



On the Fourth Day of 18c/19c, Viscosity Gave to me...

Autonomous Database

December 1, 2022

Oracle introduced a disruptive technology and revolutionized how data is managed with the introduction of the Autonomous Database (ADB). ADB supports four different workload types, and each one provides performance improvements with additional features:

- Autonomous Transaction Processing: optimized to meet the customer's requirements for Online Transaction Processing
- Autonomous Data Warehouse: designed to support all standard SQL and business intelligence (BI) tools, optimized for data warehouse workloads
- Autonomous JSON Database: provides all the features of Autonomous Transaction Processing but is designed for developing NoSQL-style applications that use JavaScript Object Notation (JSON) documents
- Oracle APEX Application Development: APEX Service is a low-cost Oracle Cloud service offering convenient access to the Oracle APEX platform for rapidly building and deploying low-code applications

Technology Overview

Database: 18c / 19c

Company: Oracle Corporation

Topic: Autonomous Database

Viscosity can help with any of your Database Upgrade needs

Viscosity has performed numerous zero-downtime database migrations and upgrades over the years and has a proven track record with business critical and mission critical databases.

Viscosity's Database Migration & Upgrade Services can plan, upgrade, validate and migrate all database content - quickly and effectively with our automated approach and proven methodology.

Learn more about how you can maintain and maximize your investments at viscosityna.com or email us at hello@viscosityna.com.



www.viscosityna.com

The ADB technology heavily leverages machine learning and automation to attack complexity and eliminate human error & manual intervention, to provide higher reliability, scalability, manageability, security, and operational efficiencies.

ADB handles creating the database, backing up the database, patching and upgrading the database, growing or shrinking the database, and provides excellent out-of-the-box performance and other routine database maintenance tasks without human intervention and with no service downtime.

Some of the main reasons to move to the Autonomous Database in Oracle Cloud include:

- Self-driving - You set up the size, speed, and service levels of the database; Oracle manages the rest. Automates all database and infrastructure management and monitoring.
- Self-securing - Imagine a database that is patched before you even know that you need a patch (let alone apply it). Oracle ADB provides protection from both external attacks and malicious internal users.
- Self-repairing: Automated protection from all downtime, it backs itself up. Oracle eliminates human errors with automation.
- Self-tuning: It looks at indexes and ensures the proper execution plan is used while creating or dropping indexes as needed using machine learning.
- Self-patching and upgrading: Security patches are automatically applied.

Innovative Autonomous Features

Oracle has a very long history as the leader in data management and is now a pioneer in automation and machine learning. Within the last 30-plus years, Oracle has been automating the core capabilities of the database technology from memory to storage management. Autonomous Database includes the following innovative features and capabilities:

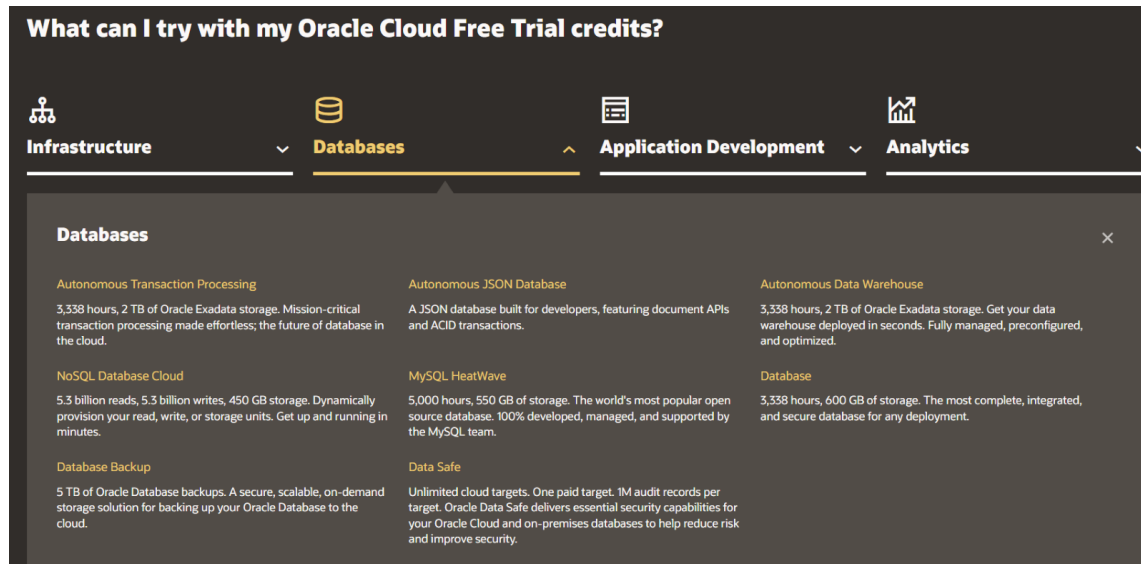
1. **Auto Provisioning:** Deploys mission-critical databases, including RAC, on Exadata Infrastructure with fault-tolerant, highly available, seamless scale-out, protection from server failure, and maintenance with rolling fashion management.
2. **Auto Configuration:** Configures databases to optimize specific workloads with everything from memory to data formats and storage structure to ensure performance. Just load the data and start using the database.
3. **Auto Indexing:** Monitors database workloads and adds indexes to accelerate applications, including validation for effectiveness with machine learning for correction and adjustment.
4. **Auto Scaling:** Allows your database to use more CPU and IO resources or additional storage automatically when the workload or storage demand requires additional resources without downtime.
5. **Auto Data Protection:** Protects sensitive data with user-defined data classification and secures data for unusual database activities.
6. **Auto Security:** Encrypts data for the entire database, backup, and during data transport across the network with additional protection from phishing attacks, such as admin, internal, and OS privileges.
7. **Auto Backup and Recovery:** Backs up databases based on daily schedules and on-demand, including recovery capability with point-in-time within the last 60 days.
8. **Auto Patching:** Patches or upgrades with zero downtime for application.
9. **Auto Resolution and Detection:** Detects failures across hardware and software with machine learning, such as fault and error pattern recognition. Eliminates timeouts and deviation, such as redirecting unhealthy compute resources before a fault occurs.
10. **Auto Optimization:** Optimizes workloads with data formats, parallel processing, and database execution plans, including baselines.
11. **Autonomous Data Guard and Automatic Failover:** Data Guard can be used to protect critical databases from failures and disasters. Automatic Failover with zero-data loss to standby provides 99.995% SLA and is completely transparent to end-user applications.

Autonomous Databases are all auto-scale enabled by default, meaning they can scale up in compute resources as needed to optimize cost and provide performance on demand. All scaling operations occur while the applications continue to be available online to process business-critical workloads.

Where do you start?

You can try out the autonomous database for 30 days at: cloud.oracle.com/tryit or oracle.com/cloud/free

It will take you to a screen that will allow you to register for a free trial. The free trial gives you access to many products, but you can continue using the autonomous database indefinitely (as long as you use it regularly).



Once you've set up your account, you can log in, and Oracle will take you to the Get Started Screen. Notice that if you want to continue with the free version, this also tells you which products are *Always Free Eligible*. You can also select these items from the "hamburger icon," the three lines in the upper left corner.



Creating an Autonomous Database

Let's create an Autonomous Data Warehouse (ADW) Database. Click the hamburger menu in the upper left corner and select Oracle Database. Click create ADW box and notice the choices that come up for ADW (Autonomous Data Warehouse), ATP (Autonomous Transaction Processing), AJD (Autonomous JSON Database), and Apex (Application Development Database).

It will also ask for the number of CPUs, size in Terabytes, and username/password.

Create Autonomous Database

Display name

AUKW9SFRT03DU9RP

A user-friendly name to help you easily identify the resource.

Database name

AUKW9SFRT03DU9RP

The name must contain only letters and numbers, starting with a letter. Maximum of 30 characters.

Choose a workload type

Data Warehouse

Built for decision support and data warehouse workloads. Fast queries over large volumes of data.

✓

Transaction Processing

Built for transactional workloads. High concurrency for short-running queries and transactions.

JSON

Built for JSON-centric application development. Developer-friendly document APIs and native JSON storage.

APEX

Built for Oracle APEX application development. Creation and deployment of low-code applications, with database included.

Choose a deployment type

Shared infrastructure

Run Autonomous Database on Shared Exadata Infrastructure.

✓

Dedicated infrastructure

Run Autonomous Database on Dedicated Exadata Infrastructure.

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.

Storage (TB)

1

☒ OCPU auto scaling

Allows systems to expand up to three times the provisioned OCPU as workload increases. [Learn more](#) about auto scaling.

☐ Storage auto scaling

Allows system to expand up to three times the reserved storage.

Next, the database is provisioning (being built). The process takes little time. In our example, this process took approximately 2.5 minutes. In the following figure, the database is now available.

ADW

PROVISIONING

DB20220112

Database Actions

DB Connection

Performance Hub

Manage Scaling

More actions ▼

Autonomous Database information

Tools

Tags

General information

Database name: DB20220112

Workload type: Data Warehouse

Compartment: ██████████

OCID: ...zqxnwq [Show](#) [Copy](#)

Created: Mon, Dec 5, 2022, 18:09:39 UTC

OCPU count: 1

OCPU auto scaling: Enabled ⓘ

Storage: 1 TB

Storage auto scaling: Disabled ⓘ

License type: Bring your own license (BYOL), Standard Edition

Database version: 19c

Lifecycle state: Provisioning [Check database availability](#)

Instance type: Paid

Character set: AL32UTF8

National character set: AL16UTF16

Infrastructure

Dedicated infrastructure: No

Autonomous Data Guard ⓘ

Status: Disabled [Enable](#)

Backup

Last automatic backup: No active backups exist for this database.

Network

Access type: Allow secure access from everywhere

Access control list: Disabled [Edit](#)

Mutual TLS (mTLS) authentication: Required [Edit](#) ⓘ

Maintenance ⓘ

As shown below, you can also easily **scale up/down** the CPUs or the database size on the fly.

With Autonomous DB, we can create a point-in-time copy of the database or a backup of the ADB.

We can create three types of clones:

1. Full Clone: completely new database with all data and metadata.
2. Refreshable Clone: a refreshable PDB with the ability to create a carousel for up to 7 days.
3. Metadata Clone: schema structure without any data.

Create Autonomous Database Clone

Choose a clone type

Full Clone

Creates a new database with source database's data and metadata.



Refreshable Clone

Creates a read-only full clone that can be easily refreshed with source database data. Must be refreshed within 7 days (168 hours) to remain connected to the source database.

Metadata Clone

Creates a new database that includes all source database schema metadata, but not the source database data.

Clone source ⓘ

☒ Clone from database instance

Creates a clone of a running database as it currently exists.

☐ Clone from a backup

Use to create a clone of a backup, or to create a point-in-time clone.

Provide basic information for the Autonomous Database clone

Choose your preferred region

US West (Phoenix) - Current Region

Create in compartment

[Redacted]

Source database name *Read-only*

DB20220112

Create Autonomous Database Clone

[Cancel](#)

Autonomous JSON Database and Application Development Database

You can also build an Autonomous JSON Database (AJD) and an Application Development Database, as shown in the following image, by selecting the Workload type on the Autonomous Database resource page.

Autonomous Database

Autonomous Database

Dedicated Infrastructure

Autonomous Container Database
Autonomous Exadata VM Cluster
Exadata Infrastructure

List scope

Compartment

Filters

Workload type

All
All
Data Warehouse
Transaction Processing
JSON Database
APEX

Autonomous Databases in (root) Compartment

Autonomous Database delivers fast performance and requires no database administration. It performs all routine database maintenance. Databases located in the Oracle cloud can run on dedicated or shared infrastructure. [Learn more](#)

Create Autonomous Database

Display Name	State	Dedicated	OCPUs	Storage	Workload type
DB20220112	Available	No	1	1 TB	Data Warehouse


The AJD fully supports the native binary JSON datatype, which is available in Oracle Database 21c. With AJD, customers can leverage relational database features, including transactions, indexing, declarative querying, and views. AJD supports the new native binary JSON file sizes of up to 32 MB, which is twice the size of the leading competitor.

Application Development Database is an Oracle Database pre-integrated and pre-configured with APEX for rapidly building and deploying modern data-driven applications in Oracle Cloud. Business users, citizens, and application developers can create enterprise apps 20X faster with 100X less code—without having to learn complex web technologies with just a browser.

Provisioning the AJD or Apex DB can take anywhere between 5-7 minutes.

Autonomous Database and Machine Learning

We believe that leveraging the Autonomous Database for Machine Learning is the best use of all. It makes using SQL & PL/SQL easy to leverage built-in algorithms that Oracle's massive AI, Machine Learning, and Data Science team have put together over the past decade. Below shows how to go from the Service Console to Development (includes: SQL, APEX, and Machine Learning).



AVAILABLE

DB20220112

Database Actions DB Connection Performance Hub Manage Scaling More actions

Autonomous Database information Tools Tags

General information

Database name: DB20220112

Workload type: Data Warehouse

Compartment: (root)

OCID: ...zqemvq Show Logs

Infrastructure

Dedicated Infrastructure: No

Autonomous Data Guard

ORACLE Database Actions | Launchpad

Development

<p>SQL</p> <p>Execute queries and scripts, browse and manage your database object...</p>	<p>DATA MODELER</p> <p>Reverse-engineer schemas to relational diagrams and data...</p>
<p>REST</p> <p>An IDE for your REST APIs that enables you to manage templates...</p>	<p>LIQUIBASE</p> <p>View ChangeLogs applied to your schema.</p>
<p>JSON</p> <p>Create collections, upload documents, query and filter your...</p>	<p>CHARTS</p> <p>Use SQL queries to build rich charts and dashboards containing multip...</p>
<p>SCHEDULING</p> <p>An interface for DBMS_SCHEDULER that enables you to monitor jobs...</p>	<p>ORACLE MACHINE LEARNING</p> <p>Oracle Machine Learning provides several components accessible...</p>
<p>APEX</p> <p>Login to APEX, develop and run rich, low-code web applications.</p>	<p>GRAPH STUDIO</p> <p>Oracle Graph Studio lets you create property graph databases and...</p>

Data Studio

<p>DATA STUDIO OVERVIEW</p> <p>Data Studio Tools</p>	<p>DATA LOAD</p> <p>Load or access data from local files or remote databases.</p>
<p>CATALOG</p> <p>Understand data dependencies and the impact of changes.</p>	<p>DATA INSIGHTS</p> <p>Discover anomalies, outliers and hidden patterns in your data.</p>
<p>DATA TRANSFORMS</p> <p>Transform data for analysis and other applications.</p>	<p>DATA ANALYSIS</p> <p>Analyze your data.</p>

Administration

<p>DATABASE USERS</p> <p>REST enable schemas, change passwords, assign storage quota...</p>	<p>APEX WORKSPACES</p> <p>Create and delete APEX workspaces, view the list of...</p>
<p>DATA PUMP</p> <p>View Data Pump jobs and use our wizard to quickly create and run...</p>	<p>DOWNLOAD CLIENT CREDENTIALS (WALLET)</p> <p>Connections to Autonomous Database use a secure connection...</p>

Monitoring

<p>PERFORMANCE HUB</p> <p>Access SQL Monitoring reports and Active Session History (ASH)...</p>	<p>DATABASE DASHBOARD</p> <p>Monitor database activity charts such as CPU usage, number of...</p>
---	---

The following screen shows how to get started, run SQL, or look at great examples.

How Do I?



Get Started

Get started with Oracle Machine Learning



Use AutoML

How to create AutoML Experiments



Deploy Models

How to Deploy Machine Learning Models



Create Notebooks

How to create a notebook



Create Jobs

How to create a job



Manage Permissions

How to manage collaborative permissions in workspaces



Try It

Follow along with a hands on workshop

Quick Actions



AutoML

Create and run AutoML Experiments



Models

Manage and Deploy Machine Learning Models



Scratchpad

Run Scratchpad



Notebooks

The place for data discovery and analytics



Jobs

Schedule notebooks to run at certain times



Examples

Check out some examples

Example Templates

+ Create Notebook

Filter

OML Import Wiki ESA Model

This notebook imports the wiki ESA model to Autonomous Database for...

Author: Oracle

Date Added: 8/19/22, 2:41 AM

Tags: '19c' '21c' 'SQL' 'Python' 'Explicit Semantic Analysis' 'ESA' 'Text Anal...

☆ 0 Likes

OML Run-me-first

This notebook loads and prepares tables with data from the CUSTOMER...

Author: Oracle

Date Added: 1/6/22, 12:14 PM

Tags: '19c' '21c' 'SQL' 'Data Loading' 'Object Storage' 'DBMS_CLOUD' 'N...

☆ 0 Likes

OML Third-Party Packages - Environment Creation

This notebook demonstrates a typical workflow for third-party conda en...

Author: Oracle

Date Added: 12/1/22, 10:57 PM

Tags: '19c' '21c' 'Object Storage' 'Python' 'R' 'conda' 'third party' 'packag...

☆ 0 Likes

OML Third-Party Packages - Python Environment ...

This notebook demonstrates a typical workflow for third-party conda en...

Author: Oracle

Date Added: 12/1/22, 10:57 PM

Tags: '19c' '21c' 'Python' 'conda' 'third party' 'package' 'library'

☆ 0 Likes

OML Third-Party Packages - R Environment Usage

This notebook demonstrates a typical workflow for third-party conda en...

Author: Oracle

Date Added: 12/1/22, 10:57 PM

Tags: '19c' '21c' 'R' 'conda' 'third party' 'package' 'library'

☆ 0 Likes

OML4Py -0- Tour

This notebook highlights a wide range of OML4Py features and different...

Author: Oracle

Date Added: 1/6/22, 12:14 PM

Tags: '19c' '21c' 'Python' 'AutoML' 'Summary Statistics' 'Model Build' 'Mo...

☆ 0 Likes

OML4Py -1- Introduction

This notebook highlights OML4Py core features

Author: Oracle

Date Added: 1/6/22, 12:14 PM

Tags: '19c' '21c' 'Python' 'Model Build' 'Model Apply' 'Create Database T...

☆ 0 Likes

OML4Py -2- Data Selection and Manipulation

This notebook highlights the OML4Py Transparency Layer for data select...

Author: Oracle

Date Added: 1/6/22, 12:14 PM

Tags: '19c' '21c' 'Python' 'Correlation' 'iris' 'Data Selection' 'Proxy Object...

☆ 0 Likes

As you see above, there are many examples of Machine Learning to choose from; but the number of algorithms and business applications are even more numerous.

By December 2021, 40 Regions will exist worldwide for customers to provision cloud services, and another 9+ are being added soon.

Oracle's investment in their R&D and Cloud makes them a formidable vendor, as you consider database and application workloads in the Cloud.

Summary

If you are considering migrating databases to the Cloud, you should consider Autonomous Databases as an option for simplicity and cost savings.

You can use the Database Migration Utility provided by Autonomous Database to easily migrate your data from MySQL, PostgreSQL, SQL Server, and other databases. ADB supports connectivity via SQL*Net, JDBC, and ODBC. Are you using Microsoft Azure? No problem. Microsoft Azure and Azure Active Directory (Azure AD) users can now connect to an Autonomous Database instance. Also, 12 of the available regions in OCI are interconnected with Azure, and you can directly connect ADB with your Azure Web Apps.

While migrating critical workloads to the Cloud, ATP/ADW/AJD/Apex (whether with bringing your own license (BYOL) or with all licenses included models) often is a cost-effective option while providing greater performance and flexibility.

While considering migrating to the Cloud, please consult the Oracle Autonomous Database Schema Advisor DOC ID: 2462677.1. The ADB Schema Advisor is a light-weight utility that analyzes the customer's database schemas for migration to the Autonomous Database. The Advisor analyzes the schema objects and identifies if differences exist when the object gets created on ADB by providing reports on:

- Counts of discovered objects and a summary of migration status
- Identify objects that cannot be migrated to the Autonomous Database potential issues like certain data types, database options, and SQL
- Identify objects that will migrate with modifications
- Provide some best practice recommendations and guidance

One of the sayings we have at Viscosity is our customers "have four aces in their pocket." Over the next 8 days, the talented staff at Viscosity, along with our Oracle ACEs, will address more Oracle Database 18c and 19c new features. Continue to join us next year as we continue our Oracle Database 19c hands-on lab workshops.

Happy Holidays!

References

- Oracle 19c/20c Documentation
- *Oracle12c Release 2 Performance Tuning Tips & Techniques*; Richard J. Niemiec; Oracle Press
- www.viscosityna.com, www.ioug.org, www.oracle.com, en.wikipedia.org, www.amazon.com, www.rolta.com, computerweekly.com, www.tusc.com, TechTarget, Pepper the Robot & technet.oracle.com
- Maria Colgan ADWC presentation, George Lumpkin ADWC introduction, Yasin Baska ADWC step-by-step guide, Information Week, Gartner, Computerworld.
- All companies and product names are trademarks or registered trademarks of the respective owners
- Rich Niemiec ©2020. This document cannot be reproduced without expressed written consent from Rich Niemiec or Viscosity NA, but may be reproduced or copied for article, presentation and conference use.
- Neither Viscosity nor the author guarantee this document to be error-free. Please provide comments/questions to richniemiec@gmail.com – rich.niemiec@viscosityna.com; I am always looking to improve!