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Year & Section: 3 – BSCS – A

Types of Database

1. **Relational Database**

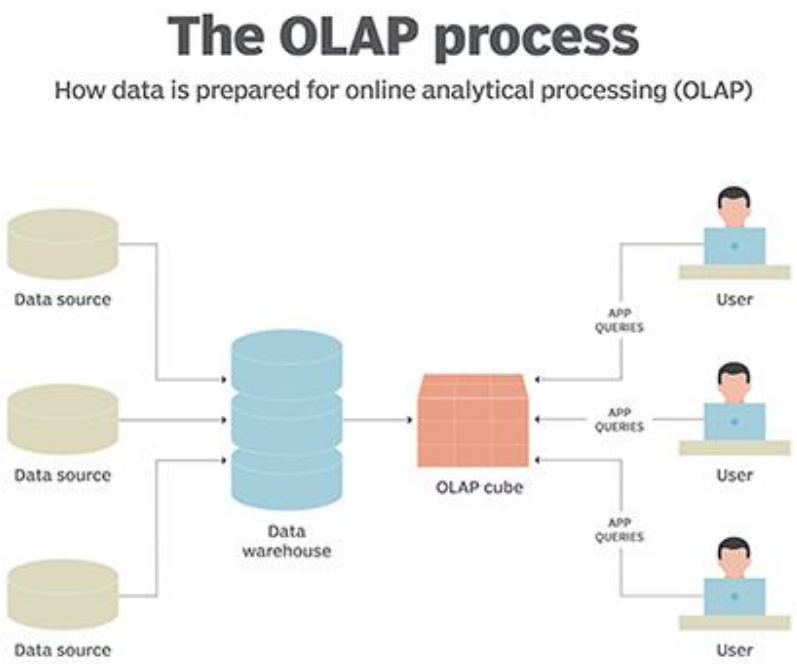
- The relational database management system (RDBMS) is the software that allows you to create, update, and manage relational databases. Data is stored in rows and columns within the tables. They adhere to the ACID (Atomicity, Consistency, Isolation, and Durability) standard, which is a set of properties for reliable database transactions. Relational databases perform well when dealing with structured data. A relational database organizes data into tables that can be linked (or related) based on data that is shared by all. With a single query, you can create an entirely new table from data in one or more existing tables.

    - Popular examples of standard relational databases include Microsoft SQL Server, Oracle Database, MySQL and IBM DB2.

2. **Analytical (OLAP) Database**

- OLAP (online analytical processing) is a computing method that allows users to extract and query data easily and selectively in order to analyse it from various perspectives. OLAP begins with data gathered from various sources and stored in a data warehouse. The data is then cleansed and stored in OLAP cubes, from which users can run queries.

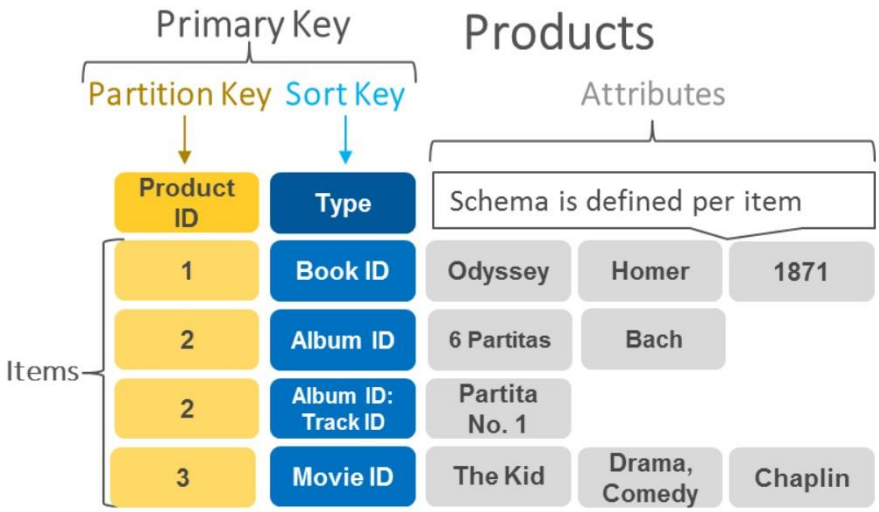
    - OLAP products include IBM Cognos, Oracle OLAP and Oracle Essbase. The feature of this also included in tools such as Microsoft Excel and Microsoft SQL Server's Analysis Services.



3. Key Value Database

- A key-value database is a nonrelational database that stores data using the simple key-value method. A key-value database stores data as a collection of key-value pairs, each with its own unique identifier. Keys and values can both be anything, from simple objects to complex compound objects. Key-value databases are highly partitionable, allowing for horizontal scaling at scales that other types of databases cannot. For example, if an existing partition reaches capacity and more storage space is required, Amazon DynamoDB allocates additional partitions to the table.

The following diagram shows an example of data stored as key-value pairs in DynamoDB.



4. Column-Family Database

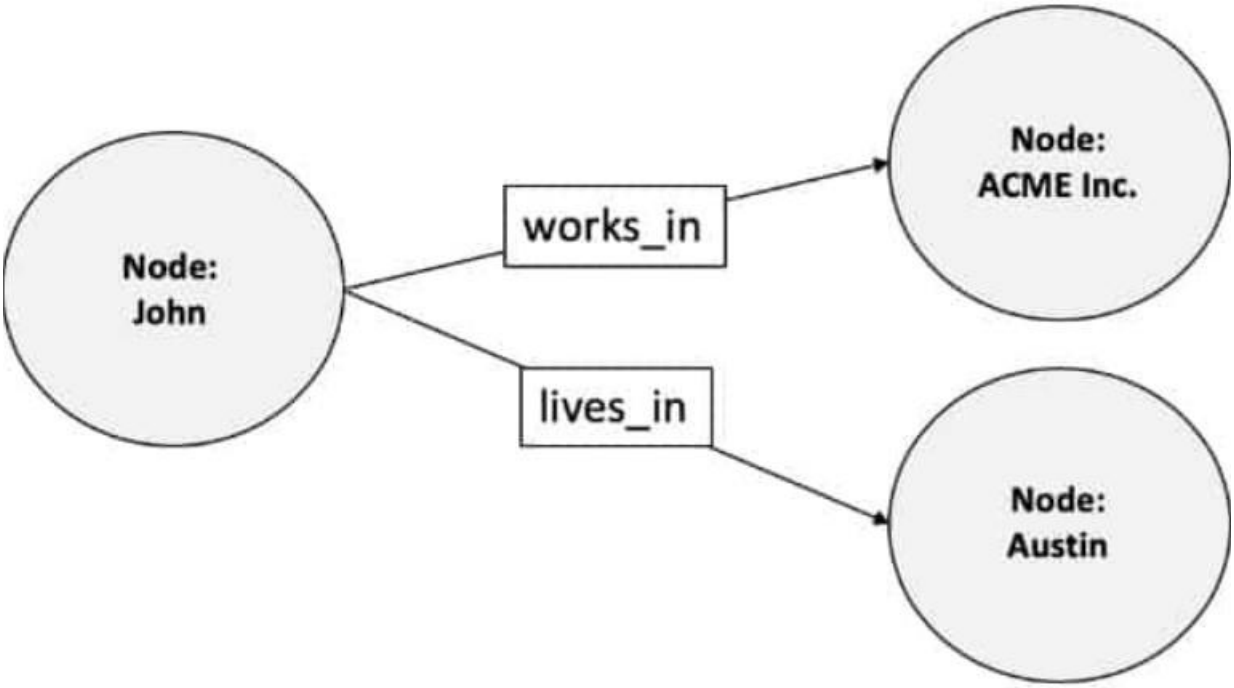
- Column families are groups of columns that are all related to each other. Columns that are frequently used together should be grouped together in the same column family. For example, address information for a customer, such as street, city, state, and zip code, should be grouped together in a single column family. A key space is used to save column families. A row key is used to distinguish each row in a column family. As a result, a column family is comparable to a table in a relational database. However, there are significant distinctions. The data in relational database tables is not always stored in the same order. Relational table rows are not versioned in the same way that column family database rows are.

Street	City	State	Province	Zip	Postal Code	Country
178 Main St.	Boise	ID		83701		U.S.
89 Woodridge	Baltimore	MD		21218		U.S.
293 Archer St.	Ottawa		ON		K1A 2C5	Canada
8713 Alberta DR	Vancouver		BC		VSK 0AI	Canada

5. Graph Database

- Graph Database presents data as entities, or *nodes*. Nodes can have properties that have further information. Nodes are connected to other nodes with *edges*. Each connection between two nodes can be labelled with properties. The data is stored in the manner in which we first drew it, showing how each individual entity connects with or is related to others. And it's not only stores the relationships between objects in a native way, making queries about relationships fast and easy, but allows you to include different kinds of objects and different kinds of relationship in the graph.

  Node A: John
  Node B: ACME Inc.
  Node C: Austin
  Edge 1: works_in
  Edge 2: lives_in
  This database tells you that John works in ACME Inc. and he lives in Austin.



6. Document Database

- A document database is a type of nonrelational database that stores and queries data in JSON-like documents. Document databases make it easier for developers to store and query data in a database by employing the same document-model format that they use in their application code. Document-oriented databases that are popular include MongoDB, DynamoDB, and CosmosDB. MongoDB is a popular example of a document-oriented database. Amazon Web Services' DynamoDB is a fully managed NoSQL database service.