
ORACLE®

Transforming Data Management

with Oracle Database 12*c* Release 2

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, and timing of any features or functionality described for Oracle's products remains at the sole discretion of Oracle.

Oracle Database 12c Release 2 on Oracle Cloud

- Available now
  - Exadata Express Cloud Service
  - Enterprise Cloud Service
  - Exadata Cloud Service
- Available December
  - Exadata Cloud Machine

Transforming Data Management

While preserving customer's investments

- From Disk-based to In-Memory Databases
- From Data Warehouse to Big Data
- From On-Prem to Database Optimized Cloud

Transforming Data Management

While preserving customer's investments

- **From Disk-based to In-Memory Databases**
- From Data Warehouse to Big Data
- From On-Prem to Database Optimized Cloud

In-Memory Databases

From Disk-Based

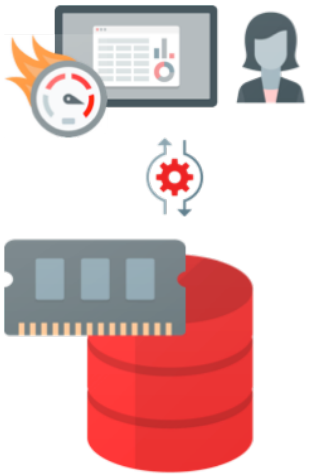
- Optimized for disk I/O
- Row format
- Buffer cache in DRAM plus disk storage

To In-Memory Databases

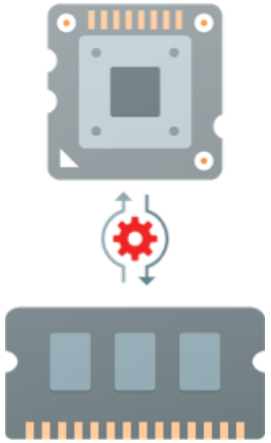
- Optimized for memory access
- Dual row/column format
- Integrated DRAM, Flash and NVRAM storage

Evolution of In-Memory

Cost of memory continues to decrease



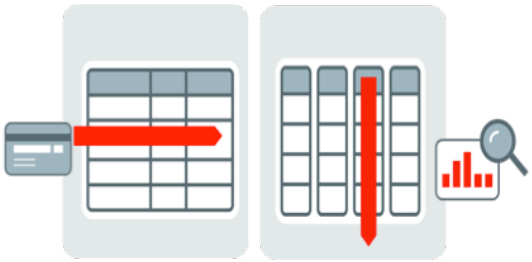
Demand for real-time analytics continues to increase



Non-volatile memory in development

In-Memory with Oracle Database 12*c*

Real Time Analytics



OLTP & Analytics on same database

Performance

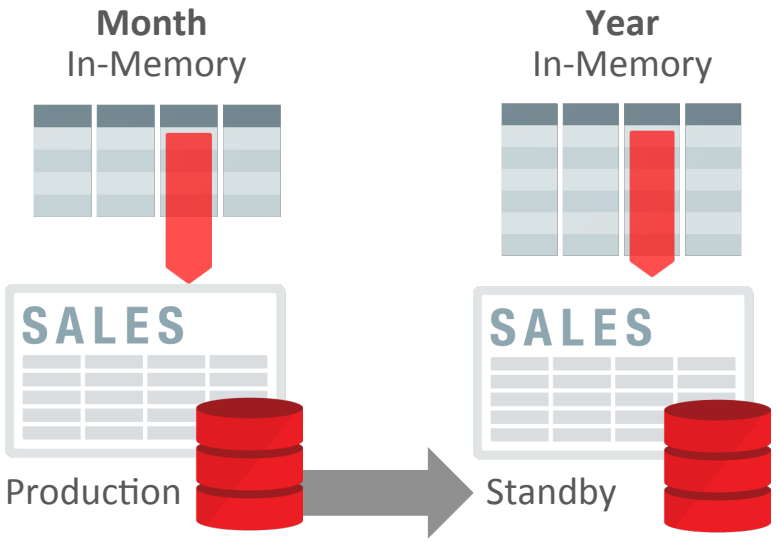
Sub-second reporting & analytics

Simple to Implement

No application changes

New in 12.2 on Oracle Cloud

In-Memory runs on Active Data Guard standby



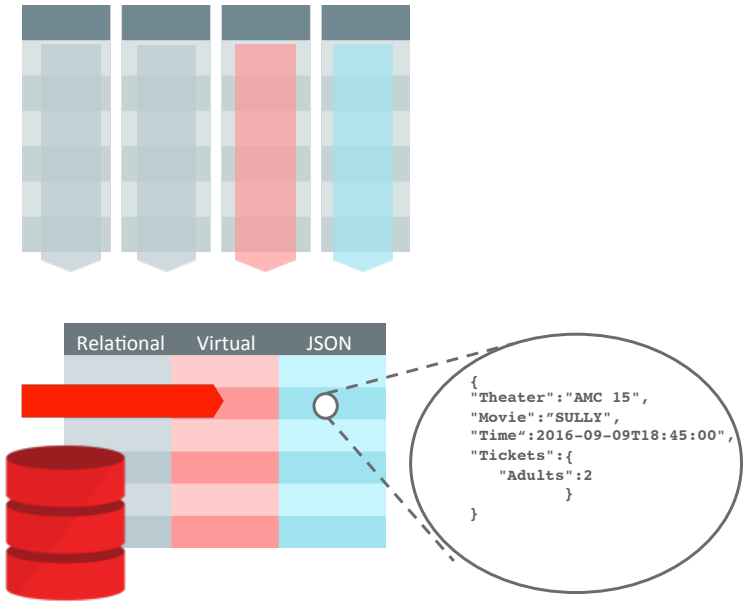
- Real-time analytics with no impact on production database
- Make productive use of standby database resources
- Can populate with different data from production database

New in 12.2 on Oracle Cloud

Performance Enhancements

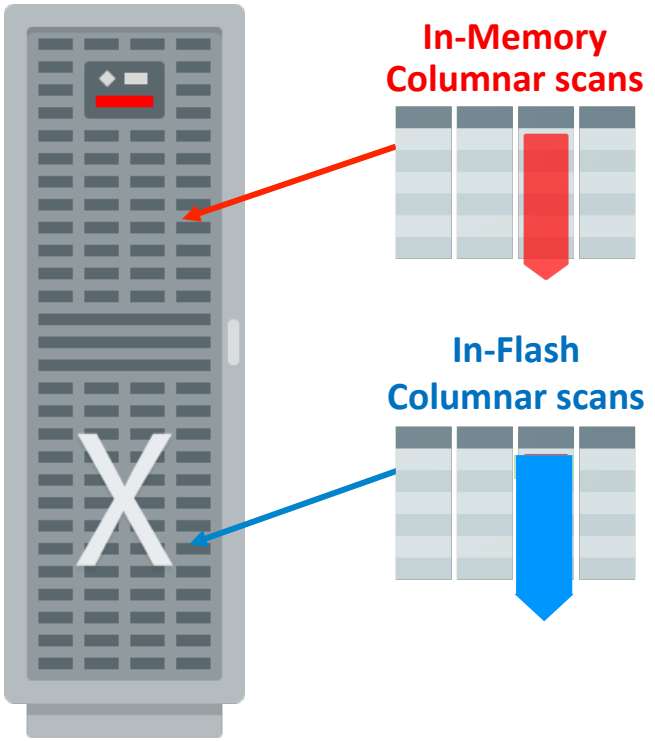
- Up to 3X faster joins
  - Using in-memory join groups
- Up to 10X faster complex queries
  - Using in-memory expressions
- Up to 60X faster JSON queries
  - Using new optimized binary format

In-Memory Column Store



New in 12.2 on Oracle Cloud

In-Memory Column Format in Exadata Flash Cache



- In-Memory format now used in Smart Columnar Flash Cache
- Enables in-memory optimizations on data in Exadata Flash Cache
- In-memory performance seamlessly extended from server DRAM memory to **10x** larger flash in storage

Oracle Database In-Memory

The Customer's View

Transforming Data Management

While preserving customer's investments

- From Disk-based to In-Memory Databases
- **From Data Warehouse to Big Data**
- From On-Prem to Database Optimized Cloud

Transforming to Big Data

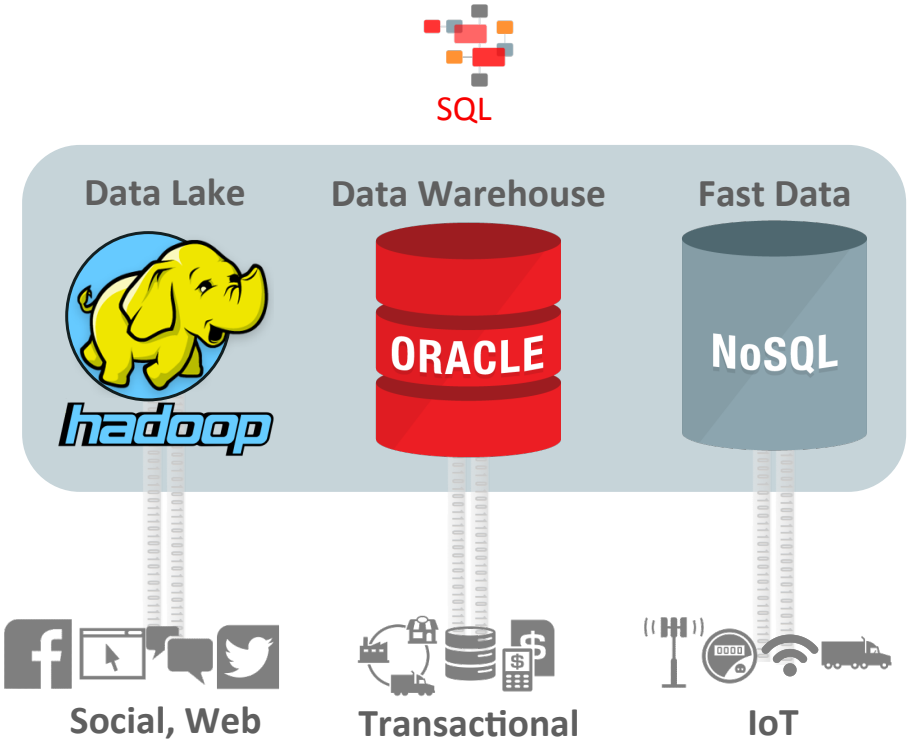
From Data Warehouse

- Relational
  - On-Premises
- Transactional data
- Analytics + Data Mining

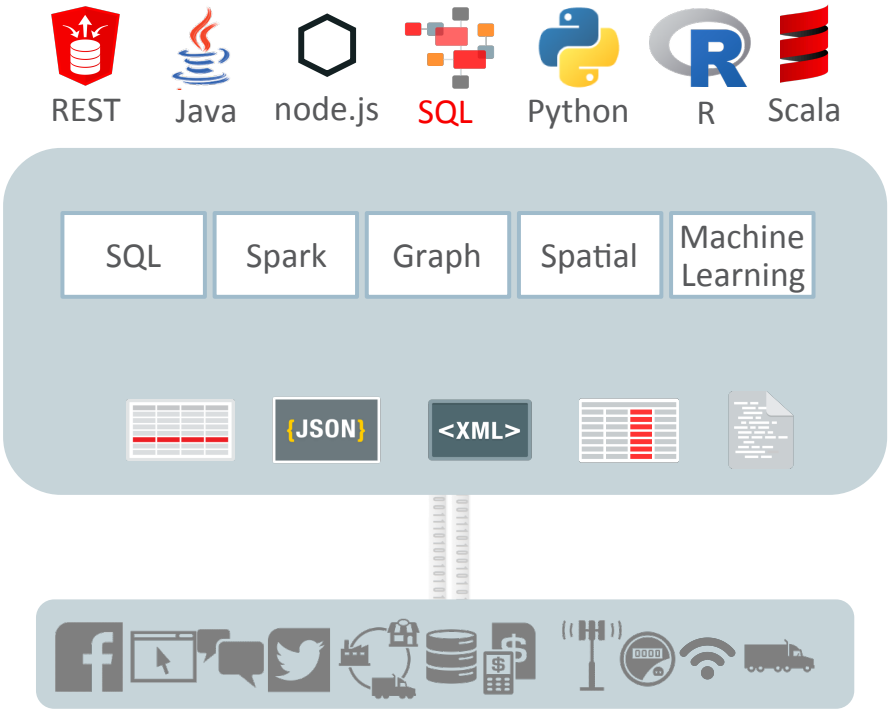
To Big Data

- Relational + Hadoop and NoSQL
  - On-Premises + Cloud
- Transactional + Social, Web and IoT
- Analytics + Data Mining + Machine Learning

Data Warehouse Evolution



Oracle Big Data Platform



Access with any language

Analysis of any type

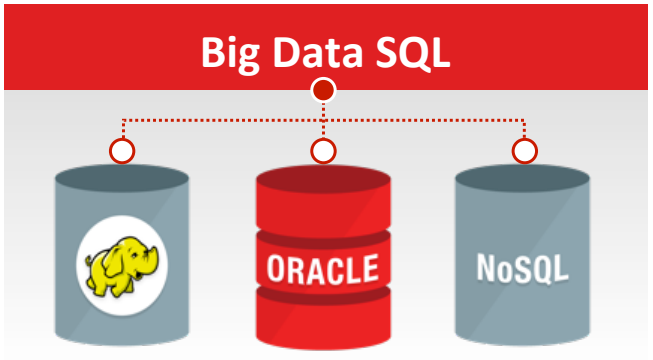
Data of any type

Any data **source**

Fast SQL access for Relational, Hadoop and NoSQL

Using Oracle Big Data SQL

- Unified SQL language for all data sources
  - With full power of Oracle SQL
- Massively parallel, distributed query processing
  - Local processing using 'Smart Scan' technology
  - Scalable joins between data sources
- Secure data access
  - Redaction and row-based security on all data sources



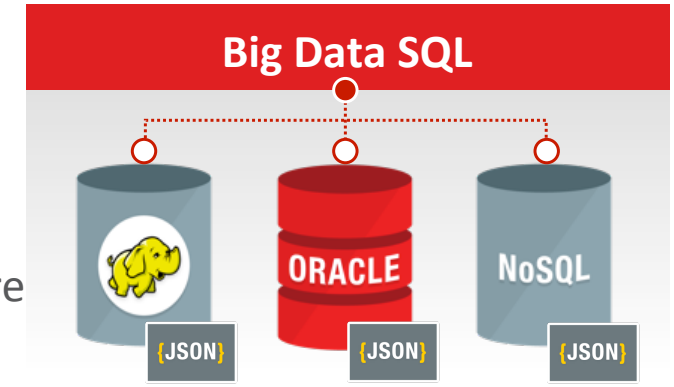
Fast SQL access for Relational, Hadoop and NoSQL

Using Oracle Big Data SQL on JSON data

- Intuitive SQL syntax over JSON

```
SELECT    c.json_column.address.city
FROM      customers c;
```

- Use JSON data in any SQL query
  - Join JSON with any other data source
  - Apply any SQL analytics to JSON
- New in Big Data SQL on Oracle Cloud
  - Data Guide: Automatically understand JSON structure



Comprehensive Data Science Capabilities

Any analysis across relational, Hadoop and NoSQL

Machine Learning

- Massively-scalable R processing
- In-Database and Spark algorithms
- Enhances and extends SparkML

Graph

- Massively-scalable Graph Database
- 40+ in-memory parallel algorithms
- Simple standard interfaces

Spatial

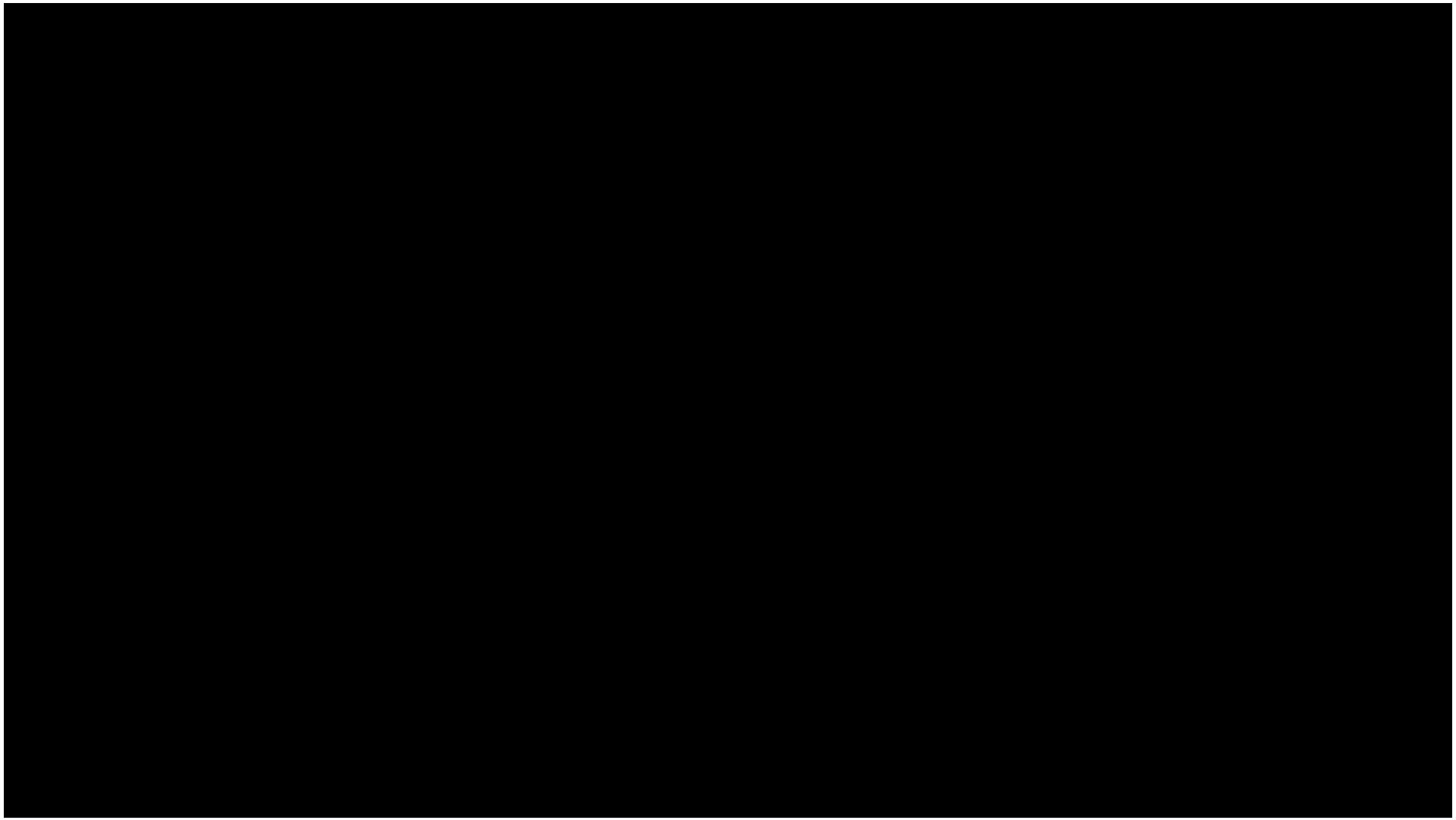
- Massively-scalable Vector and Raster processing: 50+ functions
- Spatial data enrichment, filtering, and categorization

Multi-media

- Massively-scalable open framework for image and video processing
- Use-cases: face recognition; OCR; license plate recognition

Oracle Big Data

The Customer's View



Big Data Cloud Service

Comprehensive, high-performance service for Hadoop, Spark, and NoSQL

- Big Data Cloud Service includes:
  - Cloudera Enterprise Data Hub
  - Embedded analytics including R and Property Graph analytics
  - Embedded data integration tools
- Start with 3-node cluster, scales to 100's of nodes
- Big Data SQL Cloud Service coming soon

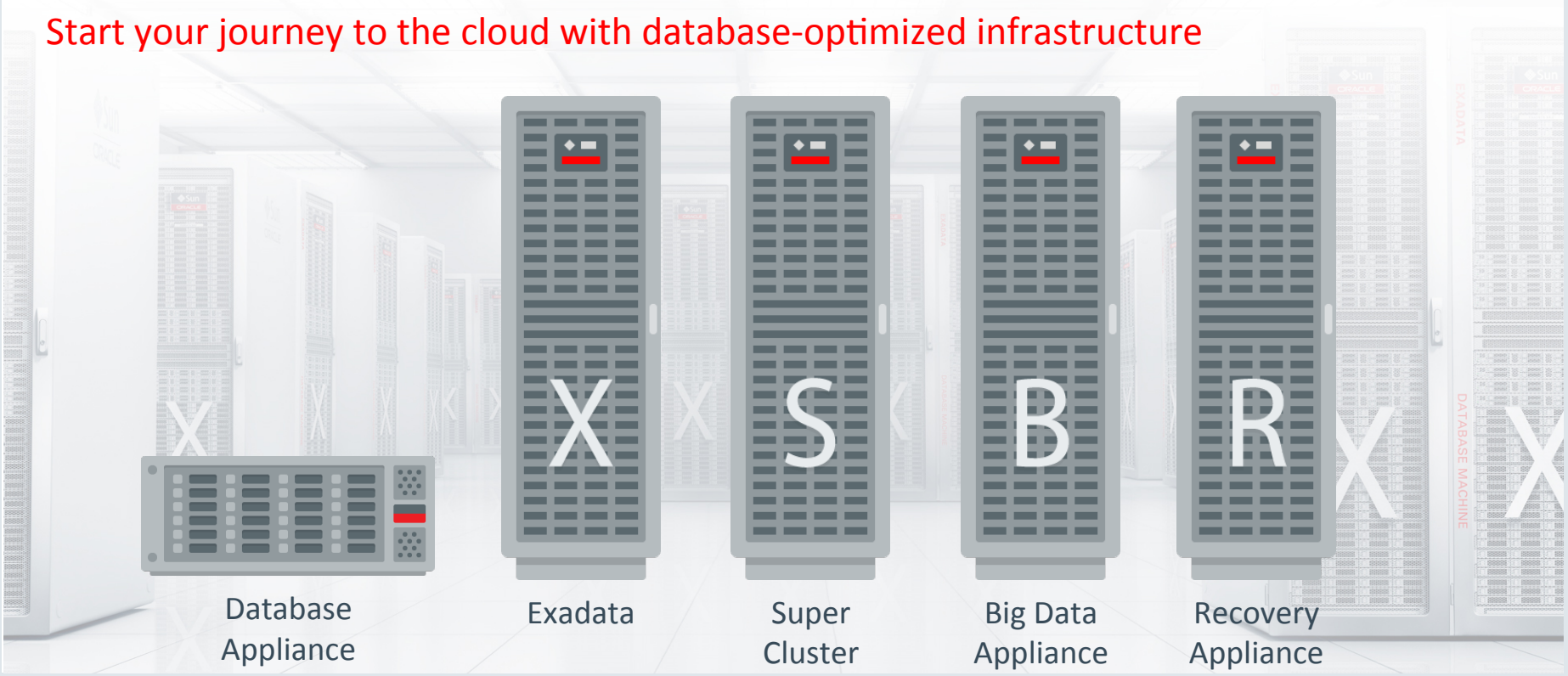
Transforming Data Management

While preserving customer's investments

- From Disk-based to In-Memory Databases
- From Data Warehouse to Big Data
- **From On-Prem to Database Optimized Cloud**

Engineered Systems for Data Management

Start your journey to the cloud with database-optimized infrastructure



Transforming to Database-Optimized Cloud

- Lower Costs
  - Manage many databases as-one
- Agility
  - Rapid provisioning, cloning, movement
- Elastic Scaling
  - Scale-up, scale-out **and** scale-down

Lowering Costs

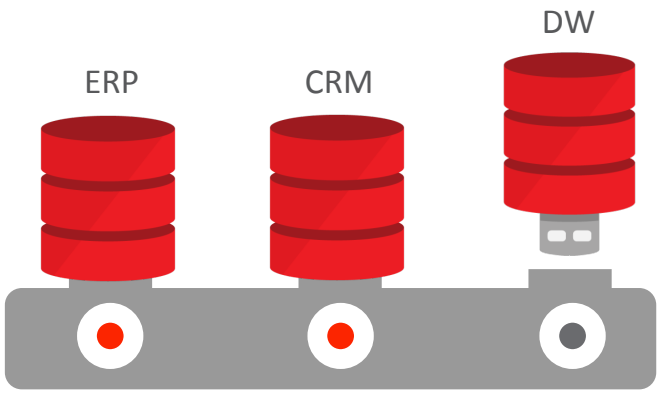
From On-Prem

- Pay up-front
  - for peak capacity
- Manual deployment and upgrade
- High operational cost
  - Manage Many Databases

To Database-Optimized Cloud

- Pay as you go
  - for capacity on-demand
- Self-service deployment and upgrade
- Low operational cost
  - Manage Many-as-One

Oracle Database 12c Multitenant Architecture

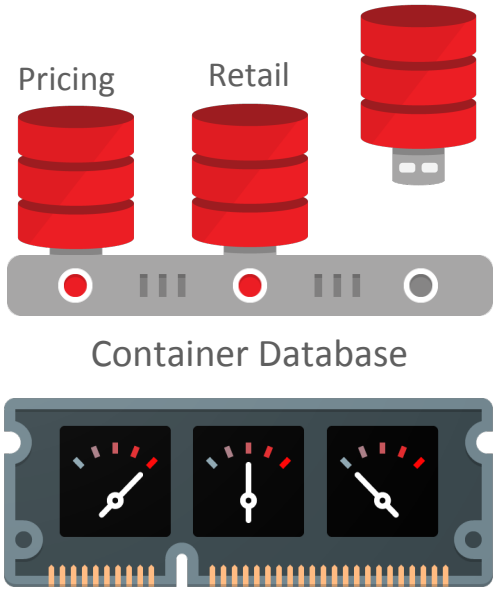


- Virtualize databases into Container Database
  - Applications run unchanged
- Lower Operational Expenses
  - Manage many Pluggable Databases as one
- Lower Capital Expenses
  - More Pluggable Databases per server
- More Agile
  - Fast provisioning, movement and cloning

New in 12.2 on Oracle Cloud

Greater Consolidation and Isolation at Scale

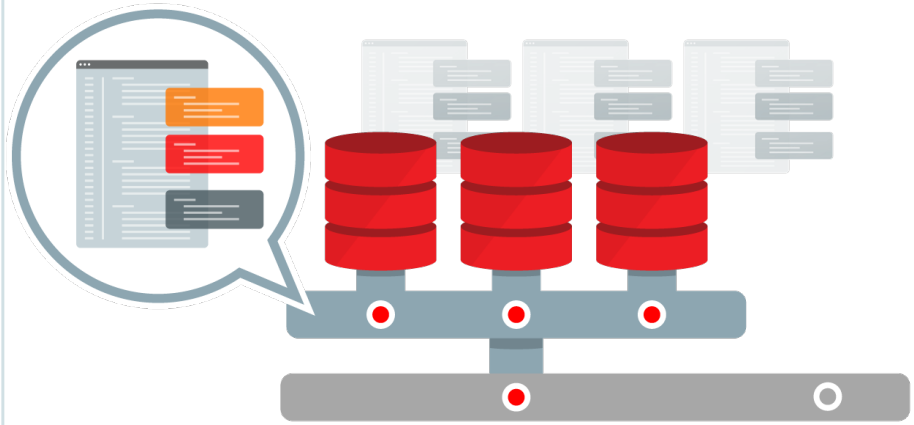
- Up to 4,096 PDBs per container
- Memory, CPU and I/O resource prioritization
- Configurable isolation between private and public clouds



New in 12.2 on Oracle Cloud

Consolidation with Application Containers

- PDBs share application objects
  - Code, metadata and data
- Further simplifies management
  - Manage tenant applications as one
- Suitable for many applications
  - SaaS, franchise, divisional, etc.



Agility

From On-Prem

- Manual database configuration
  - Design HW/SW stack from scratch
- Months to deploy, upgrade
- Single tenant databases

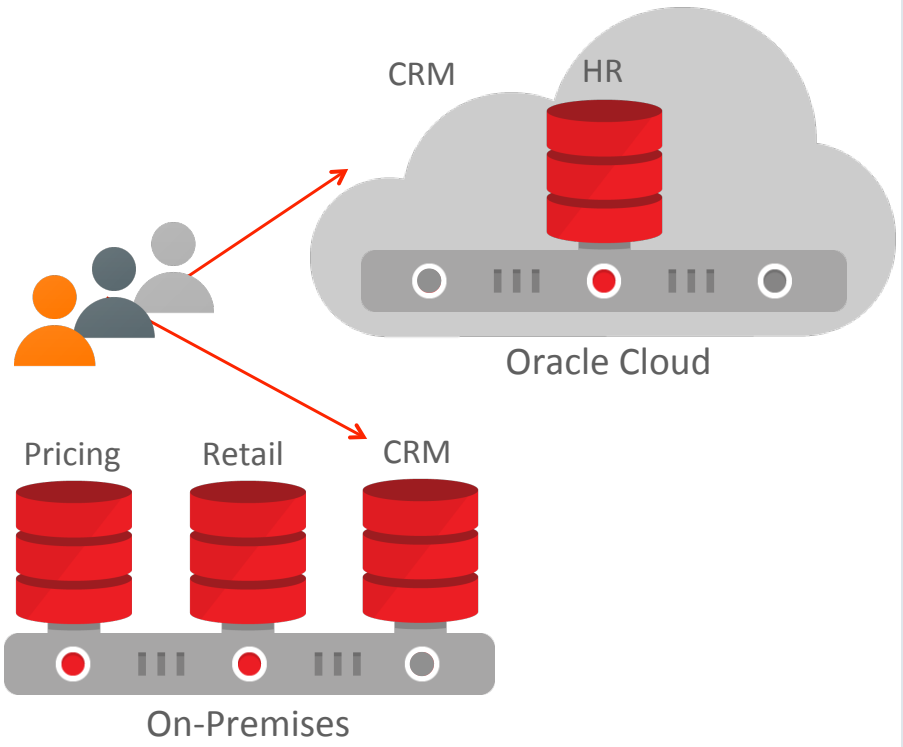
To Database-Optimized Cloud

- Self-service database provisioning
  - Choose from list of Cloud services
- Minutes to deploy, upgrade
- Multitenant container databases
  - Hot cloning and relocate PDBs

New in 12.2 on Oracle Cloud

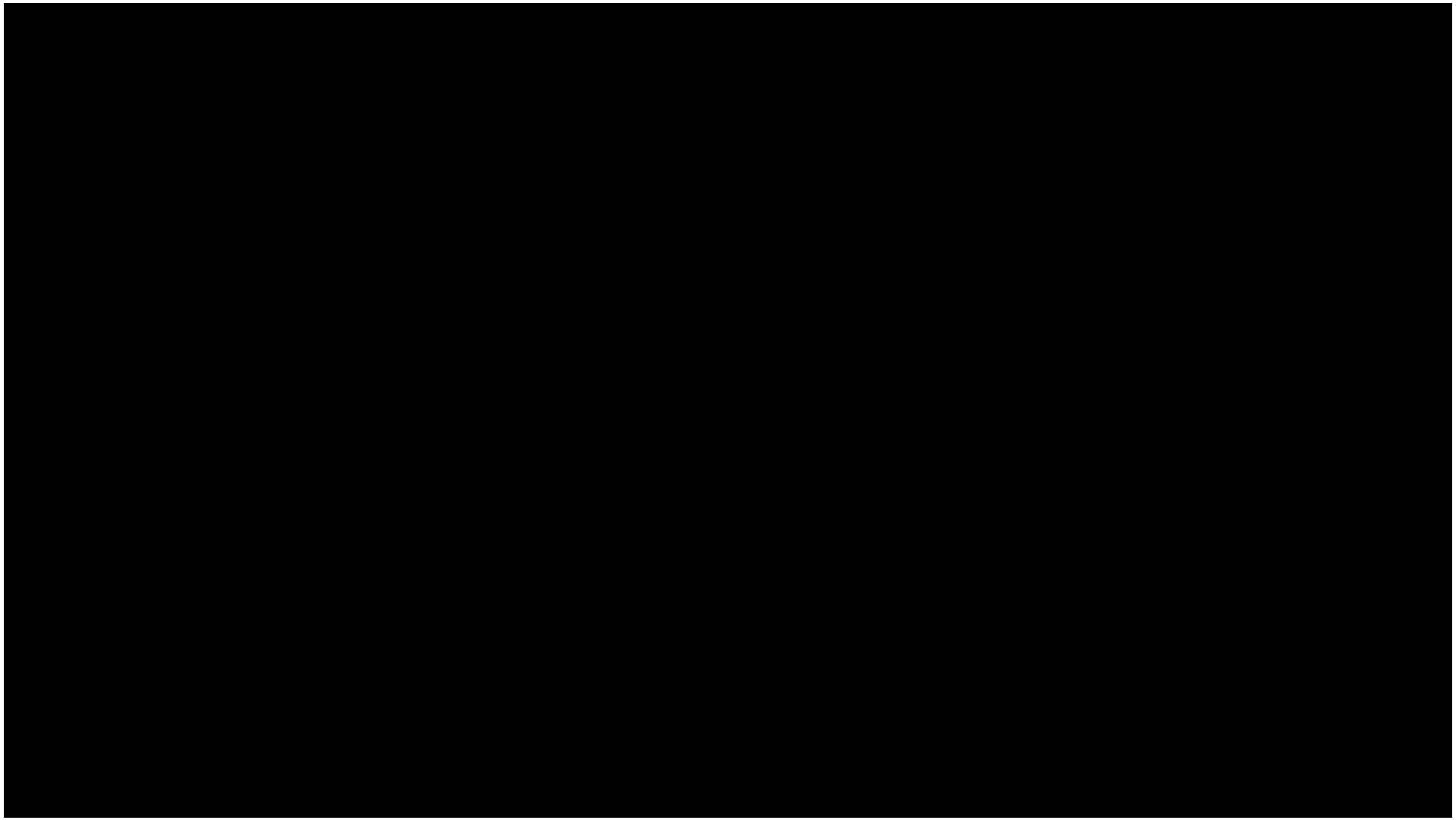
Online PDB Operations

- PDB Hot Clone
  - Faster test master instantiation
- PDB Refresh
  - Simple operation for latest data
- PDB Relocate
  - Relocate with no downtime



Multitenant on Oracle Cloud

The Customer's View



Elastic Scaling

From On-Prem

- Manual scale-up of single servers and scale-out RAC clusters
  - With no bursting
- Provision for peak-demand
- Massive scalability & reliability
  - Manual database sharding

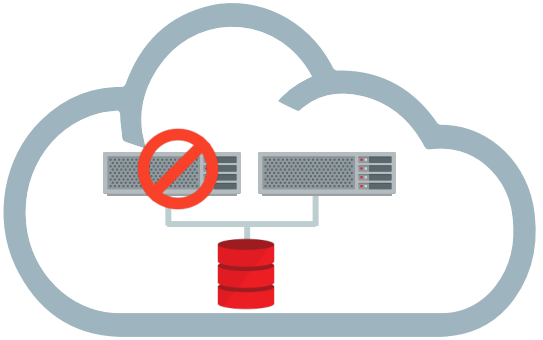
To Database-Optimized Cloud

- Self-service scale-up of single servers and scale-out RAC clusters
  - With bursting
- Provision capacity on-demand
- Massive scalability & reliability
  - Automated database sharding

Unique scale-out and fault tolerance with Oracle RAC

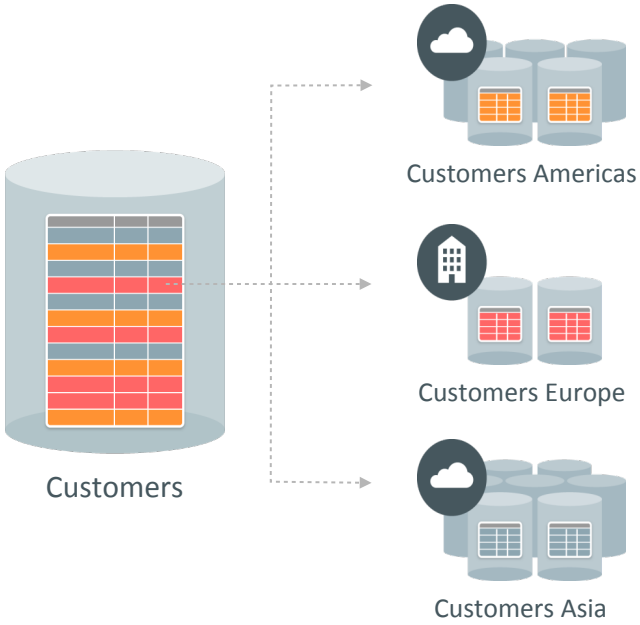
No application changes required

- Protects databases from server failure
- Scale-out database performance
  - With bursting as required
- Supports the world's largest OLTP and Data Warehouse workloads
- New in 12.2 on Oracle Cloud
  - Optimized for multitenant databases
  - Scale-out to hundreds of nodes



New in 12.2 on Oracle Cloud

Native Database Sharding for massive scalability and reliability for OLTP applications



One giant database partitioned into many small databases (shards)

- RAC and Data Guard meet needs of over 99% of applications while preserving application transparency
- Some Global-Scale OLTP applications prefer to shard massive databases into a farm of smaller databases
- Requires designing applications so that workloads are automatically routed to specific shards in the farm
- SQL for sharded tables across up to 1000 Shards

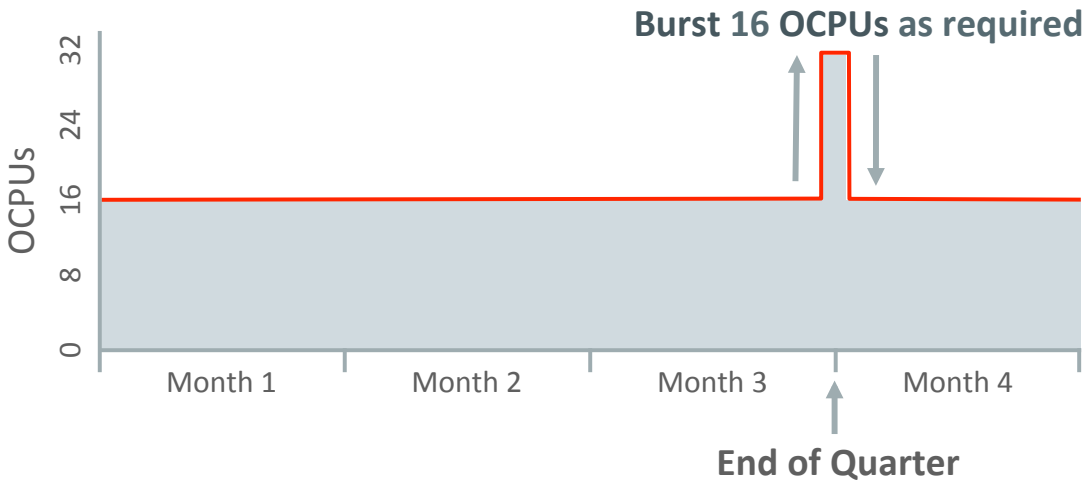
Oracle Exadata Cloud Service

#1 database on only cloud infrastructure optimized for database

- Oracle Database with all options
- On fastest and most reliable Database Cloud Platform
  - Scale-Out Compute, Scale-Out Intelligent Storage, Elastic Expansion
  - Complete Isolation of tenants with no overprovisioning
- All benefits of Public Cloud
  - Fully managed infrastructure
  - Rapid, elastic, database provisioning
  - No CapEx with pay-per use subscription

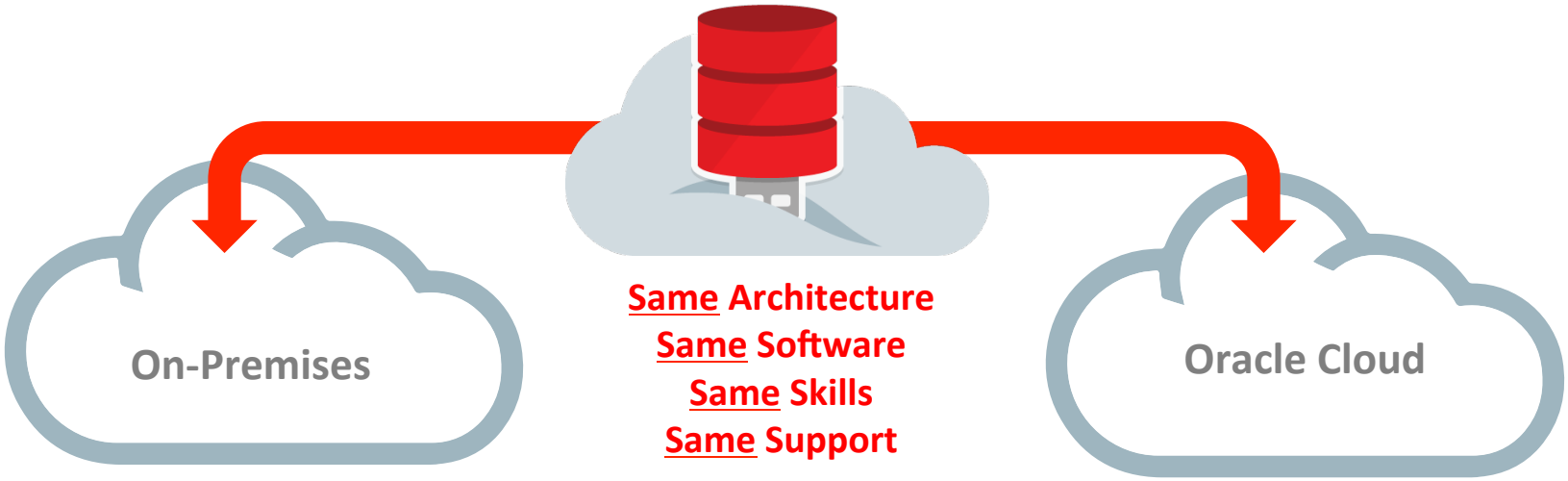
Pay-as-you-go Exadata Cloud Service

Monthly subscription rates and burst OCPUs on demand



100% Compatible Hybrid Cloud

Graceful co-existence and migration between private and public clouds



Automated movement of applications & data between on-premises & public cloud

Oracle ‘Cloud at Customer’

Helps conform to business and government security and compliance requirements

- Same PaaS and IaaS hardware and software as Oracle Public Cloud
- Managed by Oracle and delivered as a service behind your firewall
- Same cost-effective subscription pricing model as Oracle Cloud

Choice of Exadata Deployment Models

Exadata Database Machine

Customer Data Center

Purchased

Customer Managed

Exadata Cloud Machine

Customer Data Center

Subscription

Oracle Managed

Exadata Cloud Service

Oracle Cloud

Subscription

Oracle Managed

Introducing Exadata Express Cloud Service

Simple to use, lowest cost Database Cloud Service, running 12.2

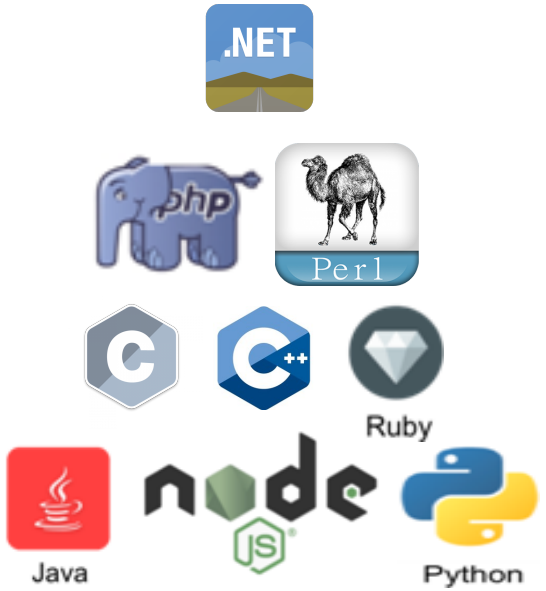
- #1 Database, including options, on Exadata
- Fully managed by Oracle
- Low cost, starting at $175 per month

Use Cases: Exadata Express Cloud Service

- Application development
- Testing and quality assurance
- Short-term, time sensitive projects
- Analytics and sandboxes
- Production departmental workloads

Development on the Oracle Cloud

- All popular languages supported
- Full database support for
  - JSON
  - Rest
- Development tools included
  - Application Express
  - SQL Developer



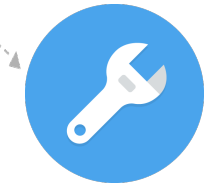
and more…

Oracle Application Express (APEX)

Complete Application Platform as a Service (aPaaS)

Provision

Included with ALL Oracle Database editions and Cloud Services



Develop

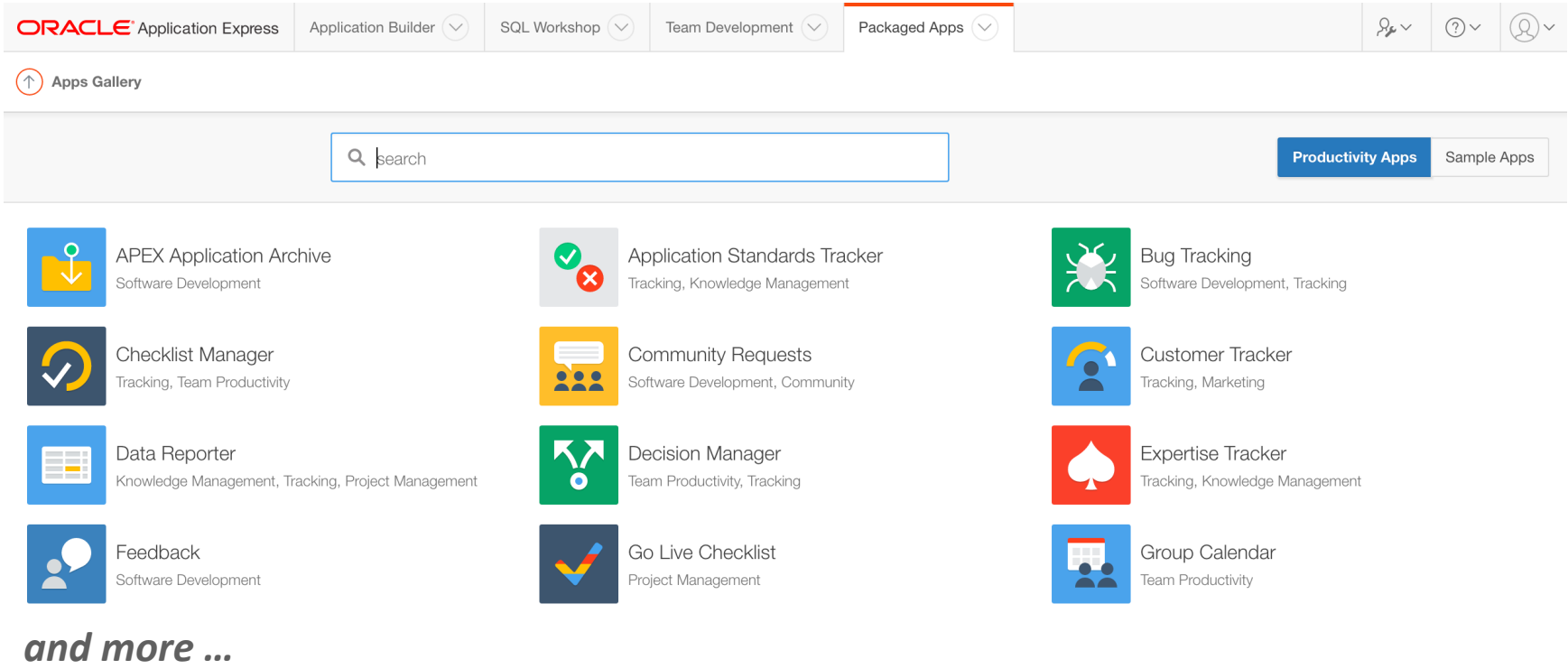
Customize

- RAD browser based tool
- Create and manage database objects
- Robust visualization components
- 300K+ developers, 100's of partners

Deploy

100% compatibility between on-premises and Oracle Cloud

Productivity Apps included in APEX



and more …

Spectrum of Oracle Database Cloud Services

Scale from entry-level to the largest mission critical database workloads

	Exadata Express	Enterprise	Exadata
Database Development	✓	✓	✓
SMB & Departmental Applications	✓	✓	✓
Enterprise Applications		✓	✓
Highest availability, scalability and performance			✓

Transforming Data Management

While preserving customer's investments

- From Disk-based to In-Memory Databases
- From Data Warehouse to Big Data
- From On-Prem to Database Optimized Cloud

Safe Harbor Statement

The preceding 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, and timing of any features or functionality described for Oracle's products remains at the sole discretion of Oracle.

Integrated Cloud

Applications & Platform Services


ORACLE®