Основни сведения за NoSQL бази от данни. Шаблони за денормализация. Прости CRUD примери с MongoDB

Калин Георгиев

19 април 2021 г.

Relational vs. NoSQL DB

Релационни БД vs. Нерелационни БД

Books

id	title	genre
0	Програмиране на C++	Учебна
1	Сборник задачи по C++	Учебна

Authors

id	name	position
0	Магдалина Тодорова	Професор
1	Калин Георгиев	Асистент

BooksAuthors

idBook	idAuthor
0	0
1	0
1	1

Заявка

```
SELECT Authors.name FROM (Books
      INNER JOIN BooksAuthors ON
      Books.id = BooksAuthors.idBook
      ) INNER JOIN Authors ON
      BooksAuthors.idAuthor = Author
      .id WHERE Books.id = 1;
```

```
Books[0] = {id:0,
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Заявка

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  .authors
  .map(a=>a.name);
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Релационни БД vs. Нерелационни БД

Java

```java
package com.helloworld;

public class HelloWorld
{
  public static void main(String[] args)
  {
    System.out.println("Hello World");
  }
}
```

Node.js

```javascript
// Call the console.log function.
console.log("Hello World");
```

НРСУБД: Характеристика и видове

Характеристика

- Класическият релационен модел е неприложим
- Не поддържат информацията под формата на таблици и не предоставят поддръжка на стандартния език за структурирани заявки SQL
- Често не предоставят функционалност отвъд съхранението на записите
- Нарушават ACID

Видове

- key-value
- Графови бази данни
- Документни бази данни

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Видове

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НРСУБД: Проблем с референтната цялост

- СУБД не поддържат ограничения за цялостност (relational constraints)
- В частност външни ключове
- Проблем с изолацията

Някои представители и приложения

- key-value (KV):Apache Cassandra, Dynamo, memcached, Redis, BigTable,
- Document: Apache CouchDB, MongoDB, SimpleDB

Шаблони за денормализация

“Denormalization” patterns

- Collapsing relations
- Partitioning relation
- Redundant attributes
- Derived attributes

Seung Kyoon Shin, G. Lawrence Sanders Denormalization strategies for data retrieval from data warehouses, Decision Support Systems 42 (2006) 267–282

Collapsing relations

```
CUSTOMER (Customer_ID, Customer_Name, Address)
CUSTOMER_ACCOUNT (Customer_ID, Account_Bal, Market_Segment)
```

```
CUSTOMER (Customer_ID, Customer_Name,
          Address, Account_Bal, Market_Segment)
```

Partitioning relations (vertical)

```
PART (Part_ID, Width, Length, Height, Weight, ···,
      Price, Stock, Supplier_ID, Warehouse,···)
```

```
PART_SPEC_INFO (Part_ID, Width, Length,
                Height, Weight, Strength,···)
PART_INVENTORY_INFO (Part_ID, Price,
                     Stock, Supplier_ID, Warehouse,···)
```

Partitioning relations (horizontal)

```
SALE_HISTORY (Sale_ID, Timestamp, Store_ID,
              Customer_ID, Amount, ···)
```

```
SALE_HISTORY_Period_1 (Sale_ID, Timestamp, Store_ID,
                       Customer_ID, Amount, ···)
SALE_HISTORY_Period_2 (Sale_ID, Timestamp, Store_ID,
                       Customer_ID, Amount, ···)
```

Redundant attributes

```
PART (Part_ID, Width, Length, Height,
      Weight, Price, Stock, Supplier_ID, ···)
SUPPLIER (Supplier_ID, Supplier_Name, Address,
          State, ZIP, Phone, Sales_Rep, ···)
```

```
PART (Part_ID, Width, Length, Height, Weight,
      Price, Stock, Supplier_ID, Supplier_Name, ···)
SUPPLIER (Supplier_ID, Supplier_Name, Address,
          State, ZIP, Phone, Sales_Rep, ···)
```

Derived attributes

```
CUSTOMER (Customer_ID, Customer_Name, Address, ZIP)
ORDER (Order_ID, Customer_ID, Order_Date,
       Standard_Price, Quantity)
```

```
CUSTOMER (Customer_ID, Customer_Name,
          Address, ZIP, Sum_Of_Purchases)
ORDER (Order_ID, Customer_ID, Order_Date,
       Standard_Price, Quantity)
```

Прости CRUD заявки с MongoDB

“CRUD” заявки

- Create
- Read
- Udpate
- Delete

Read

```
var bookOne =
  db.books.findOne ({id:1});

var books =
  db.books.find ({id: { $lt: 2}});

var kalinsBooks =
  db.books.find(
    {authors:
      {$elemMatch:
        {name: "Калин Георгиев" }}});
```

```
Books[0] =
  {id:0,
   title:"Програмиране на C++",
   authors:
     [{id:0, name: "Магдалина Тодорова"}]}
Books[1] =
  {id:1,
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   authors:
     [{id:0, name: "Магдалина Тодорова"},
      {id:1, name: "Калин Георгиев"}]}
```

Create

```
use kalindb;

KalinsNewBook =
   {id:3,
    title:"Нещо умно",
    authors:
       [{id:1, name: "Калин Георгиев"}]};

db.books.insert (KalinsNewBook);
```

Update

```
db.books.update(
    { id: 3 },
    { $set: { title: "Нещо нетолковаумно" } },
    { multi: false });
)
```

Delete

```
db.books.remove({ id: 3 });
```

MapReduce

Нова концепция за “заявки”

```
[1,2,3].map ((x)=>x+1);
```

```
[1,2,3].reduce ((sum,current)=>sum+current);
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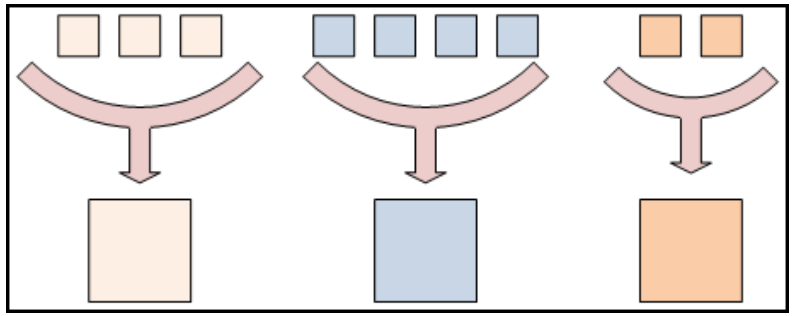
MapReduce

```
people[0] = {gender:"male", age:34};
people[1] = {gender:"female", age:24};
people[2] = {gender:"male", age:35};
people[3] = {gender:"female", age:54};
```

```
var mapFunction = function(){
  emit(this.gender, this.age);
 };
```



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{key:"male", values[34,35]}
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```

```
var reduceFunction = function(keyGender, valuesAges){
  return Array.sum(valuesAges)/valuesAges.length;
};
```

```
reduce ("male", [34,35]) --> 34.5
reduce ("female", [24,54]) --> 39
```

```
db.people.mapReduce ( mapFunction, reduceFunction, { out: "mrexample" });
```

MapReduce

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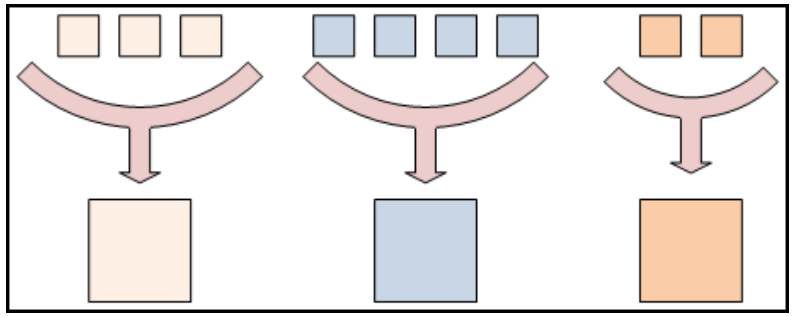

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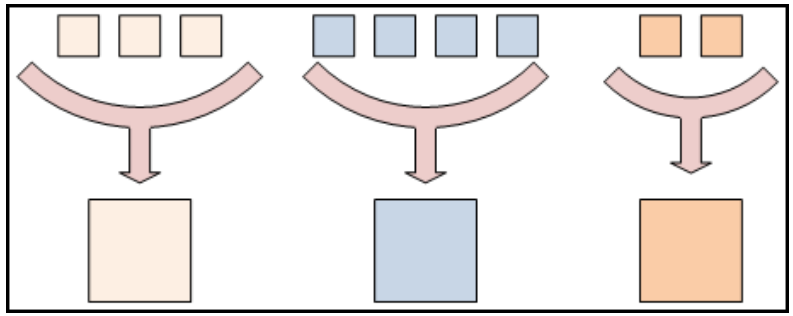

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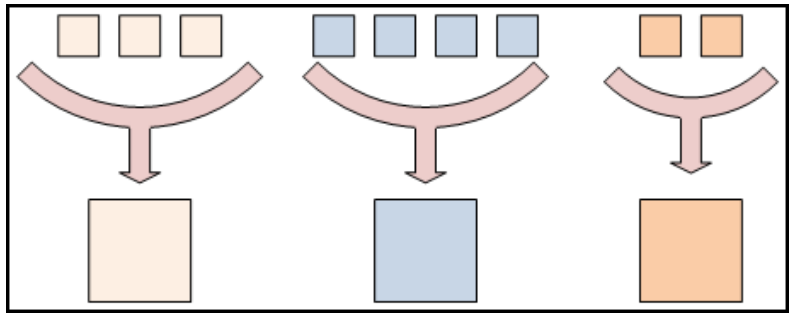

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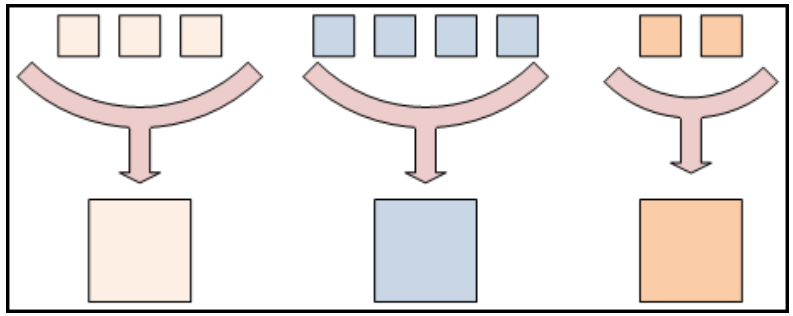

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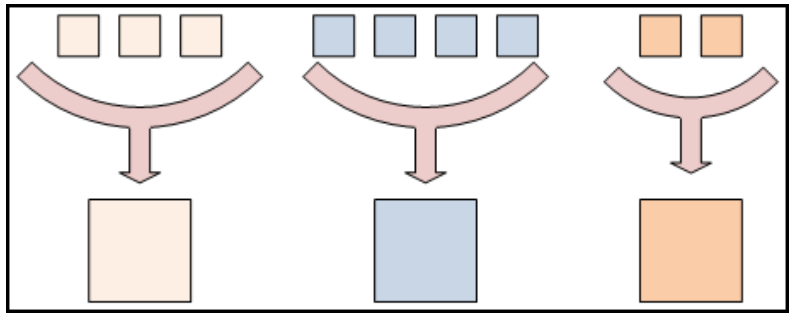

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