Oracle Platinum Partner

Oracle Database 12c Release 2 / 18c
For IT Transformation

Part 1: Oracle 12.2

Part 2: Oracle 18c and 19c

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AZORA

Charles Kim, CEO

Oracle ACE Director

January 2019

Industry Experts

- Viscosity founders hold 25+ years each in the Oracle space
- Authors of 20+ books in the Oracle space
- 4 ACE Directors, only 36 in the United States
  - +1 ACE
- SharePlex Platinum Partner
- Direct connections to Oracle support and Product Managers support
- Expertise in Oracle 11g, 12c, 18c, RAC, ASM, Data Guard, Zero Downtime Upgrades, Performance Tuning, and much more

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We've written 20+ books on Data, Cloud, and Oracle…

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Charles Kim

VISCOSITY NORTH AMERICA

- 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

vmware vEXPERT

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ORACLE
ACE Director
My Core Expertise:
Oracle Exadata Implementation Specialist, 2014, 2016
Oracle RAC Certified Expert
Automation – I am an Autonomous DBA ☺
VISCOSITY NORTH AMERICA

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

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 ....

@ViscosityNA

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) **+ Data Guard**
DMA	**2010+ Database Machine Administrator**
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*
PDBAs	**2017+ Multi-Tenant with Oracle Database 12c Release 2 GA – March 2017**
Oracle 18c	**February 2018 in Oracle Cloud, July 2018 On-Premise**

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

Upgrade Plans

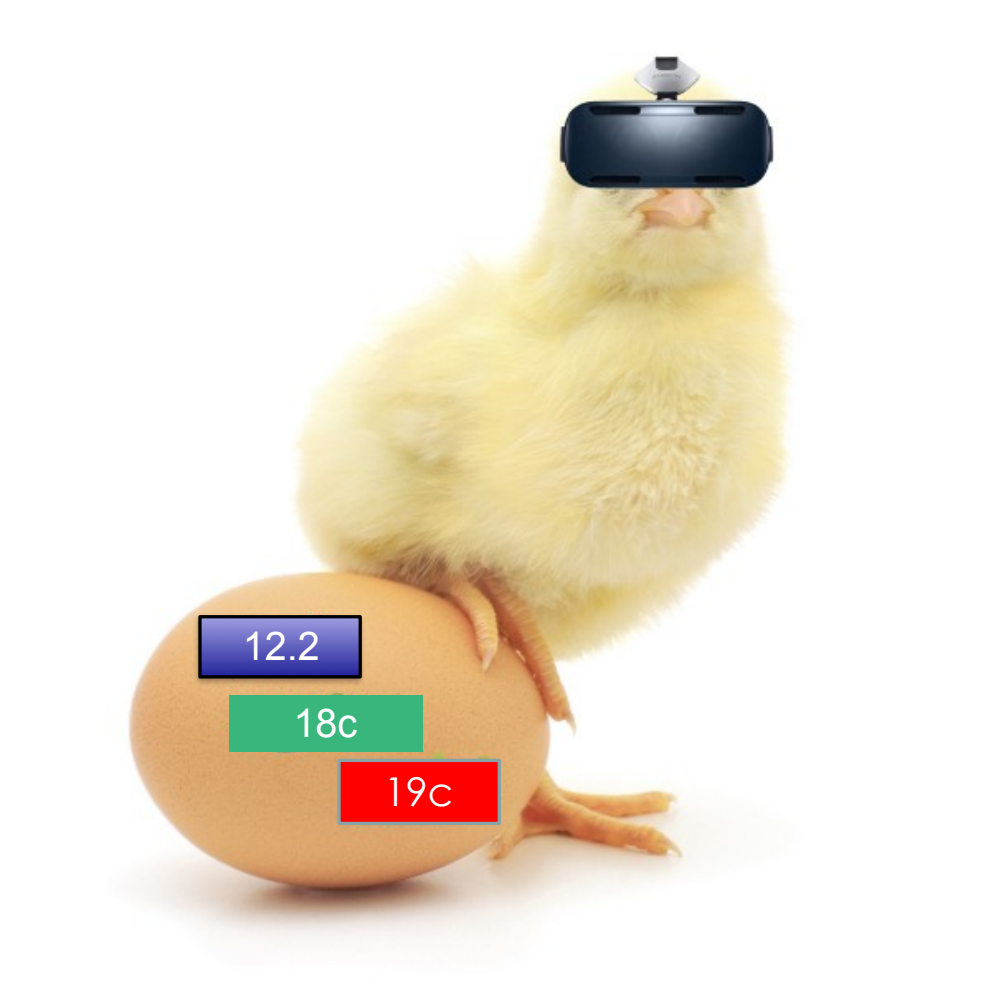
Upgrade On-Premise? Upgrade to the Cloud?

- 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 ?

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

Oracle Database 18.4
Jan 2019

Oracle Database 18c

(18.4)

IBM AIX	ZIP (4.1 GB) See All
HP-UX ia64	ZIP (4.7 GB) See All
Linux on System z (64-bit)	ZIP (3.3 GB) See All

(18.3)

Microsoft Windows x64 (64-bit)	ZIP (4.4 GB) See All
Linux x86-64	ZIP (4.3 GB) | RPM (3.3 GB) See All
Oracle Solaris (SPARC systems, 64-bit)	ZIP (4.1 GB) See All
Oracle Solaris (x86 systems, 64-bit)	ZIP (3.7 GB) See All

Oracle Database 12c Release 2

(12.2.0.1.0) - Standard Edition 2 and Enterprise Edition

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

ORACLE CLOUD

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Oracle Software Delivery Cloud

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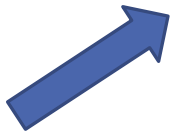
- **REL: Oracle Database** 12.2.0.1.0
- **REL: Oracle Database** 12.1.0.2.0
- **REL: Oracle Database** 12.1.0.1.0
- **REL: Oracle Database** 11.2.0.4.0
- **REL: Oracle Database** 11.2.0.3.0
- **REL: Oracle Database** 11.2.0.2.0
- **REL: Oracle Database** 11.2.0.1.0
- **REL: Oracle Database** 11.1.0.7.0
- **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
- **REL: Oracle Database** Certified Configuration with Framework 11.2.0.1.0



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Back Remove All Continue

Selected Software	Terms and Restrictions	Platforms / Languages	Size	Published Date
Oracle Database (Exadata and SuperCluster) 18.0.0.0.0	Oracle Standard Terms and Restrictions	Linux x86-6	3.5 GB	Feb 16, 2018

Back Remove All Continue

Feedback

Oracle XE 18c*

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 queses
  - In-memory column store
  - In-memory aggregation and attribute clustering
  - Oracle Partitioning
  - Advanced Analytics
  - Column Level Encryption and Tabelspace 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

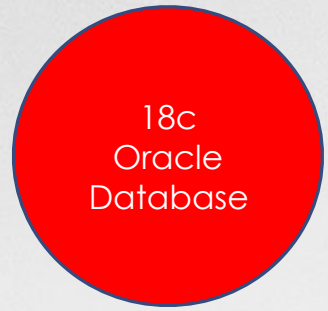
Oracle Database 18c

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

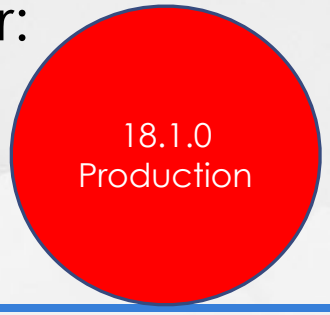


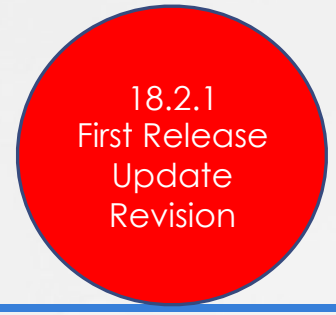
Production	April	July	October	January	April	July
18.1.0	18.2.0	18.3.0	18.4.0	18.5.0 & **19.1.0**	18.6.0 & **19.2.0**	19.3.0
		18.2.1	18.3.1	18.4.1	18.5.1?	19.2.1
			18.2.2	18.3.2	18.4.2	18.5.2 ?

In 3 years, you may run either:

- 18.12
- 19.5
- 20.1

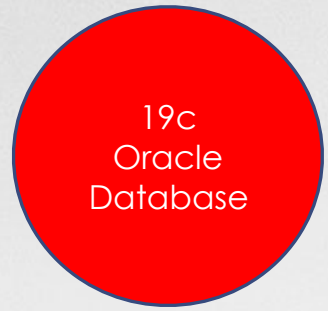
with additional RU or RUR.





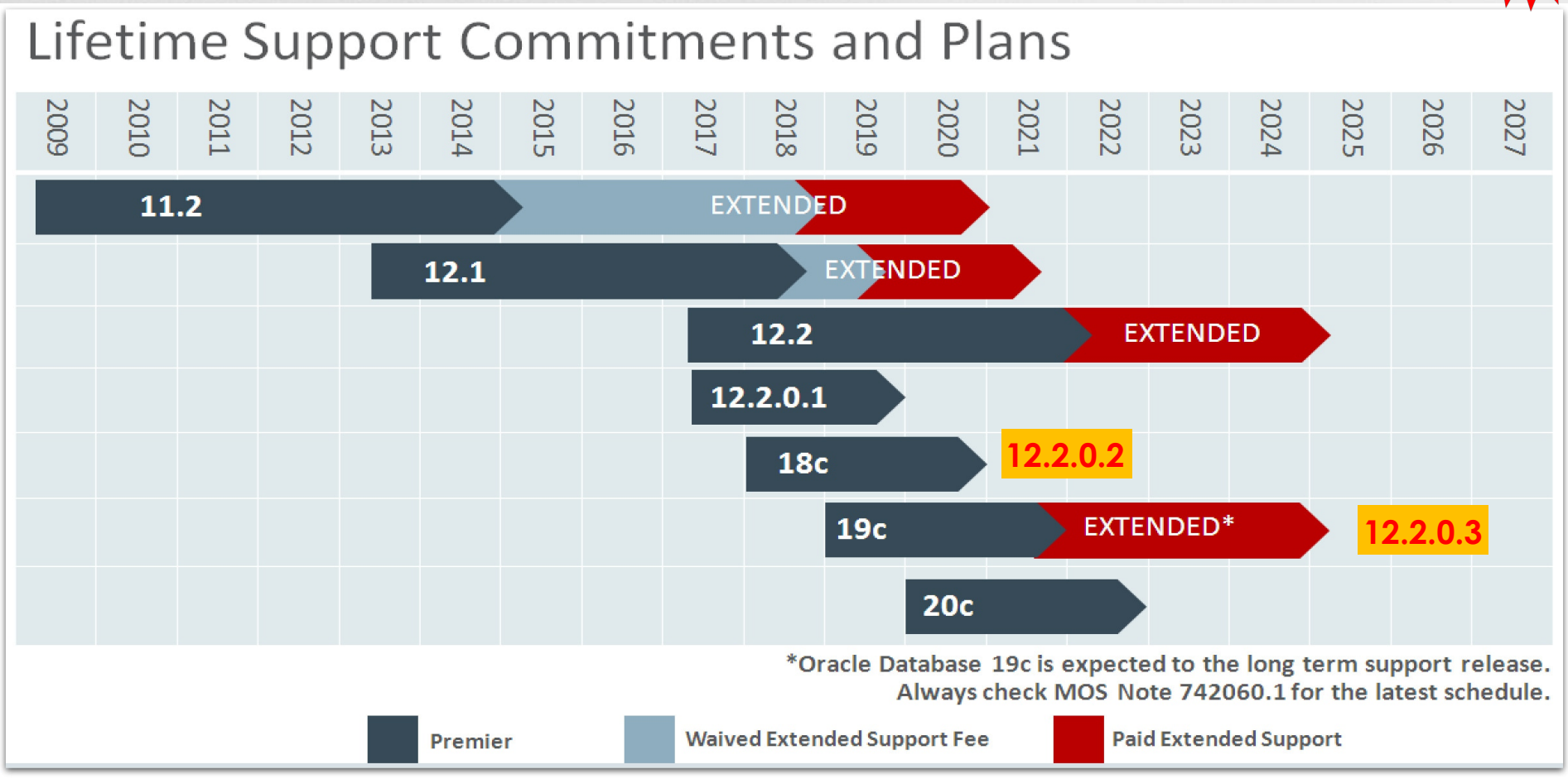
Oracle Database 19c

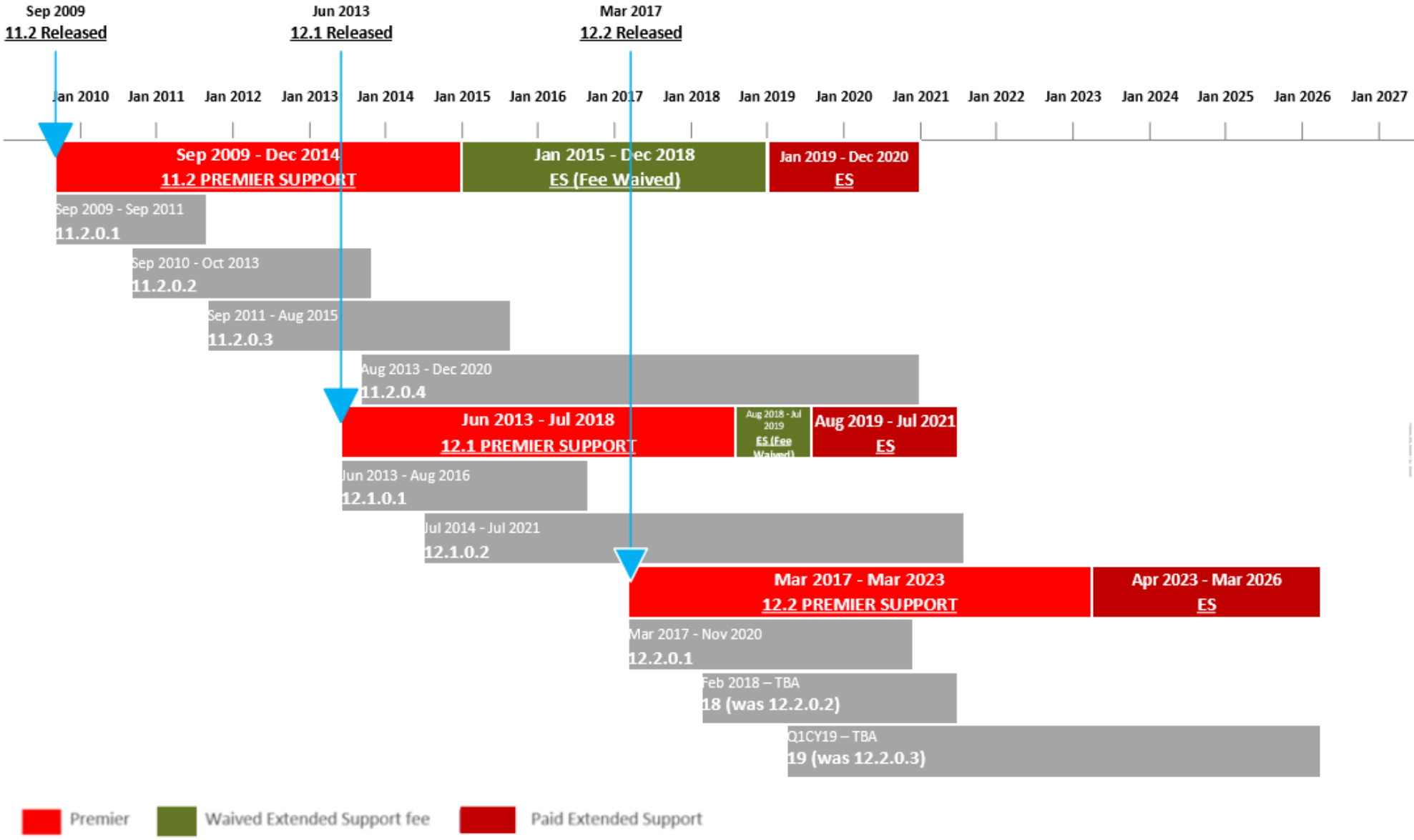
Sample Version Number Timelines With RUs and RURs



January	April	July	October 2019
19.1.0 & 18.5.0	**19.2.0 & 18.6.0**	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	

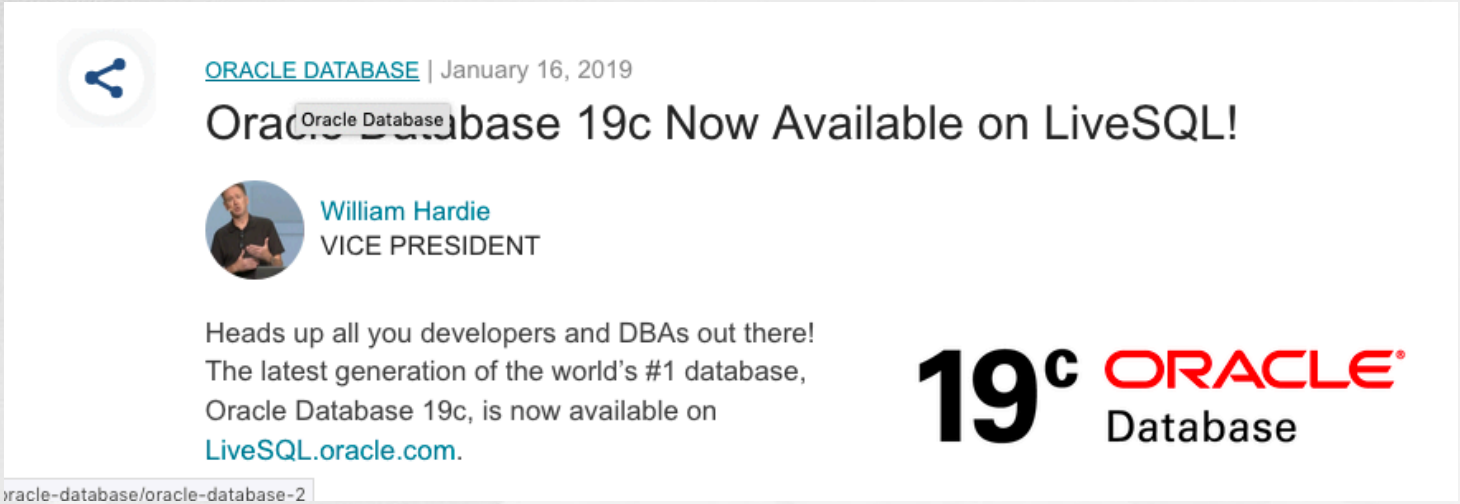
Oracle Database 19c Extended Support




Sep 2009
11.2 Released
Jun 2013
12.1 Released
Mar 2017
12.2 Released
Jan 2010
Jan 2011
Jan 2012
Jan 2013
Jan 2014
Jan 2015
Jan 2016
Jan 2017
Jan 2018
Jan 2019
Jan 2020
Jan 2021
Jan 2022
Jan 2023
Jan 2024
Jan 2025
Jan 2026
Jan 2027
Sep 2009 - Dec 2014
11.2 PREMIER SUPPORT
Jan 2015 - Dec 2018
ES (Fee Waived)
Jan 2019 - Dec 2020
ES
Sep 2009 - Sep 2011
11.2.0.1
Sep 2010 - Oct 2013
11.2.0.2
Sep 2011 - Aug 2015
11.2.0.3
Aug 2013 - Dec 2020
11.2.0.4
Jun 2013 - Jul 2018
12.1 PREMIER SUPPORT
Aug 2018 - Jul 2019
ES (Fee Waived)
Aug 2019 - Jul 2021
ES
Jun 2013 - Aug 2016
12.1.0.1
Jul 2014 - Jul 2021
12.1.0.2
Mar 2017 - Mar 2023
12.2 PREMIER SUPPORT
Apr 2023 - Mar 2026
ES
Mar 2017 - Nov 2020
12.2.0.1
Feb 2018 – TBA
18 (was 12.2.0.2)
Q1CY19 – TBA
19 (was 12.2.0.3)
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 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 Paris
  - &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
  - 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 wil be in sync to maintain redundancy

Mission Critical

Zero Downtime Upgrades and Migrations

Zero Risk With Reverse Replication

Oracle Autonomous Data Warehouse Cloud

Oracle 18c, 19c & Exadata

Only need 5 things for provisioning	Self	Data Loading	Default Settings	Load Data and Run
Database Name?	Self-Driving	From SQL*Net for small data sets	Init.ora optimized for Data Warehouse	Do not have to define Indexes
Which Data Center?	Self-Securing	**From Oracle Object Storage for large data**	Result Cache is enabled by default	Do not create partitions
# of CPUs?	Self-Repairing	From AWS S3	**Stats are gathered automatically for Direct Load**	No Tuning
Size in TB?	Self-Tuning	Roadmap: Hadoop File Format	All Tables: EHCC (cannot be turned off)	No Database Expertise Needed
Admin Password?	Self-Scaling		Memory, parallelism, sessions set per OCPU	

Oracle 18c Autonomous Database

- Continuous Adaptive Performance Tuning
- Fully Automated Hardware Resource Elasticity

- SLA: **99.995 %** Uptime leveraging
  - Exadata/RAC/ASM
  - Active Data Guard
  - RAC Rolling Upgrade
  - Transient Logical Standby
  - Online and Edition Based Re-definiition
  - Flashback transaction, table, or database

  - KSplice on the server side

99.995% Uptime

Availability %	Downtime per year	Downtime per month
99.95% ("three and a half nines")	4.38 hours	21.56 minutes
99.99% ("four nines")	52.56 minutes	4.38 minutes
99.995% ("**four and a half nines**")	**26.28** minutes	**2.16** minutes
99.999% ("**five nines**")	5.26 minutes	25.9 seconds

Loading Data from the Oracle Object Store

- Load data directly into the target table without any intermediate steps
- Data format in the source file easily specified as JSON

```
begin
 dbms_cloud.copy_data(
    table_name =>'CHANNELS',
    credential_name =>'OBJ_STORE_CRED',
    file_uri_list =>'https://swiftobjectstorage.us-ashburn-
1.oraclecloud.com/v1/dwcsdemo/DEMO_DATA/chan_v3.dat',
    format => json_object('ignoremissingcolumns' value 'true',
                          'removequotes' value 'true')
 );
end;
/
```

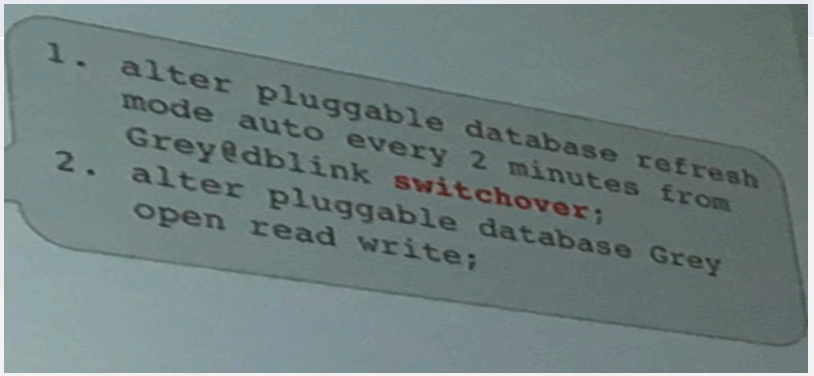
DBMS_CLOUD

- DBMS_CLOUD.CREATE_CREDENTIAL – Creates a credential object to authenticate to the object store (Oracle or AWS S3)
- DBMS_CLOUD.COPY_DATA – Copies data from the object store into a table.
  Parameters: fulltable_name, file_uri_list, format
- DBMS_CLOUD.CREATE_EXTERNAL_TABLE – Create an external table pointing to the files in the object store
  - Does not load data into tables
- USER_LOAD_OPERATIONS: View to display information about load operations

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	

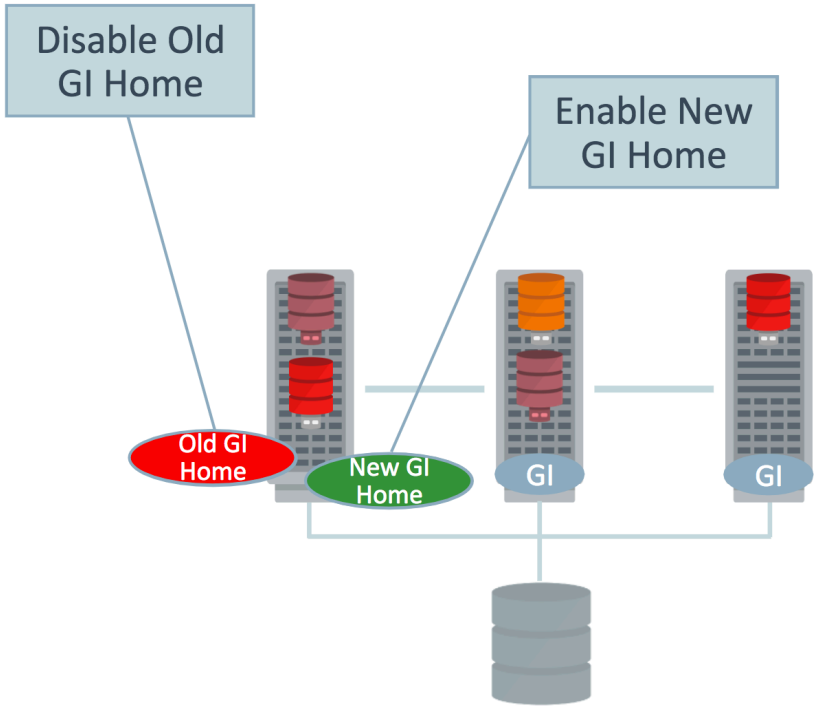


NEW IN 18c

Really 19c

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

Silent Installation of RAC / ASM / DB - Oracle Database 12.2

Different Way of Installing / Configuring Oracle

- Create 2-4 Node RAC environments easily with automation
- Create ASM instances in silent mode (for non-RAC)
- Create ASM Disk Groups with automation
- Perform Silent Installations of Oracle DB Software
- Create Databases with dbca in silent mode

Automate Oracle 12.2 RAC Installation

Unzip Oracle Grid Infrastructure 12.2 binaries to the target GI Home only on 1 Node

↓

Download and extract the latest OPatch

↓

Apply one-offs (because there is a bug with running root.sh - causes failure on the first node)

→

```
/u01/app/12.2.0.1/grid/gridSetup.sh -silent -applyOneOffs /u01/app/stage/GI/OPatch/28183653/28163133
/u01/app/12.2.0.1/grid/gridSetup.sh -silent -applyOneOffs /u01/app/stage/GI/OPatch/28183653/28163190
/u01/app/12.2.0.1/grid/gridSetup.sh -silent -applyOneOffs /u01/app/stage/GI/OPatch/28183653/28163235
/u01/app/12.2.0.1/grid/gridSetup.sh -silent -applyOneOffs /u01/app/stage/GI/OPatch/28183653/26839277
/u01/app/12.2.0.1/grid/gridSetup.sh -silent -applyOneOffs /u01/app/stage/GI/OPatch/28183653/27144050
```

run gridSetup.sh - ./gridSetup.sh -silent -skipPrereqs -responseFile /u01/app/12.2.0.1/grid/grid.rsp

run orainstRoot.sh - /u01/app/oraInventory/orainstRoot.sh
run root.sh - /u01/app/12.2.0.1/grid/root.sh
On EACH NODE

As install user, execute the following command to complete the configuration:
/u01/app/12.2.0.1/grid/gridSetup.sh -executeConfigTools -responseFile /u01/app/12.2.0.1/grid/grid.rsp [-silent]

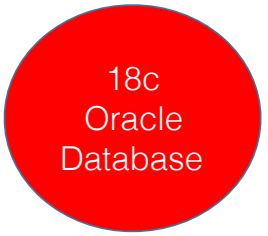
Oracle Read-Only Oracle Home

- 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
Automatic In-Memory - 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 **PREPLUGIN** 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

Partitioning

Partitioning Overview

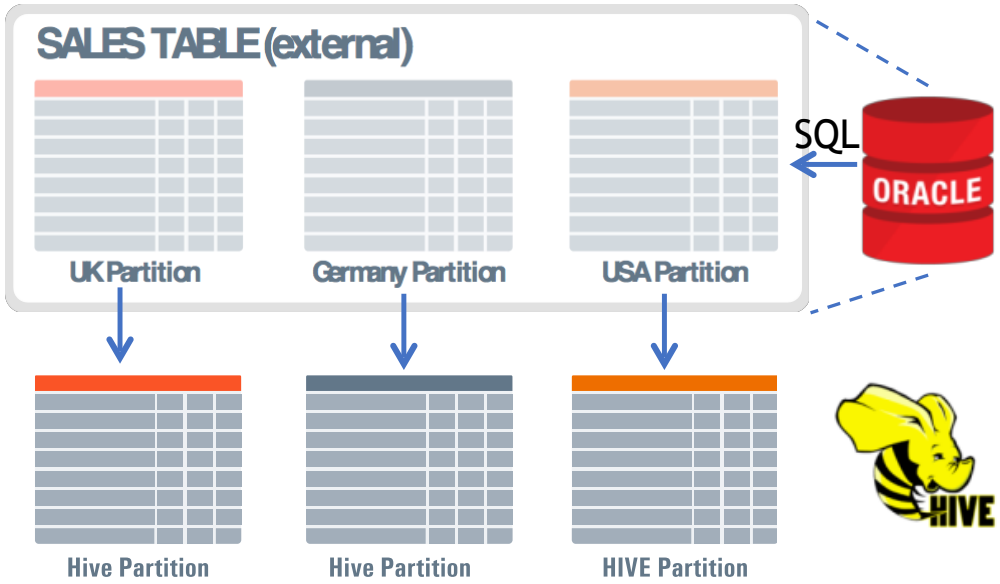
Additional Features

- Convert Non-Partitioned Table to a Partitioned Table
- Read-Only Partitions
- Multi-Column List Partition
- Split Partition with Online Maintenance
- Create a Partitioned External Table
  - Support to map partitioned Hive tables into the Oracle Database ecosystem as well as providing declarative partitioning on top of any Hadoop Distributed File System (HDFS) based data store.
  - External Tables Can Access Data Stored in Hadoop Data Sources Including HDFS and Hive

Big Data Innovations

Partitioned External Tables

- External tables can be partitioned
  - using any partitioning technique
- Partition pruning
  - For faster query performance
- Basic partition maintenance
  - Add, drop, exchange



18c Oracle Database

In 18c: Inline and In-Memory External Tables

Thanks Oracle: Graphics

Partitioning
Split Partitions in 12.2


```
ALTER TABLE mytable
SPLIT PARTITION p1 at (100)
INTO (PARTITION p1_1, PARTITION p1_2) ONLINE;
```

(Can Split Sub-Partitions too – both in 12cR2)

18c Oracle Database

In 18c: Alter Table **Merge Partition Online** &
Alter Table **Merge Subpartition Online**

Partitioning
Merge Partitions Example in 18c

- With UPDATE INDEXES clause, the indexes remain usable during the move operation

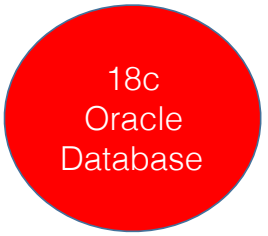
Merge Range Partitions:

```
ALTER TABLE four_seasons
MERGE PARTITIONS quarter_one, quarter_two
INTO PARTITION quarter_two UPDATE INDEXES ONLINE;
```

Merge List Partitions:

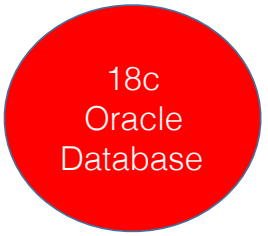
```
ALTER TABLE q1_sales_by_region
MERGE PARTITIONS q1_northcentral, q1_southcentral
INTO PARTITION q1_central STORAGE(MAXEXTENTS 20) ONLINE;
```

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

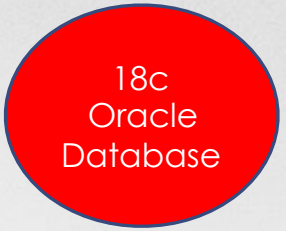
- Standby Nologging for Data Availability - commit of a loading operation is delayed until all standby have applied data

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



- 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

VISCOSITY NORTH AMERICA

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 );
```

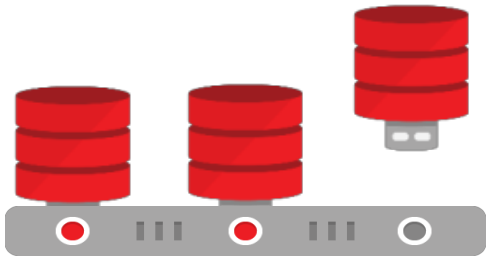
ORACLE

Multitenant

18c Oracle Database

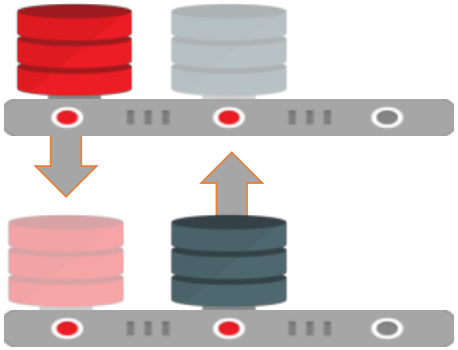
VISCOSITY NORTH AMERICA

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

12.2 GRID INFRASTRUCTURE

CONSOLIDATION MANAGEMENT AND STABILITY

Grid Infrastructure

Streamlined GI Installation

- GI Software available as an image file for download and installation
- Simple steps:
  - Create new GI Oracle Home with appropriate user/group permissions (on all nodes)
  - Extract image file into one new home
  - Execute ./gridsetup.sh to invoke the setup wizard
- Can be used for all RAC and Standalone configurations
- Significantly reduces time to deploy GI and RAC

Grid Infrastructure

Rapid Home Provisioning

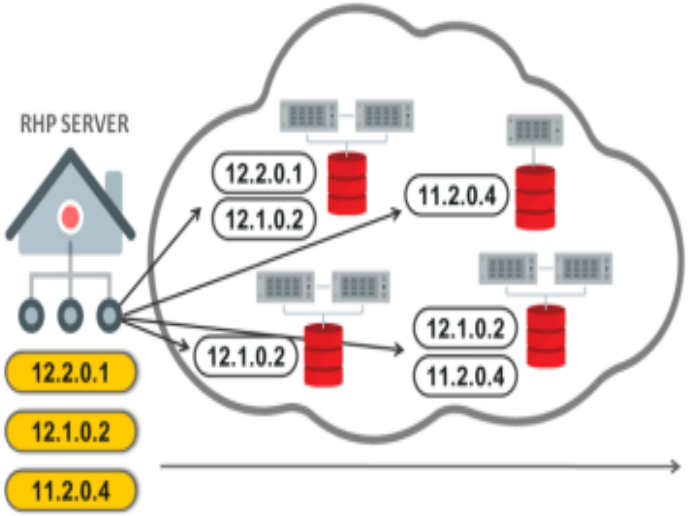
- Rapid Home Provisioning (RHP) represents new standard way for provisioning, patching and upgrading software repositories or software depots
  - A method of deploying software homes to client nodes.
  - Can be Oracle database software or custom software.
  - Allows Software Depot Admins to create, store and manage templates of Oracle homes as images, called gold images

- 12.2 RHP can used to create a new database or upgrade the database to the newly provisioned software stack.
  - Provision Full Oracle Stack – GI/DB Homes of 11.2.0.3/4, 12.1.0.2, and 12.2
  - Provision RAC clusters, Patch, and Upgrade Oracle Grid Infrastructure
  - Custom Workflow

Grid Infrastructure - Rapid Home Provisioning

Key components of RHP features

- RHP Server manages provisioning and is installed as part of 12.2.0.1 Grid Infrastructure stack
- RHP Client - Client node/cluster consumes the provisioned software from RHP Server.
- Grid Naming Service (GNS) -advertises the location of RHP server for RHP client
- VIP to support HA-NFS required if remote serving of homes to client clusters is required
- ASM Cluster File System (ACFS) - Used to store snapshots of working copies.
- Metadata Management Repository - Maintains metadata info on images and working copies
- The Management Repository Database - (MGMTDB) is created when installing Oracle Grid Infrastructure



Grid Infrastructure
Load-Aware Resource Placement

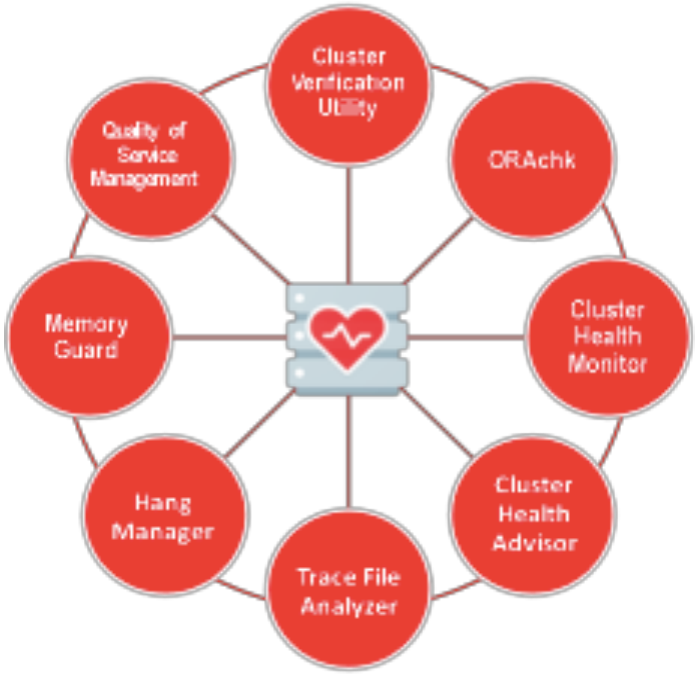
- Define database resources such as CPU and memory to Clusterware

```
$ srvctl modify database -db vnadb -cpucount 8 –memorytarget 32G
```

- Clusterware places databases instances only on servers with sufficient number of CPUs, Memory or Both.
  - Prevents overloading a server with more database instances than the server is capable of running
  - Downside - Requires Instance Caging/DBRM to be enabled and use AMM ☹

Grid Infrastructure
Autonomous Health Framework

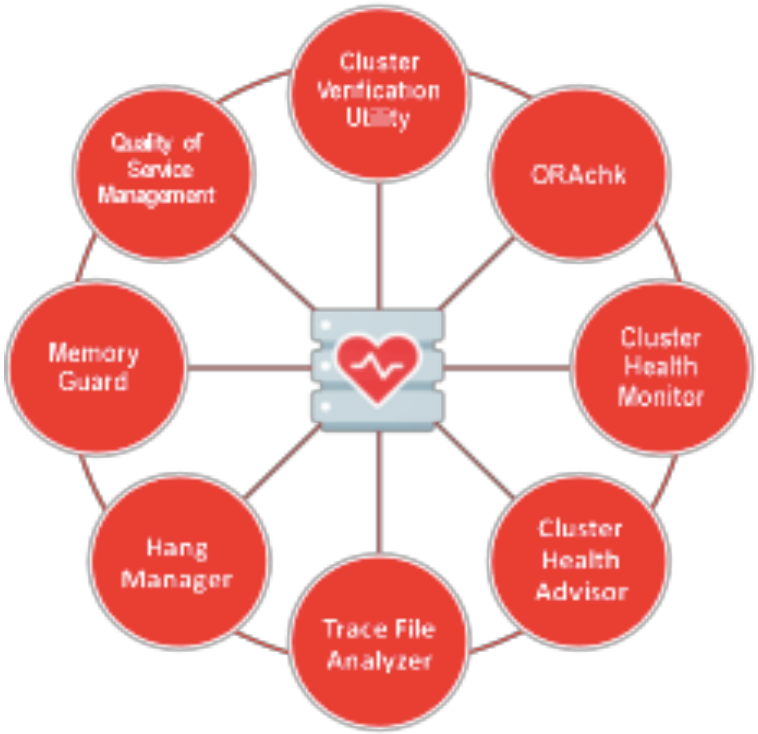
- Framework for monitoring, diagnosing, and preventing **availability** and **performance** issues.
- Pulls all provider data into a single repository – GIMR
- GIMR clients (TFA, diagcollector, CHA, etc.) report off the repository and alert as necessary
- Setup separate diskgroup for GIMR DB



Grid Infrastructure
Autonomous Health Framework

- Cluster Health Advisor -
  - Provides early warning of pending performance issues, root causes,& corrective actions for RAC databases and cluster nodes.
  - Generate a HTML or text reports on key issues
  - Built in models or Define user models for workloads

```
chactl calibrate database -db nishan -model weekday
-timeranges 'start=start=2016-09-09
16:00:00,end=2016-09-09 23:00:00' -kpiset
'name=CPUPERCENT min=10 max=60'
```



Grid Infrastructure

Server Weight-Based Node Eviction

- For split brain condition, more insight/intelligence is hinted
- Ensure specific nodes survive the tie-breaking process, and don't get evicted
- Favoritism to particular databases or services.
- Assign weight to particular nodes, resources, or services
- Two mechanisms: automatic or user input based
- Set database or service as CSS_CRITICAL

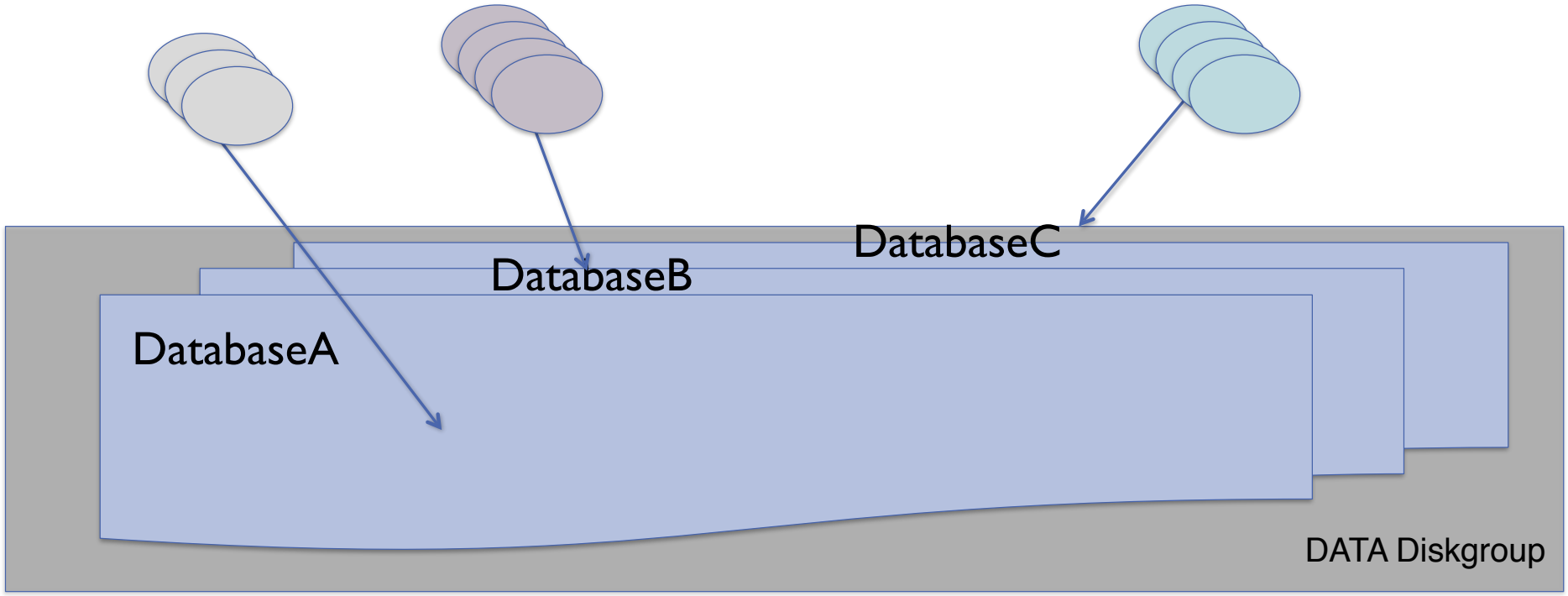
```
srvctl modify database -d nishan -diskgroup DATA -css_critical yes
   -cpucount 8 -cpucap 16 -acfspath "/u01/acfsdata/goldengate_trails"

crsctl set server -css_critical yes
```

12.2 ASM AND ACFS

ASM

Traditional ASM-Database relationship



ASM
Flex Disk Groups and File Groups

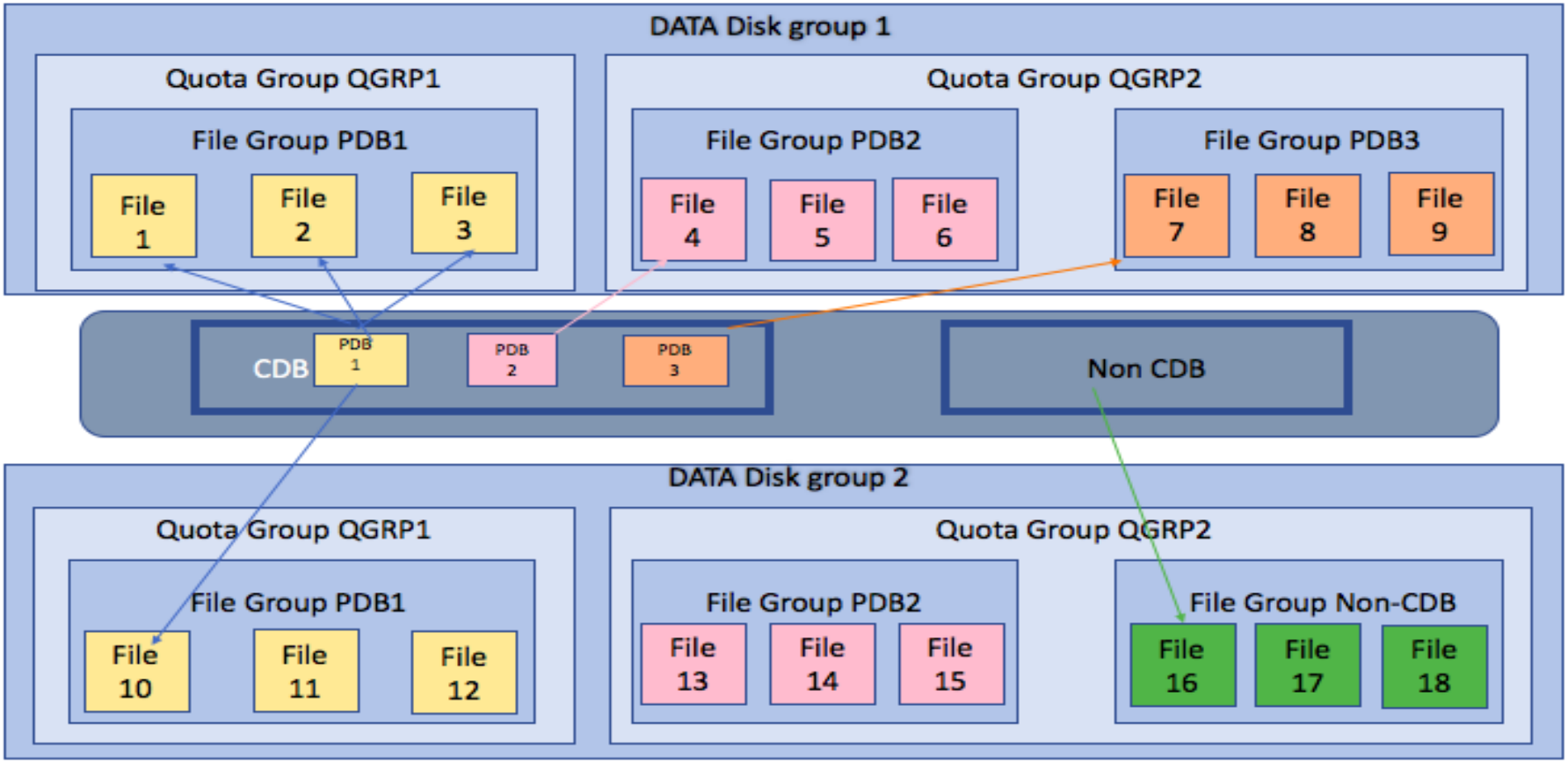
- Flex Disk groups are the foundation to support new features such as File groups

- File group is a group of files that share the same set of properties and characteristics
  - This set of properties includes redundancy, rebalance rebuild priority, rebalance power limit, client compatibility, striping, quota group, and the access control list.

  - A major benefit is the ability to have a different availability specification for each database that shares the same disk group. File groups are also useful for point-in-time database clones.

ASM

Flex Disk Groups and File Groups



ASM
Flex Disk Groups and File Groups

Disk group

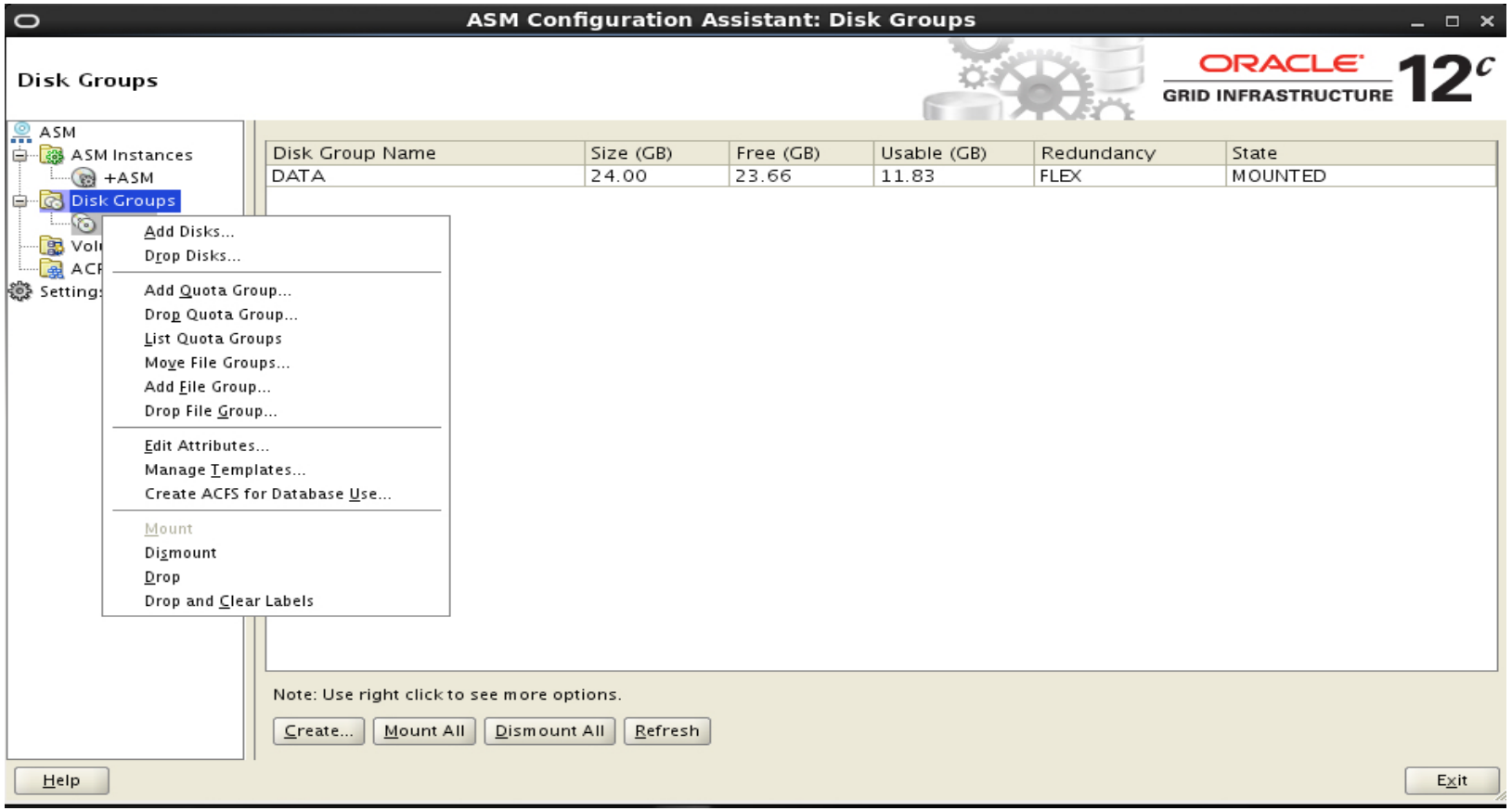
- Contains at least one file group, the default file group
- Can contain multiple file groups
- Must have FLEX redundancy to contain a file group

File group

- Can belong to only one disk group
- Can describe only one database, PDB, CDB, volume, or cluster
- File group can belong to only one quota group
- Database can span multiple disk groups with multiple file groups in different disk groups

ASM

Flex Disk Groups and File Groups



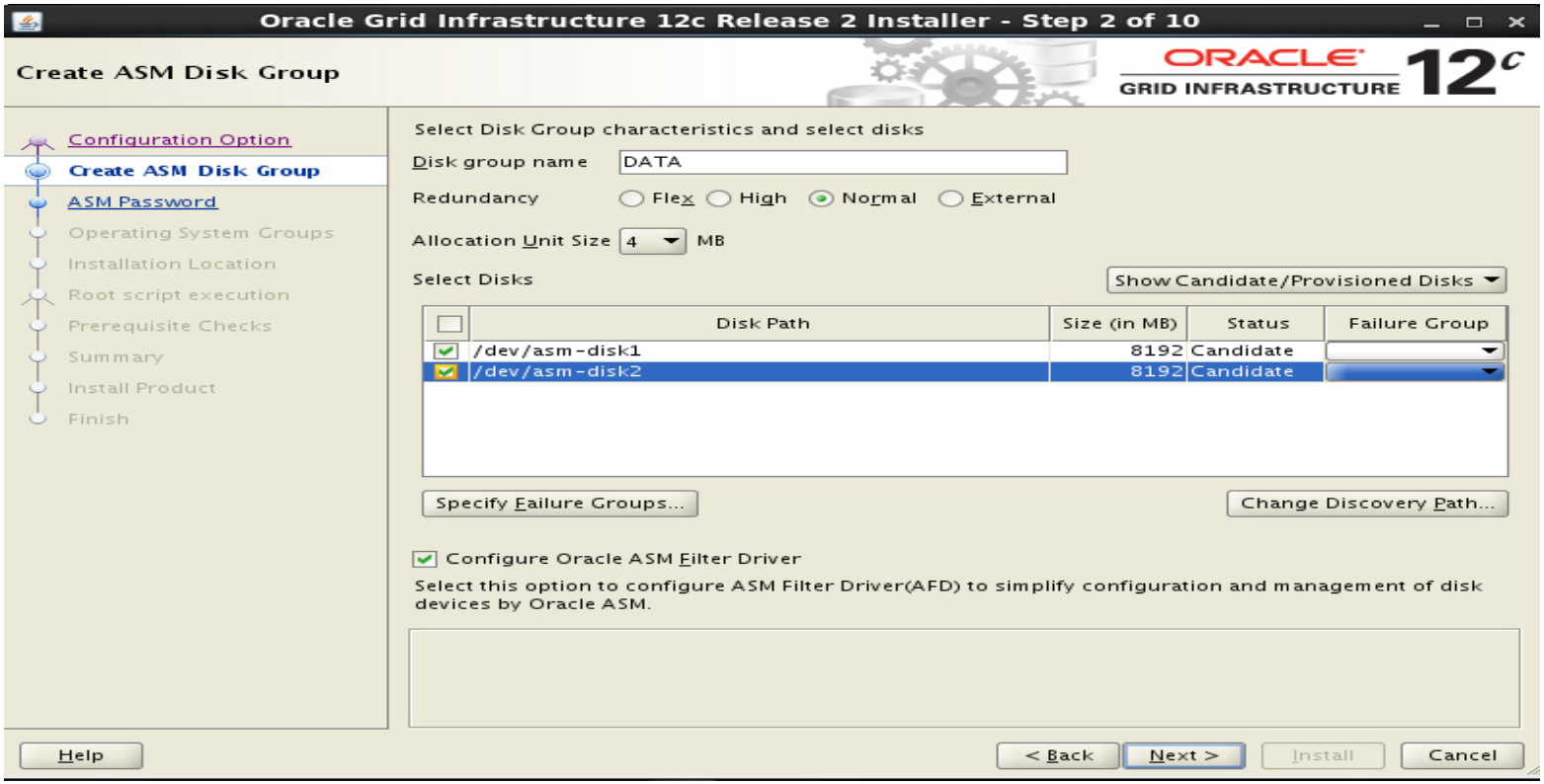
ASM
Misc Features

- **Filter Driver Installation and Configuration**
  - Installation and configuration for ASM Filter Driver (ASMFD) is enabled as part of Oracle Grid Infrastructure installation

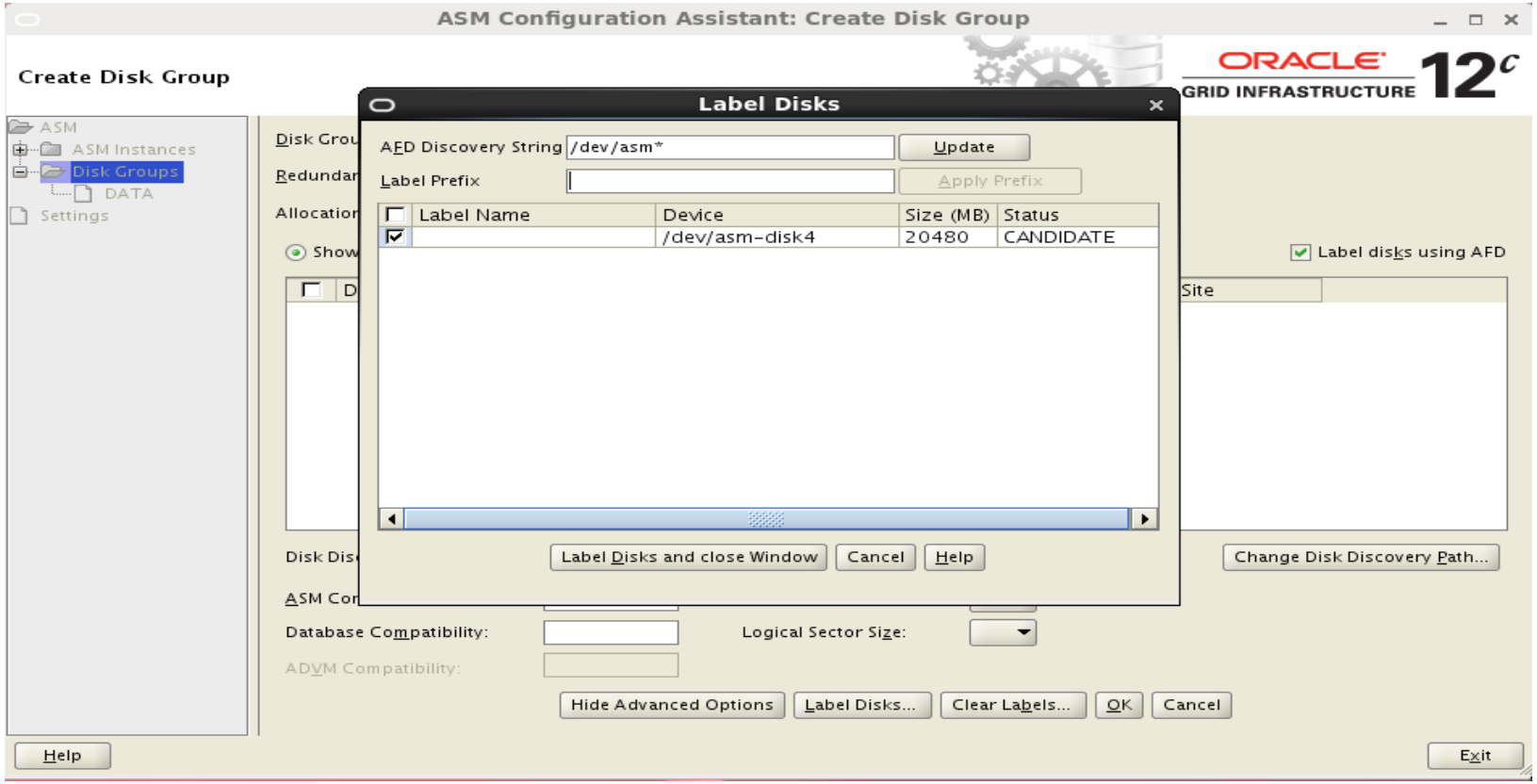
- **Extended Support for 4K Sector Size**
  - Logical_sector_size defines the logical sector size (in bytes) of the disk group and specifies the smallest I/O that can be used

- **Support for Preferred Read on Extended Clusters**
  - The preferred read failure groups capability is automatically detected and set in the ASM instance when extended clusters are deployed.

ASM
Filter Driver



ASM
Filter Driver



ACFS

- **Snapshot Enhancements**
  - Snapshot based replication
  - Admins can impose quotas to snapshots to limit amount of write operations that can be done on a snapshot
  - Rename an existing ACFS snapshot, for more user-friendly names
  - ACFS snapshot remaster capability allows for a snapshot in the snapshot registry to become primary file system

- **4K Sectors**
  - If the COMPATIBLE.ADVM ASM Diskgroup attribute is set to 12.2 or greater, then the metadata block is 4096 bytes by default
  - Use mkfs –i
  - If COMPATIBLE.ADVM attribute is set to <12.2, then the block size is set to 512 bytes

ACFS

- **Compression Enhancements**
  - ACFS compression - enabled for specific ACFS file systems for database files, RMAN backup files, archivelogs, data pump extract files, and general purpose files.
  - Oracle does not support redo log/flashback logs/control file compression
  - Databases with 2k or 4k block sizes are not supported for ACFS compression.
  - ACFS compression is supported on Linux and AIX, as well as ACFS snapshot-based replication.

- **Defragger**
  - “acfsutil defrag dir” or “acfsutil defrag file” commands for on-demand defragmentation.
  - ACFS will perform all defrag operations in the background.
  - With the –r option of the “acfsutil defrag dir”command, you can recursively defrag subdirectories.

ACFS

- **Loopback Devices**
  - We can now take OVM images, templates, and virtual disks and present them as a block device
  - Files can be sparse or non-sparse
  - ACFS also supports Direct I/O on sparse images

- **Metadata Accelerator**
  - Dramatically speeds up filesystem operations
  - Enables many critical ACFS metadata structures, including extent metadata, storage bitmaps, volume logs, and some snapshot metadata to be placed on accelerator storage
  - The accelerator volume can be created on Linux environments with the -a option of the mkfs command.
  - Recommended starting accelerator size is minimally 0.6% of the size of the file system

- **Auto-Resize Enhancements**
  - The auto-resize feature, allows to “autoextend” a file system if the size of the file system is about to run out of space.
  - Just like an Oracle datafile that has the autoextend option enabled, we can now “autoextend” the ACFS file system to the size of the increment by option.
  - With the –a option to the “acfsutil size” command, we can specify the increment by size.
  - We can also specify the maximum size or quota for the ACFS file system to “autoextend” to guard against a runaway space consumption.
  - To set the maximum size for an ACFS file system, execute the “acfsutil size” command with the –x option.

ACFS New Features – Complete List

- Snapshot-Based Replication
- Snapshot Enhancements
- Compression and Defragger
- Support for 4K Sectors
- Automatic Resize
- Metadata Acceleration
- NAS Maximum Availability eXtensions
- Sparse Files
- Scrubbing Functionality
- Loopback Functionality
- Diagnostic Commands

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