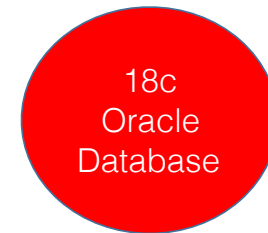
# Zero Impact Patching

## Never take down a Database



1. Node running from old GI-Home
2. Configure new GI-Home
3. Stop old GI-Home
  - no GI stack running at this point
4. Start new GI-Home
  - RDBMS instances unaffected

# Oracle Read-Only Oracle Home



- ▶ Some Files that used to be in ORACLE\_HOME are in ORACLE\_BASE\_HOME and ORACLE\_BASE\_CONFIG
- ▶ Biggest **benefit is Patching and Update the Database** without large downtimes.
- ▶ One Read-Only Image can be to distribute to many Databases
- ▶ To enable/help commands:

```
$roohctl -enable (next, run ./dbca from the bin directory)
```

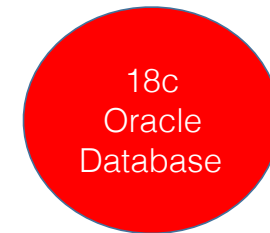
```
$roohctl -help
```

Following are the possible commands:

-enable Enable Read-only Oracle Home

-disable Disable Read-only Oracle Home

# Oracle Read-Only Oracle Home & RPM Install



- ▶ The **database tools and processes** write under the ORACLE\_BASE path instead of under the Oracle home directory.
- ▶ A read-only Oracle home **separates the software from the database configuration** information and **log** files.
- ▶ This separation enables you to easily share the software across different deployments.
- ▶ A read-only Oracle home also **simplifies version** control and **standardization**.

- ▶ Oracle 18c also includes an **RPM-based Database Installation**:
  - `$rpm -ivh` (performs preinstallation validations, extracts packaged software, reassigns ownership, executes root operations for the installation...etc.)



# Oracle Database 18c

## New Features



Database In-Memory Support for External Tables -Great for HDFS	Rolling patches for OJVM
Integration with Active Directory (No OID) Authorization to database through Active Directory user/group mappings to database schema users and roles	Per PDB Key storage Password-less schema creation No default passwords
In-Memory for external tables Build and load in single query Virtual columns in-memory	Private Temporary Tables (to go along with current Global Temporary Tables) • CREATE PRIVATE TEMPORARY TABLE is the same as GTT but only visible to the session that creates it
<b>Automatic In-Memory</b> - evicts the infrequently accessed IM columns out of memory in the situation of memory insufficiency - based on the Heat Map	Alter Table Merge Partition & SubPartition Online

# Oracle Database 18c

## Additional Features



Official Docker Support for 18c (and RAC Support Coming)	Snapshot Carousel Duplicate PDBs across CDBs
Not just Star Schema Support for Analytics Views (Now Snowflake & Flat/Denormalized)	Inline External Tables External Table Definition provided at runtime No need to pre-create external tables that's only used once
Dynamic Data Masking - redact data before it is returned to the application	
The Express Edition (XE) is free use for development or production (not recommended)	
Nearly all functionality is Included Limited to 12G of user storage (was 11G in 11g) Limited to 2G of SGA	

# Oracle Database 18c

## Additional Features



Shadow Lost Write Protection -DB, TS or Datafile	Transportable Backups Backups from non-CDBs are usable after migration to CDB - Backups on source DB are <b>PREPLUGIN</b> backups
RMAN duplicate PDB into existing CDB	Backup to archive storage - Enhances Oracle SBT Library to Archive Storage Cloud
Manual termination of run-away queries  Manually kill a statement without breaking the session:  ALTER SYSTEM CANCEL SQL.  ALTER SYSTEM CANCEL SQL 'SID, SERIAL, @INST_ID, SQL_ID';	
New parallel statement queue timeout and dequeue actions	

# Oracle Database 18c

## Additional Features



### Zero Downtime Database Upgrade

- \* Gold Image Distribution among RHP Servers

### New Default Location of Oracle Database Password File

Note that the new password file path is already in ORACLE\_BASE, not ORACLE\_HOME.

### Concurrent SQL Execution with SQL Performance Analyzer (SPA)

- SPA can run in parallel (by default, it is serial)
- Complete the SPA test faster.

### Designating a CDB Fleet Member

1. **Access the root of the CDB** that you want to designate as a fleet member:  
`ALTER SESSION SET CONTAINER = CDB$ROOT;`
2. **Create the database link to cdb1:**  
`CREATE PUBLIC DATABASE LINK lead_link CONNECT TO C#CF1 IDENTIFIED BY password USING 'lead_pod';`
3. **Set the LEAD\_CDB\_URI property to the name of the database link:**  
`ALTER DATABASE SET LEAD_CDB_URI = 'dblink:LEAD_LINK';`

PDBs may be managed using CDB “fleets” (group of CDBs)

- A **CDB fleet** is a collection of CDBs and hosted PDBs that you can manage as one logical CDB.

### Set the Lead PDB in a CDB Fleet

```
ALTER SESSION SET CONTAINER = CDB$ROOT;  
ALTER DATABASE SET LEAD_CDB = TRUE;
```





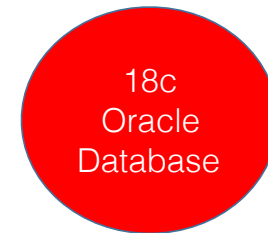
## Multi-Instance Redo Apply Supports Use of Block Change Tracking Files for RMAN Backups

**MIRA + BCT = ADG (Best of both worlds)**

- RMAN block change tracking file can now be enabled on an Oracle Active Data Guard standby that is using multi-instance Redo Apply
- Fastest redo apply technology + incremental backup technology on the same Oracle Active Data Guard

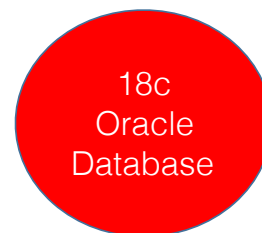


# Standby Nologging



- ▶ Standby Nologging tells the database not to log operations that qualify to be done without logging.
- ▶ **Standby Nologging tells the database to send the data blocks created by the Nologging operation to each qualifying standby database in Data Guard configuration**
- ▶ This typically results in those standbys NOT having invalid blocks.
- ▶ You can **set standby no logging** for load performance or data availability in the following statements:
  - ALTER DATABASE
  - ALTER PLUGGABLE DATABASE
  - CREATE DATABASE
  - CREATE CONTROLFILE

# Standby Nologging



- ▶ **Database nologging** extended for **better use with Oracle Active Data Guard** environment (without significantly increasing the amount of redo generated).

## There are two new nologging modes:

- ▶ **Standby Nologging for Load Performance** – Standbys receive **non-logged data changes** (minimum impact on loading speed at). Non-logged blocks automatically **resolved by managed standby recovery**.
- ▶ **Standby Nologging for Data Availability** - Standbys have data when primary load commits (at the cost of throttling the speed of loading data at the primary), which means the **standbys never have any non-logged blocks to worry about**.
- ▶ ***Nologging** can be used when loading data into your production databases **without compromising the integrity of Data Guard standby databases**, pick your level of synchronization between primary & standby databases.*

# Automatic Correction of Non-logged Blocks at a Data Guard Standby Database

## 2 Modes

- Standby Nologging for Data Availability - commit of a loading operation is delayed until all standby have applied data

```
SQL> ALTER DATABASE SET STANDBY NOLOGGING FOR DATA AVAILABILITY;
```

- Standby Nologging for Load Performance

```
SQL> ALTER DATABASE SET STANDBY NOLOGGING FOR LOAD PERFORMANCE;
```



# PDB Switchover Clause

18c  
Oracle  
Database

- Reverses the roles between a refreshable clone PDB and a primary PDB.
- The former Refreshable clone PDB becomes the primary PDB, which can now be opened in read write mode.
- The *formerly* primary PDB now is the refreshable clone and can only be opened in READ ONLY mode.
- This command must be executed from the primary PDB.
- The dblink must point to the root CDB where the refreshable clone PDB resides.

```
alter pluggable database refresh mode auto every 2 minutes  
from new_pdb@dblink switchover;
```

# Oracle 18c – Inline External Tables

18c  
Oracle  
Database



## Inline external tables

- External table definition provided at runtime
  - Similar to inline view
- No need to pre-create external tables that are used one time only
  - Increased developer productivity

```
CREATE TABLE sales_xt
(prod_id number, ... )
TYPE ORACLE_LOADER
...
LOCATION 'new_sales_kw13')
REJECT LIMIT UNLIMITED );
INSERT INTO sales SELECT * FROM
sales_xt;
DROP TABLE sales_xt;
```



```
INSERT INTO sales
SELECT sales_xt.*
FROM EXTERNAL (
(prod_id number, ... )
TYPE ORACLE_LOADER
...
LOCATION 'new_sales_kw13')
REJECT LIMIT UNLIMITED );
```

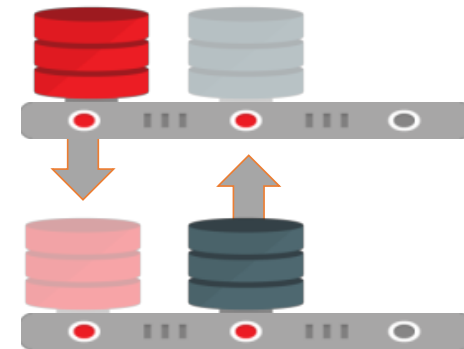
# Multitenant

## Oracle 12c

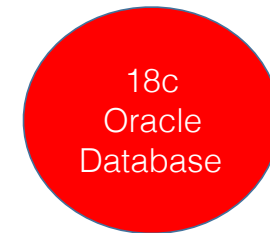


- Container managed database virtualization
- Manage Many as one (Great!)
  - Patching, Backup, Security, Online Cloning, Online Relocation

## Oracle Database 18c



- Per-PDB Switchover
- Transportable Backups
- Snapshot Carousel



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