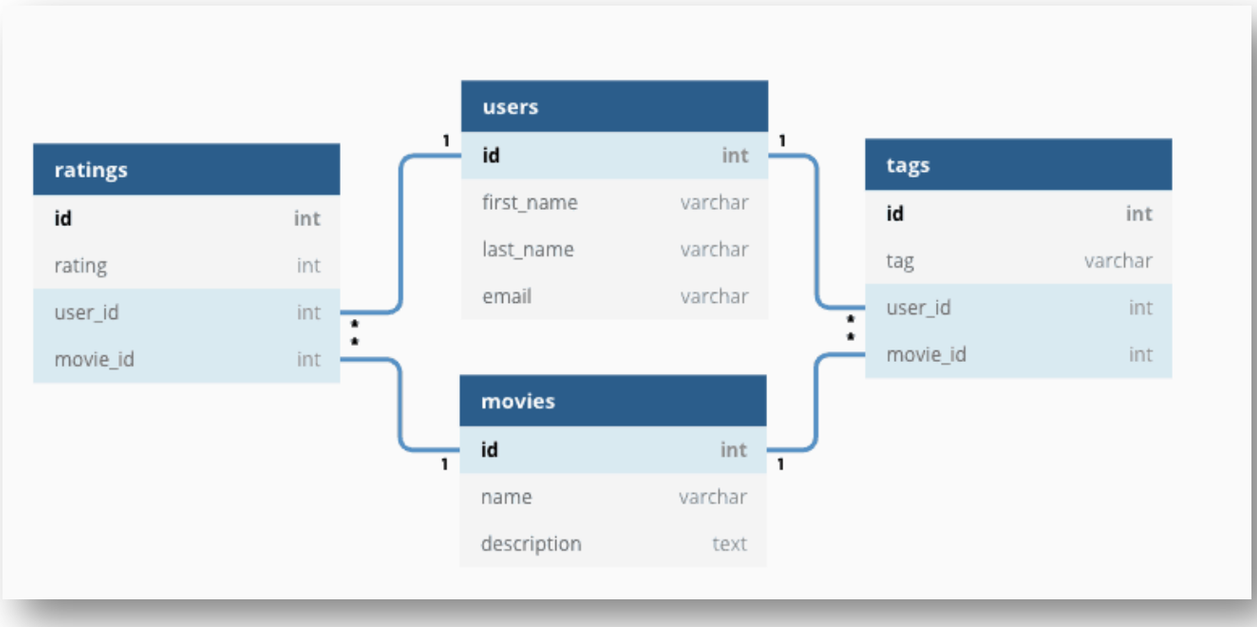
TYPES OF DATABASES

What are databases?

A database is an organized collection of data, also known as structured data. Databases have become an indispensable part of modern life. If you rely on a computer to store information, whether as an individual or for your job, it's critical that you understand the various types of databases that exist and how to use them.

Relational Database

A relational database is a form of database that stores and allows access to data elements that are linked. The relational model, a simple and obvious means of representing data in tables, is the foundation of relational databases. Each row in a table in a relational database is a record with a unique ID called the key. The attributes of the data are stored in the table's columns, and each record usually contains a value for each attribute, making it simple to construct links between data points.

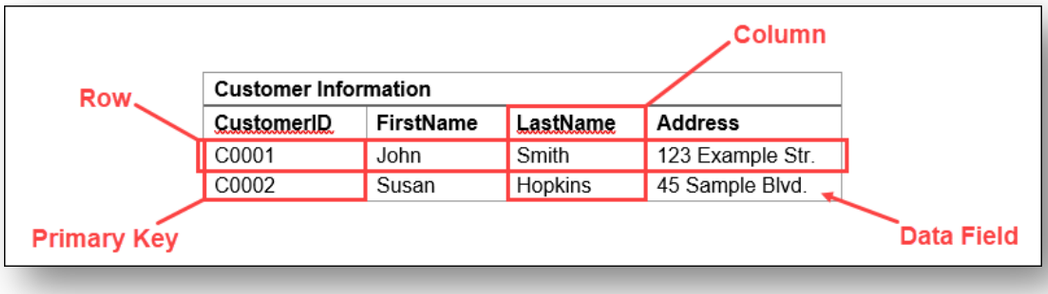


Examples of relational databases are MySQL, PostgreSQL, MariaDB and SQLite.

How Is Data in a Relational Database System Organized?

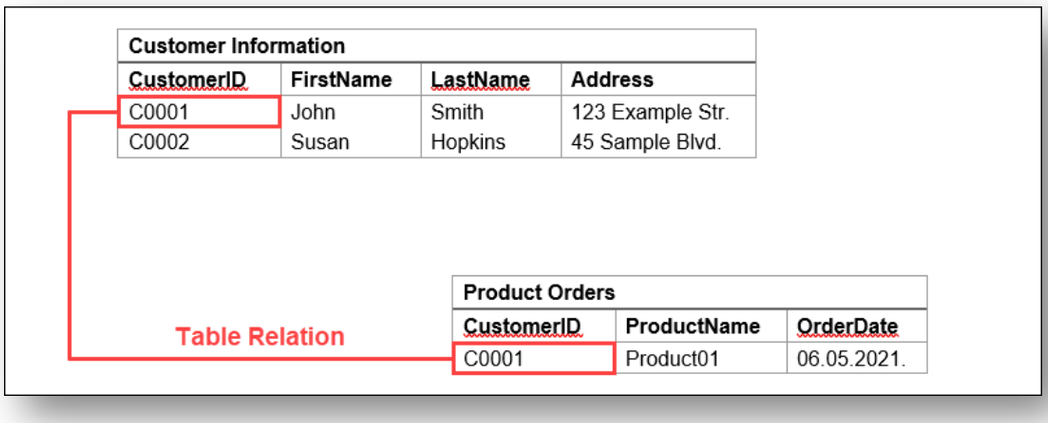
Relational database systems use a model that organizes data into tables of rows (also called *records* or *tuples*) and columns (also called *attributes* or *fields*). Generally, columns represent categories of data, while rows represent individual instances.

Let's use a digital storefront as an example. Our database might have a table containing customer information, with columns representing customer names or addresses, while each row contains data for one individual customer.



These tables can be linked or related using keys. Each row in a table is identified using a unique key, called a primary key. This primary key can be added to another table, becoming a foreign key. The primary/foreign key relationship forms the basis of the way relational databases work.

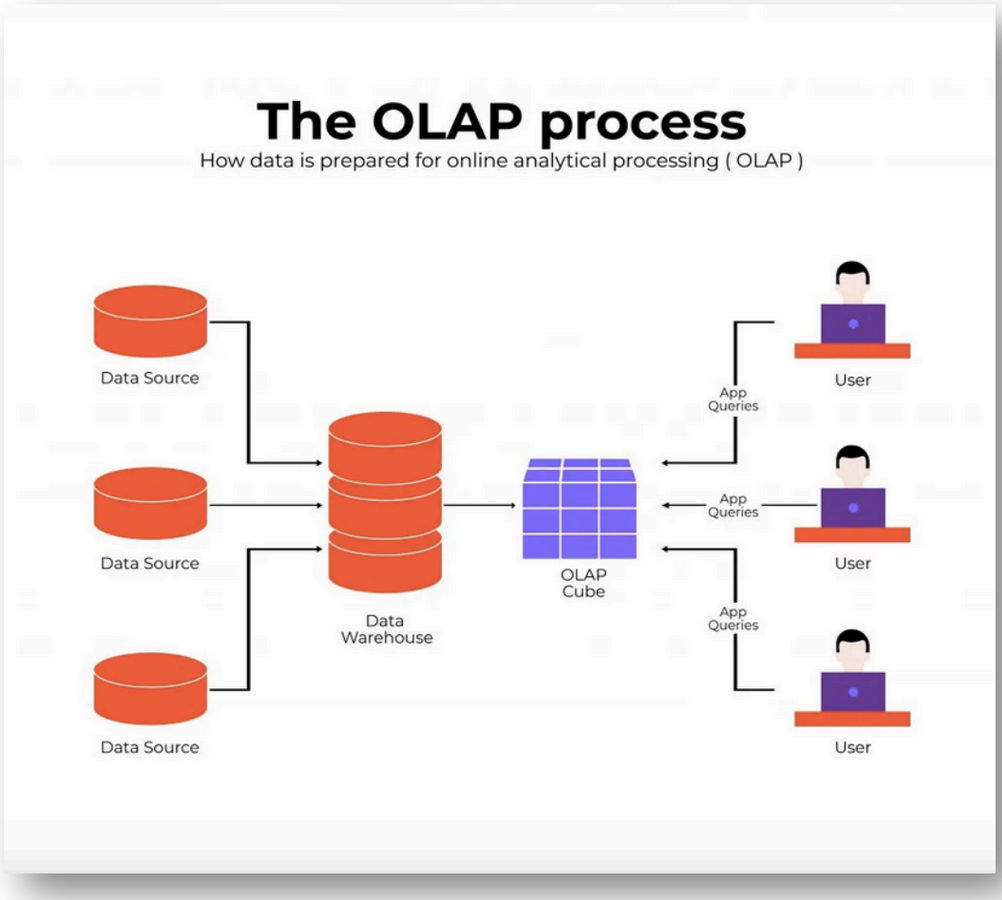
Returning to our example, if we have a table representing product orders, one of the columns might contain customer information. Here, we can import a primary key that links to a row with the information for a specific customer.



This way, we can reference the data or duplicate data from the customer information table. It also means that these two tables are now related.

Analytical (Online Analytical Processing)

OLAP (online analytical processing) is a computer approach that allows users to extract and query data quickly and selectively in order to examine it from many perspectives. Trend analysis, financial reporting, sales forecasting, budgeting, and other planning tasks are frequently aided by OLAP business intelligence queries. Analytical databases, stores data from previous sources and through that information they establish their approach to take. For instance, businesses process collected data and make analytics based on that.



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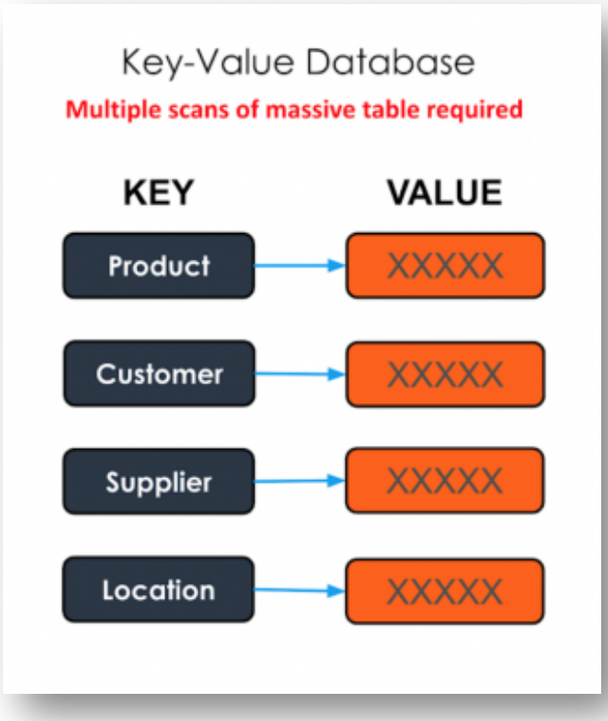
For example, a user can ask for data to be analyzed in order to see a spreadsheet showing all of a company's beach ball products sold in Florida in July, compare revenue figures with those for the same products in September, and then compare other product sales in Florida during the same time period. Data is collected from many data sources and stored in data warehouses, then cleansed and structured into data cubes to support this type of analysis. Data is categorized by dimensions (such as customers, geographic sales region, and time period) in each OLAP cube, which are produced from dimensional tables in the data warehouses. Members (such as customer names, countries, and months) are then sorted hierarchically to populate dimensions. When compared to relational databases, OLAP cubes are frequently pre-summarized across dimensions. OLAP products include IBM Cognos, Oracle OLAP and Oracle Essbase.

Key-Value Database

A key-value database is a nonrelational database that stores data using a simple key-value mechanism. Data is stored in a key-value database as a collection of key-value pairs, with a key serving as a unique identifier. Both keys and values can be any type of object, from simple to sophisticated compound objects. Key-value databases are extremely partitionable and can scale horizontally to scales that other databases cannot. If a current partition fills to capacity and extra storage space is necessary, Amazon DynamoDB assigns additional partitions to the database.



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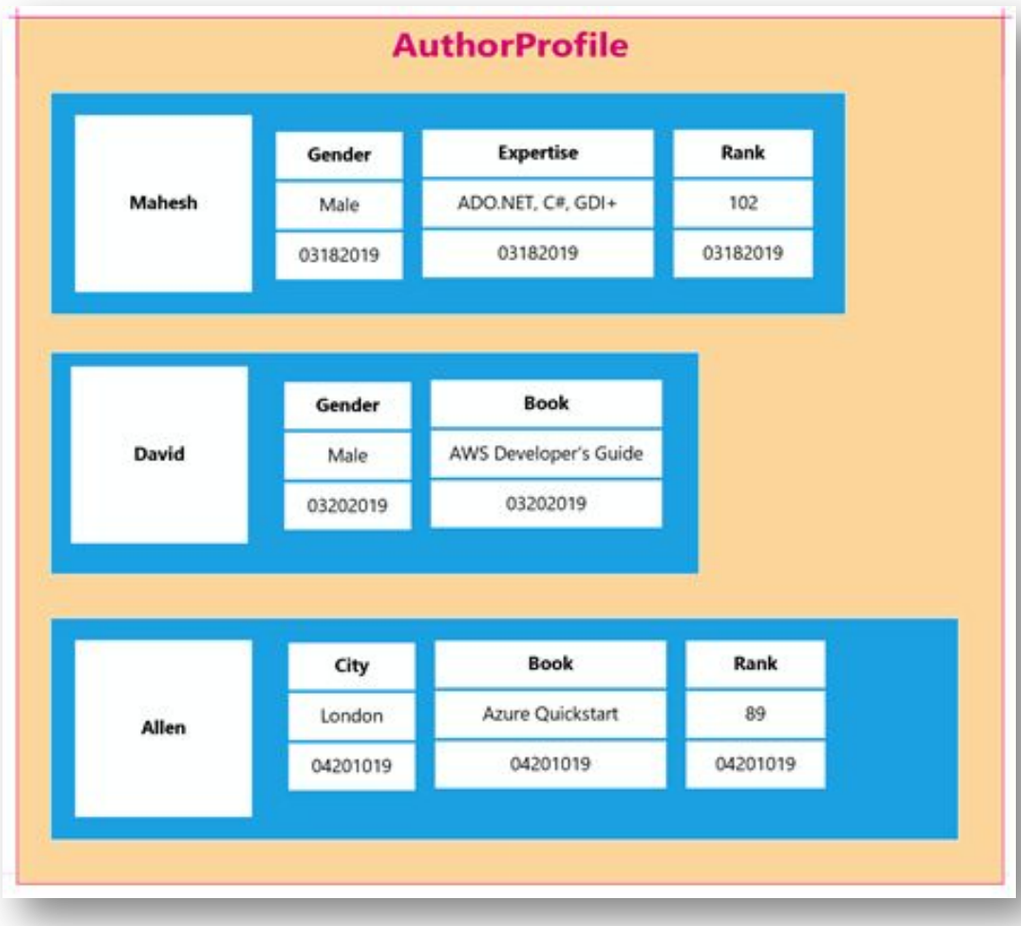
The concept of a key-value store is actually rather simple. A value is saved with a key that specifies its location. A value can be any piece of data or information. In reality, as an array or map object, this is a design notion that can be found in almost every piece of programming. The distinction is that it's kept in a database management system for a long time. The fact that information is kept as an opaque blob rather than discrete data is what makes key-value storage so popular. As a result, indexing the database to make it faster isn't necessary. Instead, because of the way it's built, it runs quicker on its own. It doesn't have its own language, either, relying instead on simple get, put, and delete commands. Of course, this has the drawback that the data you receive from a request isn't screened. In some cases, the lack of control over the data can be a concern, but for the most part, it's worth the trade-off. Most programmers get past any filter/control issues they encounter since key-value storage are fast and dependable. Redis, Riak, and Oracle NoSQL database are examples of key-value databases.

Column-Family

A column data store is often referred to as a column-oriented database management system (DBMS) or a columnar database management system (DBMS). Data is stored in columns rather than rows in column store DBMS. Data is stored in rows and data characteristics are stored as column headers in relational database management systems (RDBMS). Although both row-based and column-based DBMS employ SQL as their query language, column-oriented DBMS may be faster. Consider the following scenario: you need to list all names from a table based on an ID; instead of traversing through all the rows, you could merely retrieve a single table column.

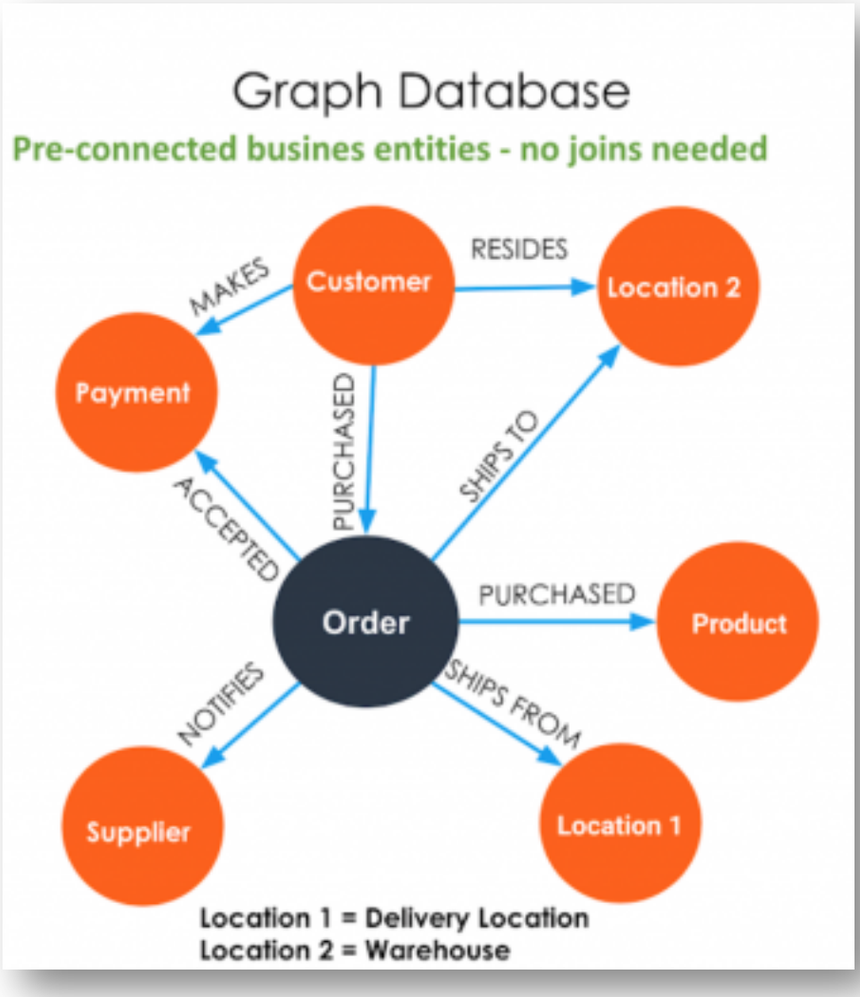


https://www.c-sharpcorner.com/article/what-is-a-column-store-database/

Relational databases that store data by column rather than by row are known as column stores. A column-based store employs one logical file per attribute, as opposed to a standard row-based store, which stores the attributes of one row together, followed by the attributes of the following row, and so on (column). Bigtable, Cassandra, HBase, Druid, Hypertable, MariaDB, Azure SQL Data Warehouse, Google BigQuery, IBM Db2, MemSQL, SQL Server, and SAP HANA are examples of popular column-oriented DBMS.

Graph Database

A graph database, to put it simply, is a database that treats data relationships as equally significant as the data itself. Its purpose is to store information without restricting it to a pre-defined model. Instead, the data is kept in the same way that we originally drew it out, with each unique item connected to or related to others. Graph-Oriented Database Management Systems (DBMS) software is designed to identify and work with the connections between data points.



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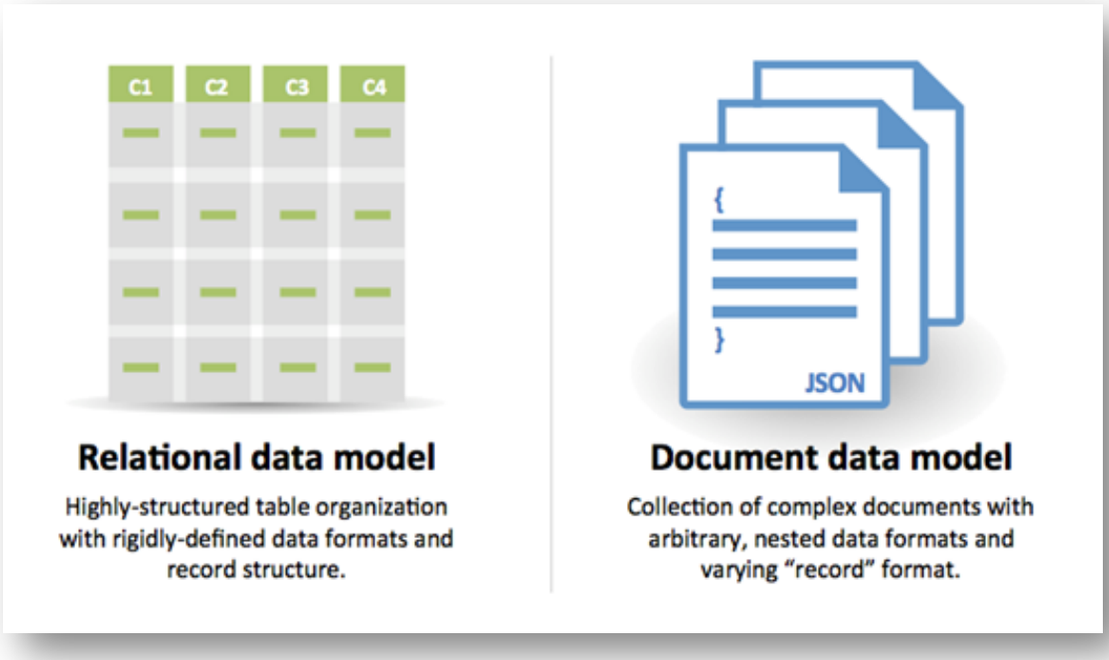
Nodes can represent consumers, companies, or any other data that a business wants to keep track of. The database creates edges so that the user may quickly understand the relationships between nodes. When pulling data and without wanting to spend time structuring it into discrete relationships, businesses might use graph databases. Large businesses may utilize complicated queries to extract precise and in-depth information on their customers and users, as well as product tracking data. Database administrators can work with large amounts of data while still producing useable models. An RDF database, a sort of graph database that focuses on retrieving triples, or information arranged in a subject-predicate-object relationship, may be used by some enterprises. Dgraph, OrientDB, Amazon, Neptune, FlockDB, DataStax, Cassandra, Titan, and Cayley are examples of graph databases.

Document Database

A document database is a type of NoSQL data storage that stores and queries data as JSON-like documents. Document databases save data as documents, complete with metadata. The document is saved as a key/value pair, with the key being the document's unique identification. Document databases are faster to load, access, and parse than relational databases. Document database management systems, document-oriented databases, and document store databases are all terms used to describe document databases.



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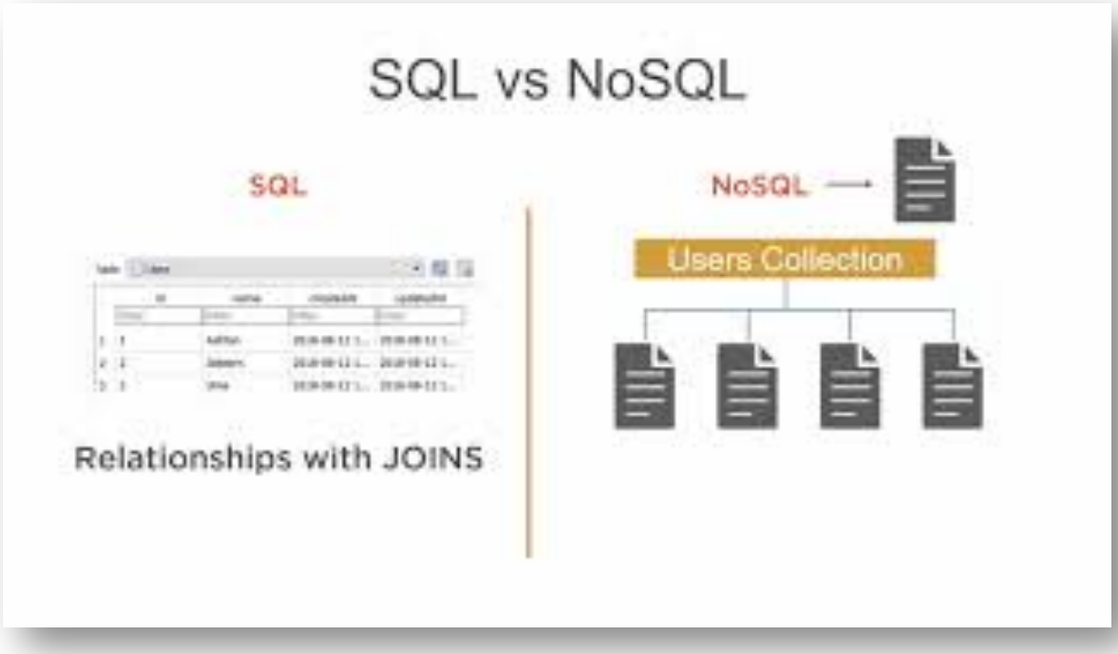

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Traditional relational DBMSs aren't built to handle huge documents or unstructured data efficiently. We don't need organized design for catalogs, profiles, or document storage. A structured format is not required for storing a document in a CMS, for example. Large documents are stored in a key/value store that is easy to search and access in document databases. The entire document is read into a readable and presentable memory object. Document DBMS are commonly used for user profiles, content management systems, and catalogs. Keeping C# Corner articles in a document database rather than a DRBMS is a great example of how to use a document database. MongoDB, Cosmos DB, ArangoDB, Couchbase Server, CouchDB, Amazon DocumentDB, and Elasticsearch are examples of document databases.

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