ORACLE

# Safe harbor statement

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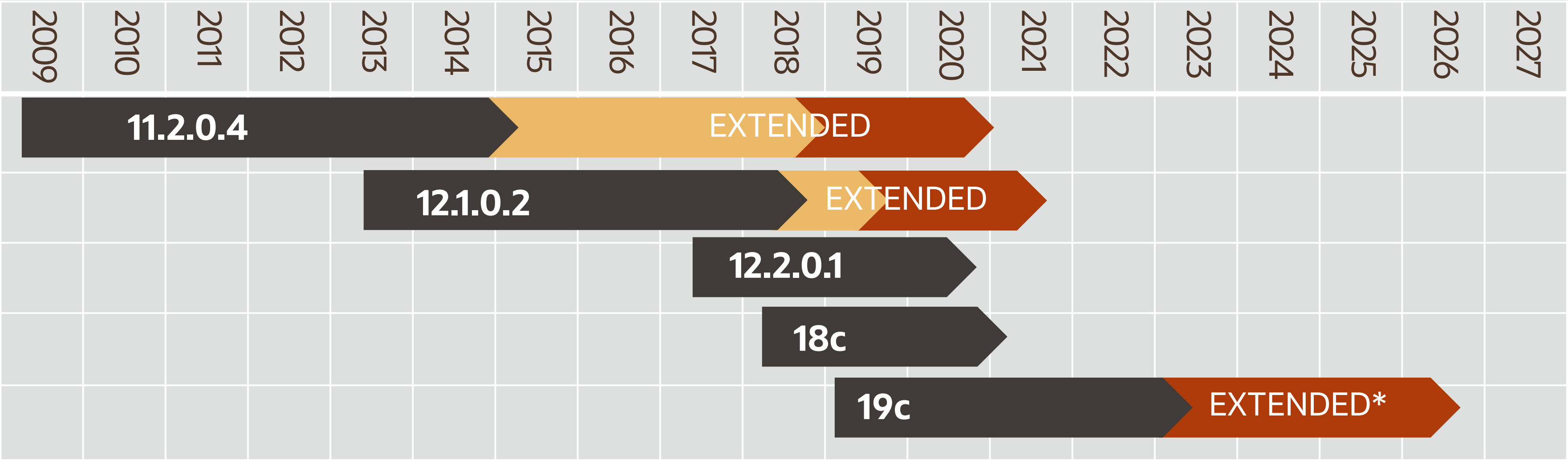
The development, release, timing, and pricing of any features or functionality described for Oracle's products may change and remains at the sole discretion of Oracle Corporation.

# Oracle Database

## What’s New, What’s Next

# 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

12c
RELEASE 2

2017

18c

2018

19c

2019

# Oracle Database 12c Release 2 Innovations

12c
RELEASE 2

2017

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

# Oracle Database 18c Innovations

12c
RELEASE 2

2017

18c

2018

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

# Oracle Database 19c Innovations

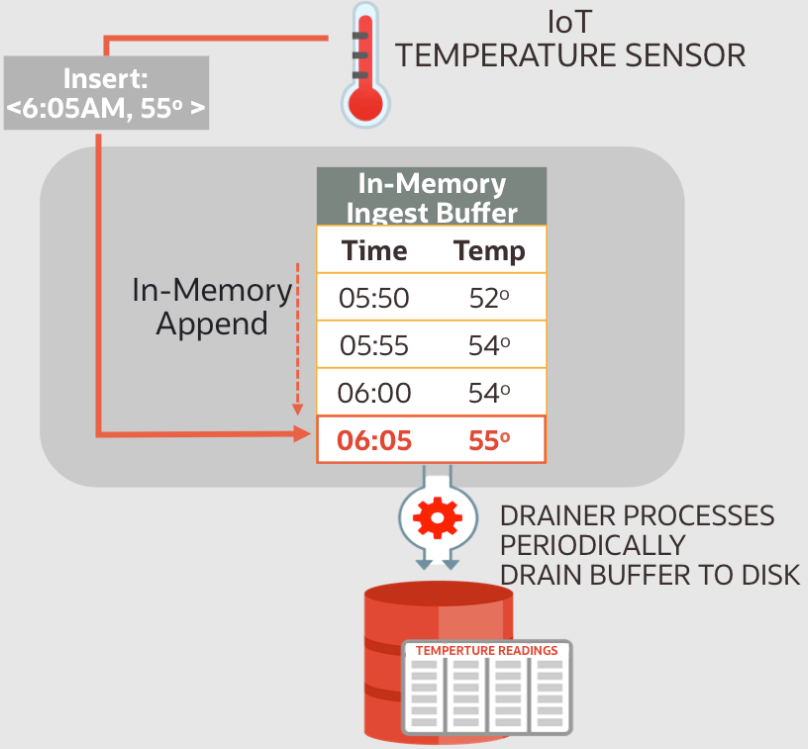
- Streaming Insert for IoT
- Active Data Guard Updates
- Automatic Indexing
- SQL Query of Object Stores
- Global fault-tolerant Key Vault

19c

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



IoT
TEMPERATURE SENSOR

**Insert:**
**<6:05AM, 55° >**

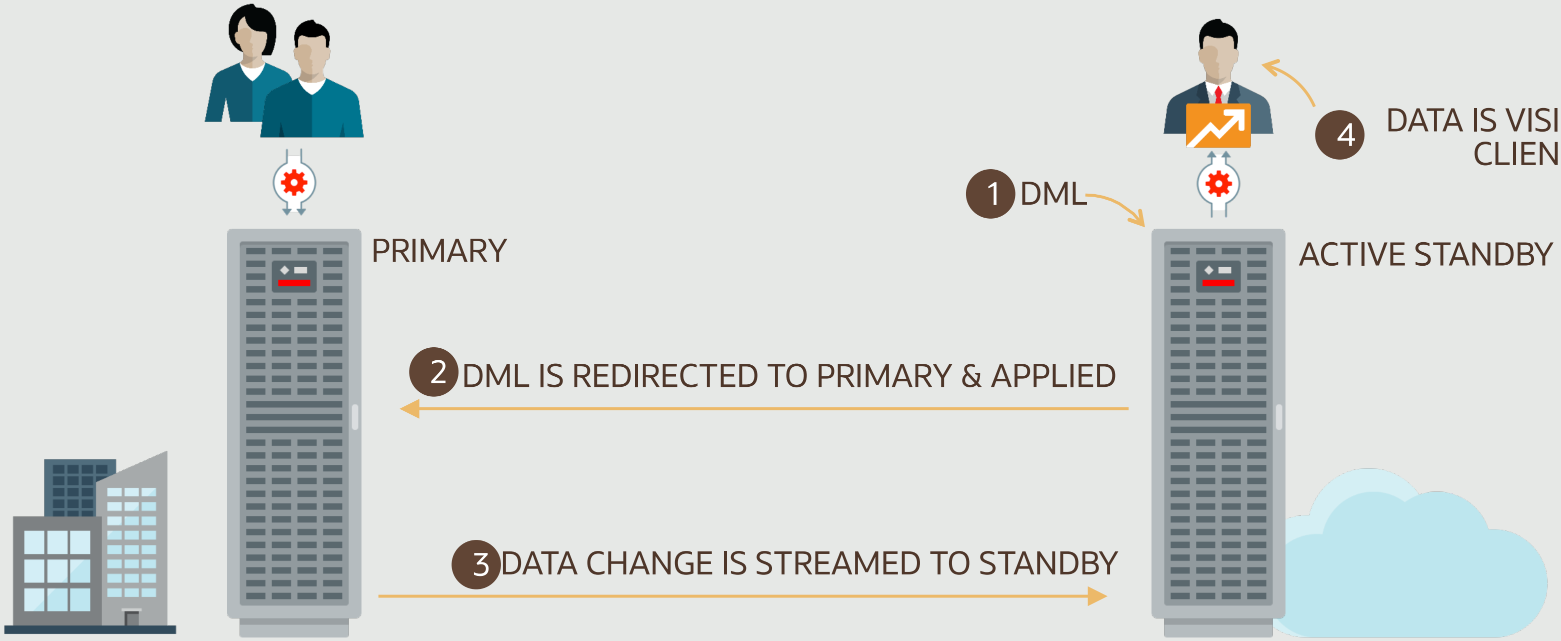
In-Memory
Append

**In-Memory Ingest Buffer**

| Time | Temp |
|---|---|
| 05:50 | 52° |
| 05:55 | 54° |
| 06:00 | 54° |
| **06:05** | **55°** |

DRAINER PROCESSES
PERIODICALLY
DRAIN BUFFER TO DISK

# New | Active Data Guard Standby Updates



PRIMARY

ACTIVE STANDBY

① DML

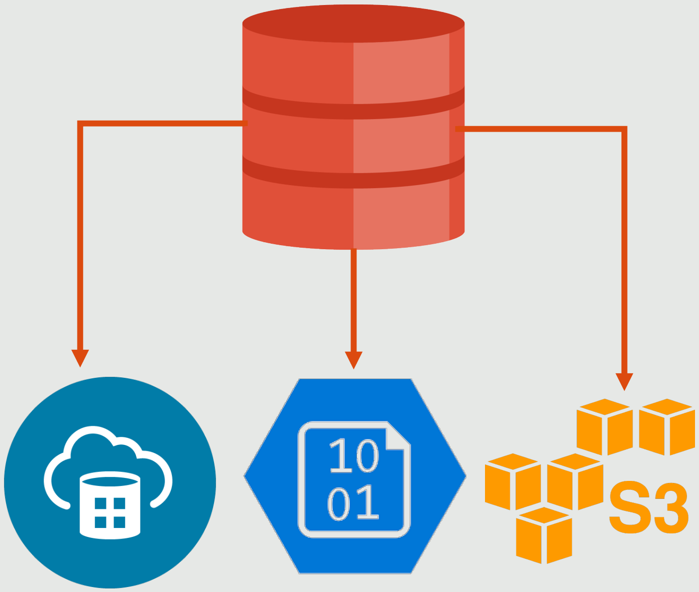
② DML IS REDIRECTED TO PRIMARY & APPLIED

③ DATA CHANGE IS STREAMED TO STANDBY

④ DATA IS VISIBLE TO CLIENT

# 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



# New | Automatic Indexing

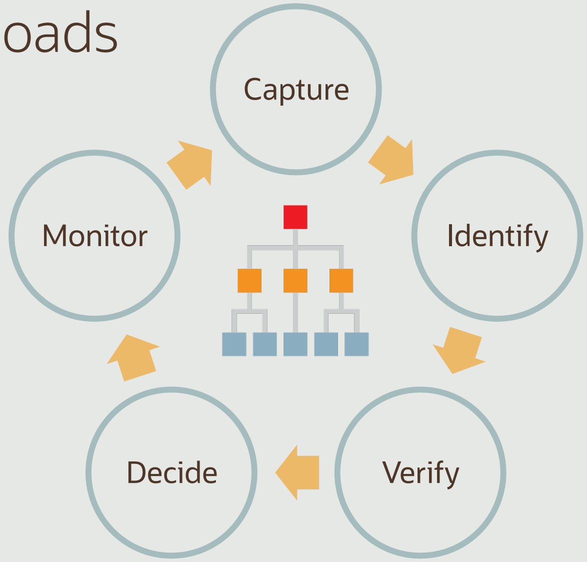
Self-tuning for transactional and mixed workloads

- 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


Capture
Identify
Verify
Decide
Monitor

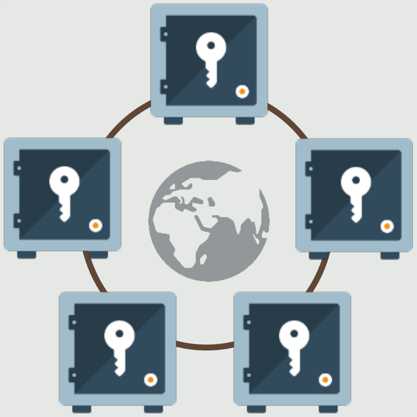
# New | Global Fault-Tolerant Key Vault

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



# 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

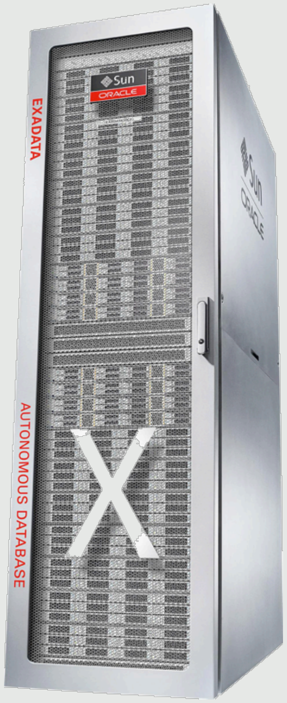
Fast unified InfiniBand internal fabric

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

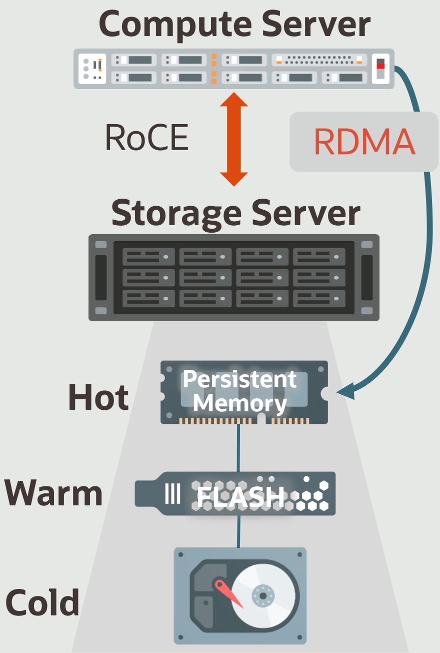
- 60% more processing cores and 40% more storage capacity

NEW Storage Server Extended (XT)

- Low cost storage for infrequently accessed data


EXADATA
Sun
ORACLE
AUTONOMOUS DATABASE
X

# New | Oracle Exadata X8M


Compute Server
RoCE
RDMA
Storage Server
Hot
Persistent Memory
Warm
FLASH
Cold

**<19 usec IO latency**

- 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 | APEX on Autonomous Database

| APEX on Autonomous | VS. | JavaScript on AWS |
|---|---|---|
| – Declarative | | – Hand coding |
| – Few lines of code | | – Lots and lots of code |
| – Robust | | – Complex to maintain and diagnose |
| – Secure by default | | – Security coded by each developer |

**20X faster to develop**

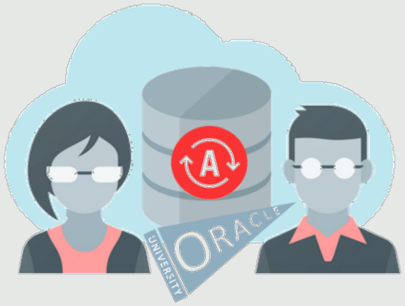
**100X fewer lines of code**

# New | Free Autonomous Database

Runs on same infrastructure as ADW/ATP

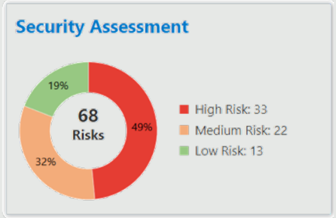
Always-free “micro” instances with up to
  - 2 always free ADB instances per OCI tenancy
  - 20 GB database storage per instance
  - 1 OCPU per instance

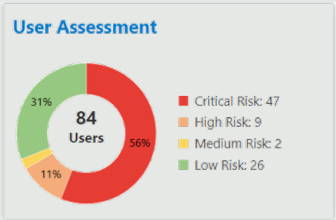
Full functionality, full experience, including
  - APEX
  - REST Interface (ORDS)
  - SQL Developer Web
  - Machine Learning Notebooks

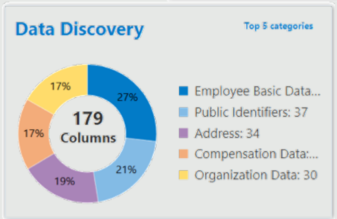


# New | Oracle Data Safe

- 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





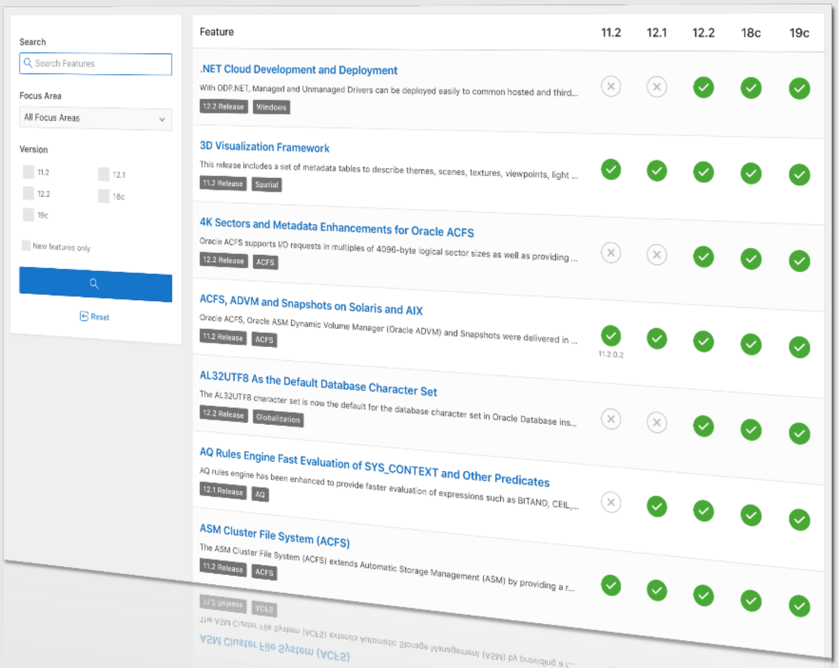


# New | Database Features & Licensing App

Part of Oracle Documentation

Interactively compare releases/features

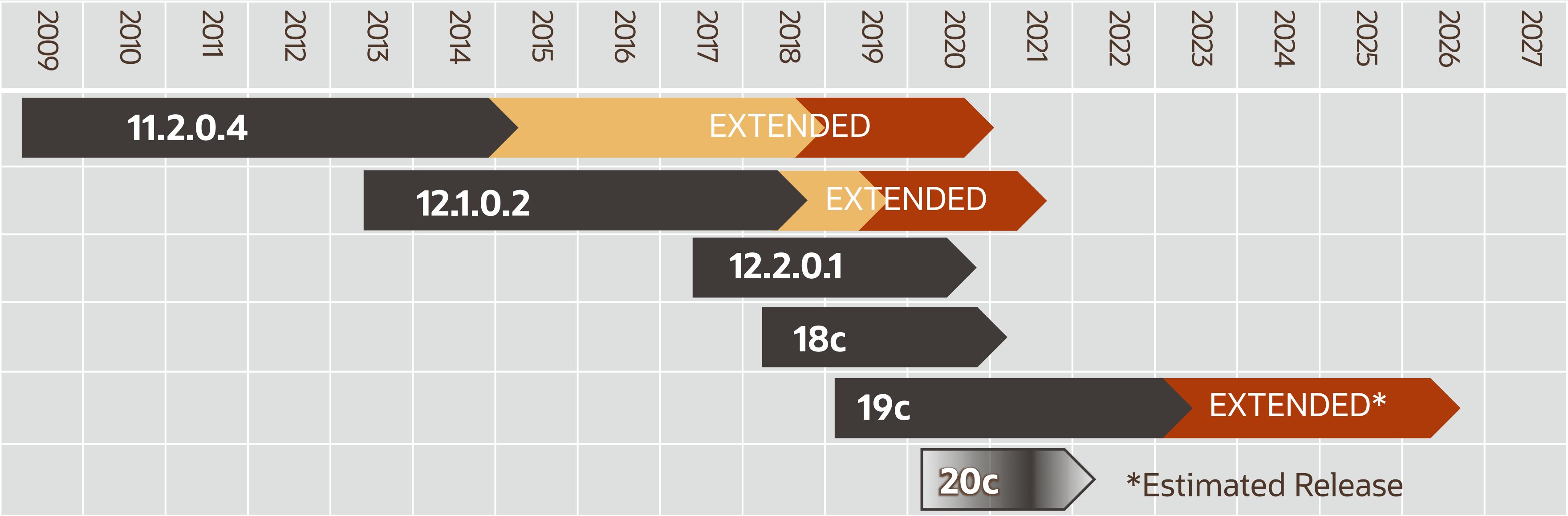
apex.oracle.com/database-features/



| Feature | 11.2 | 12.1 | 12.2 | 18c | 19c |
|---|---|---|---|---|---|
| .NET Cloud Development and Deployment<br>With ODP.NET, Managed and Unmanaged Drivers can be deployed easily to common hosted and third...<br>12.2 Release Windows | ✗ | ✗ | ✓ | ✓ | ✓ |
| 3D Visualization Framework<br>This release includes a set of metadata tables to describe themes, scenes, textures, viewpoints, light ...<br>11.2 Release Spatial | ✓ | ✓ | ✓ | ✓ | ✓ |
| 4K Sectors and Metadata Enhancements for Oracle ACFS<br>Oracle ACFS supports I/O requests in multiples of 4096-byte logical sector sizes as well as providing ...<br>12.2 Release ACFS | ✗ | ✗ | ✓ | ✓ | ✓ |
| ACFS, ADVM and Snapshots on Solaris and AIX<br>Oracle ACFS, Oracle ASM Dynamic Volume Manager (Oracle ADVM) and Snapshots were delivered in ...<br>11.2 Release ACFS | ✓<br>11.2.0.2 | ✓ | ✓ | ✓ | ✓ |
| AL32UTF8 As the Default Database Character Set<br>The AL32UTF8 character set is now the default for the database character set in Oracle Database ins...<br>12.2 Release Globalization | ✗ | ✗ | ✓ | ✓ | ✓ |
| AQ Rules Engine Fast Evaluation of SYS_CONTEXT and Other Predicates<br>AQ rules engine has been enhanced to provide faster evaluation of expressions such as BITAND, CEIL,...<br>12.1 Release AQ | ✗ | ✓ | ✓ | ✓ | ✓ |
| ASM Cluster File System (ACFS)<br>The ASM Cluster File System (ACFS) extends Automatic Storage Management (ASM) by providing a r...<br>11.2 Release ACFS | ✓ | ✓ | ✓ | ✓ | ✓ |

# 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 supports **up to 3 user-created** PDBs 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

**20c**

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

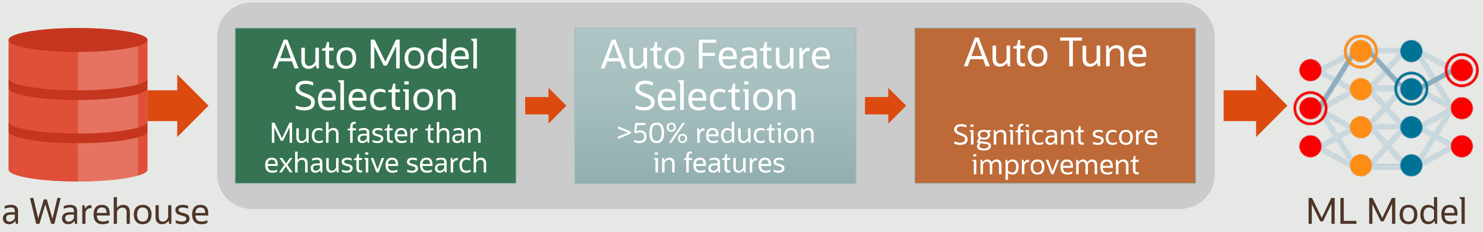
# Oracle In-Database Machine Learning

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 | AutoML

Enables non-expert users to leverage Machine Learning



Data Warehouse

**Auto Model Selection**
Much faster than exhaustive search

**Auto Feature Selection**
>50% reduction in features

**Auto Tune**
Significant score improvement

ML Model

- Auto Model Selection
  - Identify in-database algorithm that achieves highest model quality
  - Find best model faster than with exhaustive search
- Auto Feature Selection
  - Reduce # of features by identifying most predictive
  - Improve performance and accuracy
- Auto Tune Hyperparameters
  - Significantly improve model accuracy
  - Avoid manual or exhaustive search techniques

# Next | AutoML

Enables non-expert users to leverage Machine Learning

ML Model

Apply

OLTP Data

=

Better Predictions

- Auto Model Selection
  - Identify in-database algorithm that achieves highest model quality
  - Find best model faster than with exhaustive search
- Auto Feature Selection
  - Reduce # of features by identifying most predictive
  - Improve performance and accuracy
- Auto Tune Hyperparameters
  - Significantly improve model accuracy
  - Avoid manual or exhaustive search techniques

# 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

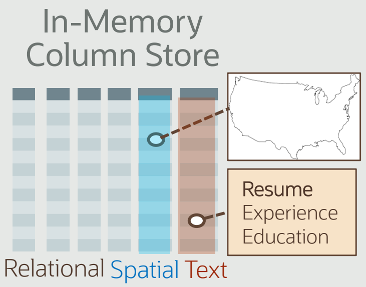
```
CREATE TABLE j_order
 (
   id      INTEGER PRIMARY KEY,
   po_doc JSON
 );
```

- SQL UPDATE now allows SET and REMOVE of JSON elements
- Declarative transformations for JSON

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

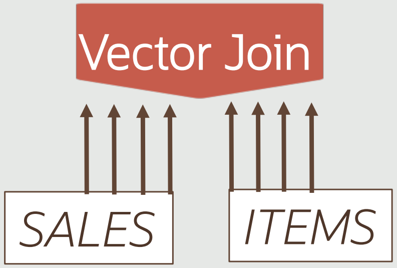
# Next | 20c for Database In-Memory

### In-Memory Spatial and Text


In-Memory
Column Store
Resume
Experience
Education
Relational Spatial Text

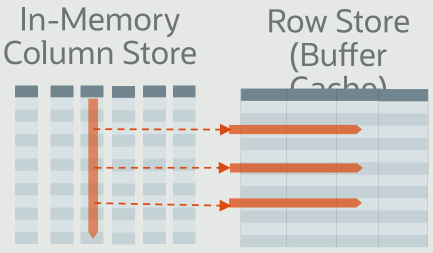
10x faster spatial analytics
3x faster text analytics

### In-Memory Vector Joins


Vector Join
SALES
ITEMS

5-10x faster joins using SIMD vector instructions

### In-Memory Hybrid Scans


In-Memory
Column Store
Row Store
(Buffer
Cache)

10x faster hybrid queries

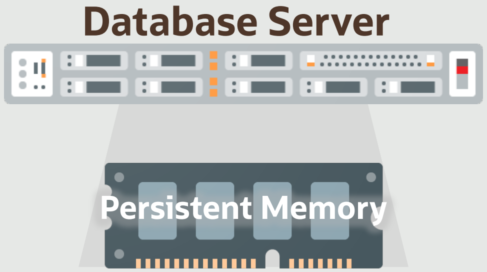
### Self-Managing In-Memory

In-Memory
Column Store

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


Database Server
Persistent Memory

# Next | Autonomous Database at Customer

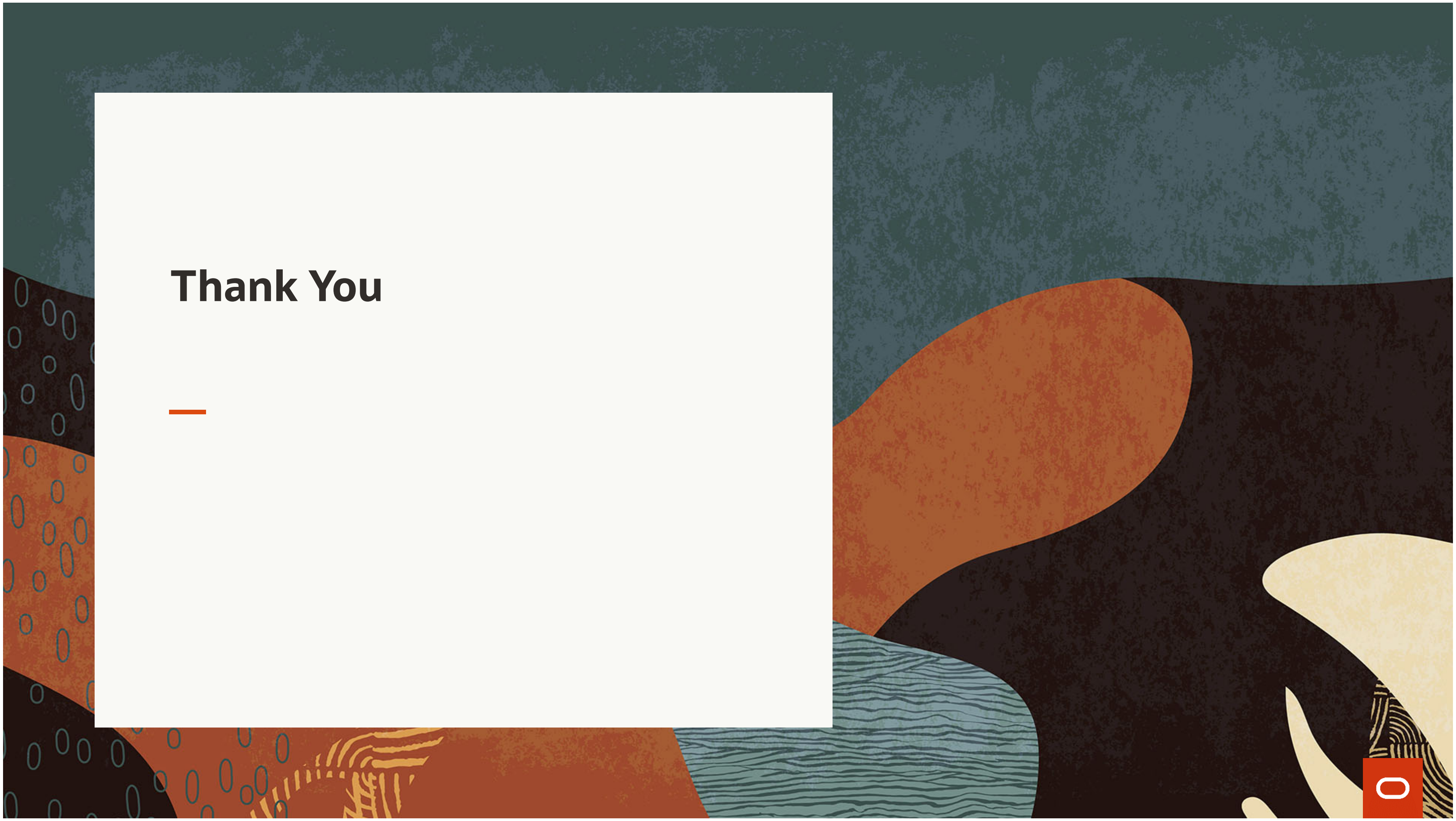
- Autonomous Database (ADB) in customer’s data center
- ADB is Cloud only since it automates the entire stack:
  - –Servers, storage, network, interconnect, software
- Some customers cannot move to public cloud
  - –Regulations, corporate policies, network latency
- Managed by OCI public cloud control 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 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



# Thank You