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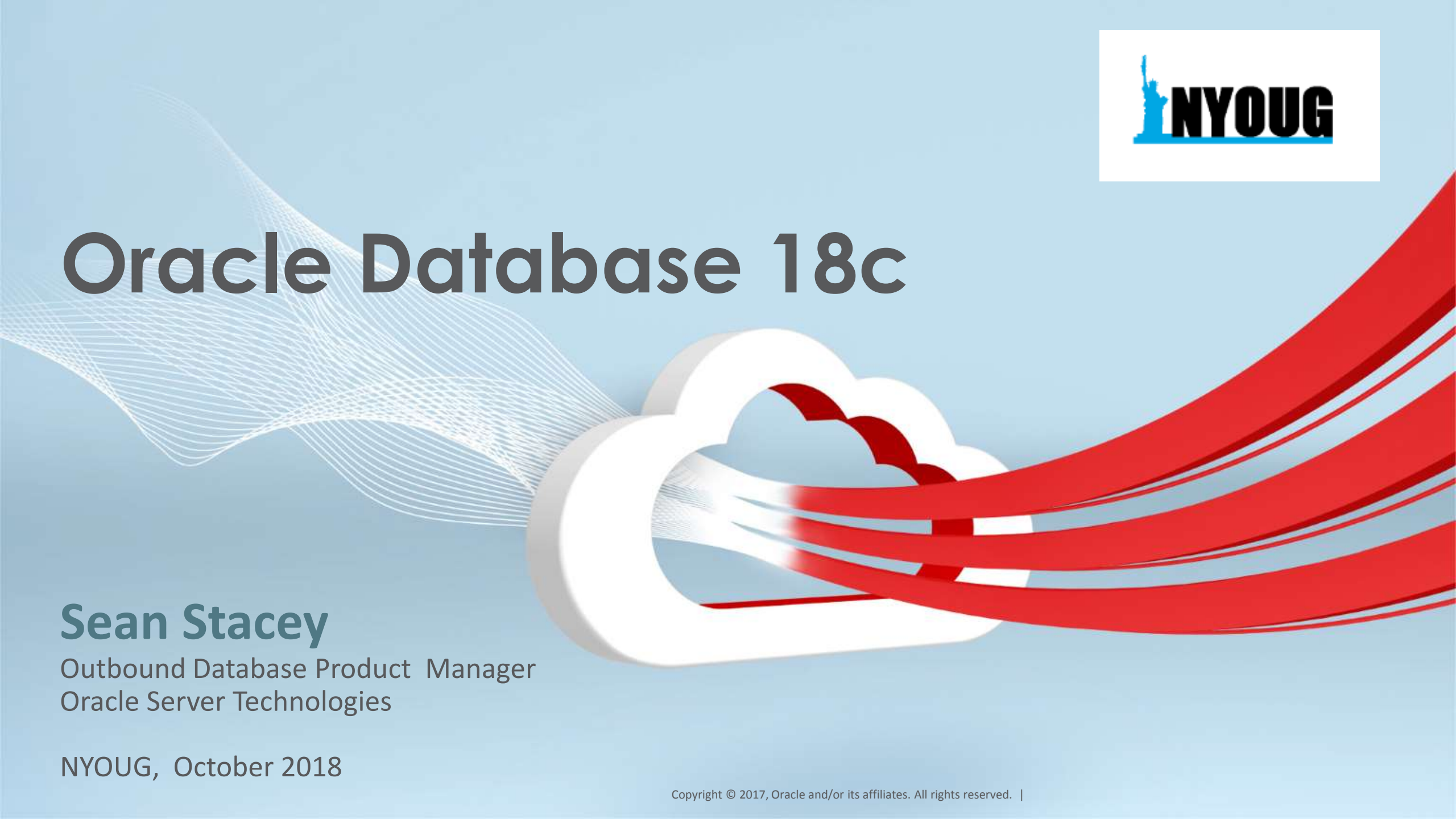

Oracle Database 18c

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Oracle Server Technologies

NYOUG, October 2018

Safe Harbor Statement

The following is intended to outline our general product direction. It is intended for information purposes only, and may not be incorporated into any contract. It is not a commitment to deliver any material, code, or functionality, and should not be relied upon in making purchasing decisions. The development, release, timing and price of any features or functionality described for Oracle's products may change and remains at the sole discretion of Oracle corporation. Fees apply for new database product offerings.

Program Agenda

1. Oracle Database Release Model
2. Oracle Database 18c
3. Autonomous Database
4. A few other things…

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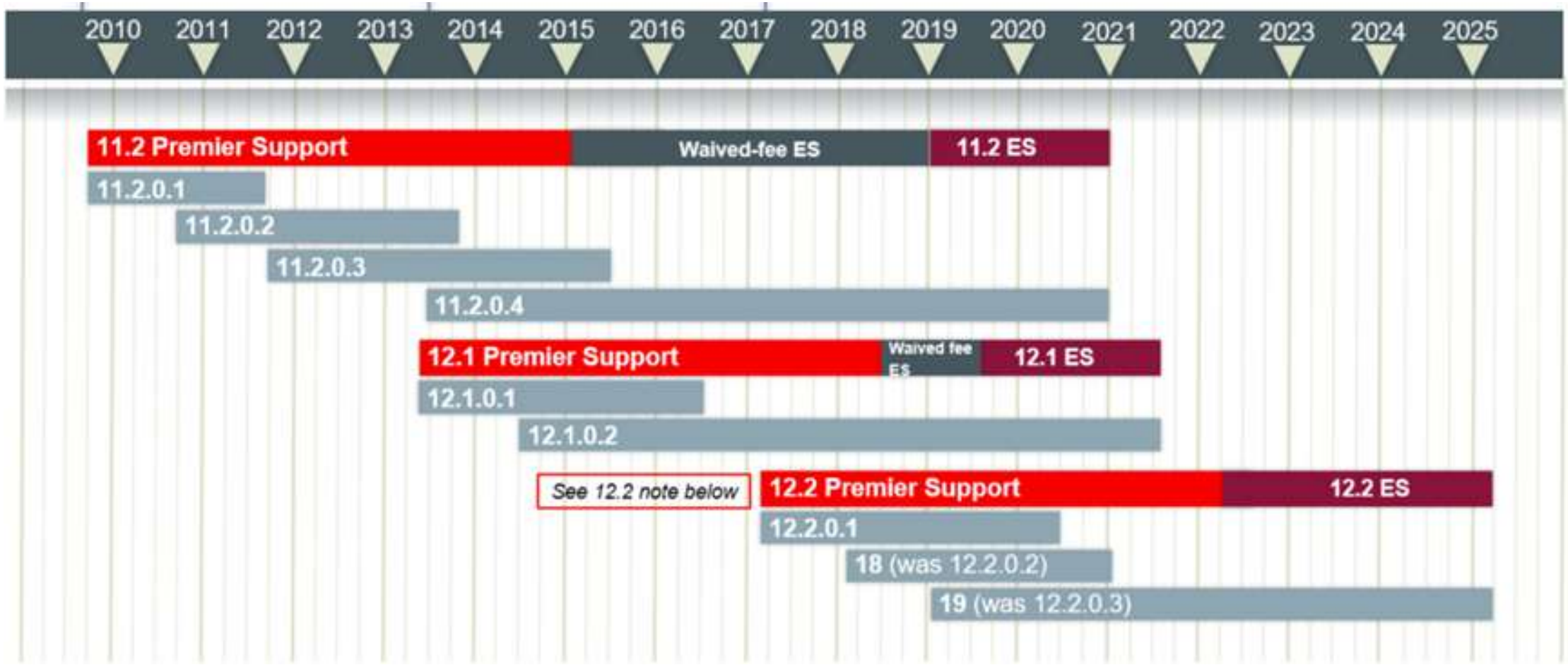
Lifetime Support Commitments and Plans



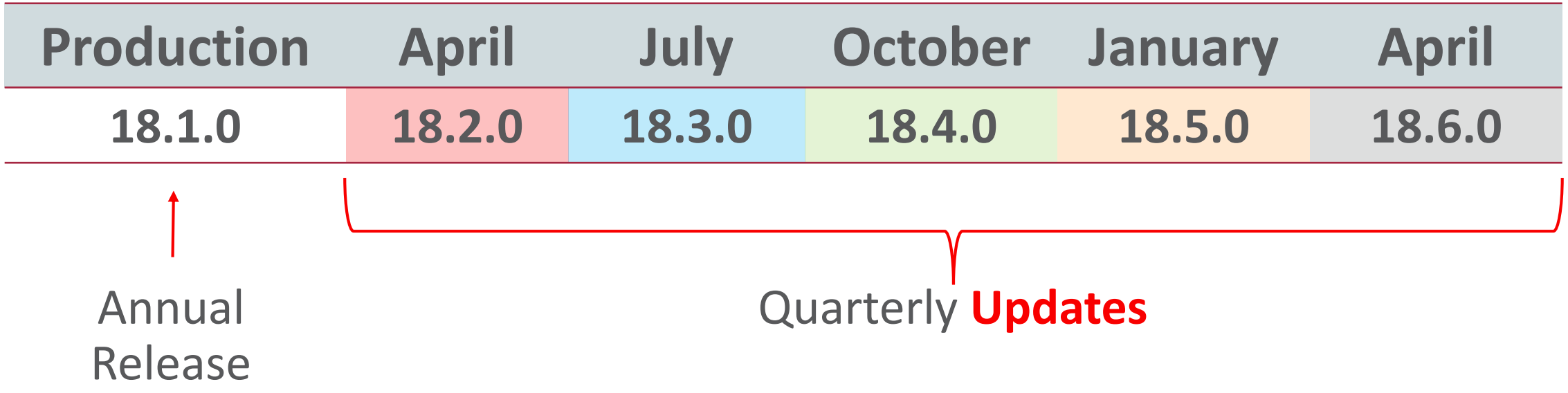
Always check MOS Note 742060.1 for the latest schedule.

Premier **Waived Extended Support Fee** **Paid Extended Support**

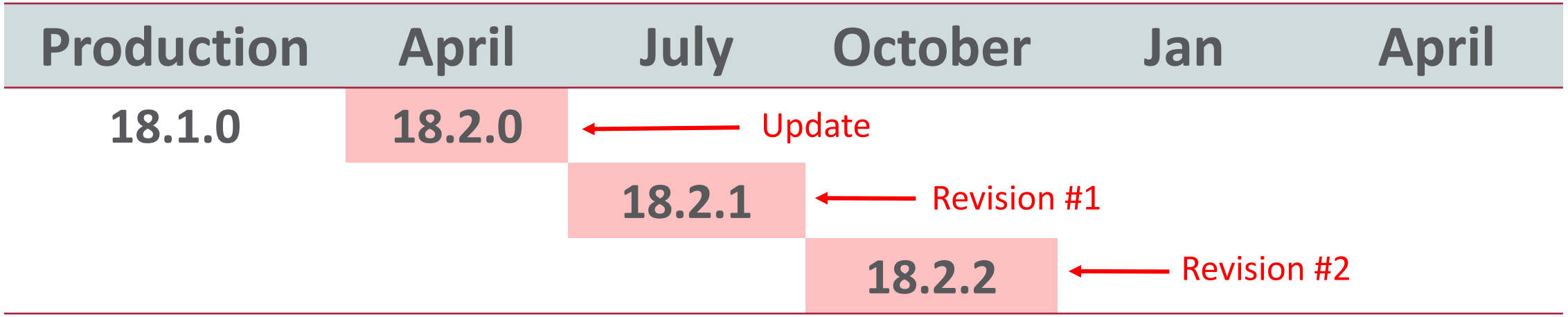
Review - New Annual Release Model and Motivation

- Huge Releases every few years – big bang of many features creates instability
  - Solution: Annual **Releases** – fewer changes, easier to test
- Want large patch bundles to avoid one-off patch proliferation
  - Solution: Quarterly **Updates** – include all important fixes
- However, bundling many fixes together increases risk of regression
  - Solution: Quarterly **Revisions** – only includes **security** and **regression** fixes

Quarterly Database **Updates**

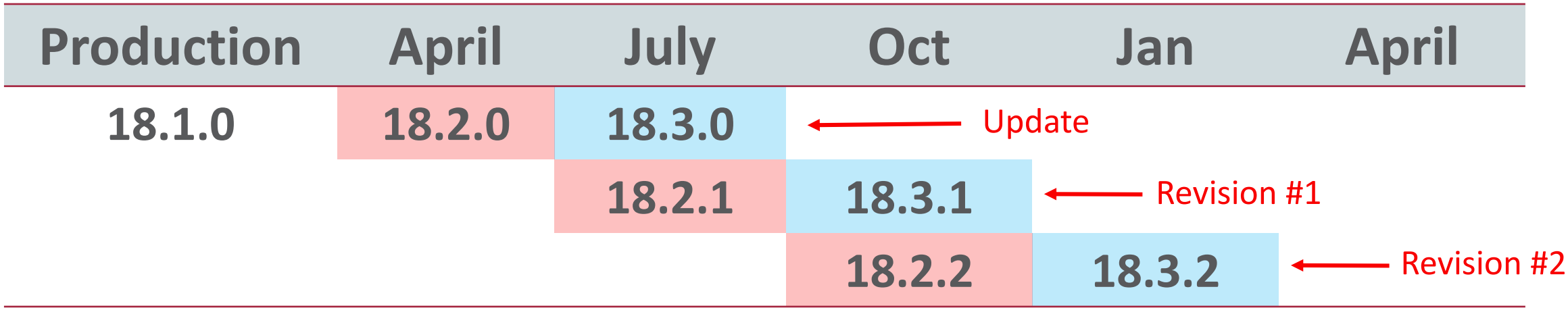


Revisions



- New **Releases** change or add **Millions** of lines of code
- **Quarterly Updates** modify **tens of thousands** of lines of code
- Strategy must deal with potential regressions introduced into releases and updates

Updates and Revisions



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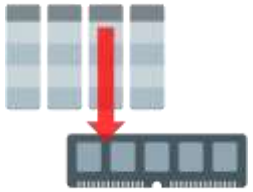
Performance

Oracle Database 12c



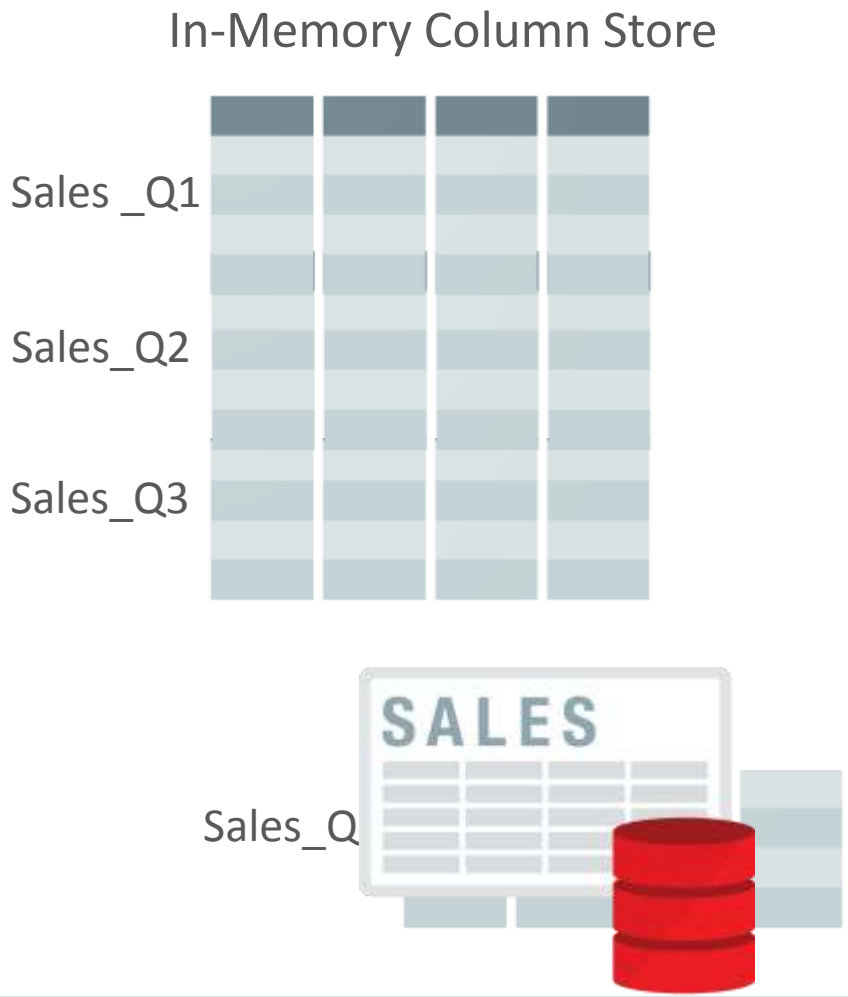
- In-Memory Column Store
- Software in Silicon
- Engineered Systems

Oracle Database 18c

- Low Latency Memory Transactions
  - 4x throughput for low latency key lookups
- Non Volatile Memory Support
  - Multi Tiered Database Cache
- In-Memory Column Store Improvements
  - Performance improvements
  - Automatic Population

Automatic In-Memory Management

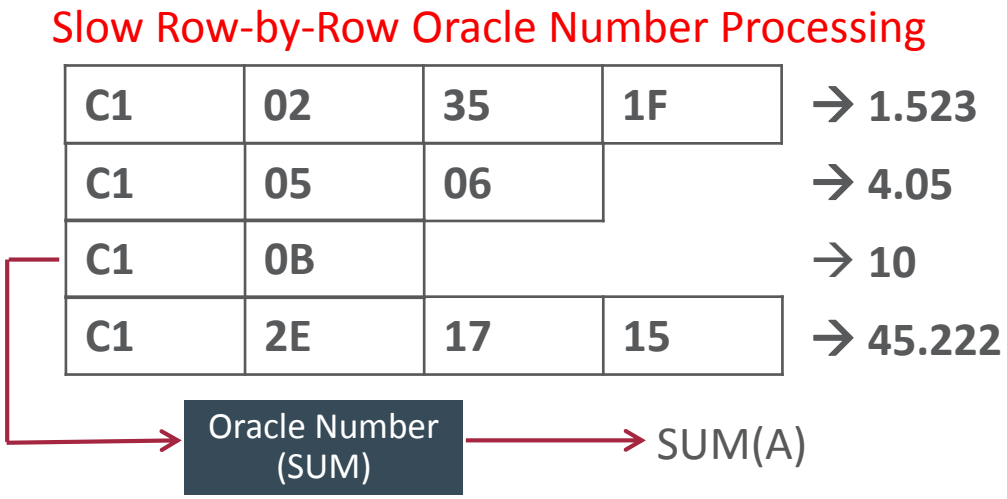
Greater Automation and Reduced Administration for Cloud Services

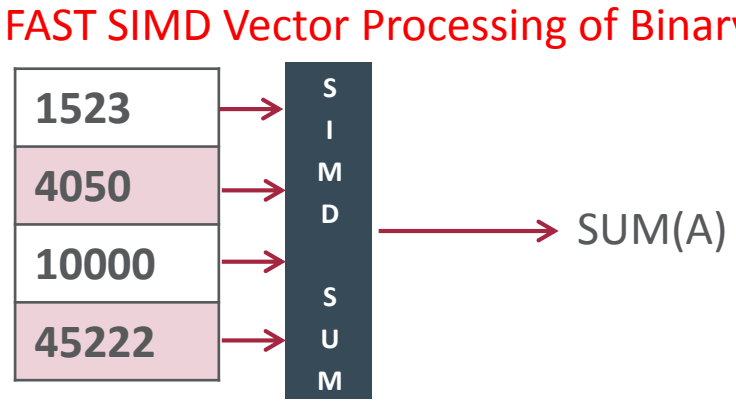


- In-Memory tables and partitions automatically ranked using access Heat Map
- Hot data automatically chosen for In-Memory population
- Colder In-Memory data automatically evicted
- Useful for managed cloud services since no user intervention required

In-Memory Optimized Arithmetic

Blazing fast numeric operation





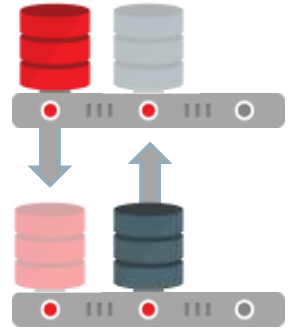
- Column-Store maintains native binary representation of NUMBER columns
  - Instead of software-implemented, variable-width ORACLE NUMBERs.
- SIMD Vector Processing applicable on native binary number representation.
- Aggregation and Arithmetic operators can improve up to 40X

Multitenant

Oracle Database 12c

- Container managed database virtualization
- Manage Many as one
  - Patching, Backup, Security, Online Cloning, Online Relocation
- Software as Service
  - Shared metadata, Data location transparency

Oracle Database 18c

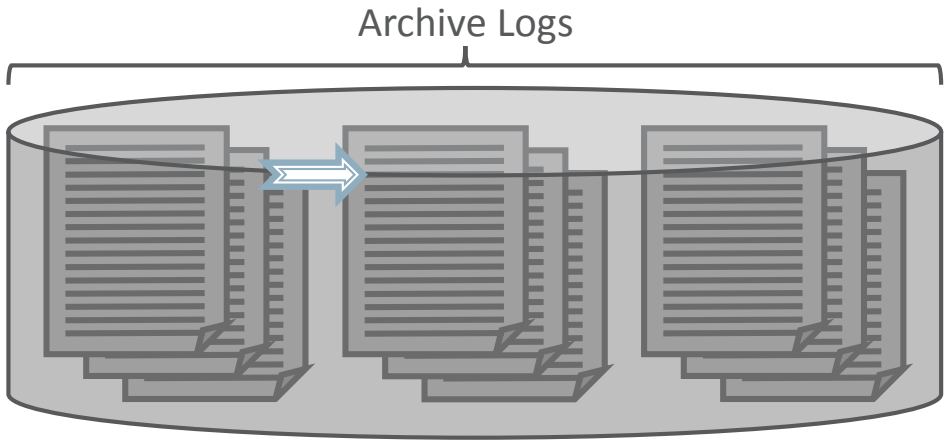


- Per-PDB Switchover
- Transportable Backups
- Snapshot Carousel
- Faster Upgrades

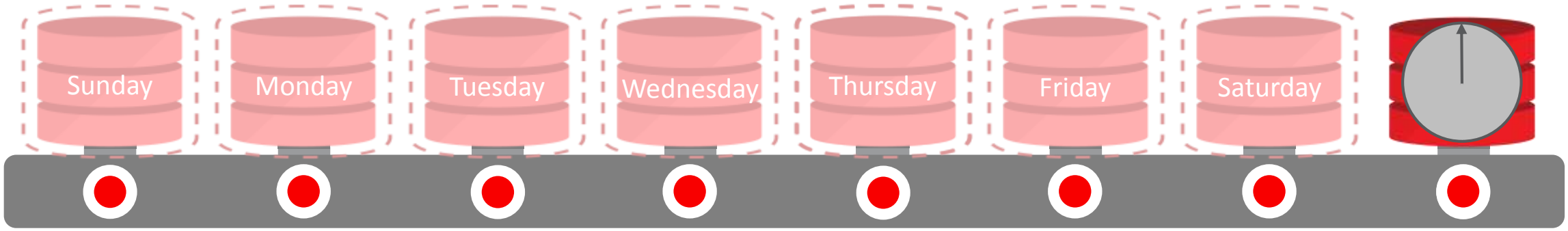
Point-in-Time Recovery with Snapshot Carousel

NEW IN 18c

Carousel stores archive logs along with corresponding snapshot clones



- ”Flashback” to Thursday 10:17am:
  1. Restore Thursday midnight’s snapshot
  2. Roll forward to 10:17am from archivelog
     - PDB will be “transactionally consistent” as of this time

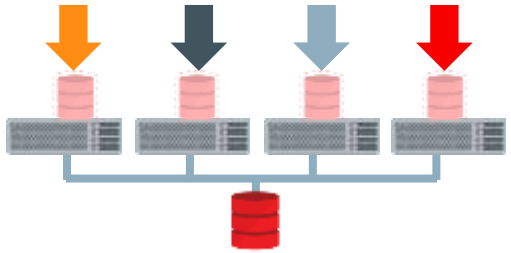


Availability

Oracle Database 12.2

- Comprehensive HA and disaster recovery functionality
  - Real Application Clusters, Active Data Guard, Recovery Appliance
- Oracle Golden Gate for heterogeneous replication
- Scale out and fault isolation with Oracle Database Sharding

Oracle Database 18c

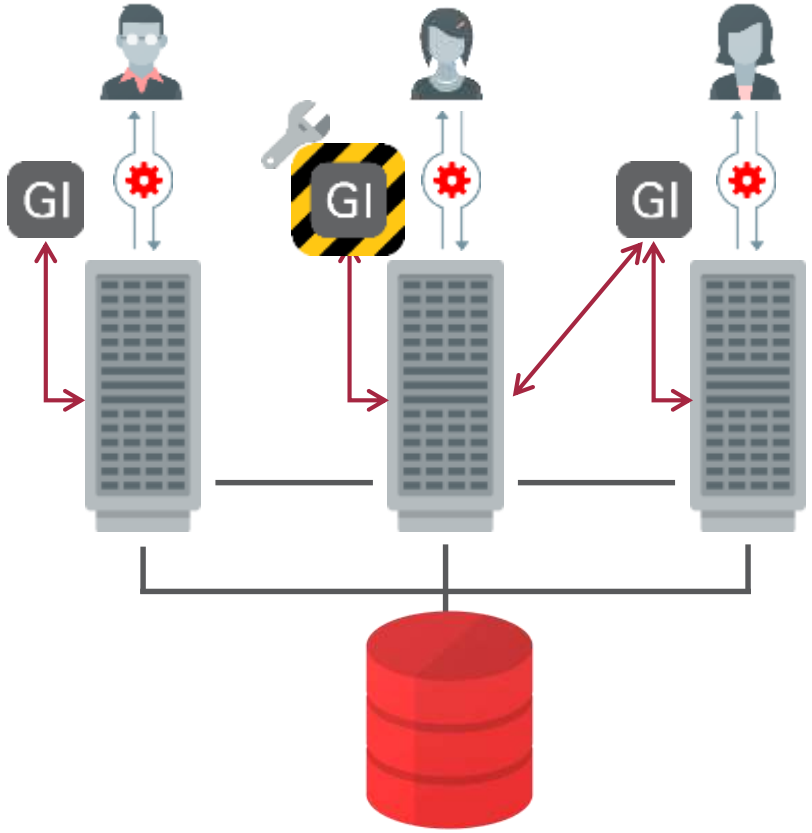


- Zero Impact Grid Infrastructure Patching
- Sharded RAC
  - Logically partition data across instances in RAC
  - Sharded access for shard-aware applications and transparency for non-sharded applications
- Sharding improvements
  - User Defined Sharding
  - Improved Cross Shard Query support
  - Sharding Swim Lanes

Zero Impact Grid Infrastructure Patching

Never take down a database instance to patch Grid Infrastructure

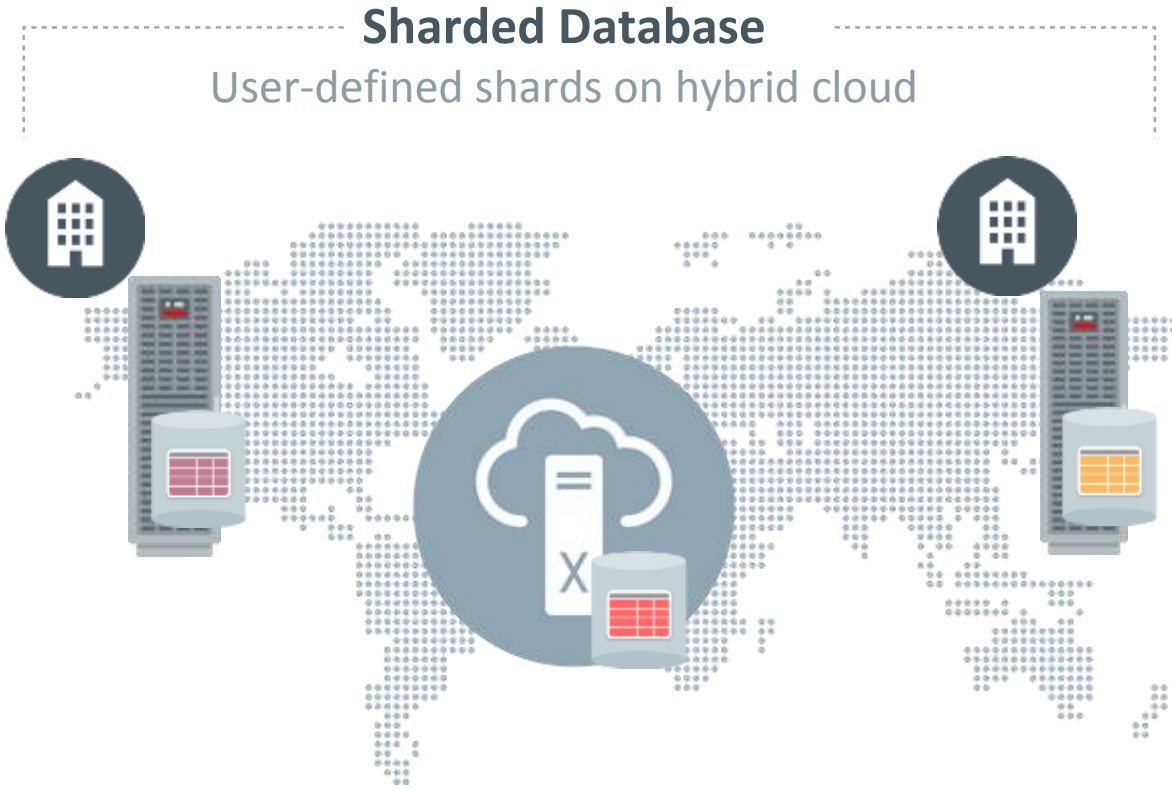
- Zero Impact Patching enables patching of the Oracle Grid Infrastructure without interrupting database operations.
- Patches are applied out-of-place and in a rolling fashion with one node being patched at a time while the **database instance(s) on that node remain up and running**.
- Zero Impact Patching supports Oracle Real Application Clusters (RAC) databases on clusters with two or more nodes.



New Sharding Method: User-defined Sharding

Explicit mapping of data to individual shards for performance & regulations

- Partition shards by RANGE or LIST
  - List or Range of sharding key values are assigned to each chunk by the user
- Supported by Data Guard and Active Data Guard
- Full control on location of data provides:
  - Regulatory compliance
    - Data remains in country of origin
  - Hybrid cloud and cloud bursting
    - Some shards on premises; other shards in the cloud
  - Efficient range queries
  - Precisely controlled data distribution



Security

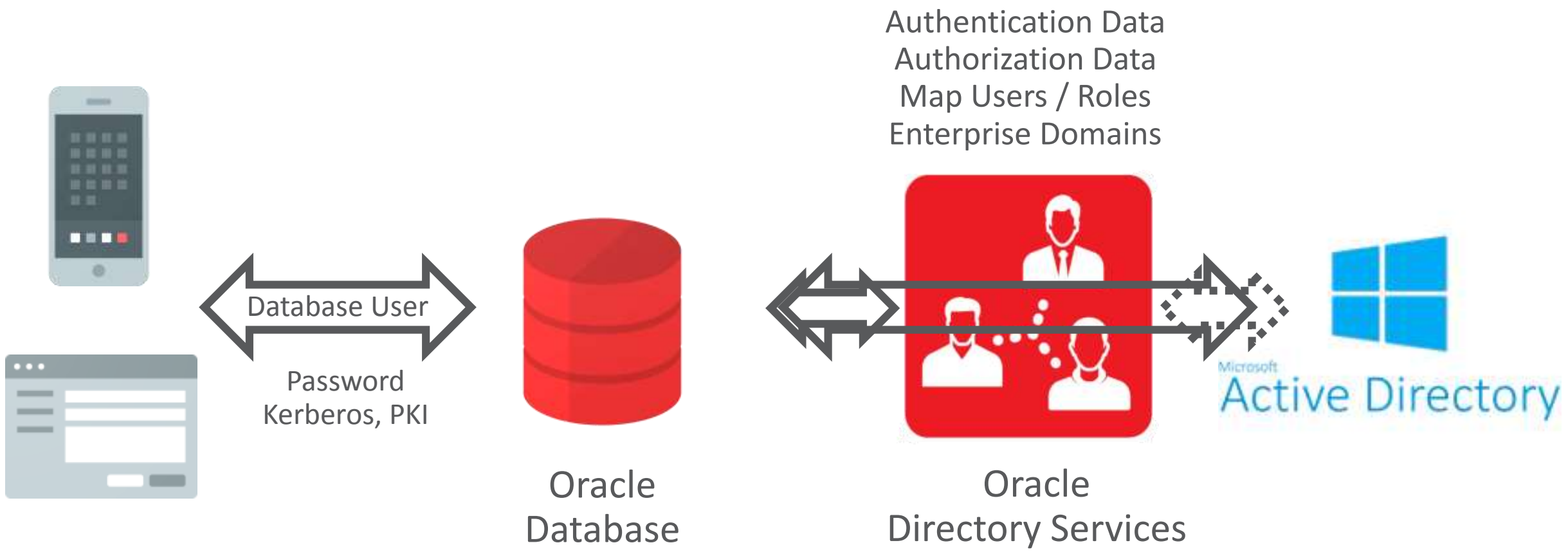
Oracle Database 12.2

- Security In-Depth
  - Access Controls, Encryption, Redaction, Masking, Auditing, SQL Firewalls
- Key Vault
- Audit Vault Database Firewall
- Security Assessment Tool

Oracle Database 18c

- Integration with Active Directory
  - 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

Centrally Managed Users Directly in Active Directory



Data Warehousing and Big Data

Oracle Database 12.2

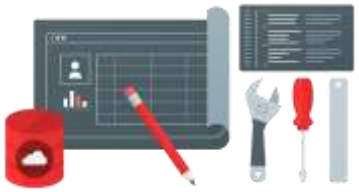
- The most advanced analytics engine available today
  - Partitioning, Compression, SQL, Analytical Views, Analytical SQL, Data Mining
- Easily analyze data held in Hadoop with Big Data SQL
- Big Data Appliance

Oracle Database 18c

- In-Memory for external tables
- Automatic propagation of nologged data to standby
- More Machine Learning algorithms
- Polymorphic Table Functions
- Alter Table Merge Partition Online
- Approximate Query Improvements

Development

Oracle Database 12.2



- Application Express 5.1
- SQL Developer & SQLCl
- Comprehensive Language support
  - PL/SQL, SQL , Python, Node.js, PHP, Java, C, .NET, REST
- JSON
  - SODA API, SODA REST API
  - SQL Support

Oracle Database 18c

- Improved JSON Support
- Property Graph Improvements
  - Support for PGQL
- Rolling patches for OJVM
- Private Temporary Tables

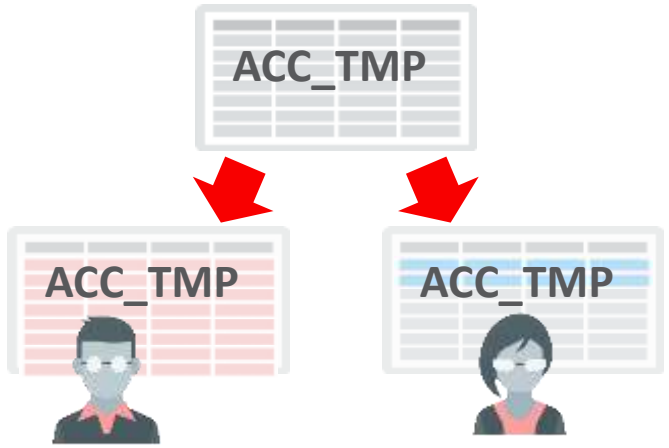
JSON Enhancements

Simpler development of JSON-centric applications using Oracle Database

- Generate large JSON documents from relational data
  - JSON generation extended to supports LOB's
- New SODA (Simple Oracle Document Access) drivers
  - OCI and PL/SQL now added, in additional to JSON and REST
  - Simple, non-relational ('nosql-like') API for accessing JSON data
- New TREAT (<expression> AS JSON) operator
  - Dynamically declare operands to be handled as JSON data, enabling more seamless JSON optimizations
- Extended key length for JSON search indexes
  - Raise the key length from 64 bytes to 255 bytes; enables faster search queries for JSON objects containing long key names.

Private temporary tables

Transient tables useful for reporting applications



Global temporary tables

- Persistent, shared (global) table definition
- Temporary, private (session-based) data content
  - Data physically exists for a transaction or session
  - Session-private statistics

Private temporary tables (18c)

- Temporary, private (session-based) table definition
  - Private table name and shape
- Temporary, private (session-based) data content
  - Session or transaction duration

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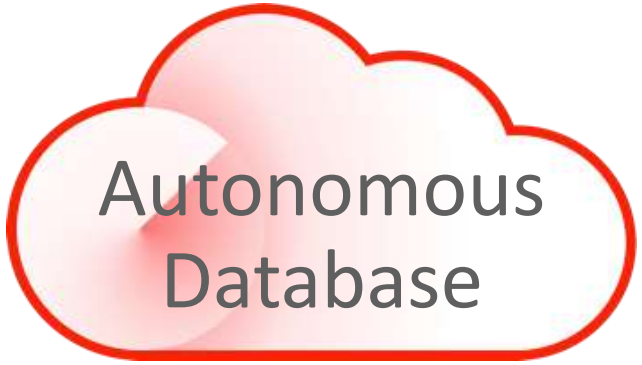
Oracle's Vision for Autonomous Database

- Self-Driving
  - User defines service levels, database makes them happen
- Self-Securing
  - Protection from both external attacks and malicious internal users
- Self-Repairing
  - Automated protection from all downtime



Self-Driving

Built Using Applied Machine Learning

- Fully Automated
  - Eliminates the complexity of provisioning and operating databases
  - Monitors for resource exhaustion and bottlenecks
  - Errors logged to support and automatically analyzed for quickest resolution
- Self Tuning
  - Specialized by workload type – analytics, OLTP, etc.
  - Extensive performance diagnostics

Self-Securing

- Automated Protection from external attacks
  - Automatically updates to latest security patches
  - Native encryption prevents data access from outside the database
- Automated Protection from internal users
  - Database Vault prevents administrators from seeing user data
  - Data Masking finds and conceals sensitive data from testers

Self-Repairing

Protected from planned and unplanned downtime with GUARANTEED 99.995% SLA

- System failures
  - Exadata, Real Application Clusters (RAC), Automatic Storage Management, Backup
- Regional outages
  - Active Data Guard
- Patches and Upgrades
  - Rolling RAC updates and transient logical standby
- Table changes and User Error
  - Online redefinition and flashback

Instant Elasticity

Key differentiator for Oracle Autonomous Database Cloud

- Independently specify compute and storage
  - No selection of rigid ‘shapes’
- Pay for compute when in use only
  - No charges incurred when compute is suspended/shutdown
- Instant scaling and bursting of compute and storage
  - No downtime required

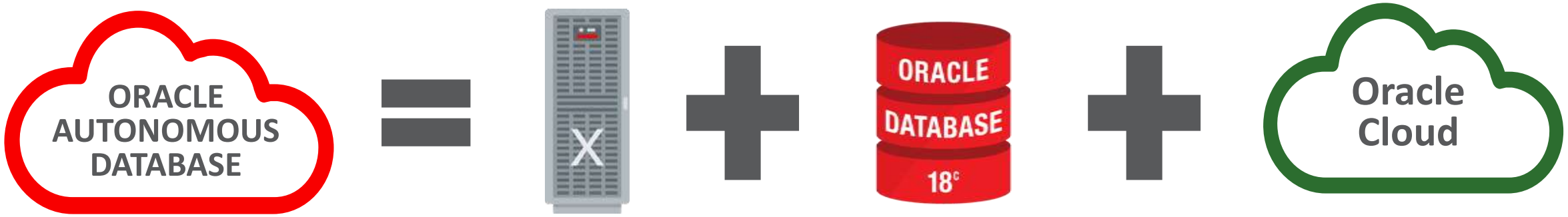
Autonomous Data Warehouse Cloud

- Easy
  - Simply create tables, load data, and run queries
  - No need to tune, define indexes, create partitions, etc.
  - Automatically optimizes Analytic workloads
- Fast
  - Based on Exadata technology
- Elastic
  - Instant scaling of compute or storage with no downtime

Expected CY 2017

Autonomous Completes the Journey

Brings Full Automation to Entire Database Lifecycle



Complete Infrastructure Automation

Complete Database Automation

Automated Data Center Operations and Machine Learning

World's First Autonomous Database

Journey to Autonomous Database

- Oracle has been developing sophisticated database automation for decades

Oracle Database 9i, 10g

- Automatic Storage Management (ASM)
- Automatic Memory Management
- Automatic DB Diagnostic Monitor (ADDM)
- Automatic Workload Repository (AWR)
- Automatic Undo tablespaces
- Automatic Segment Space Management
- Automatic Statistics Gathering
- Automatic Standby Management (Broker)
- Automatic Query Rewrite

Oracle Database 11g, 12c

- Automatic SQL Tuning
- Automatic Workload Replay
- Automatic Capture of SQL Monitor
- Automatic Data Optimization
- Automatic Storage Indexes
- Automatic Columnar Cache
- Automatic Diagnostic Framework
- Automatic Refresh of Database Cloning
- Autonomous Health Framework

Traditionally DBAs are Responsible for:

- **Generic Tasks**
  - Configuration and tuning of systems, network, storage
  - Database provisioning, patching
  - Database backups, H/A, disaster recovery
  - Database optimization
- **Tasks Specific to Business**
  - Architecture, planning, data modeling
  - Data security and lifecycle management
  - Application related tuning
  - End-to-End service level management

Autonomous Database Removes Generic Tasks

Freedom from Drudgery for DBA: More Time to Innovate and Improve the Business

- ~~**Generic Tasks**~~
  - ~~Configuration and tuning of systems, network, storage~~
  - ~~Database provisioning, patching~~
  - ~~Database backups, H/A, disaster recovery~~
  - ~~Database optimization~~
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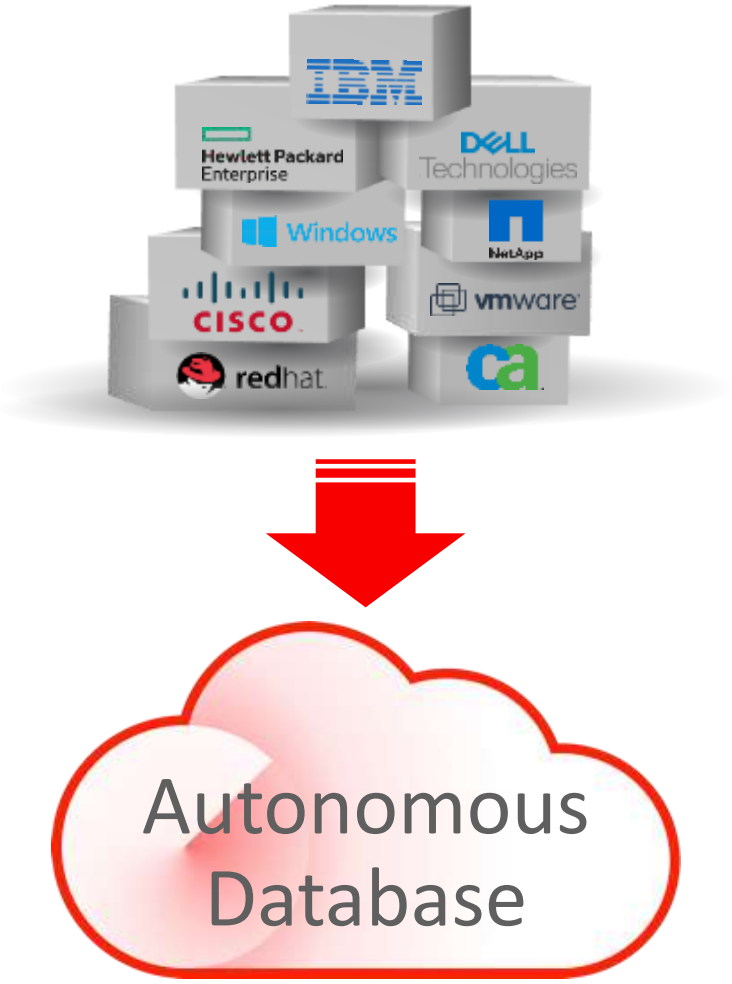
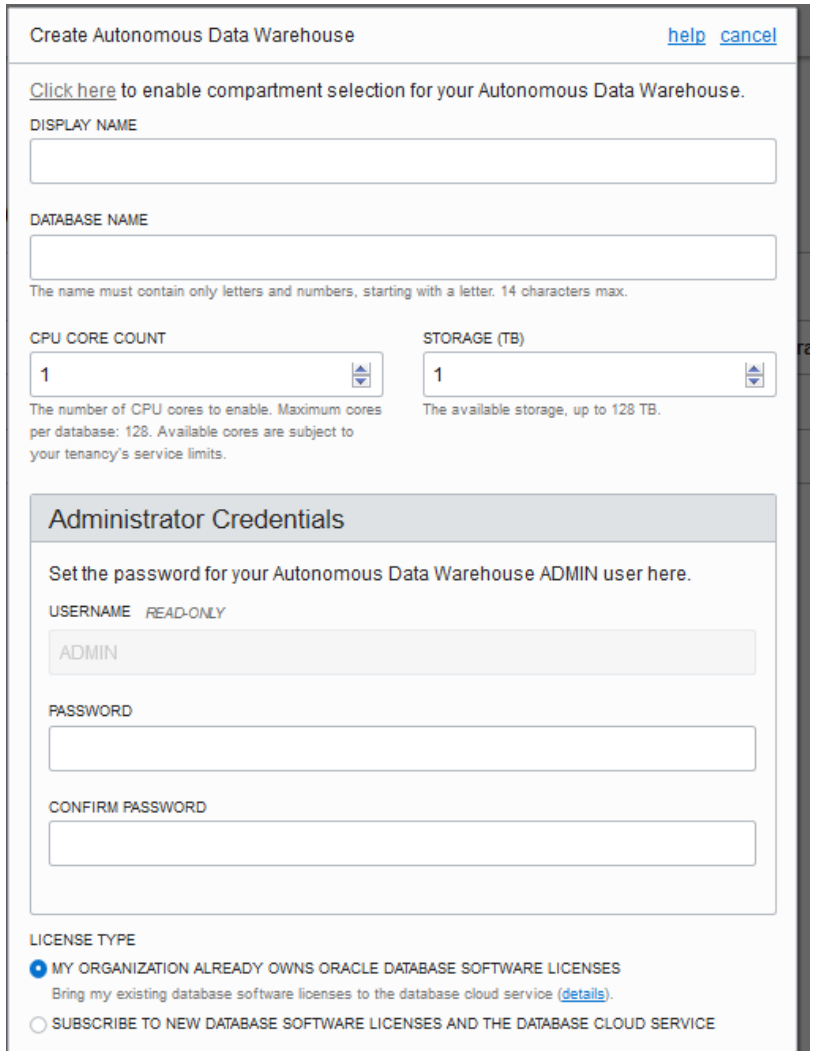


Getting Started with Autonomous Database Cloud

- Provisioning requires answers to only 6 simple questions:
  - Display Name ?
  - Database name?
  - How many CPU's?
  - How many TB's?
  - Admin password?
  - License Type?
- New service created in <2 minutes (regardless of size)
  - Ready to connect via sqlnet



One Autonomous Database - Optimized by Workload

Autonomous Data Warehouse (ADW)

Best for all Analytic Workloads:
- Data Warehouse, Data Mart
- Data Lake, Machine Learning

Autonomous Transaction Processing (ATP)

Best for TP and Mixed Workloads:
- Transactions, Batch, Reporting, IoT
- Application Dev, Machine Learning

Autonomous Transaction Processing (ATP) vs Autonomous Data Warehouse (ADW)

Service	Autonomous Transaction Processing	Autonomous Data Warehouse
Database Version	18c	18c
Typical Workload	Online Transaction Processing (OLTP)	Data Warehousing (DW/DM)
Time Sensitivity	Runs the business in Real-time	Report on / Analyze the business after the fact
Performance	Critical (e.g. Lost eCommerce transactions & revenue due to slow app performance)	Less Critical (e.g. Users complain about slow performance; loss productivity)
Workload Characteristics	Read & Write	Mostly Read
Availability	Mission Critical – Runs the Business	Critical – Reports on the Business
Analytics	Drive real-time decisions	Analyze after the fact and adjust
Backup	Critical – Single source of truth	Typically copied (refreshed) from a source system

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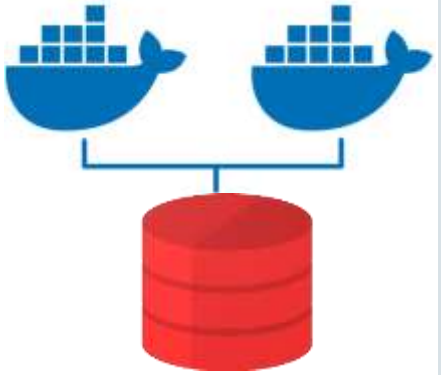
Database Instance Management REST API

- A REST API to provide instance management and monitoring
- Same consistent API for Cloud **and** On Premises
- Simple API for all database lifecycle operations
- Supports Oracle Databases integration with orchestration frameworks

```
https://myserver.mydomain.com/ords/databases/exadata/pdbs
```

List the pdbs in the exadata database container

Official Docker Support



- Oracle Database is fully supported on Docker for
  - Oracle Linux 7
  - Red Hat Enterprise Linux 7
- MOS Note: **Oracle Support for Database Running on Docker (Doc ID 2216342.1)**
- Oracle 12.2.0.1 & 12.1.0.2 images are available on Oracle Container Registry
  - https://container-registry.oracle.com
- Oracle RAC is also supported on Docker
- Docker build files also available at
  - : https://github.com/oracle/docker-images

New Installation Approaches

- Oracle Gold Image as a Service
  - On demand image creation including application of RUs, RURs and one off patches
  - Request images as a
    - Zip file, TAR File, Docker Image, Virtual Box, VM (Ravello, BMC, Vbox)
  - Web Interface or REST API
  - Coming soon…
- Oracle Installation via RPM
  - Oracle EE, SE2, and Grid Infrastructure

Oracle Database 18c Express Edition

- Free use for development and production
- Expected CY 2018
- Nearly all functionality is included
- Limited to 12GB of user storage
- Limited to 2GB of SGA

Integrated Cloud

Applications & Platform Services


ORACLE®