



# **Database Systems (ACCA7002)**

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**Database report for Abertawe**

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## Abstract

This paper starts with comparison between SQL and NoSQL database, and talks about both advantages and disadvantages of SQL and NoSQL database. Then based on the case of the Abertawe Arts Center, this paper illustrates the idea of database specially designed for the arts center.

## 1. SQL vs. NoSQL

### 1.1 Relational database(SQL)

Relational database refers to the database that uses the relational model to organize data. It stores data in the form of rows and columns to facilitate users' understanding. A series of rows and columns of relational database are called tables, and a group of tables constitute the database. The user searches the data in the database through the query, and the query is an executive code used to limit some areas in the database. Relational model can be simply understood as two-dimensional table model, and a relational database is a data organization composed of two-dimensional tables and their relationships.

#### 1.1.1 advantages of SQL

Storage: the traditional relational database uses forms to storage data. Data is stored in rows and columns, which can be very convenient to read and query. Relational database stores data in a structured way. Each table must define each field well (that is, define the structure of the table first), and then store the data according to the structure of the table. The advantage of this is that the form and content of the data have been defined before the data is stored, so the reliability and stability of the whole data table are relatively high. In order to avoid duplication, standardize data and make full use of storage space, relational database stores data in the form of minimum relational table, so that data management can become very clear.

Transactional: relational database emphasizes acid rules (atomicity, consistency,

isolation, durability), which can meet the data operation with high transactional requirements or complex data query, and can fully meet the requirements of high performance and stability of database operation. And the relational database emphasizes the strong consistency of data, and it has a good support for transaction operation. Relational database can control transaction atomicity and fine granularity, and once the operation is wrong or necessary, the transaction can be rolled back immediately.

Query mode: the relational database uses structured query language (SQL) to query the database. SQL has long been supported by various database manufacturers and has become the standard of the database industry. It can support CRUD (add, query, update, delete) operation of the database and has very powerful functions. SQL can use similar index methods to speed up the query operation Make.

Normalization: in the process of database design and development, developers usually need to operate on one or more data entities (including arrays, lists and nested data) at the same time. In this way, in relational database, a data entity is generally divided into multiple parts first, and then the divided parts are normalized, and then the normalized data is saved into multiple parts In a relational data table, this is a complex process. The good news is that with the development of software technology, quite a number of software development platforms provide some simple solutions. For example, ORM layer (that is, object relational mapping) can be used to map the object model in the database to the SQL based relational database, and to convert the data of different types of systems.

#### 1.1.2 disadvantages of SQL

Read and write performance: when the amount of data reaches a certain scale, because the system logic of relational database is very complex, in order to maintain consistency, it is very easy to have concurrency problems such as birth and death lock,

so the read and write speed drops very seriously.

Table structure update: the table structure can be updated after being defined, but it will become more complex if there is a large structural change.

High concurrency: the concurrency of website users is very high, often reaching tens of thousands of read and write requests per second. For traditional relational database, hard disk I/O is a big bottleneck.

Massive data: for relational database, the efficiency of querying in a table containing massive data is very low.

## 1.2 NoSQL

NoSQL is a concept, which generally refers to non-relational databases. Different from relational databases, they do not guarantee the acid characteristics of relational data. NoSQL is a new revolutionary movement of database. Its supporters advocate the use of non-relational data storage. Compared with the overwhelming use of relational database, this concept is undoubtedly a new injection of thinking.

### 1.2.1 advantages of NoSQL

The emergence of non-relational database is mostly due to the insufficient performance of relational database, so the advantages of non-relational database are obvious

Read and write performance: no need to go through the SQL layer parsing, read and write performance is very high. The main example is Redis. Because of its simple logic and pure memory operation, its performance is excellent. A single node can handle more than 100000 read and write operations per second;

Simple extension: Based on key value pairs, data is not coupled and easy to

extend. A typical example is Cassandra. Because its architecture is similar to the classic P2P, it can easily expand the cluster by adding new nodes;

There are many storage formats: key value format, document format and picture format are supported, while relational database only supports basic types;

Low cost: This is a common feature of most distributed databases, because they are mainly open source software, and there is no expensive license cost.

#### 1.2.2 disadvantages of NoSQL

No support for SQL: if NoSQL does not support industry standards like SQL, it will cost users a certain amount of learning and application migration costs

The supporting features are not rich enough: the functions provided by the existing products are relatively limited, most NoSQL databases do not support transactions, nor can they provide various additional functions like MS SQL server and Oracle, such as BI and report

The existing products are not mature enough: most of them are still in the initial stage, which is different from the improvement of relational database for decades

## 2. Database design

Since the Abertawe Arts Centre has a new theatre complex completed and needs a database to deal with its business including selling tickets and booking venues for entertainment production companies. Therefore the database should include at least three tables, one includes the basic information of the theatre, one includes the information of booking venues and one for selling tickets. Besides there should also have some restricted conditions, like the end date of booking should be later than the start date.

## 2.1 Constrains

The Arts Centre has a problem that sometimes venue bookings are recorded but the details of the specific date(s) requested by the production companies are not registered in the system. This can be solved by using constrains, which set the booking date not null. Also the end date of booking must be later than the start date and this can also be limited by using constrains at the end of the table.

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