

ORACLE

Oracle Machine Learning using ADB

Use natural language to query your data using Select AI and Gen AI

Marcel Lamarca

Exadata Cloud Specialist

Oracle, Alliances & Channels LAD

March, 2024



SQL> select * from person where name = 'Marcel Lamarca'



MARCEL LAMARCA

Exadata Cloud Specialist

Upgrade, Utilities, Patching, Performance & Migrations

 [marcel-lamarca](#)

 marcel.lamarca@oracle.com

About My Career

- 22 Years dedicated to study and support Oracle Databases.
- 13 Years working with Exadata (On-prem, C@C and Cloud Services) .
- 5 Year working for Oracle do Brasil
- 2 Year on Alliances LAD knowledge Team

Certifications

Oracle Cloud Specialist (OCS)

- Exadata Database Machine X9M Certified Specialist
- OCI Foundation 2020 / 2023
- Oracle Autonomous Database Administrator Professional 2019 / 2023
- Oracle Cloud Database Migration and Integration 2021
- OCI Cloud Certified Architect Associate 2022
- OCI Cloud Certified Architect Professional 2022
- OCI Multi-Cloud Architect Professional 2023
- Oracle Database Services Certified Professional 2023

Oracle Certified Professional (OCP)

- Oracle Database certified professional 10g, 11g, 12c and 19c.
- Mysql 8.0 Database Administrator Certified Professional

Oracle Certified Specialist (OCE)

- Grid/RAC Database Administrator 11g
- Oracle Golden Gate 12c Certified Implementation Specialist

Agenda



Why Oracle Autonomous Database ?



Autonomous Database concepts



Autonomous Billing and Features



ADB with Oracle Machine Learning



Resources

Why Oracle Autonomous Database ?

Your data can drive innovation, but...

95%

requires extensive
manual involvement

60%

complained about
overall management
complexity

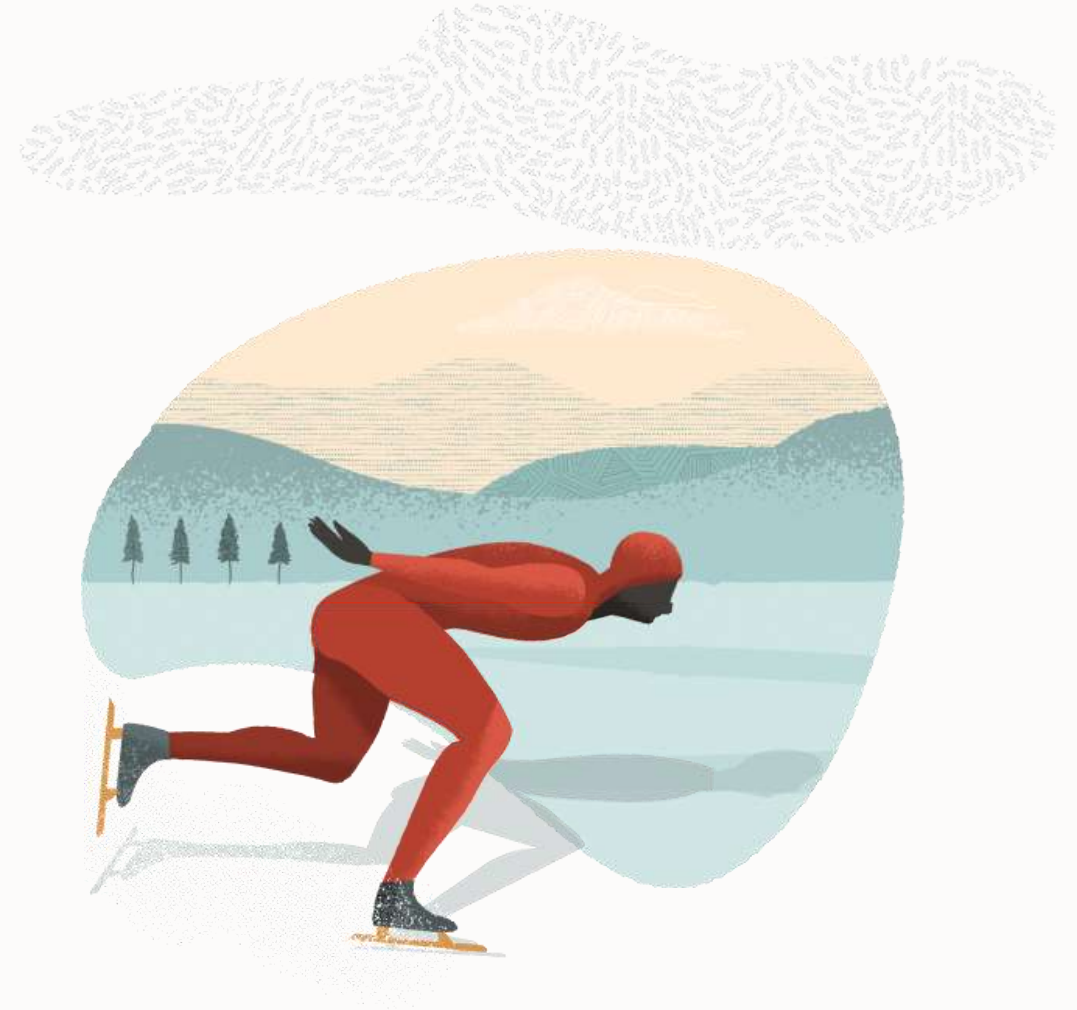
38%

too costly to acquire
and maintain

33%

too slow to deploy

**Data systems and tools need to be
modernized to deliver more and faster**



Oracle Autonomous Database supports a wide range of transactional and analytics workloads



Oracle Autonomous Data Warehouse

Analytical and machine learning workloads

62% lower
total cost of operations



Oracle Autonomous Transaction Processing

Business applications and mixed workloads

50X better storage latency
than Amazon Aurora



Oracle Autonomous JSON Database

Document database

30% cheaper
than MongoDB Atlas

Support multiple data models without sacrificing security and governance controls

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%

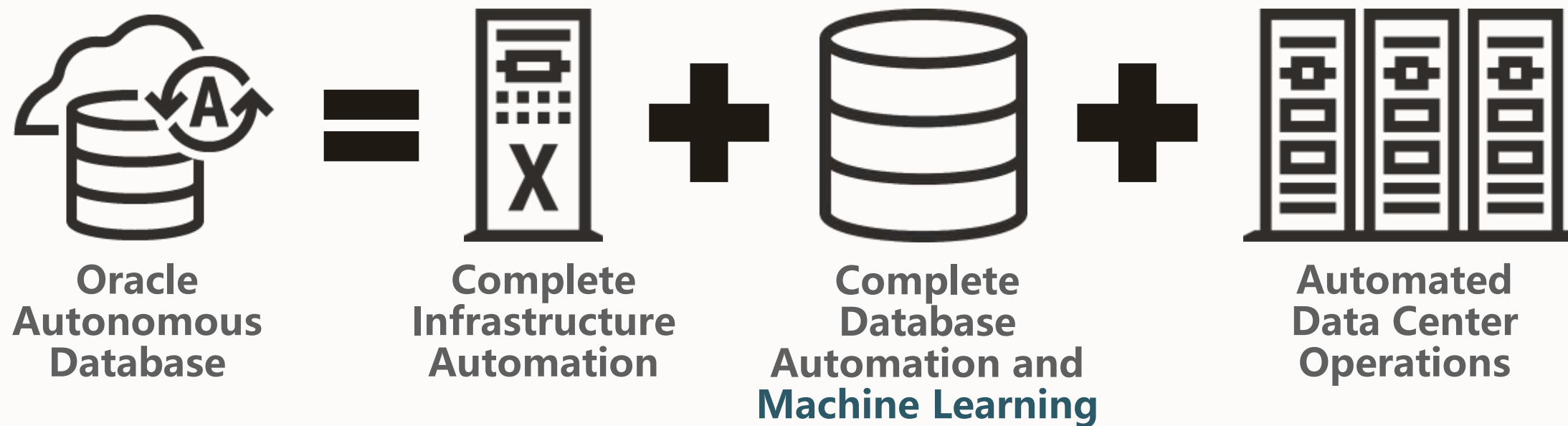
n = 7, Source: IDC In-depth Interviews, December 2020



Oracle Autonomous Database Concepts

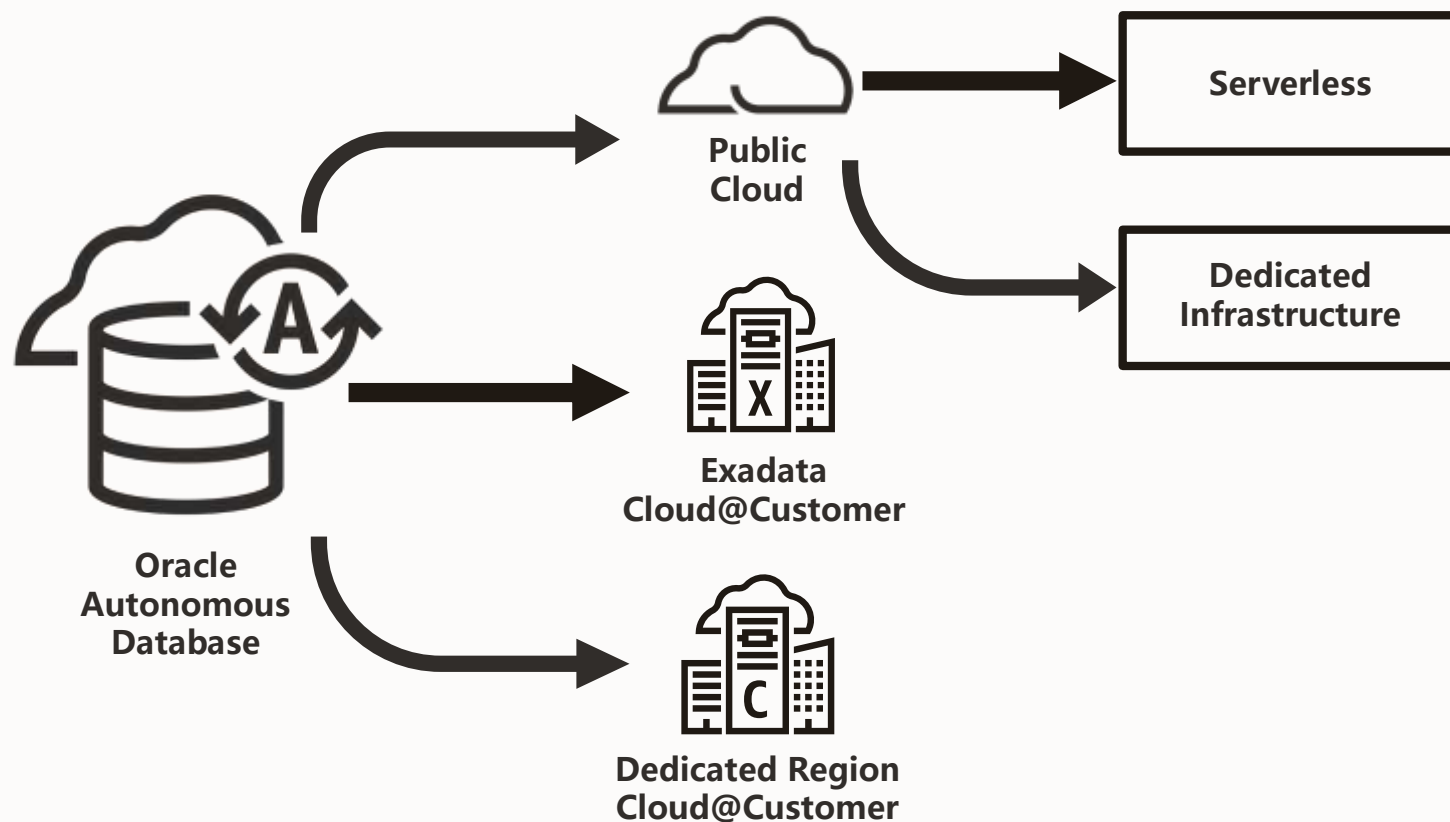
What is Oracle Autonomous Database?

Using the cloud to eliminate all the complexity of mission critical databases



Multiple deployment choices

The most complete support for hybrid cloud strategies



Oracle Public Regions

Hyperscale cloud regions in more than 40 worldwide locations



Dedicated Regions

All OCI services, running in customer data centers



Exadata Cloud@Customer

Cloud Autonomous Databases, running in your data center



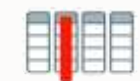
Worldwide or exactly where you need it, with scale and control



Oracle Database and Exadata Platform Innovations



Multitenant



In-Memory DB



Real Application Clusters



Active Data Guard



Partitioning



Advanced Compression



**Advanced Security,
Label Security, DB
Vault
Real Application
Testing**

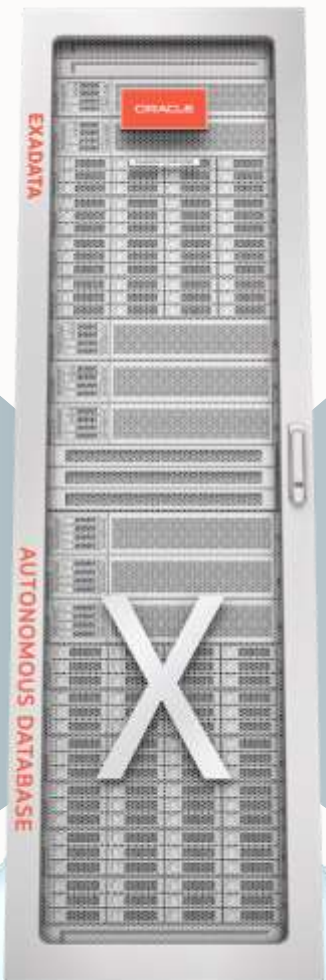


**Advanced Analytics,
Spatial and Graph**



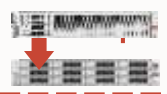
**Management Packs
for
Oracle Database**

**All Oracle
Database
Innovations**



**All Exadata
DB Machine
Innovations**

**Offload SQL to
Storage
RoCE Fabric**



100 Gbps

**XRMEM
Data Accelerator**



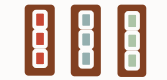
Smart Flash Cache



**Storage
Indexes**



Columnar Flash Cache



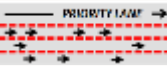
**Hybrid Columnar
Compression**



**I/O Resource
Management**



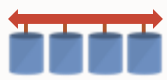
**Network Resource
Management**



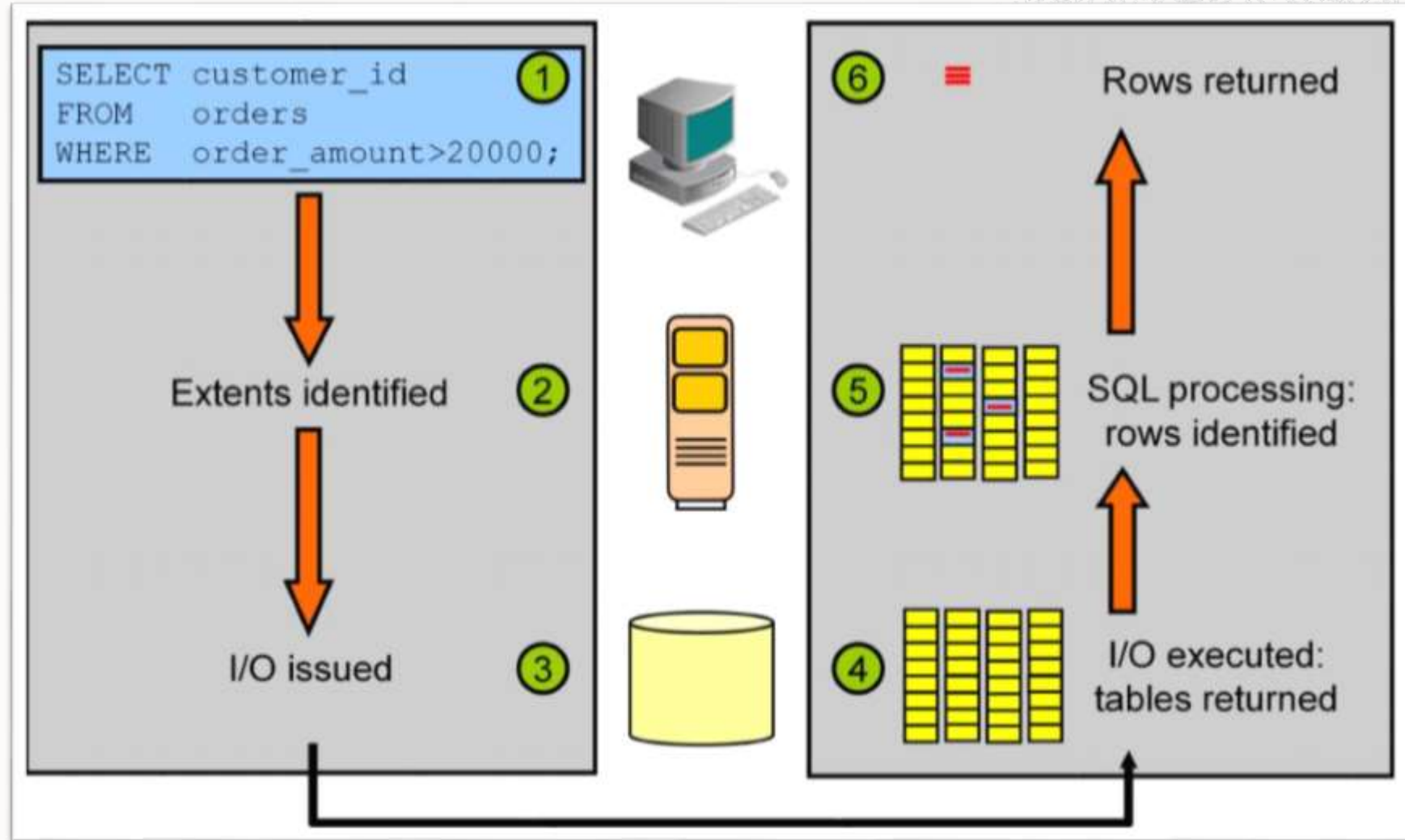
**In-Memory Fault
Tolerance**



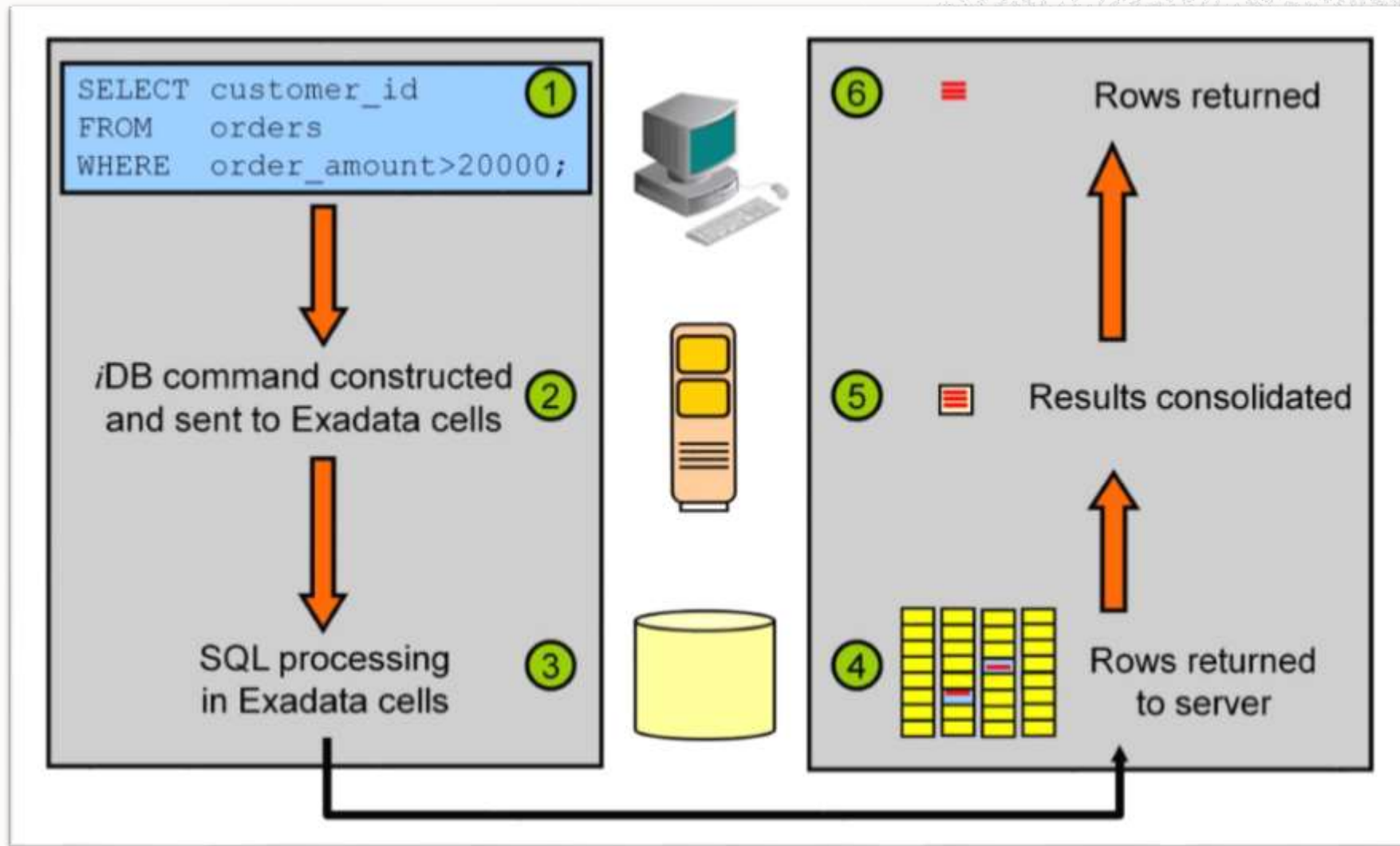
**Exafusion
Direct-to-Wire Protocol**



Oracle Database | No Exadata System



Exadata Cloud a Smart Scan | Off Load Querying

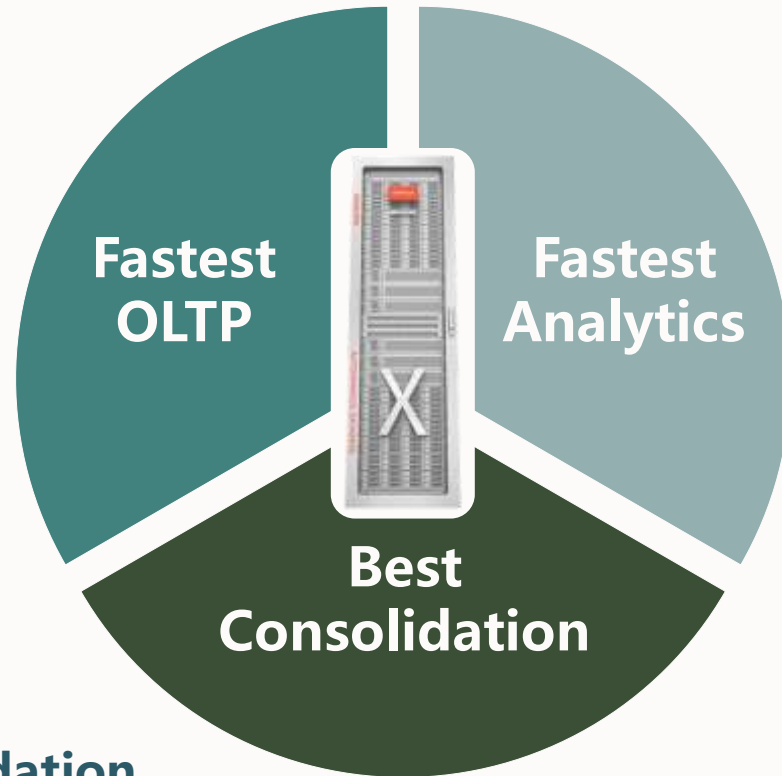


Exadata's Superior Software Architecture Highlights

Smart system software enables highest performance for OLTP | Analytics | Consolidation workloads

Fastest OLTP

- **Fastest OLTP I/O** with scale-out storage, RDMA to storage, and NVMe flash
- **Fastest scale-out** with unique RDMA algorithms for inter-node cluster coordination
- **Fastest recovery** from unplanned downtime and component failure



Fastest Analytics

- **Unique Smart Scan** automatically offloads data intensive SQL operations to storage
- **Unique Smart Flash Cache and Storage Index** automatically accelerate database I/O
- **Unique Columnarization** automatically converts data to fast In-Memory Columnar format in flash

Best Consolidation

- **Unique Prioritization** of latency sensitive or important workloads
- **Unique Workload Isolation** of multiple tenants or workloads







Autonomous
operations

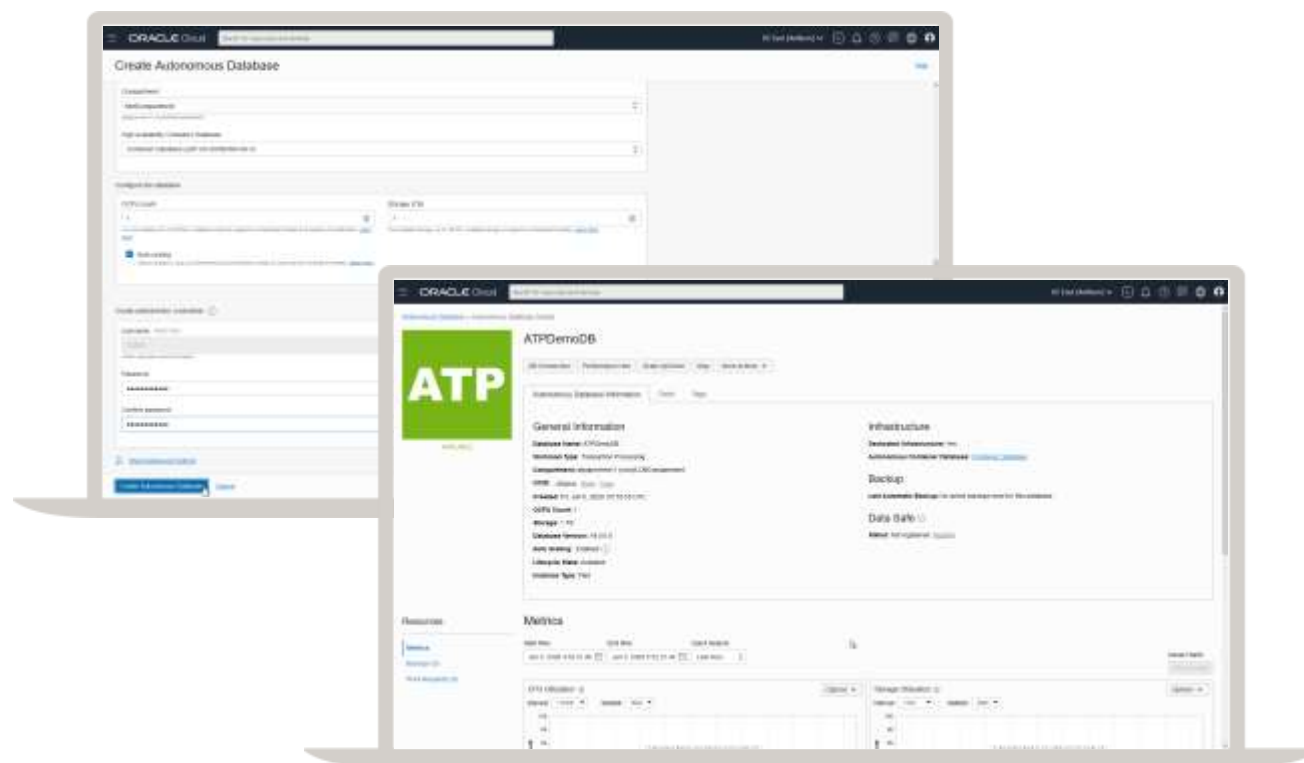
Simplified application
development

Complete data protection
and security

High performance and
availability above 99.95%

Features

-  Automatic provisioning
-  Automatic configuration
-  Automatic encryption
-  Automatic online patching and updating
-  Automatic elastic scaling
-  Automatic tuning



Autonomous
operations

Simplified application
development

Complete data protection
and security

High performance and
availability above 99.95%



No-code/Low-code development

Eliminate 98% of hand coding with built-in low-code application development platform, APEX.



In-database machine learning (ML) algorithms

Easily build ML models and analytical dashboards without moving data out of the database.



Self-service data tools

Quickly load any data, run queries, build sophisticated analytical models, visualize information.



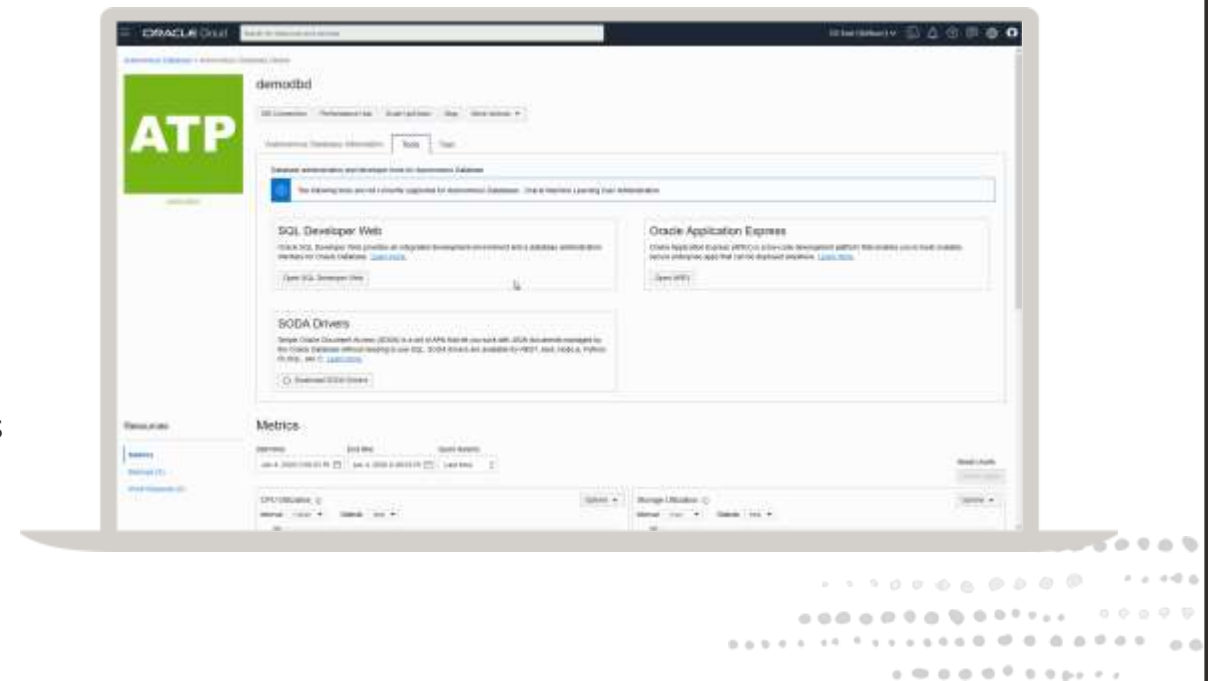
Native relational and nonrelational data models

Simpler application development using multiple data types including document, graph, spatial, JSON, XML, and more.



REST API support

Enable all your data for simpler and faster access.



Autonomous
operations

Simplified application
development

**Complete data
protection and security**

High performance and
availability above 99.95%



Always-on encryption

This ensures the data is always secure at rest and in motion.



Auto-patching

Applications continue to run as patching occurs.



Data privacy

Enables database administrators to perform all administrative tasks without ever seeing customer data.



Security for sensitive data

Oracle Data Safe, makes it easy to discover sensitive data, evaluate security risks, mask sensitive data, and implement and monitor security controls.



Advanced auditing

You can log & monitor all events with minimal impact on performance - analysis, forensics, and compliance.



Autonomous
operations

Simplified application
development

Complete data protection
and security

High performance and
availability above
99.95%



High performance

Delivers 80% lower latency and more than 5X throughput than other cloud providers by utilizing database-optimized hardware, automated tuning, and indexing.



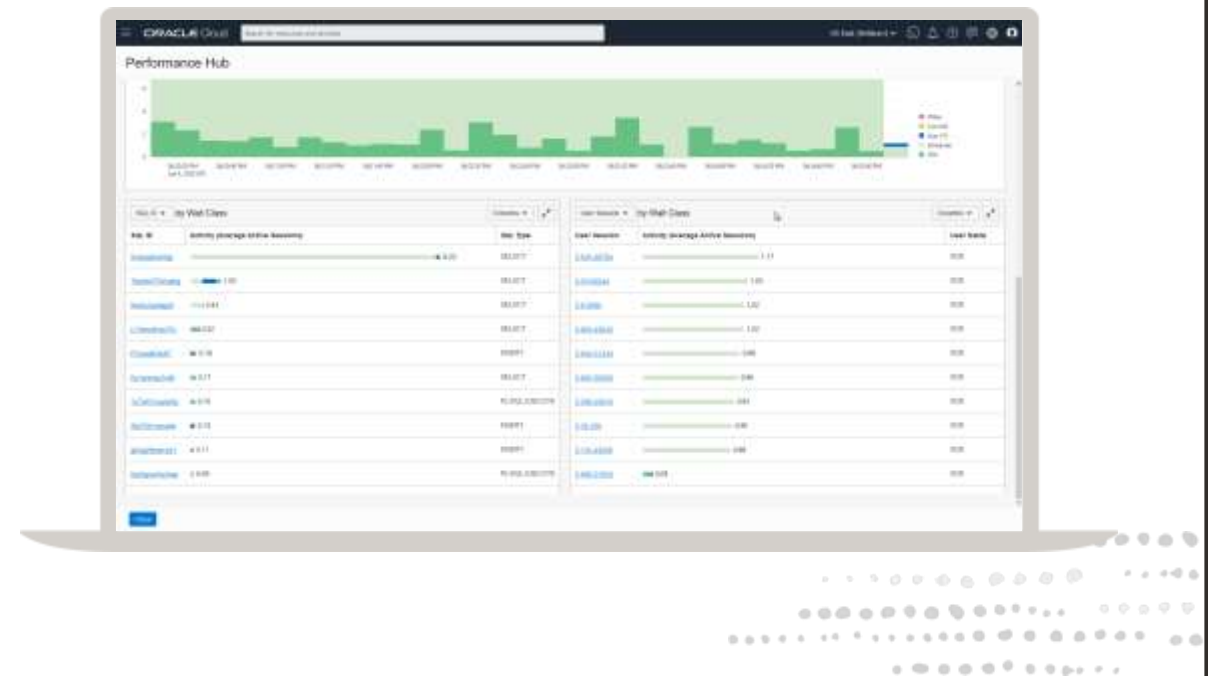
Always online

Provides more than 99.95% availability using a combination of Oracle's Gen 2 Cloud Infrastructure, Oracle RAC, Autonomous Data Guard, and daily automatic backups.

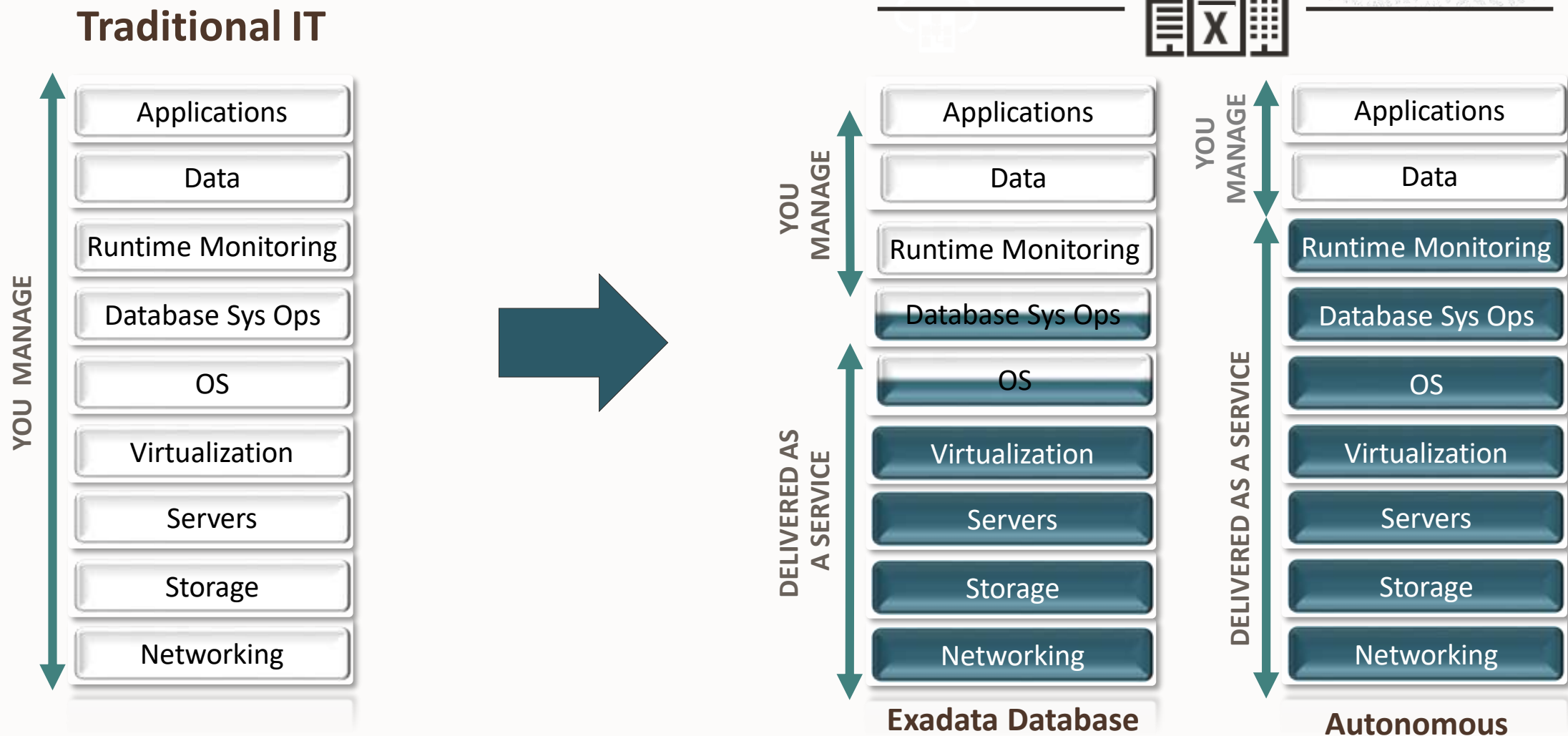


Protection from human error

Oracle Flashback, provided with Autonomous Transaction Processing, instantly rewinds accidental changes to application schemas, protecting users from human errors. It supports recovery at all levels including row, transaction, and table—and across the entire database.



Transfer more responsibility to the service while lowering costs

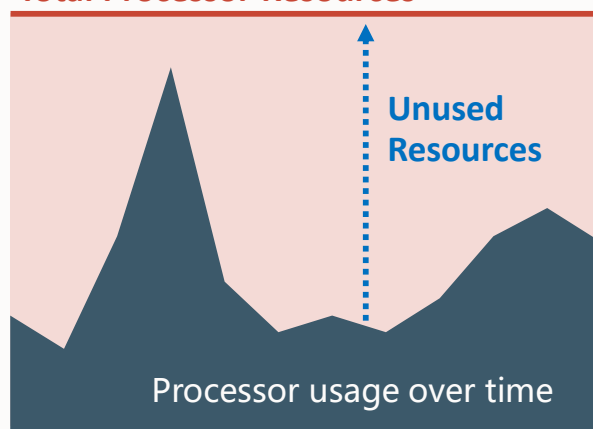


Autonomous Database Billing

Online, Elastic Scaling with Exadata and Autonomous Database Services

Pay only for what you use, in OCI or your data center

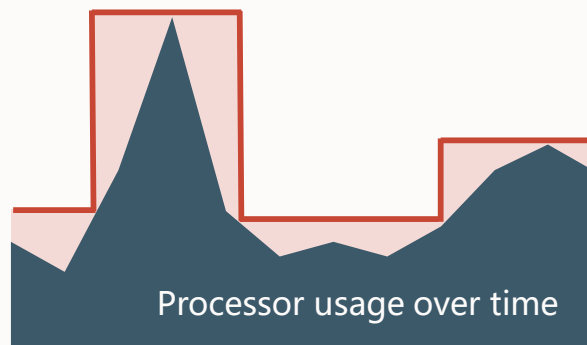
Total Processor Resources



On-Premises & Other Clouds – Static

Purchase server processors and software licenses for **highest projected peak load**

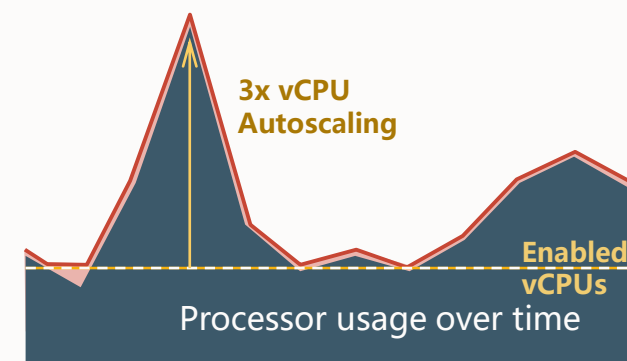
Manually Scaled CPU cores



Exadata Database Service – Elastic

Adjust enabled CPUs to match **actual workload** via APIs and web UI - CPUs are charged per second

Autonomously Scaled CPU cores



Autonomous Database – Self-scaling

Automatically scales CPU core consumption based on **dynamic workload demands**, in real-time



Autonomous Database ECPU billing



SCAN ME



- The introduction of ECPU's is simply a new pricing metric. Using an ECPU Autonomous Database is essentially identical to an OCPU Autonomous Database
- The OCPU billing metric has been retired on Autonomous Data Warehouse and Autonomous Transaction Processing as of January 2024
- ECPU's provide similar or better price-performance than OCPU's for a given Autonomous Database workload.



Retirement Of The OCPU Billing Metric In Autonomous Database Serverless (Doc ID 2998742.1)

ACTIONS

What action do I need to take now?

We encourage customers to provision all new Autonomous Data Warehouse and Autonomous Transaction Processing databases or clones with the ECPU billing metric. We also encourage customers to update all existing databases to the ECPU billing metric, which is a simple and seamless button click or API call, as described in the documentation here. While you may choose not to update your existing databases' billing metric at this time, Oracle may convert your databases from the OCPU billing metric to the ECPU billing metric in the future.

Note: Autonomous Data Warehouse databases provisioned as part of Oracle Data Intelligence Platform (formerly Fusion Analytics Warehouse) service instance will be updated to the ECPU billing metric by Oracle. No user action is required on those databases.

How will updating my databases to the ECPU billing metric affect my service?

Updating your Autonomous Database Serverless to the ECPU billing metric will have **no impact to your service** and incur **no downtime**.

Which SKUs are affected by this retirement notice?

Oracle Autonomous Database will be retiring the OCPU-based SKUs and replacing them with the ECPU-based SKUs listed below:

Retired OCPU Billing Metric - SKU Name	Part Number	Metric
Oracle Autonomous Data Warehouse	B89040	OCPU Per Hour
Oracle Autonomous Data Warehouse - BYOL	B89039	OCPU Per Hour



Retirement Of The OCPU Billing Metric In Autonomous Database On Dedicated Infra (Doc ID 2998755.1)

ACTIONS

What action do I need to take now?

We encourage users to provision new Autonomous VM Clusters (AVM) with the ECPU billing metric. Oracle will offer an online conversion capability to update existing OCPU AVMs and their respective Autonomous Container Databases and Autonomous Databases to the ECPU billing metric via the OCI console and API in Q3 CY2024. In the meantime, users can also use database cloning to migrate existing OCPU ADBs to ECPU if they have AVMs configured with the ECPU billing metric. While you may choose not to update your existing databases' billing metric at this time, Oracle may convert your databases from the OCPU billing metric to the ECPU billing metric in the future.

Which SKUs are affected by this retirement notice?

Oracle Autonomous Database on Dedicated Infrastructure will be retiring the OCPU-based SKUs and replacing them with the ECPU-based SKUs listed below:

Retired OCPU Billing Metric - SKU Name	Part Number	Metric
Oracle Autonomous Data Warehouse - Dedicated	B92182	OCPU Per Hour
Oracle Autonomous Data Warehouse – Dedicated - BYOL	B92184	OCPU Per Hour
Oracle Autonomous Transaction Processing - Dedicated	B92181	OCPU Per Hour
Oracle Autonomous Transaction Processing – Dedicated - BYOL	B92183	OCPU Per Hour





Reduce TCO moving to Autonomous ADB Standard Edition

Software cost totals

Oracle Autonomous Database

\$ 46,398

On-premises Oracle Database Standard Edition

\$ 4,350

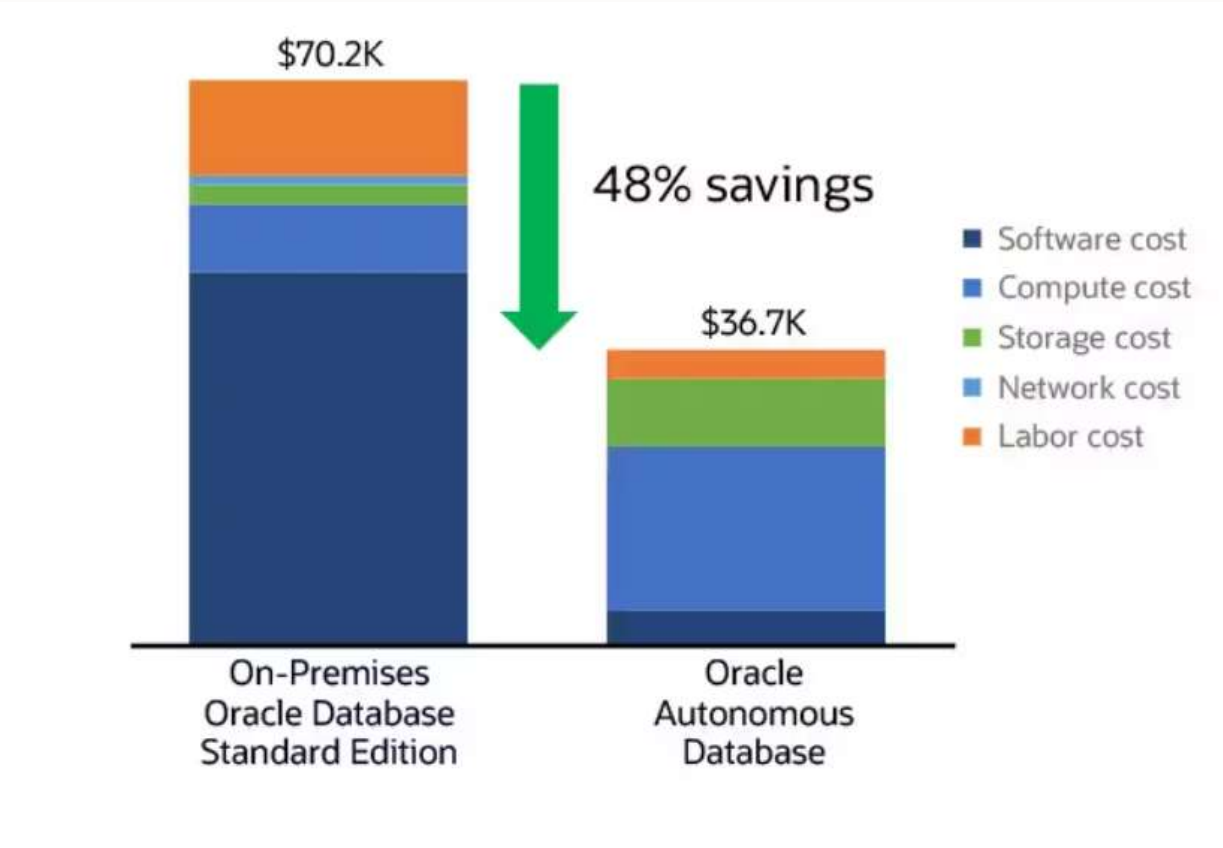
Labor cost totals

Oracle Autonomous Database

\$ 3,552

On-premises Oracle Database Standard Edition

\$ 11,853



Multi Application deploy options

NEW Self-Service Tools for Data Analysts

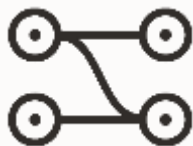
From data to insights with built-in self-service data tools

NEW Data Load



Simple drag & drop loading

NEW Transforms



Declarative transformations and data cleansing

NEW Business Models



Automatically create powerful business models

NEW Select AI



Query data using natural language

NEW Insights



Guided discovery of hidden patterns and anomalies

NEW Data Sharing



Enabling better collaboration



Comprehensive data and privacy protection

Reduce risk with autonomous security and data privacy



Secure database infrastructure

- Always encrypted, always audited, always patched

Understand your users and your data

- Risk assessment and analysis of user privileges
- Automatic discovery of sensitive data

Only the right users can see your data

- Prevents privileged users from accessing others' business data
- Mask sensitive data

YOU
MANAGE



Identification

SSN
Name
Email
Phone
Passport
DL
Tax ID
...



Biography

Age
Gender
Race
Citizenship
Address
Family data
Date of birth
Place of birth
...



IT

IP address
User ID
Password
Hostname
GPS location
...



Financial

Credit card
CC Security PIN
Bank name
Bank account
IBAN
Swift code
...



Healthcare

Provider
Insurance
Height
Blood type
Disability
Pregnancy
Test results
ICD code
...



Employment

Employee ID
Job title
Department
Hire date
Salary
Stock
...



Academic

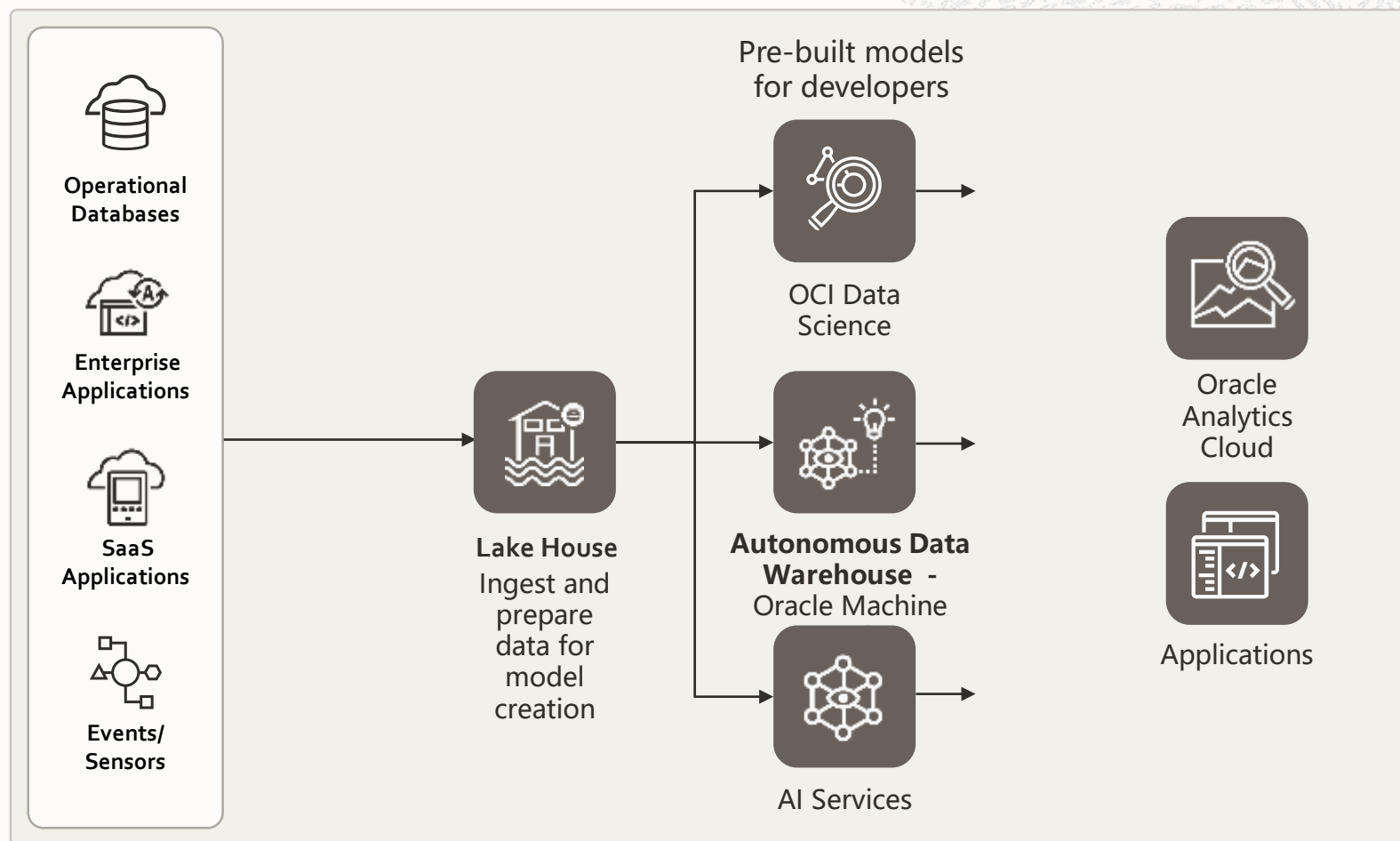
College name
Grade
Student ID
Financial aid
Admission date
Graduation date
Attendance
...





Augment decision making with machine learning

Data Lakehouse & Sandboxes



Autonomous Database speaks “human”

Oracle can bring AI
to the enterprise
at **every layer**
of our stack



SaaS Apps

AI Services

Data

Infrastructure

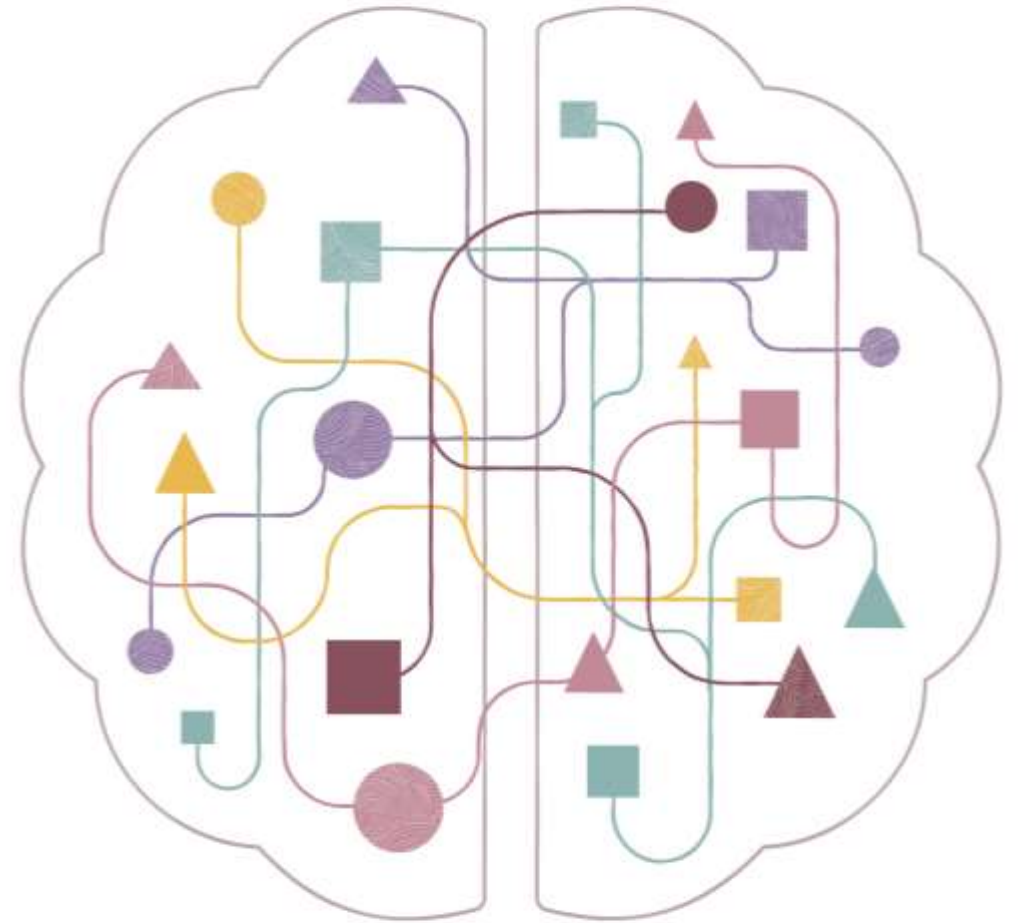
Partners

Autonomous Database Select AI

Simplest way to get answers about your business

Use **your language** to query data

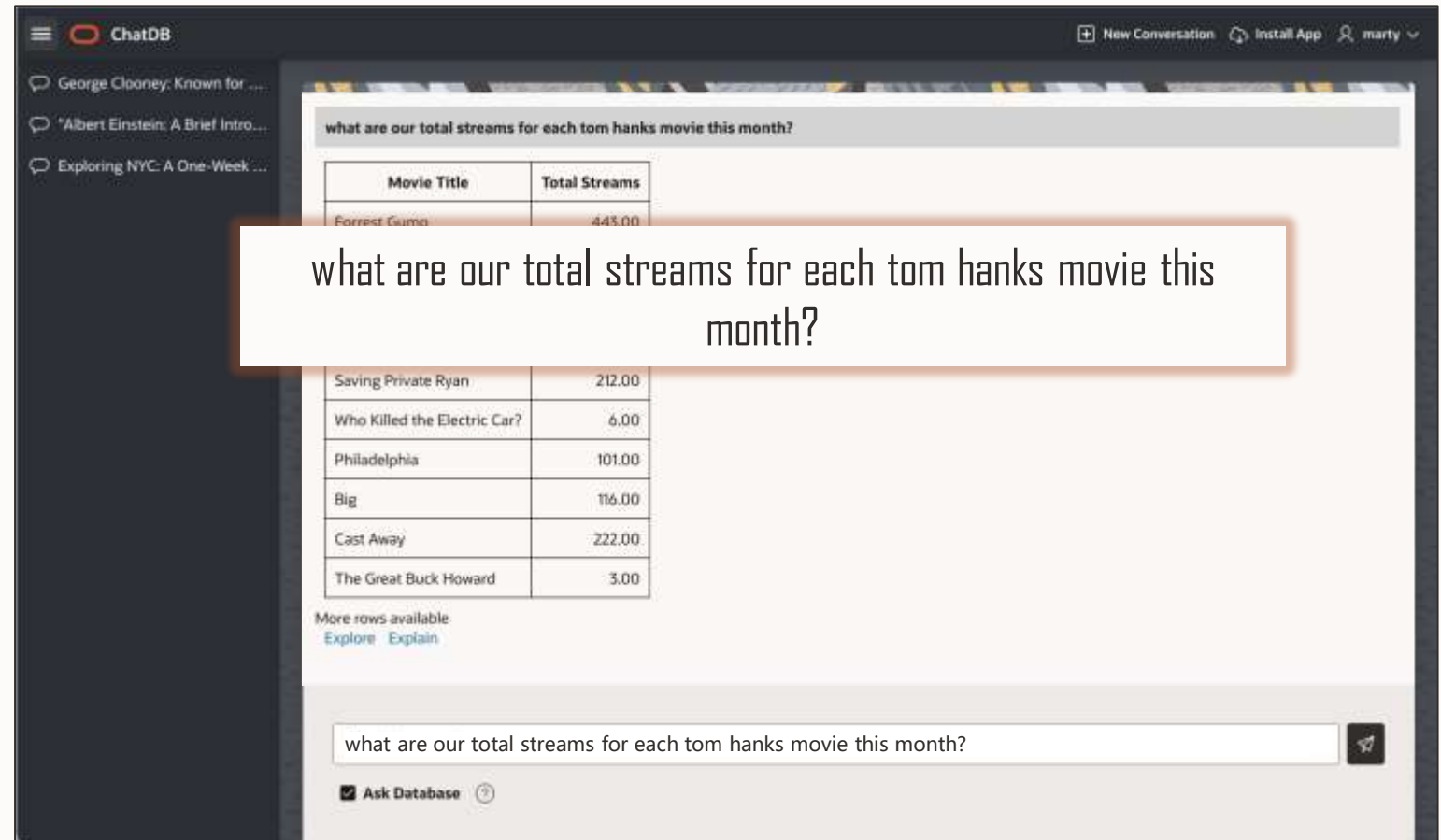
No need to understand where and how your data is stored to gain insights



Select AI - Simplest way to get answers about your business

Just ask a question

Autonomous Database
manages the entire
query process to
produce your answer



The screenshot shows the ChatDB web interface. On the left is a sidebar with a menu icon and the text 'ChatDB'. Below it are three conversation snippets: 'George Clooney: Known for ...', 'Albert Einstein: A Brief Intro...', and 'Exploring NYC: A One-Week ...'. The main area displays a query 'what are our total streams for each tom hanks movie this month?' in a search bar. Below the query is a table with two columns: 'Movie Title' and 'Total Streams'. The table contains the following data:

Movie Title	Total Streams
Forrest Gump	445.00
Saving Private Ryan	212.00
Who Killed the Electric Car?	6.00
Philadelphia	101.00
Big	116.00
Cast Away	222.00
The Great Buck Howard	3.00

Below the table, it says 'More rows available' with links for 'Explore' and 'Explain'. At the bottom, there is a text input field with the same query, a send button, and a checkbox labeled 'Ask Database' which is checked.



Historically, answering these types of questions has not been easy
We infer a lot from human language

what are our total streams for each tom hanks movie this
month?

total number of
movie views

breakout views
by movie

tom hanks
is an actor

understandin
g of time

Select AI translates your language into Oracle SQL language

Processes question using an AI large language model (LLM)

Question	Inference
what are our	
<u>total streams</u>	total number of movie views
<u>for each</u>	breakout views by movie
<u>tom hanks</u> movie	tom hanks is an actor
<u>this month?</u>	Understanding of time

```
SELECT
  m.title AS movie_title,
  COUNT(s.views) AS total_streams
FROM movie m
  JOIN activity s ON m.movie_id = s.movie_id
  JOIN actors a ON m.movie_id = a.movie_id
WHERE a.actor = 'Tom Hanks'
AND EXTRACT(MONTH FROM s.day_id) =
      EXTRACT(MONTH FROM SYSDATE)
GROUP BY m.title
```

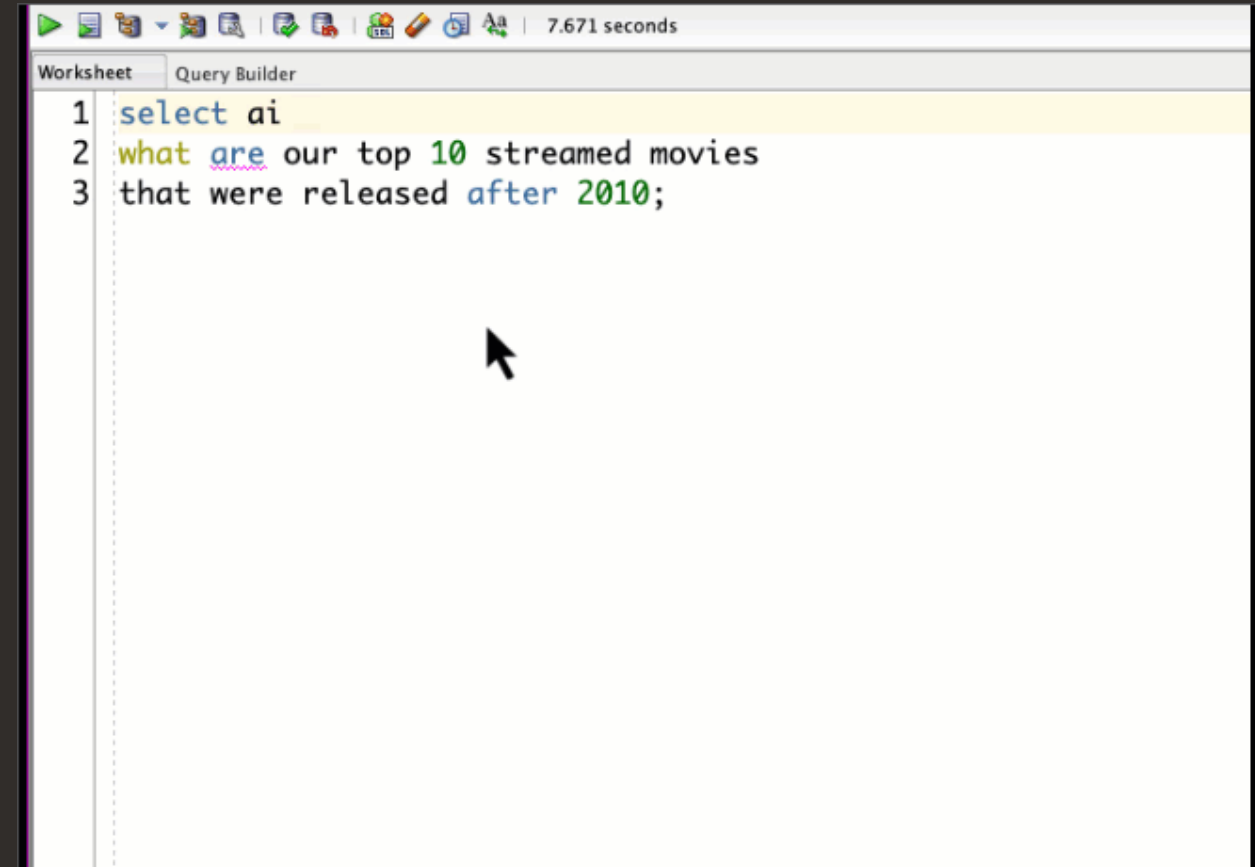
LLMs are remarkable at inferring intent (and getting better)
They are not perfect! It is important to verify results



Easy to extend and build new natural language apps

Use a **standard SELECT** statement
followed by AI and your question

Process the result as you would
any other SQL result set



Easy to configure your data for natural language queries

Use one or more **Select AI Profiles** that is best for your business

1

Choose an LLM to generate a database query from natural language

Available today

Cohere

OpenAI

Azure OpenAI

OCI Generative AI

2

Specify schemas, tables and/or views to participate in processing

Finance



ACTUALS



PLAN

Streaming



CUSTOMERS



MOVIES



VIEWS



SEGMENTS



Easy to configure your data for natural language queries

Use one or more AI profiles that is best for your business

1

Choose an LLM to generate a database query from natural language

2

Specify schemas, tables and/or views to participate in processing

Simple PLSQL API creates AI profile:

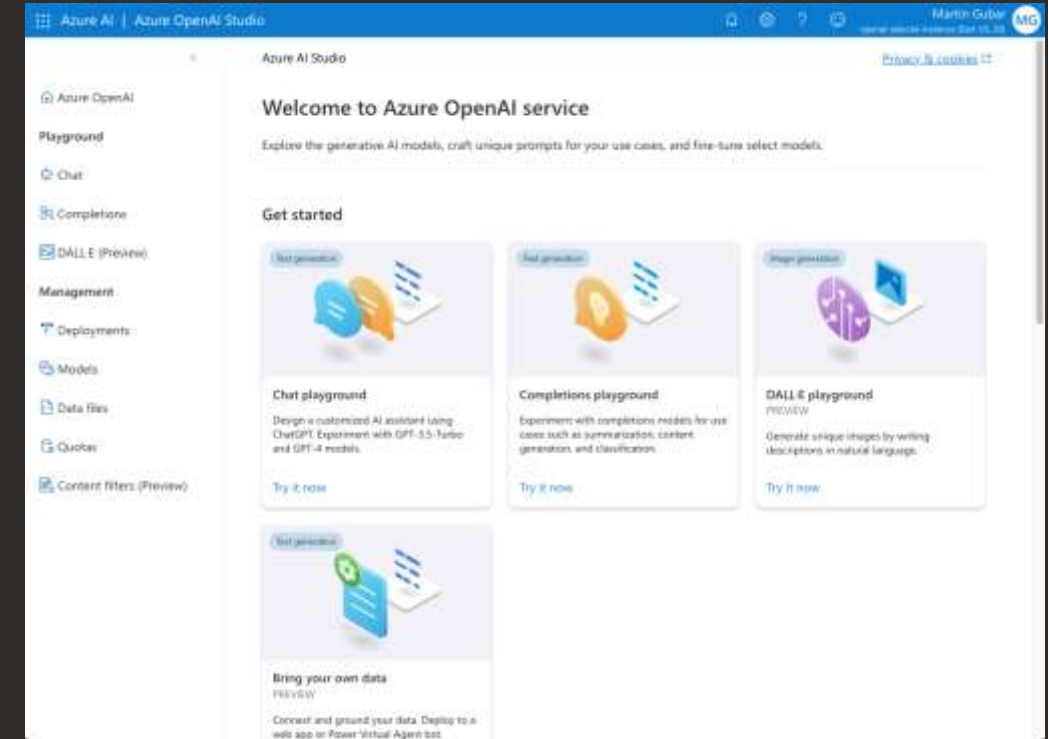
```
dbms_cloud_ai.create_profile(  
  profile_name => 'movie_nl_processing',  
  attributes =>  
    '{"provider": "openai",  
     "credential_name": "OPENAI_CRED",  
     "object_list": [{"owner": "myschema",  
                      "name": "movie"},  
                    {"owner": "myschema",  
                      "name": "sales_sample"},  
                    {"owner": "myschema",  
                      "name": "customer"} ]  
  }'  
);
```

Pluggable models make it easy to improve your apps

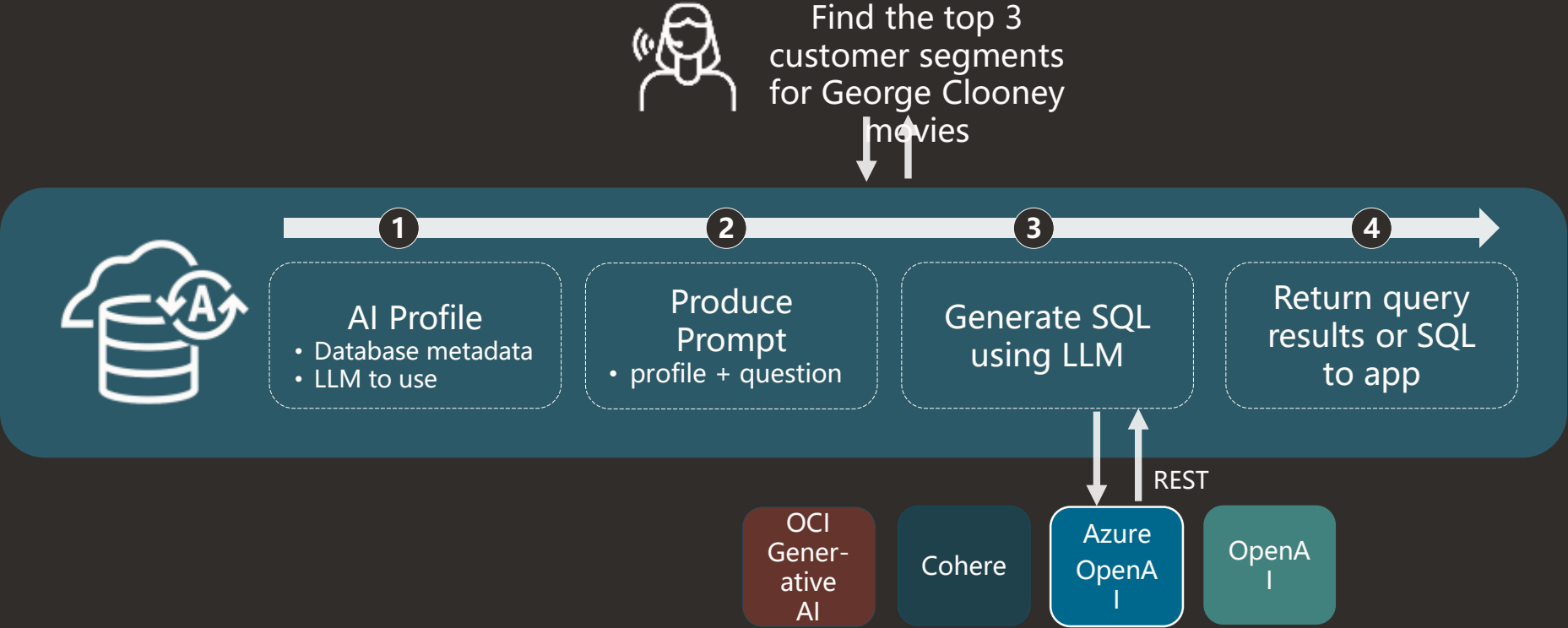
Select AI Profiles future-proof your solutions

Select AI supports Azure OpenAI

- Continues Oracle deep partnership with Azure
- Benefit from Azure data privacy, governance and security
- Use latest models from OpenAI and fine-tune for better results



SQL query generation process flow



Integrate natural language queries with your application

SELECT AI what are our top selling movies?

Result:

Movie Title	Total Sales
Aladdin	82426.71
Aquaman	78091.19
Captain Marvel	77146.21
The Lion King	66606.75
Spider-Man: Far from Home	66516.26

Optional ACTION keywords:

runsql	return sql result set
narrate	return a conversational result
showsql	return the generated query
chat	general AI-chat conversation



SQL WorksheetHistory

jarvis-livelab

WorksheetQuery Builder

27

-- Some of our data

28

select * from movies;

29

select * from streams;

30

31

-- Actions:

32

-- 1. chat - general AI chat

33

-- 2. runsql - [default] ask a question and get a structured result

34

-- 3. narrate - ask a question and get a conversational result

35

-- 4. showsql - SQL used to produce the result

36

37

-- Actions work across models (Cohere, GPT)

38

39

-- ~~~~

40

-- Question that doesn't use MovieStream private data

41

select ai chat

42

what is a movie streaming service ;

43

44

-- ~~~~

45

-- Different ways of asking a simple question

46

select ai narrate how many movies do we have

Script Output x

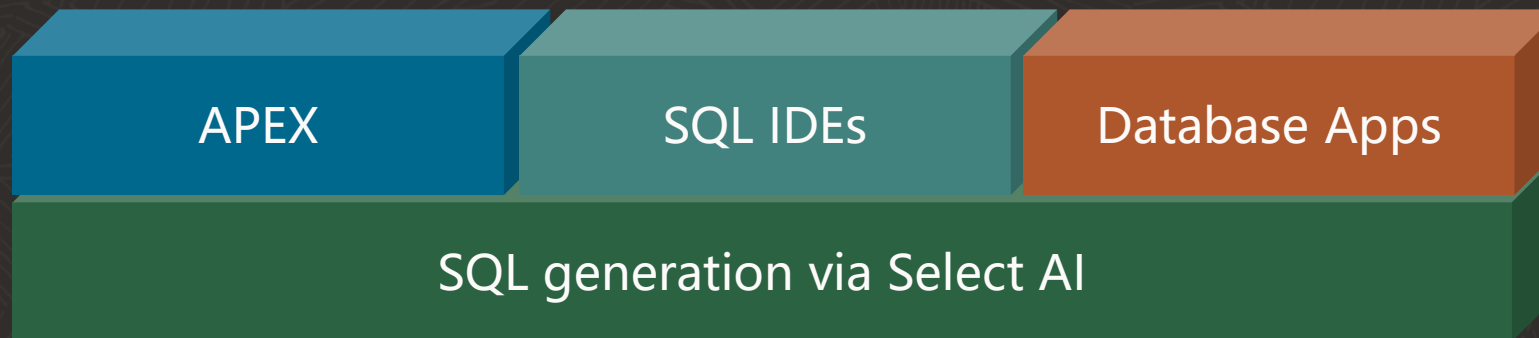
Task completed in 3.195 seconds

42 Copyright © 2024, Oracle and/or its affiliates

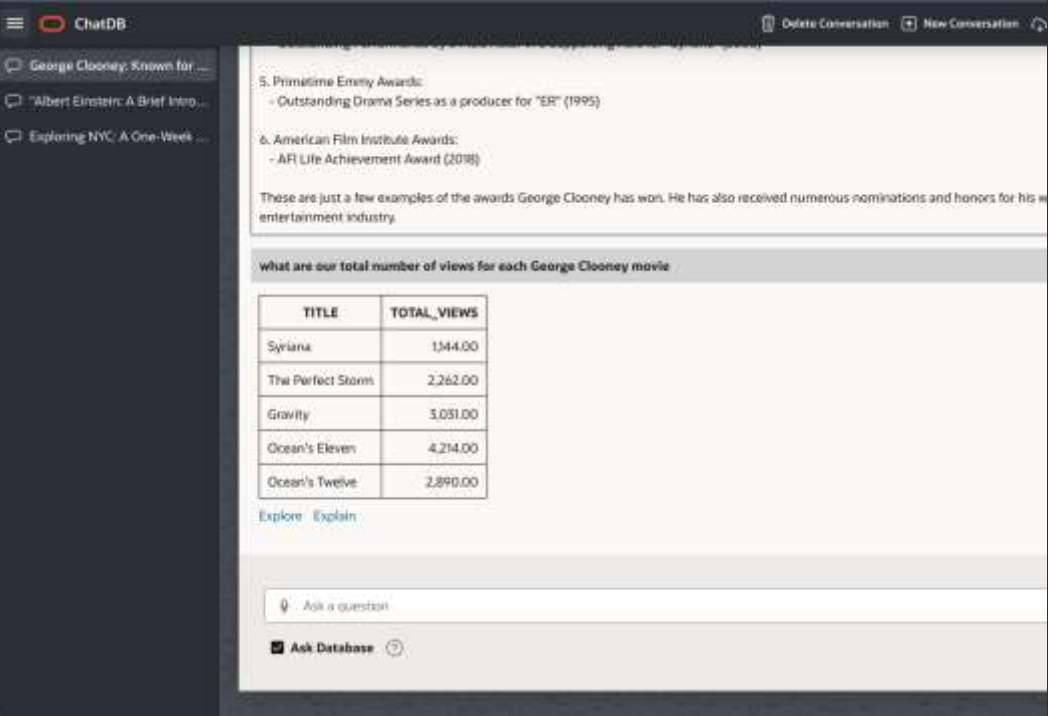
Select AI – *available today!*

Foundation functionality for SQL-to-Natural-Language for any database application

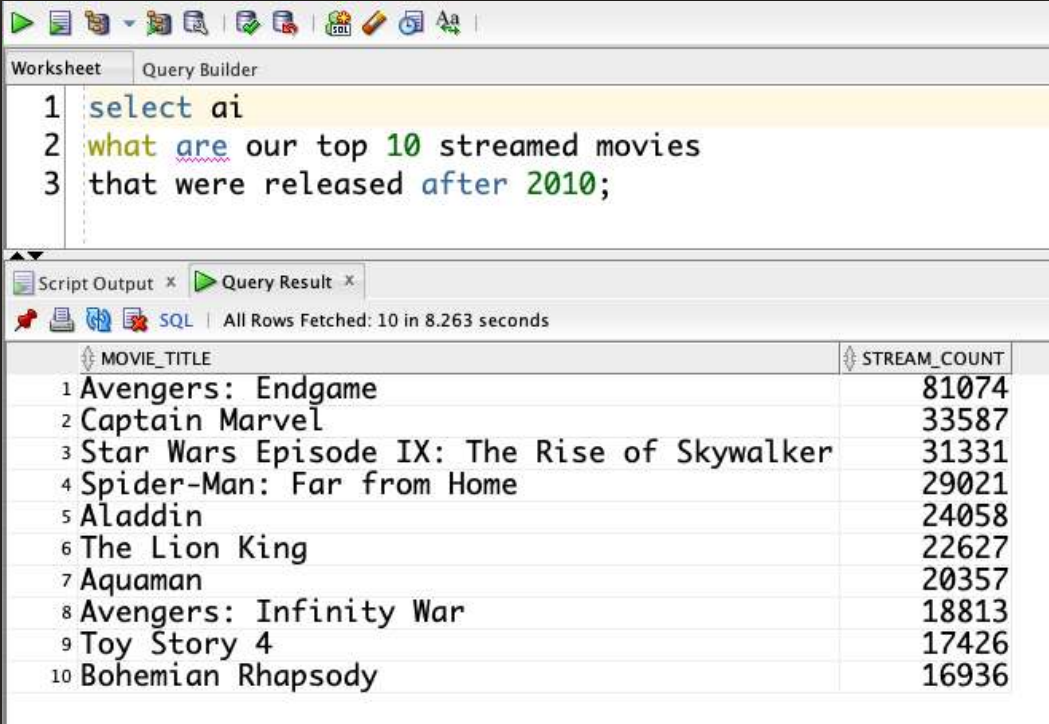
- Available immediately via any existing client or database driver – *no new downloads or installations*
- Inherit security and authentication of the database
- Choice of Large Language Models – *easily adaptable to latest technology or proprietary extensions*



Demonstration

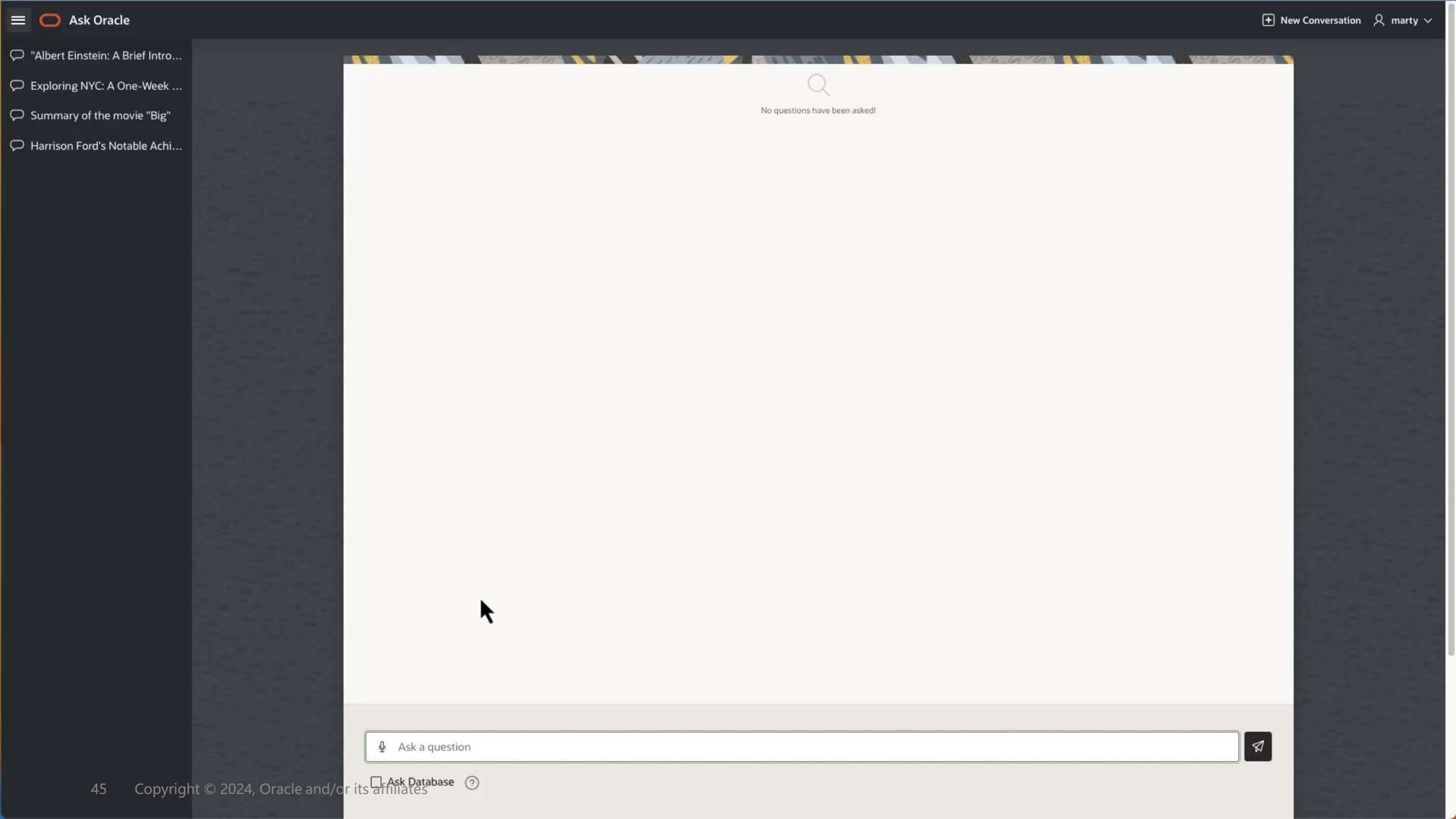


ChatDB APEX App
"Speak Human" to Autonomous Database to get your business questions answered



Select AI
Behind the scenes: How you can use Select AI to deliver natural language apps





- "Albert Einstein: A Brief Intro...
- Exploring NYC: A One-Week ...
- Summary of the movie "Big"
- Harrison Ford's Notable Achi...



No questions have been asked!



Ask a question



☐ Ask Database ?

Resources

- **Autonomous Database Get Started**

<https://www.oracle.com/autonomous-database/get-started>

- **Autonomous Data Warehouse**

<https://www.oracle.com/autonomous-database/autonomous-data-warehouse/>

- **Autonomous Transaction Processing**

<https://www.oracle.com/autonomous-database/autonomous-transaction-processing/>

- **Autonomous JSON Database**

<https://www.oracle.com/autonomous-database/autonomous-json-database>

- **Autonomous Database Free services**

<https://www.oracle.com/autonomous-database/free-trial/>

- **Architecture Center Autonomous Database**

<https://docs.oracle.com/en/cloud/paas/autonomous-database/index.html>

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Thank you



Marcel Lamarca

marcel.lamarca@oracle.com



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