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Oracle Database

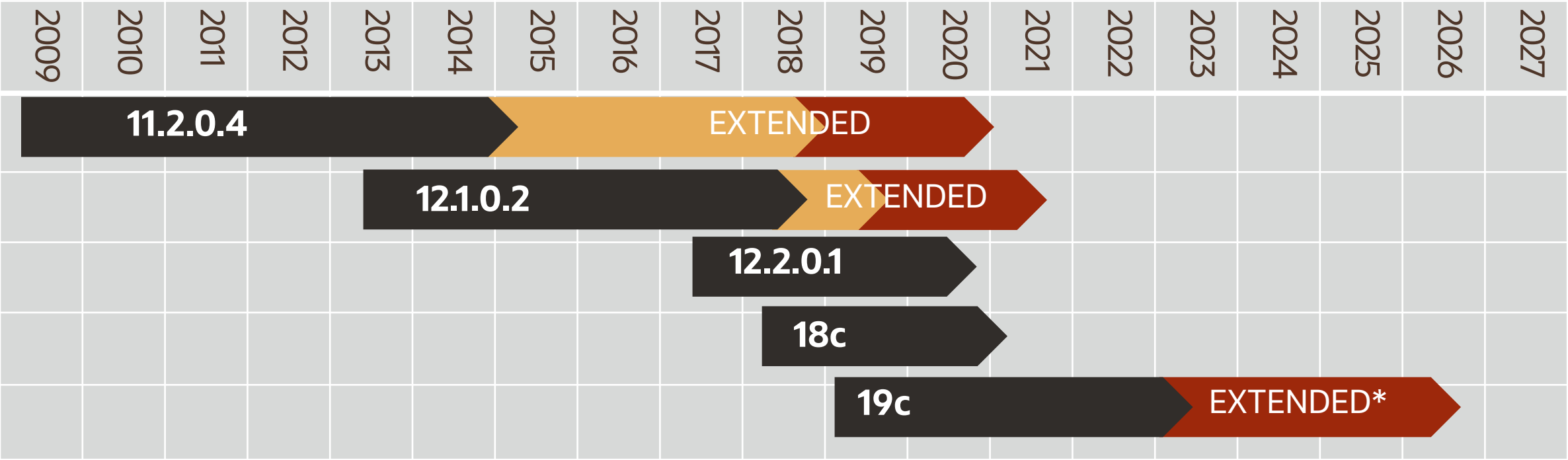
What's New, What's Next

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DECEMBER 5th 2019

What's New?

Database Release and Support Timelines



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

Premier
 Waived Extended Support Fee
 Paid Extended Support



Annual Releases Accelerate Innovation

12^c
RELEASE 2

2017

18^c

2018

19^c

2019

Oracle Database 12c Release 2 Innovations

The logo for Oracle Database 12c Release 2. It features the number '12' in a large, bold, red font, with a small 'c' in a red superscript to its upper right. Below the '12' is a black rectangular box containing the text 'RELEASE 2' in white, uppercase letters. A grey line with a circular end connects the top of the '12' to the top-left corner of the innovation list box.

12^c
RELEASE 2

2017

- Native Database Sharding
- PDB Clone and Relocate
- Autonomous Health Framework
- Enhanced Database In-Memory
- Online Database Encryption

Oracle Database 18c Innovations

12^c
RELEASE 2

2017

18^c

2018

- Active Directory Integration
- Sharded RAC
- PDB Snapshot Carousel
- In-Memory for Key-Value
- Private Temporary Tables

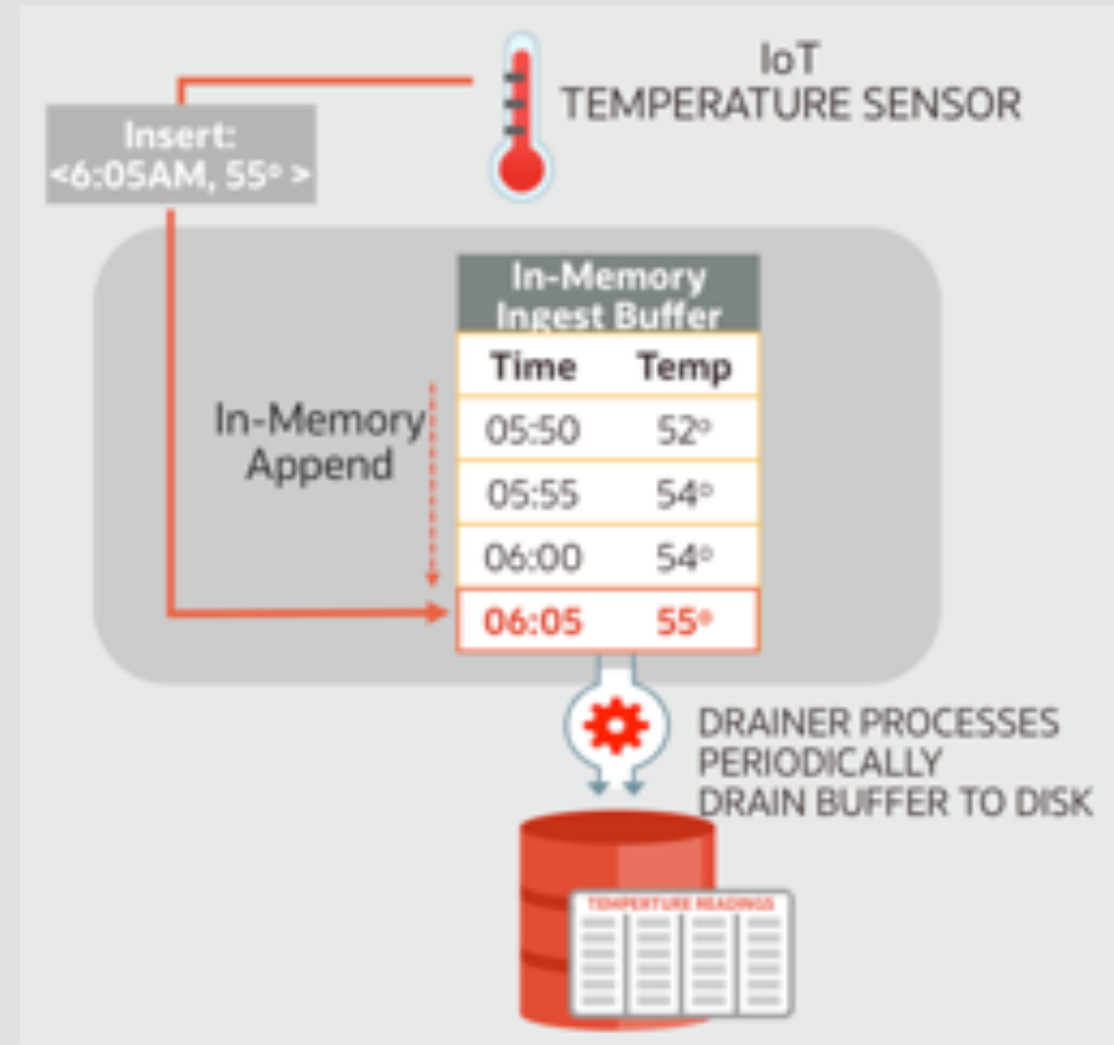
Oracle Database 19c Innovations

- Streaming Insert for IoT
- Active Data Guard Updates
- Automatic Indexing
- SQL Query of Object Stores
- Global fault-tolerant Key Vault

19^c
2019

New | Streaming Insert for IoT

- New in-memory insert algorithm
 - Declare table MEMOPTIMIZE FOR WRITE
 - Client performs low-latency insert into in-memory buffer
 - High throughput bulk insert done asynchronously in background
- 25 million inserts per second on two socket server



Memoptimized Rowstore

```
alter system set MEMOPTIMIZE_POOL_SIZE = 10G scope=spfile;
```

```
SQL> show parameter MEMOPTIMIZE_POOL_SIZE
NAME                                TYPE                                VALUE
-----                                -                                -
memoptimize_pool_size                big integer                          10G
```

```
CREATE TABLE tbl_fast_lookup
  ( id NUMBER(5) PRIMARY KEY,
    test_col VARCHAR2(15) )
MEMOPTIMIZE FOR READ;
```

```
execute DBMS_MEMOPTIMIZE.POPULATE('soe', 'tbl_fast_lookup');
```

```
CREATE TABLE tbl_fast_ingest
  ( id NUMBER(5) PRIMARY KEY,
    test_col VARCHAR2(15) )
MEMOPTIMIZE FOR WRITE;
```

```
INSERT /*+ MEMOPTIMIZE_WRITE */ INTO tbl_fast_ingest VALUES (1,'test');
```

Statistics Collecting

High Frequency Automatic Statistics Collection

- Fully automated task
- Frequently inspects the database to establish if there are any stale statistics
- If stale statistics are found they will be refreshed
- Runs independently of the maintenance window

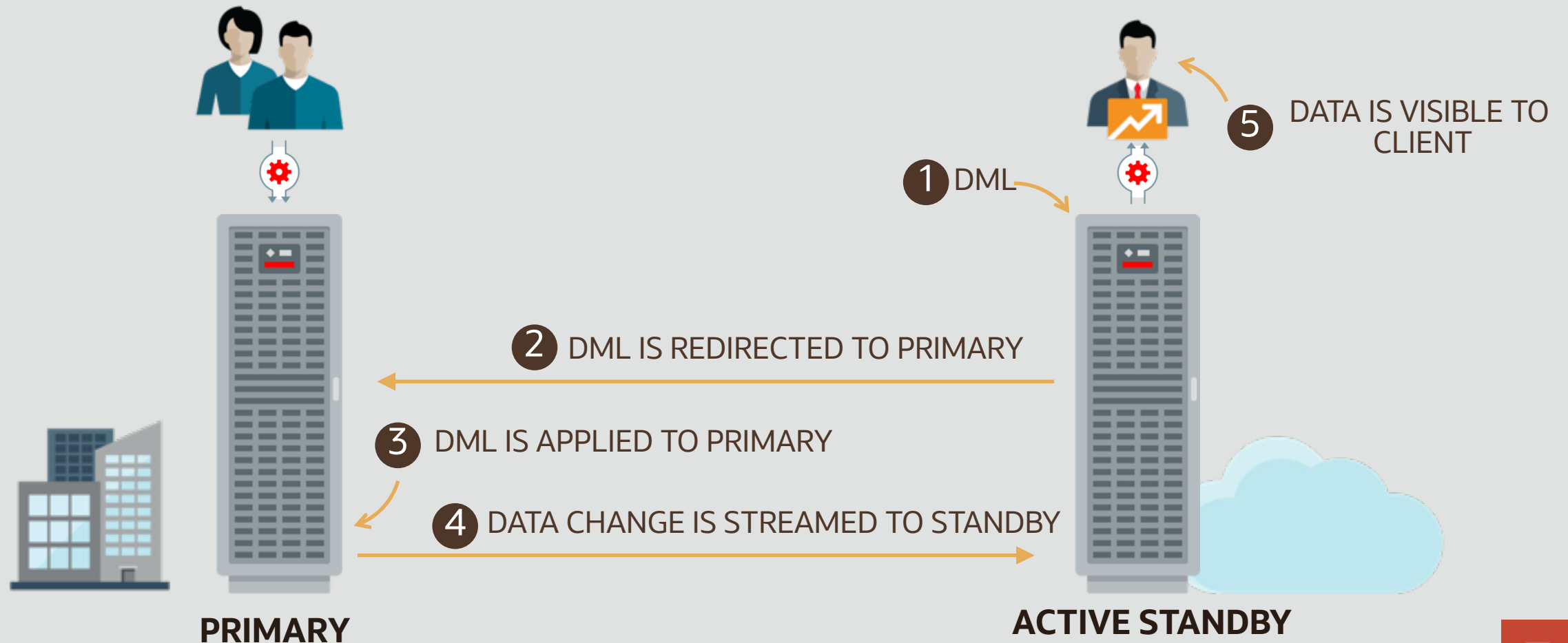
Real Time Statistics Collection

- Augments automatic statistics collection operations
- Statistics are collected during Bulk AND conventional DML operations
- Most essential optimizer statistics are collected in real time
- Stored in Memory in real-time, asynchronously written to disk

Technical White Paper- [Best Practices for Gathering Optimizer Statistics With Oracle Database 19c](#)

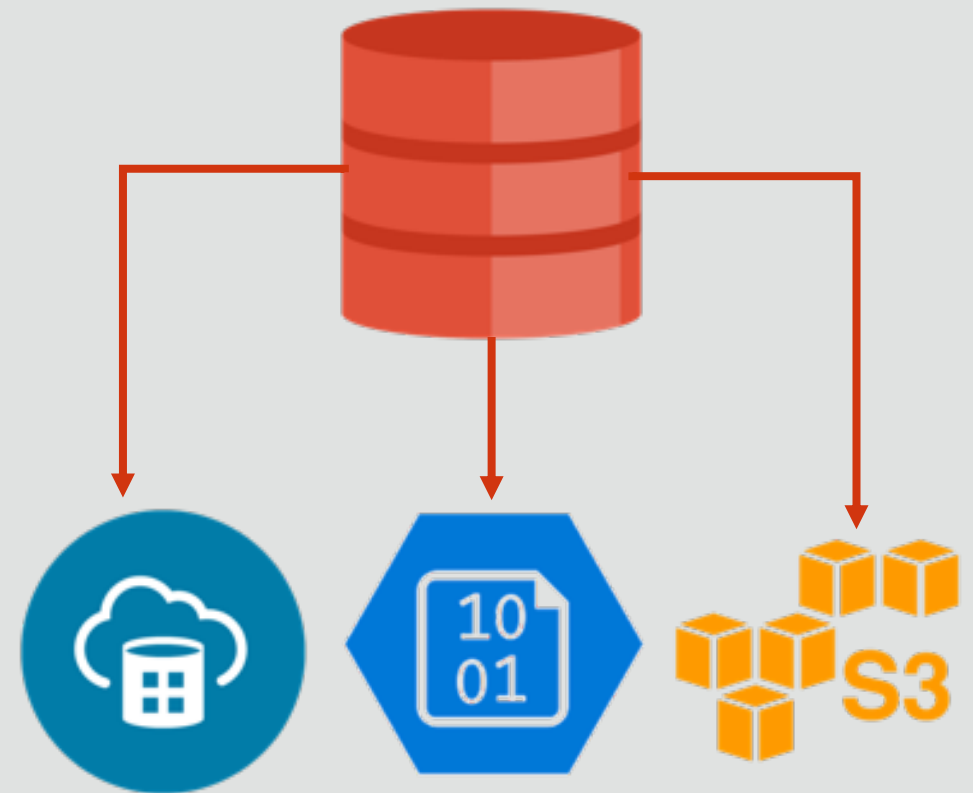
Active Data Guard : DML Redirection

19c

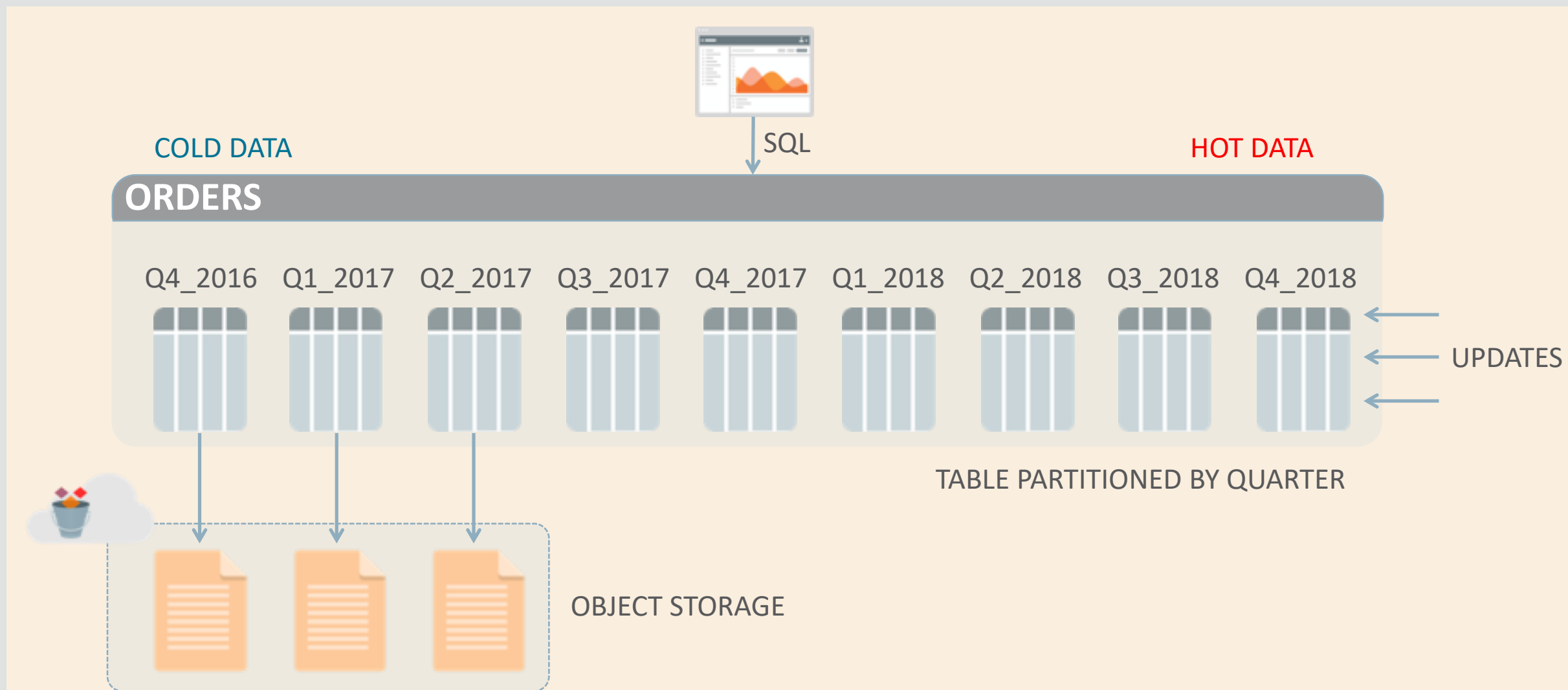


New | SQL Query of Cloud Object Stores

- Enables high-performance SQL over
 - Oracle Object Store
 - AWS S3
 - Azure Blob Storage
- Supports many file formats
 - Including text, CSV, JSON, Parquet and Avro
- Scalable joins with data lakes simplifies
 - Loading data into data warehouse
 - Connecting to data lake sources



Oracle Hybrid Partitioned Table



New | Automatic Indexing

Self-tuning for transactional and mixed workloads

Or use in advisory mode for existing workloads

Machine Learning continuous monitoring

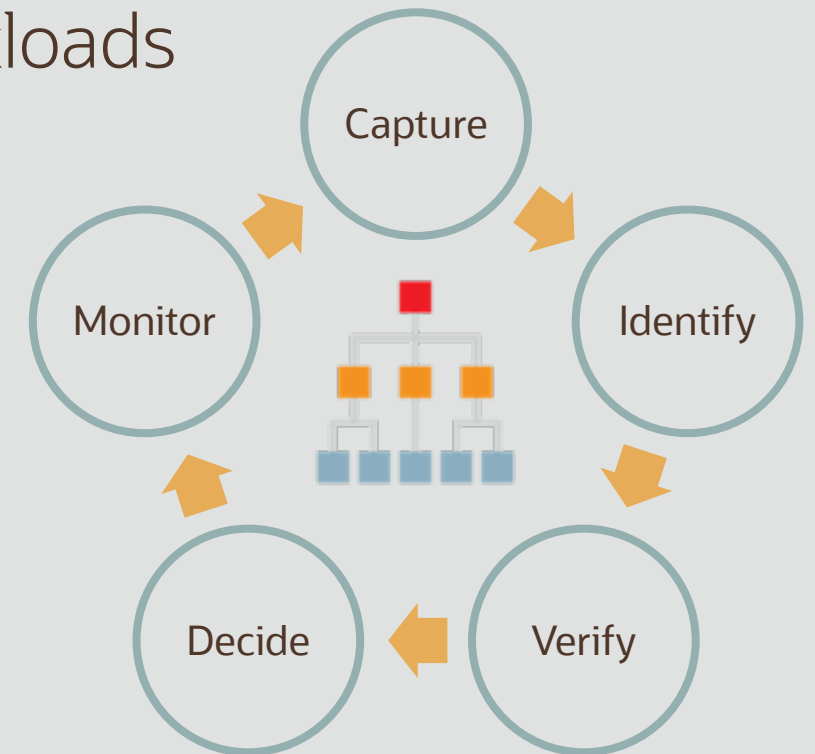
Captures all SQL statements

Identifies **new** SQL plans and indexes

Changes **tested** outside of production

Then **validated** on first execution

All auditable by customer



New | Global Fault-Tolerant Key Vault

Key Vault stores and manages 1000s encryption keys

Supports popular hardware security modules

New **multi-master replication architecture**

Replication across regions for continuous key availability

Speed of local access with global consistency

For cloud and on-premises databases



19c

Why Oracle Database 19c

Has all the innovations in 12cR2, 18c and 19c

Long-term support release for the 12cR2, 18c and 19c family:

Premier support to March 2023

Extended support to March 2026

Also recently released!

New | Oracle Exadata X8

Scale-out 2-socket and 8-socket **database** servers

- 15% faster clock rate – latest 24 core Intel Cascade Lake

Fast unified InfiniBand internal fabric

Scale-out intelligent 2-socket **storage** servers

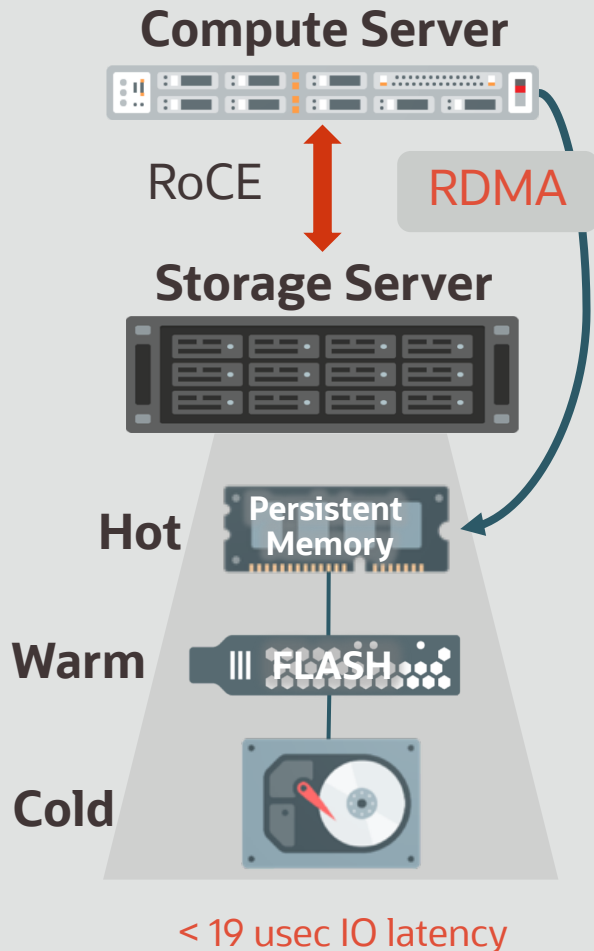
- 60% more processing cores and 40% more storage capacity

NEW Storage Server Extended (XT)

- Low cost storage for infrequently accessed data



New | Oracle Exadata X8M



- 100Gb Ethernet + RoCE (RDMA over Converged Ethernet)
 - 2.5x faster networking
- RoCE and Persistent Memory (PMEM) for extreme performance
 - Storage Servers feature PMEM Accelerator in front of Flash memory
- Database uses RDMA instead of IO to access PMEM
 - Bypasses the network and IO software stack giving 10X lower latency
- Customers can choose RoCE-based Exadata
 - Or continue to use InfiniBand-based Exadata for compatibility

New | Autonomous Database Dedicated

Deploy on **dedicated** Exadata Cloud infrastructure

With **guaranteed** 99.995% SLA (< 2.5 minutes downtime per month)

Complete stack is fully **isolated** from other tenants:

Virtual Cloud Network is hardware enforced

Unique **fully isolated private cloud** in Public Cloud

Enables more customer control over updates

Ideal for customers consolidating databases on-prem



New | Free Autonomous Database

Runs on same infrastructure as ADW/ATP

Always-free “micro” instances with up to

- 2 always free ADB instances per OCI tenancy
- 20 GB database storage per instance
- 1 OCPU per instance

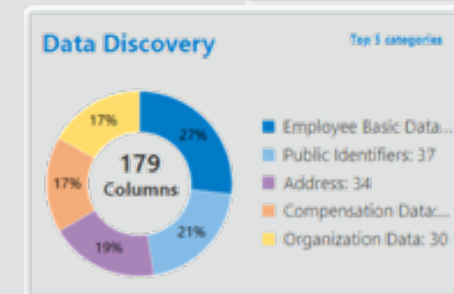
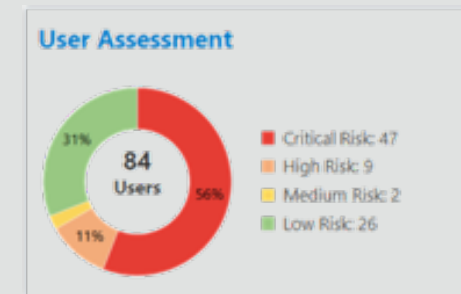
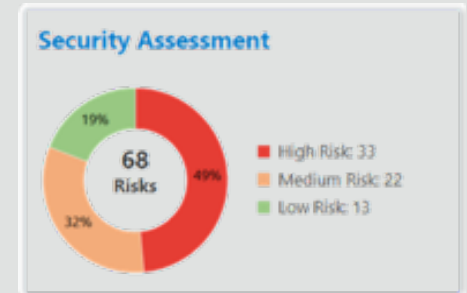
Full functionality, full experience, including

- APEX
- REST Interface (ORDS)
- SQL Developer Web
- Machine Learning Notebooks



New | Oracle Data Safe

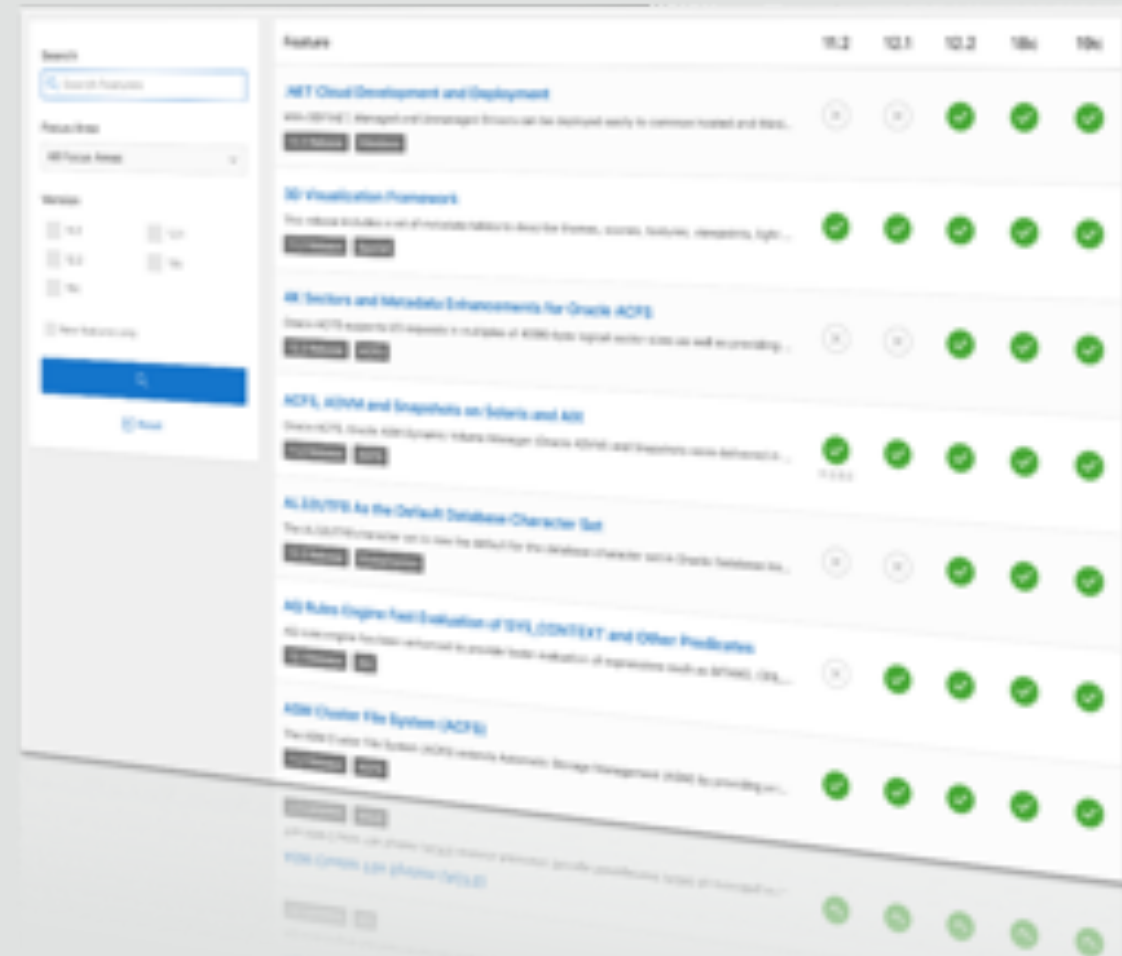
- Unified database security control center
 - Sensitive data discovery
 - User risk assessment
 - User activity auditing
- Defense in depth for all customers
 - Saves time and mitigates security risks
 - No special security expertise needed
- **Free** with all Oracle Cloud Databases



New | Database Features & Licensing App

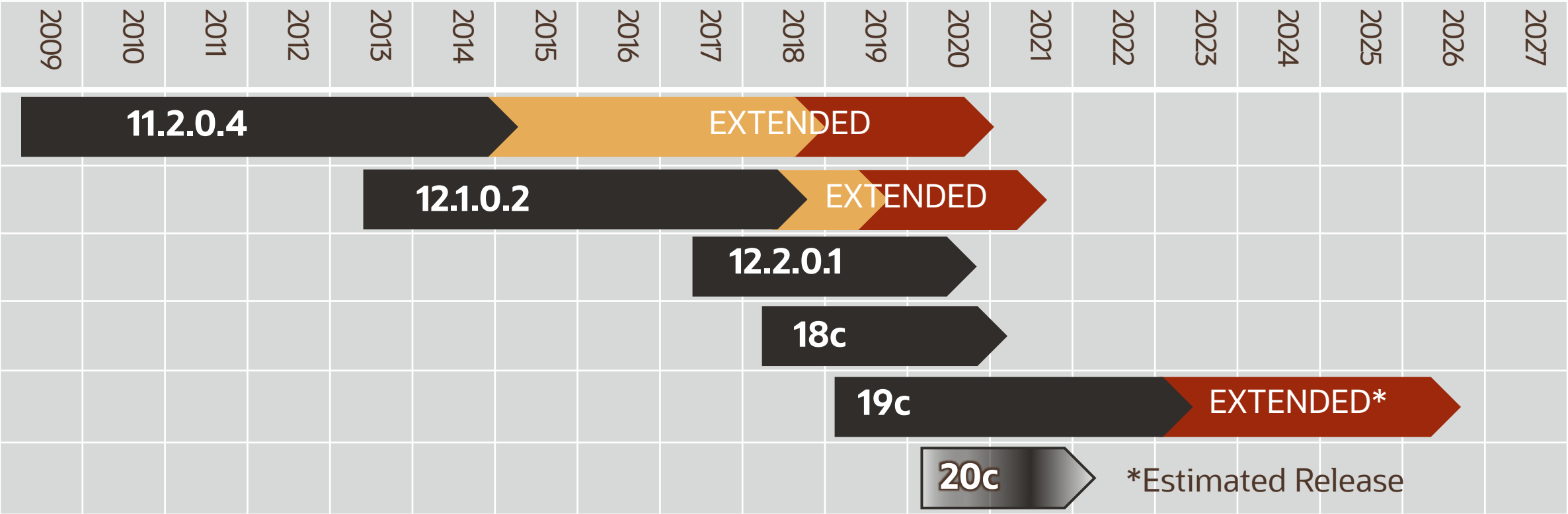
Part of Oracle Documentation
Interactively compare releases/features

apex.oracle.com/database-features/



What's Next?

Planned Release and Support Timelines



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De-Support of Non-CDB Architecture

From **Oracle Database 20c** onwards;

Non-CDB architecture will be de-supported

From **Oracle Database 19c** onwards;

CDBs can support up to 3 user-created PDB databases

Multitenant license required for 4 or more PDBs per CDB

Next | Database Innovation Continues

Multi-model Enhancements

- Native Blockchain tables
- AutoML

Better Performance

- JSON binary representation
- Persistent memory store



20^c
2020

Next | Native Blockchain Tables

Secure ledger table managed by a trusted provider to prevent fraud



Specialized table that allows normal SQL inserts and queries

```
CREATE BLOCKCHAIN TABLE LEDGER_OF_TRADES
```

Insert-only

Rows are cryptographically chained, chain is verifiable by participants

Blockchain table can participate in queries with other tables

Orders of magnitude easier to use and more functional than existing blockchains

Oracle In-Database Machine Learning

Bring Algorithms to the Data, Not Data to Algorithms

Oracle natively includes ML algorithms including **deep learning**

Perform parallel ML directly in Data Warehouse or OLTP for fast model building and **real time scoring** of new data

Extend in-database algorithms with Python and R

Easily deploy models via REST API

Next | JSON Speed and Flexibility

New high performance **binary JSON datatype** in SQL and PL/SQL

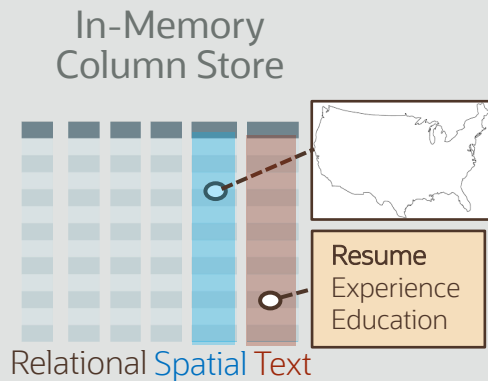
- Scans up to **10x** faster
- Updates up to **4x** faster
- **SQL UPDATE** now allows **SET** and **REMOVE** of JSON elements
- Declarative transformations for JSON

```
CREATE TABLE j_order  
(  
  id          INTEGER PRIMARY KEY,  
  po_doc JSON  
);
```

```
UPDATE j_order  
SET po_doc = JSON_TRANSFORM( po_doc,  
SET '$.address.city' = 'Santa Cruz',  
REMOVE '$.phones[*]?(@.type = "office")'  
)  
WHERE id = 555;
```

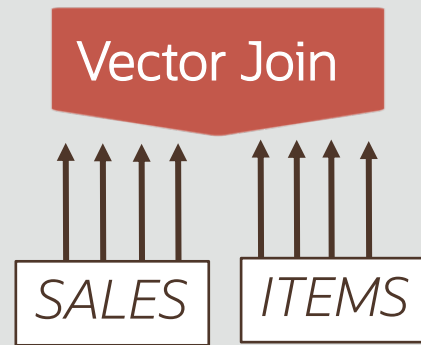

Next | 20c for Database In-Memory

In-Memory Spatial and Text



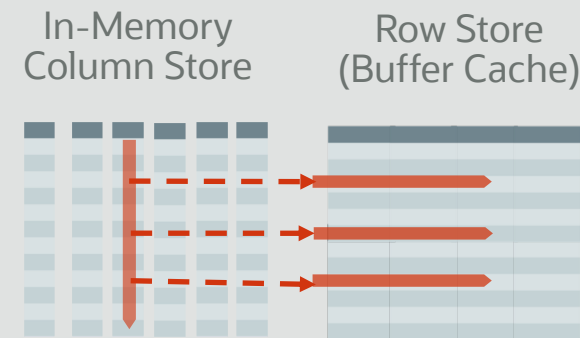
10x faster spatial analytics
3x faster text analytics

In-Memory Vector Joins



5-10x faster joins using SIMD vector instructions

In-Memory Hybrid Scans



10x faster hybrid queries

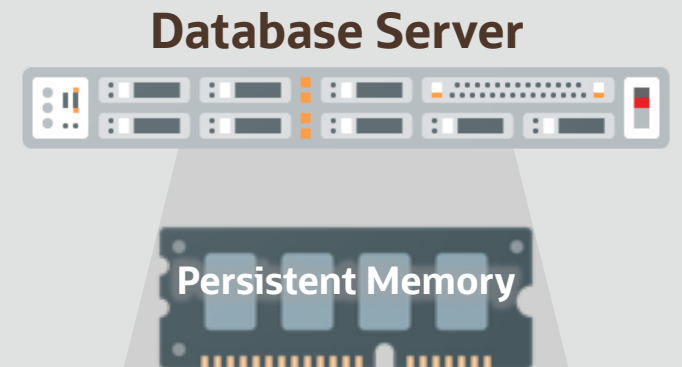
Self-Managing In-Memory



Auto in-memory populate / evict
No need to declare tables
INMEMORY

Next | Persistent Memory (PMEM) Store

- Native Persistent Memory Store keeps database data and redo in local PMEM
 - For workloads that need lower latency than flash memory
- SQL runs directly on data stored in mapped Persistent Memory file system
 - Eliminates IO code path, no need for large buffer cache



Next | Autonomous Database at Customer

Autonomous Database (ADB) in customer's data center

ADB is **Cloud only** since it automates the entire stack:

- Servers, storage, network, interconnect, software

Some customers cannot move to public cloud

- Regulations, corporate policies, network latency

Managed by OCI public cloud control plane

- Same** Exadata hardware, software, interfaces

- Same** pay-per-use subscription model



Summary | What's New and What's Next

Oracle Database 19c is here and **20c** is coming soon

- For on-premises and In Oracle Cloud

Oracle Exadata X8 and X8M are here

- NEW Exadata Storage Server Extended (XT)
- NEW Ethernet RoCE and Persistent Memory

Oracle Autonomous Database is here

- Choice of serverless or dedicated services
- Run in public cloud or cloud at customer

Oracle Cloud Infrastructure

New Free Tier



oracle.com/cloud/free

Always Free

Services you can use for unlimited time



30-Day Free Trial

Get \$500 in free credits



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