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Making Movie Recommendations by Using Graph Analytics

Public

Purpose Statement

This paper describes how developers and technical professionals can use Graph Studio in Oracle Autonomous Database to detect and create customer communities rooted in movie-viewing behavior. By using the features of Graph Studio, readers can gain insight into the connections within their data and unlock valuable information related to customer trends, personalized recommendations, and entity relationships. With a focus on ease of data ingestion and support for diverse data workloads, this paper aims to help users explore connections within data, foster a deeper understanding of customer dynamics, and enable the generation of targeted movie recommendations for community members. Whether you want to enhance recommendation systems or improve traceability in smart manufacturing, the guidance provided here ensures a robust and insightful exploration of graph analytics capabilities in Oracle Autonomous Database.

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Introduction

This technical paper documents the key learnings from an immersive workshop focused on Oracle's converged database offering, which incorporates graph databases and analytics as essential components. Leveraging the built-in graph capabilities of Oracle Database eliminates the need for a standalone, specialized database and the replication of data. This empowers analysts and developers to perform thorough analyses and uncover connections in data that provide valuable insights, such as identifying customer trends, enhancing fraud detection, or improving traceability in smart manufacturing. These analyses can be run with the added benefits of enterprise-grade security, streamlined data ingestion, and support for diverse data workloads.

Oracle Autonomous Database provides a streamlined, one-click provisioning, self-service solution called Graph Studio, which is designed to automate and simplify the modeling, management, analysis, and visualization of graphs throughout the data life cycle. Graph Studio grants users access to an array of graph analytics, encompassing over 60 prebuilt graph algorithms and a declarative language known as Property Graph Query Language (PGQL), akin to SQL. Additionally, Graph Studio supports notebooks, which lets data enthusiasts and developers conduct step-by-step analyses with the assistance of an in-memory graph analytics engine (PGX).

Modeling data through graphs provides an intuitive approach and emphasizes the connections between data entities. Graphs make it easier to explore the links between connected data entities, facilitating navigation and the drawing of fresh insights. Fundamental elements within graphs include vertices (or nodes) and edges, which establish connections between two vertices. Common instances in which graphs are applicable include social networks, financial transactions, bills of materials, and data lineage.

Graph Studio is a feature of the Oracle Autonomous Database on Shared Infrastructure, integrated into both Autonomous Transactional Processing and Autonomous Data Warehouse. Tailored for developers, analysts, data engineers, and data scientists who work with graphs, Graph Studio provides a user-friendly, low-code interface. This interface streamlines tasks such as automating graph modeling from existing relational tables in a data warehouse, conducting graph analysis, developing graph applications, and visualizing and sharing results. The combination of the Autonomous Database and Graph Studio ensures the deployment of a comprehensive graph database platform within minutes, and features one-click provisioning, integrated tooling, and robust security. Importantly, it eliminates the need for users to possess specialized database or graph expertise, enabling a quick and productive start.

Graph databases streamline the management, representation, and interaction with intricate data relationships. The graph model lets users employ pattern recognition, classification, and statistical analysis, facilitating more effective large-scale analysis of extensive datasets. The use of a graph allows for the revelation of insights from queries and algorithms.

The intent of this paper is to guide developers and technical professionals in using Oracle Autonomous Database's Graph Studio to analyze and understand customer communities derived from movie-viewing behavior. The paper helps readers use Graph Studio to detect patterns and relationships within data, particularly focusing on customer trends, recommendations, and entity relationships. The goal is to provide insights that enable the creation of targeted movie recommendations for community members.

This paper explores the following key objectives:

- **Graph Studio overview:** An introduction to the capabilities of Oracle Autonomous Database's Graph Studio, highlighting its features and functionalities related to graph analytics.

- **Customer community detection:** Guidance on using Graph Studio to identify and create customer communities based on movie viewing behavior. This includes exploring how graph analytics can reveal patterns and connections within customer data.

- **Recommendation generation:** After communities are established, the paper explains how to use the insights gained from graph analytics to generate personalized movie recommendations for community members. This involves understanding the relationships and preferences discovered through the analysis.

- **Use cases and examples:** The paper provides practical use cases and examples to illustrate the application of Graph Studio in the context of movie recommendations, including scenarios in which graph analytics add value to understanding customer behavior.

- **Implementation guide:** Step-by-step instructions on implementing the described processes using Graph Studio, ensuring that developers and technical professionals can effectively apply the concepts in a real-world setting.

- **Benefits and achievements:** The paper highlights the benefits of employing Graph Studio for customer community detection and recommendation generation, including improved customer engagement, enhanced recommendation accuracy, and operational efficiencies.

This paper is based on an Oracle LiveLabs workshop that covers certain aspects of Graph Studio. By covering these aspects, the paper aims to empower readers to harness the capabilities of Graph Studio for meaningful insights into customer behavior, ultimately leading to the creation of targeted and effective movie recommendations within the context of customer communities. The details of the LiveLabs workshops are covered in the "Getting Started Resources" section of this paper.

To get started, you need access to an Oracle Cloud Infrastructure (OCI) tenancy. If you don't have an OCI tenancy created already, set one up by using the instructions in Get an Oracle.com Account.

Alternatively, you can register on Oracle LiveLabs to access the Use Graph Analytics to Recommend Movies workshop.

Access the Autonomous Database

Sign in to OCI and access an existing instance of Autonomous Database that has the data you want to use.

1. Sign in to the Oracle Cloud Console by using your cloud username and password, or the credentials provided in the Oracle LiveLabs workshop.

   The home page of the Console is displayed.
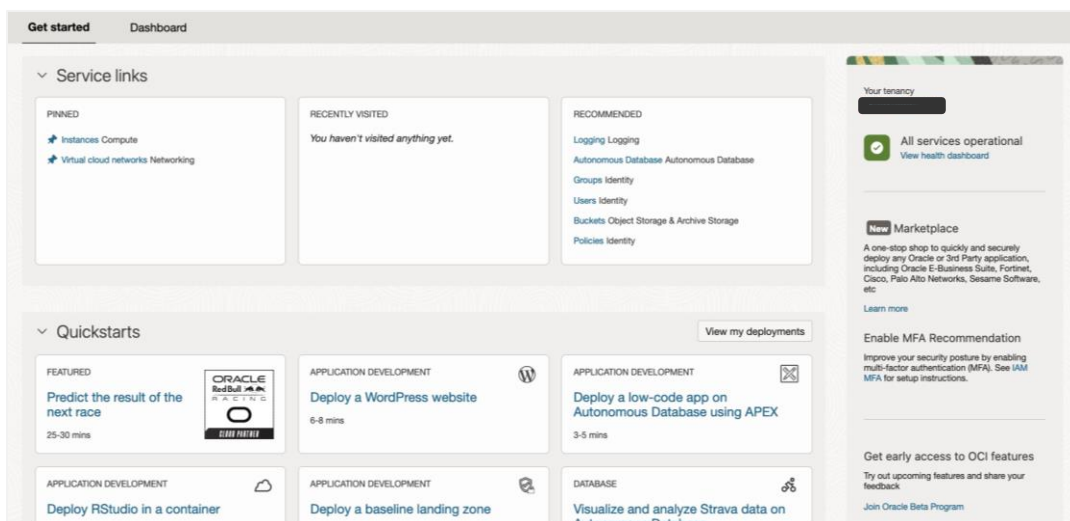
2. From the navigation menu, select **Oracle Database,** and then select **Autonomous Database**.
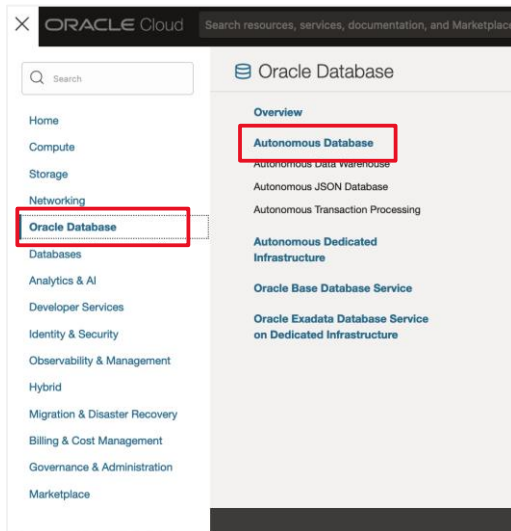

The Autonomous Databases list page for the current compartment is displayed.
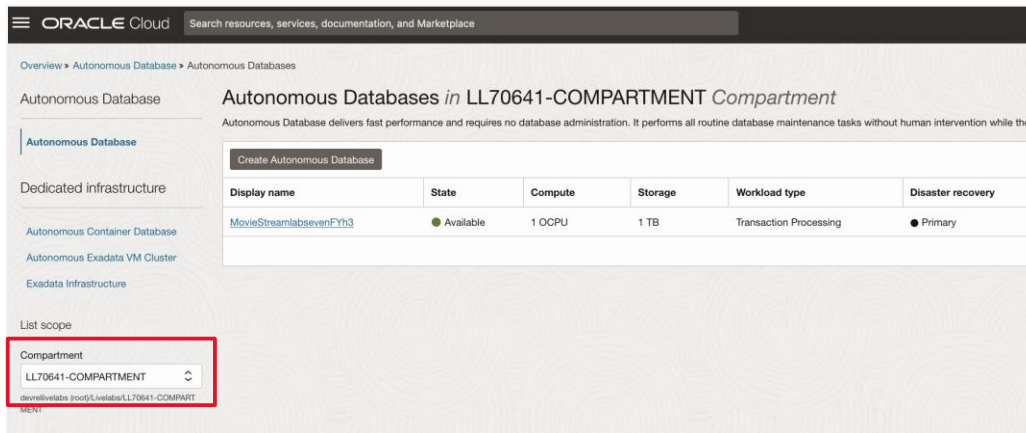
3. Ensure that you're in the compartment that contains the database that you want to use. You can view the compartment on the left-hand side of the page, under **List scope**.

   • If you're using the LiveLabs workshop, get your compartment ID from the login information page.

   • If you're not using LiveLabs workshop and have your own tenancy, select the compartment that you want to use from the list. The list displays all the compartments in the tenancy to which you have access.

4. Click the name of the database.

   The database details page is displayed.
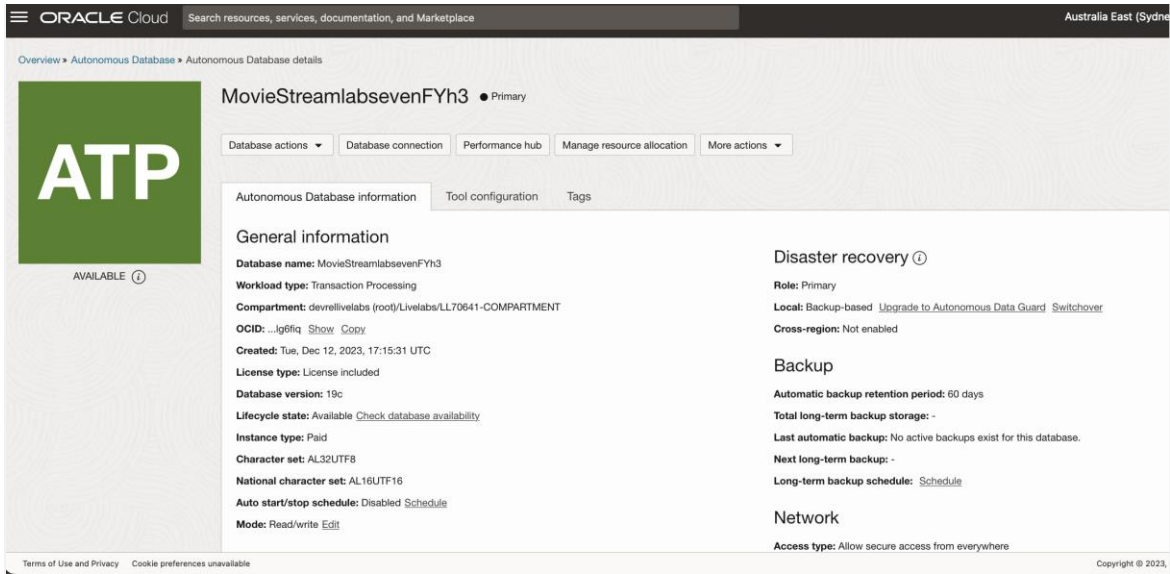
Open Graph Studio

Access to Graph Studio requires a user with graph-enabled privileges. If you're using the LiveLabs workshop, the necessary graph user has already been established for you.

1. On the database details page, select **Database actions**, and then select **View all database actions**.
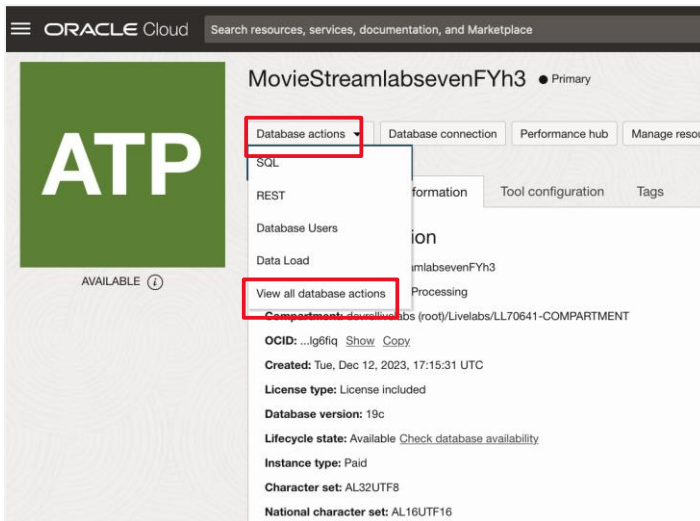
The Database Actions Launchpad is displayed.

Note: If you're using the Oracle LiveLabs workshop, use the admin credentials to sign in if needed. (The admin user password is located under **View Login Info**.) Otherwise, use the credentials that you have set up in your OCI tenancy.

2. On the Database Actions Launchpad, select **Graph Studio**.
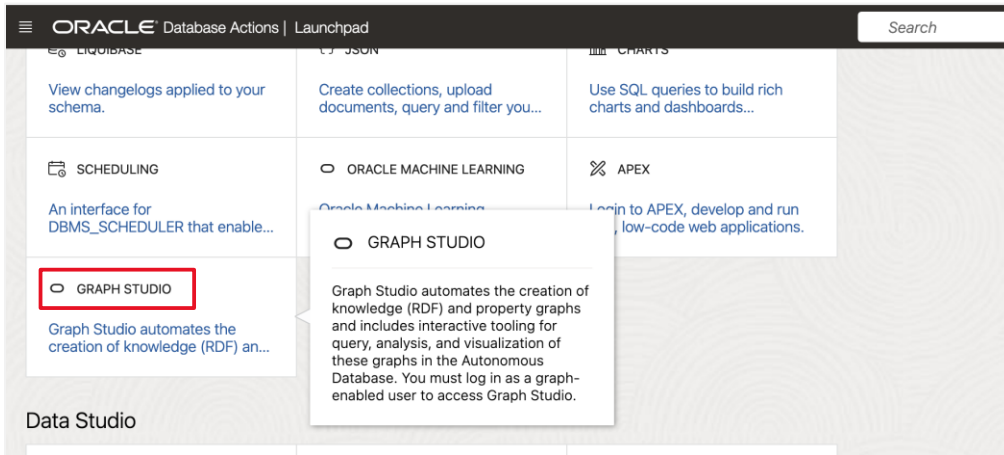
3. Log in to Graph Studio. Use the credentials for the graph user.

- If you're using the LiveLabs workshop, the graph user credentials are provided.

- If you're using your own OCI tenancy, use the Autonomous Database credentials that you created when setting up the database.
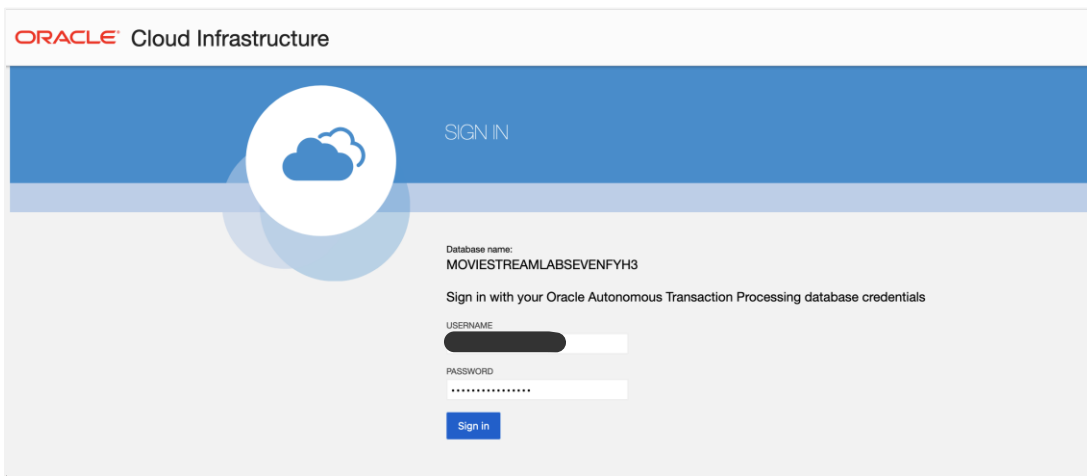
The Graph Studio interface is displayed.
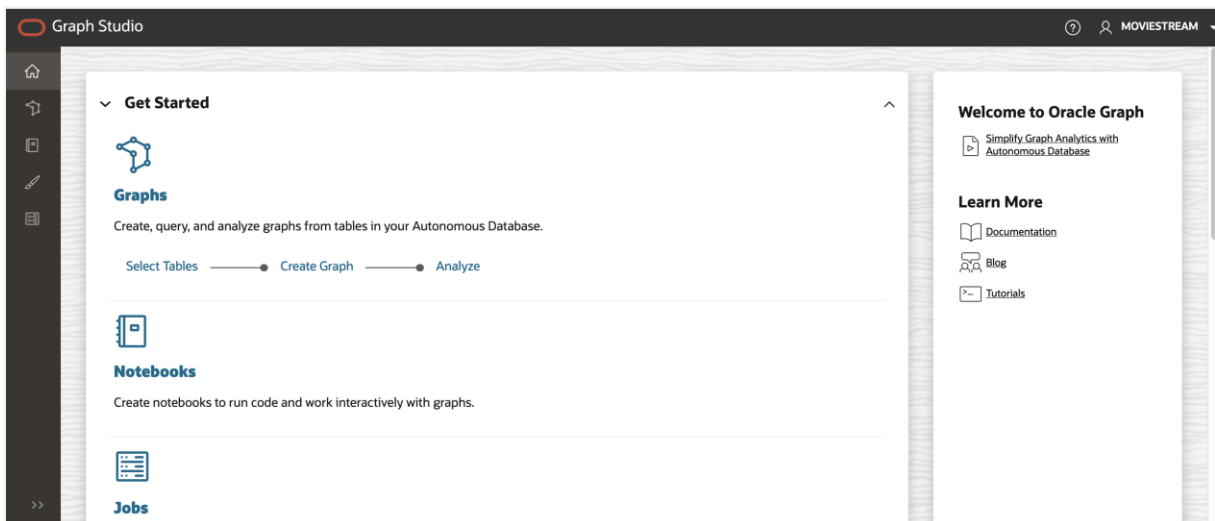
Create a Graph

1. In the left-side navigation pane of Graph Studio, select the **Graphs** icon.

   The **Graphs** page is displayed.
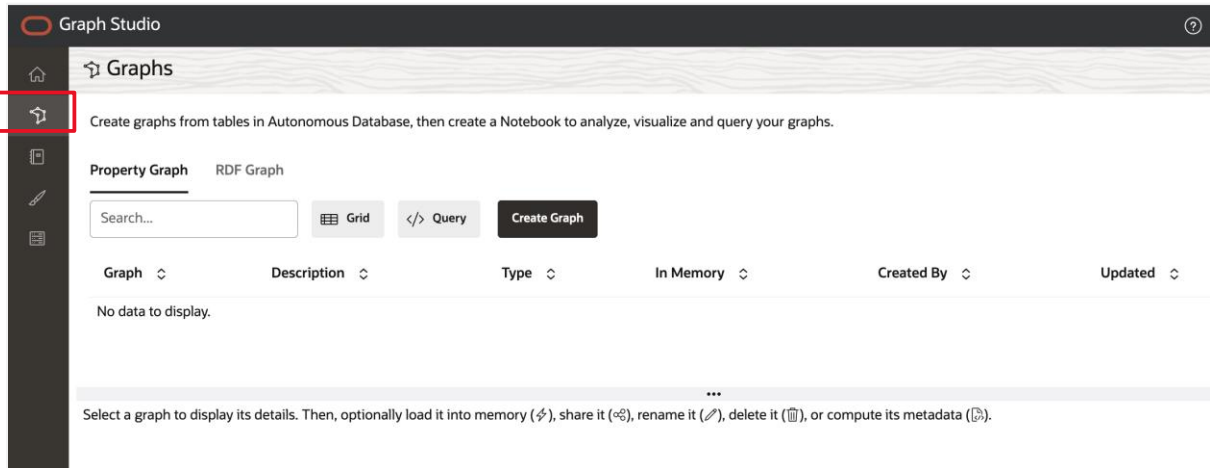
2. Select **Create Graph**.

   The **Create Graph** page is displayed.
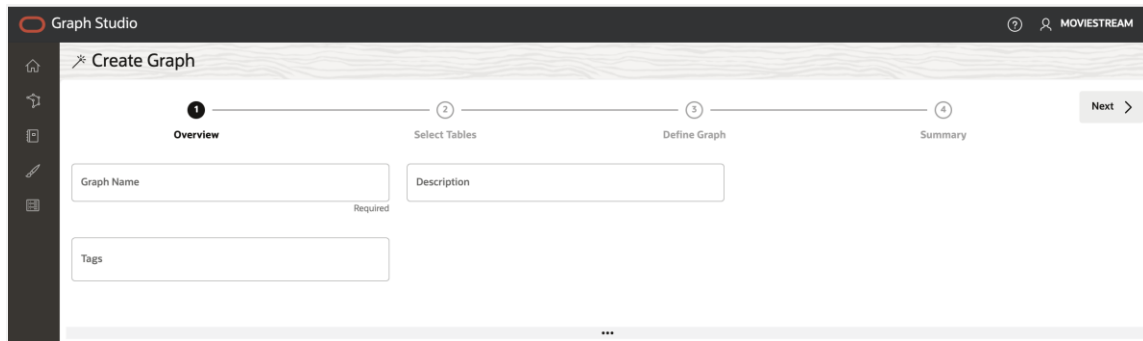
3. Enter `MOVIE_RECOMMENDATIONS` as the graph name.

   That graph name is used throughout the workshop (when using LiveLabs). If you enter a different name, then the queries and code snippets in the workshop fail.
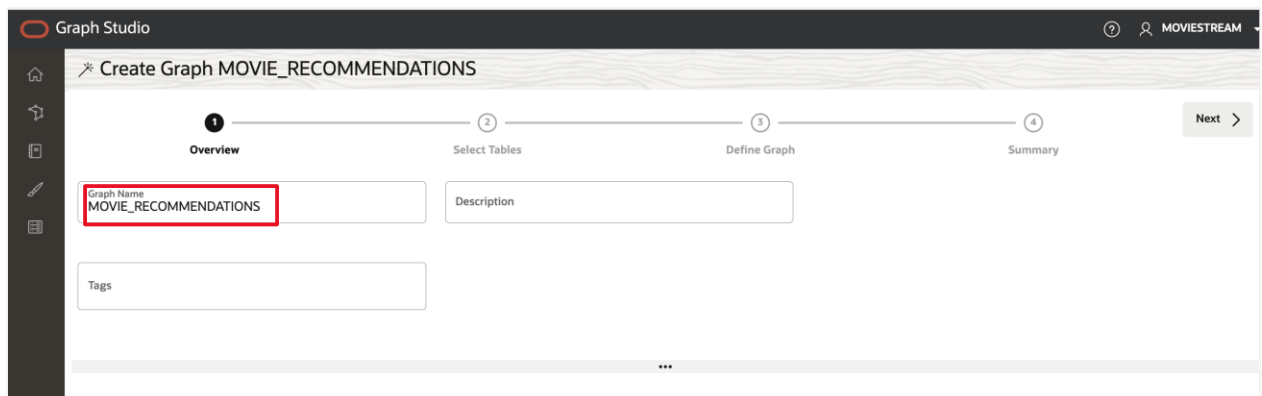
4. (Optional) Add a description and tags.
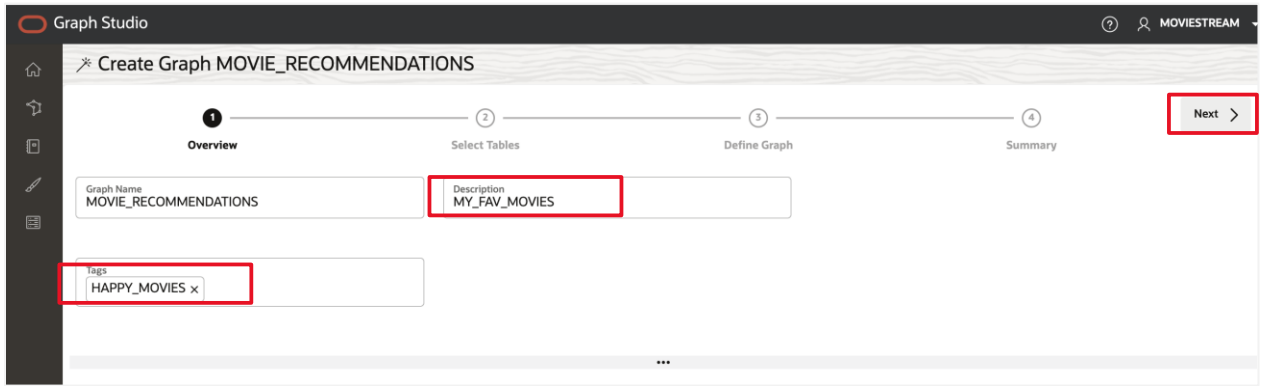
5. Select **Next**.

6. Under **Available**, expand **MOVIESTREAM** and select the **CUSTOMER_SAMPLE**, **WATCHED**, and **MOVIE** tables.
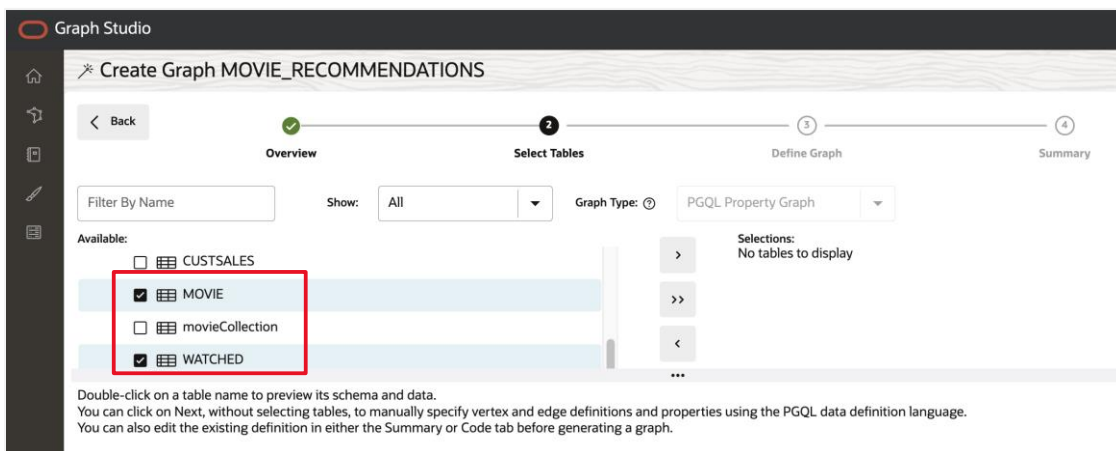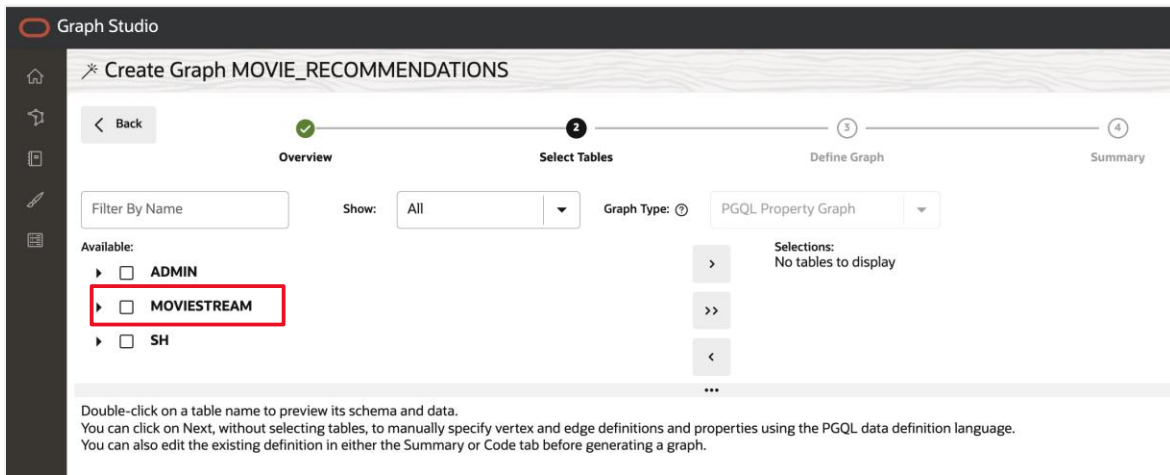
7. Select the **Add Selected Tables** arrow button to move the tables to the **Selections** list on the right side of the page.
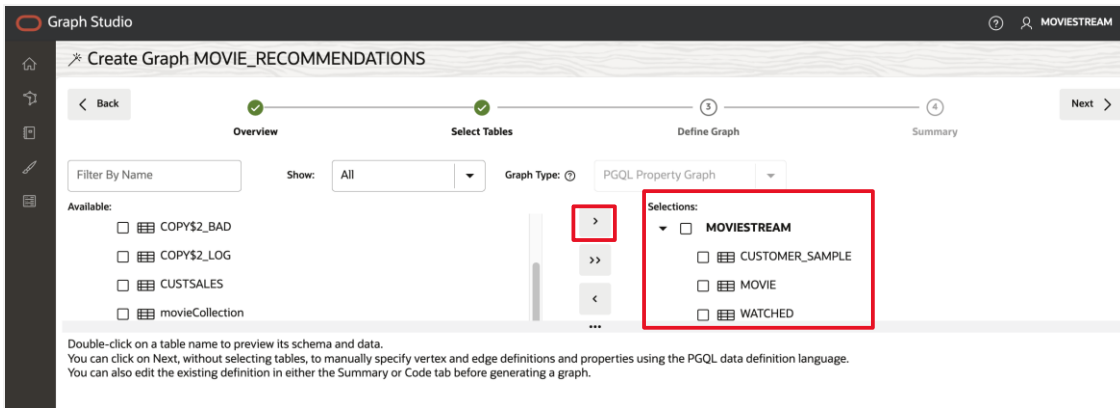
8. Click **Next**.

The suggested model shows the MOVIE and CUSTOMER_SAMPLE as vertex tables because there are foreign key constraints specified on WATCHED table that reference them.
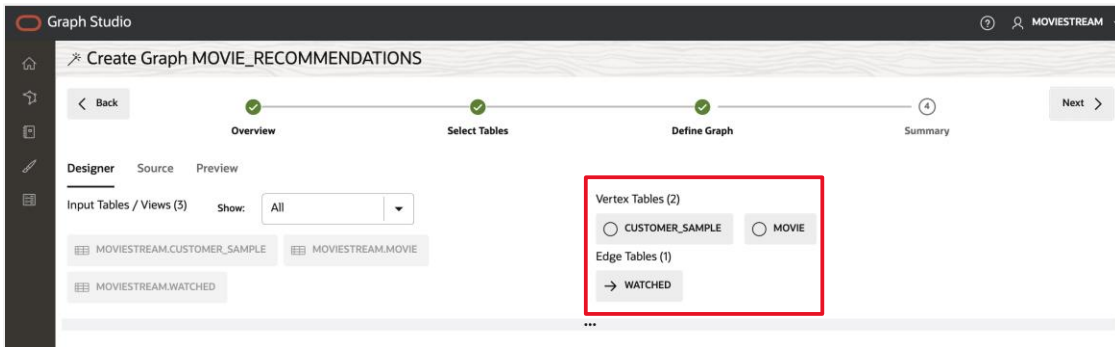
9. To view and change the properties of the graph, select one of the tables.

For example, select `WATCHED` and view the edge label. You will see this label when viewing and querying the graph. Keep the `WATCHED` label because it's used in a later section when querying the graph.
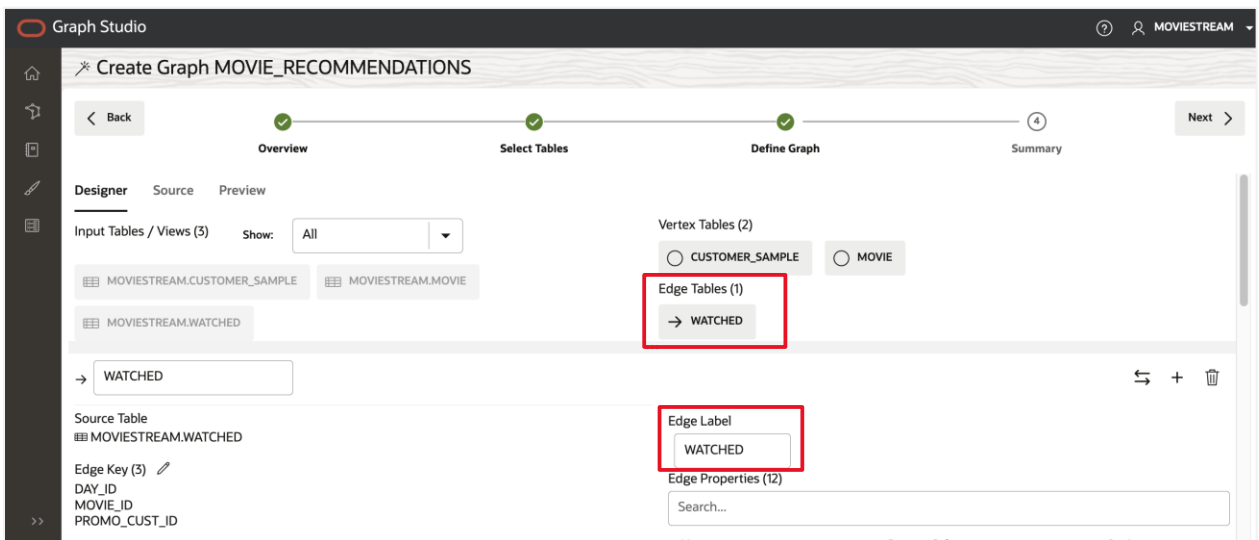
10. Click **Next**.

11. In the **Summary** step, select **Create Graph**
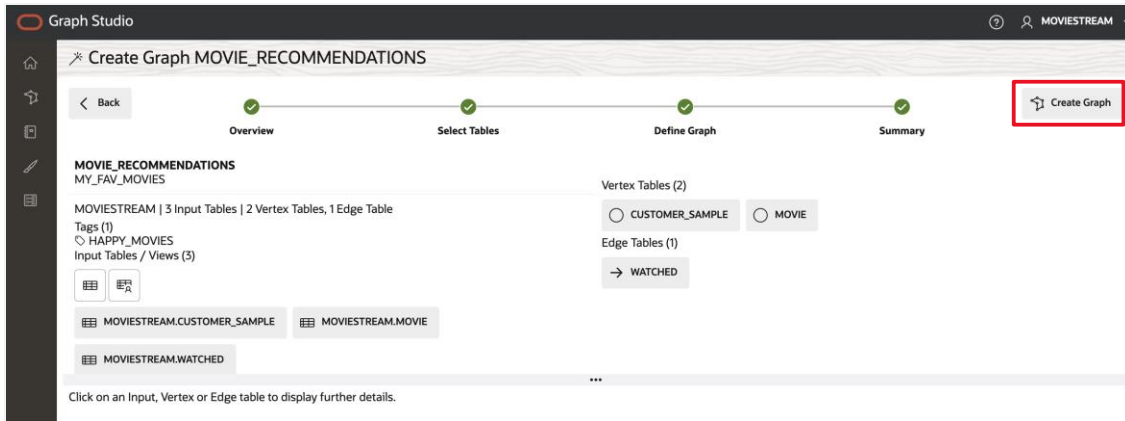
12. In the **Create Graph** dialog box, accept the default values and select **Create Graph**.
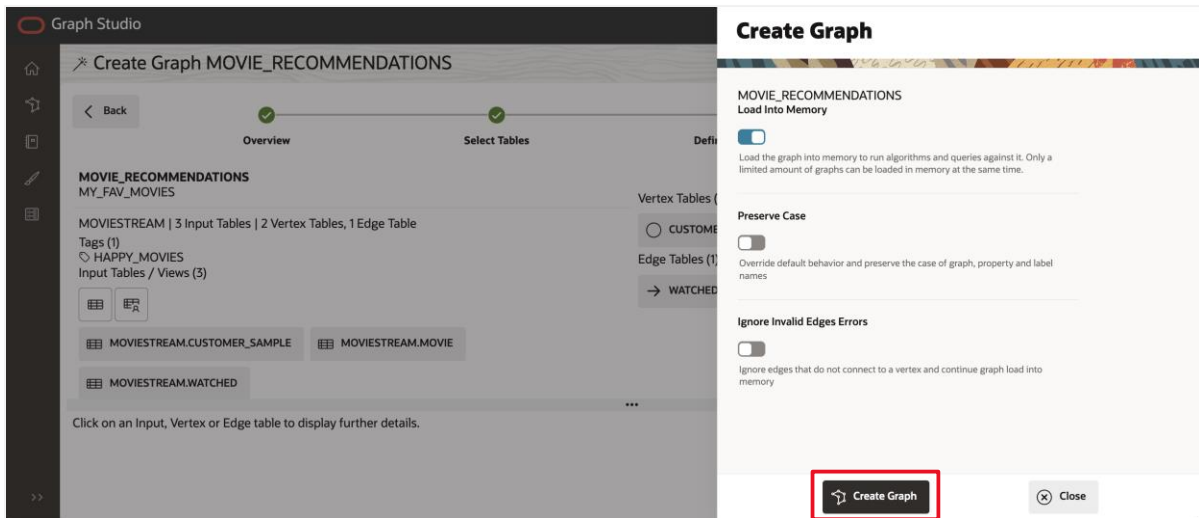
The **Jobs** page shows the progress of the graph creation process.
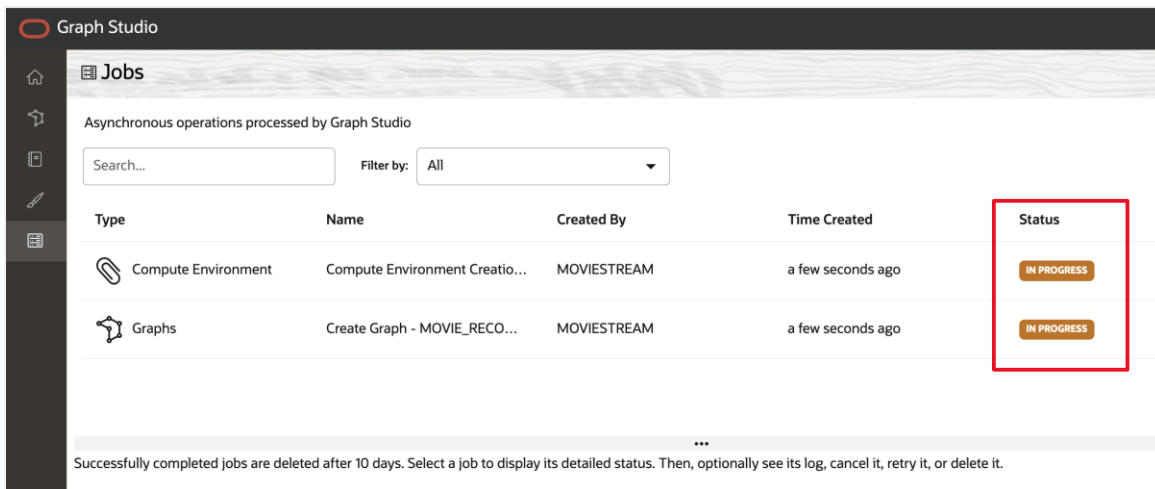
After a couple of minutes, all the jobs have a **Completed** status. You're ready to start analyzing the graph!
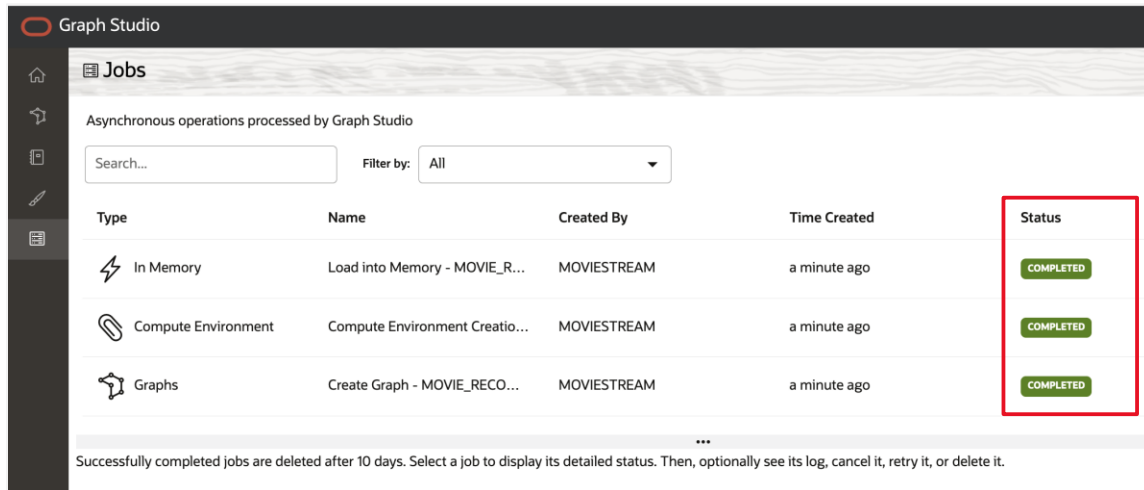
# Query, Visualize, and Analyze a Graph by Using PGQL and Python

This section covers the following tasks:

- Importing a notebook

- Creating a notebook and adding paragraphs

- Using Graph Studio notebooks and PGQL and Python paragraphs to query, analyze, and visualize a graph

Import a Notebook

You can download and import a notebook that has the graph queries and analytics for the MOVIE_RECOMMENDATIONS graph. Each paragraph in the notebook has an explanation. You can review the explanation and then run the query or analytics algorithm. Alternatively, you can create a notebook; see the next section.

1. Download the notebook and save it to a folder on your local computer.

2. In Graph Studio, select the **Notebooks** icon, and then select **Import**.
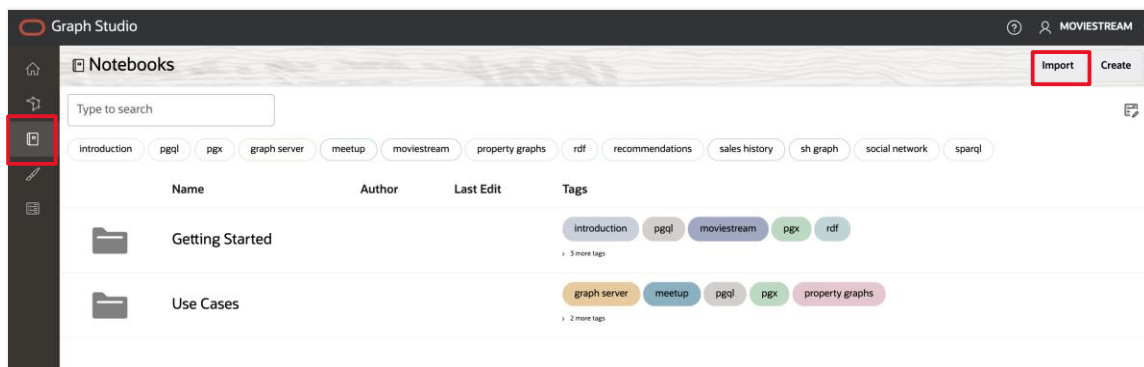
3. In the **Import notebooks** dialog box, select or drag the notebook that you downloaded or created, and then click **Import**.
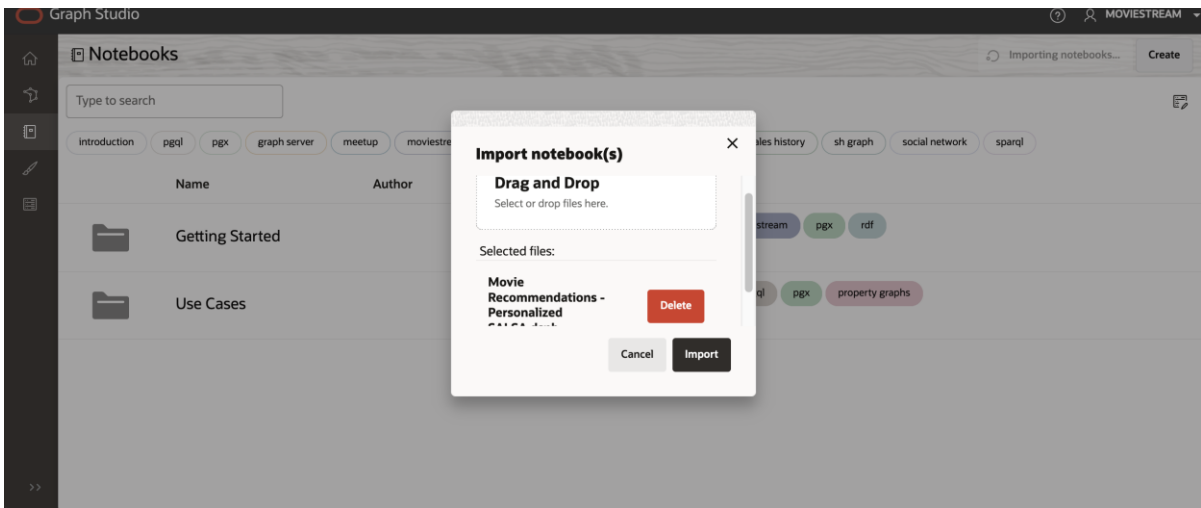
The **Environment Attaching** dialog box is displayed. It disappears when the compute environment finishes attaching, usually in less than one minute. Or you can close the dialog and start working on your environment. Note that you can't run any paragraphs until the environment finishes attaching.

After the environment is attached, the **Get Started** area of the notebook is displayed.
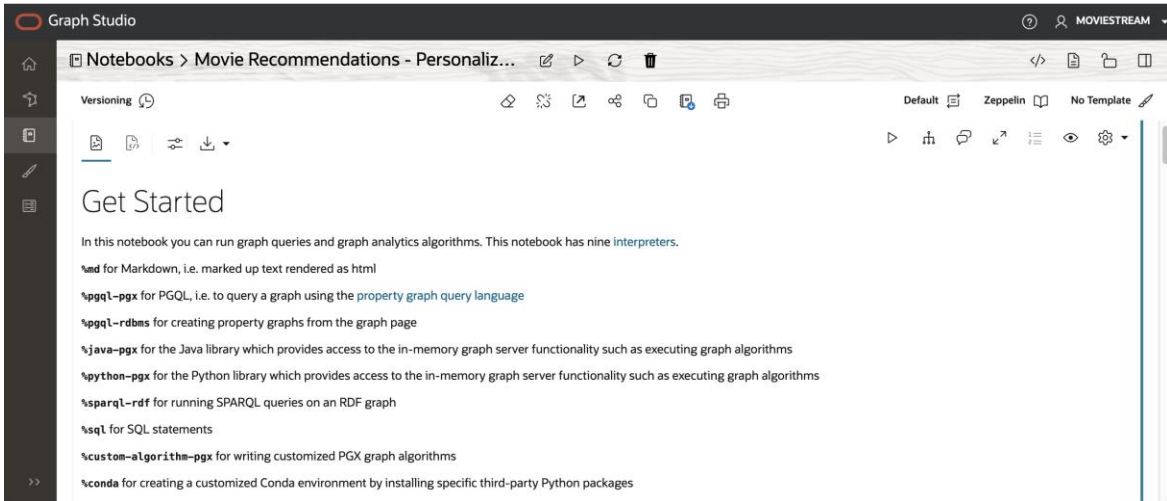

4. Scroll down to see different paragraphs.
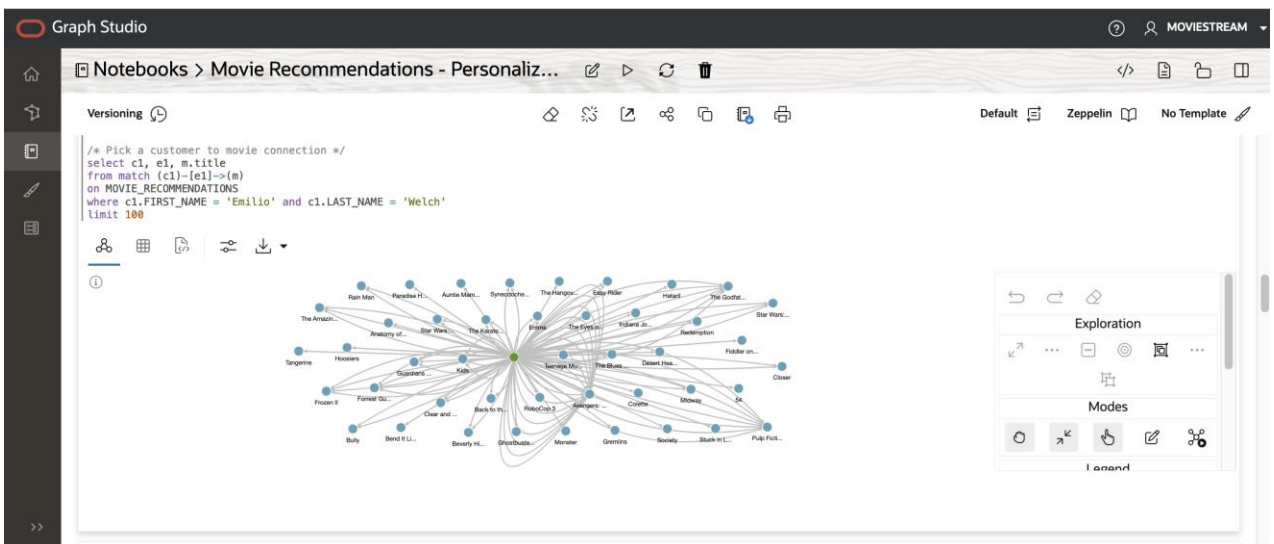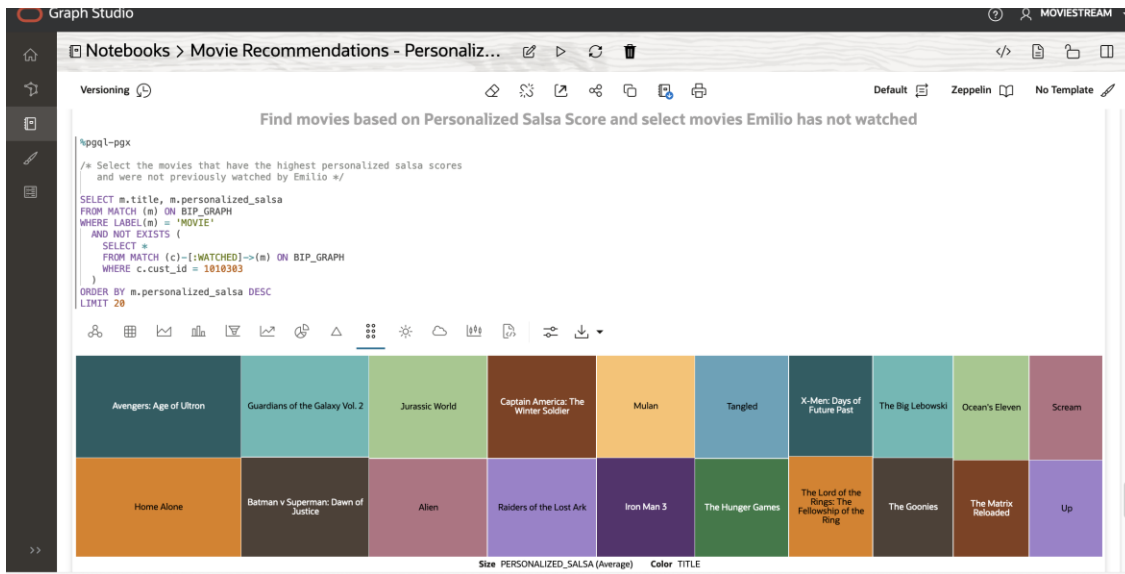
You can run the paragraphs in sequence and experiment with visualizations settings. Explore the icons shown above the paragraphs.

Create a Notebook and Add Paragraphs

If you chose not to import a notebook, you can create one and add paragraphs to it. If you imported a notebook in the previous section, you can skip to the next section.

1. In Graph Studio, select the **Notebooks** icon, and then select **Create**.
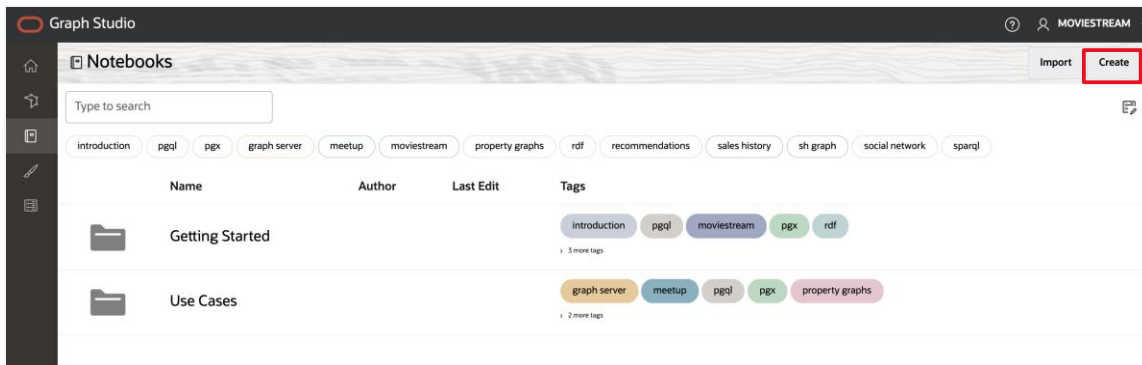
2. Add a paragraph by selecting the new paragraph icon.
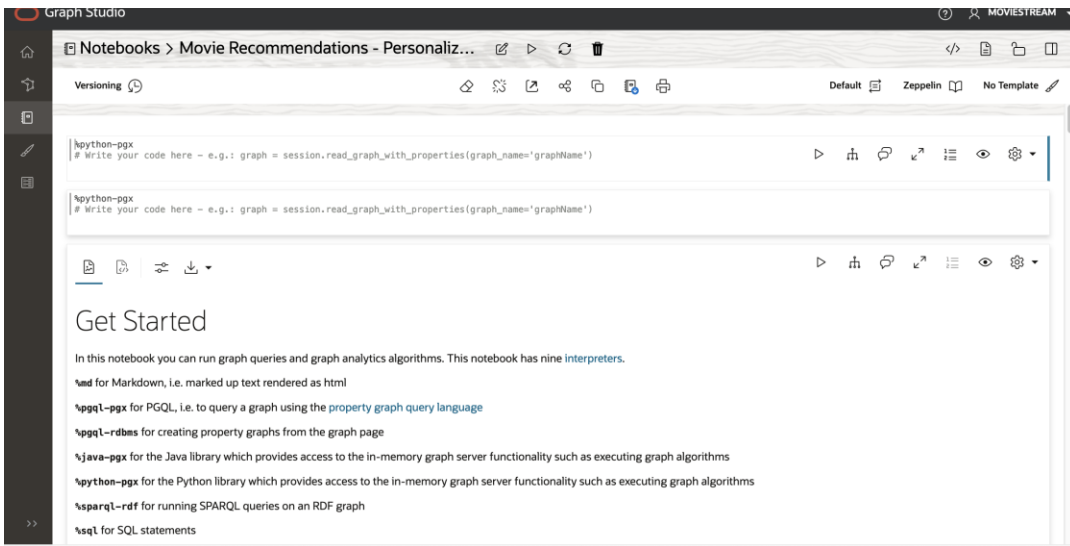
## Load and Query the Moviestream Notebook and Visualize the Results

Note: Read the following steps *before* you run any paragraphs. If the compute environment is not ready and the code can't be run, then a blue line is displayed moving across the bottom of the paragraph to indicate that a background task is in progress.

1. To run all paragraphs at once, select **Run Paragraphs** at the top of the page, and then select **Confirm**.
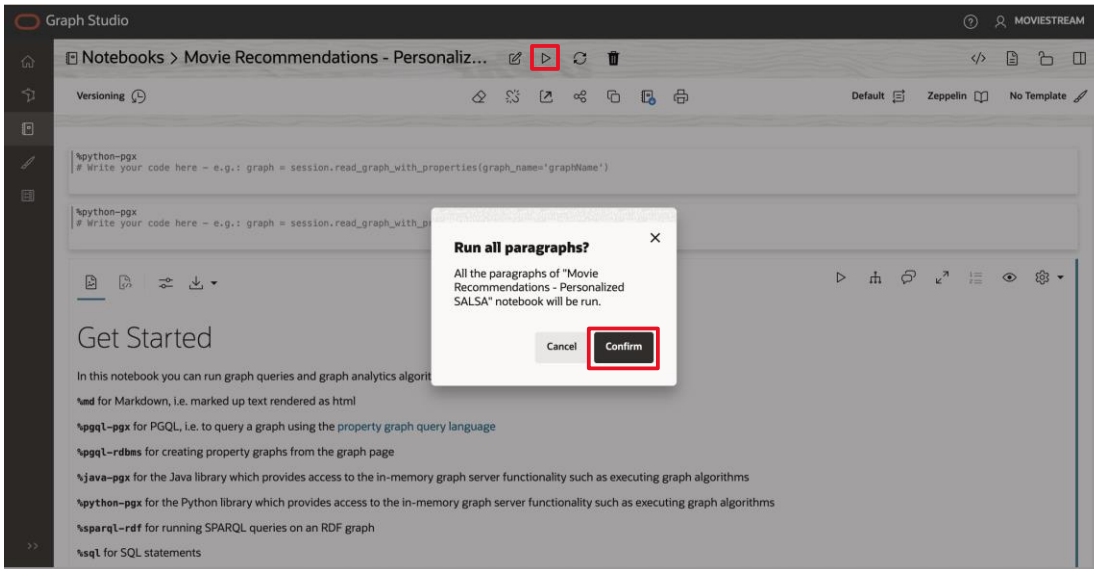
2. To run an individual paragraph, scroll to the paragraph and select **Run Paragraph**. You can then download the results by selecting **Download As** and then selecting a file type.
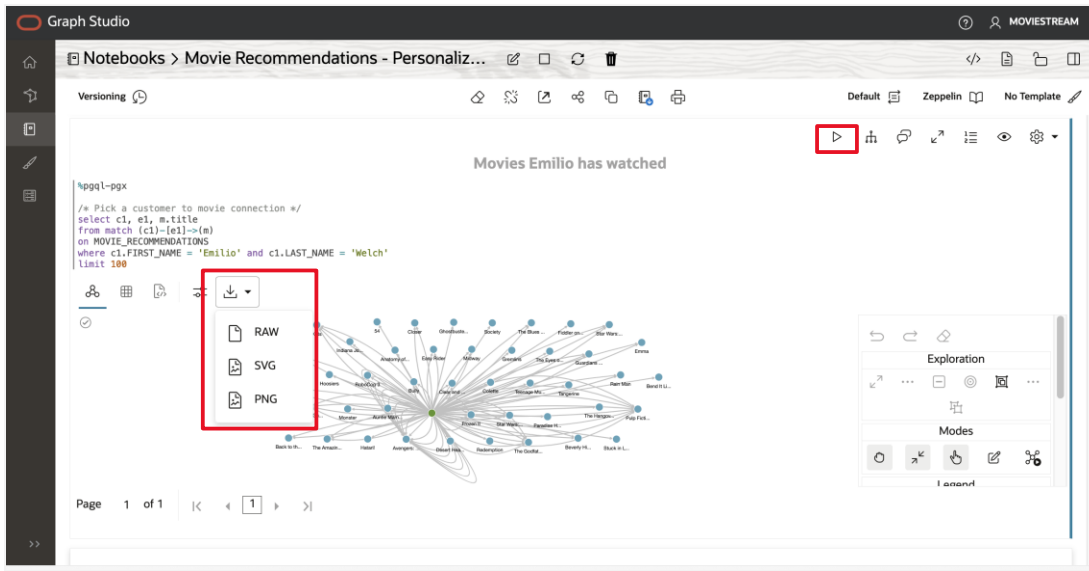
The following image shows downloaded output from running a paragraph, in this example, the movies that a user has watched.
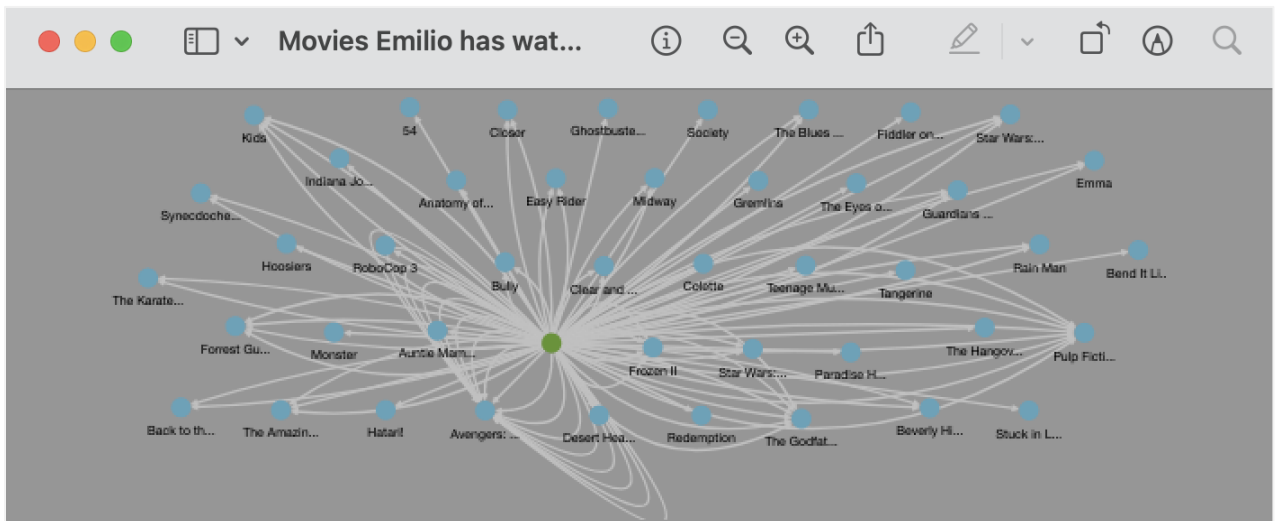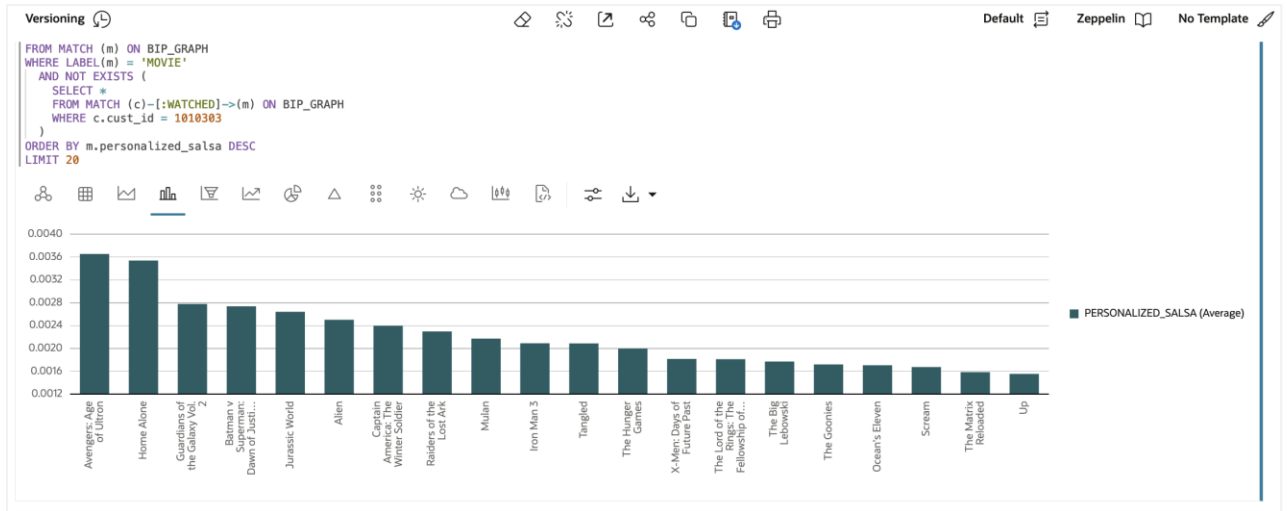

3. To show the data in different formats, select different visualization options.
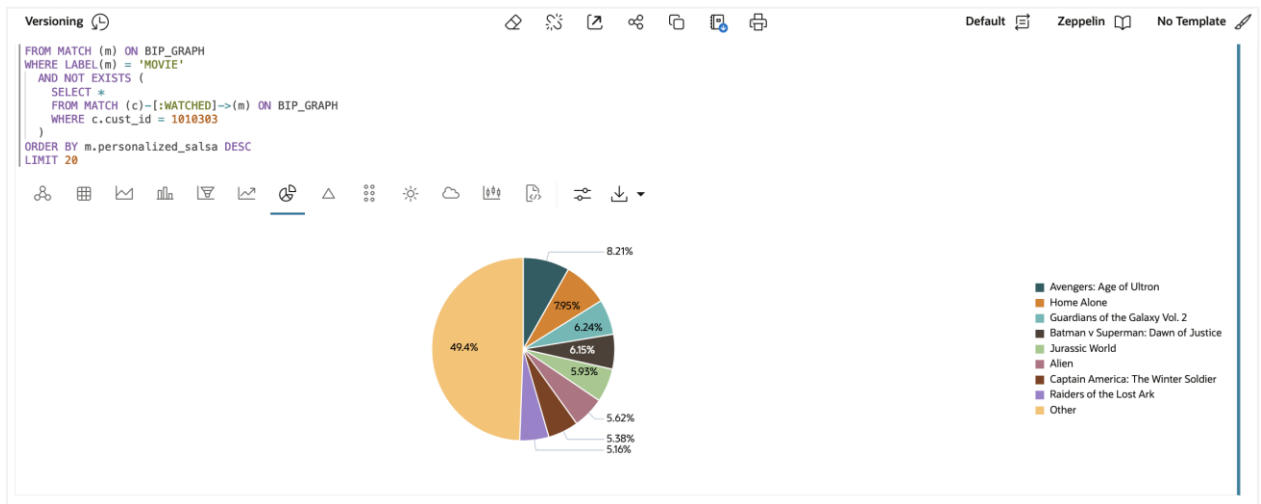
The following image shows data in the Tree Map (tiled) view. This example and the following ones show the movies that the user has watched in the genre Fantasy, Action, and Superheroes.
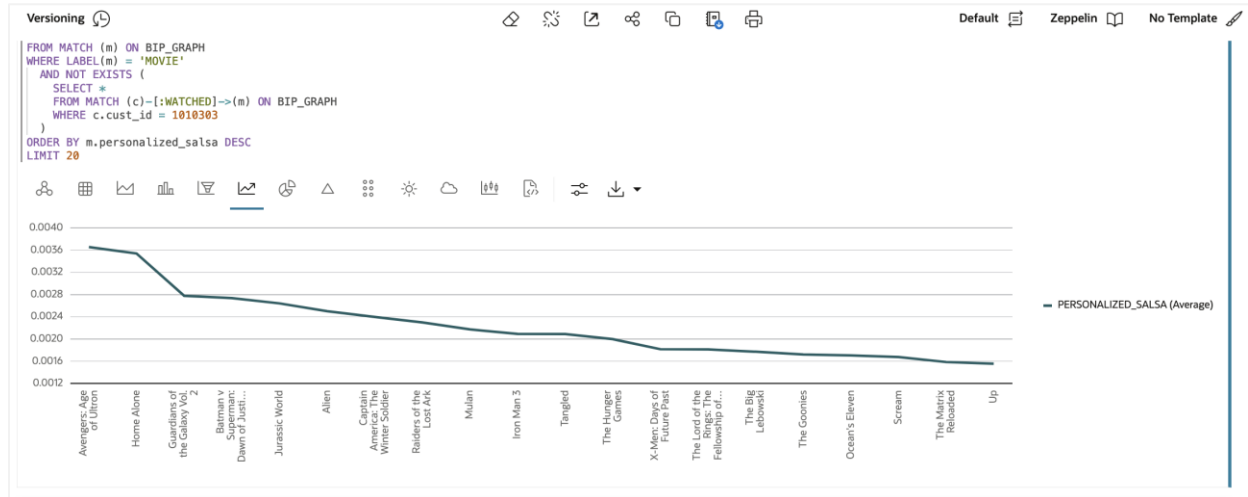
The following image shows the same data in the Bar Chart view.

The following image shows the same data in the Pie Chart view.

The following image shows the same data in the Line Diagram view.

Getting Started Resources

See the following resources to get started with Graph Studio in Oracle Autonomous Database:

Product page: Graph Database and Graph Analytics

Documentation

- 17 Use Cases for Graph Databases and Graph Analytics

- Using Graph Studio in Oracle Autonomous Database

Blog posts

- Create Graph Databases with Graph Studio

- Introducing Graph Studio with Oracle Autonomous Database

- Graph Database and Analytics for everyone

LiveLabs workshop: Use Graph Analytics to Recommend Movies

Create an account on OCI: Get an Oracle.com Account

Conclusion

This paper explores using Graph Studio within Oracle Autonomous Database and offers guidance for developers and technical professionals. Focused on the application of graph analytics, particularly in the realm of movie viewing behavior, the paper demonstrates how Graph Studio can be used to detect and create customer communities. By using Graph Studio, users can uncover patterns and relationships within data, leading to a deeper understanding of customer preferences and trends. The ability to generate targeted movie recommendations for these communities showcases the practicality and effectiveness of this approach. With an emphasis on ease of use, security, and support for diverse data workloads, Graph Studio is a valuable tool for those seeking to enhance their analytical capabilities and deliver personalized experiences. As we conclude this exploration, it's evident that Graph Studio, with its robust functionality, empowers users to unlock valuable insights and cultivate meaningful connections within their data, ultimately contributing to more informed decision-making and innovative customer-engagement strategies.

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Making Movie Recommendations by Using Graph Analytics
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