ORACLE
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Developing on Oracle Autonomous Database - Using Graph

Oracle Autonomous Database

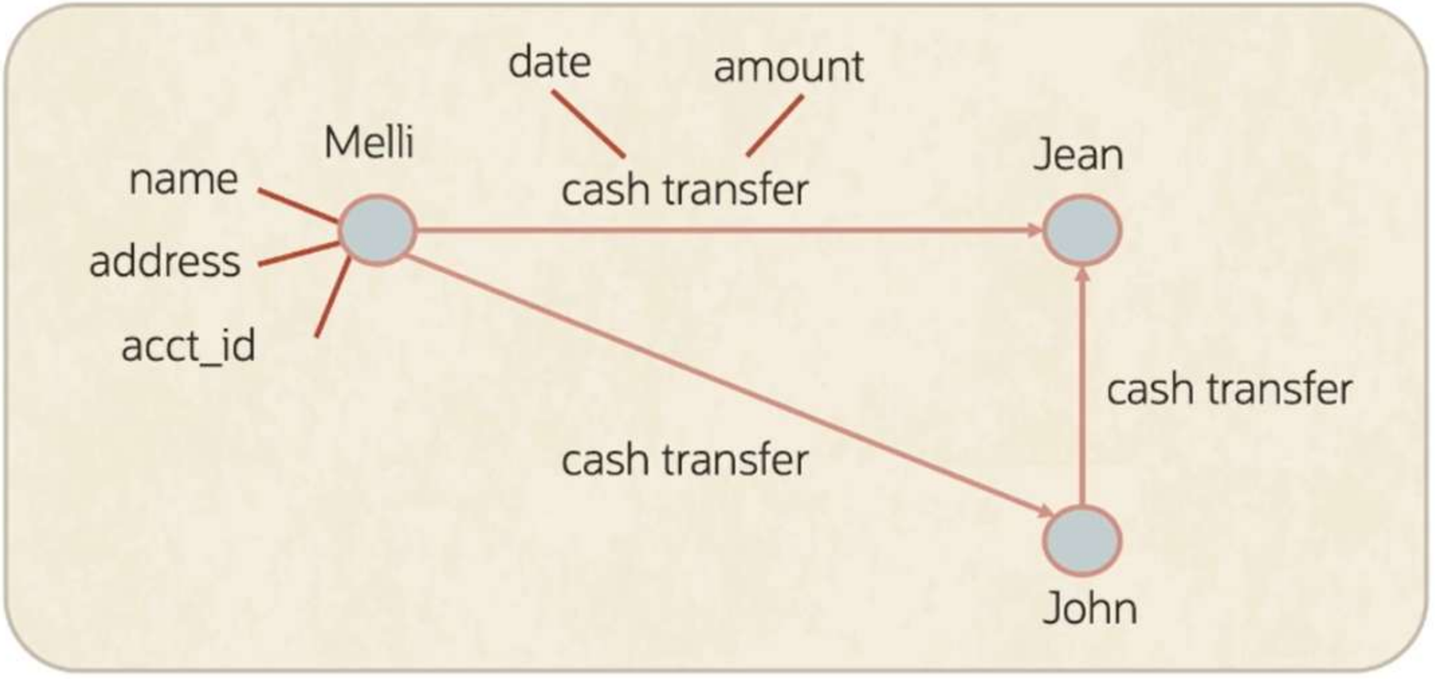
Objectives

- Use the Graph Feature of Autonomous Database
- Create, query, analyze, and visualize graphs

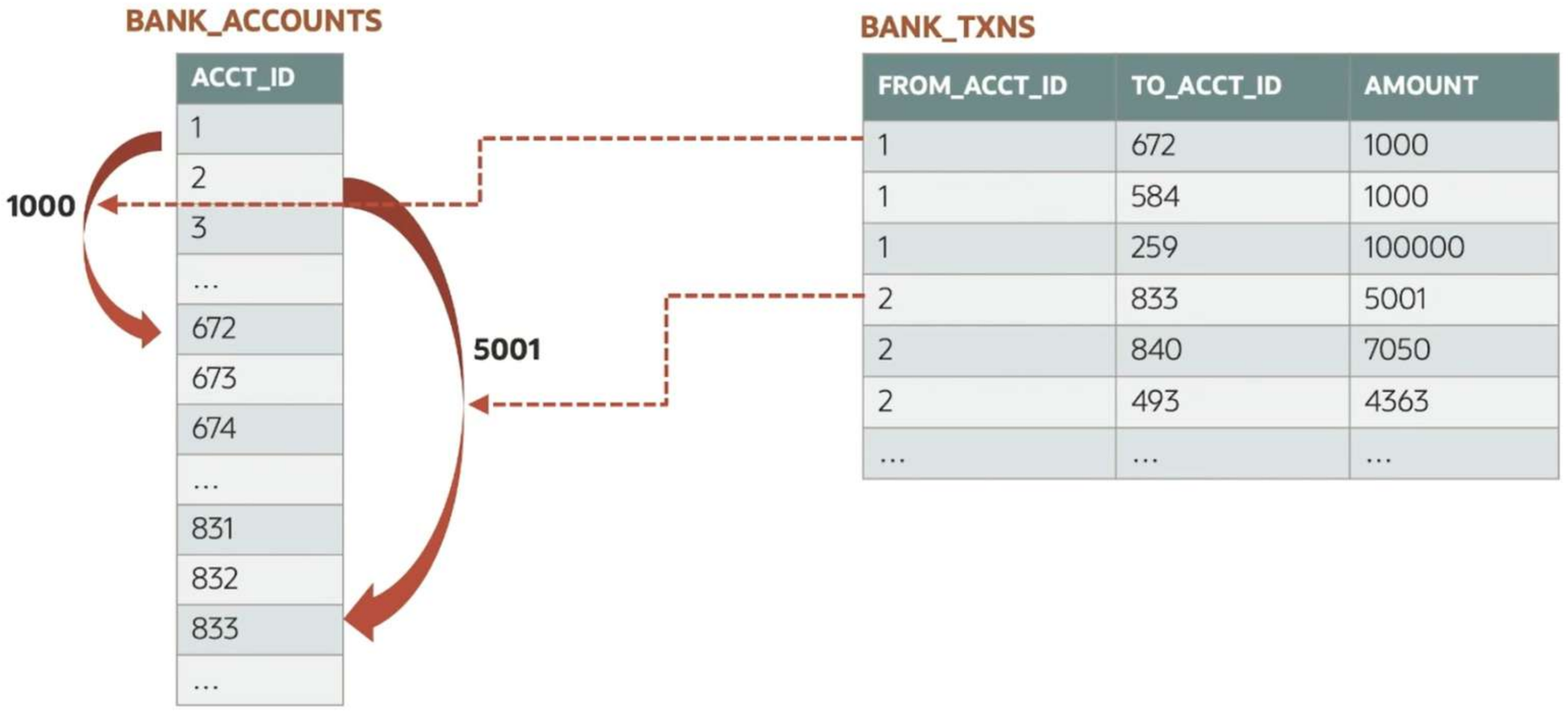
What is a graph?

Property Graph Data Model

- It is a collection of points (vertices) and lines between those points (edges).
- Vertices and edges can have properties.



Model Data in Tables As a Graph

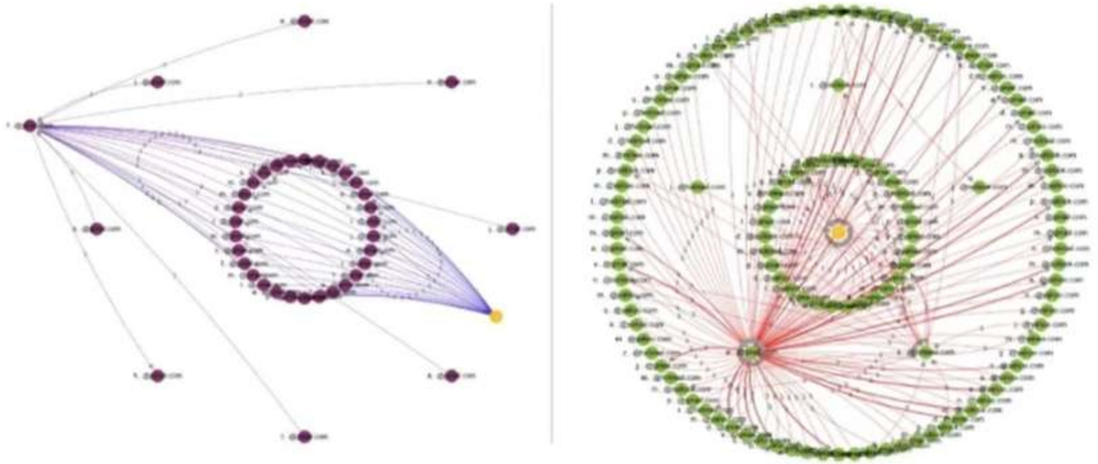


What can you do with graphs?

Detect anomalous patterns

Use case

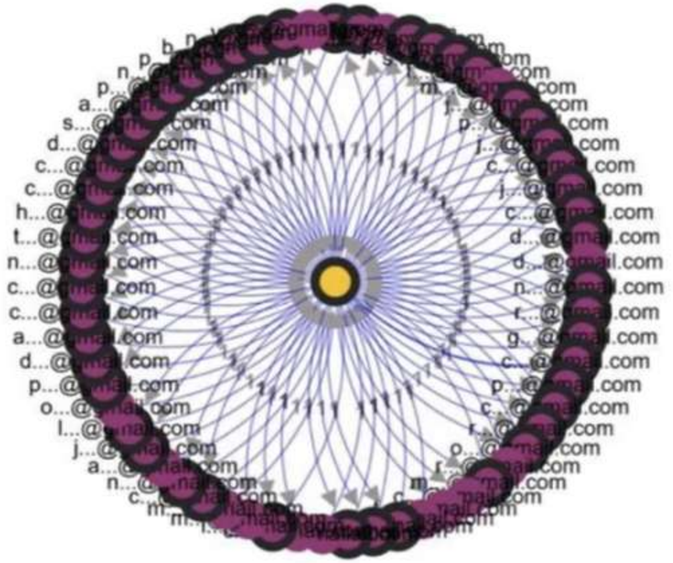
- Uncover fraud
- Money laundering



Clustering to detect communities

Use case

- Analyze churn
- Product recommendations



Images courtesy Paysafe

Analyze Data Based on Connections in Your Data

Graph Queries and Graph Analytics

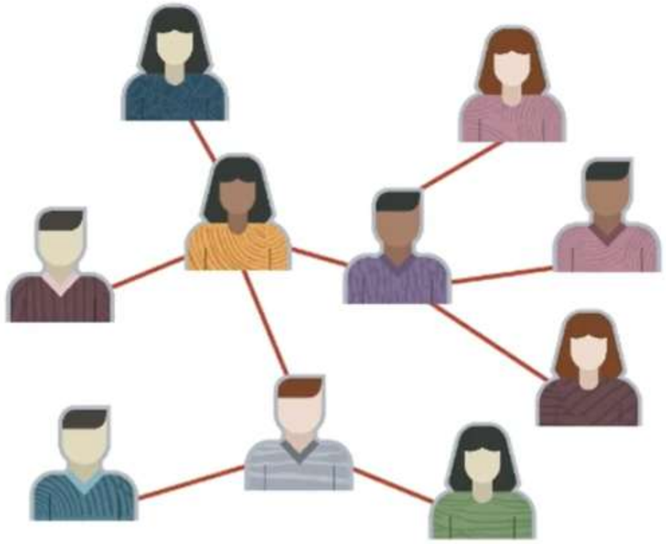
Business Problem	With Graph Analytics
Is there money laundering hidden in this set of financial transactions?	Is there a cycle in a graph representation of financial transactions?
What-if analysis in manufacturing, network management: What is the impact of changing one component?	What are the paths reachable from this vertex?
Which customers form a cluster based on their social relationships and activities together?	Are there tightly connected subgraphs in a graph of customer activities?
What new relationships can be automatically derived from existing connections?	• What vertices are reachable (path analysis)? • Can we derive new information such as similarities in buying patterns?
Catalog management: How can I dynamically add new attributes to generate new assets without modifying the database structure?	How can I model a flexible schema in my database?

Data-Driven Apps Create Value Using Graph Analytics

Oracle makes it simple to use Graph Analytics to discover:

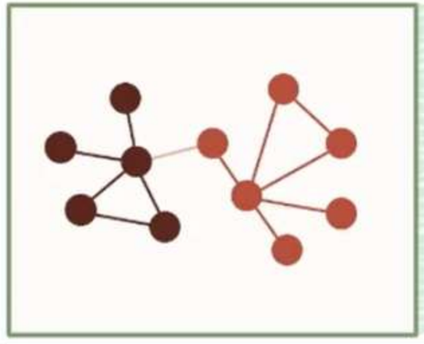
- Influencers, dependencies, communities, ranking, customers 360, and so on
  - Over 60 in-memory parallel analytic graph functions
- Easy implementation with declarative SQL-like queries
  - Oracle also provides an Open-Source Graph Language (PGQL).
  - PGQL allows users to specify graph patterns which are matched against vertices and edges in a graph.

FREE with all Oracle Database Editions



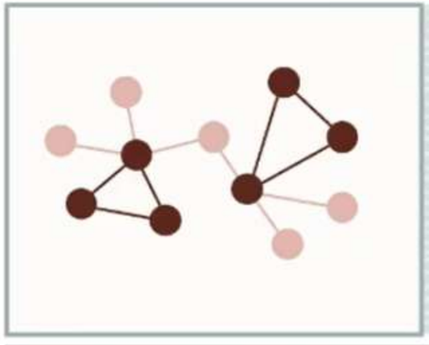
Graph Analytics: 60+ Prebuilt Algorithms

Detecting Components and Communities



Strongly Connected Components,
Weakly Connected Components,
Label Propagation,
Conductance Minimization,
Infomap

Evaluating Structures

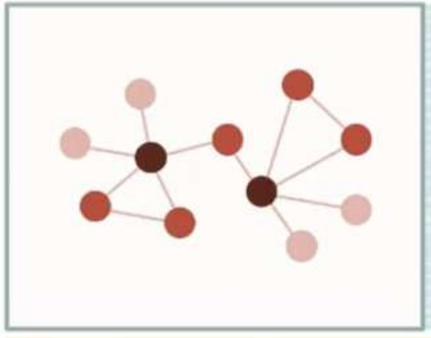


Adamic-Adar Index, Conductance,
Cycle Detection, Degree Distribution,
Eccentricity, K-Core, LCC, Modularity,
Reachability Topological Ordering,
Triangle Counting

Link Prediction

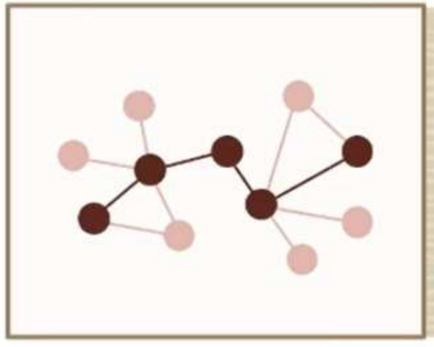
WTF (Who to follow)

Ranking and Walking



PageRank, Personalized PageRank,
Degree Centrality, Closeness Centrality,
Vertex Betweenness Centrality,
Eigenvector Centrality, HITS, SALSA,
Random Walk with Restart

Path-Finding

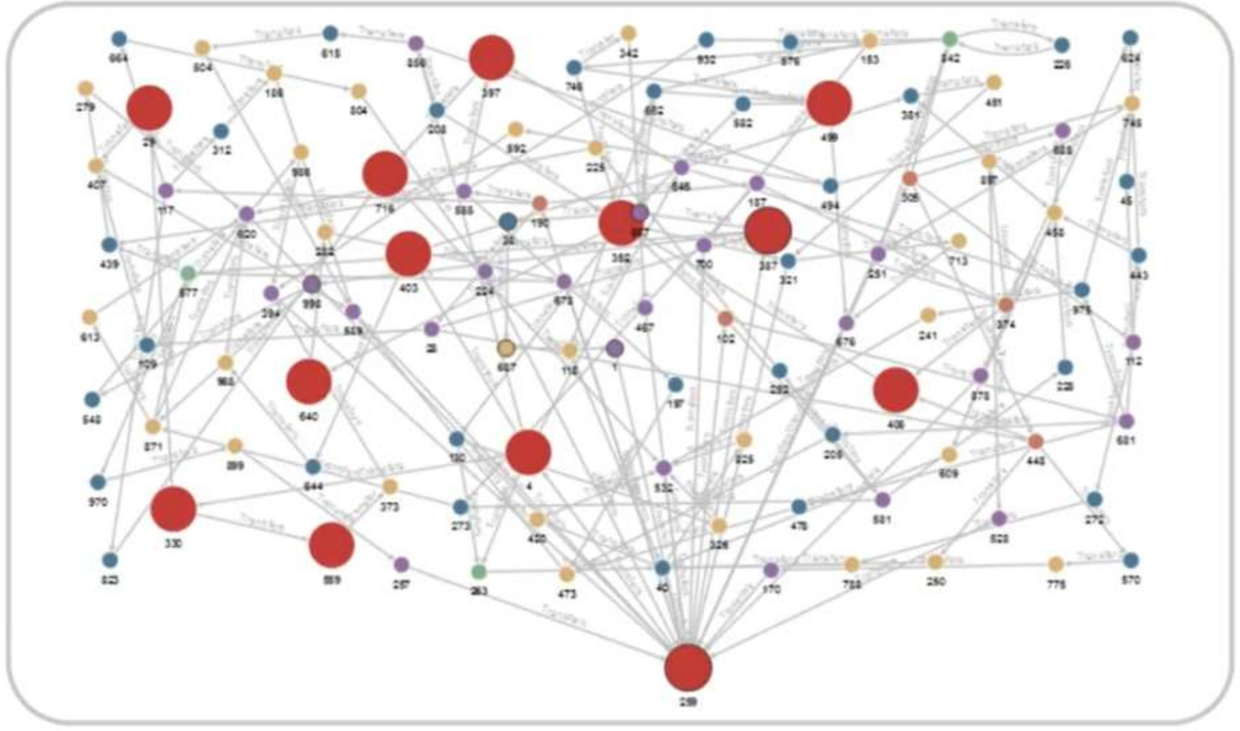


Shortest Path (Bellman-Ford, Dijkstra,
Bidirectional Dijkstra), Fattest Path,
Compute Distance Index,
Enumerate Simple Paths,
Fast Path Finding, Hop Distance

Others

Minimum Spanning-Tree,
Matrix Factorization

Find Important Vertices



Analyze and Query

- Which accounts have done a lot of transfers?
- **Which accounts are connected to accounts that have done a lot of transfers?**

```
analyst.pagerank(bank_graph)
```

Find all 6-hop cycles that include Account 259 (259 has a high pagerank value)

```
SELECT a,b,c,d,e,f,e1,e2,e3,e4,e5,e6
FROM bank_graph
MATCH (a)-[e1]->(b)-[e2]->(c)-[e3]->(d)
-[e4]->(e)-[e5]->(f)-[e6]->(a)
WHERE a.acct_id=259
```