

Graph Database - "A Future of DBMS"

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Abstract:- To increase the indexing and readability there exists a traditional way of storing the information in the forms of tables, but nowadays Graph databases are quickly gaining popularity. The representation of data in the form of a graph lends itself well to structured data with a dynamic schema. Due wide spread of graph algorithm and models, query language have been defined for graph databases. Graph databases are able to represent as graph any kind of information and they also make easier for machine learning methods to use the stored information. The Research and industrial adoption of graph database will determine the future direction of graph databases. This paper goes over current applications of graph database. Also we have discussed about the similarities and differences of traditional relational models with the graph database and also the power of using graph databases.

Keywords: Data, Graph Database, Nodes, Edges, Relationships, Applications.

I. INTRODUCTION

Graph Databases are currently gaining a lot of interest, as they can give very powerful data modeling tools that provide a closer fit to how your data works in the real world. Graph is the most generic form of storing data in a visual manner in the world of data structures. Graphs store data in the form of nodes (data blocks) where one node points to another. A graph database is a database designed to treat the relationships between data as equally important to the data itself. It is intended to hold data without constricting it to a pre-defined model. Instead, the data is stored like we first draw it out – showing how each individual entity connects with or is related to others[1].

➤ What is a Graph?

A graph is composed of two elements: a node and a relationship, each node represents an entity and each relationship represents how two nodes are associated. Data is stored in the form of nodes, every node is connected to another one and this connection is called an edge. What's mention on the edges ti defined connection between to nodes is called relationship.Graph Databases are often schema-less. This doesn't mean that there is no data model associated with the database though. [2]

➤ Graph Technology and Graph Database

Graph technology focuses on the relationship between data objects to discover valuable knowledge and insights. Graph databases are platform for storing and managing connected data for the identification of graph oriented values. Vertices are unit to express one object within

domain. Edges are unit to express the relationship between object within domain. Graph databases are built for use with transactional system. Graph databases is an online database management system [2].

➤ Why Graph Database?

Following are the five main reasons why graph database is gaining popularity over other traditional database models.

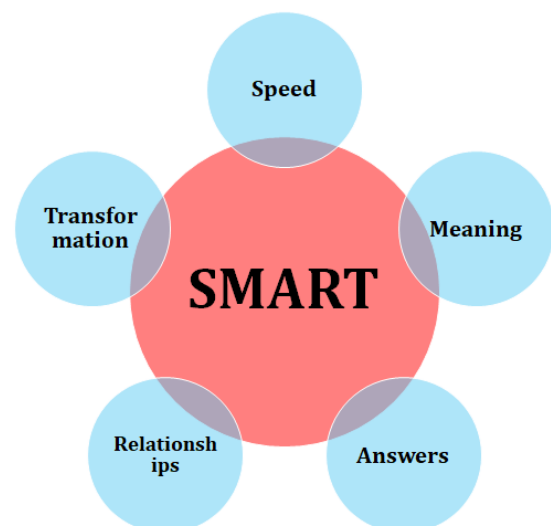


Figure 1: Graph Database Key Drivers

- **Speed** The speed with which enterprises can analyse their data is essential for reducing costs and time.
- **Meaning** these technologies use formal semantics to connect and expose the meaning of all disparate and raw data raw that surrounds us.

➤ Answer the meaning attached to the entities allows graph databases to answer questions that go far beyond simple keywords and are much closer to what people would intuitively ask.

➤ Relationship Graph Databases offer organizations a unique chance to see their proprietary data from different angles and even to connect it to external sources and reveal further relationships.

➤ Transformation Graph databases have the potential to drive innovation and transform enterprise data management into an interconnected all-round view of all data sets. [3]

II. ARCHITECTURE

A graph is a collection of node and edge tables. We can create Node or edge tables using any schema in the database, but they all belong to one logical graph. Here users are able to create one graph per database. A node table is collection of similar type of nodes. For example, a Person node table holds all the Person nodes belonging to a graph. Similarly, an edge table is a collection of similar type of edges. For example, a Friends edge table holds all the edges that connect a Person to another Person. Since nodes and edges are stored in tables, most of the operations supported on regular tables which are similar to SQL are supported on node or edge tables.

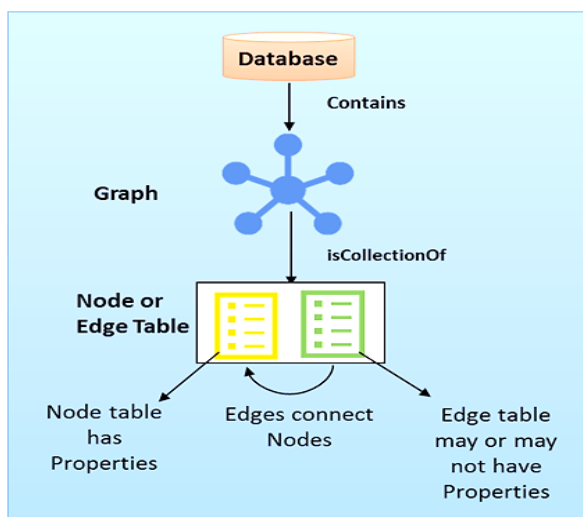


Figure 2: Architecture of SQL Graph Database

➤ Example Of Graph Database

For example in the given figure we can see that each person in a group could be represented by a node, and their relationship between each other could be represented by a relationship. A customer makes a transaction request to a bank then cashier handles the entire money related query. Similarly, supporting staff handles all the day to day routine work of bank and at last customer care handles customer related queries and provides feedback to the bank.

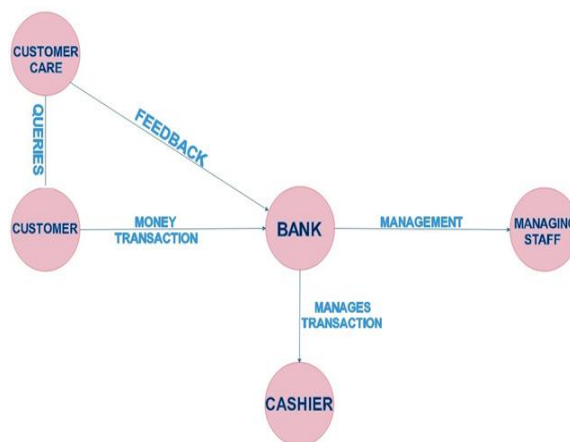


Figure 3: Example of Graph Database

III GRAPH DATABASE VS RELATIONAL DATABASE

A graph database is a good fit for exploring data that are structured like a graph, in particular when relationships between items are significant. By contrast relational databases are well suited to find All- like queries.[5]

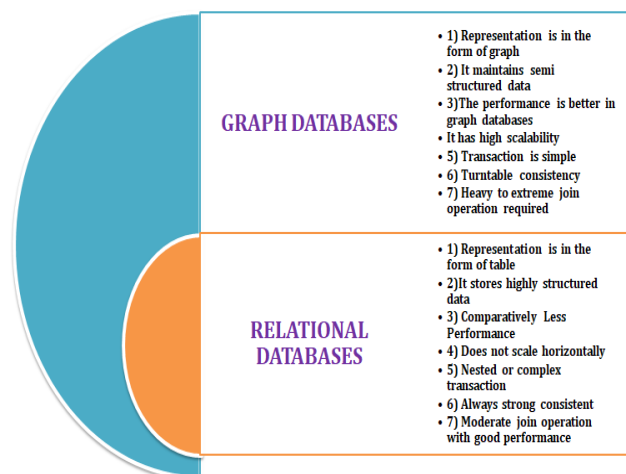


Figure 4: Graph VS Relational Database

IV ADVANTAGES & BENEFITS OF USING GRAPH DATABASES

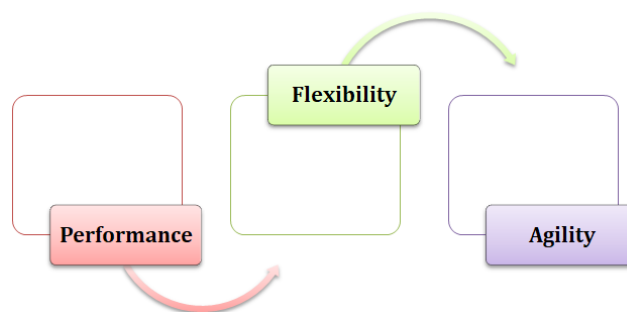


Figure: Power of Graph Database

Above Figure shows some of major advantages of using graph database [6]

Performance:

Performance of graph database is more than that of relational databases and NOSQL stores. In relational database the query performance is weaker as we handle the large datasets while in graph database it remains the same even if datasets grows, this is because queries are localized to specific graph portion which reduces the traversing time and increase execution time because we only traverse the selected part of the graph.

Flexibility: This is the most important weapon of using graph database as they are very flexible to use. As a developer they want to connect to data and domains directly without knowing the detail knowledge of schema. In this type of database we can add new nodes, new sub graphs and also new kinds of relationships to an existing structure without disturbing existing queries and application functionality. The additive nature of graphs also means we tend to perform fewer migrations, thereby reducing maintenance overhead and risk.

Agility: Developing with graph databases aligns perfectly with today’s agile, test-driven development practices, allowing your graph database to evolve in step with the rest of the application and any changing business requirements. Modern graph databases are equipped for frictionless development and graceful systems maintenance.

Also following are some of the benefits of graph database.[7]

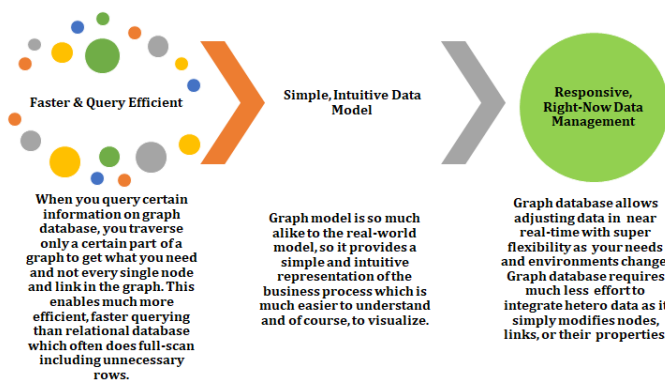


Figure: Benefits of Graph Database

V APPLICATIONS OF GRAPH DATABASE

In graph databases we are introduce to various application they are as follows:-

1. Recommendation Engines

One of the more popular graph database use cases is for powering product recommendation engines. Neo4j claims to count seven of the world’s top ten retailers as customers.

2. Fraud Detection

Graph databases are uniquely positioned to spot the connections between large data sets and identify patterns, a useful trait when it comes to spotting complex, modern fraud techniques. Neo4j says that it already counts a number of major banks using its graph services to aid fraud detection.

3. Network and IT Operations

Enterprise customers can use graph databases to map entire communications or IT networks. Graph connect about how Telco's can use graph databases to model the whole network.

4. Search

Google built its best-in-class consumer web search engine upon the principles of graph databases, and Neo4j is looking to bring that sort of contextual search capability to enterprise customers.

5. Master Data Management

Graph databases allow companies to bring together customer, product, supplier and logistics information to give a holistic view of master data. One of Neo4j’s earliest adopters was Cisco, which chose Neo4j when it decided to rebuild its master data management system.

6. Identity and Access Management

Graph databases are more dynamic by nature, and can better track changing roles and access authorizations than traditional systems. As enterprise struggle to maintain the complex network of changing rolls across the business a shift to smarter identity an access management software is required.

7. Machine Learning

Google has been running “graph-powered machine learning” for many of its AI-powered products like inbox reminders and image recognition in Google Photos, and Neo4j wants to democratize this capability on its platform [8].

VICONCLUSION

So with this paper we have covered a brief overview of graph database. Also we had focused on various points like Architecture of SQL graph database, how they differ from traditional relational database and which are the various applications of graph databases. Hence from the above study we can say that processing of data in graph database is much faster than that of the relational database. They are very flexible than relational database as we can add new nodes, new relationship and even new subgraph without disturbing the existing schema and this is the main reason why they are

so popular and gaining the attentions of many database designers hence are mostly used in big data processing and social media.

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