

Operational Property Graphs with SQL in Oracle AI Database



Your data is connected. Traversing connections in data usually requires recursive queries and multiple joins, which are harder to express using older SQL constructs. The SQL:2023 GRAPH_TABLE function and MATCH clause syntax, implemented in Oracle AI Database, enable you to write simple SQL queries to follow connections in data. You can create a graph from data in relational tables and run graph queries to easily explore connections in data. You can use graphs in transactional and analytical workloads, just like any other data in the database. Graphs have many applications—making product recommendations, detecting financial fraud, identifying dependencies in IT workflows, and more. Customers in financial services, manufacturing, retail, life sciences, healthcare, and the public sector rely on Oracle Graph technologies.

Native Representation of Graphs in Oracle AI Database

Oracle AI Database has native support for property graph data structures, enabling you to create and query graphs using SQL. You can build graph applications using existing SQL tools, languages, and development frameworks. You can use graphs in conjunction with transactional data, AI vector, JSON, spatial, and other data types. Data in online transaction processing (OLTP) applications with real-time updates can be modeled as a graph since SQL Property Graphs are like views on existing tabular or JSON data.

The property graph data model consists of vertices connected to other vertices by edges, each of which can have associated key-value pairs (properties). Typically, vertices represent entities in a dataset (such as ‘customer’ or ‘account’), and edges represent the relationships between them. Queries are based on specifying patterns that are matched against vertices and edges in a graph.

SQL Standard for Property Graphs

SQL:2023 includes SQL syntax for property graphs (defined by the ISO standard ISO/IEC 9075-16). Oracle AI Database implements this new syntax so that graph operations can be executed using SQL. Before the implementation of the standard in Oracle AI Database, graph operations were enabled by the Property Graph Query Language (PGQL). Along with PGQL, Oracle AI Database supports the SQL syntax for property graphs.

Graph Analytics

Graph analytics uses algorithms from graph theory to analyze data represented as graphs. For example, you can use the graph machine learning algorithm, DeepWalk, to identify similar patterns, for use cases such as finding bank accounts similar to a fraudulent account, customers similar to another customer and more. With SQL

Advanced Graph Data Management for the Enterprise

"Property Graph can help make seemingly complex questions—when approached relationally—become fairly straightforward. SQL Property Graph allows us to combine the two approaches."

Lucas Jellema

Chief Technology Officer and IT Architect, Conclusion | Oracle ACE Director

"Wow, that GRAPH_TABLE extension of SQL is amazing. With Oracle AI Database, I can now create Property Graphs directly in my database with simple DDL, and the new GRAPH_TABLE SQL query syntax makes short work of building complex queries against Property Graphs."

Jim Czuprynski

Chief Storyteller, Zero Defect Computing, Inc. | Oracle ACE Director

Key Benefits

- Oracle AI Database scalability, security, and manageability for enterprise graph applications
- Extreme performance for critical enterprise graph datasets
- Commercial strength scalability, and comprehensive support for property graph query and analytics

Related Products

- Oracle Cloud Infrastructure
- Oracle Autonomous AI Database
- Machine Learning in Oracle AI Database
- Oracle Exadata

Property Graphs, you can continue to use the 80+ pre-built graph analytics algorithms to get more insights into your data.

Graph Database for the Enterprise

As part of Oracle's converged database offering, Oracle Graph eliminates the need to set up a separate database and move data into a siloed system. The graph capabilities are integrated with the database. Analysts and developers can include graphs in any application and benefit from enterprise-grade security, high availability, manageability, concurrency, transactional consistency, ease of data ingestion, and other features of Oracle AI Database. Graph analytics can enhance AI, machine learning, and other types of workloads supported in the converged Oracle AI Database. Innovative technologies such as Oracle Autonomous AI Database and Oracle Autonomous AI Lakehouse, are available to graph applications.

Knowledge Graph for Better Generative AI Responses

A hot topic within generative AI research is using an LLM to create a knowledge graph from documents and then using it to improve the quality of an LLM output.

Knowledge graphs help capture relationships that relate to concepts and entities of the human world. Business facts can be leveraged to define relationships in data so that an LLM returns results based on these business facts and the structure of the relationships between them, making it easy for developers to build AI applications that can be more accurate and relevant to the business.

Working with Oracle Graph Using Developer and Visualization Tools

Take advantage of the tools included in Graph Server and Client for SQL Property Graph exploration, such as the Graph Visualization Toolkit, Graph Studio. In addition, explore graphs with SQL Developer by installing the Oracle SQL Developer Graph Visualization for VSCode extension.

Key Property Graph Features

- Support of SQL syntax for property graphs
- Java and Python API to execute 80+ powerful graph analytics algorithms in parallel in the in-memory Graph Server
- Ease of development with SQL tools and graph visualization
- Property graph analysis of RDF graphs

Resources

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