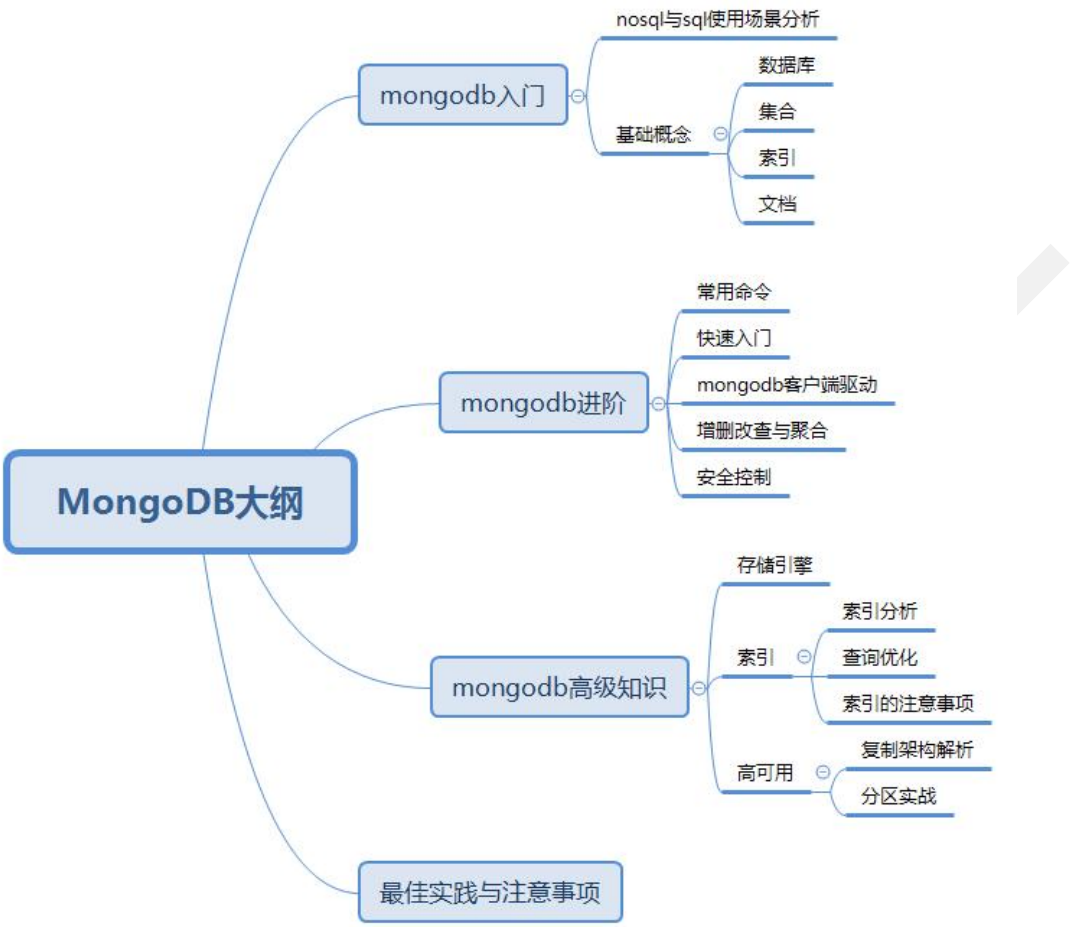
1. MongoDb 综述

1.1. 课程概述



1.2. 什么是 Nosql

NoSQL：Not Only SQL ,本质也是一种数据库的技术，相对于传统数据库技术，它不会遵循一些约束，比如：sql 标准、ACID 属性，表结构等。

Nosql 优点

- 满足对数据库的高并发读写
- 对海量数据的高效存储和访问
- 对数据库高扩展性和高可用性

- 灵活的数据结构，满足数据结构不固定的场景

Nosql 缺点

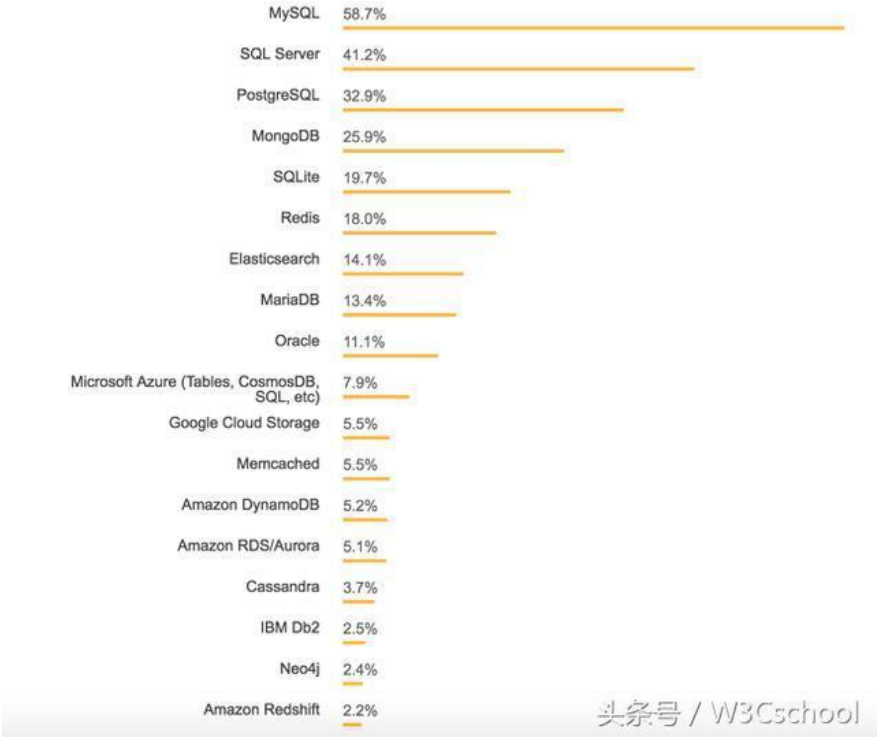
- 一般不支持事务
- 实现复杂 SQL 查询比较复杂
- 运维人员数据维护门槛较高
- 目前不是主流的数据库技术

1.2.1. NoSql 分类

序号	类型	应用场景	典型产品
1	Key-value存储	缓存，处理高并发数据访问	Redis memcached
2	列式数据库	分布式文件系统	Cassandra Hbase
3	文档型数据库	Web应用，并发能力较强，表结构可变	mongoDB
4	图结构数据库	社交网络，推荐系统，关注构建图谱	infoGrid Neo4J

1.2.2. 数据库流行程度排行

https://db-engines.com/en/ranking



1.2.3. 谁在使用 MongoDB

1.3. MongoDb 概念入门

1.3.1. 什么是 MongoDB

MongoDB：是一个数据库 ,高性能、无模式、文档性，目前 nosql 中最热门的数据库，开源产品，基于 c++开发。是 nosql 数据库中功能最丰富，最像关系数据库的。

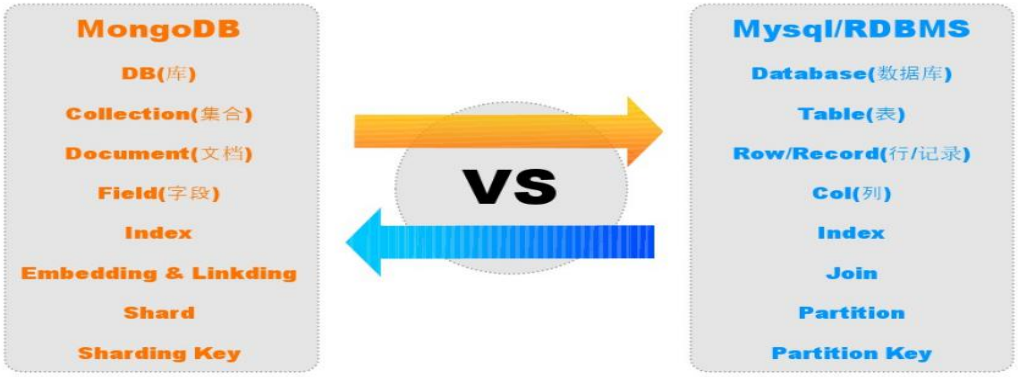
特性

- 面向集合文档的存储：适合存储 Bson（json 的扩展）形式的数据；
- 格式自由，数据格式不固定，生产环境下修改结构都可以不影响程序运行；
- 强大的查询语句，面向对象的查询语言，基本覆盖 sql 语言所有能力；
- 完整的索引支持，支持查询计划；
- 支持复制和自动故障转移；
- 支持二进制数据及大型对象（文件）的高效存储；

- 使用分片集群提升系统扩展性；
- 使用内存映射存储引擎，把磁盘的 IO 操作转换成为内存的操作；

1.3.2. MongoDB 基本概念

1.3.3. MongoDB 概念与 RDMS 概念对比



1.3.4. 应不应该用 MongoDB？

并没有某个业务场景必须要使用 MongoDB 才能解决，但使用 MongoDB 通常能让你以更低的成本解决问题（包括学习、开发、运维等成本）

应用特征	Yes / No
应用不需要事务及复杂 join 支持	必须 Yes
新应用，需求会变，数据模型无法确定，想快速迭代开发	?
应用需要2000-3000以上的读写QPS（更高也可以）	?
应用需要TB甚至 PB 级别数据存储	?
应用发展迅速，需要能快速水平扩展	?
应用要求存储的数据不丢失	?
应用需要99.999%高可用	?
应用需要大量的地理位置查询、文本查询	?

如果上述有 1 个 Yes，可以考虑 MongoDB，2 个及以上的 Yes，选择 MongoDB 绝不会后悔！

1.3.5. MongoDB 使用场景

MongoDB 的应用已经渗透到各个领域，比如游戏、物流、电商、内容管理、社交、物联网、视频直播等，以下是几个实际的应用案例：

- 游戏场景，使用 MongoDB 存储游戏用户信息，用户的装备、积分等直接以内嵌文档的形式存储，方便查询、更新
- 物流场景，使用 MongoDB 存储订单信息，订单状态在运送过程中会不断更新，以 MongoDB 内嵌数组的形式来存储，一次查询就能将订单所有的变更读取出来。
- 社交场景，使用 MongoDB 存储存储用户信息，以及用户发表的朋友圈信息，通过地理位置索引实现附近的人、地点等功能
- 物联网场景，使用 MongoDB 存储所有接入的智能设备信息，以及设备汇报的日志信息，并对这些信息进行多维度的分析
- 视频直播，使用 MongoDB 存储用户信息、礼物信息等
- ……

1.3.6. 不使用 MongoDB 的场景

- 高度事务性系统：例如银行、财务等系统。MongoDB 对事物的支持较弱；
- 传统的商业智能应用：特定问题的数据分析，多数据实体关联，涉及到复杂的、高度优化的查询方式；
- 使用 sql 方便的时候；数据结构相对固定，使用 sql 进行查询统计更加便利的时候；

2. MongoDB 应用与开发

2.1. MongoDB 安装

- 官网下载安装介质：https://www.mongodb.com/download-center，选择适当的版本，这里以 linux 版本 mongodb-linux-x86_64-4.0.4 为例；

https://www.mongodb.org/dl/linux/x86_64

tar zxvf mongodb-linux-x86_64-4.0.4.tgz
mv mongodb-linux-x86_64-4.0.4 mongodb
mkdir -p mongodb/{data/db,log,conf}
vi mongodb/conf/mgdb.conf

https://docs.mongodb.com/v2.4/reference/configuration-options/

```
dbpath=/soft/mongodb/data/db  #数据文件存放目录
logpath=/soft/mongodb/log/mongodb.log  #日志文件存放目录
port=27017  #端口，默认 27017，可以自定义
logappend=true  #开启日志追加添加日志
fork=true  #以守护程序的方式启用，即在后台运行
bind_ip=0.0.0.0  #本地监听 IP，0.0.0.0 表示本地所有 IP
auth=false  #是否需要验证权限登录(用户名和密码)
```

修改环境变量
vi /etc/profile
export MONGODB_HOME=/soft/mongodb
export PATH=$PATH:$MONGODB_HOME/bin
source /etc/profile

配置开机启动
vi /usr/lib/systemd/system/mongodb.service

```
[Unit]
Description=mongodb
After=network.target remote-fs.target nss-lookup.target

[Service]
Type=forking
RuntimeDirectory=mongodb
PIDFile=/soft/mongodb/data/db/mongod.lock
ExecStart=/soft/mongodb/bin/mongod --config /soft/mongodb/conf/mgdb.conf
```

```
ExecStop=/soft/mongodb/bin/mongod --shutdown --config /soft/mongodb/conf/mgdb.conf
PrivateTmp=true

[Install]
WantedBy=multi-user.target
```

systemctl daemon-reload
systemctl start mongodb
systemctl enable mongodb

启动 mongodb
service mongodb stop
service mongodb start

https://docs.mongodb.com/v4.0/reference/configuration-options/#storage.dbPath

```
storage:
    dbPath: "/soft/mongodb/data/db"
systemLog:
    destination: file
    path: "/soft/mongodb/log/mongodb.log"
net:
    bindIp: 0.0.0.0
    port: 27017
processManagement:
    fork: true
setParameter:
    enableLocalhostAuthBypass: false
```

2.2. 快速入门

2.2.1. 目标

- 直观感受 mongoDB 的魅力
- mongo 开发入门（原生、spring）
- 开发框架版本选择
- mongoDB 数据类型全解析
- 对 nosql 的理念有初步的认识

执行命令

mongo

2.2.2. 数据结构介绍

```
{
        "_id" : ObjectId("59f938235d93fc4af8a37114"),
        "username" : "lison",
        "country" : "in11digo",
        "address" : {
                "aCode" : "邮编",
                "add" : "d11pff"
        },
        "favorites" : {
                "movies" : ["杀破狼 2","1dushe","雷神 1"],
                "cites" : ["1sh","1cs","1zz"]
        },
       "age" : 18，
       "salary"：NumberDecimal("2.099"),
       "lenght" ： 1.79
}
```

2.2.3. 需求描述

- **新增 5 人**

- **查询**

查询喜欢的城市包含东莞和东京的 user

select * from users where favorites.cites has "东莞"、"东京"

查询国籍为英国或者美国，名字中包含 s 的 user

select * from users where username like '%s%' and (country= English or country= USA)

- **修改**

把 lison 的年龄修改为 6 岁

update users set age=6 where username = lison'

喜欢的城市包含东莞的人，给他喜欢的电影加入"小电影 2""小电影 3"

update users set favorites.movies add "小电影 2 ", "小电影 3" where favorites.cites has "东莞"

- 删除

删除名字为 lison 的 user

delete from users where username = ‘lison’

删除年龄大于 8 小于 25 的 user

delete from users where age >8 and age <25

- 事务操作

Lison 和 james 要完成一次事务操作，james 转账 0.5 给 lison

update users set lenght= lenght-0.5 where username = ‘james’

update users set lenght= lenght+0.5 where username = ‘lison’

2.2.4. 使用 MongoDB 脚本实现

2.2.4.1. 新增 5 人

```
db.users.drop();
var user1 = {
            "username" : "lison",
            "country" : "china",
            "address" : {
                        "aCode" : "411000",
                        "add" : "长沙"
            },
            "favorites" : {
                        "movies" : ["杀破狼 2","战狼","雷神 1"],
                        "cites" : ["长沙","深圳","上海"]
            },
            "age" : 18,
           "salary":NumberDecimal("18889.09"),
           "lenght" :1.79

};
var user2 = {
            "username" : "james",
            "country" : "English",
            "address" : {
                        "aCode" : "311000",
                        "add" : "地址"
            },
            "favorites" : {
```

```
                    "movies" : ["复仇者联盟","战狼","雷神 1"],
                    "cites" : ["西安","东京","上海"]
            },
            "age" : 24,
          "salary":NumberDecimal("7889.09"),
          "lenght" :1.35
};
var user3 ={
            "username" : "deer",
            "country" : "japan",
            "address" : {
                    "aCode" : "411000",
                    "add" : "长沙"
            },
            "favorites" : {
                    "movies" : ["肉蒲团","一路向西","倩女幽魂"],
                    "cites" : ["东莞","深圳","东京"]
            },
            "age" : 22,
          "salary":NumberDecimal("6666.66"),
          "lenght" :1.85
};
var user4 =
{
            "username" : "mark",
            "country" : "USA",
            "address" : {
                    "aCode" : "411000",
                    "add" : "长沙"
            },
            "favorites" : {
                    "movies" : ["蜘蛛侠","钢铁侠","蝙蝠侠"],
                    "cites" : ["青岛","东莞","上海"]
            },
            "age" : 20,
          "salary":NumberDecimal("6398.22"),
          "lenght" :1.77
};

var user5 =
{
            "username" : "peter",
            "country" : "UK",
            "address" : {
```

```
                    "aCode" : "411000",
                    "add" : "TEST"
            },
            "favorites" : {
                    "movies" : ["蜘蛛侠","钢铁侠","蝙蝠侠"],
                    "cites" : ["青岛","东莞","上海"]
            },
           "salary":NumberDecimal("1969.88")
};

db.users.insert(user1);
db.users.insert(user2);
db.users.insert(user3);
db.users.insert(user4);
db.users.insert(user5);
```

2.2.4.2. 查询

查询喜欢的城市包含东莞和东京的 user

select * from users where favorites.cites has "东莞"、"东京"

db.users.find({ "favorites.cites" : { "$all" : ["东莞" , "东京"]}}).pretty()

查询国籍为英国或者美国，名字中包含 s 的 user

select * from users where username like '%s%' and (country= English or country= USA)

db.users.find({ "$and" : [{ "username" : { "$regex" : ".*s.*"}} , { "$or" : [{ "country" : "English"} , { "country" : "USA"}]}]}).pretty()

//思考 查询姓名是 deer 或者 james 的文档

2.2.4.3. 修改

把 lison 的年龄修改为 6 岁

update users set age=6 where username = lison'

db.users.updateMany({ "username" : "lison"},{ "$set" : { "age" : 6}})

//思考，又过了一年，lison 年龄又涨了一岁

喜欢的城市包含东莞的人，给他喜欢的电影加入"小电影 2""小电影 3"

update users set favorites.movies add "小电影 2 ", "小电影 3" where favorites.cites has "东莞"

db.users.updateMany({ "favorites.cites" : " 东 莞 "}, { "$addToSet" : { "favorites.movies" : { "$each" : ["小电影 2 " , "小电影 3"]}}},true)

2.2.4.4. 删除

删除名字为 lison 的 user

```
delete from users where username = 'lison'
db.users.deleteMany({ "username" : "lison"} )
```

删除年龄大于 8 小于 25 的 user

```
delete from users where age >8 and age <25
db.users.deleteMany({"$and" : [ {"age" : {"$gt": 8}} , {"age" : {"$lt" : 25}}]})
```

2.2.4.5. 事务操作

- 事务操作

Lison 和 james 要完成一次事务操作，james 转账 1 给 lison

```
begin
  update    users    set lenght= lenght-1    where username = 'james'
  update    users    set lenght= lenght+1    where username = 'lison'
commit

db.users.find({"username": {"$in":["lison", "james"]}}).pretty();
```

```
s = db.getMongo().startSession()
s.startTransaction()

  db.users.update({"username" : "james"},{"$inc":{"lenght":-1}})
  db.users.update({"username" : "lison"},{"$inc":{"lenght":1}})

s.commitTransaction()
s.abortTransaction()
```

注：以上操作是错误的方式，事务操作一定要在集群的环境下才可以，方式如下

```
usersCollection .find({"username": {"$in":["lison", "james"]}}).pretty();
```

```
s = db.getMongo().startSession();

s.startTransaction()
usersCollection = s.getDatabase("lison").users
```

```
usersCollection.update({"username" : "james"},{"$inc":{"lenght":-1}})
usersCollection.update({"username" : "lison"},{"$inc":{"lenght":1}})

s.commitTransaction()
s.abortTransaction()
```

2.2.5. Java 客户端

2.2.5.1. 原始客户端

2.2.5.1.1. 引入 pom 文件

```
<dependencies>
    <dependency>
        <groupId>org.mongodb</groupId>
        <artifactId>mongo-java-driver</artifactId>
        <version>3.11.2</version>
    </dependency>
    <dependency>
        <groupId>junit</groupId>
        <artifactId>junit</artifactId>
        <version>4.12</version>
    </dependency>
</dependencies>
```

2.2.5.1.2. Document 方式

```
package cn.enjoy.mg;

import java.math.BigDecimal;
import java.util.ArrayList;
import java.util.Arrays;
import java.util.HashMap;
import java.util.List;
import java.util.Map;
import java.util.function.Consumer;

import org.bson.Document;
```

```
import org.bson.conversions.Bson;
import org.junit.Before;
import org.junit.Test;


import com.mongodb.MongoClient;
import com.mongodb.client.FindIterable;
import com.mongodb.client.MongoCollection;
import com.mongodb.client.MongoDatabase;
import com.mongodb.client.result.DeleteResult;
import com.mongodb.client.result.UpdateResult;

import static com.mongodb.client.model.Updates.*;
import static com.mongodb.client.model.Filters.*;


//原生 java 驱动  document 的操作方式
public class QuickStartJavaDocTest {



    //数据库
    private MongoDatabase db;

    //文档集合
    private MongoCollection<Document> doc;

    //连接客户端（内置连接池）
    private MongoClient client;


    @Before
    public void init() {
        client = new MongoClient("192.168.244.123", 27017);
        db = client.getDatabase("lison");
        doc = db.getCollection("users");
    }

    @Test
    public void insertDemo() {
        Document doc1 = new Document();
        doc1.append("username", "cang");
        doc1.append("country", "USA");
        doc1.append("age", 20);
```

```
        doc1.append("lenght", 1.77f);
        doc1.append("salary", new BigDecimal("6565.22"));//存金额，使用 bigdecimal 这个数
据类型

        //添加“address”子文档
        Map<String, String> address1 = new HashMap<String, String>();
        address1.put("aCode", "0000");
        address1.put("add", "xxx000");
        doc1.append("address", address1);

        //添加“favorites”子文档，其中两个属性是数组
        Map<String, Object> favorites1 = new HashMap<String, Object>();
        favorites1.put("movies", Arrays.asList("aa", "bb"));
        favorites1.put("cites", Arrays.asList("东莞", "东京"));
        doc1.append("favorites", favorites1);

        Document doc2 = new Document();
        doc2.append("username", "Chen");
        doc2.append("country", "China");
        doc2.append("age", 30);
        doc2.append("lenght", 1.77f);
        doc2.append("salary", new BigDecimal("8888.22"));
        Map<String, String> address2 = new HashMap<>();
        address2.put("aCode", "411000");
        address2.put("add", "我的地址 2");
        doc2.append("address", address2);
        Map<String, Object> favorites2 = new HashMap<>();
        favorites2.put("movies", Arrays.asList("东游记", "一路向东"));
        favorites2.put("cites", Arrays.asList("珠海", "东京"));
        doc2.append("favorites", favorites2);

        //使用 insertMany 插入多条数据
        doc.insertMany(Arrays.asList(doc1, doc2));

    }

    @Test
    public void testFind() {
        final List<Document> ret = new ArrayList<>();
        //block 接口专门用于处理查询出来的数据
        Consumer<Document> printDocument = new Consumer<Document>() {
            @Override
            public void accept(Document document) {
                System.out.println(document);
```

```
                    ret.add(document);
                }
            };
            //select * from users    where favorites.cites has "东莞"、"东京"
            //db.users.find({ "favorites.cites" : { "$all" : [ "东莞" , "东京"]}})
            Bson all = all("favorites.cites", Arrays.asList("东莞", "东京"));//定义数据过滤器，喜欢的城市中要包含"东莞"、"东京"
            FindIterable<Document> find = doc.find(all);

            find.forEach(printDocument);



            System.out.println("------------------>" + String.valueOf(ret.size()));
            ret.removeAll(ret);



            //select * from users    where username like '%s%' and (contry= English or contry = USA)
            // db.users.find({ "$and" : [ { "username" : { "$regex" : ".*c.*"}} , { "$or" : [ { "country" : "English"} , { "country" : "USA"}]}]})

            String regexStr = ".*c.*";
            Bson regex = regex("username", regexStr);//定义数据过滤器，username like '%s%'
            Bson or = or(eq("country", "English"), eq("country", "USA"));//定义数据过滤器，(contry= English or contry = USA)
            Bson and = and(regex, or);
            FindIterable<Document> find2 = doc.find(and);
            find2.forEach(printDocument);
            System.out.println("------------------>" + String.valueOf(ret.size()));

        }

        @Test
        public void testUpdate() {
            //update    users    set age=6 where username = 'lison'
//          db.users.updateMany({ "username" : "lison"},{ "$set" : { "age" : 6}},true)

            Bson eq = eq("username", "cang");//定义数据过滤器，username = 'cang'
            Bson set = set("age", 8);//更新的字段.来自于 Updates 包的静态导入
            UpdateResult updateMany = doc.updateMany(eq, set);
            System.out.println("------------------>" + String.valueOf(updateMany.getModifiedCount()));//打印受影响的行数

            //update users    set favorites.movies add "小电影 2 ", "小电影 3" where favorites.cites
```

```
has "东莞"
            //db.users.updateMany({    "favorites.cites"    :    "    东    莞    "},    {    "$addToSet"    :
{ "favorites.movies" : { "$each" : [ "小电影 2 " , "小电影 3"]}},true)

            Bson eq2 = eq("favorites.cites", "东莞");//定义数据过滤器，favorites.cites    has "东莞
"
            Bson addEachToSet = addEachToSet("favorites.movies", Arrays.asList("小电影 2 ", "小
电影 3"));//更新的字段.来自于 Updates 包的静态导入
            UpdateResult updateMany2 = doc.updateMany(eq2, addEachToSet);
            System.out.println("------------------>"                                          +
String.valueOf(updateMany2.getModifiedCount()));
        }

        @Test
        public void testDelete() {

            //delete from users where username = 'lison'
            //db.users.deleteMany({ "username" : "lison"} )
            Bson eq = eq("username", "lison");//定义数据过滤器，username='lison'
            DeleteResult deleteMany = doc.deleteMany(eq);
            System.out.println("------------------>"                                          +
String.valueOf(deleteMany.getDeletedCount()));//打印受影响的行数

            //delete from users where age >8 and age <25
            //db.users.deleteMany({"$and" : [ {"age" : {"$gt": 8}} , {"age" : {"$lt" : 25}}]})

            Bson gt = gt("age", 8);//定义数据过滤器，age > 8，所有过滤器的定义来自于 Filter
这个包的静态方法，需要频繁使用所以静态导入
//          Bson gt = Filter.gt("age",8);

            Bson lt = lt("age", 25);//定义数据过滤器，age < 25
            Bson and = and(gt, lt);//定义数据过滤器，将条件用 and 拼接
            DeleteResult deleteMany2 = doc.deleteMany(and);
            System.out.println("------------------>"                                          +
String.valueOf(deleteMany2.getDeletedCount()));//打印受影响的行数
        }


@Test
        public void testTransaction() {
//          begin
//          update    users    set lenght= lenght-1    where username = 'james'
//          update    users    set lenght= lenght+1    where username = 'lison'
//          commit
```

```
            ClientSession clientSession = client.startSession();
            clientSession.startTransaction();
            Bson eq = eq("username", "james");
            Bson inc = inc("lenght", -1);
            doc.updateOne(clientSession,eq,inc);

            Bson eq2 = eq("username", "lison");
            Bson inc2 = inc("lenght", 1);

            doc.updateOne(clientSession,eq2,inc2);

            clientSession.commitTransaction();
           // clientSession.abortTransaction();

    }

}
```

2.2.5.1.3. POJO 方式

新增 Favorites

```
package cn.enjoy.entity;

import java.util.List;

public class Favorites {
    private List<String> movies;
    private List<String> cites;
    public List<String> getMovies() {
        return movies;
    }
    public void setMovies(List<String> movies) {
        this.movies = movies;
    }
    public List<String> getCites() {
        return cites;
    }
    public void setCites(List<String> cites) {
        this.cites = cites;
    }
```

```
    @Override
    public String toString() {
        return "Favorites [movies=" + movies + ", cites=" + cites + "]";
    }

}
```

新增 Address

```
package cn.enjoy.entity;

public class Address {

  private String aCode;
  private String add;
  public String getaCode() {
        return aCode;
  }
  public void setaCode(String aCode) {
        this.aCode = aCode;
  }
  public String getAdd() {
        return add;
  }
  public void setAdd(String add) {
        this.add = add;
  }
  @Override
  public String toString() {
        return "Address [aCode=" + aCode + ", add=" + add + "]";
  }
}
```

新增 User

```
    package cn.enjoy.entity;

    import java.math.BigDecimal;

    import org.bson.types.ObjectId;

    public class User {

        private ObjectId id;
```

```
private String username;

private String country;

private Address address;

private Favorites favorites;

private int age;

private BigDecimal salary;

private float lenght;


public String getUsername() {
	return username;
}
public void setUsername(String username) {
	this.username = username;
}
public String getCountry() {
	return country;
}
public void setCountry(String country) {
	this.country = country;
}
public Address getAddress() {
	return address;
}
public void setAddress(Address address) {
	this.address = address;
}
public Favorites getFavorites() {
	return favorites;
}
public void setFavorites(Favorites favorites) {
	this.favorites = favorites;
}
public ObjectId getId() {
	return id;
}
public void setId(ObjectId id) {
```

```
            this.id = id;
        }
        public int getAge() {
            return age;
        }
        public void setAge(int age) {
            this.age = age;
        }
        public BigDecimal getSalary() {
            return salary;
        }
        public void setSalary(BigDecimal salary) {
            this.salary = salary;
        }
        public float getLenght() {
            return lenght;
        }
        public void setLenght(float lenght) {
            this.lenght = lenght;
        }


        @Override
        public String toString() {
            return "User [id=" + id + ", username=" + username + ", country="
                    + country + ", address=" + address + ", favorites=" + favorites
                    + ", age=" + age + ", salary=" + salary + ", lenght=" + lenght +"]";
        }
    }
```

```
package cn.enjoy.mg;

import static com.mongodb.client.model.Updates.*;
import static com.mongodb.client.model.Filters.*;

import java.math.BigDecimal;
import java.util.ArrayList;
import java.util.Arrays;
import java.util.List;
import java.util.function.Consumer;
```

```
import org.bson.Document;
import org.bson.codecs.configuration.CodecRegistries;
import org.bson.codecs.configuration.CodecRegistry;
import org.bson.codecs.pojo.PojoCodecProvider;
import org.bson.conversions.Bson;
import org.junit.Before;
import org.junit.Test;


import cn.enjoy.entity.Address;
import cn.enjoy.entity.Favorites;
import cn.enjoy.entity.User;
import com.mongodb.MongoClient;
import com.mongodb.MongoClientOptions;
import com.mongodb.ServerAddress;
import com.mongodb.client.FindIterable;
import com.mongodb.client.MongoCollection;
import com.mongodb.client.MongoDatabase;
import com.mongodb.client.model.Filters;
import com.mongodb.client.model.Updates;
import com.mongodb.client.result.DeleteResult;
import com.mongodb.client.result.UpdateResult;

//原生 java 驱动  Pojo 的操作方式
public class QuickStartJavaPojoTest {



    private MongoDatabase db;

    private MongoCollection<User> doc;

    private MongoClient client;


    @Before
    public void init(){
        //编解码器的 list
        List<CodecRegistry> codecResgistes = new ArrayList<>();
        //list 加入默认的编解码器集合
        codecResgistes.add(MongoClient.getDefaultCodecRegistry());
        //生成一个 pojo 的编解码器
        CodecRegistry pojoCodecRegistry = CodecRegistries.
                fromProviders(PojoCodecProvider.builder().automatic(true).build());
```

```
        //list 加入 pojo 的编解码器
        codecResgistes.add(pojoCodecRegistry);
        //通过编解码器的 list 生成编解码器注册中心
        CodecRegistry registry = CodecRegistries.fromRegistries(codecResgistes);

        //把编解码器注册中心放入 MongoClientOptions
        //MongoClientOptions 相当于连接池的配置信息
        MongoClientOptions build = MongoClientOptions.builder().
                codecRegistry(registry).build();

        ServerAddress serverAddress = new ServerAddress("192.168.244.123", 27017);

        client = new MongoClient(serverAddress, build);
        db =client.getDatabase("lison");
        doc = db.getCollection("users",User.class);
    }



    @Test
    public void insertDemo(){
        User user = new User();
        user.setUsername("cang");
        user.setCountry("USA");
        user.setAge(20);
        user.setLenght(1.77f);
        user.setSalary(new BigDecimal("6265.22"));

        //添加“address”子文档
        Address address1 = new Address();
        address1.setaCode("411222");
        address1.setAdd("sdfsdf");
        user.setAddress(address1);

        //添加“favorites”子文档，其中两个属性是数组
        Favorites favorites1 = new Favorites();
        favorites1.setCites(Arrays.asList("东莞","东京"));
        favorites1.setMovies(Arrays.asList("西游记","一路向西"));
        user.setFavorites(favorites1);



        User user1 = new User();
        user1.setUsername("chen");
        user1.setCountry("China");
```

```
        user1.setAge(30);
        user1.setLenght(1.77f);
        user1.setSalary(new BigDecimal("6885.22"));
        Address address2 = new Address();
        address2.setaCode("411000");
        address2.setAdd("我的地址 2");
        user1.setAddress(address2);
        Favorites favorites2 = new Favorites();
        favorites2.setCites(Arrays.asList("珠海","东京"));
        favorites2.setMovies(Arrays.asList("东游记","一路向东"));
        user1.setFavorites(favorites2);


        //使用 insertMany 插入多条数据
        doc.insertMany(Arrays.asList(user,user1));

    }


    @Test
    public void testFind(){

        final List<User> ret = new ArrayList<>();
        Consumer<User> printDocument = new Consumer<User>() {
            @Override
            public void accept(User t) {
                System.out.println(t.toString());
                ret.add(t);
            }

        };

        //select * from users    where favorites.cites has "东莞"、"东京"
        //db.users.find({ "favorites.cites" : { "$all" : [ "东莞" , "东京"]}})
        Bson all = all("favorites.cites", Arrays.asList("东莞","东京"));//定义数据过滤器，喜欢
的城市中要包含"东莞"、"东京"
        FindIterable<User> find = doc.find(all);
        find.forEach(printDocument);
        System.out.println("------------------>"+String.valueOf(ret.size()));
        ret.removeAll(ret);

        //select * from users    where username like '%s%' and (contry= English or contry =
USA)
        // db.users.find({ "$and" : [ { "username" : { "$regex" : ".*c.*"}} , { "$or" : [ { "country" :
```

```
"English"} , { "country" : "USA"}]}]})
            String regexStr = ".*c.*";
            Bson regex = regex("username", regexStr);//定义数据过滤器， username like '%s%'
            Bson or = or(eq("country","English"),eq("country","USA"));//定义数据过滤器，(contry=
English or contry = USA)
            FindIterable<User> find2 = doc.find(and(regex,or));
            find2.forEach(printDocument);
            System.out.println("------------------>"+String.valueOf(ret.size()));

        }


        @Test
        public void testUpdate(){
            //update    users    set age=6 where username = 'lison'
           //db.users.updateMany({ "username" : "lison"},{ "$set" : { "age" : 6}},true)
            Bson eq = eq("username", "lison");//定义数据过滤器， username = 'lison'
            Bson set = set("age", 8);//更新的字段.来自于 Updates 包的静态导入
            UpdateResult updateMany = doc.updateMany(eq, set);

        System.out.println("------------------>"+String.valueOf(updateMany.getModifiedCount()));//打
印受影响的行数

            //update users    set favorites.movies add "小电影 2 ", "小电影 3" where favorites.cites
has "东莞"
            //db.users.updateMany({ "favorites.cites" : "东莞"}, { "$addToSet" :
{ "favorites.movies" : { "$each" : [ "小电影 2 " , "小电影 3"]}}},true)
            Bson eq2 = eq("favorites.cites", "东莞");//定义数据过滤器，favorites.cites    has "东莞
"
            Bson addEachToSet = addEachToSet("favorites.movies", Arrays.asList( "小电影 2 ", "小
电影 3"));//更新的字段.来自于 Updates 包的静态导入
            UpdateResult updateMany2 = doc.updateMany(eq2, addEachToSet);

        System.out.println("------------------>"+String.valueOf(updateMany2.getModifiedCount()));
        }

        @Test
        public void testDelete(){

            //delete from users where username = 'lison'
            //db.users.deleteMany({ "username" : "lison"} )
            Bson eq = eq("username", "lison");//定义数据过滤器， username='lison'
            DeleteResult deleteMany = doc.deleteMany(eq);
            System.out.println("------------------>"+String.valueOf(deleteMany.getDeletedCount()));//
```

```
打印受影响的行数

        //delete from users where age >8 and age <25
        //db.users.deleteMany({"$and" : [ {"age" : {"$gt": 8}} , {"age" : {"$lt" : 25}}]})
        Bson gt = gt("age",8);//定义数据过滤器，age > 8，所有过滤器的定义来自于 Filter 这个包的静态方法，需要频繁使用所以静态导入

        Bson lt = lt("age",25);//定义数据过滤器，age < 25
        Bson and = and(gt,lt);//定义数据过滤器，将条件用 and 拼接
        DeleteResult deleteMany2 = doc.deleteMany(and);

    System.out.println("------------------>"+String.valueOf(deleteMany2.getDeletedCount()));//打印受影响的行数
    }


}
```

com.mongodb.MongoClient

```
public class MongoClient extends Mongo implements Closeable {
    public static CodecRegistry getDefaultCodecRegistry() {
        return MongoClientSettings.getDefaultCodecRegistry();
    }
```

2.2.5.2. Spring-data-mongodb 客户端

2.2.5.2.1. 引入 Spring 等 jar

```
<dependency>
            <groupId>org.springframework.data</groupId>
            <artifactId>spring-data-mongodb</artifactId>
            <version>2.2.1.RELEASE</version>
        </dependency>

        <dependency>
            <groupId>org.springframework</groupId>
            <artifactId>spring-context</artifactId>
            <version>5.2.1.RELEASE</version>
        </dependency>
```

```
        <dependency>
            <groupId>org.springframework</groupId>
            <artifactId>spring-core</artifactId>
            <version>5.2.1.RELEASE</version>
        </dependency>
        <dependency>
            <groupId>org.springframework</groupId>
            <artifactId>spring-context-support</artifactId>
            <version>5.2.1.RELEASE</version>
        </dependency>
        <dependency>
            <groupId>org.springframework</groupId>
            <artifactId>spring-beans</artifactId>
            <version>5.2.1.RELEASE</version>
        </dependency>
        <dependency>
            <groupId>org.springframework</groupId>
            <artifactId>spring-aop</artifactId>
            <version>5.2.1.RELEASE</version>
        </dependency>

        <dependency>
            <groupId>org.springframework</groupId>
            <artifactId>spring-test</artifactId>
            <version>5.2.1.RELEASE</version>
        </dependency>
```

2.2.5.2.2. 新增 applicationContext.xml

在 resources 目录下新增 spring 配置文件

```
<?xml version="1.0" encoding="UTF-8"?>
<beans xmlns="http://www.springframework.org/schema/beans"
        xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xmlns:context="http://www.springframework.org/schema/context"
        xmlns:mongo="http://www.springframework.org/schema/data/mongo"
        xsi:schemaLocation="http://www.springframework.org/schema/beans
                            http://www.springframework.org/schema/beans/spring-beans.xsd
                            http://www.springframework.org/schema/context
```

```
http://www.springframework.org/schema/context/spring-context.xsd
                                http://www.springframework.org/schema/data/mongo

http://www.springframework.org/schema/data/mongo/spring-mongo.xsd">

    <context:component-scan base-package="cn.enjoy">

    </context:component-scan>

    <!-- mongodb 连接池配置 -->
    <mongo:mongo-client id="mongo" host="192.168.244.123" port="27017">
        <mongo:client-options
                write-concern="ACKNOWLEDGED"
                threads-allowed-to-block-for-connection-multiplier="5"
                max-wait-time="1200"
                connect-timeout="1000"/>
    </mongo:mongo-client>

    <!-- mongodb 数据库工厂配置 -->
    <mongo:db-factory dbname="lison" mongo-ref="mongo" />


    <!-- mongodb 模板配置 -->
    <bean                                                   id="anotherMongoTemplate"
class="org.springframework.data.mongodb.core.MongoTemplate">
        <constructor-arg name="mongoDbFactory" ref="mongoDbFactory" />
    </bean>

</beans>
```

2.2.5.2.3. 修改实体类

```
package cn.enjoy.entity;

import java.math.BigDecimal;

import org.bson.types.ObjectId;
import org.springframework.data.mongodb.core.mapping.Document;

@Document(collection="users")
```

```
public class User {

	private ObjectId id;

	private String username;

	private String country;

	private Address address;

	private Favorites favorites;

	private int age;

	private BigDecimal salary;

	private float lenght;

	public String getUsername() {
		return username;
	}
	public void setUsername(String username) {
		this.username = username;
	}
	public String getCountry() {
		return country;
	}
	public void setCountry(String country) {
		this.country = country;
	}
	public Address getAddress() {
		return address;
	}
	public void setAddress(Address address) {
		this.address = address;
	}
	public Favorites getFavorites() {
		return favorites;
	}
	public void setFavorites(Favorites favorites) {
		this.favorites = favorites;
	}
	public ObjectId getId() {
		return id;
```

```
    }
    public void setId(ObjectId id) {
        this.id = id;
    }
    public int getAge() {
        return age;
    }
    public void setAge(int age) {
        this.age = age;
    }
    public BigDecimal getSalary() {
        return salary;
    }
    public void setSalary(BigDecimal salary) {
        this.salary = salary;
    }
    public float getLenght() {
        return lenght;
    }
    public void setLenght(float lenght) {
        this.lenght = lenght;
    }


    @Override
    public String toString() {
        return "User [id=" + id + ", username=" + username + ", country="
                + country + ", address=" + address + ", favorites=" + favorites
                + ", age=" + age + ", salary=" + salary + ", lenght=" + lenght +"]";
    }

}
```

2.2.5.2.4. 新增单元测试

```
package cn.enjoy.mg;

import static org.springframework.data.mongodb.core.query.Criteria.where;
import static org.springframework.data.mongodb.core.query.Query.query;
import static org.springframework.data.mongodb.core.query.Update.update;
```

```
import java.math.BigDecimal;
import java.util.Arrays;
import java.util.List;

import javax.annotation.Resource;

import cn.enjoy.entity.Address;
import cn.enjoy.entity.Favorites;
import cn.enjoy.entity.User;
import com.mongodb.client.result.DeleteResult;
import com.mongodb.client.result.UpdateResult;
import org.junit.Test;
import org.junit.runner.RunWith;
import org.slf4j.Logger;
import org.slf4j.LoggerFactory;
import org.springframework.data.mongodb.core.MongoOperations;
import org.springframework.data.mongodb.core.query.Criteria;
import org.springframework.data.mongodb.core.query.Query;
import org.springframework.data.mongodb.core.query.Update;
import org.springframework.test.context.ContextConfiguration;
import org.springframework.test.context.junit4.SpringJUnit4ClassRunner;

//spring Pojo 的操作方式
@RunWith(SpringJUnit4ClassRunner.class)
@ContextConfiguration("classpath:applicationContext.xml")
public class QuickStartSpringPojoTest {


    @Resource
    private MongoOperations tempelate;


    @Test
    public void insertDemo(){
        User user = new User();
        user.setUsername("cang");
        user.setCountry("USA");
        user.setAge(20);
        user.setLenght(1.77f);
        user.setSalary(new BigDecimal("6265.22"));

        //添加“address”子文档
        Address address1 = new Address();
```

```
        address1.setaCode("411222");
        address1.setAdd("sdfsdf");
        user.setAddress(address1);

        //添加“favorites”子文档，其中两个属性是数组
        Favorites favorites1 = new Favorites();
        favorites1.setCites(Arrays.asList("东莞","东京"));
        favorites1.setMovies(Arrays.asList("西游记","一路向西"));
        user.setFavorites(favorites1);


        User user1 = new User();
        user1.setUsername("chen");
        user1.setCountry("China");
        user1.setAge(30);
        user1.setLenght(1.77f);
        user1.setSalary(new BigDecimal("6885.22"));
        Address address2 = new Address();
        address2.setaCode("411000");
        address2.setAdd("我的地址 2");
        user1.setAddress(address2);
        Favorites favorites2 = new Favorites();
        favorites2.setCites(Arrays.asList("珠海","东京"));
        favorites2.setMovies(Arrays.asList("东游记","一路向东"));
        user1.setFavorites(favorites2);

        tempelate.insertAll(Arrays.asList(user,user1));
    }

    @Test
    public void testFind(){

        //select * from users   where favorites.cites has "东莞"、"东京"
        //db.users.find({ "favorites.cites" : { "$all" : [ "东莞" , "东京"]}})
        Criteria all = where("favorites.cites").all(Arrays.asList("东莞","东京"));
        List<User> find = tempelate.find(query(all), User.class);
        System.out.println(find.size());
        for (User user : find) {
            System.out.println(user.toString());
        }


        //select * from users   where username like '%s%' and (contry= English or contry =
USA)
```

```
        // db.users.find({ "$and" : [ { "username" : { "$regex" : ".*s.*"}} , { "$or" : [ { "country" :
"English"} , { "country" : "USA"}]}]})
        String regexStr = ".*c.*";
        //username like '%s%'
        Criteria regex = where("username").regex(regexStr);
        //contry= EngLish
        Criteria or1 = where("country").is("English");
        //contry= USA
        Criteria or2 = where("country").is("USA");

        Criteria or = new Criteria().orOperator(or1,or2);

        Query query = query(new Criteria().andOperator(regex,or));

        List<User> find2 = tempelate.find(query, User.class);

        System.out.println(find2.size());
        for (User user : find2) {
            System.out.println(user.toString());
        }
    }


    @Test
    public void testUpdate(){
        //update    users    set age=6 where username = 'lison'
       //db.users.updateMany({ "username" : "lison"},{ "$set" : { "age" : 6}},true)
        Query query = query(where("username").is("lison"));
        Update update = update("age", 6);
        UpdateResult updateFirst = tempelate.updateMulti(query, update, User.class);
        System.out.println(updateFirst.getModifiedCount());

        //update users    set favorites.movies add "小电影 2 ", "小电影 3" where favorites.cites
has "东莞"
        //db.users.updateMany({    "favorites.cites"    :    "    东    莞    "},    {    "$addToSet"    :
{ "favorites.movies" : { "$each" : [ "小电影 2 " , "小电影 3"]}}},true)
        query = query(where("favorites.cites").is("东莞"));
        update = new Update().addToSet("favorites.movies").each("小电影 2 ", "小电影 3");
        UpdateResult updateMulti = tempelate.updateMulti(query, update, User.class);
        System.out.println("---------------------->"+updateMulti.getModifiedCount());
    }

    @Test
    public void testDelete(){
```

```
        //delete from users where username = 'lison'
        //db.users.deleteMany({ "username" : "lison"} )
        Query query = query(where("username").is("lison"));
        DeleteResult remove = tempelate.remove(query, User.class);
        System.out.println("---------------------->"+remove.getDeletedCount());

        //delete from users where age >8 and age <25
        //db.users.deleteMany({"$and" : [ {"age" : {"$gt": 8}} , {"age" : {"$lt" : 25}}]})
        query = query(new Criteria().andOperator(where("age").gt(8),where("age").lt(25)));
        DeleteResult remove2 = tempelate.remove(query, User.class);
        System.out.println("---------------------->"+remove2.getDeletedCount());
    }

}
```

2.2.5.2.5. 事务测试

2.2.5.2.5.1. 修改 applicationContext.xml

```
<?xml version="1.0" encoding="UTF-8"?>
<beans xmlns="http://www.springframework.org/schema/beans"
        xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xmlns:context="http://www.springframework.org/schema/context"
        xmlns:mongo="http://www.springframework.org/schema/data/mongo"
        xmlns:tx="http://www.springframework.org/schema/tx"
        xsi:schemaLocation="http://www.springframework.org/schema/beans
                            http://www.springframework.org/schema/beans/spring-beans.xsd
                            http://www.springframework.org/schema/context

http://www.springframework.org/schema/context/spring-context.xsd
                            http://www.springframework.org/schema/tx
                            http://www.springframework.org/schema/tx/spring-tx.xsd
                            http://www.springframework.org/schema/data/mongo

http://www.springframework.org/schema/data/mongo/spring-mongo.xsd">

    <context:component-scan base-package="cn.enjoy">

    </context:component-scan>

    <!-- mongodb 连接池配置 -->
```

```
    <!--<mongo:mongo-client id="mongo" host="192.168.244.123" port="27017"
credentials="lison:lison@lison">-->
    <mongo:mongo-client id="mongo" host="192.168.244.123" port="27017">
        <mongo:client-options
            write-concern="ACKNOWLEDGED"
            threads-allowed-to-block-for-connection-multiplier="5"
            max-wait-time="1200"
            connect-timeout="1000"/>
    </mongo:mongo-client>

    <!-- mongodb 数据库工厂配置 -->
    <mongo:db-factory  dbname="lison" mongo-ref="mongo" />

    <tx:annotation-driven transaction-manager="transactionManager"/>

    <bean id="transactionManager"
class="org.springframework.data.mongodb.MongoTransactionManager">
        <property name="dbFactory" ref="mongoDbFactory"/>
    </bean>



    <!-- mongodb 模板配置 -->
    <bean id="anotherMongoTemplate"
class="org.springframework.data.mongodb.core.MongoTemplate">
        <constructor-arg name="mongoDbFactory" ref="mongoDbFactory" />
        </bean>

</beans>
```

2.2.5.2.5.2. 新增 UserService

```
package cn.enjoy.service;
public interface UserService {
    void doTransaction();
}
```

2.2.5.2.5.3. 新增实现类 UserServiceImpl

```
package cn.enjoy.service.impl;
```

```
import cn.enjoy.entity.User;
import cn.enjoy.service.UserService;
import com.mongodb.MongoClient;
import org.springframework.data.mongodb.core.MongoOperations;
import org.springframework.data.mongodb.core.query.Query;
import org.springframework.data.mongodb.core.query.Update;
import org.springframework.stereotype.Service;
import org.springframework.transaction.annotation.Transactional;

import javax.annotation.Resource;

import static org.springframework.data.mongodb.core.query.Criteria.where;
import static org.springframework.data.mongodb.core.query.Query.query;

@Service
public class UserServiceImpl    implements UserService{

    @Resource
    private MongoOperations tempelate;

    @Override
    @Transactional
    public void doTransaction() {
        Query query = query(where("username").is("lison"));
        Update update = new Update().inc("lenght",1);
        tempelate.updateMulti(query,update, User.class);

        query = query(where("username").is("james"));
        update = new Update().inc("lenght",-1);
        tempelate.updateMulti(query,update, User.class);
    }
}
```

2.2.5.2.5.4. 修改 QuickStartSpringPojoTest

增加 spring 事务单元测试

```
@Test
    public void doTransaction() {
        userService.doTransaction();
    }
```

2.2.5.3. 日志显示

如果需要显示日志

```
        <!-- 日志相关依赖 -->
        <dependency>
            <groupId>org.slf4j</groupId>
            <artifactId>slf4j-api</artifactId>
            <version>1.7.10</version>
        </dependency>
        <dependency>
            <groupId>ch.qos.logback</groupId>
            <artifactId>logback-classic</artifactId>
            <version>1.1.2</version>
        </dependency>
        <dependency>
            <groupId>ch.qos.logback</groupId>
            <artifactId>logback-core</artifactId>
            <version>1.1.2</version>
        </dependency>
```

在 resource 目录下新增 logback.xml

```
<?xml version="1.0" encoding="UTF-8"?>
<!--
scan：当此属性设置为 true 时，配置文件如果发生改变，将会被重新加载，默认值为 true。
scanPeriod：设置监测配置文件是否有修改的时间间隔，如果没有给出时间单位，默认单位是毫秒当 scan 为 true 时，此属性生效。默认的时间间隔为 1 分钟。
debug：当此属性设置为 true 时，将打印出 logback 内部日志信息，实时查看 logback 运行状态。默认值为 false。
-->
<configuration scan="false" scanPeriod="60 seconds" debug="false">
    <!-- 定义日志的根目录 -->
<!--        <property name="LOG_HOME" value="/app/log" /> -->
    <!-- 定义日志文件名称 -->
    <property name="appName" value="netty"></property>
    <!-- ch.qos.logback.core.ConsoleAppender 表示控制台输出 -->
    <appender name="stdout" class="ch.qos.logback.core.ConsoleAppender">
        <Encoding>UTF-8</Encoding>
        <!--
        日志输出格式：%d 表示日期时间，%thread 表示线程名，%-5level：级别从左显示 5 个字符宽度
        %logger{50} 表示 logger 名字最长 50 个字符，否则按照句点分割。 %msg：日志消息，%n 是换行符
```

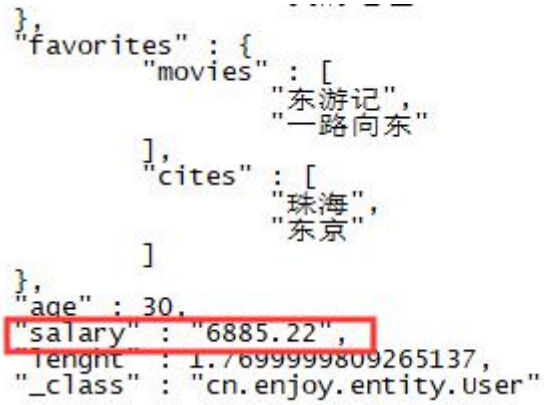
```
        -->
        <encoder>
            <pattern>%d{yyyy-MM-dd HH:mm:ss.SSS} [%thread] %-5level %logger{50} - %msg%n</pattern>
        </encoder>
    </appender>

    <!-- 滚动记录文件，先将日志记录到指定文件，当符合某个条件时，将日志记录到其他文件 -->
    <appender name="appLogAppender" class="ch.qos.logback.core.rolling.RollingFileAppender">
        <Encoding>UTF-8</Encoding>
        <!-- 指定日志文件的名称 -->
        <file>cache-demo2.log</file>
        <!--
        当发生滚动时，决定 RollingFileAppender 的行为，涉及文件移动和重命名
        TimeBasedRollingPolicy： 最常用的滚动策略，它根据时间来制定滚动策略，既负责滚动也负责出发滚动。
        -->
        <rollingPolicy class="ch.qos.logback.core.rolling.TimeBasedRollingPolicy">
            <!--
            滚动时产生的文件的存放位置及文件名称 %d{yyyy-MM-dd}：按天进行日志滚动
            %i：当文件大小超过 maxFileSize 时，按照 i 进行文件滚动
            -->
            <fileNamePattern>${appName}-%d{yyyy-MM-dd}-%i.log</fileNamePattern>
            <!--
            可选节点，控制保留的归档文件的最大数量，超出数量就删除旧文件。假设设置每天滚动，
            且 maxHistory 是 365，则只保存最近 365 天的文件，删除之前的旧文件。注意，删除旧文件是，
            那些为了归档而创建的目录也会被删除。
            -->
            <MaxHistory>365</MaxHistory>
            <!--
            当日志文件超过 maxFileSize 指定的大小是，根据上面提到的%i 进行日志文件滚动 注意此处配置 SizeBasedTriggeringPolicy 是无法实现按文件大小进行滚动的，必须配置 timeBasedFileNamingAndTriggeringPolicy
            -->
            <timeBasedFileNamingAndTriggeringPolicy class="ch.qos.logback.core.rolling.SizeAndTimeBasedFNATP">
                <maxFileSize>100MB</maxFileSize>
            </timeBasedFileNamingAndTriggeringPolicy>
        </rollingPolicy>
```

```
        <!--
        日志输出格式：%d 表示日期时间，%thread 表示线程名，%-5level：级别从左显示5 个字符宽度 %logger{50} 表示 logger 名字最长 50 个字符，否则按照句点分割。 %msg：日志消息，%n 是换行符
        -->
        <encoder>
            <pattern>%d{yyyy-MM-dd HH:mm:ss.SSS} [ %thread ] - [ %-5level ] [ %logger{50} : %line ] - %msg%n</pattern>
        </encoder>
    </appender>

    <!--
    logger 主要用于存放日志对象，也可以定义日志类型、级别
    name：表示匹配的 logger 类型前缀，也就是包的前半部分
    level：要记录的日志级别，包括 TRACE < DEBUG < INFO < WARN < ERROR
    additivity：作用在于 children-logger 是否使用 rootLogger 配置的 appender 进行输出，false：表示只用当前 logger 的 appender-ref，true：表示当前 logger 的 appender-ref 和 rootLogger 的 appender-ref 都有效
    -->

<!--    <logger name="edu.hyh" level="info" additivity="true">
        <appender-ref ref="appLogAppender" />
    </logger> -->

    <!--
    root 与 logger 是父子关系，没有特别定义则默认为 root，任何一个类只会和一个 logger 对应，
    要么是定义的 logger，要么是 root，判断的关键在于找到这个 logger，然后判断这个 logger 的 appender 和 level。
    -->

    <logger name="org.springframework.beans.factory.support" level="info" additivity="true">

    </logger>

    <root level="debug">
        <appender-ref ref="stdout" />
        <appender-ref ref="appLogAppender" />
    </root>
</configuration>
```

2.2.6. 类型转换器

在 mongodb 3.4 版本里面新增了个数据类型 Decimal128

但在前面操作的时候发现 User 里面的 salary 依然还是字符串



这种情况需要使用到类型转换器

2.2.6.1. 新增 BigDecimalToDecimal128Converter

```
package cn.enjoy.convert;

import java.math.BigDecimal;

import org.bson.types.Decimal128;
import org.springframework.core.convert.converter.Converter;

public class BigDecimalToDecimal128Converter implements Converter<BigDecimal, Decimal128>
{

    @Override
    public Decimal128 convert(BigDecimal source) {
        return new Decimal128(source);
    }

}
```

2.2.6.2. 新增 Decimal128ToBigDecimalConverter

```
package cn.enjoy.convert;

import java.math.BigDecimal;

import org.bson.types.Decimal128;
import org.springframework.core.convert.converter.Converter;
```

```
public class Decimal128ToBigDecimalConverter implements Converter<Decimal128, BigDecimal>
{

	@Override
	public BigDecimal convert(Decimal128 source) {
		return source.bigDecimalValue();
	}

}
```

2.2.6.3. 修改 applicationContext.xml

```
<?xml version="1.0" encoding="UTF-8"?>
<beans xmlns="http://www.springframework.org/schema/beans"
	xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
	xmlns:context="http://www.springframework.org/schema/context"
	xmlns:mongo="http://www.springframework.org/schema/data/mongo"
	xsi:schemaLocation="http://www.springframework.org/schema/beans
				http://www.springframework.org/schema/beans/spring-beans.xsd
				http://www.springframework.org/schema/context

http://www.springframework.org/schema/context/spring-context.xsd
				http://www.springframework.org/schema/data/mongo

http://www.springframework.org/schema/data/mongo/spring-mongo.xsd">

	<context:component-scan base-package="cn.enjoy">

	</context:component-scan>

	<!-- mongodb 连接池配置 -->
	<mongo:mongo-client id="mongo" host="192.168.244.123" port="27017">
		<mongo:client-options
			write-concern="ACKNOWLEDGED"
			threads-allowed-to-block-for-connection-multiplier="5"
			max-wait-time="1200"
			connect-timeout="1000"/>
	</mongo:mongo-client>

	<!-- mongodb 数据库工厂配置 -->
```

```
    <mongo:db-factory dbname="lison" mongo-ref="mongo" />

    <mongo:mapping-converter base-package="cn.enjoy.convert">
        <mongo:custom-converters>
            <mongo:converter>
                <bean class="cn.enjoy.convert.BigDecimalToDecimal128Converter"/>
            </mongo:converter>
            <mongo:converter>
                <bean class="cn.enjoy.convert.Decimal128ToBigDecimalConverter"/>
            </mongo:converter>
        </mongo:custom-converters>
    </mongo:mapping-converter>


    <!-- mongodb 模板配置  -->
    <bean                                                    id="anotherMongoTemplate"
class="org.springframework.data.mongodb.core.MongoTemplate">
        <constructor-arg name="mongoDbFactory" ref="mongoDbFactory" />
        <constructor-arg name="mongoConverter" ref="mappingConverter"/>
    </bean>

</beans>
```

2.2.6.4. 测试

```
}
{
        "_id" : ObjectId("5dc65d12be776a41fbdb065f"),
        "username" : "chen",
        "country" : "China",
        "address" : {
                "aCode" : "411000",
                "add" : "我的地址2"
        },
        "favorites" : {
                "movies" : [
                        "东游记",
                        "一路向东"
                ],
                "cites" : [
                        "珠海",
                        "东京"
                ]
        },
        "age" : 30,
        "salary" : NumberDecimal("6885.22"),
        "lenght" : 1.7699999809265137,
        "_class" : "cn.enjoy.entity.User"
}
```

2.2.7. 开发框架版本选择

2.2.8. java 驱动与 mongoDB 兼容性

https://docs.mongodb.com/ecosystem/drivers/java/

Java Driver Version	MongoDB 4.2	MongoDB 4.0	MongoDB 3.6	MongoDB 3.4	MongoDB 3.2	MongoDB 3.0	MongoDB 2.6
Version 3.11	✓	✓	✓	✓	✓	✓	✓
Version 3.10		✓	✓	✓	✓	✓	✓
Version 3.9		✓	✓	✓	✓	✓	✓
Version 3.8		✓	✓	✓	✓	✓	✓
Version 3.7			✓	✓	✓	✓	✓
Version 3.6			✓	✓	✓	✓	✓
Version 3.5				✓	✓	✓	✓
Version 3.4				✓	✓	✓	✓
Version 3.3					✓	✓	✓
Version 3.2					✓	✓	✓

可见 mongodb 具备强大的向下兼容性

2.2.9. java 驱动与 jdk 的兼容性

Java Driver Version	Java 5	Java 6	Java 7	Java 8	Java 11 [1]
Version 3.11		✓	✓	✓	✓
Version 3.10		✓	✓	✓	✓
Version 3.9		✓	✓	✓	✓
Version 3.8		✓	✓	✓	✓
Version 3.4		✓	✓	✓	✓
Version 3.3		✓	✓	✓	✓
Version 3.2		✓	✓	✓	✓
Version 3.1		✓	✓	✓	✓
Version 3.0		✓	✓	✓	✓

2.2.10. spring data mongo 与 java mongo 驱动兼容性

spring mongodb 版本	spring版本支持	jdk版本支持	mongodb server支持	默认的mongoDB java驱动版本
Spring Data MongoDB 1.x	4.3.13.RELEASE 以上	jdk 1.6以上	2.6版本以上，3.4以下	2.14.3
Spring Data MongoDB 2.x	5.0.2.RELEASE 以上	jdk 1.8以上	2.6版本以上，3.6	3.5.0

2.2.11. mongoDB 数据类型

数据类型	示例	说明
null	{"key":null}	null表示空值或者不存在该字段
布尔	{"key","true"} {"key","false"}	布尔类型表示真或者假
32位整数	{"key":8}	存储32位整数，但再shell界面显示会被自动转成64位浮点数
64位整数	{"key":{"floatApprox":8}}	存储64位整数，floatApprox意思是使用64位浮点数近似表示一个64位整数
64位浮点数	{"key":8.21}	存储64位整数，shell客户端显示的数字都是这种类型;
字符串	{"key":"value"} {"key":"8"}	UTF-8格式
对象ID	{"key":ObjectId()}	12字节的唯一ID
日期	{"key":new Date()}	
代码	{"key":function(){}}	
二进制数据		主要存储文件
未定义	{"key":undefined}	值没有定义，null和undefined是不同的
数组	{"key":[16,15,17]}	集合或者列表
内嵌文档	{"user":{"name":"lison"}}	子对象
Decimal128	{"price":NumberDecimal("2.099")}	3.4版本新增的数据类型，无精度问题

2.3. 查询

```
db.users.drop();
var user1 = {
        "username" : "lison",
        "country" : "china",
        "address" : {
                "aCode" : "411000",
                "add" : "长沙"
        },
        "favorites" : {
                "movies" : ["杀破狼 2","战狼","雷神 1"],
                "cites" : ["长沙","深圳","上海"]
        },
```

```
            "age" : 18,
            "salary":NumberDecimal("18889.09"),
            "lenght" :1.79

};
var user2 = {
            "username" : "james",
            "country" : "English",
            "address" : {
                        "aCode" : "311000",
                        "add" : "地址"
            },
            "favorites" : {
                        "movies" : ["复仇者联盟","战狼","雷神 1"],
                        "cites" : ["西安","东京","上海"]
            },
            "age" : 24,
            "salary":NumberDecimal("7889.09"),
            "lenght" :1.35
};
var user3 ={
            "username" : "deer",
            "country" : "japan",
            "address" : {
                        "aCode" : "411000",
                        "add" : "长沙"
            },
            "favorites" : {
                        "movies" : ["肉蒲团","一路向西","倩女幽魂"],
                        "cites" : ["东莞","深圳","东京"]
            },
            "age" : 22,
            "salary":NumberDecimal("6666.66"),
            "lenght" :1.85
};
var user4 =
{
            "username" : "mark",
            "country" : "USA",
            "address" : {
                        "aCode" : "411000",
                        "add" : "长沙"
            },
            "favorites" : {
```

```
                    "movies" : ["蜘蛛侠","钢铁侠","蝙蝠侠"],
                    "cites" : ["青岛","东莞","上海"]
          },
          "age" : 20,
         "salary":NumberDecimal("6398.22"),
         "lenght" :1.77
};

var user5 =
{
          "username" : "peter",
          "country" : "UK",
          "address" : {
                    "aCode" : "411000",
                    "add" : "TEST"
          },
          "favorites" : {
                    "movies" : ["蜘蛛侠","钢铁侠","蝙蝠侠"],
                    "cites" : ["青岛","东莞","上海"]
          },
         "salary":NumberDecimal("1969.88")
};

db.users.insert(user1);
db.users.insert(user2);
db.users.insert(user3);
db.users.insert(user4);
db.users.insert(user5);
```

2.3.1. 查询概要

MongoDB 查询数据的语法格式如下：

db.collection.find(query, projection)

- query ：可选，使用查询操作符指定查询条件
- projection ：可选，使用投影操作符指定返回的键。查询时返回文档中所有键值， 只需省略

  该参数即可（默认省略）。

  注意：0 表示字段排除，非 0 表示字段选择并排除其他字段，所有字段必须设置同样的值；
- 需要以易读的方式来读取数据，可以使用 pretty() 方法；

举例子：db.users.find({"$and":[{"username":"lison"},{"age":18}]},{"username":0,"age":0})

2.3.2. 查询选择器

运算符类型	运算符	描述
范围	$eq	等于
	$lt	小于
	$gt	大于
	$lte	小于等于
	$gte	大于等于
	$in	判断元素是否在指定的集合范围里
	$all	判断数组中是否包含某几个元素,无关顺序
	$nin	判断元素是否不在指定的集合范围里
布尔运算	$ne	不等于，不匹配参数条件
	$not	不匹配结果
	$or	有一个条件成立则匹配
	$nor	所有条件都不匹配
	$and	所有条件都必须匹配
	$exists	判断元素是否存在
其他	.	子文档匹配
	$regex	正则表达式匹配

2.3.3. 查询选择器实战

(1)client 指定端口和 ip 连接 mongodb

./mongo localhost:27022

(2)in 选择器示例：

```
db.users.find({"username":{"$in":["lison", "mark", "james"]}}).pretty()
db.users.find({$or:[{username:"lison"},{username:"james"},{username:"mark"}]})
```

查询姓名为 lison、mark 和 james 这个范围的人

(3)exists 选择器示例：

```
db.users.find({"lenght":{"$exists":true}}).pretty()
```

判断文档有没有关心的字段

(4)not 选择器示例：

```
db.users.find({"lenght":{"$not":{"$gte":1.77}}}).pretty()
```

查询高度小于 1.77 或者没有身高的人

not 语句 会把不包含查询语句字段的文档 也检索出来

```
db.users.find({"lenght":{"$lt":1.77}}).pretty()
db.users.find({"$or":[{"lenght":{"$lt":1.77}},{"lenght":{"$exists":false}}]}).pretty()
```

2.3.4. 查询选择

- 映射

字段选择并排除其他字段：db.users.find({},{'username':1})
db.users.find({},{'username':1,'age':1})
字段排除：db.users.find({},{'username':0})

- 排序

sort()：db.users.find().sort({"username":1}).pretty()
1：升序 -1：降序

- 跳过和限制

skip(n)：跳过 n 条数据
limit(n)：限制 n 条数据
e.g： db.users.find().sort({"username":1}).limit(2).skip(2)

- 查询唯一值

distinct()：查询指定字段的唯一值，e.g：db.users.distinct("username")

2.3.5. 字符串数组选择查询

- 数组单元素查询

db.users.find({"favorites.movies":"蜘蛛侠"})
查询数组中包含"蜘蛛侠"

- 数组精确查找

db.users.find({"favorites.movies":["杀破狼 2", "战狼", "雷神 1"]},{"favorites.movies":1})
查询数组等于["杀破狼 2", "战狼", "雷神 1"]的文档，严格按照数量、顺序；

- 数组多元素查询

db.users.find({"favorites.movies":{"$all":["雷神 1", "战狼"]}},{"favorites.movies":1})
查询数组包含["雷神 1", "战狼"]的文档，跟顺序无关，跟数量有关

db.users.find({"favorites.movies":{"$in":["雷神 1", "战狼"]}},{"favorites.movies":1})
查询数组包含["雷神 1", "战狼"]中任意一个的文档，跟顺序无关，跟数量无关

- 索引查询

db.users.find({"favorites.movies.0":"杀破狼 2"},{"favorites.movies":1})
查询数组中第一个为"杀破狼 2"的文档

- 返回数组子集

db.users.find({},{"favorites.movies":{"$slice":[1,2]},"favorites":1})
$slice 可以取两个元素数组,分别表示跳过和限制的条数；
对比 db.users.find({},{"favorites":1})

2.3.6. 对象数组选择查询

```
db.users.drop();
var user1 = {
            "username" : "lison",
            "country" : "china",
            "address" : {
                        "aCode" : "411000",
                        "add" : "长沙"
            },
            "favorites" : {
                        "movies" : ["妇联 4","杀破狼 2","战狼","雷神 1","神奇动物在哪里"],
                        "cites" : ["长沙","深圳","上海"]
            },
            "age" : 18,
           "salary":NumberDecimal("18889.09"),
           "lenght" :1.79,
           "comments" :    [
                        {
                              "author"    :    "lison1",
                              "content"    :    "lison 评论 1",
                              "commentTime" : ISODate("2017-01-06T00:00:00")
                        },
                        {
                              "author"    :    "lison2",
                              "content"    :    "lison 评论 2",
                              "commentTime" : ISODate("2017-02-06T00:00:00")
                        },
                        {
                              "author"    :    "lison3",
                              "content"    :    "lison 评论 3",
                              "commentTime" : ISODate("2017-03-06T00:00:00")
                        },
                        {
                              "author"    :    "lison4",
                              "content"    :    "lison 评论 4",
                              "commentTime" : ISODate("2017-04-06T00:00:00")
                        },
                        {
```

```
                        "author"    :    "lison5",
                        "content"    :    "lison 是苍老师的小迷弟",
                        "commentTime" : ISODate("2017-05-06T00:00:00")
                    },
                    {
                        "author"    :    "lison6",
                        "content"    :    "lison 评论 6",
                        "commentTime" : ISODate("2017-06-06T00:00:00")
                    },
                    {
                        "author"    :    "lison7",
                        "content"    :    "lison 评论 7",
                        "commentTime" : ISODate("2017-07-06T00:00:00")
                    },
                    {
                        "author"    :    "lison8",
                        "content"    :    "lison 评论 8",
                        "commentTime" : ISODate("2017-08-06T00:00:00")
                    },
                    {
                        "author"    :    "lison9",
                        "content"    :    "lison 评论 9",
                        "commentTime" : ISODate("2017-09-06T00:00:00")
                    }
            ]

};
var user2 = {
            "username" : "james",
            "country" : "English",
            "address" : {
                        "aCode" : "311000",
                        "add" : "地址"
            },
            "favorites" : {
                        "movies" : ["复仇者联盟","战狼","雷神 1"],
                        "cites" : ["西安","东京","上海"]
            },
            "age" : 24,
          "salary":NumberDecimal("7889.09"),
          "lenght" :1.35,
          "comments" :    [
                        {
                        "author"    :    "lison1",
```

```
                        "content"    :    "lison 评论 1",
                        "commentTime" : ISODate("2017-10-06T00:00:00")
                    },
                    {
                        "author"    :    "lison6",
                        "content"    :    "lison 评论 6",
                        "commentTime" : ISODate("2017-11-06T05:26:18")
                    },
                    {
                        "author"    :    "lison12",
                        "content"    :    "lison 评论 12",
                        "commentTime" : ISODate("2017-11-06T00:00:00")
                    }
            ]
};
var user3 ={
            "username" : "deer",
            "country" : "japan",
            "address" : {
                        "aCode" : "411000",
                        "add" : "长沙"
            },
            "favorites" : {
                        "movies" : ["肉蒲团","一路向西","倩女幽魂"],
                        "cites" : ["东莞","深圳","东京"]
            },
            "age" : 22,
           "salary":NumberDecimal("6666.66"),
           "lenght" :1.85,
           "comments" :    [
                    {
                        "author"    :    "lison1",
                        "content"    :    "lison 评论 1",
                        "commentTime" : ISODate("2017-10-06T00:00:00")
                    },
                    {
                        "author"    :    "lison22",
                        "content"    :    "lison 评论 6",
                        "commentTime" : ISODate("2017-11-06T00:00:00")
                    },
                    {
                        "author"    :    "lison16",
                        "content"    :    "lison 评论 12",
                        "commentTime" : ISODate("2017-11-06T00:00:00")
```

```
                        }
            ]
};
var user4 =
{
            "username" : "mark",
            "country" : "USA",
            "address" : {
                        "aCode" : "411000",
                        "add" : "长沙"
            },
            "favorites" : {
                        "movies" : ["蜘蛛侠","钢铁侠","蝙蝠侠"],
                        "cites" : ["青岛","东莞","上海"]
            },
            "age" : 20,
           "salary":NumberDecimal("6398.22"),
           "lenght" :1.77
};

var user5 =
{
            "username" : "peter",
            "country" : "UK",
            "address" : {
                        "aCode" : "411000",
                        "add" : "TEST"
            },
            "favorites" : {
                        "movies" : ["蜘蛛侠","钢铁侠","蝙蝠侠"],
                        "cites" : ["青岛","东莞","上海"]
            },
           "salary":NumberDecimal("1969.88")
};

db.users.insert(user1);
db.users.insert(user2);
db.users.insert(user3);
db.users.insert(user4);
db.users.insert(user5);
```

- 单元素查询

db.users.find({"comments":{
"author" : "lison6",
"content" : "lison 评 论 6","commentTime" : ISODate("2017-06-06T00:00:00Z")}})

备注：对象数组精确查找

- 查找 lison1 或者 lison12 评论过的 user （$in 查找符）

db.users.find({"comments.author":{"$in":["lison1","lison12"]}}).pretty()

备注：跟数量无关，跟顺序无关；

- 查找 lison1 和 lison12 都评论过的 user

db.users.find({"comments.author":{"$all":["lison12","lison1"]}}).pretty()

备注：跟数量有关，跟顺序无关；

- 查找 lison5 评语为包含"苍老师"关键字的 user（$elemMatch 查找符）

db.users.find({"comments":{"$elemMatch":{"author" : "lison5",
"content" : { "$regex" : ".*苍老师.*"}}}}) .pretty()

备注：数组中对象数据要符合查询对象里面所有的字段，$全元素匹配，和顺序无关；

2.3.7. Java 客户端解析

2.3.7.1. 原生客户端

- **MongoClient → MongoDatabase →MongoCollection**

✓ MongoClient 被设计成线程安全、可以被多线程共享的。通常访问数据库集群的应用只需要一个实例

✓ 如果需要使用 pojo 对象读写，需要将 PojoCodecProvider 注入到 client 中

- **查询和更新的 API 类**

✓ 查询器：com.mongodb.client.model.Filters

✓ 更新器：com.mongodb.client.model.Updates

✓ 投影器：com.mongodb.client.model.Projections

```
package cn.enjoy.mg;

import static com.mongodb.client.model.Filters.*;
import static com.mongodb.client.model.Projections.*;
import static com.mongodb.client.model.Sorts.*;
import static com.mongodb.client.model.Aggregates.*;
```

```
import java.text.ParseException;
import java.text.SimpleDateFormat;
import java.time.LocalDateTime;
import java.time.ZoneId;
import java.time.ZonedDateTime;
import java.util.ArrayList;
import java.util.Arrays;
import java.util.Date;
import java.util.List;

import javax.annotation.Resource;

import org.bson.BSON;
import org.bson.BsonDocument;
import org.bson.Document;
import org.bson.codecs.BsonTypeClassMap;
import org.bson.codecs.DocumentCodec;
import org.bson.codecs.configuration.CodecRegistries;
import org.bson.codecs.configuration.CodecRegistry;
import org.bson.codecs.pojo.PojoCodecProvider;
import org.bson.conversions.Bson;
import org.junit.Before;
import org.junit.Test;
import org.junit.runner.RunWith;
import org.junit.runner.manipulation.Filter;
import org.slf4j.Logger;
import org.slf4j.LoggerFactory;
import org.springframework.data.mongodb.core.MongoOperations;
import org.springframework.test.context.ContextConfiguration;
import org.springframework.test.context.junit4.SpringJUnit4ClassRunner;

import com.mongodb.Block;
import com.mongodb.MongoClient;
import com.mongodb.MongoClientOptions;
import com.mongodb.ServerAddress;
import com.mongodb.WriteConcern;
import com.mongodb.client.AggregateIterable;
import com.mongodb.client.FindIterable;
import com.mongodb.client.MongoCollection;
import com.mongodb.client.MongoDatabase;
import com.mongodb.client.model.Accumulators;
import com.mongodb.client.model.Filters;
import com.mongodb.client.model.Projections;
import com.mongodb.client.model.PushOptions;
```

```
import com.mongodb.client.model.Updates;
import com.mongodb.client.result.UpdateResult;
import com.mongodb.operation.OrderBy;

@RunWith(SpringJUnit4ClassRunner.class)
@ContextConfiguration("classpath:applicationContext.xml")
public class JavaQueryTest {

	private static final Logger logger = LoggerFactory
			.getLogger(JavaQueryTest.class);

	private MongoDatabase db;

	private MongoCollection<Document> collection;

	private MongoCollection<Document> orderCollection;

	@Resource(name="mongo")
	private MongoClient client;

	@Before
	public void init() {
		db = client.getDatabase("lison");
		collection = db.getCollection("users");
		orderCollection = db.getCollection("ordersTest");
	}

	// ----------------------------操作符使用实例----------------------------------------

	// db.users.find({"username":{"$in":["lison", "mark", "james"]}}).pretty()
	//  查询姓名为 lison、mark 和 james 这个范围的人
	@Test
	public void testInOper() {
		Bson in = in("username", "lison", "mark", "james");
		FindIterable<Document> find = collection.find(in);
		printOperation(find);
	}

	// db.users.find({"lenght":{"$exists":true}}).pretty()
	//  判断文档有没有关心的字段
	@Test
	public void testExistsOper() {
		Bson exists = exists("lenght", true);
		FindIterable<Document> find = collection.find(exists);
```

```
        printOperation(find);
    }

    // db.users.find().sort({"username":1}).limit(1).skip(2)
    // 测试 sort，limit，skip
    @Test
    public void testSLSOper() {
        Document sort = new Document("username", 1);
        FindIterable<Document> find = collection.find().sort(sort).limit(1).skip(2);
        printOperation(find);
    }

    // db.users.find({"lenght":{"$not":{"$gte":1.77}}}).pretty()
    // 查询高度小于 1.77 或者没有身高的人
    // not 语句 会把不包含查询语句字段的文档 也检索出来

    @Test
    public void testNotOper() {
        Bson gte = gte("lenght", 1.77);
        Bson not = not(gte);
        FindIterable<Document> find = collection.find(not);
        printOperation(find);
    }

    // ----------------------------字符串数组查询实例----------------------------------------

    // db.users.find({"favorites.movies":"蜘蛛侠"})
    // 查询数组中包含"蜘蛛侠"
    @Test
    public void testArray1() {
        Bson eq = eq("favorites.movies", "蜘蛛侠");
        FindIterable<Document> find = collection.find(eq);
        printOperation(find);
    }

    // db.users.find({"favorites.movies":[ "妇联 4","杀破狼 2", "战狼", "雷神 1","神奇动物在哪里"]},{"favorites.movies":1})
    // 查询数组等于[ “杀破狼 2”, “战狼”, “雷神 1” ]的文档，严格按照数量、顺序；

    @Test
    public void testArray2() {
        Bson eq = eq("favorites.movies", Arrays.asList("妇联 4","杀破狼 2", "战狼", "雷神 1","神奇动物在哪里"));
        FindIterable<Document> find = collection.find(eq);
```

```
        printOperation(find);
    }


    //数组多元素查询
    @Test
    public void testArray3() {

        // db.users.find({"favorites.movies":{"$all":[ "雷神 1", "战狼"]}},{"favorites.movies":1})
        //  查询数组包含["雷神 1", "战狼" ]的文档，跟顺序无关
        Bson all = all("favorites.movies", Arrays.asList("雷神 1", "战狼"));
        FindIterable<Document> find = collection.find(all);
        printOperation(find);
//      db.users.find({"favorites.movies":{"$in":[ "雷神 1", "战狼" ]}},{"favorites.movies":1})
//      查询数组包含[“雷神 1”, “战狼” ]中任意一个的文档，跟顺序无关，跟数量无关
        Bson in = in("favorites.movies", Arrays.asList("雷神 1", "战狼"));
        find = collection.find(in);
        printOperation(find);
    }

    // // db.users.find({"favorites.movies.0":"妇联 4"},{"favorites.movies":1})
    //  查询数组中第一个为"妇联 4"的文档

    @Test
    public void testArray4() {
        Bson eq = eq("favorites.movies.0", "妇联 4");
        FindIterable<Document> find = collection.find(eq);
        printOperation(find);
    }

    // db.users.find({},{"favorites.movies":{"$slice":[1,2]},"favorites":1})
    // $slice 可以取两个元素数组,分别表示跳过和限制的条数；

    @Test
    public void testArray5() {
        Bson slice = slice("favorites.movies", 1, 2);
        Bson include = include("favorites");
        Bson projection = fields(slice, include);
        FindIterable<Document> find = collection.find().projection(projection);
        printOperation(find);
    }

    // ----------------------------对象数组查询实例----------------------------------------
```

```
    //db.users.find({"comments":{"author":"lison6","content":"lison 评 论
6","commentTime":ISODate("2017-06-06T00:00:00Z")}})
    //备注：对象数组精确查找
    @Test
    public void testObjArray1() throws ParseException {
        SimpleDateFormat formatter = new SimpleDateFormat("yyyy-MM-dd hh:mm:ss");
        Date commentDate = formatter.parse("2017-06-06 08:00:00");

        Document comment = new Document().append("author", "lison6")
                                         .append("content", "lison 评论 6")
                                         .append("commentTime", commentDate);
        Bson eq = eq("comments", comment);
        FindIterable<Document> find = collection.find(eq);
        printOperation(find);     }


    //数组多元素查询
    @Test
    public void testObjArray2() {


//        查找 lison1 或者 lison12 评论过的 user （$in 查找符）
//        db.users.find({"comments.author":{"$in":["lison1","lison12"]}}).pretty()
//          备注：跟数量无关，跟顺序无关；

        Bson in = in("comments.author", Arrays.asList("lison1","lison12"));
        FindIterable<Document> find = collection.find(in);
        printOperation(find);

//        查找 lison1 和 lison12 都评论过的 user
//        db.users.find({"comments.author":{"$all":["lison12","lison1"]}}).pretty()
//         备注：跟数量有关，跟顺序无关；

        Bson all = all("comments.author", Arrays.asList("lison12","lison1"));
        find = collection.find(all);
        printOperation(find);
    }



    //查找 lison5 评语为包含“苍老师”关键字的 user（$elemMatch 查找符）
//    db.users.find({"comments":{"$elemMatch":{"author" : "lison5", "content" : { "$regex" : ".*
苍老师.*"}}}})
```

```
//备注：数组中对象数据要符合查询对象里面所有的字段，$全元素匹配，和顺序无关；

    @Test
    public void testObjArray3() throws ParseException {
        Bson eq = eq("author","lison5");
        Bson regex = regex("content", ".*苍老师.*");
        Bson elemMatch = Filters.elemMatch("comments", and(eq,regex));
        FindIterable<Document> find = collection.find(elemMatch);
        printOperation(find);
    }



    private Block<Document> getBlock(final List<Document> ret) {
        Block<Document> printBlock = new Block<Document>() {
            @Override
            public void apply(Document t) {
                System.out.println("----------------------");
                CodecRegistry                    codecRegistry                    =
CodecRegistries.fromRegistries(MongoClient.getDefaultCodecRegistry());
                final DocumentCodec codec = new DocumentCodec(codecRegistry, new
BsonTypeClassMap());
                System.out.println(t.toJson(codec));
                System.out.println("----------------------");
                ret.add(t);
            }
        };
        return printBlock;
    }

    //打印查询出来的数据和查询的数据量
    private void printOperation( FindIterable<Document> find) {
        final List<Document> ret = new ArrayList<Document>();
        Block<Document> printBlock = getBlock(ret);
        find.forEach(printBlock);
        System.out.println(ret.size());
        ret.removeAll(ret);
    }



    private void printOperation(List<Document> ret, Block<Document> printBlock,
            AggregateIterable<Document> aggregate) {
        aggregate.forEach(printBlock);
        System.out.println(ret.size());
```

```
        ret.removeAll(ret);

    }



    @Test
    // 测试 elemMatch 操作符，数组中对象数据要符合查询对象里面所有的字段
    // 查找 lison5 评语为“lison 是苍老师的小迷弟”的人
    // db.users.find({"comments":{"$elemMatch":{"author" : "lison5","content" :
    // "lison 是苍老师的小迷弟"}}}) .pretty()
    public void testElemMatch() {
        Document filter = new Document().append("author", "lison5").append(
                "content", "lison 是苍老师的小迷弟");
        Bson elemMatch = Filters.elemMatch("comments", filter);

        FindIterable<Document> find = collection.find(elemMatch);

        printOperation(find);

    }


}
```

2.3.7.2. Spring mongodb 解析

2.3.7.2.1. 修改 User 实体类

```
package cn.enjoy.entity;

import java.math.BigDecimal;
import java.util.List;

import org.bson.types.ObjectId;
import org.springframework.data.mongodb.core.mapping.DBRef;
import org.springframework.data.mongodb.core.mapping.Document;

@Document(collection="users")
public class User {
```

```
private ObjectId id;

private String username;

private String country;

private Address address;

private Favorites favorites;

private int age;

private BigDecimal salary;

private float lenght;

private List<Comment> comments;


public String getUsername() {
	return username;
}
public void setUsername(String username) {
	this.username = username;
}
public String getCountry() {
	return country;
}
public void setCountry(String country) {
	this.country = country;
}
public Address getAddress() {
	return address;
}
public void setAddress(Address address) {
	this.address = address;
}
public Favorites getFavorites() {
	return favorites;
}
public void setFavorites(Favorites favorites) {
	this.favorites = favorites;
}
public ObjectId getId() {
```

```
        return id;
    }
    public void setId(ObjectId id) {
        this.id = id;
    }
    public int getAge() {
        return age;
    }
    public void setAge(int age) {
        this.age = age;
    }
    public BigDecimal getSalary() {
        return salary;
    }
    public void setSalary(BigDecimal salary) {
        this.salary = salary;
    }
    public float getLenght() {
        return lenght;
    }
    public void setLenght(float lenght) {
        this.lenght = lenght;
    }



    public List<Comment> getComments() {
        return comments;
    }
    public void setComments(List<Comment> comments) {
        this.comments = comments;
    }
    @Override
    public String toString() {
        return "User [id=" + id + ", username=" + username + ", country="
                + country + ", address=" + address + ", favorites=" + favorites
                + ", age=" + age + ", salary=" + salary + ", lenght=" + lenght
                + ", comments=" + comments + "]";
    }


}
```

2.3.7.2.2. 新增 Comment 实体类

```
package cn.enjoy.entity;

import java.util.Date;
import org.springframework.data.mongodb.core.mapping.Document;

public class Comment {
	private String author;

	private String content;

	private Date commentTime;

	public String getAuthor() {
		return author;
	}

	public void setAuthor(String author) {
		this.author = author;
	}

	public Date getCommentTime() {
		return commentTime;
	}

	public void setCommentTime(Date commentTime) {
		this.commentTime = commentTime;
	}

	public String getContent() {
		return content;
	}

	public void setContent(String content) {
		this.content = content;
	}

	@Override
	public String toString() {
		return "Comment [author=" + author + ", commentTime=" + commentTime
				+ ", content=" + content + "]";
	}
```

```
}
```

2.3.7.2.3. Spring 查询测试类

```
package cn.enjoy.mg;

import static org.springframework.data.mongodb.core.aggregation.Aggregation.*;
import static org.springframework.data.mongodb.core.query.Criteria.*;
import static org.springframework.data.mongodb.core.query.Query.*;

import java.text.ParseException;
import java.text.SimpleDateFormat;
import java.util.ArrayList;
import java.util.Arrays;
import java.util.Date;
import java.util.List;

import javax.annotation.Resource;

import cn.enjoy.entity.Comment;
import cn.enjoy.entity.User;
import com.mongodb.client.result.UpdateResult;
import org.bson.Document;
import org.bson.conversions.Bson;
import org.junit.Test;
import org.junit.runner.RunWith;
import org.slf4j.Logger;
import org.slf4j.LoggerFactory;
import org.springframework.data.domain.Sort;
import org.springframework.data.domain.Sort.Direction;
import org.springframework.data.mongodb.core.MongoOperations;
import org.springframework.data.mongodb.core.aggregation.Aggregation;
import org.springframework.data.mongodb.core.aggregation.AggregationResults;
import org.springframework.data.mongodb.core.query.Criteria;
import org.springframework.data.mongodb.core.query.Query;
import org.springframework.data.mongodb.core.query.Update;
import org.springframework.data.mongodb.core.query.Update.PushOperatorBuilder;
import org.springframework.test.context.ContextConfiguration;
import org.springframework.test.context.junit4.SpringJUnit4ClassRunner;
```

```
import com.mongodb.Block;
import com.mongodb.WriteResult;
import com.mongodb.client.FindIterable;
import com.mongodb.client.model.Filters;

@RunWith(SpringJUnit4ClassRunner.class)
@ContextConfiguration("classpath:applicationContext.xml")
public class SpringQueryTest {

	private static final Logger logger = LoggerFactory
			.getLogger(SpringQueryTest.class);

	@Resource
	private MongoOperations tempelate;



	// ----------------------------操作符使用实例----------------------------------------

	// db.users.find({"username":{"$in":["lison", "mark", "james"]}}).pretty()
	//  查询姓名为 lison、mark 和 james 这个范围的人
	@Test
	public void testInOper() {
		Query query = query(where("username").in("lison", "mark", "james"));
		List<User> find = tempelate.find(query, User.class);
		printUsers(find);


	}


	// db.users.find({"lenght":{"$exists":true}}).pretty()
	//  判断文档有没有关心的字段
	@Test
	public void testExistsOper() {

		Query query = query(where("lenght").exists(true));
		List<User> find = tempelate.find(query, User.class);
		printUsers(find);

	}
```

```
    // db.users.find().sort({"username":1}).limit(1).skip(2)
    // 测试 sort，limit，skip
    @Test
    public void testSLSOper() {

        //Query query = query(where(null)).with(new Sort(new Sort.Order(Direction.ASC,
"username"))).limit(1).skip(2);
        Query query = query(where(null)).with(Sort.by(Direction.ASC,
"username")).limit(1).skip(2);
        List<User> find = tempelate.find(query, User.class);
        printUsers(find);

    }

    // db.users.find({"lenght":{"$not":{"$gte":1.77}}}).pretty()
    // 查询高度小于 1.77 或者没有身高的人
    // not 语句 会把不包含查询语句字段的文档 也检索出来

    @Test
    public void testNotOper() {
        Query query = query(where("lenght").not().gte(1.77));
        List<User> find = tempelate.find(query, User.class);
        printUsers(find);


    }

    // ----------------------------字符串数组查询实例----------------------------------------

    // db.users.find({"favorites.movies":"蜘蛛侠"})
    // 查询数组中包含"蜘蛛侠"
    @Test
    public void testArray1() {
        Query query = query(where("favorites.movies").is("蜘蛛侠"));
        List<User> find = tempelate.find(query, User.class);
        printUsers(find);
    }

    // db.users.find({"favorites.movies":[ "妇联 4","杀破狼 2", "战狼", "雷神 1","神奇动物在哪
里"]},{"favorites.movies":1})
    // 查询数组等于[ “杀破狼 2”, “战狼”, “雷神 1” ]的文档，严格按照数量、顺序；

    @Test
    public void testArray2() {
```

```
        Query query = query(where("favorites.movies").is(Arrays.asList("妇联 4","杀破狼 2", '
战狼", "雷神 1","神奇动物在哪里")));
        List<User> find = tempelate.find(query, User.class);
        printUsers(find);
    }


    //数组多元素查询
    @Test
    public void testArray3() {
        // db.users.find({"favorites.movies":{"$all":[ "雷神 1", "战狼"]}},{"favorites.movies":1})
        //  查询数组包含["雷神 1", "战狼" ]的文档，跟顺序无关

        Query query = query(where("favorites.movies").all(Arrays.asList("雷神 1", "战狼")));
        List<User> find = tempelate.find(query, User.class);
        printUsers(find);


//        db.users.find({"favorites.movies":{"$in":[ "雷神 1", "战狼" ]}},{"favorites.movies":1})
//        查询数组包含[“雷神 1”, “战狼” ]中任意一个的文档，跟顺序无关，跟数量无关
         query = query(where("favorites.movies").in(Arrays.asList("雷神 1", "战狼")));
         find = tempelate.find(query, User.class);
         printUsers(find);
    }

    // // db.users.find({"favorites.movies.0":"妇联 4"},{"favorites.movies":1})
    //  查询数组中第一个为"妇联 4"的文档

    @Test
    public void testArray4() {
        Query query = query(where("favorites.movies.0").is("妇联 4"));
        List<User> find = tempelate.find(query, User.class);
        printUsers(find);
    }

    // db.users.find({},{"favorites.movies":{"$slice":[1,2]},"favorites":1})
    // $slice 可以取两个元素数组,分别表示跳过和限制的条数；

    @Test
    public void testArray5() {
        Query query = query(where(null));
        query.fields().include("favorites").slice("favorites.movies", 1, 2);
        List<User> find = tempelate.find(query, User.class);
        printUsers(find);
```

```
    }

    // ----------------------------对象数组查询实例----------------------------------------


    //db.users.find({"comments":{"author":"lison6","content":"lison 评 论
6","commentTime":ISODate("2017-06-06T00:00:00Z")}})
    //备注：对象数组精确查找
    //坑：居然和属性定义的顺序有关
    @Test
    public void testObjArray1() throws ParseException {
        SimpleDateFormat formatter = new SimpleDateFormat("yyyy-MM-dd hh:mm:ss");
        Date commentDate = formatter.parse("2017-06-06 08:00:00");
        Comment comment = new Comment();
        comment.setAuthor("lison6");
        comment.setCommentTime(commentDate);
        comment.setContent("lison 评论 6");

        Query query = query(where("comments").is(comment));
        List<User> find = tempelate.find(query, User.class);
        printUsers(find);
    }


    //数组多元素查询
    @Test
    public void testObjArray2() {



//        查找 lison1 或者 lison12 评论过的 user （$in 查找符）
//        db.users.find({"comments.author":{"$in":["lison1","lison12"]}}).pretty()
//          备注：跟数量无关，跟顺序无关；

        Query query = query(where("comments.author").in(Arrays.asList("lison1","lison12")));
        List<User> find = tempelate.find(query, User.class);
        printUsers(find);



//        查找 lison1 和 lison12 都评论过的 user
//        db.users.find({"comments.author":{"$all":["lison12","lison1"]}}).pretty()
//         备注：跟数量有关，跟顺序无关；

        query = query(where("comments.author").all(Arrays.asList("lison1","lison12")));
```

```
        find = tempelate.find(query, User.class);
        printUsers(find);
    }




    private void printUsers(List<User> find) {
        for (User user : find) {
            System.out.println(user);
        }
        System.out.println(find.size());
    }


    //-------------------------------------------------------




    //查找 lison5 评语为包含“苍老师”关键字的 user（$elemMatch 查找符）
//    db.users.find({"comments":{"$elemMatch":{"author" : "lison5", "content" : { "$regex" : ".*苍老师.*"}}}})
//备注：数组中对象数据要符合查询对象里面所有的字段，$全元素匹配，和顺序无关；

    @Test
    public void testObjArray3() throws ParseException {
//        and(where("author").is("lison5"),where("content").regex(".*苍老师.*")))
        Criteria andOperator = new Criteria().andOperator(where("author").is("lison5"),where("content").regex(".*苍老师.*"));
        Query query = query(where("comments").elemMatch(andOperator));
        List<User> find = tempelate.find(query, User.class);
        printUsers(find);
    }

    @Test
    // db.users.find({"comments":{"$elemMatch":{"author" : "lison5","content" :
    // "lison 是苍老师的小迷弟"}}}) .pretty()
    public void testElemMatch() {
        Query query = query(where("comments").elemMatch(where("author").is("lison5").and("content").is("lison 是苍老师的小迷弟")));
        List<User> find = tempelate.find(query, User.class);
```

```
            System.out.println(find.size());

        }

}
```

2.3.8. Mongodb 连接池配置

参数名	默认值	说明
writeConcern	ACKNOWLEDGED	写入安全机制，是一种客户端设置，用于控制写入安全的级别: ACKNOWLEDGED 默认选项，数据写入到Primary就向客户端发送确认 0 Unacknowledged 对客户端的写入不需要发送任何确认，适用于性能要求高，但不关注正确性的场景; 1 W1 数据写入后，会等待集群中1台发送确认 2 W2 数据写入后，会等待集群中两台台发送确认 3 W3 数据写入后，会等待集群中3台台发送确认 JOURNALED 确保所有数据提交到 journal file MAJORITY 等待集群中大多数服务器提交后确认;
codecRegistry	MongoClient.getDefaultCodecRegistry()	编解码类，实现Codec接口
minConnectionsPerHost		最小连接数，connections-per-host
connectionsPerHost	100	最大连接数
threadsAllowedToBlockForConnectionMultiplier	5	此参数跟connectionsPerHost的乘机为一个线程变为可用的最大阻塞数，超过此乘机数之后的所有线程将及时获取一个异常
maxWaitTime	1000 * 60 * 2	一个线程等待链接可用的最大等待毫秒数，0表示不等待
maxConnectionIdleTime	0	设置池连接的最大空闲时间，0表示没有限制
maxConnectionLifeTime	0	设置池连接的最大使用时间，0表示没有限制
connectTimeout	1000*10	连接超时时间
alwaysUseMBeans	false	是否打开JMX监控

参数名	默认值	说明
heartbeatFrequency	10000	设置心跳频率。 这是驱动程序尝试确定群集中每个服务器的当前状态的频率。
minHeartbeatFrequency	500	设置最低心跳频率。 如果驱动程序必须经常重新检查服务器的可用性，那么至少要等上一次检查以避免浪费。
heartbeatConnectTimeout	20000	心跳检测连接超时时间
heartbeatSocketTimeout	20000	心跳检测Socket超时时间

2.3.9. 数据模式设计

2.3.9.1. mongoDB 的数据结构

```
{
        "_id" : ObjectId("59f938235d93fc4af8a37114"),
        "username" :  “lison",
        "country" : "in11digo",
        "address" : {
                "aCode" : "邮编",
                "add" : "d11pff"
        },
        "favorites" : {
                "movies" : ["杀破狼2","1dushe","雷神1"],
                "cites" : ["1sh","1cs","1zz"]
        },
       "age" : 18 ,
       "salary" : NumberDecimal("2.099"),
       "lenght"  : 1.79
}
```

2.3.9.2. MySql 等数据库

User表	
字段	类型
Id	Nvarchar
Username	Nvarchar
……	……

favorites表	
字段	类型
Id	Nvarchar
Type	Nvarchar
……	……

2.3.9.3. nosql 在数据模式设计上的优势

- 读写效率高-在 IO 性能上有先天独厚的优势；
- 可扩展能力强,不需要考虑关联，数据分区分库，水平扩展就比较简单；
- 动态模式，不要求每个文档都具有完全相同的结构。对很多异构数据场景支持非常好；
- 模型自然-文档模型最接近于我们熟悉的对象模型；

2.3.9.4. mongoDB 能不能实现关联查询？

先准备测试数据

```
var comments1 = {
                "_id":"xxoo1",
                "lists":
                 [
                     {
                          "author"   :   "lison1",
                          "content"   :   "lison 评论 1",
                          "commentTime" : ISODate("2017-12-06T04:26:18")
                     },
                     {
                          "author"   :   "lison2",
                          "content"   :   "lison 评论 2",
                          "commentTime" : ISODate("2017-12-06T04:26:18")
                     },
                     {
                          "author"   :   "lison3",
                          "content"   :   "lison 评论 3",
                          "commentTime" : ISODate("2017-12-06T04:26:18")
                     },
                     {
                          "author"   :   "lison4",
                          "content"   :   "lison 评论 4",
                          "commentTime" : ISODate("2017-12-06T04:26:18")
                     },
                     {
                          "author"   :   "lison5",
                          "content"   :   "lison 评论 5",
                          "commentTime" : ISODate("2017-12-06T04:26:18")
                     },
                     {
```

```
                    "author"   :   "lison6",
                    "content"   :   "lison 评论 6",
                    "commentTime" : ISODate("2017-12-06T04:26:18")
                },
                {
                    "author"   :   "lison7",
                    "content"   :   "lison 评论 7",
                    "commentTime" : ISODate("2017-12-06T04:26:18")
                },
                {
                    "author"   :   "lison8",
                    "content"   :   "lison 评论 8",
                    "commentTime" : ISODate("2017-12-06T04:26:18")
                },
                {
                    "author"   :   "lison9",
                    "content"   :   "lison 评论 9",
                    "commentTime" : ISODate("2017-12-06T04:26:18")
                }
            ]
        };

var comments2 = {
            "_id":"xxoo2",
            "lists":
             [
                {
                    "author"   :   "james1",
                    "content"   :   "james 评论 1",
                    "commentTime" : ISODate("2017-12-06T04:26:18")
                },
                {
                    "author"   :   "james2",
                    "content"   :   "james 评论 2",
                    "commentTime" : ISODate("2017-12-06T04:26:18")
                },
                {
                    "author"   :   "james3",
                    "content"   :   "james 评论 3",
                    "commentTime" : ISODate("2017-12-06T04:26:18")
                },
                {
                    "author"   :   "james4",
                    "content"   :   "james 评论 4",
```

```
                    "commentTime" : ISODate("2017-12-06T04:26:18")
                },
                {
                    "author"   :   "james5",
                    "content"   :   "james 评论 5",
                    "commentTime" : ISODate("2017-12-06T04:26:18")
                },
                {
                    "author"   :   "james6",
                    "content"   :   "james 评论 6",
                    "commentTime" : ISODate("2017-12-06T04:26:18")
                },
                {
                    "author"   :   "james7",
                    "content"   :   "james 评论 7",
                    "commentTime" : ISODate("2017-12-06T04:26:18")
                },
                {
                    "author"   :   "james8",
                    "content"   :   "james 评论 8",
                    "commentTime" : ISODate("2017-12-06T04:26:18")
                },
                {
                    "author"   :   "james9",
                    "content"   :   "james 评论 9",
                    "commentTime" : ISODate("2017-12-06T04:26:18")
                }
            ]
        };
db.comments.drop();
db.comments.insert(comments1);
db.comments.insert(comments2);

db.users.drop();
var user1 = {
        "username" : "lison",
        "country" : "china",
        "address" : {
                "aCode" : "411000",
                "add" : "长沙"
        },
        "favorites" : {
                "movies" : ["杀破狼 2","战狼","雷神 1"],
                "cites" : ["长沙","深圳","上海"]
```

```
            },
            "age" : 18,
          "salary":NumberDecimal("18889.09"),
          "lenght" :1.79,
          "comments":{
                        "$ref" : "comments",
                        "$id" : "xxoo1",
                        "$db" : "lison"
            }
};
var user2 = {
            "username" : "james",
            "country" : "English",
            "address" : {
                        "aCode" : "311000",
                        "add" : "地址"
            },
            "favorites" : {
                        "movies" : ["复仇者联盟","战狼","雷神 1"],
                        "cites" : ["西安","东京","上海"]
            },
            "age" : 24,
          "salary":NumberDecimal("7889.09"),
          "lenght" :1.35
};
var user3 ={
            "username" : "deer",
            "country" : "japan",
            "address" : {
                        "aCode" : "411000",
                        "add" : "长沙"
            },
            "favorites" : {
                        "movies" : ["肉蒲团","一路向西","倩女幽魂"],
                        "cites" : ["东莞","深圳","东京"]
            },
            "age" : 22,
          "salary":NumberDecimal("6666.66"),
          "lenght" :1.85
};
var user4 =
{
            "username" : "mark",
            "country" : "USA",
```

```
            "address" : {
                        "aCode" : "411000",
                        "add" : "长沙"
            },
            "favorites" : {
                        "movies" : ["蜘蛛侠","钢铁侠","蝙蝠侠"],
                        "cites" : ["青岛","东莞","上海"]
            },
            "age" : 20,
           "salary":NumberDecimal("6398.22"),
           "lenght" :1.77
};

var user5 =
{
            "username" : "peter",
            "country" : "UK",
            "address" : {
                        "aCode" : "411000",
                        "add" : "TEST"
            },
            "favorites" : {
                        "movies" : ["蜘蛛侠","钢铁侠","蝙蝠侠"],
                        "cites" : ["青岛","东莞","上海"]
            },
           "salary":NumberDecimal("1969.88")
};

db.users.insert(user1);
db.users.insert(user2);
db.users.insert(user3);
db.users.insert(user4);
db.users.insert(user5);
```

- 先考虑内嵌， 直接按照你的对象模型来设计你的数据模型。如果你的对象模型数量不多，关系不是很复杂，直接一种对象对应一个集合就可以了

- 单个 bson 文档最大不能超过 16M；当文档超过 16M 的时候，就应该考虑使用引用（DBRef）了，在主表里存储一个 id 值，指向另一个表中的 id 值。

  DBRef 语法：{ "$ref" : <value>, "$id" : <value>, "$db" : <value> }
  $ref：引用文档所在的集合的名称；
  $id：所在集合的_id 字段值；

$db：可选，集合所在的数据库实例；

2.3.9.4.1. 注意：

Tips：DBRef 只是关联信息的数据载体，本身并不会去关联数据；

2.3.9.4.2. 使用 dbref 脚本示例：

```
var lison = db.users.findOne({"username":"lison"});
var dbref = lison.comments;
db[dbref.$ref].findOne({"_id":dbref.$id})
```

2.3.9.4.3. JAVA 客户端解析

JavaQueryTest.dbRefTest

```
@Test
public void dbRefTest() {
    FindIterable<Document> find = collection.find(eq("username", "lison"));
    printOperation(find);
}
```

2.3.9.4.4. Spring data mongo 解析

2.3.9.4.4.1. 新增实体类 Comments

```
package cn.enjoy.entity;

import java.util.List;
```

```
import org.springframework.data.mongodb.core.mapping.Document;

@Document(collection="comments")
public class Comments {

	private List<Comment> lists;

	public List<Comment> getLists() {
		return lists;
	}

	public void setLists(List<Comment> lists) {
		this.lists = lists;
	}

	@Override
	public String toString() {
		return "Comments{" +
				"lists=" + lists +
				'}';
	}
}
```

2.3.9.4.4.2. 修改 Users 实体类

```
package cn.enjoy.entity;

import java.math.BigDecimal;
import java.util.List;

import org.bson.types.ObjectId;
import org.springframework.data.mongodb.core.mapping.DBRef;
import org.springframework.data.mongodb.core.mapping.Document;

@Document(collection="users")
public class User {

	private ObjectId id;

	private String username;

	private String country;

	private Address address;
```

```
private Favorites favorites;

private int age;

private BigDecimal salary;

private float lenght;
//private List<Comment> comments;
private Comments comments;

public Comments getComments() {
	return comments;
}

public void setComments(Comments comments) {
	this.comments = comments;
}




public String getUsername() {
	return username;
}
public void setUsername(String username) {
	this.username = username;
}
public String getCountry() {
	return country;
}
public void setCountry(String country) {
	this.country = country;
}
public Address getAddress() {
	return address;
}
public void setAddress(Address address) {
	this.address = address;
}
public Favorites getFavorites() {
	return favorites;
}
public void setFavorites(Favorites favorites) {
```

```
            this.favorites = favorites;
        }
        public ObjectId getId() {
            return id;
        }
        public void setId(ObjectId id) {
            this.id = id;
        }
        public int getAge() {
            return age;
        }
        public void setAge(int age) {
            this.age = age;
        }
        public BigDecimal getSalary() {
            return salary;
        }
        public void setSalary(BigDecimal salary) {
            this.salary = salary;
        }
        public float getLenght() {
            return lenght;
        }
        public void setLenght(float lenght) {
            this.lenght = lenght;
        }


//      public List<Comment> getComments() {
//          return comments;
//      }
//      public void setComments(List<Comment> comments) {
//          this.comments = comments;
//      }
        @Override
        public String toString() {
            return "User [id=" + id + ", username=" + username + ", country="
                    + country + ", address=" + address + ", favorites=" + favorites
                    + ", age=" + age + ", salary=" + salary + ", lenght=" + lenght
                    + ", comments=" + comments + "]";
        }
}
```

2.3.9.4.4.3. 测试

cn.enjoy.mg.SpringQueryTest#dbRefTest

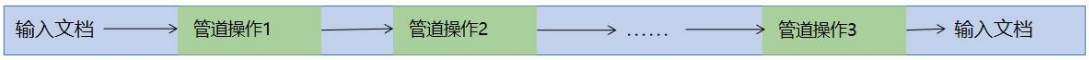
```
216
217     @Test
218     //spring对dbRef进行了封装，发起了两次查询请求
219     public void dbRefTest(){
220         System.out.println("----------------------------");
221         List<User> users = tempelate.findAll(User.class, collectionName: "users");
222         System.out.println("----------------------------");
223         System.out.println(users);
224 //      System.out.println(users.get(0).getComments());
225     }
226
227
228
```

1 test passed – 443ms

```
...comments=Comments{lists=[Comment [author=lison1, commentTime=Wed Dec 06 12:26:18 CST 2017, content=lison评论1], Comment [author=lison2, commentTime=Wed Dec 06 12:26:18 CST 2017, content=lison评论2], Comment [auth
```

2.3.10. 聚合的理解

聚合框架就是定义一个管道，管道里的每一步都为下一步输出数据数据 （类似于 JDK8 的 Stream API，既流式编程）



2.3.10.1. 常用的管道操作

$project：投影，指定输出文档中的字段；
$match：用于过滤数据，只输出符合条件的文档。$match 使用 MongoDB 的标准查询操作
$limit：用来限制 MongoDB 聚合管道返回的文档数。
$skip：在聚合管道中跳过指定数量的文档，并返回余下的文档。
$unwind：将文档中的某一个数组类型字段拆分成多条，每条包含数组中的一个值。
$group：将集合中的文档分组，可用于统计结果。
$sort：将输入文档排序后输出。

2.3.10.2. $group 操作符

- $group：可以分组的数据执行如下的表达式计算：
  $sum：计算总和。
  $avg：计算平均值。
  $min：根据分组，获取集合中所有文档对应值得最小值。
  $max：根据分组，获取集合中所有文档对应值得最大值。

2.3.10.3. 聚合训练

2.3.10.3.1. 新建实体 Order

```
package cn.enjoy.entity;

import java.math.BigDecimal;
import java.util.Date;

import org.bson.types.ObjectId;
import org.springframework.data.annotation.Id;
import org.springframework.data.mongodb.core.mapping.Document;

@Document(collection = "orders")
public class Order {
	@Id
	private String id;

	private String orderCode;

	private String useCode;

	private Date orderTime;

	private BigDecimal price;

	private String[] Auditors;

	public String getOrderCode() {
		return orderCode;
	}
```

```
public void setOrderCode(String orderCode) {
	this.orderCode = orderCode;
}

public Date getOrderTime() {
	return orderTime;
}

public void setOrderTime(Date orderTime) {
	this.orderTime = orderTime;
}



public BigDecimal getPrice() {
	return price;
}

public void setPrice(BigDecimal price) {
	this.price = price;
}

public String getId() {
	return id;
}

public void setId(String id) {
	this.id = id;
}

public String getUseCode() {
	return useCode;
}

public void setUseCode(String useCode) {
	this.useCode = useCode;
}

public String[] getAuditors() {
	return Auditors;
}

public void setAuditors(String[] auditors) {
	Auditors = auditors;
}
```

```
}
```

2.3.10.3.2. 产生测试数据

```
package cn.enjoy.mg;

import java.math.BigDecimal;
import java.text.SimpleDateFormat;
import java.util.Date;

import org.junit.Test;

public class RondomDateTest {

	@Test
	public void testRondomDate() {
		for(int i=0;i<=10000;i++){
//			Date date = randomDate("2015-01-01","2017-10-31");
//			System.out.println(new SimpleDateFormat("yyyy.MM.dd HH:mm:ss").format(date));
			BigDecimal test = randomBigDecimal(10000,1);
			System.out.println(test.toString());
		}
	}

	/**
	 * 获取随机日期
	 * @param beginDate 起始日期，格式为：yyyy-MM-dd
	 * @param endDate 结束日期，格式为：yyyy-MM-dd
	 * @return
	 */
	public static Date randomDate(String beginDate,String endDate){
		try {
			SimpleDateFormat format = new SimpleDateFormat("yyyy-MM-dd");
			Date start = format.parse(beginDate);
			Date end = format.parse(endDate);

			if(start.getTime() >= end.getTime()){
				return null;
			}
```

```
                long date = random(start.getTime(),end.getTime());

                return new Date(date);
            } catch (Exception e) {
                e.printStackTrace();
            }
            return null;
        }

        private static long random(long begin,long end){
            long rtn = begin + (long)(Math.random() * (end - begin));
            if(rtn == begin || rtn == end){
                return random(begin,end);
            }
            return rtn;
        }


        public static BigDecimal randomBigDecimal(float max,float min) {
//          float Max = 10000, Min = 1.0f;
            BigDecimal db = new BigDecimal(Math.random() * (max - min) + min);
             return db.setScale(2, BigDecimal.ROUND_HALF_UP);// 保留 30 位小数并四舍五
入
        }
}
```

使用 GenarateOrdersTest 产生 100000 条测试数据，代码如下

```
package cn.enjoy.mg;

import static org.springframework.data.mongodb.core.query.Criteria.where;
import static org.springframework.data.mongodb.core.query.Query.query;
import static org.springframework.data.mongodb.core.query.Update.update;

import java.util.ArrayList;
import java.util.HashSet;
import java.util.List;
import java.util.Random;
import java.util.UUID;

import javax.annotation.Resource;
import cn.enjoy.entity.Order;
import org.junit.Test;
import org.junit.runner.RunWith;
```

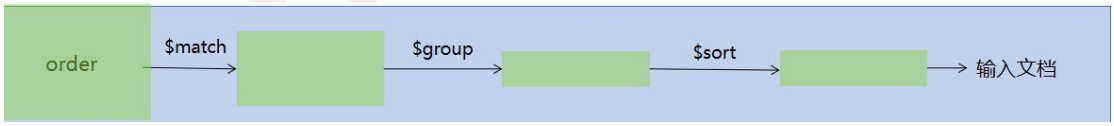
```
import org.slf4j.Logger;
import org.slf4j.LoggerFactory;
import org.springframework.data.mongodb.core.MongoOperations;
import org.springframework.test.context.ContextConfiguration;
import org.springframework.test.context.junit4.SpringJUnit4ClassRunner;


@RunWith(SpringJUnit4ClassRunner.class)
@ContextConfiguration("classpath:applicationContext.xml")
public class GenarateOrdersTest {

	private static final Logger logger = LoggerFactory.getLogger(GenarateOrdersTest.class);

	@Resource
	private MongoOperations tempelate;

	//随机生成 orderTest 数据
	@Test
	public void batchInsertOrder() {
		String[] userCodes = new String[] { "james", "AV", "allen", "six",
				"peter", "mark", "king", "zero", "lance", "deer", "lison" };
		String[] auditors = new String[]
{ "auditor1","auditor2","auditor3","auditor4","auditor5"};
		List<Order> list = new ArrayList<Order>();
		Random rand = new Random();
		for (int i = 0; i < 100000; i++) {
			Order order = new Order();
			int num = rand.nextInt(11);
			order.setUseCode(userCodes[num]);
			order.setOrderCode(UUID.randomUUID().toString());
			order.setOrderTime(RondomDateTest.randomDate("2015-01-01","2017-10-31"));
			order.setPrice(RondomDateTest.randomBigDecimal(10000, 1));
			int length = rand.nextInt(5)+1;
			String[] temp = new String[length];
			for (int j = 0; j < temp.length; j++) {
				temp[j] = getFromArrays(temp,auditors,rand);
			}
			order.setAuditors(temp);
			list.add(order);
		}
		tempelate.insertAll(list);
	}

	private String getFromArrays(String[] temp, String[] auditors, Random rand) {
```

```
            String ret = null;
            boolean test = true;
            while (test) {
                ret = auditors[rand.nextInt(5)];
                int i =0;
                for (String _temp : temp) {
                    i++;
                    if(ret.equals(_temp)){
                        break;
                    }
                }
                if(i==temp.length){
                    test=false;
                }

            }
            return ret;
        }
}
```

2.3.10.3.3. 训练 1

查询 2015 年 4 月 3 号之前，每个用户每个月消费的总金额，并按用户名进行排序：

```
db.orders.aggregate([
        {"$match":{ "orderTime" : { "$lt" : new Date("2015-04-03T16:00:00.000Z")}}},
{"$group":{"_id":{"useCode":"$useCode","month":{"$month":"$orderTime"}},"total":{"$sum":"$price"}}},
{"$sort":{"_id":1}}
])
```

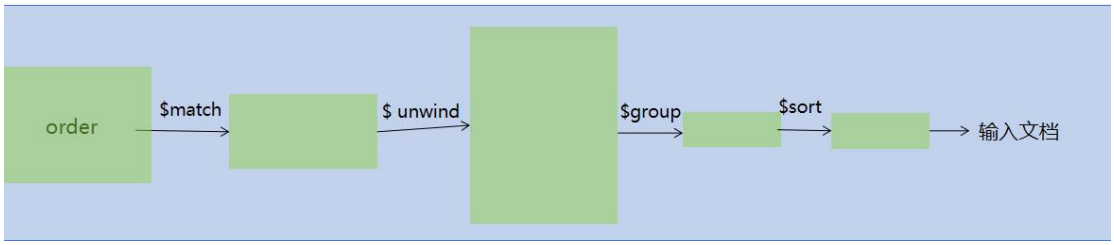


2.3.10.3.4. 训练 2

查询 2015 年 4 月 3 号之前，每个审核员分别审批的订单总金额，按审核员名称进行排序：

```
db.orders.aggregate([{"$match":{ "orderTime" : { "$lt" : new Date("2015-04-03T16:00:00.000Z")}}},
                        {"$unwind":"$Auditors"},
```

```
                    {"$group":{"_id":{"Auditors":"$Auditors"},"total":{"$sum":"$price"}}},
                    {"$sort":{"_id":1}}])
```



2.3.10.3.5. Java 代码

cn.enjoy.mg.JavaQueryTest#aggretionTest

```
    /**
     *    db.orders.aggregate([
     {"$match":{ "orderTime" : { "$lt" : new Date("2015-04-03T16:00:00.000Z")}}},

{"$group":{"_id":{"useCode":"$useCode","month":{"$month":"$orderTime"}},"total":{"$sum":"$
price"}}},
     {"$sort":{"_id":1}}
     ])
     */
    @Test
    public void aggretionTest1() throws Exception {
        Block<Document> printBlock = new Block<Document>() {
            @Override
            public void apply(Document t) {
                logger.info("----------------------");
                System.out.println(t.toJson());
                logger.info("----------------------");
            }
        };

        SimpleDateFormat formatter = new SimpleDateFormat("yyyy-MM-dd hh:mm:ss");
        Date commentDate = formatter.parse("2015-04-03 08:00:00");

        DBObject groupFileds=new BasicDBObject();
        groupFileds.put("useCode","$useCode");
        groupFileds.put("month",eq("$month","$orderTime"));
```

```
        List<Bson> aggregates = new ArrayList<Bson>();
        aggregates.add(match(lt("orderTime",commentDate)));
        aggregates.add(group(groupFileds, Accumulators.sum("sum", "$price")));
        aggregates.add(sort(eq("_id",1)));
        AggregateIterable<Document> aggregate = orderCollection
                .aggregate(aggregates);
        aggregate.forEach(printBlock);
    }


    /**
     *
            db.orders.aggregate([{"$match":{ "orderTime" : { "$lt" : new
Date("2015-04-03T16:00:00.000Z")}}},
     {"$unwind":"$Auditors"},
     {"$group":{"_id":{"Auditors":"$Auditors"},"total":{"$sum":"$price"}}},
     {"$sort":{"_id":1}}])
     */
    @Test
    public void aggretionTest2() throws Exception {
        Block<Document> printBlock = new Block<Document>() {
            @Override
            public void apply(Document t) {
                logger.info("----------------------");
                System.out.println(t.toJson());
                logger.info("----------------------");
            }
        };

        SimpleDateFormat formatter = new SimpleDateFormat("yyyy-MM-dd hh:mm:ss");
        Date commentDate = formatter.parse("2015-04-03 08:00:00");
        List<Bson> aggregates = new ArrayList<Bson>();
        aggregates.add(match(lt("orderTime",commentDate)));
        aggregates.add(unwind("$Auditors"));
        aggregates.add(group("$Auditors", Accumulators.sum("sum", "$price")));
        aggregates.add(sort(eq("_id",1)));
        AggregateIterable<Document> aggregate = orderCollection
                .aggregate(aggregates);
        aggregate.forEach(printBlock);
    }
```

2.3.10.3.6. Spring Data 代码

cn.enjoy.mg.SpringQueryTest#aggretionTest

```
@Test
	public void aggretionTest1() throws Exception {
		SimpleDateFormat formatter = new SimpleDateFormat("yyyy-MM-dd hh:mm:ss");
		Date commentDate = formatter.parse("2015-04-04 00:00:00");
		Aggregation aggs =	newAggregation(
				match(where("orderTime").lt(commentDate)),

	project("useCode","price","orderTime").and(DateOperators.DateToString.dateOf("orderTim
e").toString("%m")).as("month"),
				group("useCode","month").sum("price").as("total"),
				sort(Sort.by(Direction.ASC,"_id"))
		);

		AggregationResults<Object> aggregate = tempelate.aggregate(aggs, "orders",
	Object.class);
		List<Object> mappedResults = aggregate.getMappedResults();
		System.out.println(mappedResults);

	}


	/**
	 *
		db.orders.aggregate([{"$match":{ "orderTime" : { "$lt" : new
Date("2015-04-03T16:00:00.000Z")}}},
	 {"$unwind":"$Auditors"},
	 {"$group":{"_id":{"Auditors":"$Auditors"},"total":{"$sum":"$price"}}},
	 {"$sort":{"_id":1}}])
	 */
	@Test
	public void aggretionTest2() throws Exception {
		SimpleDateFormat formatter = new SimpleDateFormat("yyyy-MM-dd hh:mm:ss");
		Date commentDate = formatter.parse("2015-04-04 00:00:00");
		Aggregation aggs =	newAggregation(
				match(where("orderTime").lt(commentDate)),
				unwind("Auditors"),
				group("Auditors").sum("price").as("total"),
				sort(Sort.by(Direction.ASC,"_id"))
		);
```

```
        AggregationResults<Object> aggregate = tempelate.aggregate(aggs, "orders",
    Object.class);
        List<Object> mappedResults = aggregate.getMappedResults();
        System.out.println(mappedResults);


    }
```

2.4. 更新

2.4.1. 新增操作

insertOne：插入单个文档
insertMany：插入多个文档
如果数据库和集合不存在，insert 操作将自动创建；
对于插入的数据，mongoDB 自动生成 ObjectId 作为_id 字段（物理主键）

2.4.2. 删除操作

deleteOne(query)：删除单个文档
deleteMany(query)：删除多个文档
删除操作是不会删除索引的，就算你把数据全部删除；

2.4.3. 修改

2.4.3.1. 更新的方法

2.4.3.1.1. 替换更新

```
db.users.update({"username":"lison"},{"country":"USA"})
```

2.4.3.1.2. 操作符更新 （推荐使用）

- 性能更好

- 原子性操作

db.users.update({"username":"james"},{"$set":{"country":"USA"}})

2.4.3.2. 修改语法

update() 方法用于更新已存在的文档。语法格式如下：
db.collection.update(<query>, <update>, { upsert: <boolean>, multi: <boolean>, writeConcern: <document> })
参数说明：

- query : update 的查询条件，类似 sql update 查询内 where 后面的；
- update : update 的对象和一些更新的操作符（如$,$inc...）等，也可以理解为 sql update 查询内 set 后面的
- upsert : 可选，这个参数的意思是，如果不存在 update 的记录，是否插入,true 为插入，默认是 false，不插入。
- multi : 可选，mongodb 默认是 false,只更新找到的第一条记录，如果这个参数为 true,就把按条件查出来多条记录全部更新。
- writeConcern :可选，写策略配置。

2.4.3.2.1. 示例

db.users.update({"username":"cang"},{"$set":{"age":18}},{"upsert":true})

- 数据不存在，记录将被插入
- 与插入操作相比，upsert 插入的结果返回了_id 字段

2.4.3.3. 更新选择器

类型	运算符	描述
操作符	$inc	指定值加n
	$set	更新指定字段
	$unset	将指定字段删除
	$rename	更新字段名称
数组操作符	$	定位到某一个元素
	$push	添加值到数组中
	$addToSet	添加值到数组中，有重复则不处理
	$pop	删除数组第一个或者最后一个
	$pull	从数组中删除匹配查询条件的值
	$pullAll	从数组中删除多个值
数组运算修饰符	$each	与$push和$addToSet等一起使用来操作多个值
	$slice	与$push和$each一起使用来操作用来缩小更新后数组的大小
	$sort	与$push、$each和$slice一起使用来对数组进行排序

2.4.3.3.1. 删除字段示例

db.users.updateMany({"username":"lison"},{"$unset":{"country":"","age":""}})

2.4.3.3.2. 更新字段名称示例

db.users.updateMany({"username":"lison"},{"$rename":{"lenght":"height",
"username":"name"}})

2.4.3.3.3. $each 作用示例

db.users.updateMany({ "username" : "james"}, { "$addToSet" : { "favorites.movies" : ["小电影 2 " , "小电影 3"]}})
db.users.updateMany({ "username" : "james"}, { "$addToSet" : { "favorites.movies" : { "$each" : ["小电影 2 " , "小电影 3"]}}})

2.4.3.3.4. 删除字符串数组中元素示例

db.users.updateMany({ "username" : "james"}, { "$pull" : { "favorites.movies" : ["小电影 2 " , "小电影 3"]}})

db.users.updateMany({ "username" : "james"}, { "$pullAll" : { "favorites.movies" : ["小电影 2 " , "小电影 3"]}})

db.users.updateMany({ "username" : "james"}, { "$pull" : { "favorites.movies" : {$in:["小电影 2 " , "小电影 3"]}}})

2.4.3.3.5. 向对象数组中插入元素

给 james 老师增加一条评论（$push,默认放在数组最后）
db.users.updateOne({"username":"james"},{"$push":{"comments":{"author":"lison23","content":"ydddyyytttt","commentTime":ISODate("2019-01-06T00:00:00")}}})

给 james 老师批量新增两条评论（$push,$each）

```
db.users.updateOne({"username":"james"},
        {"$push":{"comments":

{"$each":[{"author":"lison22","content":"yyyytttt","commentTime":ISODate("2019-07-06T00:00:
00")},

{"author":"lison23","content":"ydddyyyttttt","commentTime":ISODate("2019-06-06T00:00:00")}]}}
})
```

给 james 老师批量新增两条评论并对数组进行排序（$push,$each,$sort）

```
db.users.updateOne({"username":"james"},
        {"$push": {"comments":

{"$each":[  {"author":"lison22","content":"yyyytttt","commentTime":ISODate("2019-04-06T00:00:
00")},

{"author":"lison23","content":"ydddyyyttttt","commentTime":ISODate("2019-05-06T00:00:00")} ],
                        $sort: {"commentTime":-1} } } })
```

2.4.3.3.6. 删除对象数组中元素示

删除 lison22 对 james 的所有评论 （批量删除）

```
    db.users.update({"username":"james"},
                                {"$pull":{"comments":{"author":"lison22"}}})
```

删除 lison5 对 lison 评语为"lison 是苍老师的小迷弟"的评论

```
  db.users.update({"username":"lison"},
                                {"$pull":{"comments":{"author":"lison5",
                                                                "content":"lison
是苍老师的小迷弟"}}})
```

2.4.3.3.7. 更新对象数组中元素，$符号示例

```
db.users.updateMany({"username":"james","comments.author":"lison23"},
                        {"$set":{"comments.$.content":"xxoo",
                                "comments.$.author":"lison10" }})
```

含义：精确修改某人某一条精确的评论，如果有多个符合条件的数据，则修改第一条数据。无法批量修改数组元素，也无法对数组元素做批量更新

2.4.4. 更新的注意点

- mongodb 的更新都是原子的，mongodb 所有的写操作都是有锁的。mongoDB 2.2 之前锁级别为实例级别，mongoDB 2.2 到 3.2 之前的版本锁级别为数据库级别，mongoDB 3.2 以后，WiredTiger 的锁级别是文档级别；

- findAndModify 命令：在同一往返过程中原子更新文档并返回它；

2.4.4.1. findAndModify 命令示例

- 常规的 update 的方法不能返回更新后的数据

```
db.fam.update({"name":"morris1"},{"$inc":{"age":1}})
```

- 使用 findandModify 方法在修改数据同时返回更新前的数据或更新后的数据

```
db.fam.findAndModify({query:{name:'morris1'},
                      update:{$inc:{age:1}},
                      'new':true});
```

https://docs.mongodb.com/manual/reference/method/db.collection.findAndModify/

2.4.4.1.1. 测试脚本

```
db.fam.drop()

var doc1 = {
_id : 1,
name : 'morris1',
age : 18};

db.fam.insert(doc1);



var doc2 = {
_id : 2,
name : 'morris2',
age : 18};
```

```
db.fam.insert(doc2);

var doc3 = {
_id : 3,
name : 'morris1',
age : 18};

db.fam.insert(doc3);
```

```
var ret1    = db.fam.update({"name":"morris1"},{"$inc":{"age":1}})
printjson(ret1);

var ret2 = db.fam.findAndModify({
query:{name:'morris1'},

update:{$inc:{age:1}},
                                                    'new':true
});
```

2.4.5. JAVA 客户端实现

```
package cn.enjoy.mg;

import static com.mongodb.client.model.Filters.*;
import static com.mongodb.client.model.Projections.*;
import static com.mongodb.client.model.Sorts.*;
import static com.mongodb.client.model.Aggregates.*;
import static com.mongodb.client.model.Updates.*;

import java.text.ParseException;
import java.text.SimpleDateFormat;
import java.util.ArrayList;
import java.util.Arrays;
import java.util.Date;
import java.util.List;

import javax.annotation.Resource;

import org.bson.BSON;
import org.bson.BsonDocument;
```

```
import org.bson.Document;
import org.bson.codecs.configuration.CodecRegistries;
import org.bson.codecs.configuration.CodecRegistry;
import org.bson.codecs.pojo.PojoCodecProvider;
import org.bson.conversions.Bson;
import org.bson.types.ObjectId;
import org.junit.Before;
import org.junit.Test;
import org.junit.runner.RunWith;
import org.slf4j.Logger;
import org.slf4j.LoggerFactory;
import org.springframework.test.context.ContextConfiguration;
import org.springframework.test.context.junit4.SpringJUnit4ClassRunner;

import com.mongodb.Block;
import com.mongodb.MongoClient;
import com.mongodb.MongoClientOptions;
import com.mongodb.ServerAddress;
import com.mongodb.WriteConcern;
import com.mongodb.client.AggregateIterable;
import com.mongodb.client.FindIterable;
import com.mongodb.client.MongoCollection;
import com.mongodb.client.MongoDatabase;
import com.mongodb.client.model.Filters;
import com.mongodb.client.model.FindOneAndUpdateOptions;
import com.mongodb.client.model.Projections;
import com.mongodb.client.model.PushOptions;
import com.mongodb.client.model.ReturnDocument;
import com.mongodb.client.model.UpdateOptions;
import com.mongodb.client.model.Updates;
import com.mongodb.client.result.UpdateResult;
import com.mongodb.operation.OrderBy;


@RunWith(SpringJUnit4ClassRunner.class)
@ContextConfiguration("classpath:applicationContext.xml")
public class JavaUpdateObjArray {

    private static final Logger logger = LoggerFactory.getLogger(JavaUpdateObjArray.class);

    private MongoDatabase db;


    private MongoCollection<Document> collection;
```

```
@Resource(name="mongo")
private MongoClient client;


@Before
public void init(){
        db = client.getDatabase("lison");
        collection=db.getCollection("users");
}



//--------------------------------------upsert demo----------------------------------------------------------

//测试 upsert
//db.users.update({"username":"cang"},{"$set":{"age":18}},{"upsert":true})
@Test
public void upsertTest(){
    Bson filter = eq("username","cang");
    Bson update = set("age", 18);
    UpdateOptions upsert = new UpdateOptions().upsert(true);
    UpdateResult updateOne = collection.updateOne(filter, update,upsert);
    System.out.println(updateOne.getModifiedCount());
    System.out.println(updateOne.getUpsertedId());

}

//测试 unset,删除字段示例
//db.users.updateMany({"username":"lison"},{"$unset":{"country":"","age":""}})
@Test
public void unsetTest(){
    Bson filter = eq("username","lison");
    Bson country = unset("country");
    Bson age = unset("age");
    Bson update = combine(country,age);
    UpdateResult updateOne = collection.updateMany(filter, update);
    System.out.println(updateOne.getModifiedCount());
    System.out.println(updateOne.getUpsertedId());

}

//测试 rename,更新字段名称示例
//db.users.updateMany({"username":"lison"},{"$rename":{"lenght":"height",
```

```
"username":"name"}})

    @Test
    public void renameTest(){
        Bson filter = eq("username","lison");
        Bson rename1 = rename("lenght", "height");
        Bson rename2 = rename("username", "name");
        Bson update = combine(rename1,rename2);
        UpdateResult updateOne = collection.updateMany(filter, update);
        System.out.println(updateOne.getModifiedCount());
        System.out.println(updateOne.getUpsertedId());

    }


    //测试 pull pullAll,删除字符串数组中元素示例
//      db.users.updateMany({ "username" : "james"}, { "$pull" : { "favorites.movies" : [ "小电影 2
" , "小电影 3"]}})
//       db.users.updateMany({ "username" : "james"}, { "$pullAll" : { "favorites.movies" : [ "小电
影 2 " , "小电影 3"]}})

    @Test
    public void pullAllTest(){
        Bson filter = eq("username","james");
        Bson pull = pull("favorites.movies", Arrays.asList("小电影 2 " , "小电影 3"));
        UpdateResult updateOne = collection.updateMany(filter, pull);
        System.out.println(updateOne.getModifiedCount());
        System.out.println(updateOne.getUpsertedId());

        Bson pullAll = pullAll("favorites.movies", Arrays.asList("小电影 2 " , "小电影 3"));
        updateOne = collection.updateMany(filter, pullAll);
        System.out.println(updateOne.getModifiedCount());
        System.out.println(updateOne.getUpsertedId());
    }




    //--------------------------------------insert demo----------------------------------------------------------

    //给 james 老师增加一条评论（$push）
    //db.users.updateOne({"username":"james"},
//                                {"$push":{"comments":{"author":"lison23",
//                                                      "content":"ydddyyytttt",
```

```
//
"commentTime":ISODate("2019-01-06T00:00:00")}}})

    @Test
    public void addOneComment(){
        Document comment = new Document().append("author", "lison23")
                                         .append("content", "ydddyyyttttt")
                                                 .append("commentTime",
getDate("2019-01-06"));
        Bson filter = eq("username","james");
        Bson update = push("comments",comment);
        UpdateResult updateOne = collection.updateOne(filter, update);
        System.out.println(updateOne.getModifiedCount());

    }




    //      给 james 老师批量新增两条评论（$push,$each）
//      db.users.updateOne({"username":"james"},
//                  {"$push":{"comments":
//
{"$each":[{"author":"lison22","content":"yyyytttt","commentTime":ISODate("2019-02-06T00:00:
00")},
//
{"author":"lison23","content":"ydddyyyttttt","commentTime":ISODate("2019-03-06T00:00:00")}]}}
})

    @Test
    public void addManyComment(){
        Document comment1 = new Document().append("author", "lison33")
                                         .append("content", "lison33lison33")
                                                 .append("commentTime",
getDate("2019-02-06"));
        Document comment2 = new Document().append("author", "lison44")
                                         .append("content", "lison44lison44")
                                         .append("commentTime",
getDate("2019-03-06"));

        Bson filter = eq("username","james");
        Bson pushEach = pushEach("comments",Arrays.asList(comment1,comment2));
```

```
        UpdateResult updateOne = collection.updateOne(filter, pushEach);
        System.out.println(updateOne.getModifiedCount());

    }


//      给 james 老师批量新增两条评论并对数组进行排序（$push,$eachm,$sort）
//      db.users.updateOne({"username":"james"},
//                  {"$push": {"comments":
//
{"$each":[  {"author":"lison22","content":"yyyytttt","commentTime":ISODate("2019-04-06T00:00:
00")},
//
{"author":"lison23","content":"ydddyyyyttttt","commentTime":ISODate("2019-05-06T00:00:00")} ],
//                                  $sort: {"commentTime":-1} } } })

    @Test
    public void addManySortComment(){
        Document comment1 = new Document().append("author", "lison00")
                                          .append("content", "lison00lison00")
                                                  .append("commentTime",
getDate("2019-04-06"));
        Document comment2 = new Document().append("author", "lison01")
                                          .append("content", "lison01lison01")
                                                  .append("commentTime",
getDate("2019-05-06"));

        Bson filter = eq("username","james");

        Document sortDoc = new Document().append("commentTime", -1);
        PushOptions pushOption = new PushOptions().sortDocument(sortDoc);

        Bson                                pushEach                                =
pushEach("comments",Arrays.asList(comment1,comment2),pushOption);

        UpdateResult updateOne = collection.updateOne(filter, pushEach);
        System.out.println(updateOne.getModifiedCount());

    }

    //-------------------------------------delete demo-----------------------------------------------------------

//      删除 lison1 对 james 的所有评论 （批量删除）
//      db.users.update({"username": “james"},
```

```
//                                          {"$pull":{"comments":{"author":"lison33"}}})

    @Test
    public void deleteByAuthorComment(){
        Document comment = new Document().append("author", "lison33");
        Bson filter = eq("username","james");
        Bson update = pull("comments",comment);
        UpdateResult updateOne = collection.updateOne(filter, update);
        System.out.println(updateOne.getModifiedCount());
    }


//    删除 lison5 对 lison 评语为“lison 是苍老师的小迷弟”的评论（精确删除）
//    db.users.update({"username":"lison"},
//            {"$pull":{"comments":{"author":"lison5",
//                                  "content":"lison 是苍老师的小迷弟"}}})
    @Test
    public void deleteByAuthorContentComment(){
        Document comment = new Document().append("author", "lison5")
                                         .append("content", "lison 是苍老师的小迷弟
");
        Bson filter = eq("username","lison");
        Bson update = pull("comments",comment);
        UpdateResult updateOne = collection.updateOne(filter, update);
        System.out.println(updateOne.getModifiedCount());
    }

    //-------------------------------------update demo-----------------------------------------------------------
//    db.users.updateMany({"username":"james","comments.author":"lison01"},
//            {"$set":{"comments.$.content":"xxoo",
//                     "comments.$.author":"lison10" }})
//        含义：精确修改某人某一条精确的评论，如果有多个符合条件的数据，则修改最后一条数据。无法批量修改数组元素
  @Test
  public void updateOneComment(){
        Bson filter = and(eq("username","james"),eq("comments.author","lison01"));
        Bson updateContent = set("comments.$.content","xxoo");
        Bson updateAuthor = set("comments.$.author","lison10");
        Bson update = combine(updateContent,updateAuthor);
        UpdateResult updateOne = collection.updateOne(filter, update);
        System.out.println(updateOne.getModifiedCount());

  }
```

```
//-------------------------------------findandModify
demo----------------------------------------------------------------
  //使用 findandModify 方法在修改数据同时返回更新前的数据或更新后的数据
//db.fam.findAndModify({query:{name:'morris1'},
//       update:{$inc:{age:1}},
//       'new':true});

   @Test
   public void findAndModifyTest(){
         Bson filter = eq("name","morris1");
         Bson update = inc("age",1);
//       //实例化 findAndModify 的配置选项
         FindOneAndUpdateOptions fauo = new FindOneAndUpdateOptions();
//       //配置"new":true
         fauo.returnDocument(ReturnDocument.AFTER);//
         MongoCollection<Document> numCollection = db.getCollection("fam");
         Document ret = numCollection.findOneAndUpdate(filter, update,fauo);
         System.out.println(ret.toJson());
   }


   private Date getDate(String string) {
            SimpleDateFormat sdf = new SimpleDateFormat("yyyy-MM-dd");

            Date parse=null;
            try {
                  parse = sdf.parse(string);
            } catch (ParseException e) {
                  e.printStackTrace();
            }
            return parse;
      }

}
```

2.4.6. Spring Data 实现

2.4.6.1. 把 User 实体修改回来

```
public List<Comment> getComments() {
            return comments;
```

```
    }

    public void setComments(List<Comment> comments) {
        this.comments = comments;
    }

    private List<Comment> comments;
```

2.4.6.2. 新增实体 Doc

```
package cn.enjoy.entity;

import org.springframework.data.mongodb.core.mapping.Document;

@Document(collection="fam")
public class Doc {

    private String id;

    private String name;

    private int age;

    public String getId() {
        return id;
    }

    public void setId(String id) {
        this.id = id;
    }

    public String getName() {
        return name;
    }

    public void setName(String name) {
        this.name = name;
    }

    public int getAge() {
        return age;
    }
```

```
    public void setAge(int age) {
        this.age = age;
    }

    @Override
    public String toString() {
        return "Doc [id=" + id + ", name=" + name + ", age=" + age + "]";
    }

}
```

2.4.6.3. 单元测试

```
package cn.enjoy.mg;


import static org.springframework.data.mongodb.core.query.Criteria.where;
import static org.springframework.data.mongodb.core.query.Query.query;
import static org.springframework.data.mongodb.core.query.Update.update;

import java.text.ParseException;
import java.text.SimpleDateFormat;
import java.util.Arrays;
import java.util.Date;

import javax.annotation.Resource;

import com.mongodb.client.result.UpdateResult;
import org.bson.types.ObjectId;
import org.junit.Test;
import org.junit.runner.RunWith;
import org.slf4j.Logger;
import org.slf4j.LoggerFactory;
import org.springframework.data.domain.Sort;
import org.springframework.data.domain.Sort.Direction;
import org.springframework.data.mongodb.core.FindAndModifyOptions;
import org.springframework.data.mongodb.core.MongoOperations;
import org.springframework.data.mongodb.core.query.Criteria;
import org.springframework.data.mongodb.core.query.Query;
```

```
import org.springframework.data.mongodb.core.query.Update;
import org.springframework.data.mongodb.core.query.Update.PushOperatorBuilder;
import org.springframework.test.context.ContextConfiguration;
import org.springframework.test.context.junit4.SpringJUnit4ClassRunner;

import cn.enjoy.entity.Comment;
import cn.enjoy.entity.Doc;
import cn.enjoy.entity.User;
import com.mongodb.WriteResult;


@RunWith(SpringJUnit4ClassRunner.class)
@ContextConfiguration("classpath:applicationContext.xml")
public class SpringUpdateObjArray {

    private static final Logger logger = LoggerFactory.getLogger(SpringUpdateObjArray.class);

    @Resource
    private MongoOperations tempelate;



    //-------------------------------------upsert demo----------------------------------------------------------

    //测试 upsert
    //db.users.update({"username":"cang"},{"$set":{"age":18}},{"upsert":true})
    @Test
    public void upsertTest(){
        Query query = query(Criteria.where("username").is("cang"));
        Update set = new Update().set("age", 18);
        UpdateResult upsert = tempelate.upsert(query, set, User.class);
        System.out.println(upsert.getModifiedCount());
        System.out.println(upsert.getUpsertedId());

    }



    //测试 unset,删除字段示例
    //db.users.updateMany({"username":"lison"},{"$unset":{"country":"","age":""}})
    @Test
    public void unsetTest(){
        Query query = query(Criteria.where("username").is("lison"));
        Update unset = new Update().unset("country").unset("age");
```

```
        UpdateResult upsert = tempelate.updateMulti(query, unset, User.class);
        System.out.println(upsert.getModifiedCount());
    }

    //测试 rename,更新字段名称示例
    //db.users.updateMany({"username":"lison"},{"$rename":{"lenght":"height",
"username":"name"}})

    @Test
    public void renameTest(){
        Query query = query(Criteria.where("username").is("lison"));
        Update rename = new Update().rename("lenght", "height").rename("username",
"name");
        UpdateResult upsert = tempelate.updateMulti(query, rename, User.class);
        System.out.println(upsert.getModifiedCount());

    }


    //测试 pull pullAll,删除字符串数组中元素示例
//      db.users.updateMany({ "username" : "james"}, { "$pull" : { "favorites.movies" : [ "小电影 2
" , "小电影 3"]}})
//       db.users.updateMany({ "username" : "james"}, { "$pullAll" : { "favorites.movies" : [ "小电
影 2 " , "小电影 3"]}})

    @Test
    public void pullAllTest(){

        Query query = query(Criteria.where("username").is("james"));
        Update pull = new Update().pull("favorites.movies", Arrays.asList("小电影 2 " , "小电影
3"));
        UpdateResult upsert = tempelate.updateMulti(query, pull, User.class);
        System.out.println(upsert.getModifiedCount());



        query = query(Criteria.where("username").is("james"));
        Update pullAll = new Update().pullAll("favorites.movies", new String[]{"小电影 2 " , "小
电影 3"});
        upsert = tempelate.updateMulti(query, pullAll, User.class);
        System.out.println(upsert.getModifiedCount());
    }
```

```
    //-------------------------------------insert demo----------------------------------------------------------


    //给 james 老师增加一条评论（$push）
    //db.users.updateOne({"username":"james"},
//                                {"$push":{"comments":{"author":"lison23",
//                                                      "content":"ydddyyyttttt",
//
"commentTime":ISODate("2019-01-06T00:00:00")}}})
    @Test
    public void addOneComment(){
        Query query = query(Criteria.where("username").is("james"));
        Comment comment = new Comment();
        comment.setAuthor("lison23");
        comment.setContent("ydddyyyttttt");
        comment.setCommentTime(getDate("2019-01-06"));
        Update push = new Update().push("comments", comment);
        UpdateResult updateFirst = tempelate.updateFirst(query, push, User.class);
        System.out.println(updateFirst.getModifiedCount());
    }


    //      给 james 老师批量新增两条评论（$push,$each）
//   db.users.updateOne({"username":"james"},
//              {"$push":{"comments":
//
{"$each":[{"author":"lison22","content":"yyyyttttt","commentTime":ISODate("2019-02-06T00:00:
00")},
//
{"author":"lison23","content":"ydddyyyttttt","commentTime":ISODate("2019-03-06T00:00:00")}]}}
})
    @Test
    public void addManyComment(){
        Query query = query(Criteria.where("username").is("james"));
        Comment comment1 = new Comment();
        comment1.setAuthor("lison55");
        comment1.setContent("lison55lison55");
        comment1.setCommentTime(getDate("2019-02-06"));
        Comment comment2 = new Comment();
        comment2.setAuthor("lison66");
```

```
        comment2.setContent("lison66lison66");
        comment2.setCommentTime(getDate("2019-03-06"));
        //Update push = new Update().pushAll("comments", new
Comment[]{comment1,comment2});
        //Update push = new Update().push("comments", new
Comment[]{comment1,comment2});
        Update push = new Update().push("comments").each(new
Comment[]{comment1,comment2});
        UpdateResult updateFirst = tempelate.updateFirst(query, push, User.class);
        System.out.println(updateFirst.getModifiedCount());
    }

//  给 james 老师批量新增两条评论并对数组进行排序（$push,$eachm,$sort）
//  db.users.updateOne({"username":"james"},
//            {"$push": {"comments":
//
{"$each":[  {"author":"lison22","content":"yyyytttt","commentTime":ISODate("2019-04-06T00:00:
00")},
//
{"author":"lison23","content":"ydddyyyyttt","commentTime":ISODate("2019-05-06T00:00:00")} ],
//                          $sort: {"commentTime":-1} } } })
    @Test
    public void addManySortComment(){
        Query query = query(Criteria.where("username").is("james"));
        Comment comment1 = new Comment();
        comment1.setAuthor("lison77");
        comment1.setContent("lison55lison55");
        comment1.setCommentTime(getDate("2019-04-06"));
        Comment comment2 = new Comment();
        comment2.setAuthor("lison88");
        comment2.setContent("lison66lison66");
        comment2.setCommentTime(getDate("2019-05-06"));


        Update update = new Update();
        PushOperatorBuilder pob = update.push("comments");
        pob.each(comment1,comment2);
        pob.sort(Sort.by(Direction.DESC, "commentTime"));

        System.out.println("----------");
        UpdateResult updateFirst = tempelate.updateFirst(query, update,User.class);
        System.out.println(updateFirst.getModifiedCount());
    }
```

```
    //-------------------------------------delete demo-----------------------------------------------------------

//      删除 lison1 对 james 的所有评论 （批量删除）
//      db.users.update({"username":“james"},
//                                          {"$pull":{"comments":{"author":"lison23"}}})

    @Test
    public void deleteByAuthorComment(){
        Query query = query(Criteria.where("username").is("james"));

        Comment comment1 = new Comment();
        comment1.setAuthor("lison55");


/*      BasicDBObject comment1 = new BasicDBObject ();
        comment1.put("author","lison23");*/

        Update pull = new Update().pull("comments",comment1);
        UpdateResult updateFirst = tempelate.updateFirst(query, pull, User.class);
        System.out.println(updateFirst.getModifiedCount());
    }


//      删除 lison5 对 lison 评语为“lison 是苍老师的小迷弟”的评论（精确删除）
//      db.users.update({"username":"lison"},
//                  {"$pull":{"comments":{"author":"lison5",
//                                          "content":"lison 是苍老师的小迷弟"}}})
    @Test
    public void deleteByAuthorContentComment(){
        Query query = query(Criteria.where("username").is("lison"));
        Comment comment1 = new Comment();
        comment1.setAuthor("lison5");
        comment1.setContent("lison 是苍老师的小迷弟");
        Update pull = new Update().pull("comments",comment1);
        UpdateResult updateFirst = tempelate.updateFirst(query, pull, User.class);
        System.out.println(updateFirst.getModifiedCount());
    }

    //-------------------------------------update demo-----------------------------------------------------------
//      db.users.updateMany({"username":"james","comments.author":"lison1"},
//                  {"$set":{"comments.$.content":"xxoo",
//                                  "comments.$.author":"lison10" }})
//          含义：精确修改某人某一条精确的评论，如果有多个符合条件的数据，则修改最后一条数据。无法批量修改数组元素
```

```
   @Test
   public void updateOneComment(){
            Query                                    query                                    =
query(where("username").is("lison").and("comments.author").is("lison4"));
            Update                                   update                                   =
update("comments.$.content","xxoo").set("comments.$.author","lison11");
          UpdateResult updateFirst = tempelate.updateFirst(query, update, User.class);
            System.out.println(updateFirst.getModifiedCount());
   }

//--------------------------------------findandModify
demo----------------------------------------------------------------



   //使用 findandModify 方法在修改数据同时返回更新前的数据或更新后的数据
//db.fam.findAndModify({query:{name:'morris1'},
//       update:{$inc:{age:1}},
//       'new':true});

      @Test
      public void findAndModifyTest(){
            Query query = query(where("name").is("morris1"));
            Update update = new Update().inc("age", 1);
            FindAndModifyOptions famo = FindAndModifyOptions.options().returnNew(true);

            Doc doc = tempelate.findAndModify(query, update,famo, Doc.class);
            System.out.println(doc.toString());
      }


         private Date getDate(String string) {
                  SimpleDateFormat sdf = new SimpleDateFormat("yyyy-MM-dd");

                  Date parse=null;
                  try {
                        parse = sdf.parse(string);
                  } catch (ParseException e) {
                        // TODO Auto-generated catch block
                        e.printStackTrace();
                  }
                  return parse;
            }
```

```
}
```

2.4.7. 查询实战演练

2.4.7.1. 需求描述

A. 查看一个人的信息，打开页面只显示三条评论
B. 点击评论的下一页按钮，新加载三条评论
C. 默认按照评论时间降序，但是也可以选择按照姓名排序

2.4.7.2. 难点

A. 数组中数据的排序问题？
B. 数组中的数据怎么按照指定的方式进行排序？
C. 每次仅仅加载三条评论信息（可以包含 id 字段）？

2.4.7.3. 提示

A. 添加数据时注意排序
B. 查询的时候投影是有技巧的
C. 排序考虑聚合？