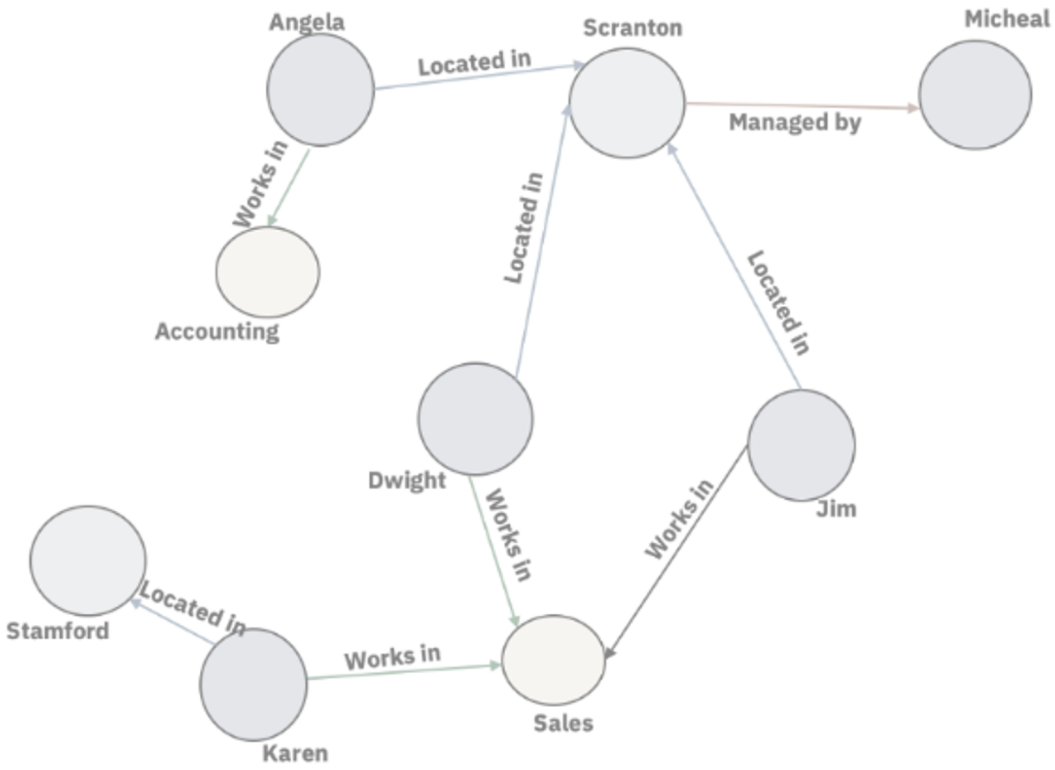
October 8, 2020

About Db2 Graph



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Agenda

Today we'll introduce Graph databases and touch on a new feature of IBM Db2 11.5.4, the technical preview of **Db2 Graph**.

01

About graphs

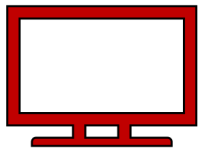
02

Db2 Graph

03

Demo

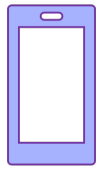
Graph databases are all around us



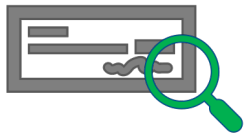
- Your favorite streaming service uses Graph databases to manage all their assets, to understand their users' viewing habits and to create personalized recommendations for movies and shows

- Companies manage the entire supply chain, inventory, orders and user history with Graph databases

- Your airline or hotel booking system may be using Graph databases to manage and recommend new options for users and build reports

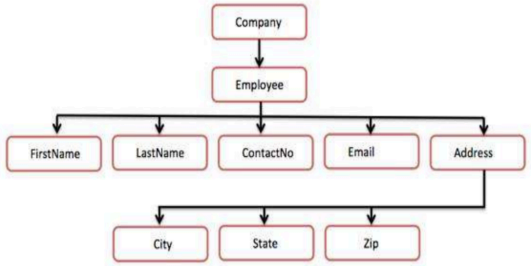


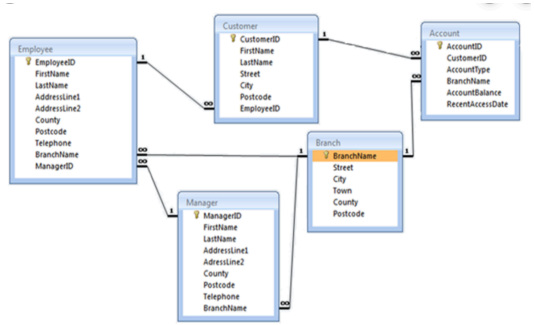
- Your network provider may be using Graph databases to model networks to manage issues, like if a cell tower goes down or in case of a breach

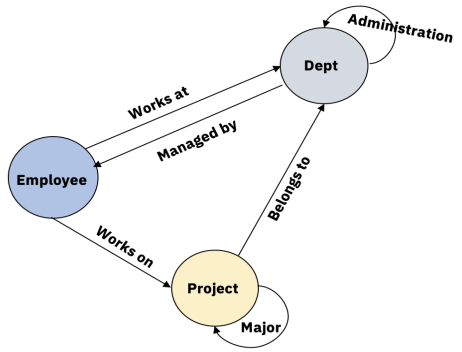


- Your search engine or navigation system was built using Graph principles

How is data stored?







- **NoSQL** (document stores)
  - Stores sets of disconnected data, may be duplication, no ACID compliance.
  - Fast updates and retrievals of sets of data.
- **RDBMS**
  - Relationships defined by joins.
  - Good for transactions, aggregations, transformations.
  - Can’t handle indirect/complex relationships.
- **Graph**
  - Traverses the network to find indirect relationships and patterns.
  - Intuitive to query and visualize from different starting points.
  - Can’t handle fast updates or aggregations.

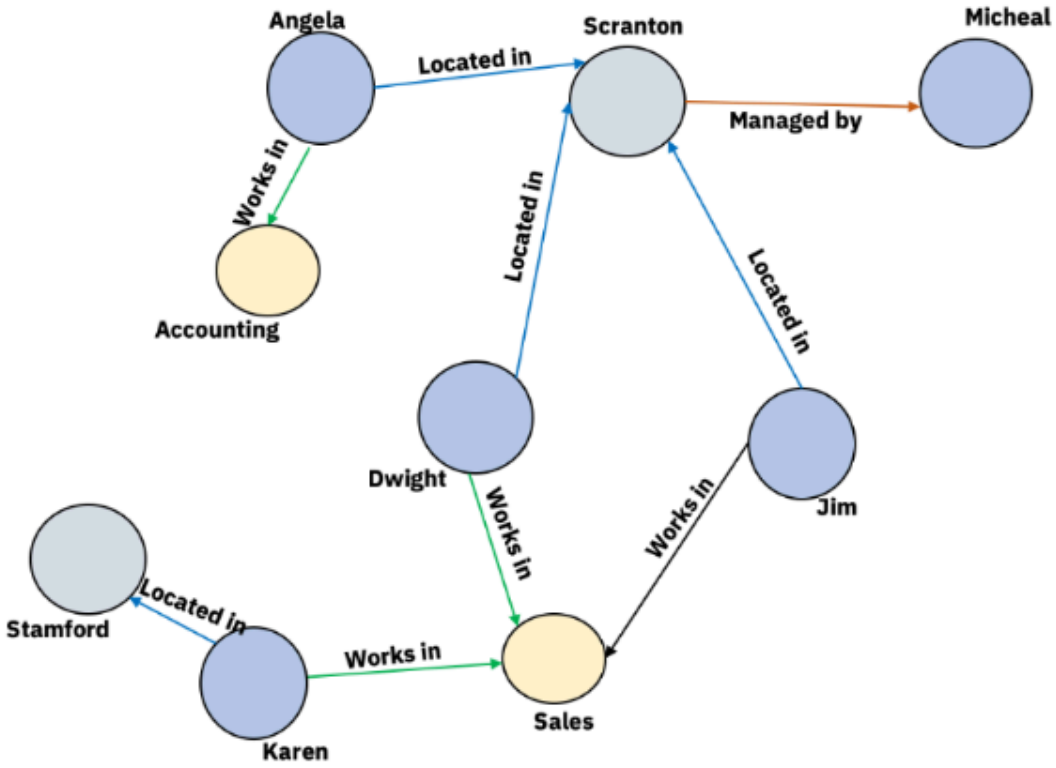
LESS

How connected is your data?

MORE

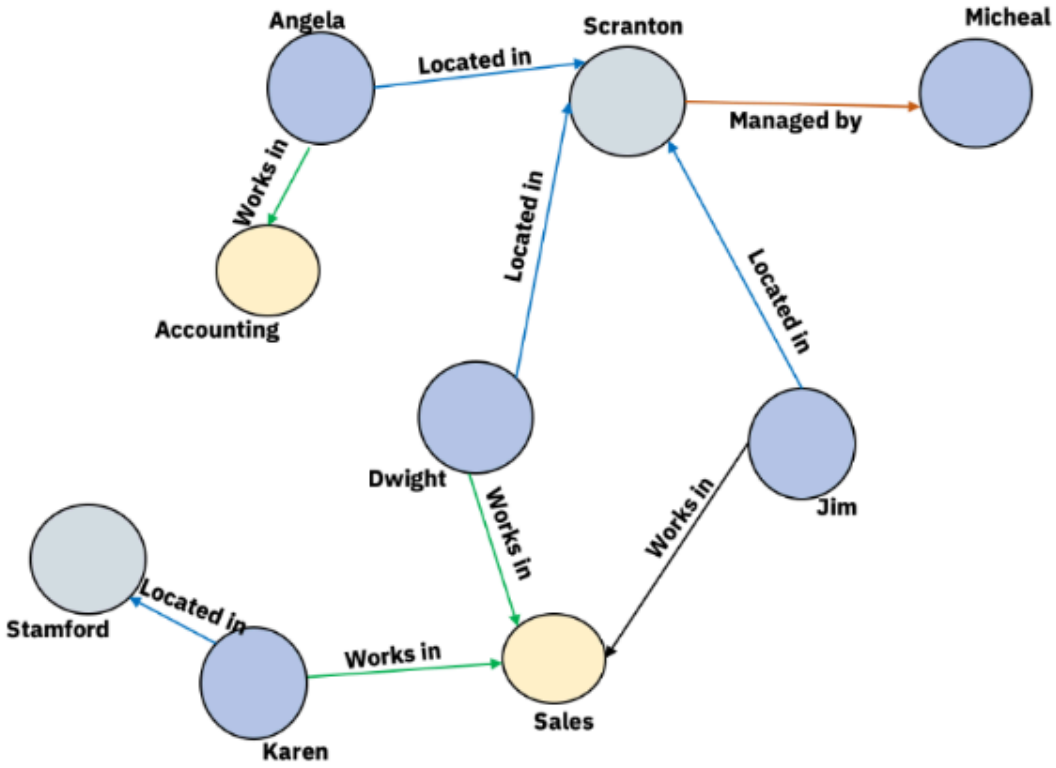
What is a property graph?

- Based on objects called **vertices** and their relationships, called **edges**.
- Vertices have **inbound** and **outbound** edges.
- Edges come **from** one vertex **to** another.
- The collection of vertices and edges define the graph.



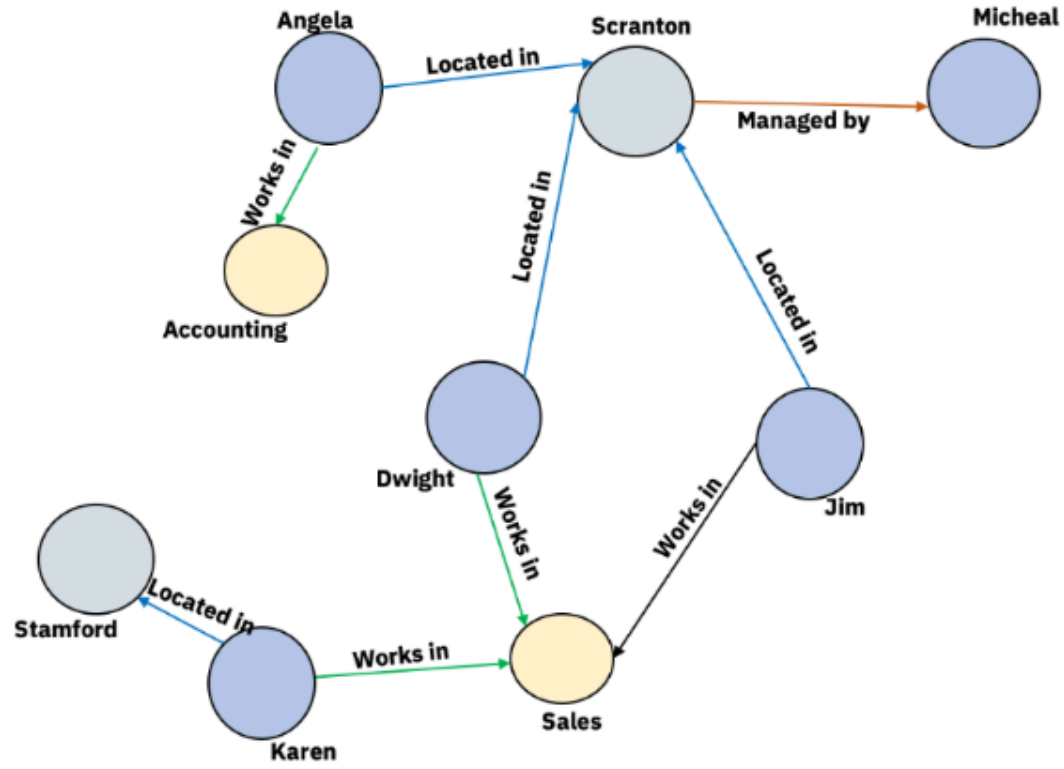
What is a property graph?

- Each vertex or edge has:
  - An **ID** that is unique across the graph
  - A **label** that represents the type of object
  - A set of **properties** that provide additional attributes.



How do you query a graph?

- Queries look at the relationships between vertices.
- An algorithm, the **graph traversal**, starts from a particular set of vertices and ends some defined depth away.
- Filters match ids, labels or properties and constrain the results.



Native vs Non-native graph databases

NATIVE:

- Specialized data store and query engine
- Implements the graph model down to the storage level

EXAMPLES:

- Neo4j, OrientDB, TigerGraph

NON-NATIVE:

- Use existing data store or materializes Graph in-memory
- Uses a complex schema to support both uses

EXAMPLES:

- MSSQL server graph extension, ArangoDB, JanusGraph

What delays adoption of existing solutions?

- **Native graph solutions** that are suitable for graph-only workloads require you to migrate data from existing systems.
- **Hybrid solutions** that duplicate data in-database or in-memory or represent data in complex formats that aren't easily accessible.

- High setup and maintenance costs.
- Relational database are used to solve many graph use cases.
- Duplicate data in another database or in-memory.
  - Inconsistent copies of data.
  - Export/import overhead to load data.
  - Cost of additional storage.

What is Db2 Graph?

- An enterprise grade in-database Graph solution
  - No movement of data into secondary storage to perform graph queries
- No additional cost to existing Db2 licenses
- Queries data and relationships with existing relational tables, supporting Graph analytics and traditional SQL on the same data
- Fetches data in real-time through JDBC

What is Db2 Graph?

- Based on Apache **TinkerPop**
  - TinkerPop is an open-source graph framework
  - **Gremlin** is the graph query language of TinkerPop
  - Db2 Graph is a provider plugin for TinkerPop
- Currently ships in a container that includes the Gremlin Server and Gremlin Console
- Released as technical preview in Db2 11.5.4

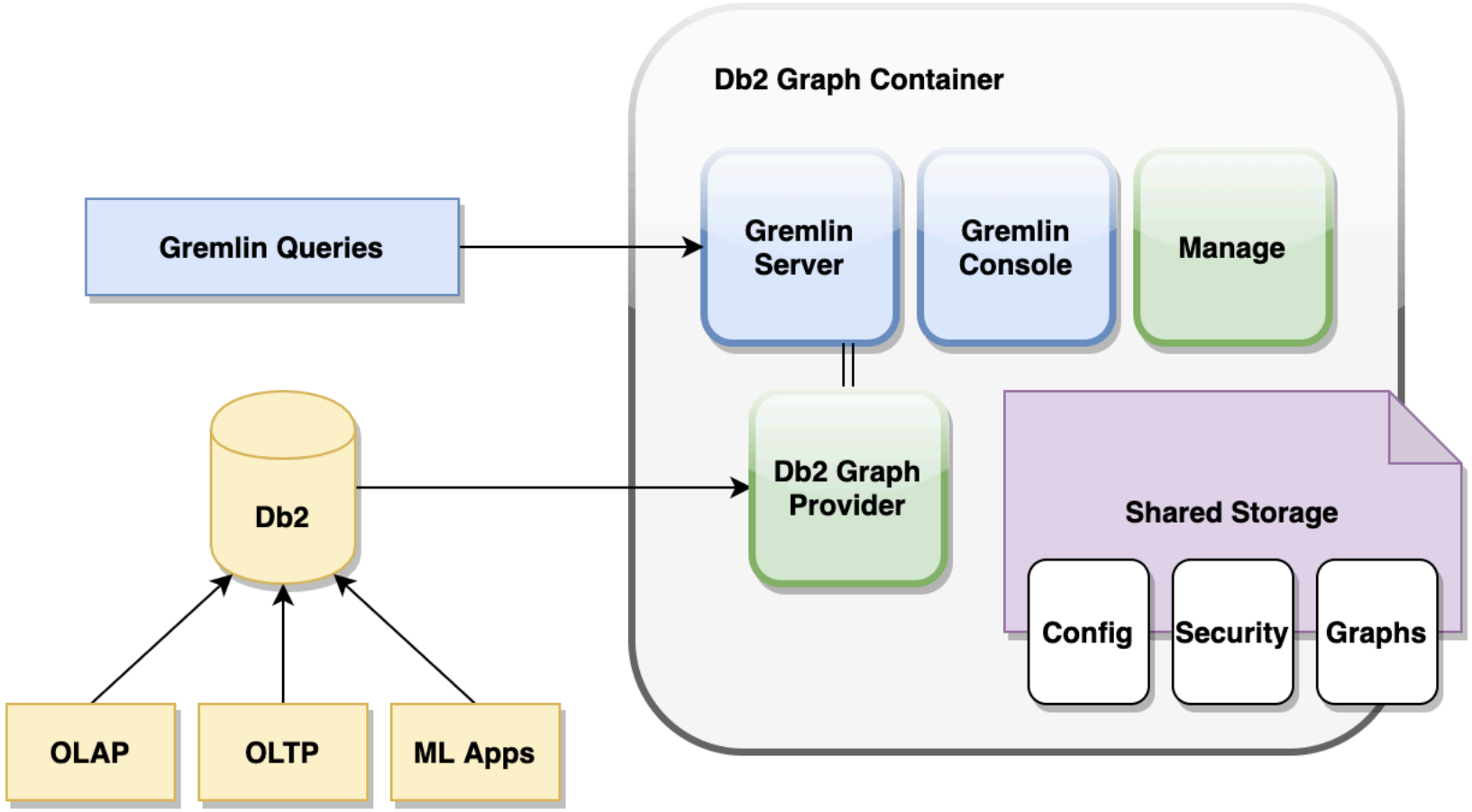
How does Graph differ from SQL?

Essential Operations on Data	RDBMS	GRAPH
Simple relationships between records	●	
Transaction information	●	
Summation and max queries	●	
Business intelligence (aggregations)	●	
Complex queries on interrelated data		●
Deep traversals		●
Indirect relationships (friend of a friend) k-hop traversals		●
Expressive query language and visual results		●
Versioning or auditing of data	●	
Fast execution of complex pattern matching queries		●
Represent multiple versions of the same graph		Db2 Graph

How do you query a graph?

- g.V().hasLabel('DEMO.CLAIM').has('CLAIM_ID', 'C4377').out('DEMO.INSURED_OF_CLAIM').out('DEMO.HAS_DISEASE').path().by(__.valueMap(True))

Db2 Graph Components



How does Db2 Graph work?

- Defines a virtual graph model, the **topology**, on top of Db2 tables
  - Uses referential information to automatically create a graph schema
  - Maps tables or views to graph vertices and edges
- Users create a **topology** using the container's manage command
- Db2 Graph uses the topology to convert Gremlin queries to SQL

How does it work?

- Db2 remains untouched. No change in data, structure or performance.
- Existing applications are uninterrupted.
- Data is fetched by Db2 Graph at time of execution. Data consistency and updates are reflected in real-time.

Mapping relational data to a graph model

- Persists the identification of vertices and edges in a json model.
  - Vertices represent tables with a primary key
  - Edges represent relationships between tables identified by a foreign key
- Views are supported, but not included in the auto-generation and must be manually added.

Patient Table

patientID	name	address	subscriptionID
1	Alice	…	115
…			…

HasDisease Table

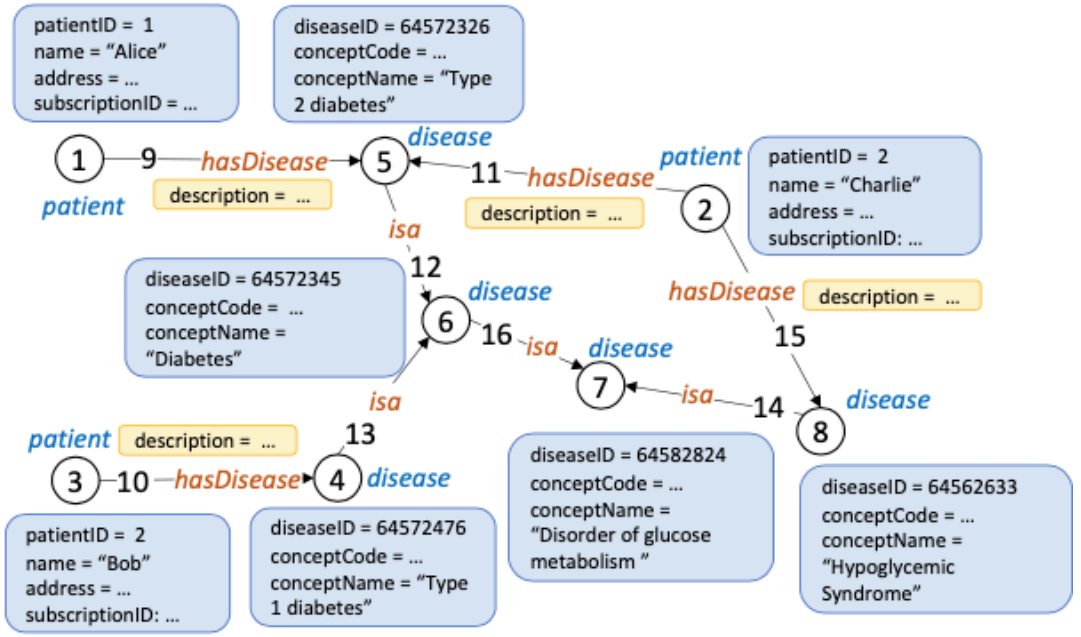
patientID	diseaseID	description
1	64572326	…
…	…	…

Disease Table

diseaseID	conceptCode	conceptName
64572326	44054006	"Type 2 diabetes"
…	…	

DiseaseOntology Table

sourceID	targetID	type
64572326	73211009	"isa"
…	…	



DEMO

Getting started

- To access Db2 Graph visit:
  - https://supportcontent.ibm.com/support/pages/technology-preview-ibm-db2-graph