关系型数据库sql, 和非关系型数据库Nosql包括graphe, document, key-value, column的区别：

1）Relational/SQL databases allows to represent entities using relations/tables,

connected using foreign keys, querying need join operations:PostgreSQL

关系型数据库会严格的按照标准化去建模（也就是常说的第一范式、第二范式、第三范式等等）：确保每一条数据都只被存储一次。

2）**基于列的数据库（column-oriented）**

-In a **column** -oriented indexed system, a columnar database stores data by columns rather than by rows. The key is the rowid that is mapped from indexed data. In the column-oriented system, the primary is the data, which is mapped from rowids.

- The compression permits columnar operations — like MIN, MAX, SUM, COUNT and AVG —to be performed very rapidly.

- A column-oriented database serializes all of the values of a column together, then the values of the next column：

10:001,12:002,11:003,22:004;

Smith:001,Jones:002,Johnson:003,Jones:004;

Joe:001,Mary:002,Cathy:003,Bob:004;

60000:001,80000:002,94000:003,55000:004;

3) **键值对存储（Key-Value Stores）**

Unlike relational databases, there are no relations, no features (attributes) associated with relations, no constraints, no need for joins. While in relational database we avoid duplicating data, in key-value (in NoSQL in general) databases it is a common practice.

特点：Simplicity, speed and scalability

- Scalability is another most wanted feature all databases wants to have. No relational dependencies write and read requests are independent. Distribution could be easily achieved.

- Many key-value database systems. No standard query language comparable to SQL

不方便的：

- When information is updated, the whole structure has to be written to a disc. As structure

grows in size, the time required to read and write the data can increase.

- Another drawback is that a such big structure is read even if we need only a small piece of

information – this way we waste time for reading and memory for storing it.

4）**文档存储（document-based databases）**

Documents in the same collection are not described using the same attributes; Hierarchy leads to a non symmetric representation, the access to the root is privileged, and a certain perspective is imposed; No information scattered among different documents likewise no need to join operations as in relational databases;

A document-oriented database:

. a row is a document, with embedded documents and arrays, complex hierarchical relationships in a single row;

. a collection is a group of documents, as a table with a dynamic schema;

. free schema: documents within a collection can have any number of different attributes, not of fixed types or sizes;

特点：No autonomous entities, redundancy and perhaps inconsistencies

MongoDB:A powerful, flexible, and scalable NoSQL

-Replication: a way of keeping identical copies of data on multiple servers->Availability+disponibilite+the fault-tolerance.

-Sharding:(horizontal partitioning)->Scalability(consistent, single-digit millisecond latency at any scale), balancing data between servers increases their performance+Latency

ACID特征：

Atomicity:MongoDB provides a document-wide transaction

Consistency:In a replica set, the primary Mongo server is targeted with all the writes

Isolation:MongoDB had a server-wide write lock! it’s a perfect isolation mechanism.It’s not really isolation since every operation is immediately visible to any other connection.

Durability:MongoDB has highly durability settings

CAP theorem：

It states that it is impossible for a distributed database to simultaneously provide more than two out of these three guarantees at each time t.

consistency(C): Every read receives the most recent write or an error. Every node sees the same version.

availability(A): Every request receives a (non-error) response – without guarantee that it contains the most recent write

partition toleration(P): The system continues to operate despite an arbitrary number of messages being dropped (or delayed) by the network between nodes

5）**图形数据库（Graph Database）**

Graph-oriented database natively embraces relationships to be able to store, process, and query connections efficiently: Neo4j.

Neo4j supports transactions. Neo4j supports only replication.

