



Ali je Oracle Autonomous Database prihodnost razvoja Oracle baze podatkov?

Autonomous Database 2022

What's New

Robert Korošec

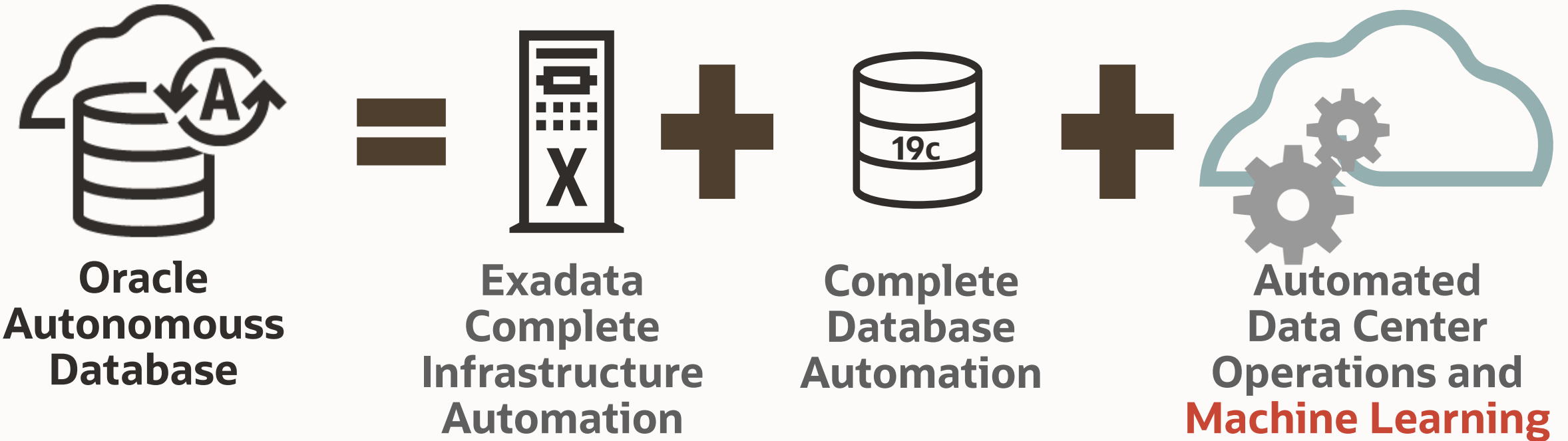
Oracle

robert.korosec@oracle.com



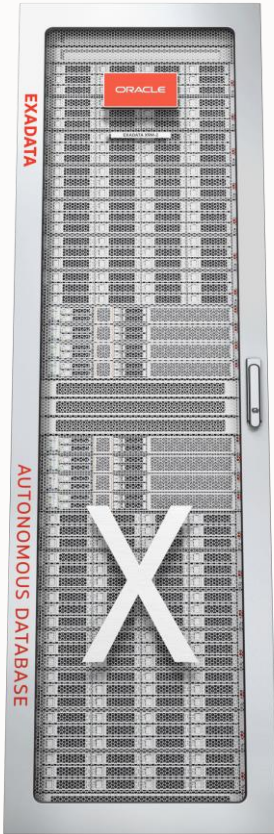
Oracle Autonomous Database | What's Inside?

Eliminates All Database & Infrastructure Complexity



Exadata Vision

Extreme Performance and Availability, Lowest Cost, Available Everywhere



Ideal Database Hardware

Scale-out, database optimized compute, networking, and storage

Database Aware System Software

Unique algorithms vastly improve OLTP, Analytics, and Consolidation

Automated Management

Fully automated and optimized end-to-end

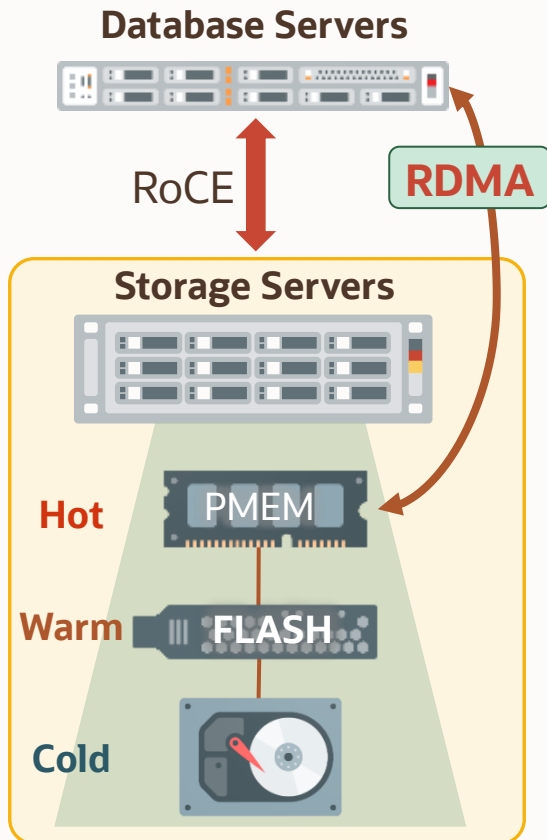
Available

On Premises

Cloud@Customer

Oracle Cloud

Exadata Superior OLTP Architecture - Persistent Memory



Database uses RDMA instead of I/O to read PMEM in Smart Storage

- Bypasses network and I/O software, interrupts, context switches

Storage servers transparently manage PMEM

- Hottest data automatically cached in PMEM, increasing effective capacity 10x
- Automatic PMEM redundancy across multiple storage servers

Speed of RDMA to PMEM for both database reads and commits

Result - 19 μ s IO latency from Database to PMEM in Storage

- 10X Faster than Flash

World's Only Shared Persistent Memory Optimized for Database

Fastest Cloud Analytics

Smart Scan (SQL Offload)

- Data-intensive processing* runs in massively parallel Exadata Storage, bypassing network bottlenecks and freeing up DB CPUs

Tiered Flash Cache

- Active data is automatically cached on PCI NVMe Flash, inactive data on low cost, high-capacity disks

Storage Indexes

- Eliminates I/O not relevant to a particular query

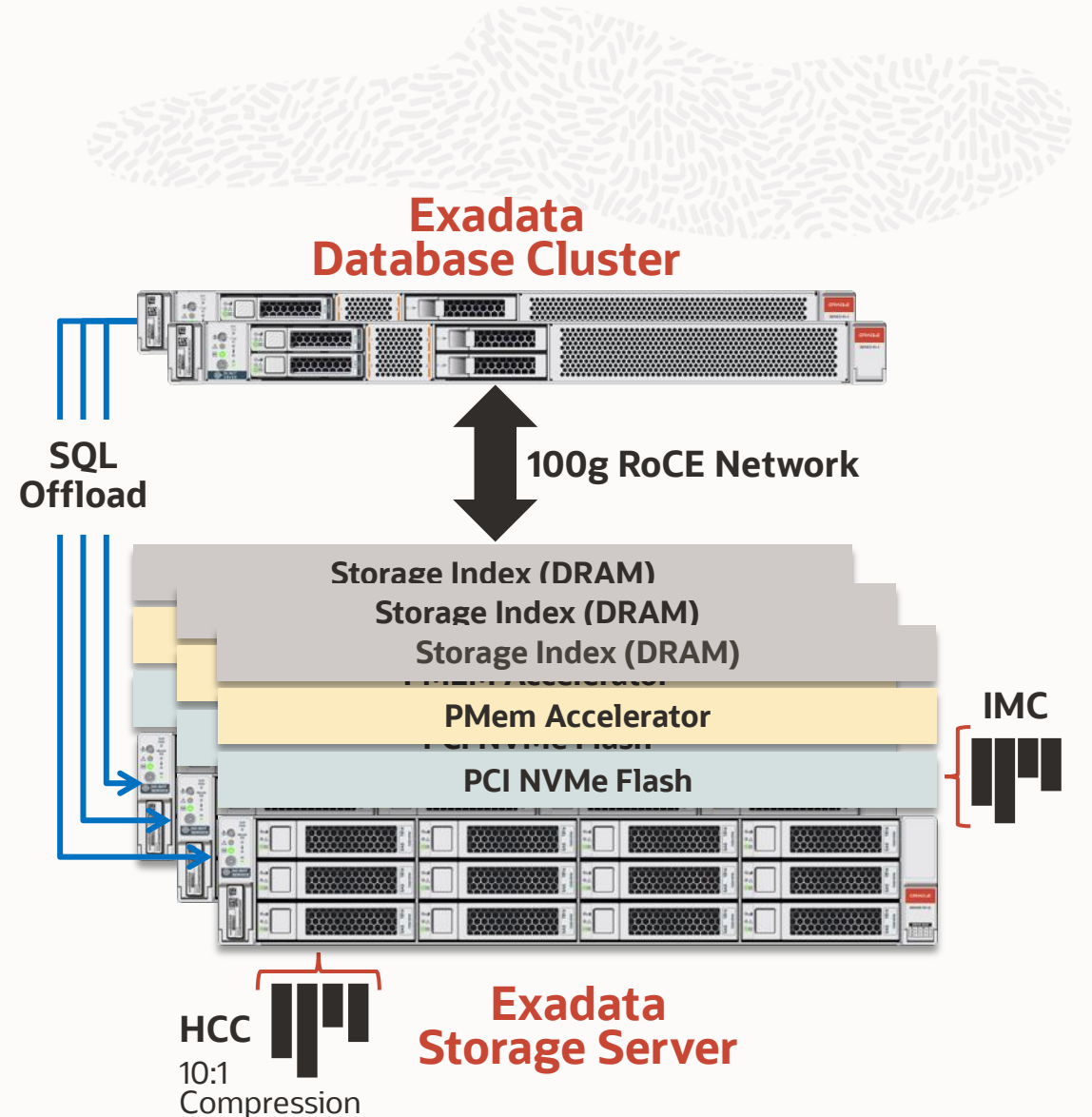
Hybrid Columnar Compression (HCC)

- Compressed, columnar format in storage, saving space, reducing I/O, speeding analytic queries

In-Memory Columnar (IMC)

- Extends In-Memory database performance to higher capacity Flash memory in storage

*Includes long-running SQL queries, backups, decryption, aggregation, data mining





What is Autonomous Database?

Family of products based on a common platform, optimized for specific workloads



Autonomous
Data Warehouse



Optimized
for JSON



Autonomous
Transaction Processing

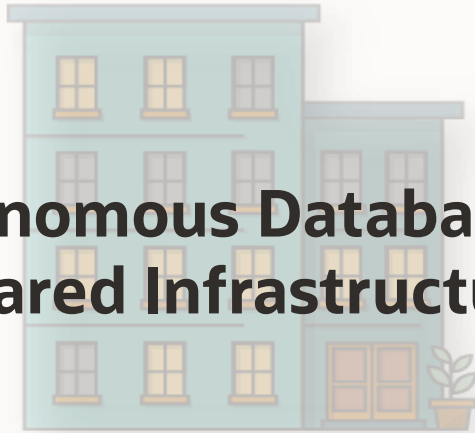


Optimized
for Graph



Shared and Dedicated Infrastructure

Autonomous Database on Shared Infrastructure



Simplest experience for non-technical users

- Oracle **automates** and **manages everything** Deployment, lifecycle, software updates, etc.
- Just choose database resources (compute, storage) & region

Completely **Elastic**

- Low minimum size - 1 OCPU and 1TB
- No fixed sized building blocks
- Scale up and down on-demand with zero downtime
- Automatically scales online **for true pay-per-use**

Autonomous Database on Dedicated Infrastructure



Provides your own **Database Cloud** running on dedicated Exadata Infrastructure

- Runs all your databases - any size, scale, or criticality

Customizable **Isolation**

- Runs inside Secure Isolation Zone for highest protection from other tenants
- Configure multiple Exadatas or Container Databases for intra-company isolation

Customizable **Operational Policies**

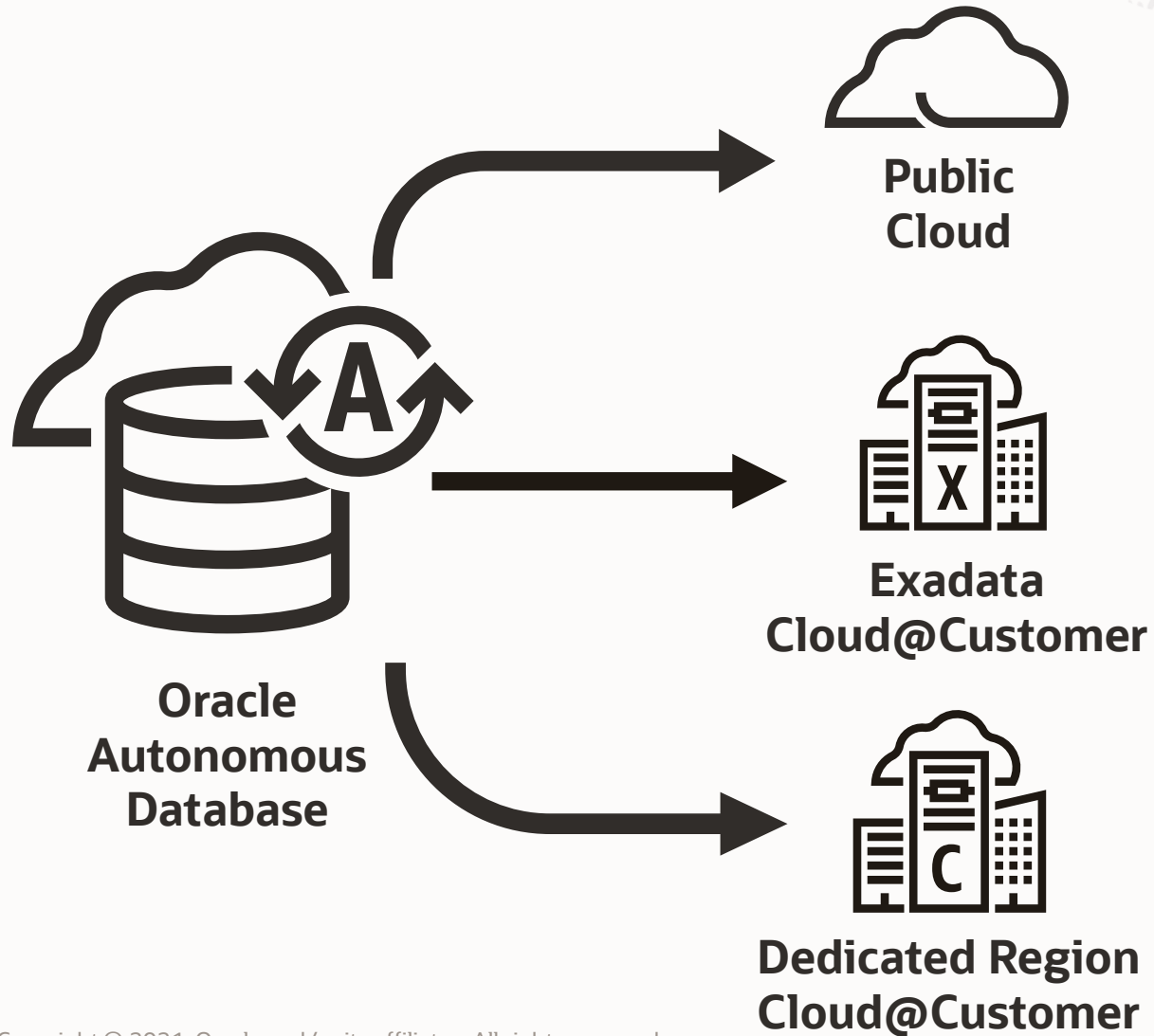
- Control of provisioning, updates, availability, density





Oracle Autonomous Database | Deployment Options

Multiple Deployment Choices



Oracle Cloud Infrastructure Global Footprint

October 2021: 31 Regions Live, 13 planned, 8 Azure Interconnect Regions



100% renewable energy by 2025



Self-Driving | Auto-Provisioning

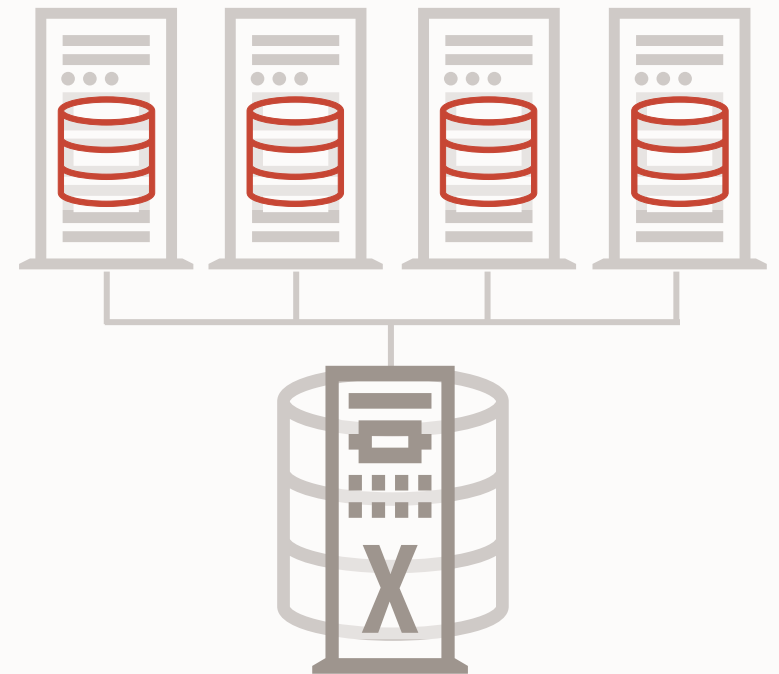
Instantly deploy a mission critical database

Quickly deploys a RAC Database on Exadata

- Provides a HA configuration
- Ensures seamless scale-out
- Enables online patching

Autonomous Database decides where to place each database during provisioning

- Fewer number of instances preferred
- Databases may be open on only one node
- Still RAC enabled

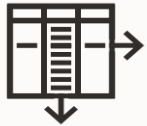


Self-Driving | Auto-Configuration

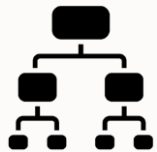
Autonomous Data Warehouse



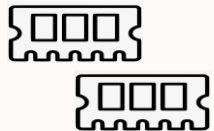
Optimizes Complex SQL



Columnar Format



Creates Data Summaries



Memory Speeds Joins, Aggs



Statistics gather as part of bulk load operations

Autonomous Transaction Processing

Optimizes Response Time

Row Format

Creates Indexes

Memory for Caching, No IO

Statistics gather as part of DML operations

Self-Driving | **Optimizer Statistics**

High-frequency Statistics Collection

- Gathers full optimizer statistics every 15 minutes if statistics are stale
- Controlled using `DBMS_STATS.SET_GLOBAL_PREFS('AUTO_TASK_STATUS', 'ON');`

Statistics are gathered automatically for direct load operations

- `CREATE TABLE ... AS SELECT ...; INSERT /*+ append */ INTO ... SELECT ...;`
- Data Pump Import loads
- DBMS_CLOUD loads

Real-Time Statistics are gathered automatically for DML operations*

- Gathers a subset of optimizer statistics for conventional DML operations
- Number of rows, MAX and MIN column values, etc.

* Controlled via DBMS_STATS – Not on by default



Self-Driving | Database Parameters

Ability to customize the service for a given region or time zone

All parameters set to optimal values based on workload type

- May be different than regular database defaults

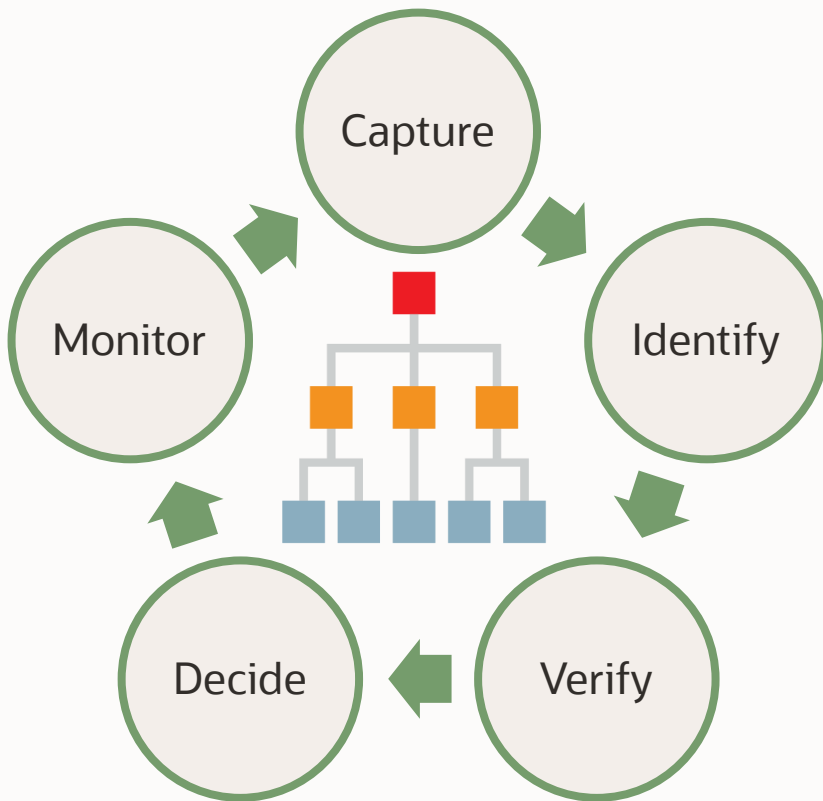
Users can only change a limited number of parameters

Allowed Parameters

APPROX_FOR_AGGREGATION	NLS_COMP	NLS_TIMESTAMP_FORMAT
APPROX_FOR_COUNT_DISTINCT	NLS_CURRENCY	NLS_TIMESTAMP_TZ_FORMAT
APPROX_FOR_PERCENTILE	NLS_DATE_FORMAT	OPTIMIZER_CAPTURE_SQL_PLAN_BASELINES (Session only)
AWR_PDB_AUTOFLUSH_ENABLED	NLS_DATE_LANGUAGE	OPTIMIZER_IGNORE_HINTS
CURRENT_SCHEMA (Session only)	NLS_DUAL_CURRENCY	OPTIMIZER_IGNORE_PARALLEL_HINTS
CURSOR_SHARING	NLS_ISO_CURRENCY	OPTIMIZER_MODE
DB_BLOCK_CHECKING	NLS_LANGUAGE	PLSCOPE_SETTINGS
DDL_LOCK_TIMEOUT	NLS_LENGTH_SEMANTICS	PLSQL_CCFLAGS
FIXED_DATE	NLS_NCHAR_CONV_EXCP	PLSQL_DEBUG
GLOBAL_NAMES	NLS_NUMERIC_CHARACTERS	PLSQL_OPTIMIZE_LEVEL
HEAT_MAP	NLS_SORT	PLSQL_WARNINGS
MAX_IDLE_TIME	NLS_TERRITORY	RECYCLEBIN
NLS_CALENDAR	NLS_TIME_FORMAT	STATISTICS_LEVEL (Session only)
	NLS_TIME_TZ_FORMAT	TIME_ZONE

Self-Driving | Automatic Indexing

Machine Learning auto-tunes your workload



- An **expert system** that implements indexes based on what a skilled performance engineer would do
- **Reinforcement Learning** allows it to learn from its own actions as all candidate indexes are **validated** before being **implementing**
- The entire process is fully automatic
- Transparency is equally important as sophisticated automation
- All tuning activities are auditable

Self-Driving | Automatic Partitioning

Applies Partitioning to Tables and Indexes to Improve Performance on Shared Infrastructure

Identifies candidate tables by analysing the captured workload

- Tables must be **64GB or larger** and have up to date statistics

Uses one of the following strategies with a single column key:

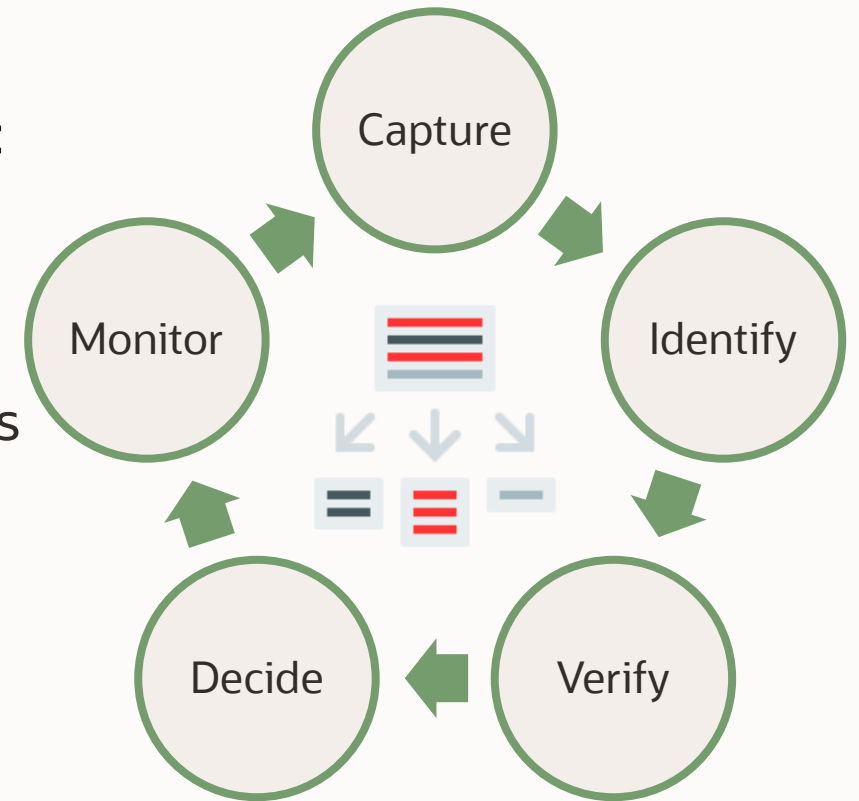
- INTERVAL AUTOMATIC: best suited for ranges of partition key values
- LIST AUTOMATIC: applies to distinct partition key values
- HASH: partitioning on the partition key's hash values

Reinforcement Learning allows it to learn from its own actions as all candidate strategies are **validated** before being used

- Selects strategy with the highest estimated IO reduction

The entire process is fully automatic, but transparency is equally important as sophisticated automation

- Controlled via new `DBMS_AUTO_PARTITIONING` package



Self-Driving | Auto Stop/Start



- Scheduling automatic database shutdowns and restarts for times when the system is not in use to stop charges
 - E.g., weekends & holidays
- Available via the SDK, REST API or cloud UI
- Only pay for storage when Database is stopped

The screenshot shows the Oracle Cloud console interface. On the left, the 'My Quick Start Lab' page displays details for an Autonomous Database instance named 'QSLDB'. A red box highlights the 'Auto Start/Stop Schedule' option in the 'More Actions' menu. An arrow points from this menu item to the 'Auto Start/Stop Schedule' configuration page on the right.

Auto Start/Stop Schedule

An Auto Start/Stop schedule allows a database to start and stop at the selected times. Once start and stop times are selected for every day of the week, the schedule is created and applied. The database will stop and start using that schedule.

The times below are in UTC

	Mon	Tue	Wed	Thur	Fri	Sat	Sun
Start	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Sele... ⌵	Sele... ⌵	00:00 ⌵	00:00 ⌵	Sele... ⌵	Sele... ⌵	Sele... ⌵
Stop	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Sele... ⌵	Sele... ⌵	23:00 ⌵	00:00 ⌵	Sele... ⌵	Sele... ⌵	Sele... ⌵

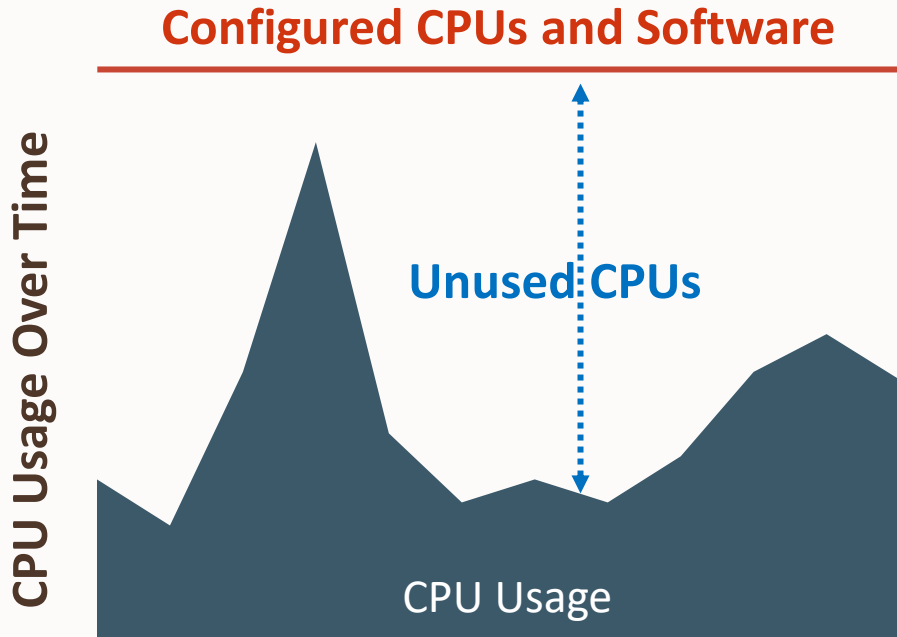
Select Time (UTC)

- 00:00
- 01:00
- 02:00
- 03:00
- 04:00
- 05:00
- 06:00
- 07:00
- 08:00
- 09:00
- 10:00
- 11:00
- 12:00
- 13:00

Apply Cancel

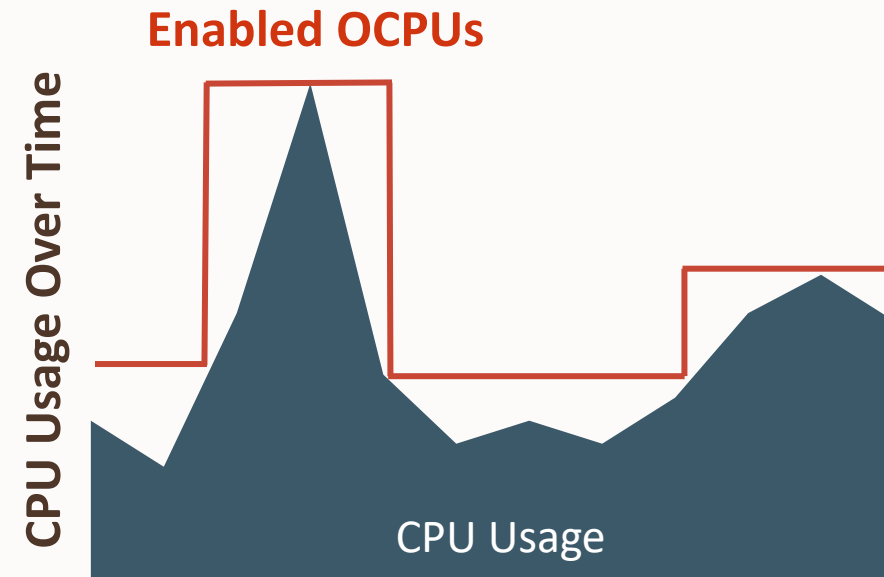


Elastic: Scaling Reduces Costs



On-Premises - Static

Purchase CPUs and software licenses for **highest projected peak load**

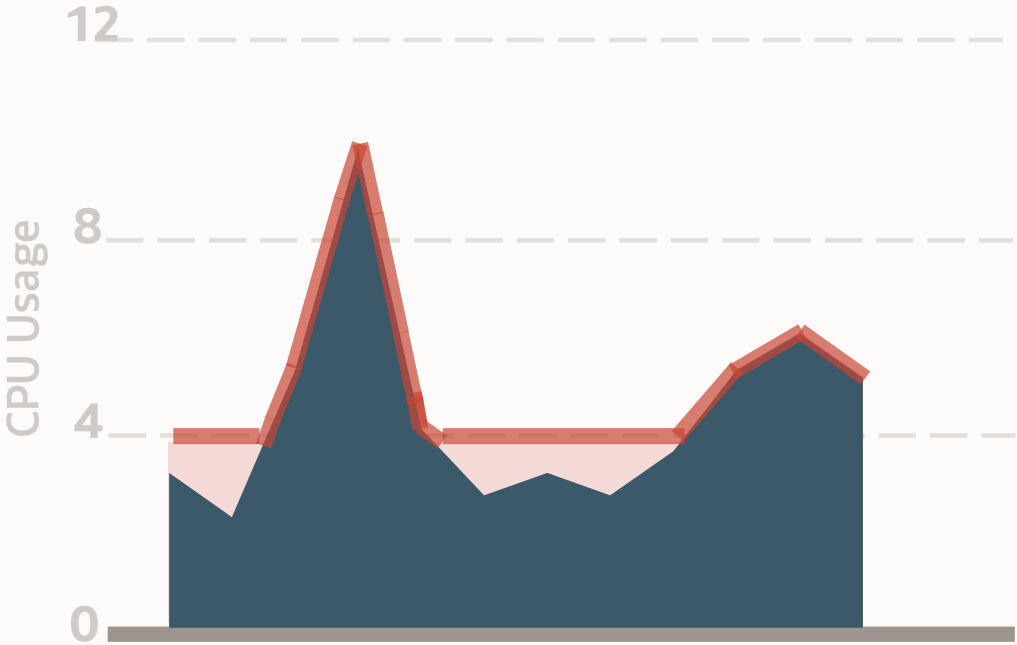


Cloud - Elastic

Adjust enabled OCPUs to match **actual load**
OCPUs are charged hourly
Zero OCPU Cost when stopped



Auto Scaling Delivers New Database Paradigm – True Pay per Use



Dynamic Auto-Scale

Automatically scale up to 3X
Scaling with zero downtime

Autonomous Database

Automatically scales compute resources when needed by workload.

All scaling occurs online, while the application continuously runs.

Enables true pay per use.





Self-Driving | Automatic scaling of storage

Works in a similar way to auto scaling for OCPUs....

System automatically (transparently) expands storage on-demand up to 3x base amount.

Expands in 1TB increments

Simplifies storage management but leaves you in control!

Helps you manage ADB costs more effectively.

Create Autonomous Database

Configure the database

Always Free ⓘ
 Show only Always Free configuration options

Choose database version
19c

OCPU count
1
The number of OCPU cores to enable. Available cores are subject to your tenancy's service limits.

OCPU auto scaling
Allows system to use up to three times the provisioned number of cores as the workload increases. [Learn more.](#)

Storage (TB)
1
The amount of storage to reserve.

Storage auto scaling
Allows system to expand up to three times the reserved storage.

Manage scaling

OCPU count
8
The number of OCPU cores to enable. Available cores are subject to your tenancy's service limits.

OCPU auto scaling
Allows system to use up to three times the number of cores specified by the OCPU count as the workload increases. [Learn more.](#)

Storage (TB)
1
The amount of storage to reserve.

Storage auto scaling
Allows system to expand up to three times the reserved storage.

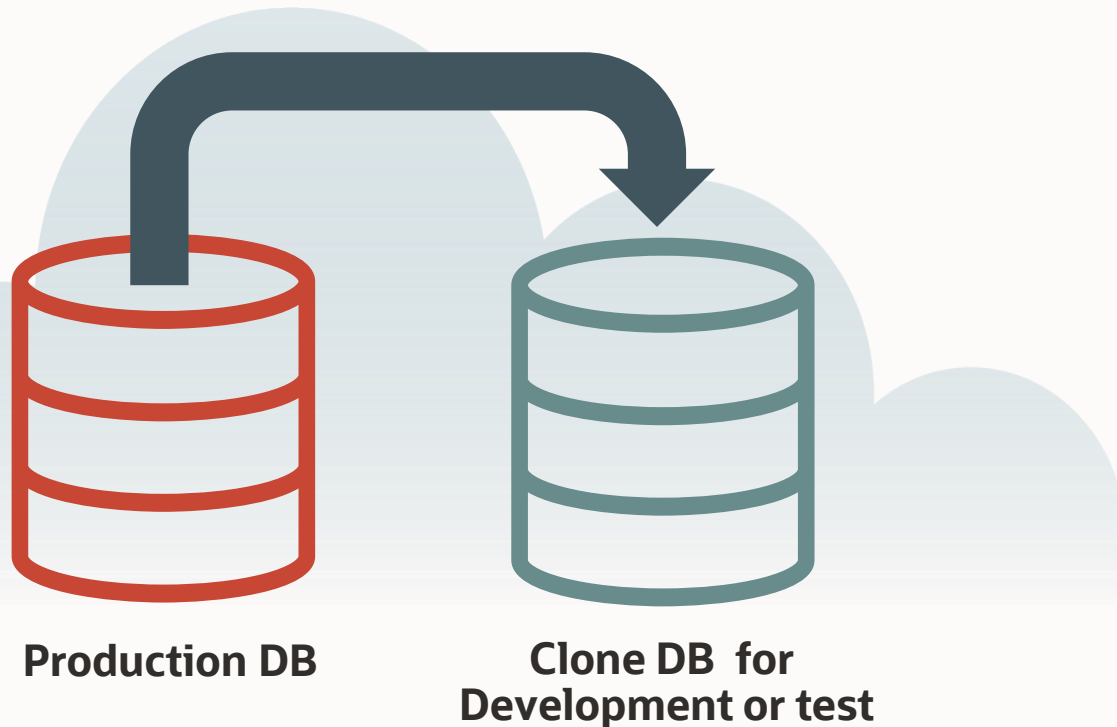
Allocated storage: 0.127 TB

Shrink
Shrink storage manually. Use after deletion of a significant amount of data. [Learn more.](#)



Self-Driving | Cloning

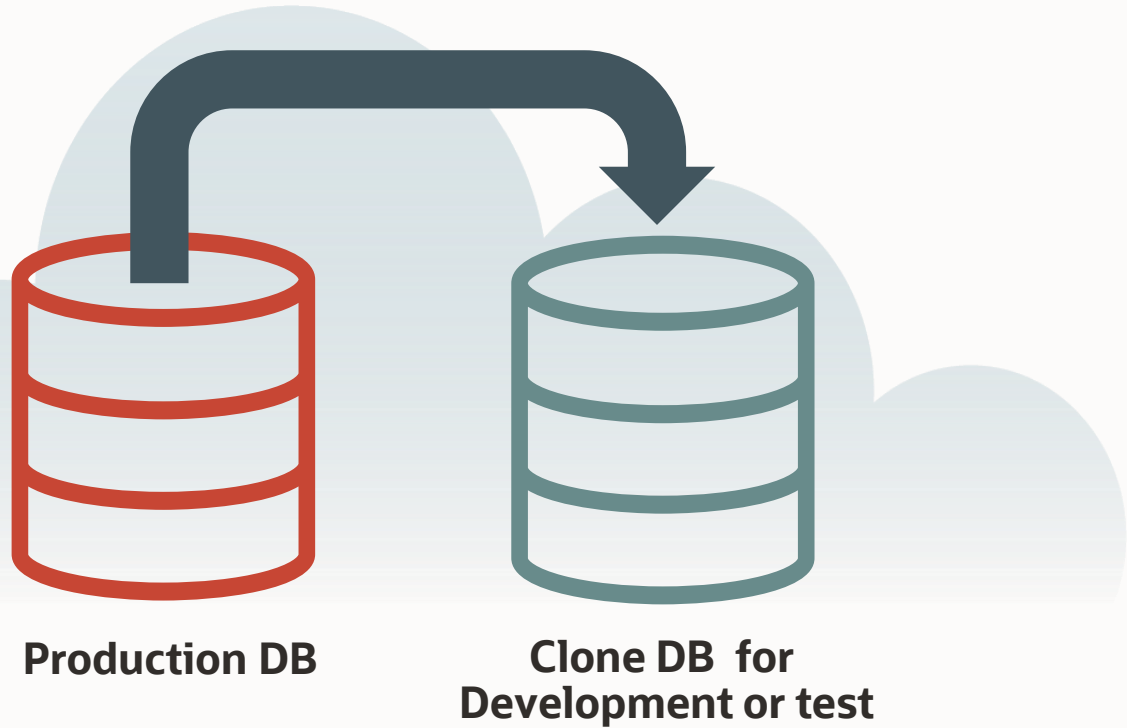
Quickly provision a point-in-time copy



- Cloning creates a point-in-time copy of
 - An Autonomous Database
 - A backup of an Autonomous Database

Self-Driving | Cloning

Quickly provision a point-in-time copy



- Cloning creates a point-in-time copy of
 - An Autonomous Database
 - A backup of an Autonomous Database
- Three types of clone can be created:
 - A full database clone
 - A metadata clone (Schema but no data)
 - Refreshable clone (read-only full clone)

Note: it is possible to temporarily discount a refreshable clone for up to 24 hours to make local changes before reconnecting to the primary



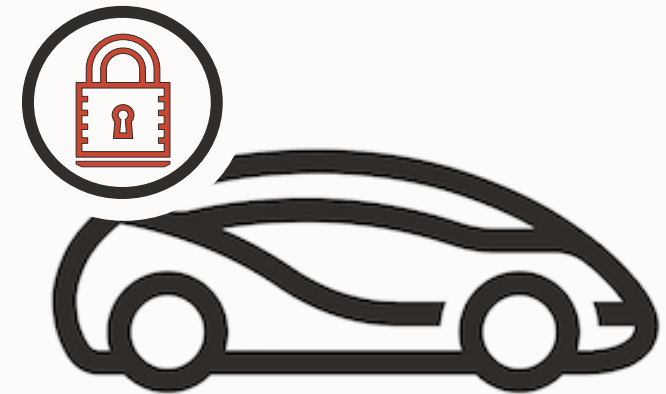
Self-Securing

Only Database is exposed to users – SQL access only

- No highly privileged access – no SYSDBA access
- No login allowed to CDB - only login to PDB
- No callouts to OS allowed

Database Vault's Automatic protects customer data from Oracle operations staff

Oracle automatically applies security updates for the entire stack



Self-Securing | Auto Patching

Automatic patching without downtime



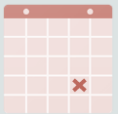
Automatic Patching of all components
(on-demand for critical security issue)

Firmware, OS, Hypervisor, Clusterware, Database



Patches applied in a rolling fashion across
RAC nodes and Exadata storage servers

Database is continuously available to application
Applications using Application Continuity
best practices, run without interruption



Patching is automatically scheduled

Customer can adjust patching window within
a time range on Dedicated deployments
Next patching windows shown on console

Note: Early access to patches now possible on both Shared & Dedicated Infrastructure




Self-Securing | Separation of Duty

Security is a **shared** responsibility

Oracle automatically takes care of

- Data encryption by default
- Network security and monitoring
- OS and platform security
- Database patches and upgrades
- Administrative separation of duties



However, there are still areas of security that need to be managed by the customer

- Ongoing security assessments
- Users & Privileges
- Sensitive data discovery
- Data protection
- Activity auditing

Self-Securing | Oracle Data Safe

Automated Data Protection

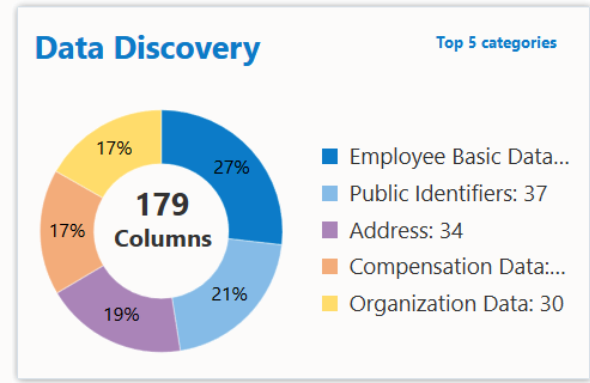
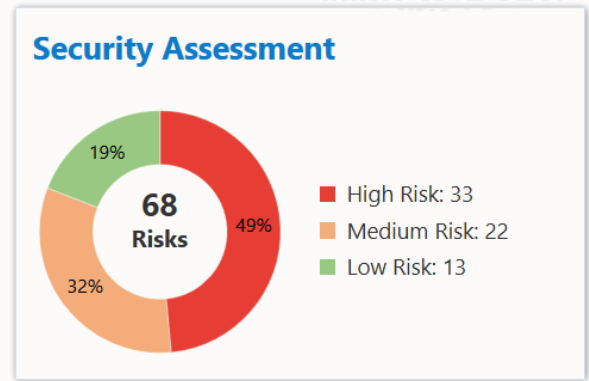
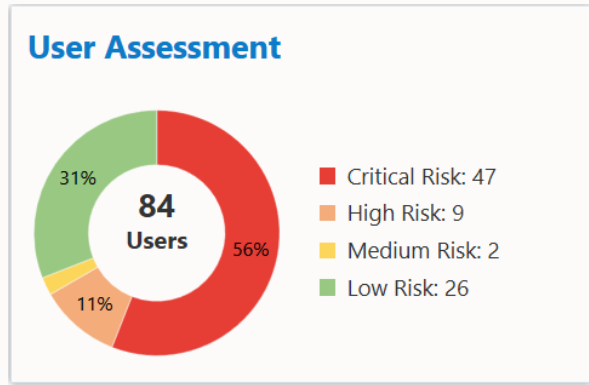
Unified database security control center

- Security configuration assessment
- User risk assessment
- User activity auditing
- Sensitive data discovery
- Data masking

Defense in depth for all customers

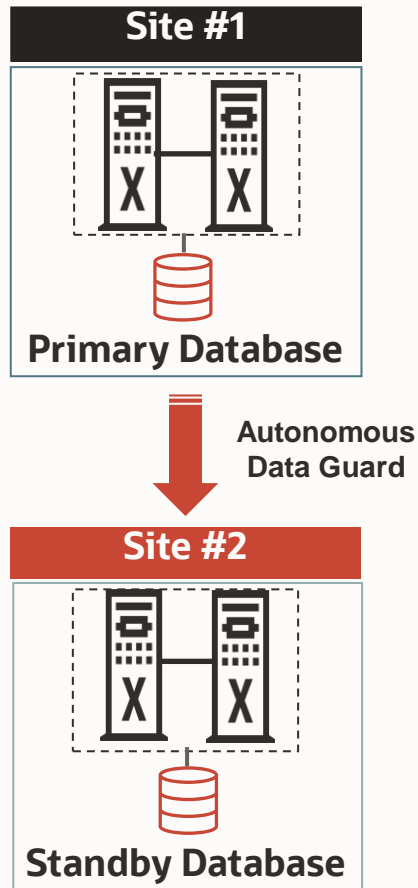
- Saves time and mitigates security risks
- No special security expertise needed

Free with all Oracle Cloud Databases



Self-Repairing | Autonomous Data Guard

Zero data loss



Maintains a real-time remote copy of a production database

- Protects from physical disasters, network outages, database corruptions
- Completely transparent to customer applications
- Standby can be in the same (RPO=0) or across regions

Automates everything

- Creation, operation, patching, backup, recovery, and monitoring
- Automatically handles fail over to the remote copy
- Automates resynchronization after the primary site is restored

Maintains copy by applying logical changes, not physical changes

- Prevents propagating data corruptions to standby
- Validates data consistency as changes are applied

Note: ADB on Shared Infra does not provide access to standby database(s)

Self-Repairing | Autonomous Data Guard

Zero data loss

Cloud automation for

- Create
- Delete
- Switchover
- Failover
- Reinstate

CLI-support to configure additional Data Guard attributes

ATP
AVAILABLE

CEE-FRA-Korosec-Autonomous-001

Database Actions DB Connection Performance Hub Service Console More Actions

Autonomous Database Information Tools Tags

General Information

- Database Name: DB202203290955
- Workload Type: Transaction Processing
- Compartment: oraseemeanortheast (root)/CEE/Robert_Korosec
- OCID: ...2rpfla [Show](#) [Copy](#)
- Created: Tue, Mar 29, 2022, 08:02:01 UTC
- OCPU count: 2
- OCPU auto scaling: Enabled ⓘ
- Storage: 1 TB
- Storage auto scaling: Disabled ⓘ
- License Type: Bring Your Own License (BYOL)
- Database Version: 19c

Infrastructure

- Dedicated Infrastructure: No
- Autonomous Data Guard ⓘ
- Status: Disabled [Enable](#)
- Backup
- Last Automatic Backup: Tue, May 31, 2022, 07:19:41 UTC
- Manual Backup Store: Not Configured
- Network

<https://console.eu-frankfurt-1.oraclecloud.com/db/adb/ocid1.autonomousdatabase.oc1.eu-frankfurt-1.antheljtpps3jiyaprzd73mimwzgae7gew3wcs6ucmlbcqqug7y4mb2rpfla/adb-dg-associations#>

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Enable Disaster Protection With a Single Click



Self-Repairing | Automated cloud operations

Pro-active detection and resolution of incidents

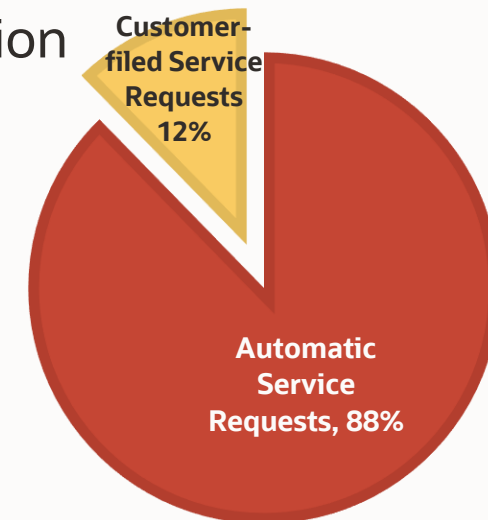
Autonomous Database detects over 85% of issues before customer

Continuous monitoring for each database: 8000+ metrics and 1500+ alarms

- Much broader than many on-premises customers
- Consolidated monitoring of entire stack: infrastructure, load balancer, connection manager, database, ORDS, APEX, OML

Automatic service requests (SRs) are generated for each deviation

- Immediate investigation and resolution by cloud ops
- Root cause analysis for every issue
- Zero customer actions required



7 out of every 8 issues are automatically resolved with zero customer actions required

Significant benefits: Five-year ROI of 417%

The real-world business value of Oracle Autonomous Data Warehouse

Business value highlights

- **417%** five-year ROI
- **63%** reduced total cost of operations
- **Five months** to payback
- **68%** more efficient database administrators
- **84%** more efficient IT infrastructure management
- **45%** reduction in IT infrastructure costs
- **94%** reduction in unplanned downtime
- **27%** more productive



TABLE 8
Five-Year ROI Analysis

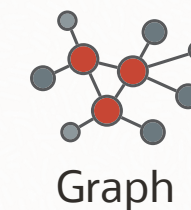
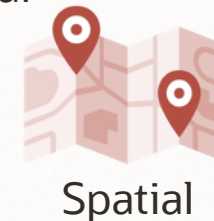
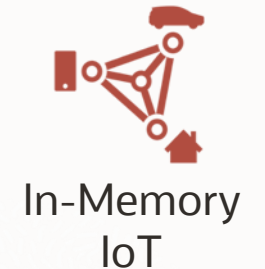
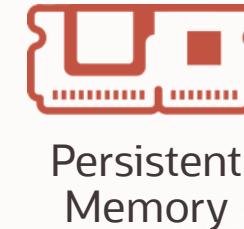
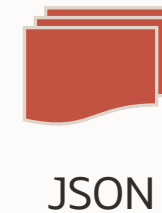
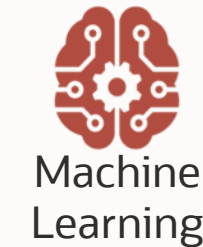
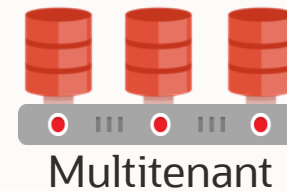
	Per Organization	Per Database
Benefit (discounted)	\$7.42M	\$536.9K
Investment (discounted)	\$1.44M	\$103.8K
Net Present Value	\$5.99M	\$433.9K
ROI (NPV/Investment)	417%	417%
Payback (Months)	5 months	5 months
Discount Factor	12%	12%

n = 7, Source: IDC In-depth Interviews, December 2020



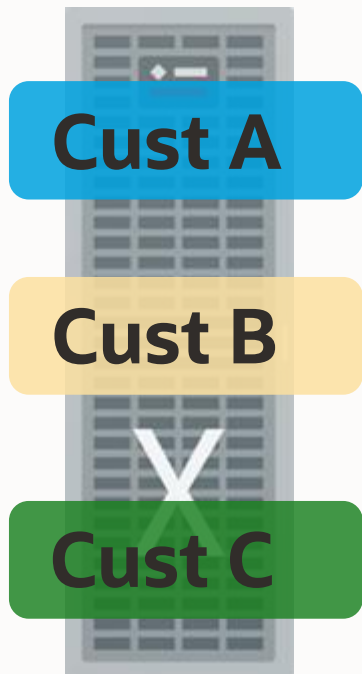
Oracle Autonomous Database Service Under the hood – A converged database

- **Multitenant** for Efficient, Agile Database Clouds
- **AutoML** for simple integrated Machine Learning
- **In-Memory** for Database Acceleration
- **Native JSON** for Document Data
- **In-Memory Ingest** for Fastest IoT
- **Cloud SQL** for integrating Object Store Data Lake
- **Persistent Memory Store** for Lowest Latency
- **Spatial and Graph** for Mapping and Social Networks
- **Licence**
 - Subscription (Licence Included) – Elastic, €1,14679 €/OCPU/hour
 - BYOL, €0,27524/OCPU/hour -> €204/OCPU/mo.
 - DB EE + Multitenant -> 2 OCPUs (<16 OCPUs; RAC otherwise)
 - Active DataGuard BYOL for Autonomous Dataguard
 - DB SE2 -> 4 OCPUs (max 8 OCPUs), no ADG, no Multitenant, no RAC



Exadata Cloud@Customer (on-premise installation)

Multi Customer Use Cases



Multi-Customer Model
Available To

- **Government Owned Clouds**
- **Hosting Service Providers (HSP)**

License Types Permitted Under
Multi-Customer Model

- **BYOL**
- **License Included**

Service Available:

- **Exadata Database Service**
- **Autonomous Database service**

“... we want all our Oracle Database customers running Autonomous Database ...”

Larry Ellison



Oracle Applications Certified with Oracle ATP, Autonomous Transaction Processing

Oracle Applications Certified with Oracle ATP, Autonomous Transaction Processing

Oracle Product	Version Number	Notes/Links
Oracle Peoplesoft	PeopleSoft 9.2, PeopleTools 8.57, 8.58, 8.59 and above	Certified with Autonomous Database-Dedicated and Shared
PeopleTools	8.57.16 and 8.58.05 and above	Certified with Autonomous Database-Dedicated and Shared
Siebel CRM	21.8	Certified with Oracle Autonomous Transaction Processing through Shared (Autonomous Database-S) or Dedicated (Autonomous Database-D) Infrastructure
Oracle JD Edwards	Applications Release 9.2	Certified with Oracle Autonomous Database on both Dedicated and Shared Exadata Infrastructure on Oracle Cloud Infrastructure - FAQ (PDF)
Oracle JD Edwards	Tools Release 9.2.4.3	Certified with Oracle Autonomous Database on both Dedicated and Shared Exadata Infrastructure on Oracle Cloud Infrastructure - FAQ (PDF)

References: Oracle internal Autonomous Deployments

<https://www.oracle.com/autonomous-database/powered-by-autonomous-database/#accelerate>

Autonomous Database deployments

Oracle Cloud Guard

Hundreds of millions of events per hour to give customers a view of their security posture.

[Explore Cloud Guard](#)

Horizon data warehouse

A 200 TB self-service data warehouse, integrated with a 2 PB data lake in a lakehouse architecture, supporting 2,000 users.

[Explore Horizon](#)

Oracle DataFox

Replace multiple databases with Autonomous Database in a microservices architecture.

[Explore Oracle DataFox](#)

Sales operations data mart

Two people supporting more than 500 users, including data scientists and business analysts.

[Explore sales operations](#)

Application performance monitoring

500 databases, no dedicated administration, and savings up to 30 people.

[Explore application performance monitoring](#)

Operational insights

More than 1,000 databases, no dedicated administration, and improved security and predictability.

[Explore operational insights](#)

Operating system management service

5,000 databases, 800 terabytes, and no dedicated administration resources.

[Explore OS management](#)

Enterprise performance management

Support more than 6,000 customer instances with no dedicated administration resources.

[Explore EPM](#)

Oracle warehouse management

Moved from AWS for better performance, higher elasticity, zero downtime, improved security, and reduced costs.

[Explore warehouse management](#)

Oracle Integration

Operate 10,000 databases managing 470 TB with no dedicated administration.

[Explore Oracle Integration](#)

Oracle analytics business unit

Run cloud product analytics on Autonomous Database in a lakehouse architecture.

[Explore analytics](#)

Oracle Service

Migrate from Hadoop to Autonomous Database and adopt a DevOps model.

[Explore Oracle Service](#)

Customer experience data platform

Deliver a real-time view of customer data and improve performance up to 30X.

[Explore Oracle Unity](#)

Oracle Content Management

Migrate to Autonomous Database and let developers spend time building new functionality, not managing databases.

[Explore Content](#)

Oracle Cloud@Customer

Data scientists analyze data from more than 60 sources using Autonomous Database.

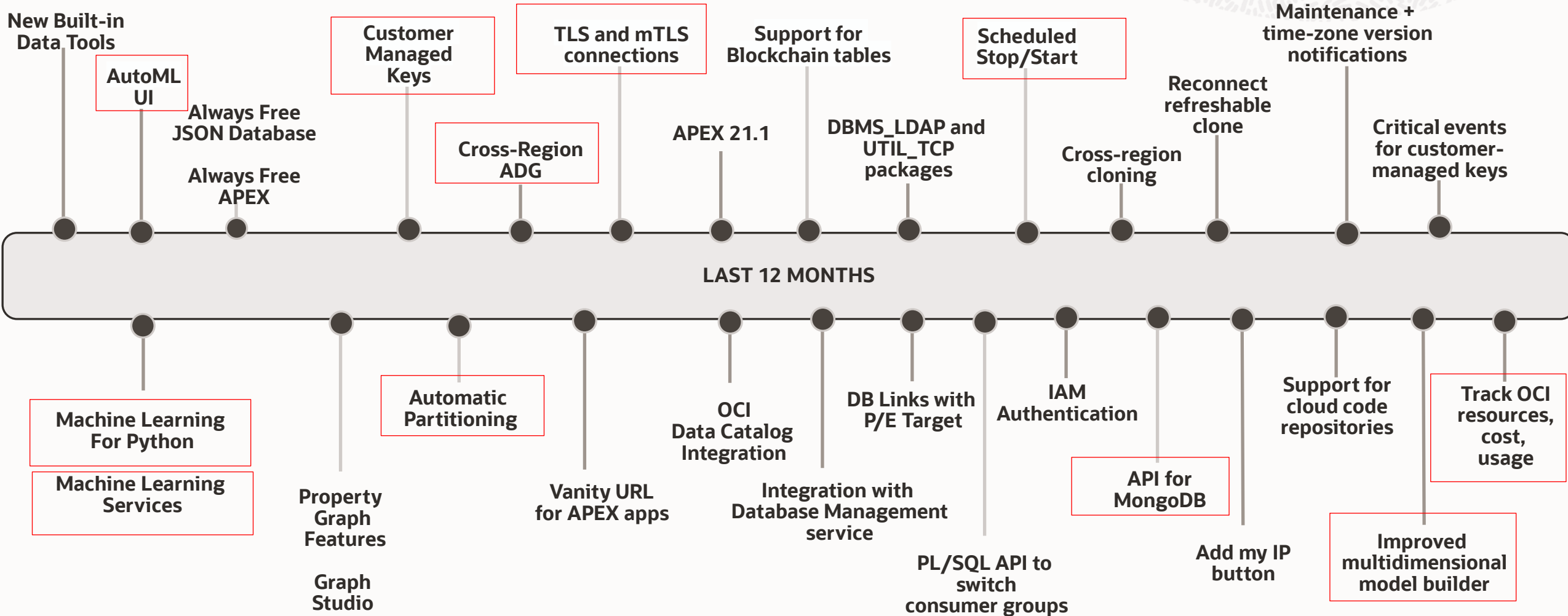
[Explore Cloud@Customer](#)

 Chat with sales



Major new features for ADB-Shared over last 12 months

<https://blogs.oracle.com/datawarehousing/category/dwh-newsletter>



Create Database Links to Non-Oracle Databases

Free



db_type Value	Database Type
AWSREDSHIFT	Amazon Redshift
AZURE	Microsoft SQL Server Azure SQL Azure Synapse Analytics
MYSQL	MySQL
POSTGRES	PostgreSQL
SNOWFLAKE	Snowflake



Innovate More = Built-In, Self-Service Tools Expand Autonomous Vision

An Complete Ecosystem Empowering Business Users To Do More With Their Data



Graph Studio



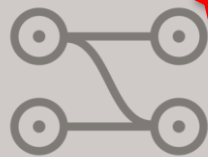
ML Notebooks



APEX



Data Loading



Transformations



Business Modeling



Data Insights

DATABASE ACTIONS TOOLS



Graph Analytics



Spatial Analytics



Machine Learning Models



Data Lake Accelerator

Oracle + 3rd Party Applications

Oracle + 3rd Party Databases

Files

Oracle + 3rd Party Streaming Services

Data Lakes over Object Stores





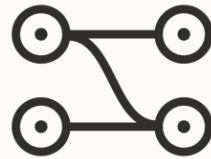
Database Actions – new suite of self-service tools for non-IT users

Load



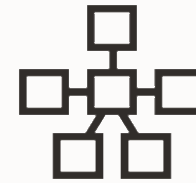
Simple drag & drop loading
([DEMO](#))

Transforms



Declarative transformations
and data cleansing ([DEMO](#))

Data Analysis

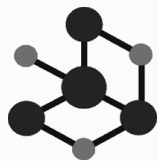


Automatically create powerful
business models ([DEMO](#))



Guided discovery of hidden
patterns and anomalies ([DEMO](#))

Graph



Prepare and explore graph
data ([DEMO](#))

ML Model



Easily create models with
AutoML ([DEMO](#))

Deploy



Integrate ML models into
apps via REST or SQL ([DEMO](#))

Build



Low-Code app-dev platform
(APEX)

OML AutoML UI

No-code AutoML-based user interface supporting automated machine learning

Powerful, easy to use UI

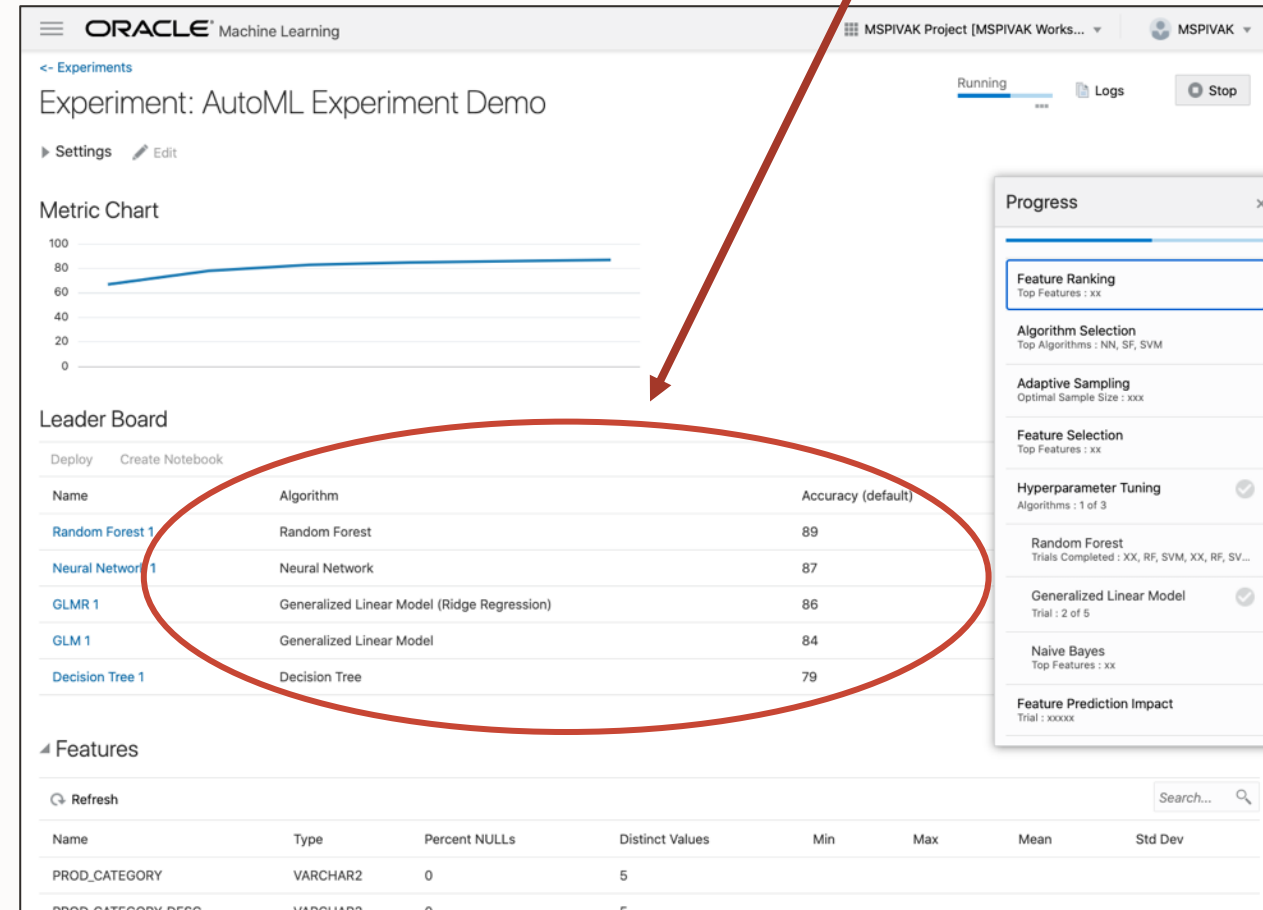
Automates model building, tuning, and deployment

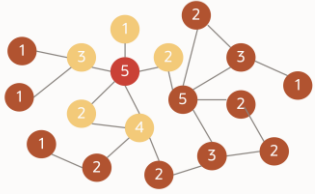
- Supports model management
- Enhance data scientist productivity
- Empower data professionals who are not ML experts

Featuring

- Minimal user input: data, target
- Model leaderboard
- Model deployment via REST endpoints
- Generate OML4Py notebooks from models

Multiple algorithms compared and best is selected



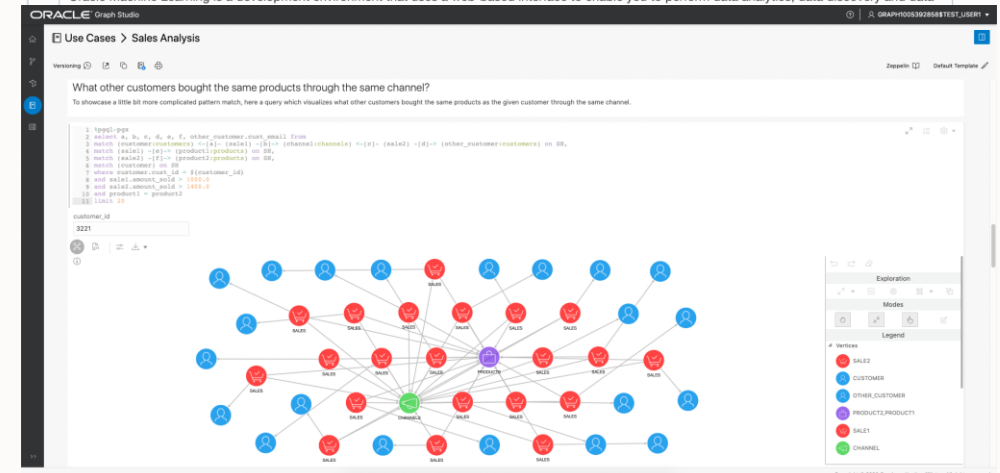
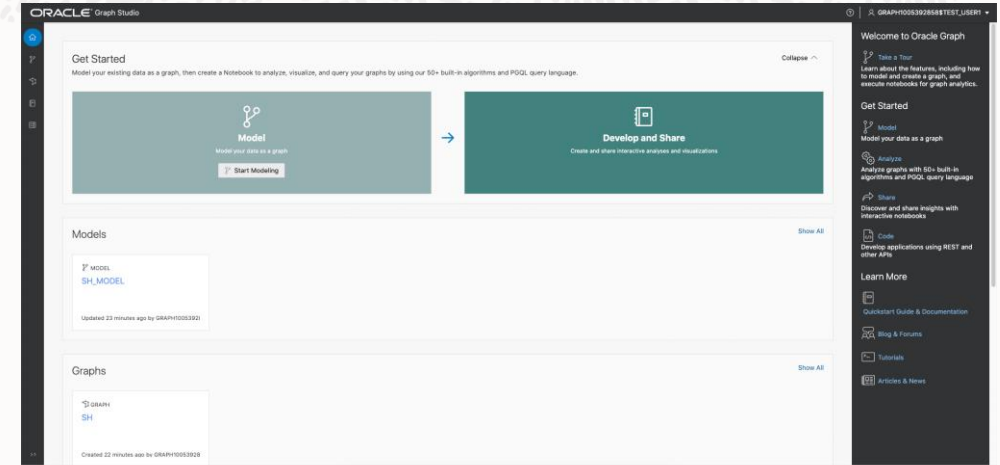


Graph Studio Now Fully GA

One-click start to analyzing with graphs in Oracle Autonomous Database

Graph Studio provides comprehensive set of features:

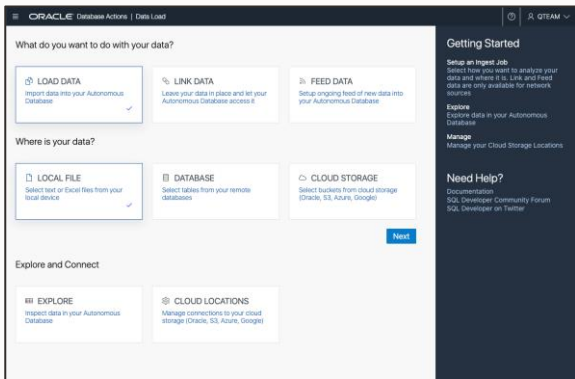
- Graph modeling tool to map relational data to graphs
- Launched directly from OCI Console
- Browser-based notebooks for interactive analysis and collaboration
- Integrated graph visualization
- PGQL: SQL-like property graph query language
- Nearly 60 pre-built property graph algorithms
 - PageRank, Community Detection, Shortest path, etc.



NEW Self-Service Tools for Data Analysts

From data to insights with built-in self-service data tools

Load



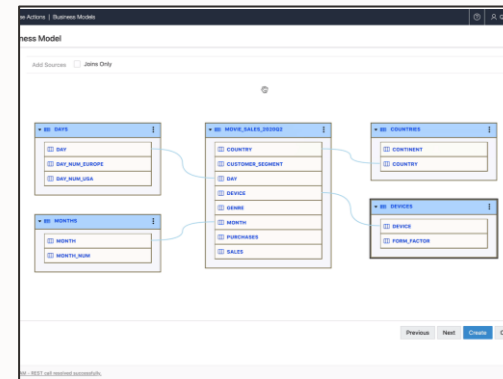
Simple drag & drop loading

NEW Transforms



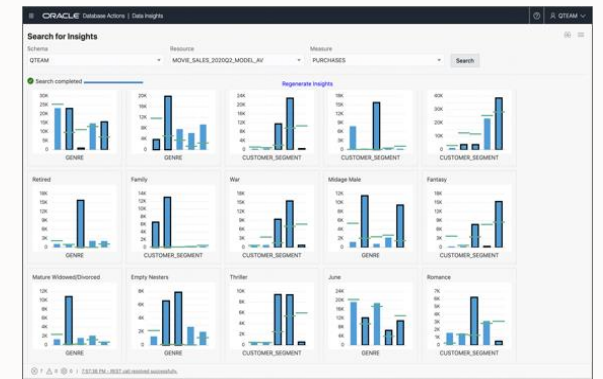
Declarative transformations and data cleansing

NEW Business Model



Automatically create business models

NEW Data Insights



Automatically discover hidden patterns and anomalies





Built-in zero-code declarative data transformation tool

ORACLE Database Actions | Data Transforms
Powered by Oracle Data Integrator

Projects » MovieStream » Data Flow Details

CleanQ2

Data Entities

Connection: MOVIE_STREAM

Schema: QTEAM

Name:

QTEAM

- COUNTRIES
- DAYS
- DEVICES
- MONTHS
- MOVIE_SALES_2020
- MOVIE_SALES_2020_Q2

DATA TRANSFORM | DATA PREPARATION | MACHINE LEARNING | TEXT | ORACLE SPATIAL AND GRAPH

Data Cleanse | Substitution | Equi_Width Binning | Quantile Binning | Lead | Lag | Replace

Fix_AllCap_Days

Name: Fix_AllCap_Days

Description: Convert upper-case day names to title case.

Help: Perform data cleansing operations on selected columns:
--Replace Null strings with blanks
--Replace Null numeric fields with 0/mean/median
mean: avg function is used to find the average value of data.
median: is an inverse distribution function that returns a continuous distribution model.

```
graph LR; A[MOVIE_SALES_...] --> B[Q2_Only]; B --> C[MOVIE_SALES_...]; D[Fix_AllCap_Days] --> C;
```

Simple “drag-and-drop” data transformations

- Auto code generation for all ODI sources and targets including Fusion, NetSuite and Salesforce
- Built-in data quality

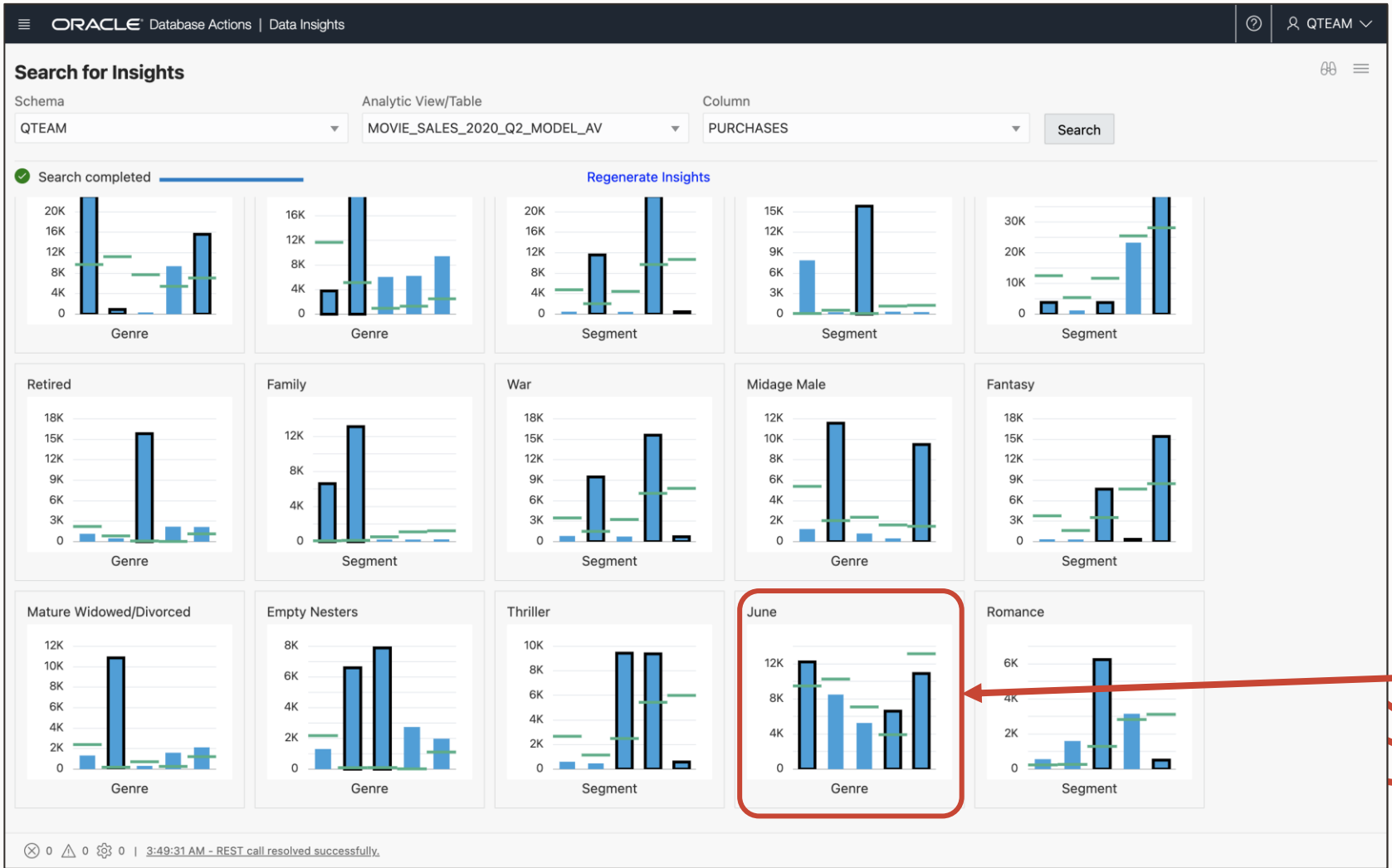
Based on Oracle Data Integrator

- New, easy-to-use web UI
- Simple migration to ADB for ODI customers
- Exposes all built-in database operators





Data Analysis tool: Machine learning driven anomaly and outlier detection



Automatic insight discovery

- Crawls over business model, running as background process
- Discovers hidden patterns, anomalies and outliers
- Variety of algorithms including regression slope

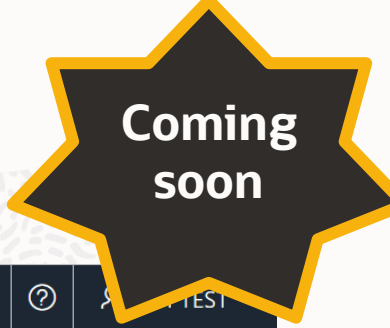
Usage

- Drill down on specific insight
- Significant differences between predicted and actual values highlighted





Data Analysis tool: Built-in wizard to help build multidimensional models



ORACLE Database Actions | Data Analysis

Analyze Data Quality Export

ADPTEST

VIDEO_GAMES_SALES_AS_AT...

GENRE

GENRE

NAME

YEAR_OF_RELEASE

PUBLISHER

NEW QUERY BUILDER

Vertical

Bar Chart

X-Axis

CUSTOMER_SE...

Values (Y-Axis)

SALES

Filters

show me "SALES" by "CUSTOMER_SEGMENT"

NEW VISUALIZATIONS

CUSTOMER_SEGMENT	SALES
Young People	145K
DINKS	15K
Single Male	155K
Empty Nesters	40K
Midage Female	90K
Retired	35K
Married with Children	76.54K
Single Female	120K
Mature Widowed/Divorced	35K
Midage Male	40K

Related Insights

NA_SALES

DATA INSIGHTS

PUBLISHER

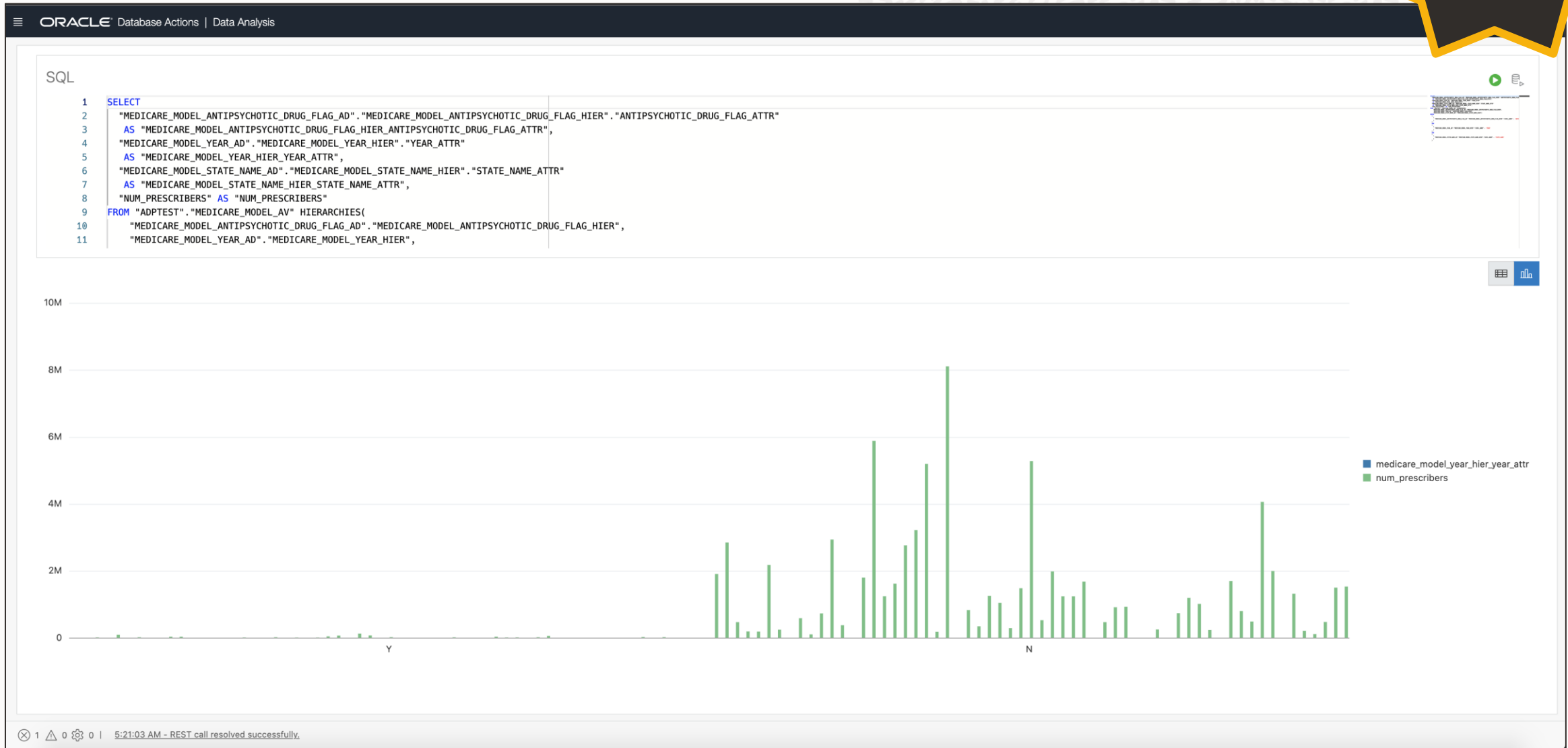
Electronic Arts





Data Analysis tool: Directly test/query the multidimensional model with SQL

Coming
soon





Data Analysis tool: Export metadata for multidimensional model to Tableau

Coming
soon

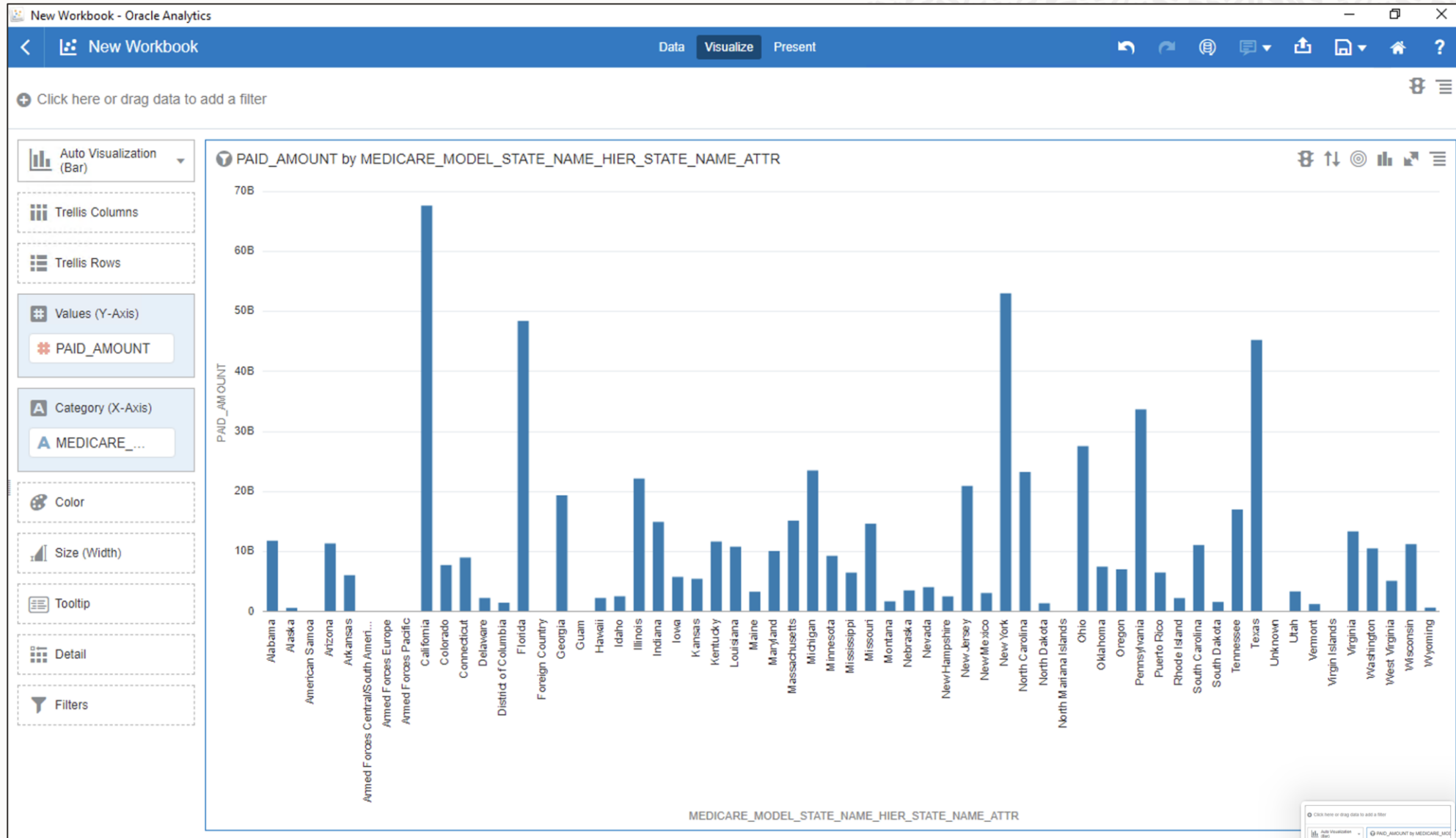
The screenshot displays the Oracle Database Actions Data Analysis interface. The 'Export' tab is selected, and the 'Export MEDICARE_MODEL_AV' window is open. The 'Export to Tableau' button is highlighted. The interface shows a list of objects under 'MEDICARE_MODEL_AV', including 'ANTIPSYCHOTIC_DRUG_FLAG', 'DRUG_NAME', 'YEAR', 'STATE_NAME', 'GENERIC_NAME', and 'Measures'. A red box highlights the 'Export' tab and the 'Export to Tableau' button.

```
<?xml version='1.0' encoding='utf-8' ?>
<!-- build 20211.21.0511.0935 -->
<datasource formatted-name='federated.1p0qrrr1hgpmto1g1v2zy0ik9ric' inline='true' source-platform='win' version='18.1' xmlns:user='http://www.tableausoftware.com/xml/user'>
  <document-format-change-manifest>
    <_.fcp.ObjectModelEncapsulateLegacy.true..ObjectModelEncapsulateLegacy />
    <_.fcp.ObjectModelRelationshipPerfOptions.true..ObjectModelRelationshipPerfOptions />
    <_.fcp.ObjectModelTableType.true..ObjectModelTableType />
    <_.fcp.SchemaViewerObjectModel.true..SchemaViewerObjectModel />
  </document-format-change-manifest>
  <connection class='federated'>
    <named-connections>
      <named-connection caption='jdbc:oracle:thin://slc13ssc:1531/cdb1_pdb7.regress.rdbms.dev.us.oracle.com'
        name='genericjdbc.5jcjg3mp98a8eafc6z9vqv7rd5v3'>
        <connection class='genericjdbc' dbname='' dialect='genericjdbc' jdbcurl='jdbc:oracle:thin://slc13ssc:1531/cdb1_pdb7.regress.rdbms.dev.us.oracle.com' port='' schema='ADPTEST' server='' username='ADPTEST' warehouse=''>
          <connection-customization class='genericjdbc' enabled='false' version='18.1'>
            <vendor name='genericjdbc' />
            <driver name='oracle' />
            <customizations>
              <customization name='CAP_CONNECT_CUSTOM_SQL_WITHOUT_SCHEMA' value='no' />
              <customization name='CAP_CREATE_TEMP TABLES' value='no' />
              <customization name='CAP_CUSTOM_NOSQL' value='no' />
              <customization name='CAP_EXTRACT_ONLY' value='no' />
              <customization name='CAP_ISOLATION_LEVEL_READ_COMMITTED' value='no' />
              <customization name='CAP_ISOLATION_LEVEL_READ_UNCOMMITTED' value='no' />
              <customization name='CAP_ISOLATION_LEVEL_REPEATABLE_READS' value='no' />
              <customization name='CAP_ISOLATION_LEVEL_SERIALIZABLE' value='no' />
              <customization name='CAP_JDBC_BIND_DETECT_ALIAS_CASE_FOLDING' value='no' />
              <customization name='CAP_JDBC_SUPPRESS_EMPTY_CATALOG_NAME' value='no' />
              <customization name='CAP_JDBC_SUPPRESS_ENUMERATE_DATABASES' value='no' />
              <customization name='CAP_JDBC_SUPPRESS_ENUMERATE_SCHEMAS' value='no' />
              <customization name='CAP_JDBC_SUPPRESS_ENUMERATE_TABLES' value='no' />
              <customization name='CAP_QUERY_BOOLEXPXPR_TO_INTEXPR' value='yes' />
              <customization name='CAP_QUERY_FROM_REQUIRES_ALIAS' value='no' />
              <customization name='CAP_QUERY_GROUP_ALLOW_DUPLICATES' value='yes' />
              <customization name='CAP_QUERY_GROUP_BY_ALIAS' value='no' />
              <customization name='CAP_QUERY_GROUP_BY_DEGREE' value='no' />
              <customization name='CAP_QUERY_HAVING_REQUIRES_GROUP_BY' value='no' />
              <customization name='CAP_QUERY_HAVING_UNSUPPORTED' value='no' />
              <customization name='CAP_QUERY_JOIN_ACROSS_SCHEMAS' value='no' />
              <customization name='CAP_QUERY_JOIN_REQUIRES_SCOPE' value='no' />
              <customization name='CAP_QUERY_NULL_REQUIRES_CAST' value='no' />
              <customization name='CAP_QUERY_SELECT_ALIASES_SORTED' value='yes' />
              <customization name='CAP_QUERY_SORT_BY_DEGREE' value='yes' />
              <customization name='CAP_QUERY_SUBQUERIES' value='yes' />
              <customization name='CAP_QUERY_SUBQUERIES_WITH_TOP' value='yes' />
              <customization name='CAP_QUERY_SUBQUERY_QUERY_CONTEXT' value='yes' />
              <customization name='CAP_QUERY_TOPSTYLE_LIMIT' value='no' />
              <customization name='CAP_QUERY_TOPSTYLE_ROWNUM' value='yes' />
              <customization name='CAP_QUERY_TOPSTYLE_TOP' value='no' />
              <customization name='CAP_QUERY_TOP_0_METADATA' value='no' />
            </customizations>
          </connection-customization>
        </connection>
      </named-connection>
    </named-connections>
  </connection>
</datasource>
</document-format-change-manifest>
```



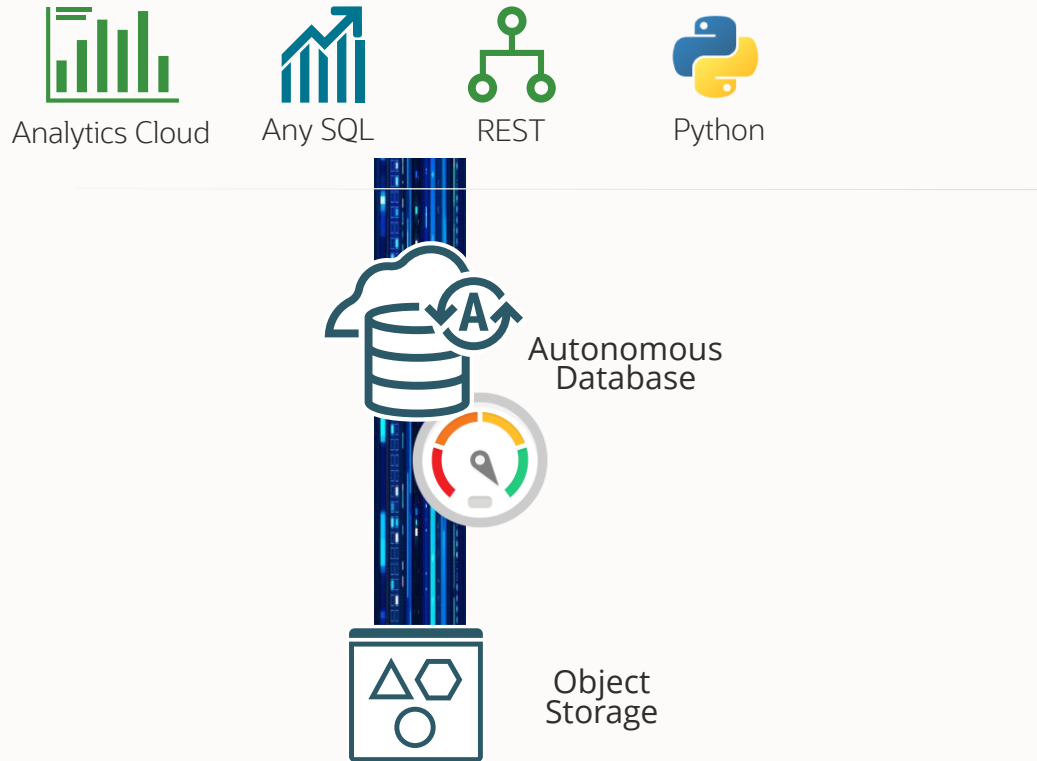


Directly read metadata and query model in OAC



Data Lake Accelerator: Analyze Data At Scale

Object Store queries just get better / smarter



Scale out queries against Object Storage

- Specialized, object storage processing
- Scans, filters and aggregates data

Automatic and transparent

- Engages only when necessary
- Uses auto-scale to augment database compute for the life of the query

Reduce impact on your database workload

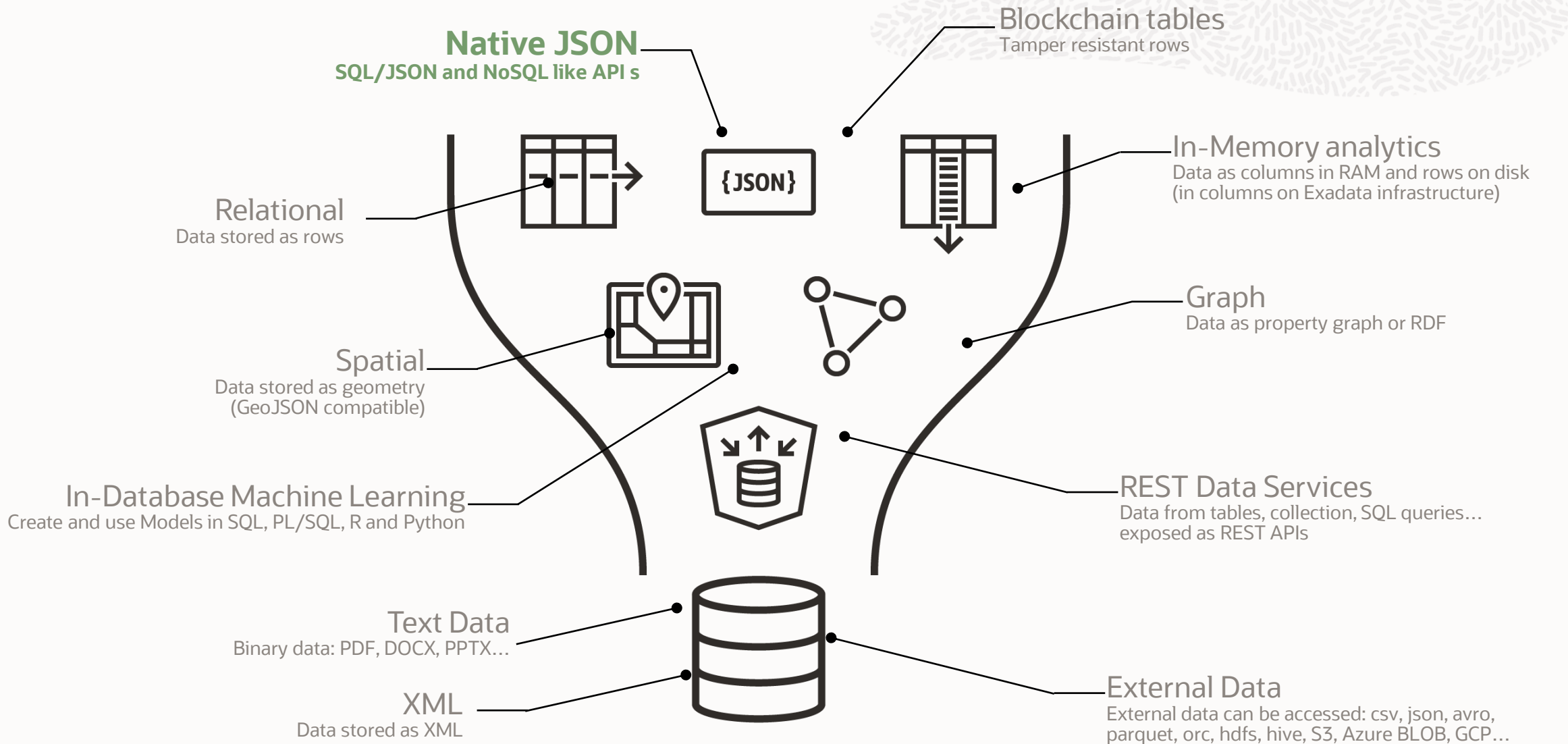
- Object store processing is isolated from database cores



Autonomous JSON Database

Better and cheaper than MongoDB Atlas

Oracle Converged Database



Oracle Autonomous JSON Database

A managed cloud service for JSON storage



- Cloud service for **JSON-centric** development
- Flexible and fast at scale
- **Native** JSON storage
- Simple **document APIs**
 - Language drivers, command-line, and REST
 - SQL not required



Oracle Autonomous JSON Database

More than a simple document store

- ✓ Autonomous
- ✓ Full SQL support
- ✓ ACID transactions
- ✓ Advanced security
- ✓ APEX low-code development
- ✓ One-click instant expansion to ATP



Java APIs Comparison SODA versus MongoDB



MongoDB 4.1.X API

```
MongoClient mongoClient = MongoClient.create(connString);
MongoDatabase database = mongoClient.getDatabase("finance");
MongoCollection<Document> coll = database.getCollection("pos"
);

Document po = Document.parse(json);
coll.insertOne(po);

Bson filter = eq("Requestor", "Alexis Bull");
MongoCursor<Document> cursor = coll.find(filter).cursor();
Document doc = cursor.next();

coll.createIndex(Indexes.ascending("Requestor"));
```



SODA for Java 1.1.X API

```
OracleClient sodaClient = new OracleRDBMSClient();
OracleDatabase database = sodaClient.getDatabase(jdbcConn);
OracleCollection coll = database.openCollection("pos");

OracleDocument po = database.createDocumentFromString(json);
coll.insert(po);

OracleCursor cursor = coll.find().filter("{"
    "Requestor": "Alexis Bull"}").getCursor();
OracleDocument doc = cursor.next();

coll.admin().createIndex(database.createDocumentFromString("{"
    "name" : "REQUESTOR_IDX",
    "fields" : [{"path" : "Requestor"}]}"));
```

The left-hand part of the x-axis shows the YCSB results for a small 4 million document database. The right-hand part of the x-axis shows the results for a much larger database with 81 million documents. Within each part are three benchmarks with different IO configurations (95% find/5% write, 50% find/50% write, 5% find/95% write).

The Oracle Autonomous JSON Database is shown in red, MongoDB is in green, and Amazon DocumentDB is in blue.

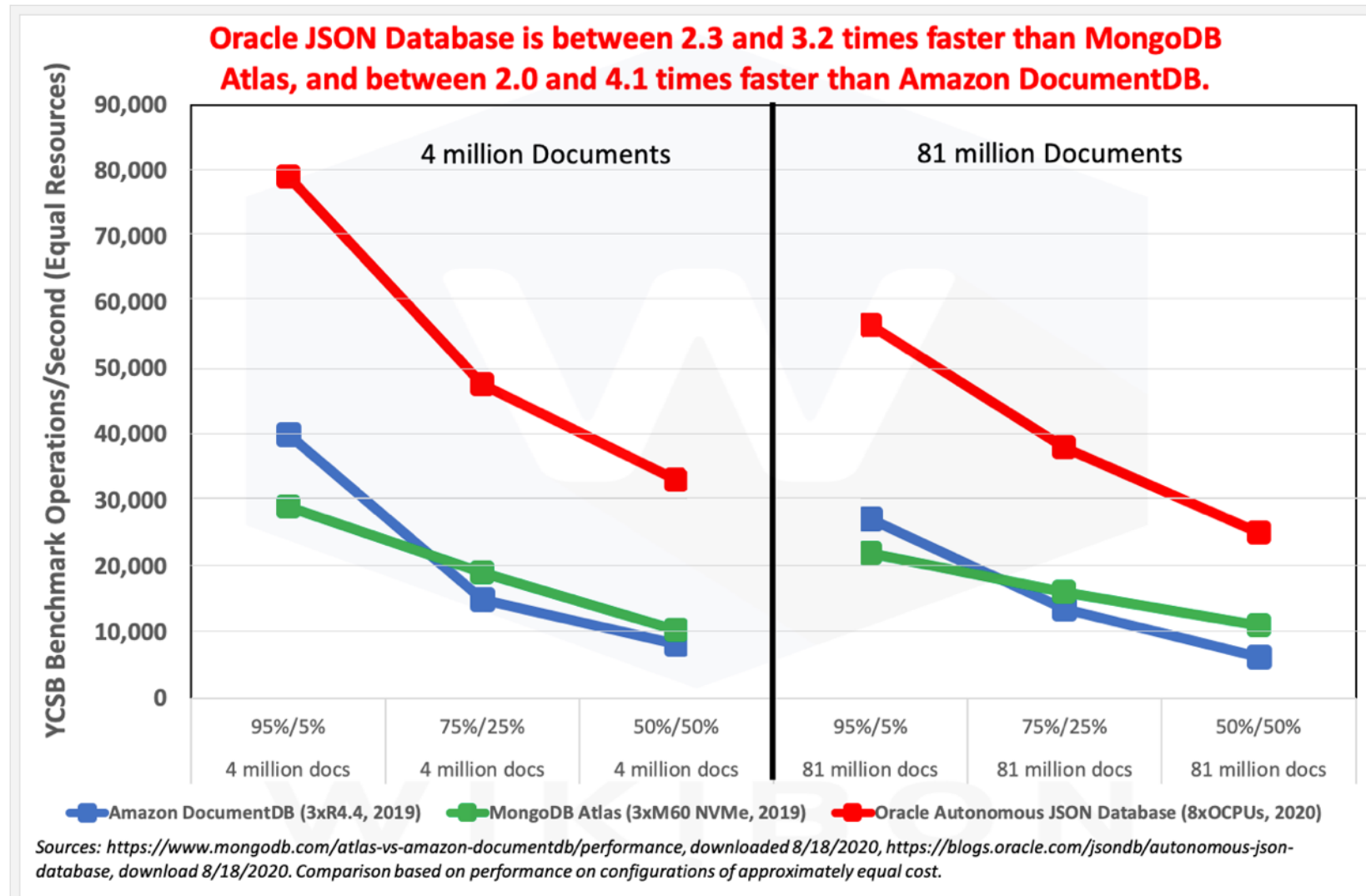


Figure 1: Document Database Performance Comparisons between Amazon DocumentDB, MongoDB Atlas, and Oracle Autonomous JSON Database.

Source: *YCSB Benchmark between MongoDB Atlas & Amazon DocumentDB*, & *YCSB Benchmark between MongoDB Atlas and Oracle Autonomous JSON Database*. Comparison based on Operations/second on configurations of approximately equal cloud hardware and costs.





Database API for MongoDB API

Demo

<https://blogs.oracle.com/database/post/mongodb-api>

Oracle Database API for MongoDB



Direct connections from MongoDB drivers to Oracle Database

- Developers keep their skills and continue to use MongoDB's tools, drivers, etc
- Easy migrations of MongoDB workloads to Oracle
 - Often minimal code changes required (exception aggregation pipeline)
- Enable SQL and Oracle ecosystem for JSON collections
 - More and faster analytical capabilities, machine learning
 - Query JSON alongside other data models: relational, XML, spatial, etc. using SQL
 - Expose relational data, reports, query results as MongoDB collections

Now available in Autonomous Database (shared only)

- Autonomous JSON Database, ATP, ADW

Future support is investigated for ADB- dedicated, DBCS, ExaCC, On-premises



Autonomous JSON Database (AJD) versus Autonomous Transaction Processing (ATP)

- All features of AJD also available in ATP
- AJD: 20GB limit on non-JSON data
- AJD costs approx. 25% of ATP
- One-click upgrade from AJD to ATP
- *Always Free* versions available for both

Autonomous „Killing“ Feature

ORDS – Auto Rest

The screenshot displays the Oracle Database Actions Launchpad interface. The browser address bar shows the URL: https://gc97f12ec6adbc9-db202203290955.adb.eu-frankfurt-1.oraclecloudapps.com/ords/demo/_sdw/. The interface is organized into several sections:

- Development:**
 - SQL:** Execute queries and scripts, and create database objects.
 - DATA MODELER:** Create relational diagrams for database objects.
 - REST:** Deploy REST APIs for your database.
 - JSON:** Manage your JSON Document Database.
 - CHARTS:** Visualize data from your database.
 - SCHEDULING:** Schedule, manage and plan jobs and tasks.
- Data Tools:**
 - DATA PUMP:** Import and export data quickly with data pump.
 - DATA LOAD:** Load or access data from local files or remote databases.
 - CATALOG:** Understand data dependencies and the impact of changes.
 - DATA INSIGHTS:** Discover anomalies, outliers and hidden patterns in your data.
 - DATA ANALYSIS:** Analyze your data.
- Administration:**
 - DATABASE USERS:** Create, edit privileges and other parameters, and REST-enable...
- Monitoring:**
 - REAL TIME SQL MONITOR:** Monitor executed SQL queries in real time.

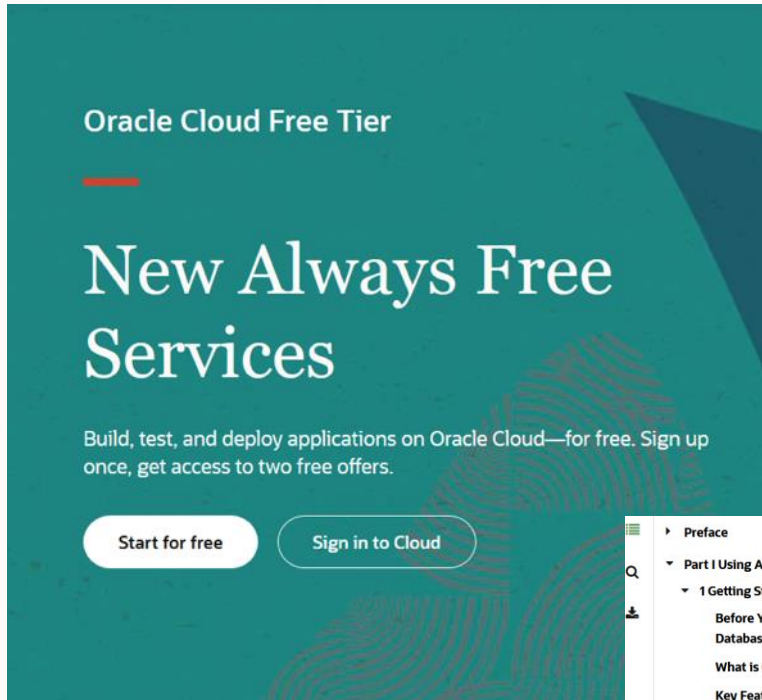
On the right side, there is a dark sidebar with the following sections:

- Getting Started:**
 - Charts:** Create visualizations using area, bar, pie, and other popular charting methods from your SQL query results.
 - RESTful Web Services:** Deploy REST APIs for your Oracle database - GET, PUT, POST and DELETE securely using HTTPS with your Oracle data and stored procedures.
 - Load Data:** Populate existing tables or build new ones from local files (Avro, JSON, XML, CSV, or Excel) using our data loading wizard.
 - JSON:** Create collections, documents, add, edit, delete, and browse your documents, and visualize your JSON Data Guides.
- Need Help?:**
 - Documentation
 - SQL Developer Community Forum
 - SQL Developer on Twitter



Try Now for Free

<https://cloud.oracle.com/try-autonomous-database>



Oracle Cloud Free Tier

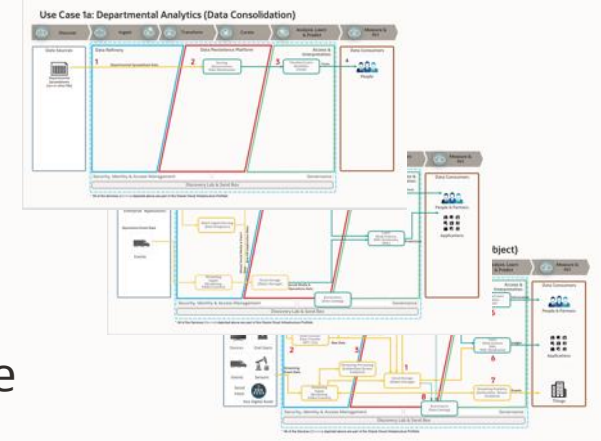
New Always Free Services

Build, test, and deploy applications on Oracle Cloud—for free. Sign up once, get access to two free offers.

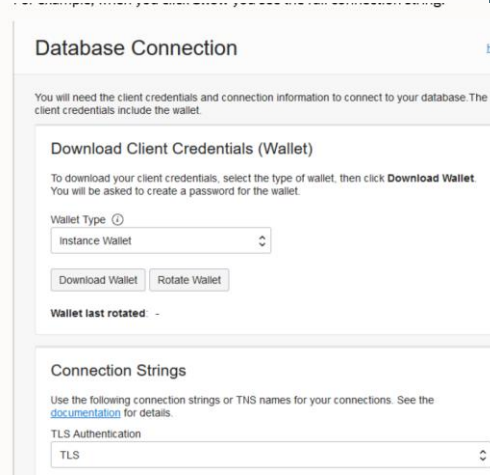
[Start for free](#) [Sign in to Cloud](#)

Resources:

- Reference Architectures
- [Hands-on-Labs](#)
- Demos
- [Cloud Navigator](#)
- [Documentation](#) all-in-one
- 875 pages (and growing)



- ▶ Preface
- ▼ Part I Using Autonomous Database
 - ▼ 1 Getting Started with Autonomous Database
 - Before You Begin with Oracle Autonomous Database
 - What is Oracle Autonomous Database?
 - Key Features of Autonomous Database
 - ▶ About Autonomous Database Workload Types
 - Autonomous Database Region Availability
 - Always Free Autonomous Database
 - ▶ Security and Authentication in Oracle Autonomous Database
 - Provision an Autonomous Database
 - Use Sample Data Sets in Autonomous Database
 - Build Reports and Dashboards with Analytics in Autonomous Database



Database Connection

You will need the client credentials and connection information to connect to your database. The client credentials include the wallet.

Download Client Credentials (Wallet)

To download your client credentials, select the type of wallet, then click **Download Wallet**. You will be asked to create a password for the wallet.

Wallet Type Instance Wallet

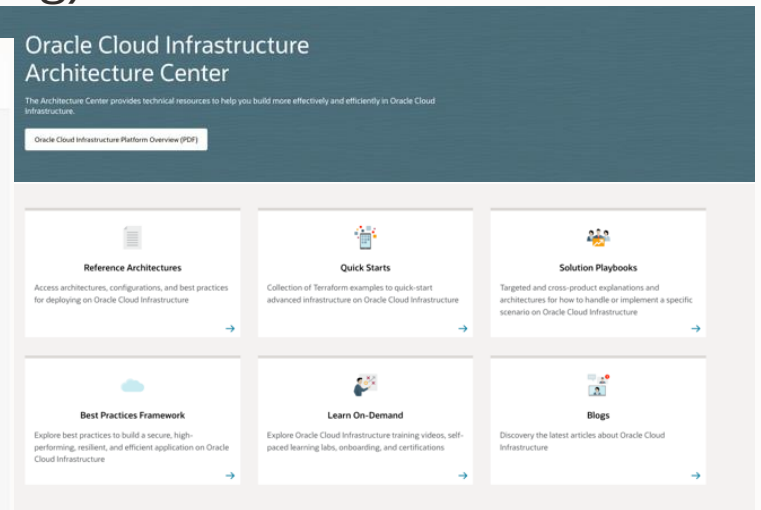
[Download Wallet](#) [Rotate Wallet](#)

Wallet last rotated: -

Connection Strings

Use the following connection strings or TNS names for your connections. See the [documentation](#) for details.

TLS Authentication TLS



Oracle Cloud Infrastructure Architecture Center

The Architecture Center provides technical resources to help you build more effectively and efficiently in Oracle Cloud Infrastructure.

[Oracle Cloud Infrastructure Platform Overview \(PDF\)](#)

- Reference Architectures**
Access architectures, configurations, and best practices for deploying on Oracle Cloud Infrastructure
- Quick Starts**
Collection of Terraform examples to quick-start advanced infrastructure on Oracle Cloud Infrastructure
- Solution Playbooks**
Targeted and cross-product explanations and architectures for how to handle or implement a specific scenario on Oracle Cloud Infrastructure
- Best Practices Framework**
Explore best practices to build a secure, high-performing, resilient, and efficient application on Oracle Cloud Infrastructure
- Learn On-Demand**
Explore Oracle Cloud Infrastructure training videos, self-paced learning labs, onboarding, and certifications
- Blogs**
Discover the latest articles about Oracle Cloud Infrastructure



LiveLabs – Deep Dive With Autonomous Database

<https://bit.ly/get-started-with-adb>



▼ Workshop Outline

- Provision ADB
- Load Data
- Query and Visualize Data
- Wallets
- Manage and Monitor
- Scale
- Machine Learning Notebooks
- Build a Machine Learning Algorithm

ORACLE