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CSD310-300O Database Development and Use
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In the context of relational databases, what are relationships? Describe at least two, and provide an example of their use.

In a database context, a relationship is when a variable creates a link with properties that are stored in a different table. These relationships can be seen through keys in a table, which can be columns or fields that specify an organization for each record.

One-To-One Relationship: This is when a record is in a table with its corresponding relationship, and the vacant relationship is present in another table.

Example: This is used when two entities that come together need to be stored independently.

One-To-Many: It's a relationship where objects from one table can be linked to one or more objects in another table.

Example: in a database backend, each customer can place multiple orders, but the customer master record remains the same even if they have more than one order; these orders are retrieved from the backend database.

What are the advantages of relational databases? What are the advantages of NoSQL databases?

Advantages of a Relational Database:

1. **Data accuracy**: In relational databases, many tables can be connected to each other, making the data non-repetitive and therefore more accurate.

2. **Data Integrity:** Relational databases have validation checks to ensure that the input is correct based on predetermined criteria. They also indicate when data is missing.

3. **High Security:** Relational databases rely on multiple tables, which allows data to be viewed only by those who need to see it and restricts access for others.

4. **Easy access**: Allows multiple users to access the data simultaneously.

5. **Normalization**: Provides rules that guarantee the integrity of the structure, preventing anomalies.

6. **Future modification:** The segregation of tables adds another benefit to the database, facilitating future updates.

7. Flexibility: You can create the tables that worked at the time and adapt them to your needs; you can edit and refine them.

8 .Simplicity: They are easy to use despite being robust, but they are not complex.

Advantages of NoSQL databases?

1. It can handle large volumes of data: these systems were created for the internet, which makes it possible to implement a scale-out architecture. This is achieved by distributing the stored data across a large cluster of computers.

2. It stores structured, semi-structured, or unstructured data: It allows data to be stored in ways that are easier to understand and similar to those used in applications.

3. Enable Easy Updates to schema and fields: It allows developers to change the data structure.

4. Developer-Friendly: Databases like MongoDB and JSON are similar in how they are coded, which allows the data structure to be under the developer's control.

5. Take full advantage of the cloud: The scale-out architecture provides a path to scalability by accommodating databases with high volumes of traffic.

What are the disadvantages of relational databases?

1. Horizontal scalability: Relational databases are optimized for vertical scaling, not horizontal scaling, which basically means adding more servers. This is problematic when you need to handle massive amounts of data.

2. Rigid schema structures: Iterative design is complicated; adding or modifying columns sometimes requires downtime.

3. Complex joins and transactions can degrade performance in a large dataset: For example, analyzing relationships across approximately 10 normalized tables might result in slow queries despite proper indexing.

What are the disadvantages of NoSQL databases?

The lack of standardization: Each one uses its own scheme; each system has its strengths and weaknesses that must be learned before using any of them.

The lack of ACID: It does not support atomicity, consistency, isolation, and durability.

The lack of JOINs: SQL uses JOIN clauses to establish connections between database tables by matching columns.

MongoDB features

1. Scalability allows adding more power to the existing machine to handle more data.

2. It uses replication; one server performs all the operations, and the other maintains a record. If the first replica fails, the second one is used.

MySQL features

1. Open source software can be modified by anyone and customized to meet specific requirements.

2. It provides a secure interface and verifies the host before accessing the database.

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