



Oracle Enterprise Manager for Autonomous Databases

This technical white paper discusses what Database Administrators (DBAs) need to know to accelerate their adoption of Oracle Autonomous Database using Oracle Enterprise Manager skills they already possess.

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PURPOSE STATEMENT

This document provides an overview of features and enhancements included in release Oracle Enterprise Manager 13.4. It is intended solely to help you assess the business benefits of upgrading to Oracle Enterprise Manager 13.4 and to plan your I.T. projects.

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Due to the nature of the product architecture, it may not be possible to safely include all features described in this document without risking significant destabilization of the code.

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INTRODUCTION

This technical white paper discusses what Database Administrators (DBAs) need to know to accelerate their adoption of Oracle Autonomous Database using Oracle Enterprise Manager skills they already possess.

Autonomous Database Products

Oracle Autonomous Database is a family of self-driving, self-securing, and self-repairing cloud services. It's the world's first autonomous database, and it redefines data management by using machine learning and automation to eliminate human labor, human error, and manual tuning, reducing cost and complexity and ensuring higher reliability, security, and more operational efficiency. Oracle Autonomous Database supports a complex mix of high-performance transactions, including reporting, batch, Internet of Things (IoT), and machine learning in a single database. This simplifies application development and deployment and enables real-time analytics, personalization, and fraud detection.

Oracle Autonomous Database is offered in two configurations, Oracle Autonomous Transaction Processing Service and Oracle Autonomous Data Warehouse Service. Both services are available in Shared Infrastructure and Dedicated forms. For more information about these services, please visit oracle.com/database.

Ongoing day-to-day management of an Autonomous Database is entirely automated. Space management, patching and upgrades, database-level tuning, diagnosing errors and performing regular health checks is done automatically without requiring user intervention. However, customers control what their application logic actually does, and as such, application-level tuning and cross-tier diagnostics tasks as well as estate-wide optimizations and planning remain key aspects of the DBA responsibility. In this shared responsibility model, DBAs can save time by allowing Oracle Autonomous Database take care of time-consuming systems tasks and focus on higher value application and business level optimizations. For those tasks, customers can take advantage of Oracle's Manageability capabilities that are provided through Oracle Enterprise Manager.

Oracle Enterprise Manager Products

Oracle Enterprise Manager is Oracle's on-premise management platform that provides a single dashboard to manage all of your Oracle deployments, in your data center or in the cloud. Through deep integration with Oracle's product stack, it provides market-leading management and automation support for Oracle applications, databases, middleware, hardware, and engineered systems. Oracle Enterprise Manager 13.4 has introduced significant updates to enable faster adoption of Oracle Autonomous Database and improve database administrators' operational visibility and control across their hybrid database estates. The capabilities include comprehensive monitoring and management for Oracle's latest technology, including Autonomous Database and Exadata Cloud Service.

Enterprise Manager Deployment Options

Oracle Enterprise Manager can be deployed on either Oracle Cloud Infrastructure or On-premises. Each deployment model has its advantages.

Oracle Enterprise Manager Deployed On-premises

This mode is the traditional method of deployment and its main advantage is that DBAs who are familiar with Oracle Enterprise Manager installation and configuration processes will simply follow their best practices to meet their requirements. Oracle Enterprise Manager deployed On-premises connects with the Autonomous database using a Private IP address, and you can use one of the following options to connect Oracle Enterprise Manager deployed in your on-premises network to the Autonomous database in your Oracle Cloud Network.

1. VPN Connect, which is an Internet Protocol Security (IPSec) VPN. IPSec VPN provides standards-based IPSec encryption over public internet.
2. FastConnect, which provides an easy way to create a dedicated, private connection between the on-premises network and the VCN in Oracle Cloud Infrastructure.

The below diagram provides an overview of how Oracle Enterprise Manager deployed on-premises connects and interacts with Autonomous Dedicated databases in Oracle Cloud Infrastructure.

The two connectivity options, VPN Connect and FastConnect, are displayed to demonstrate how Oracle Enterprise Manager deployed on-premises connects with the Autonomous databases using these options.

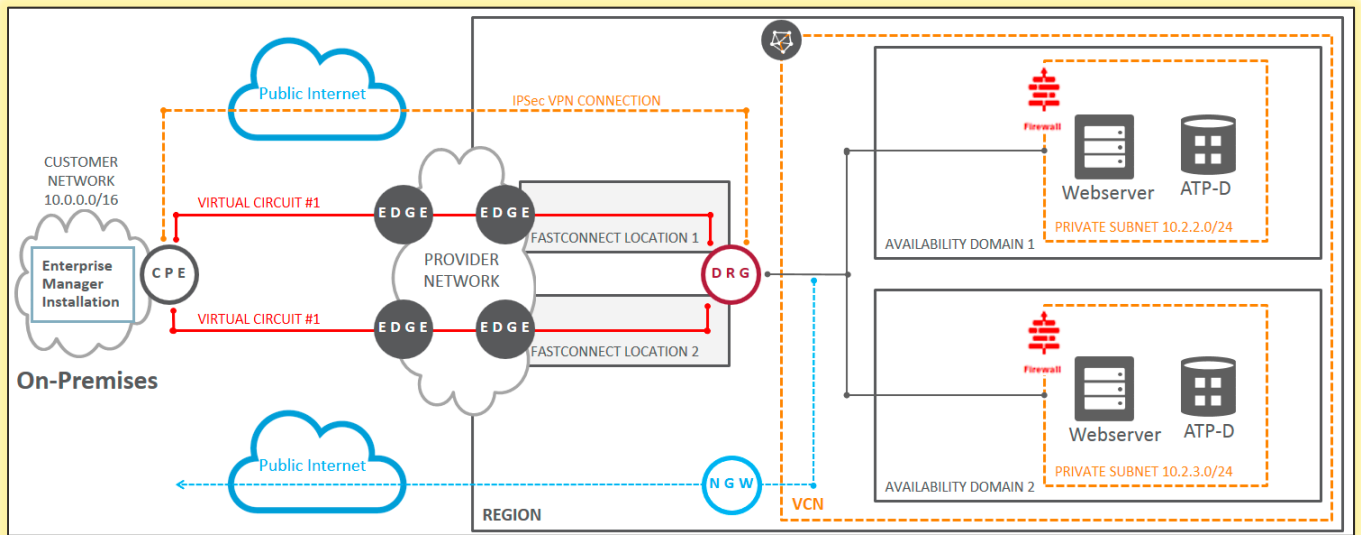


Figure 1. Oracle Enterprise Manager deployed on-premises connects with Autonomous databases in Oracle Cloud Infrastructure.

Oracle Enterprise Manager Deployed in Oracle Cloud Infrastructure

Oracle Enterprise Manager 13c is now available as a pre-configured, ready-to-use app on Oracle Cloud Marketplace. Customers who are interested in trying Oracle Enterprise Manager without having to provision on-premises hardware, have an easy path to start working with a fully configured, updated Oracle Enterprise Manager instance with minimal installation effort.

The network path to an Autonomous database is through a Virtual Cloud Network (VCN) and subnet defined by the dedicated infrastructure hosting the database. Usually, the subnet is defined as private, meaning that there is no Public Internet access to the database. Oracle Enterprise Manager should be available in a Public or Private subnet in the same VCN as the Autonomous database. Private IP addresses are used to connect Oracle Enterprise Manager with the Autonomous database in the Oracle Cloud Network.

The following diagram provides an overview of how Oracle Enterprise Manager deployed on Oracle Cloud Infrastructure Marketplace connects with Autonomous databases.

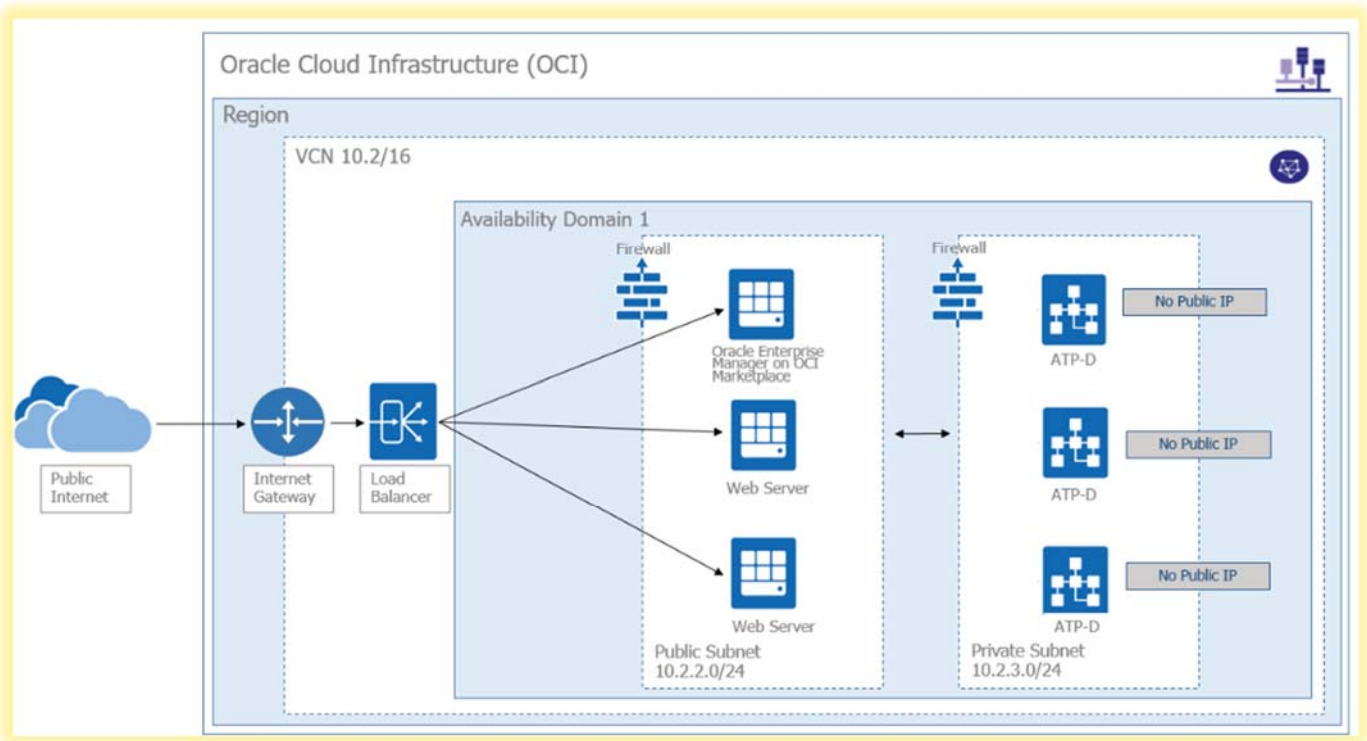


Figure 2. Oracle Enterprise Manager deployed in Oracle Cloud Infrastructure market place connects with Autonomous databases in Oracle Cloud Infrastructure.

In the following sections, we will explore what administrative functions and features are available in Oracle Enterprise Manager for monitoring and managing Oracle Autonomous Databases.

AUTONOMOUS DATABASE MANAGEMENT WITH ORACLE ENTERPRISE MANAGER

There are four areas in which Oracle Enterprise Manager can benefit DBAs who plan to deploy Oracle Autonomous Database:

1. Discovering Autonomous Databases
2. Monitoring the health and performance of Autonomous Databases and performing deep diagnostics using features like ASH Analytics, Real-Time SQL Monitoring and similar.
3. Completing database administration tasks such as automatic index management, storage management, and schema management tasks such as creating database objects
4. Migrating databases and managing the entire fleet: the new release of Enterprise Manager 13.4 adds functionality that automates database migration and provides a single dashboard that improves visibility, control, and management for hybrid IT environments.

Discover Autonomous Databases in Oracle Enterprise Manager

Oracle Autonomous Database configures and optimizes your database for you. You do not need to perform administration operations for configuring the database. This essentially means that you as an administrator do not have direct access to the database host. Similarly, other administrative interfaces and utilities such as RMAN are not available.

Traditionally, if you want to monitor a target running on a host, you first need to convert the unmanaged host to a managed host by installing a Management Agent, and then discover the targets running on it to start monitoring them. In the case of autonomous databases, this is not a viable solution, as you do not have access to the host where the autonomous database runs. Autonomous Databases are considered as non-host targets. They can be discovered and monitored using a discovery agent that runs in the customer premises or on OCI. This discovery agent is a regular Enterprise Manager agent running on a host at customer's premises or on OCI, which has SQLNET access to the Autonomous database. This agent might already exist and be running and monitoring a different Oracle database deployed on-premises or Oracle Cloud. To help aid the discovery, Enterprise manager replies on a database user called adbsnmp, which is created out-of-the-box when you create the autonomous database. NOTE: The adbsnmp user account is locked by default and you can reset the password and unlock it using Oracle Enterprise Manager or your preferred database IDE (such as Oracle SQLDeveloper Web).

Discovery process

1. The Autonomous database administrator creates the database from OCI console or API and downloads the credentials wallet
2. The Enterprise Manager administrator EITHER installs a new Enterprise Manager on OCI Marketplace OR configures an existing on-premises Enterprise Manager to connect to OCI
3. The Enterprise Manager administrator logs into Enterprise Manager and performs a manual discovery via EM user interface or emcli or REST API (see the following sections)
4. The Enterprise Manager administrator inputs the credential wallet file, monitoring user (adbsnmp) credential (unlocks it if needed) and admin credentials for active management as they would for any other database

With these 4 steps, discovery should be complete, and the Autonomous database is ready to be monitored and managed via Enterprise Manager.

Discovering Autonomous Databases Using the Oracle Enterprise Manager Console

1. From the Setup drop-down list, select Add Target, and then select Add Targets Manually.
2. On the Add Targets Manually page, click Add Target Declaratively on the Add Non-Host Targets Using Declarative Process tile.
3. In the Add Target Declaratively dialog box, select the host on which the agent that you are using to discover the Autonomous Database is installed and running.
4. In the Target Type field, enter and select Autonomous Transaction Processing Database, and click Add.
5. Oracle Enterprise Manager discovers this target type on the host you selected in the previous step.
6. On the Add Database Instance: Properties page, specify the following monitoring details:
 - a. Enter a name to identify the Autonomous Database target in the Target Name field.
 - b. Upload the client credentials wallet .zip file that contains the credentials to access data in your Autonomous Database.

- i. After you upload the client credentials wallet .zip file, the Service Name, Monitoring Username, Monitoring Password, Role, and Connection Descriptor fields are automatically populated.
 - ii. Note that you can change the Service Name value; however, it is recommended that you keep the default value, <dbname>_tp.
 - c. Enter the monitoring (adbsnmp) password. Note that if you are a first time user, you must enter a new password to reset it and unlock the adbsnmp account.
7. Click Test Connection to test the connection made to the Autonomous Database.
 8. Click next and review the displayed information.
 9. Click Submit.

After you have discovered the Autonomous Database in Oracle Enterprise Manager, you can verify if the discovery was successful by clicking the Targets drop-down list > Databases option. The Autonomous Database you discovered should be listed on the Databases page.

Discovering Autonomous Databases Using EM CLI

You can use the EM CLI command as below to discover autonomous databases.

```
emcli add_cloud_db_target -target_name="emcli_atp"
-target_type="oracle_cloud_atp"
-host="myhostname.example.com"
-zip_file_location="/u01/oracle/atpd/wallet_ATPD1.zip"
-credentials="UserName:adbsnmp;password:adbsnmp;Role:Normal"
-service="ATPD1_tp"
-is_dedicated="true"
-protocol="tcp"
```

EM CLI Options

1. -target_name: Name of the Autonomous Database.
2. -target_type: Type of Autonomous Database. The target type value for Autonomous Transaction Processing – Dedicated database is oracle_cloud_atp.
3. -host: Host on which the agent that you are using to discover the Autonomous Database is installed and running.
4. -zip_file_location: Location of the downloaded client credentials wallet .zip file.
5. -credentials: adbsnmp user credentials.
6. -service: Preconfigured database service name, for example, tp, high, and medium. tp is the default value, for example, <dbname>_tp.
7. -is_dedicated: True. Defaults to true to support Autonomous dedicated.
8. -protocol: Network communication protocol. TCP is the default value.

After you have discovered the Autonomous Database in Oracle Enterprise Manager, you can verify if the discovery was successful by clicking the Targets drop-down list > Databases option. The Autonomous Database you discovered should be listed on the Databases page.

Discovering Autonomous Databases Using REST API

You can discover Autonomous Databases using REST API as below

Feature	Description
URL	https://<OMS fully qualified domain host>:<EM port>/em/websvcs/restful/emws/oracle.sysman.db/v0/discovery/add_cloud_db_target
Request Header	Content-Type: application/json

Body	<pre>{ "target_name": "<target name>", "target_type": "<target type>", "host": "<agent host name>", "credentials": "UserName:adbsnmp;password:<password>;Role:Normal", "zip_file_location": "<client credentials wallet .zip file location>", "service_name": "<dbname>_tp", "is_dedicated": "<true>", "protocol": "tcp" }</pre>
Request Method	POST

After you have discovered the Autonomous Database in Oracle Enterprise Manager, you can verify if the discovery was successful by clicking the Targets drop-down list > Databases option. The Autonomous Database you discovered should be listed on the Databases page.

Monitor and Administer Autonomous Databases in Oracle Enterprise Manager

Oracle Enterprise Manager uses the same techniques to monitor, diagnose and troubleshoot performance issues, as well as secure and manage Oracle Autonomous Database as it does for traditional databases. So, other than manual discovery, there is nothing new to learn for existing Oracle Enterprise Manager users. Leveraging the same skillset will help DBAs accelerate adoption of Oracle Autonomous Database. Let's take a closer look at the kinds of Autonomous Database activities DBAs might undertake with Oracle Enterprise Manager

Monitor the state and workload of the Autonomous Database on the Database Home page

The Database home page provides overall monitoring of key performance indicators from the database such as resource utilization and performance information needed for making scale up/down decisions.

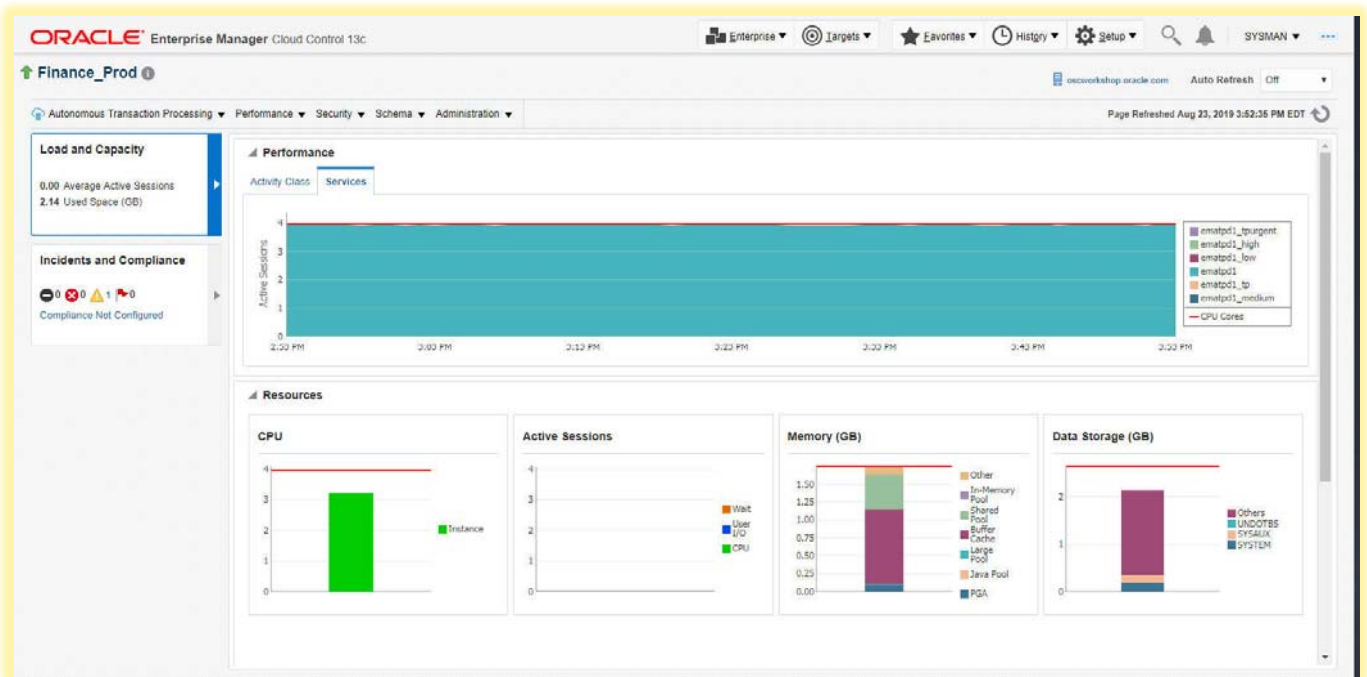


Figure 3. Oracle Enterprise Manager Database Home Page shows aggregated performance and utilization metrics for the Autonomous Database instance.

Diagnose Autonomous Database Performance

Autonomous Database includes automatic (real-time) statistics, automatic indexing, and automatic SQL plan management, relieving developers and DBAs from common and tedious performance tuning. It also gives developers and DBAs access to the same in-depth performance analysis features found in Oracle Database to provide insight into performance of SQL and applications using Autonomous Database. These enterprise manager features can be used to evaluate the effectiveness of a give database schema and functional correctness of SQL.

Autonomous Database performance diagnostics uses the same, industry-leading features that Enterprise Manager offers for other Oracle Database flavors, such as:

1. Automatic Workload Repository (AWR)
2. Performance Hub
 - ASH Analytics
 - SQL Monitoring
3. SQL advisors to optimize the Autonomous Database's performance
4. Automatic Indexing configuration (specific to Autonomous Database)
 - Automatic indexing as a feature requires little to no manual intervention, but Enterprise Manager provides control over user-managed settings that configure auto indexing and also generate Index usage reports.

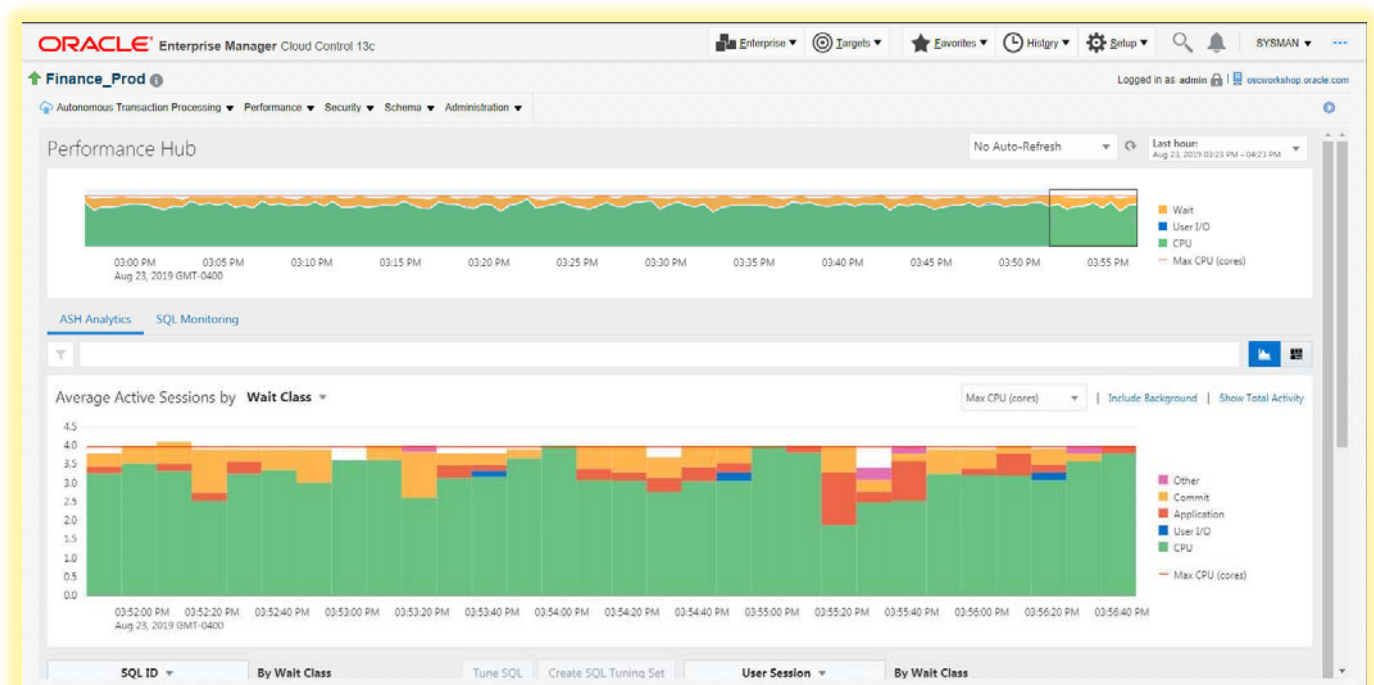


Figure 4. Oracle Enterprise Manager Performance Hub shows detailed telemetry from Active Session History (ASH) for deep diagnostics.

Keep the Autonomous Databases secure

Most Autonomous Database security aspects (such as configuration management and patching) are taken care of automatically, but users necessarily maintain control of certain settings. From the Security drop-down list on the Database Home page, you can manage the user-controlled portion of the Autonomous Database security settings by selecting one of the following options:

1. Users: Create a user with a valid username and password to prevent unauthorized use. You can also associate specified privileges, roles, and so on with a user.
2. Roles: Create a role to group together privileges and other roles. This facilitates granting multiple privileges and roles to users.
3. Profiles: Create a profile, which is a set of user authorizations and privileges.
4. Audit Settings: Set up and adjust audit settings to monitor and record selected user database actions.
5. Privilege Analysis: Perform a dynamic analysis of privileges and roles that a user account or database uses over time. You can then revoke unused grants and make other changes to better reflect the access a user requires.
6. Virtual Private Database: Create security policies to enforce row-level security policies at the object (table, view, or synonym) level, when the standard object privileges and associated database roles are insufficient to meet application security requirements.

Perform Schema Management tasks

Oracle Enterprise Manager provides a comprehensive set of tools that allows you to manage all aspects of database objects such as tables, indexes, and views. From the Schema drop-down list on the Database Home page, you can select one of the following options to perform fundamental tasks such as creating, editing, and viewing schema objects:

1. Database Objects: Create and manage all aspects of database objects such as tables and indexes.
2. Programs: Manage procedures, functions, triggers and so on associated with the Autonomous Database.

CONCLUSION

Oracle's Autonomous Database automates all system-level operational DBA functions. The new capabilities of Oracle Enterprise Manager enable enterprises to easily adopt Oracle Autonomous Database and Exadata Cloud Service and improve their security posture, while leveraging the same skillsets and processes their DBA teams are used to from Oracle Enterprise Manager. Specifically for DBAs, the ability to deliver higher quality and more agile database administration services helps to elevate their impact and effectiveness, resulting in better outcomes for IT and business.

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