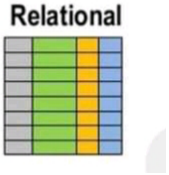
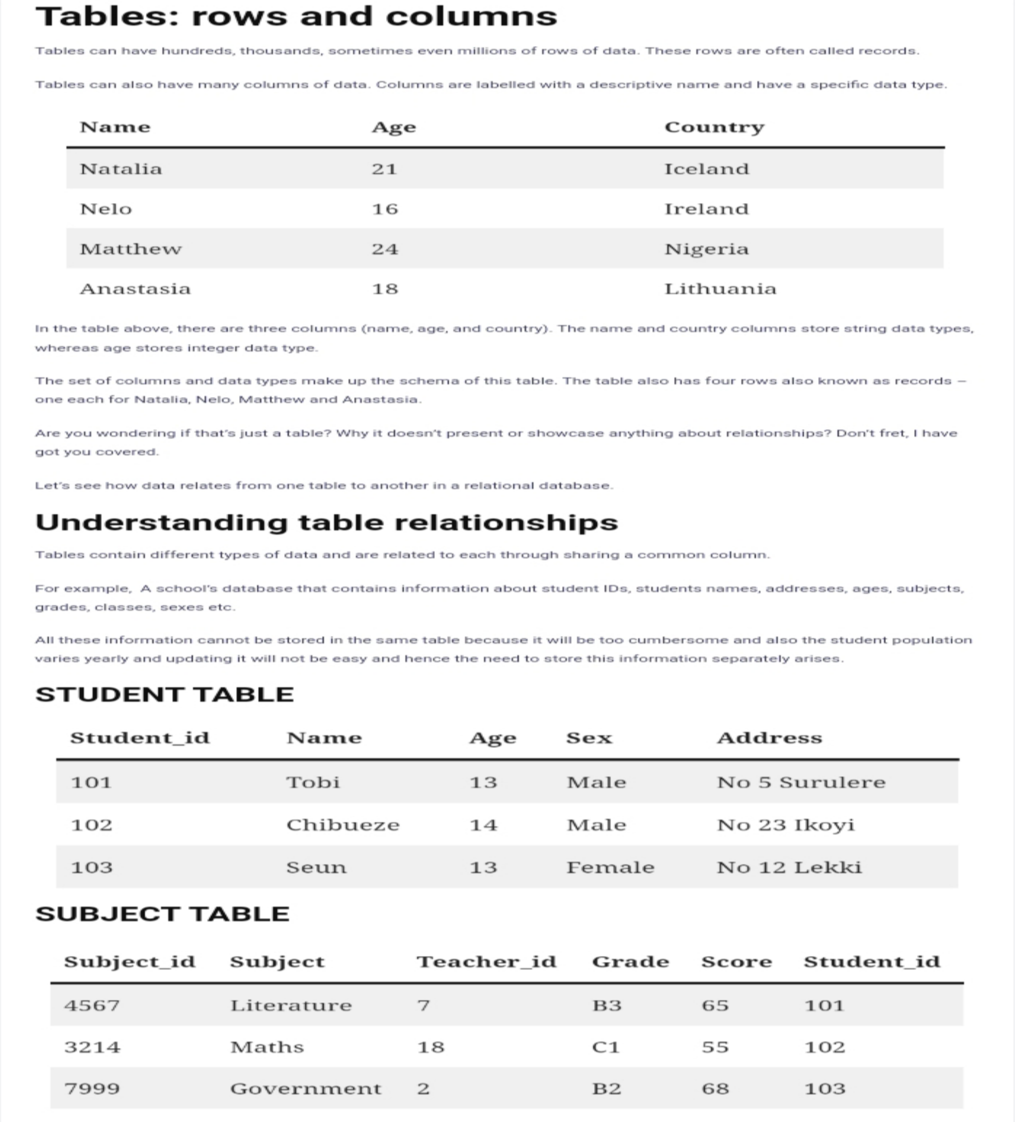
Name: Jeisa Marie D. Perez

Yr/course/section: 3/BSCS/B



What is a relational database?

A relational database is a type of database (an organized collection of information usually stored in rows and columns). It uses a structure that allows us to identify and access data in relation to another piece of data in the database. Often, data in a relational database is organized into tables.



Tables: rows and columns

Tables can have hundreds, thousands, sometimes even millions of rows of data. These rows are often called records.

Tables can also have many columns of data. Columns are labelled with a descriptive name and have a specific data type.

Name	Age	Country
Natalia	21	Iceland
Nelo	16	Ireland
Matthew	24	Nigeria
Anastasia	18	Lithuania

In the table above, there are three columns (name, age, and country). The name and country columns store string data types, whereas age stores integer data type.

The set of columns and data types make up the schema of this table. The table also has four rows also known as records – one each for Natalia, Nelo, Matthew and Anastasia.

Are you wondering if that's just a table? Why it doesn't present or showcase anything about relationships? Don't fret, I have got you covered.

Let's see how data relates from one table to another in a relational database.

Understanding table relationships

Tables contain different types of data and are related to each through sharing a common column.

For example, A school's database that contains information about student IDs, students names, addresses, ages, subjects, grades, classes, sexes etc.

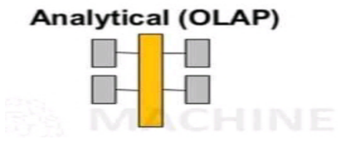
All these information cannot be stored in the same table because it will be too cumbersome and also the student population varies yearly and updating it will not be easy and hence the need to store this information separately arises.

STUDENT TABLE

Student_id	Name	Age	Sex	Address
101	Tobi	13	Male	No 5 Surulere
102	Chibueze	14	Male	No 23 Ikoyi
103	Seun	13	Female	No 12 Lekki

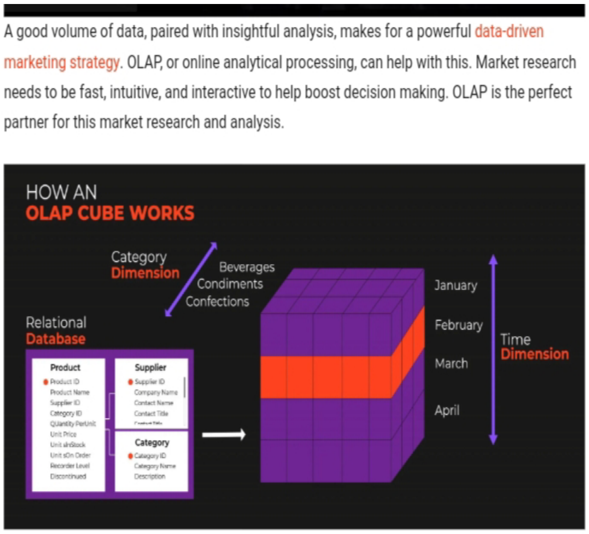
SUBJECT TABLE

Subject_id	Subject	Teacher_id	Grade	Score	Student_id
4567	Literature	7	B3	65	101
3214	Maths	18	C1	55	102
7999	Government	2	B2	68	103

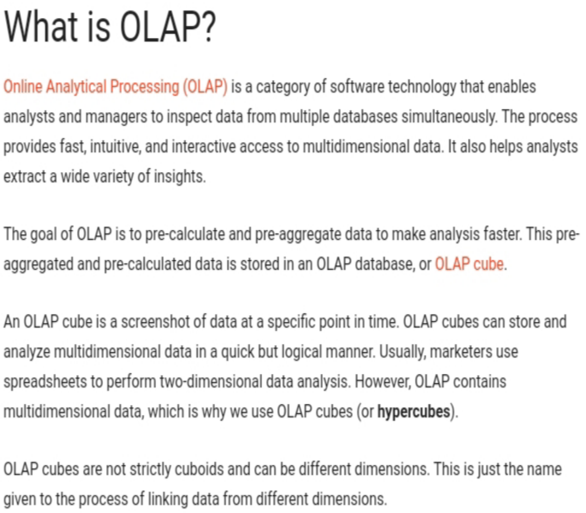


What is Analytical Database?

An analytic database is a database management system that is optimized for business analytics applications and services. It is specifically designed to support business intelligence (BI) and analytic applications, typically as part of a data warehouse or data mart.



A good volume of data, paired with insightful analysis, makes for a powerful data-driven marketing strategy. OLAP, or online analytical processing, can help with this. Market research needs to be fast, intuitive, and interactive to help boost decision making. OLAP is the perfect partner for this market research and analysis.



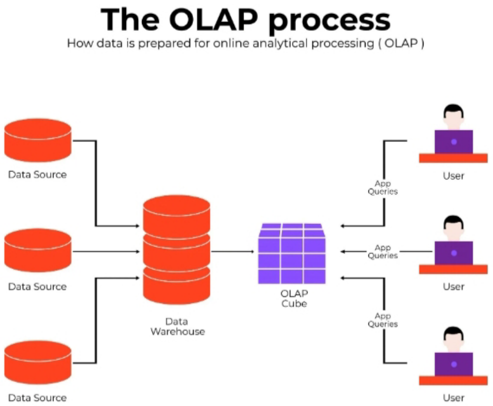
What is OLAP?

Online Analytical Processing (OLAP) is a category of software technology that enables analysts and managers to inspect data from multiple databases simultaneously. The process provides fast, intuitive, and interactive access to multidimensional data. It also helps analysts extract a wide variety of insights.

The goal of OLAP is to pre-calculate and pre-aggregate data to make analysis faster. This pre-aggregated and pre-calculated data is stored in an OLAP database, or OLAP cube.

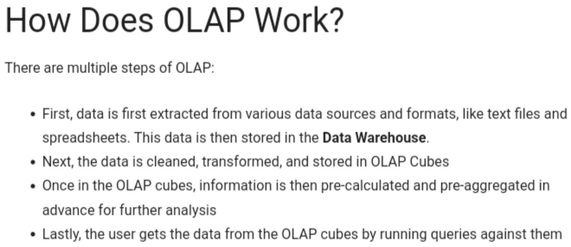
An OLAP cube is a screenshot of data at a specific point in time. OLAP cubes can store and analyze multidimensional data in a quick but logical manner. Usually, marketers use spreadsheets to perform two-dimensional data analysis. However, OLAP contains multidimensional data, which is why we use OLAP cubes (or **hypercubes**).

OLAP cubes are not strictly cuboids and can be different dimensions. This is just the name given to the process of linking data from different dimensions.



The OLAP process

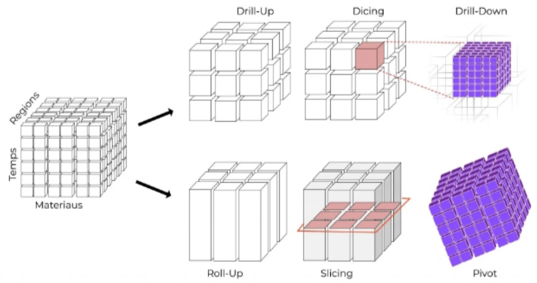
How data is prepared for online analytical processing (OLAP)

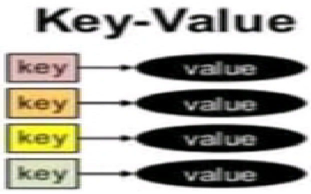


How Does OLAP Work?

There are multiple steps of OLAP:

- First, data is first extracted from various data sources and formats, like text files and spreadsheets. This data is then stored in the **Data Warehouse**.
- Next, the data is cleaned, transformed, and stored in OLAP Cubes
- Once in the OLAP cubes, information is then pre-calculated and pre-aggregated in advance for further analysis
- Lastly, the user gets the data from the OLAP cubes by running queries against them





What is Key-Value Database?

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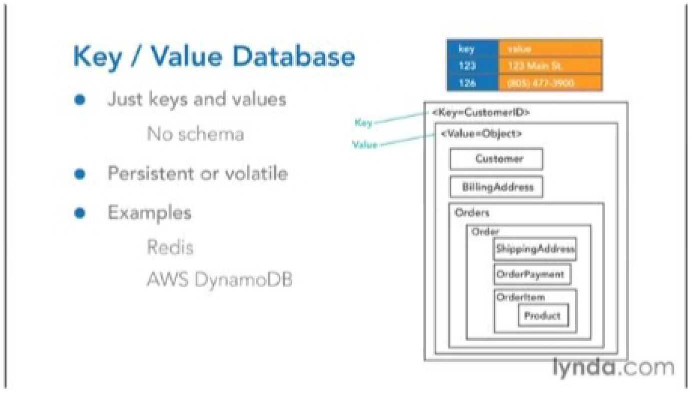
A key-value database is a type of NoSQL database which uses a key-value method to store data. Key-value databases work differently from the relational databases. They store data as a collection of key-value pairs where a key serves as a unique identifier. The key-value databases are designed for storing, retrieving, and managing a data structure known as a hash table (or dictionaries). They contain objects or records. Which records have different fields within them. These records can be retrieved using a key to quickly find the data within the database. The strength is in scalability and parallel processing. They are unsuitable for complex relational queries. They are designed to provide API for data analytics. They are simple and fast in proper use case.

In some situations, we use a datastore like a file system. In such a case, we can look up records using keys.
A key-value store or document-oriented database is practical in such a situation. We already know some of the key-value-store DB engines, such as ElasticSearch. They let us create parallel search structures which help analyze things like the log files, you can think about the ELK stack. We need a relational database when we need inter-record joins. In these use cases, we do not need joins. In these scenarios, we actually can use something like the PostgreSQL JSON functionality or equivalent functionality in MySQL. But for various specific use cases, we need some named key-value database. The key-value pair is a concept in some of the programming languages. Phone directory, IP forwarding table, stock ticker are some typical examples used to explain the fields of application.

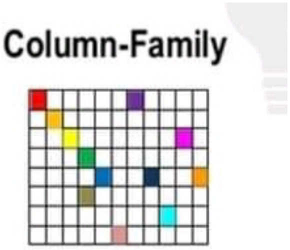


Key / Value Database

- Just keys and values
  - No schema
- Persistent or volatile
- Examples
  - Redis
  - AWS DynamoDB

key	value
123	123 Main St.
126	(805) 477-3900

The key in a key-value pair should be a unique identifier which will allow us to access the value associated with that key. The implementation of a key depends on the database. The value in a key-value store can be anything. It can be a text, a chunk of HTML or a PHP snippet or a file such as an image. The typical usage of the key-value database is in image stores, object cache, key-based file systems and so on.

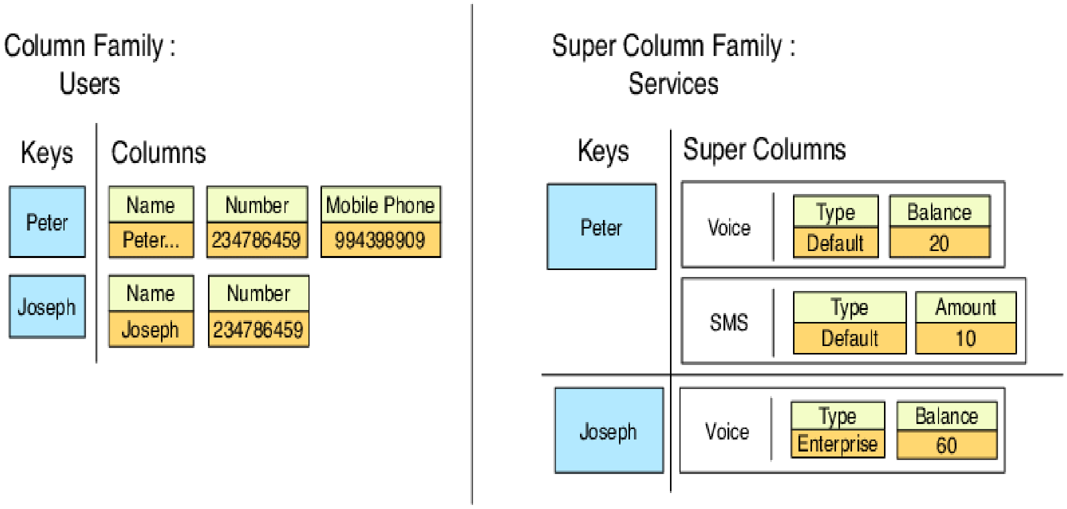


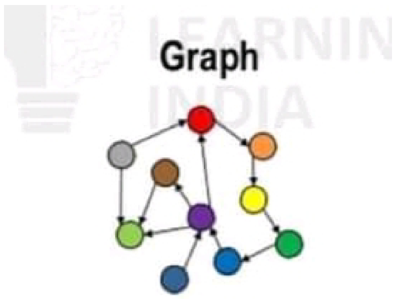
A column family is a database object that contains columns of related data. It is a tuple (pair) that consists of a key–value pair, where the key is mapped to a value that is a set of columns. In analogy with relational databases, a column family is as a "table", each key-value pair being a "row". Each column is a tuple (triplet) consisting of a column name, a value, and a timestamp. In a relational database table, this data would be grouped together within a table with other non-related data.

Two types of column families exist:

Standard column family: contains only columns

Super column family: contains a map of super columns





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A graph database is defined as a specialized, single-purpose platform for creating and manipulating graphs. Graphs contain nodes, edges, and properties, all of which are used to represent and store data in a way that relational databases are not equipped to do.

Graph analytics is another commonly used term, and it refers specifically to the process of analyzing data in a graph format using data points as nodes and relationships as edges. Graph analytics requires a database that can support graph formats; this could be a dedicated graph database, or a converged database that supports multiple data models, including graph.

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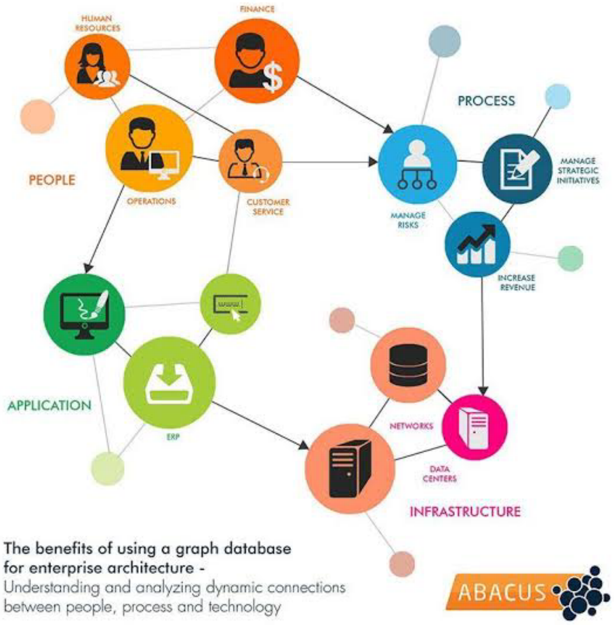


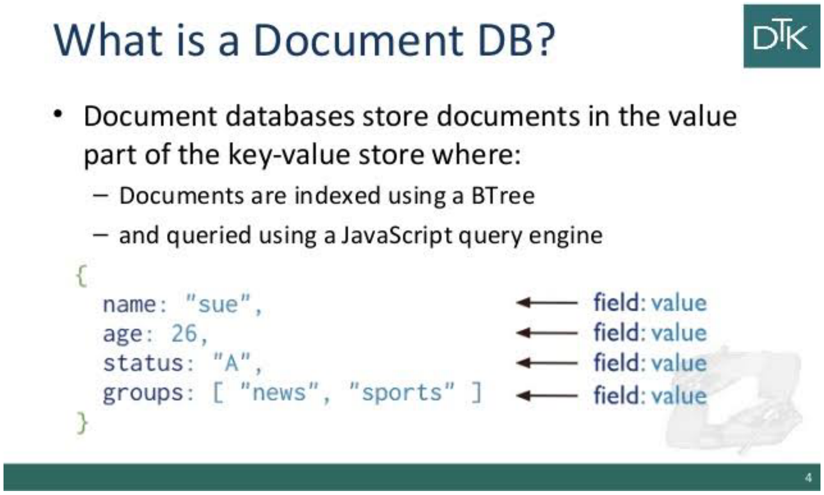
The benefits of using a graph database for enterprise architecture - Understanding and analyzing dynamic connections between people, process and technology

IG
Document

A document-oriented database, or document store, is a computer program and data storage system designed for storing, retrieving and managing document-oriented information, also known as semi-structured data. Document-oriented databases are one of the main categories of NoSQL databases, and the popularity of the term "document-oriented database" has grown[2] with the use of the term NoSQL itself. XML databases are a subclass of document-oriented databases that are optimized to work with XML documents. Graph databases are similar, but add another layer, the relationship, which allows them to link documents for rapid traversal.

Document-oriented databases are inherently a subclass of the key-value store, another NoSQL database concept. The difference lies in the way the data is processed; in a key-value store, the data is considered to be inherently opaque to the database, whereas a document-oriented system relies on internal structure in the document in order to extract metadata that the database engine uses for further optimization. Although the difference is often negligible due to tools in the systems, conceptually the document-store is designed to offer a richer experience with modern programming techniques.

Document databases contrast strongly with the traditional relational database (RDB). Relational databases generally store data in separate tables that are defined by the programmer, and a single object may be spread across several tables. Document databases store all information for a given object in a single instance in the database, and every stored object can be different from every other. This eliminates the need for object-relational mapping while loading data into the database.



What is a Document DB?

DTK

- Document databases store documents in the value part of the key-value store where:
  - Documents are indexed using a BTree
  - and queried using a JavaScript query engine

```
{
  name: "sue",                          ←— field: value
  age: 26,                              ←— field: value
  status: "A",                          ←— field: value
  groups: [ "news", "sports" ]          ←— field: value
}
```

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