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Instructions:

1. What does NoSQL mean?
2. What types of problems were NoSQL databases designed to solve?
3. What are three examples of NoSQL database products and how do each of them work?
4. What are the advantages and disadvantages of NoSQL databases?
5. What is a graph database?
6. What types of problems were graph databases designed to solve?
7. What are two examples of graph database products and how do each work?
8. What are the advantages and disadvantages of graph databases?

Non-Relational Data Storage and Retrieval Systems

Before technology, data was stored mostly on paper and in file folders that were arranged in rows in filling cabinet. In some parts of the world, especially hospitals still store their patient data in file folders and keep them in cabinets. In the developed world, data is stored in computers. One of the first technology way of storing data was introduced by Charles Babbage in the 1800 where he stored data in punch cards. Since then, the technology sector advanced and undergone a lot of changes. Today, technology is estimated to grow by 2.5 times faster in the United States alone and close to 2 time sin the rest of the world (UK tech on the Global Stage, 2021). We are in technological age. With the new technologies, there are changes in ways and types of data storage and processing. Databases Management Systems encompasses programs that enable users to create and maintain the databases.

In order for us to better understand what Database Management Systems are, we will break the terms down and define them. Data-Base are two words and start with, data can be defined as raw and unprocessed facts. Or data is defined as facts like text, numbers, audios, images, videos and so on. Bringing the word together DataBase (Database) is collection of related data or facts. Management system is efficient data storage, maintenance and retrieval of data. Organizing data in their related bases and categories and separating them in the customers needs. Data is crucial in every sector whether in business, research and all aspects of life, the data we store is a lot and because of that, there are many different types of databases. The type of database you need to use depends on the

type of information you need to store. Database types are NoSQL Database, Graph Database, Embedded Database, Document Oriented Database, and so on. In this essay, we will go over what NoSQL and Graph Databases are, problems designed to solve, examples of their product Databases and how each one works, advantages and disadvantages.

Structured Query Language or SQL are table-based and are simple to use, highly scalable, data independent, and allows a high-level query to be made. Relational Database Management Systems, data is stored in tables that are related by the use of a foreign key. Tables in RDMS are made up of rows and columns such that rows show records while columns show attributes. Even though RDMS and SQL is simple to use and have many advantages, they have other shortcomings. One shortcoming is that they have limited field length that cannot be exceeded, which makes it hard to store some data. NoSQL Databases which can be called Not Only SQL sometimes emphasizes that they may support SQL or sit alongside SQL databases.

NoSQL Databases (Not only Structured Query Language) are non-relational databases that was designed to solve relational databases' different workloads. NoSQL was developed to address several challenges that faced relational databases when dealt with various levels of user activities. NoSQL Databases' scalability and performance are much higher than relational databases. NoSQL Databases are best in storing semi-structured or non-structured hence they don't enforce a concrete schema for tables like relational databases do. It means that data attributes can be added at any time without changing the structure of the table. NoSQL databases have no particular structure and because of that they are not very good at joint queries. The data is stored in a format that can be accessed frequently- this is useful in defining the databases to the UI, the place where data will be used. They are also advantages in a sense that they are great at scaling horizontally and they provide better performance. This makes NoSQL Databases to be more attractive alternative. Even though they have better performance, they do not compare favorably to RDMS because NoSQL are not as developed as RDMS and they have fewer features. NoSQL database technology is built to solve business problems and are designed in storing distributed data that have extremely large data storage needs. There are several NoSQL products such are the Key-value databases, document databases, wide column stores, and graph databases.

Key-Value Databases are used to map keys to values. "Key" is basically identifier and it's values are implemented as an opaque binary objects. Key-value help quick access to data but the it's storage doesn't have relationships among the data they store. Document databases (previously known as Document-Oriented Databases)

store their data in XML or JSON format that are referred to as self-describing formats. They are called self-describing formats because they include descriptive labels on what data is stored. They are good in storing data that are hierarchical and nested for example books and other test-heavy contents. Graph Databases use graph theory mathematics. They represent entities as “vertexes” connected by “edges”. The vertexes and edges show relationships for example GPS routes networks or a friend of a friend relationships in social networks like Facebook. MongoDB, Cassandra and HBase are few other examples of products that can be used as NoSQL databases. In documents that are the same as that of JSON are stored in a document-oriented database or currently known Document Database like MongoDB. The Cassandra database is basically a column-oriented database, which as the name says, the data is stored in columns rather than rows. HBase is a column-oriented key-value store, meaning that it stores data in a columnar fashion.

Graph Databases are a type of NoSQL and are purpose-built. They are built to store and navigate relationships. This Graph Databases use nodes to store data entities, edges to sore relations between entities. For example, the attribute of the graph databases has start node and end node, type and direction and they describe the relationships. Graph databases are a little more specialized and they are great in social network analysis. They are less practical in other sectors such as general database workloads. They are good in identifying links in business requirements between many entities- it’s fast and efficient. Graph Databases are disadvantageous such that they are not mature, or they are less mature. Graph Databases have less features. Some examples of graph database products are Neo4j and OrientDB. Neo4j is a NoSQL graph database and stores data in nodes and show relationships. OrientDB is a NoSQL Graph Database and stores data in documents.

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