1. 分布式事务问题

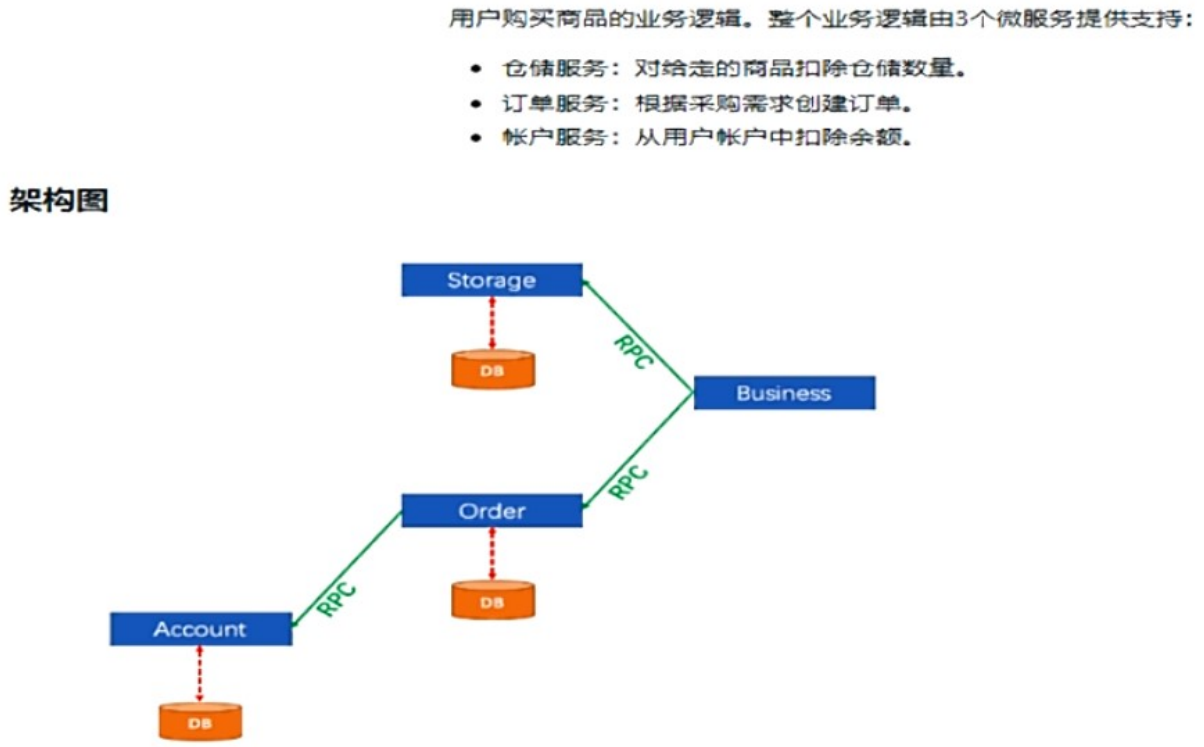
1.1. 分布式之前

单机单库没这个问题

从1：1 -> 1:N -> N: N

1.2. 分布式之后

单体应用被拆分成微服务应用，原来的三个模块被拆分成三个独立的应用，分别使用三个独立的数据源，业务操作需要调用三个服务来完成。此时每个服务内部的数据一致性由本地事务来保证，但是全局的数据一致性问题没法保证



1.3. 一句话

一次业务操作需要跨多个数据源或需要跨多个系统进行远程调用，就会产生分布式事务问题

2. Seata简介

2.1. 是什么

Seata是一款开源的分布式事务解决方案，致力于在微服务架构下提供高性能和简单易用的分布式事务服务

官网地址: http://seata.io/zh-cn/

2.2. 能干嘛

一个典型的分布式事务过程

2.2.1. 分布式事务处理过程的-ID+三组件模型

2.2.1.1. Transaction ID XID

全局唯一的事务ID

2.2.1.2. 3组件概念

Transaction Coordinator(TC)

> 事务协调器，维护全局事务的运行状态，负责协调并驱动全局事务的提交或回滚;

Transaction Manager(TM)

> 控制全局事务的边界，负责开启一个全局事务，并最终发起全局提交或全局回滚的决议;

Resource Manager(RM)

> 控制分支事务，负责分支注册，状态汇报，并接收事务协调器的指令，驱动分支（本地）事务的提交和回滚;

2.2.2. 处理过程

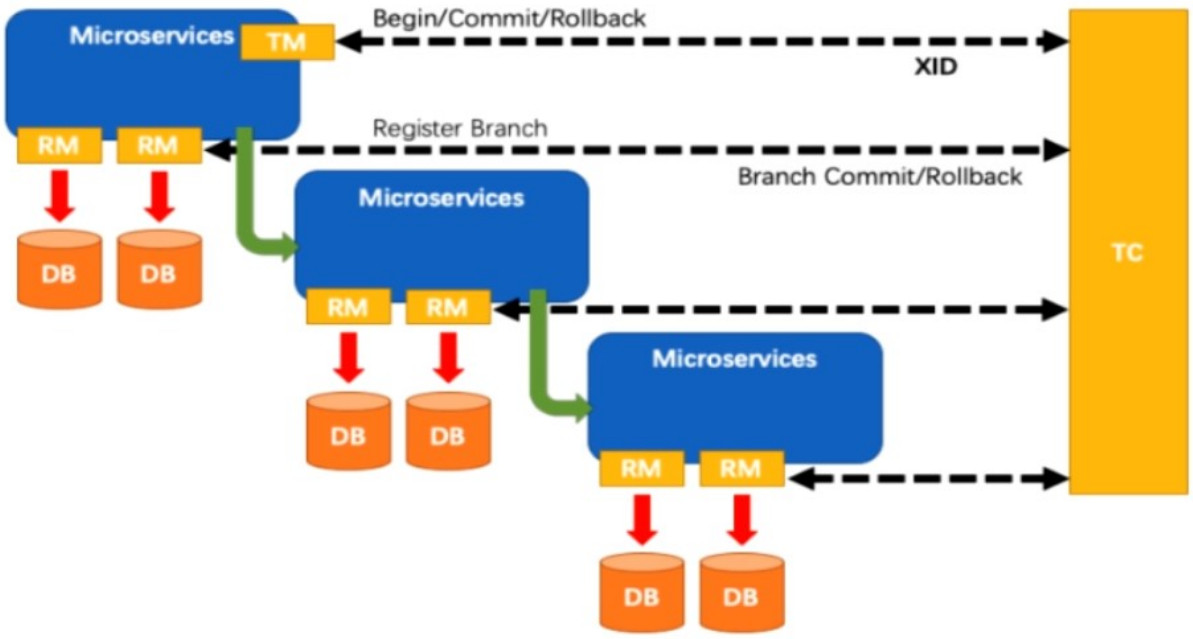
1.TM向TC申请开启一个全局事务，全局事务创建成功并生成一个全局唯一的XID

2.XID在微服务调用链路的上下文中传播;

3.RM向TC注册分支事务，将其纳入XID对应全局事务的管辖;

4.TM向TC发起针对XID的全局提交或回滚决议;

5.TC调度XID下管辖的全部分支事务完成提交或回滚请求



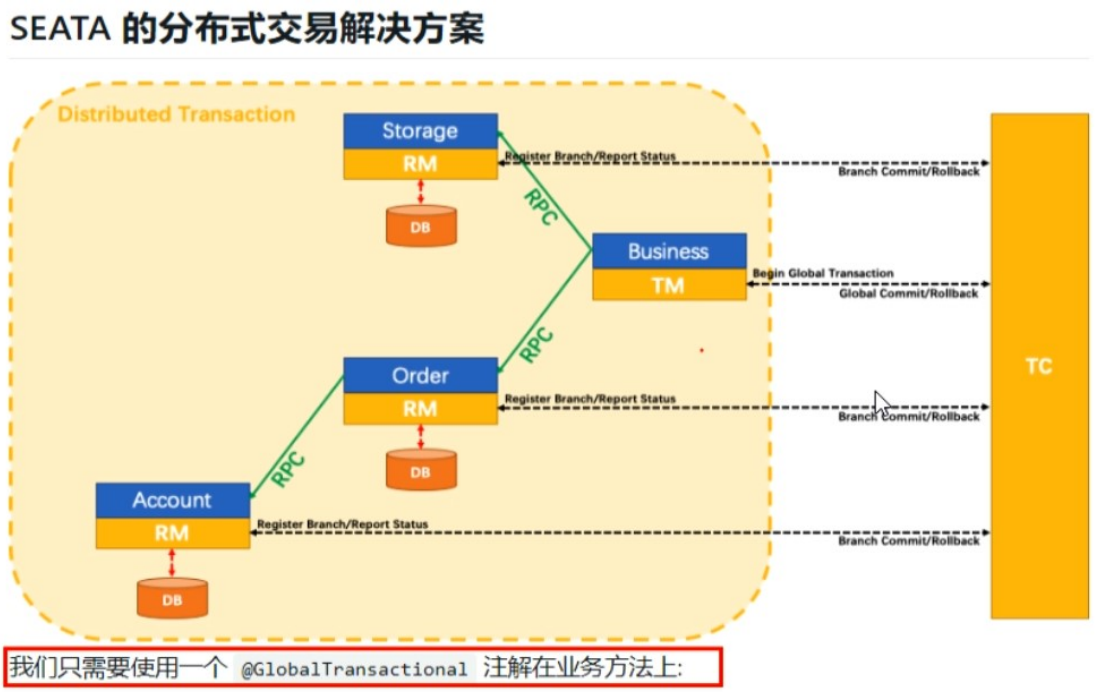
2.3. 去哪下

发布说明: https://github.com/seata/seata/releases

2.4. 怎么玩

Spring 本地 @Transactional

全局@GlobalTransactional: SEATA的分布式交易解决方案



3. Seata-Server安装

3.1. 官网地址

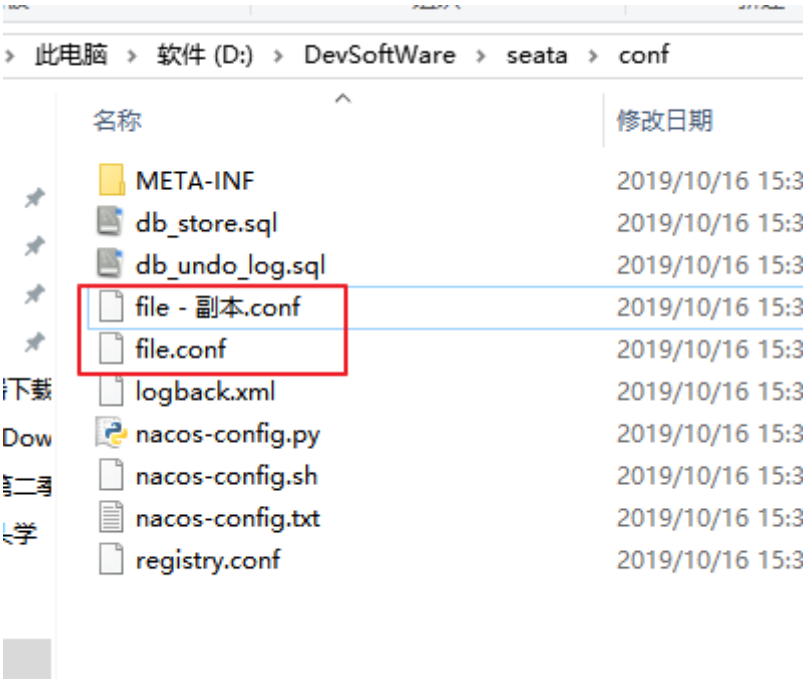
http://seata.io/zh-cn/

3.2. 下载版本

这里使用的版本为0.9.0

3.3. seata-server-0.9.0.zip解压到指定目录并修改conf目录下的file.conf配置文件

1) 先备份原始file.conf文件



2) 主要修改：自定义事务组名称+事务日志存储模式为db+数据库连接信息

3) file.conf

- service模块

```
vgroup_mapping.my_test_tx_group = "fsp_tx_group"
```

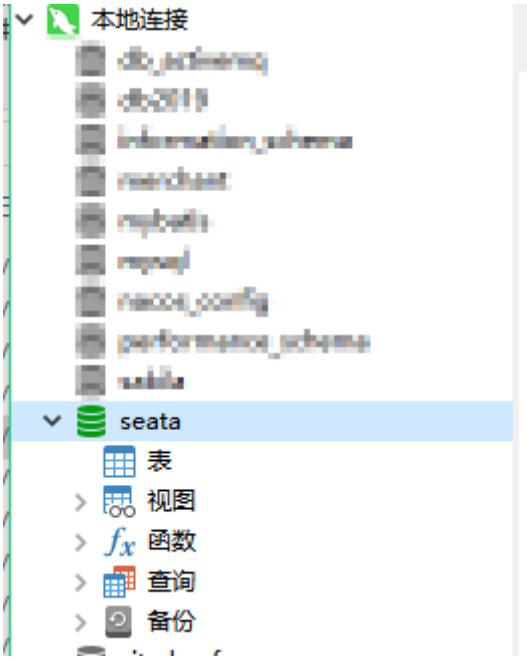
```
}
service {
  #vgroup->rgroup
  vgroup_mapping.my_test_tx_group = "fsp_tx_group"
  #only support single node
  default.grouplist = "127.0.0.1:8091"
  #degrade current not support
  enableDegrade = false
  #disable
  disable = false
  #unit ms,s,m,h,d represents milliseconds, seconds, minutes, hours, days, default permanent
  max.commit.retry.timeout = "-1"
  max.rollback.retry.timeout = "-1"
}
```

- store模块

```
mode = "db"
  url = "jdbc:mysql://127.0.0.1:3306/seata"
  user = "root"
  password = "你自己的密码"
```

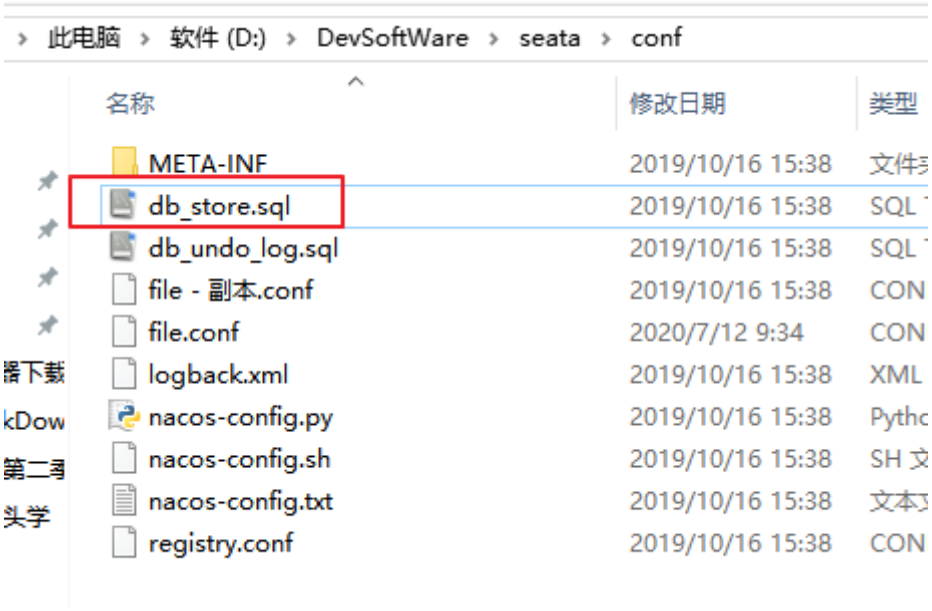
```
## transaction log store
store {
  ## store mode: file、db
  mode = "db"

  ## file store
  file {
    dir = "sessionStore"

    # branch session size , if exceeded first try compress lockkey, still exceeded throws exceptions
    max-branch-session-size = 16384
    # globe session size , if exceeded throws exceptions
    max-global-session-size = 512
    # file buffer size , if exceeded allocate new buffer
    file-write-buffer-cache-size = 16384
    # when recover batch read size
    session.reload.read_size = 100
    # async, sync
    flush-disk-mode = async
  }

  ## database store
  db {
    ## the implement of javax.sql.DataSource, such as DruidDataSource(druid)/BasicDataSource(dbcp) etc.
    datasource = "dbcp"
    ## mysql/oracle/h2/oceanbase etc.
    db-type = "mysql"
    driver-class-name = "com.mysql.jdbc.Driver"
    url = "jdbc:mysql://127.0.0.1:3306/seata"
    user = "root"
    password = "root"
```

3.4. mysql5.7数据库新建库seata



3.5. 在seata库里建表

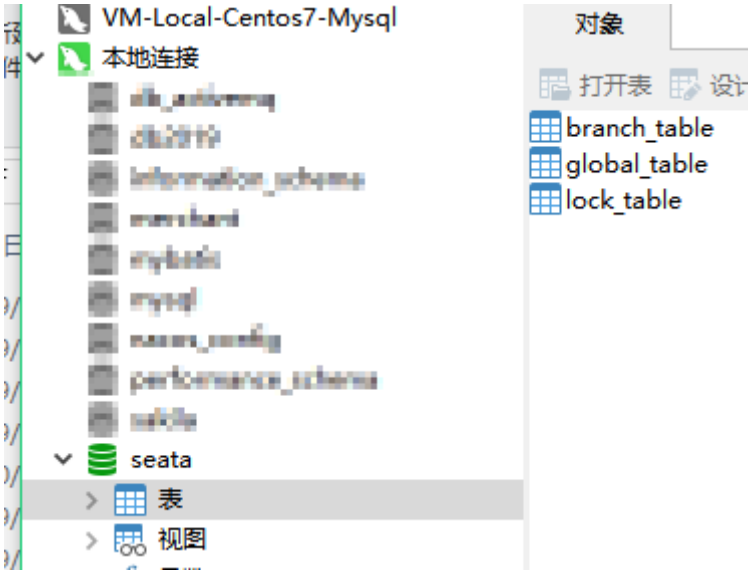
建表db_store.sql在\seata-server-0.9.0\seata\conf目录里面 => db_store.sql


此电脑 › 软件 (D:) › DevSoftWare › seata › conf
名称
修改日期
类型
META-INF
2019/10/16 15:38
db_store.sql
2019/10/16 15:38
db_undo_log.sql
2019/10/16 15:38
file - 副本.conf
2019/10/16 15:38
file.conf
2020/7/12 9:34
logback.xml
2019/10/16 15:38
nacos-config.py
2019/10/16 15:38
nacos-config.sh
2019/10/16 15:38
nacos-config.txt
2019/10/16 15:38
registry.conf
2019/10/16 15:38

```sql
-- the table to store GlobalSession data
drop table if exists `global_table`;
create table `global_table` (
  `xid` varchar(128)  not null,
  `transaction_id` bigint,
  `status` tinyint not null,
  `application_id` varchar(32),
  `transaction_service_group` varchar(32),
  `transaction_name` varchar(128),
  `timeout` int,
  `begin_time` bigint,
  `application_data` varchar(2000),
  `gmt_create` datetime,
  `gmt_modified` datetime,
  primary key (`xid`),
  key `idx_gmt_modified_status` (`gmt_modified`, `status`),
  key `idx_transaction_id` (`transaction_id`)
);

-- the table to store BranchSession data
drop table if exists `branch_table`;
create table `branch_table` (
  `branch_id` bigint not null,
  `xid` varchar(128) not null,
  `transaction_id` bigint ,
  `resource_group_id` varchar(32),
  `resource_id` varchar(256) ,
  `lock_key` varchar(128) ,
  `branch_type` varchar(8) ,
  `status` tinyint,
  `client_id` varchar(64),
  `application_data` varchar(2000),
  `gmt_create` datetime,
  `gmt_modified` datetime,
  primary key (`branch_id`),
  key `idx_xid` (`xid`)
);

-- the table to store lock data
drop table if exists `lock_table`;
create table `lock_table` (
  `row_key` varchar(128) not null,
  `xid` varchar(96),
  `transaction_id` long ,
  `branch_id` long,
  `resource_id` varchar(256) ,
  `table_name` varchar(32) ,
  `pk` varchar(36) ,
  `gmt_create` datetime ,
```

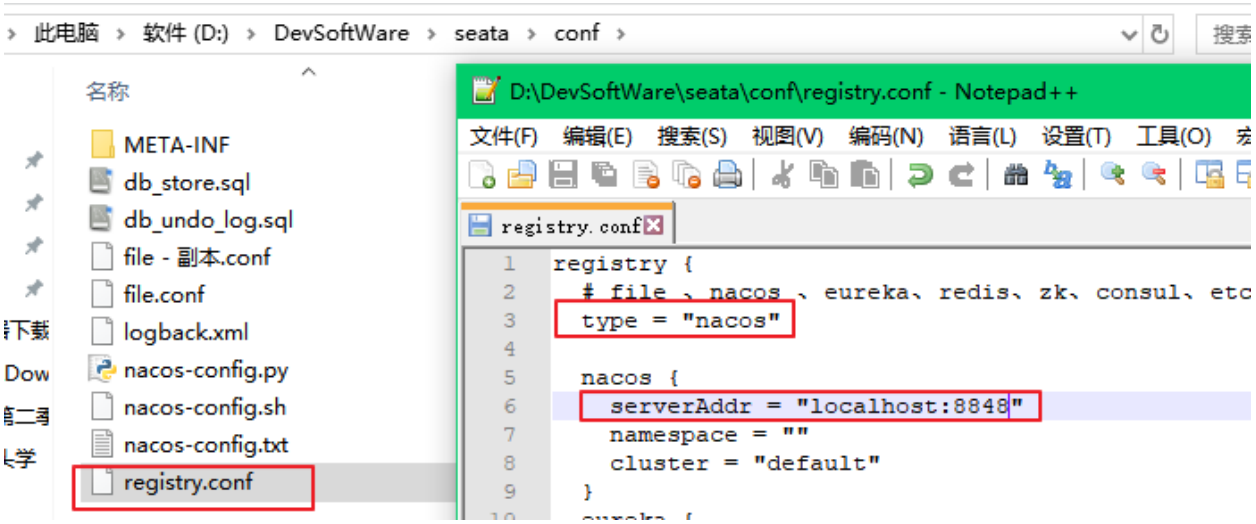
```
  `gmt_modified` datetime,
  primary key(`row_key`)
);
```

查看表是否导入成功



3.6. 修改seata-server-0.9.0\seata\conf目录下的registry.conf配置文件

```
registry {
  # file 、nacos 、eureka、redis、zk、consul、etcd3、sofa
  type = "nacos"

  nacos {
    serverAddr = "localhost:8848"
    namespace = ""
    cluster = "default"
  }
```



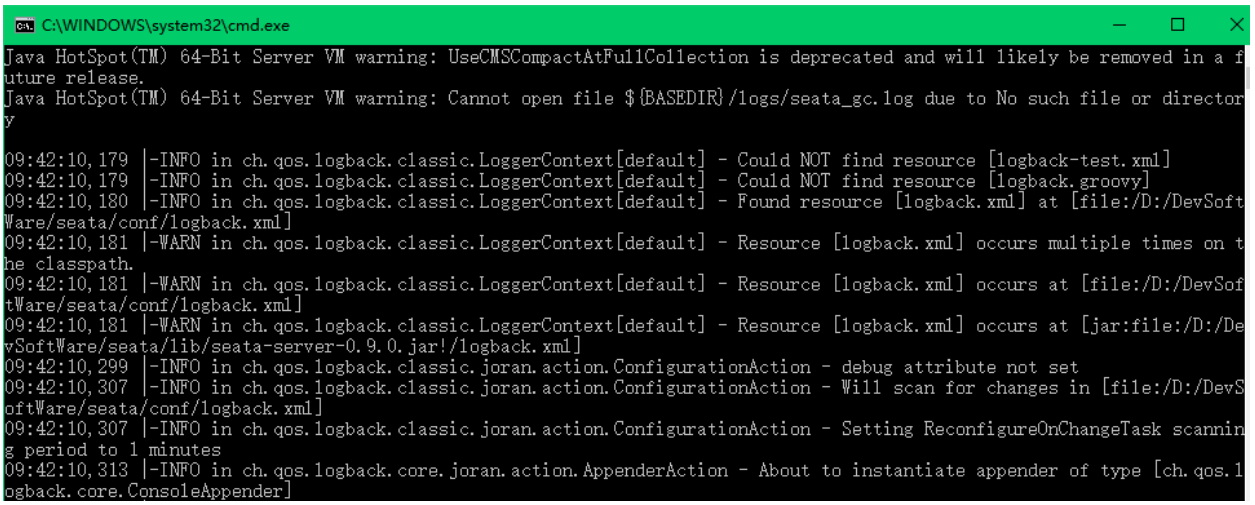
目的是：指明注册中心为nacos，及修改nacos连接信息

3.7. 先启动Nacos端口号8848

启动nacos\bin下startup.cmd

3.8. 再启动seata-server

启动seata-server-0.9.0\seata\bin下seata-server.bat



4. 订单/库存/账户业务数据库准备

4.1. 以下演示都需要先启动Nacos后启动Seata，保证两个都OK

Seata没启动报错no available server to connect

4.2. 分布式事务业务说明

4.2.1. 业务说明

这里我们会创建三个服务，一个订单服务，一个库存服务，一个账户服务。

当用户下单时，会在订单服务中创建一个订单，然后通过远程调用库存服务来扣减下单商品的库存，再通过远程调用账户服务来扣减用户账户里面的余额，最后在订单服务中修改订单状态为已完成

该操作跨越三个数据库，有两次远程调用，很明显会有分布式事务问题。

4.2.2. 业务流程

下订单-->扣库存-->减账户（余额）

4.3. 创建业务数据库

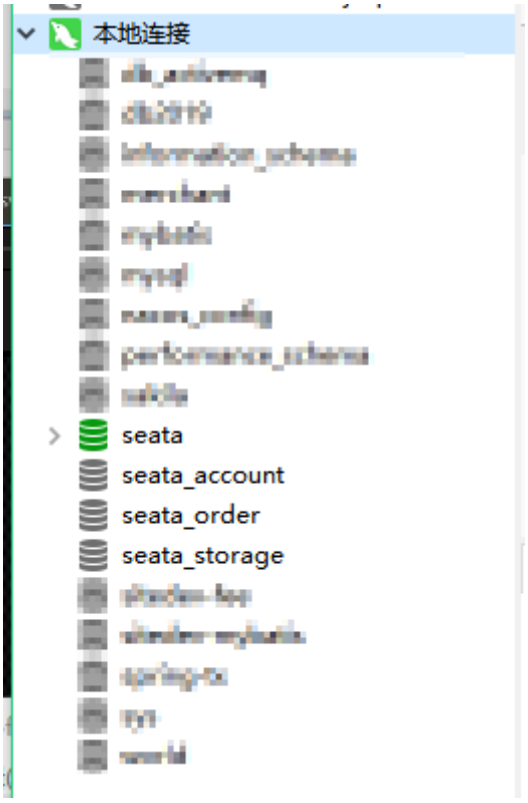
1) seata_order: 存储订单的数据库

2) seata_storage:存储库存的数据库

3) seata_account: 存储账户信息的数据库

4) 建表SQL:

```
CREATE DATABASE seata_order;

CREATE DATABASE seata_storage;

CREATE DATABASE seata_account;
```



4.4. 按照上述3库分别建对应业务表

1) seata_order库下建t_order表

```sql
USE seata_order;

CREATE TABLE t_order(
    `id` BIGINT(11) NOT NULL AUTO_INCREMENT PRIMARY KEY,
    `user_id` BIGINT(11) DEFAULT NULL COMMENT '用户id',
    `product_id` BIGINT(11) DEFAULT NULL COMMENT '产品id',
    `count` INT(11) DEFAULT NULL COMMENT '数量',
    `money` DECIMAL(11,0) DEFAULT NULL COMMENT '金额',
    `status` INT(1) DEFAULT NULL COMMENT '订单状态：0：创建中；1：已完结'
) ENGINE=INNODB AUTO_INCREMENT=7 DEFAULT CHARSET=utf8;

SELECT * FROM t_order;
```

2) seata_storage库下建t_storage表

```sql
USE seata_storage;

CREATE TABLE t_storage(
    `id` BIGINT(11) NOT NULL AUTO_INCREMENT PRIMARY KEY,
    `product_id` BIGINT(11) DEFAULT NULL COMMENT '产品id',
   `total` INT(11) DEFAULT NULL COMMENT '总库存',
    `used` INT(11) DEFAULT NULL COMMENT '已用库存',
    `residue` INT(11) DEFAULT NULL COMMENT '剩余库存'
) ENGINE=INNODB AUTO_INCREMENT=2 DEFAULT CHARSET=utf8;

INSERT INTO seata_storage.t_storage(`id`,`product_id`,`total`,`used`,`residue`)
VALUES('1','1','100','0','100');

SELECT * FROM t_storage;
```

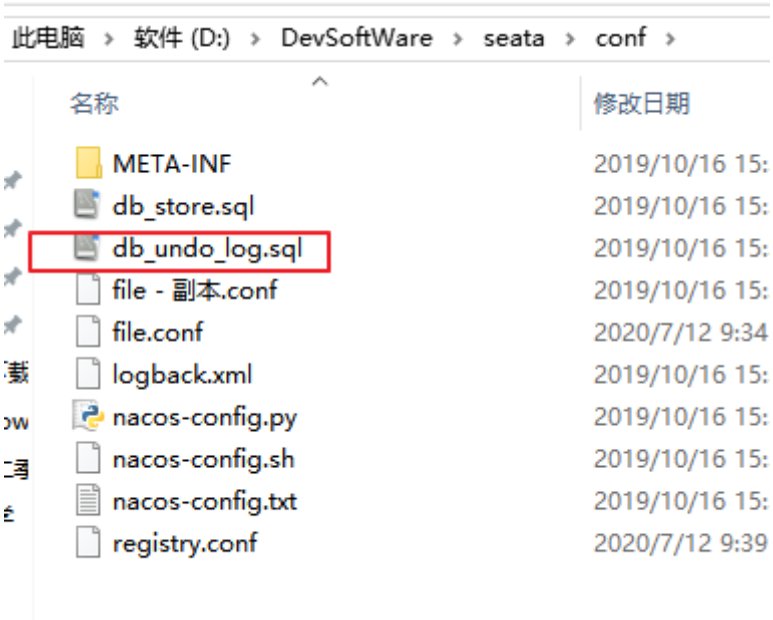
3) seata_account库下建t_account表

```sql
USE seata_account;

CREATE TABLE t_account(
    `id` BIGINT(11) NOT NULL AUTO_INCREMENT PRIMARY KEY COMMENT 'id',
    `user_id` BIGINT(11) DEFAULT NULL COMMENT '用户id',
    `total` DECIMAL(10,0) DEFAULT NULL COMMENT '总额度',
    `used` DECIMAL(10,0) DEFAULT NULL COMMENT '已用余额',
    `residue` DECIMAL(10,0) DEFAULT '0' COMMENT '剩余可用额度'
) ENGINE=INNODB AUTO_INCREMENT=2 DEFAULT CHARSET=utf8;

INSERT INTO seata_account.t_account(`id`,`user_id`,`total`,`used`,`residue`)
VALUES('1','1','1000','0','1000')

SELECT * FROM t_account;
```

4.5. 按照上述3库分别建对应的回滚日志表

1) 订单-库存-账户3个库下都需要建各自的回滚日志表

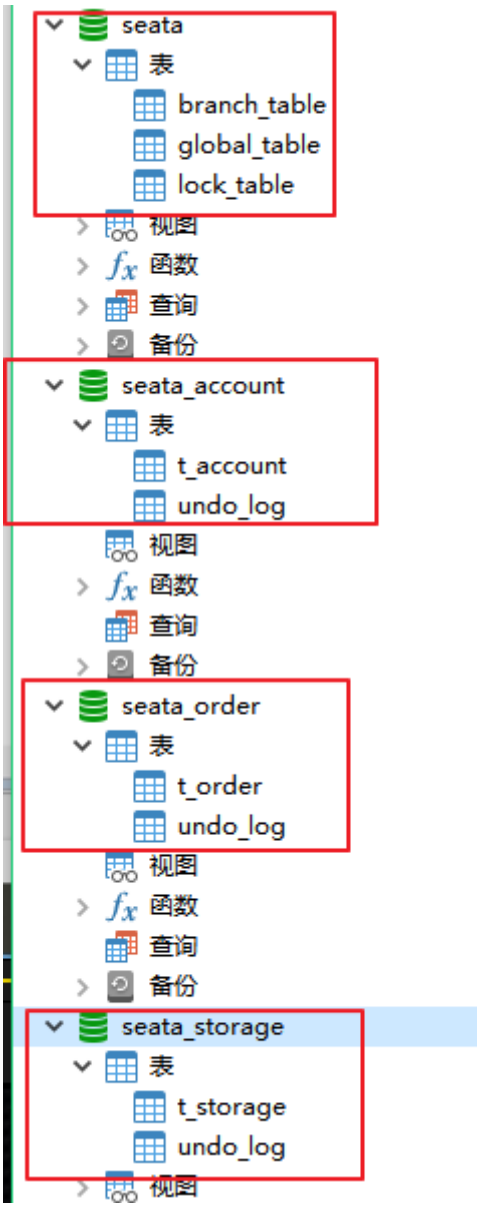
2) \seata-server-0.9.0\seata\conf目录下的db_undo_log.sql



3) 建表SQL

```sql
drop table `undo_log`;
CREATE TABLE `undo_log` (
  `id` bigint(20) NOT NULL AUTO_INCREMENT,
  `branch_id` bigint(20) NOT NULL,
  `xid` varchar(100) NOT NULL,
  `context` varchar(128) NOT NULL,
  `rollback_info` longblob NOT NULL,
  `log_status` int(11) NOT NULL,
  `log_created` datetime NOT NULL,
  `log_modified` datetime NOT NULL,
  `ext` varchar(100) DEFAULT NULL,
  PRIMARY KEY (`id`),
  UNIQUE KEY `ux_undo_log` (`xid`,`branch_id`)
) ENGINE=InnoDB AUTO_INCREMENT=1 DEFAULT CHARSET=utf8;
```

4.6. 最终效果



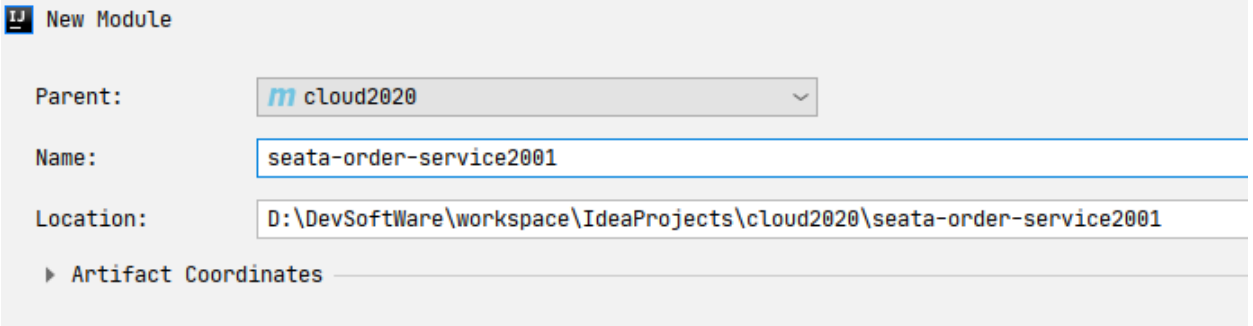
5. 订单/库存/账户业务微服务准备

5.1. 业务需求

下订单->减库存->扣余额->改（订单）状态

5.2. 新建订单Order-Module

5.2.1. 新建seata-order-service2001


New Module
Parent:
cloud2020
Name:
seata-order-service2001
Location:
D:\DevSoftWare\workspace\IdeaProjects\cloud2020\seata-order-service2001
Artifact Coordinates

5.2.2. POM

```xml
<?xml version="1.0" encoding="UTF-8"?>
<project xmlns="http://maven.apache.org/POM/4.0.0"
         xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
         xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 http://maven.apache.org/xsd/maven-4.0.0.xsd">
    <parent>
        <artifactId>cloud2020</artifactId>
        <groupId>cn.sitedev.springcloud</groupId>
        <version>1.0-SNAPSHOT</version>
    </parent>
    <modelVersion>4.0.0</modelVersion>

    <artifactId>seata-order-service2001</artifactId>

    <dependencies>
        <!--nacos-->
        <dependency>
            <groupId>com.alibaba.cloud</groupId>
            <artifactId>spring-cloud-starter-alibaba-nacos-discovery</artifactId>
        </dependency>
        <!--seata-->
        <dependency>
            <groupId>com.alibaba.cloud</groupId>
            <artifactId>spring-cloud-starter-alibaba-seata</artifactId>
            <exclusions>
                <exclusion>
                    <artifactId>seata-all</artifactId>
                    <groupId>io.seata</groupId>
                </exclusion>
            </exclusions>
        </dependency>
        <dependency>
            <groupId>io.seata</groupId>
            <artifactId>seata-all</artifactId>
            <version>0.9.0</version>
        </dependency>
        <!--feign-->
        <dependency>
            <groupId>org.springframework.cloud</groupId>
            <artifactId>spring-cloud-starter-openfeign</artifactId>
        </dependency>
        <!--web-actuator-->
        <dependency>
            <groupId>org.springframework.boot</groupId>
            <artifactId>spring-boot-starter-web</artifactId>
        </dependency>
        <dependency>
            <groupId>org.springframework.boot</groupId>
```

```
            <artifactId>spring-boot-starter-actuator</artifactId>
        </dependency>
        <!--mysql-druid-->
        <dependency>
            <groupId>mysql</groupId>
            <artifactId>mysql-connector-java</artifactId>
            <version>5.1.37</version>
        </dependency>
        <dependency>
            <groupId>com.alibaba</groupId>
            <artifactId>druid-spring-boot-starter</artifactId>
            <version>1.1.10</version>
        </dependency>
        <dependency>
            <groupId>org.mybatis.spring.boot</groupId>
            <artifactId>mybatis-spring-boot-starter</artifactId>
            <version>2.0.0</version>
        </dependency>
        <dependency>
            <groupId>org.springframework.boot</groupId>
            <artifactId>spring-boot-starter-test</artifactId>
            <scope>test</scope>
        </dependency>
        <dependency>
            <groupId>org.projectlombok</groupId>
            <artifactId>lombok</artifactId>
            <optional>true</optional>
        </dependency>
    </dependencies>

</project>
```

5.2.3. YML

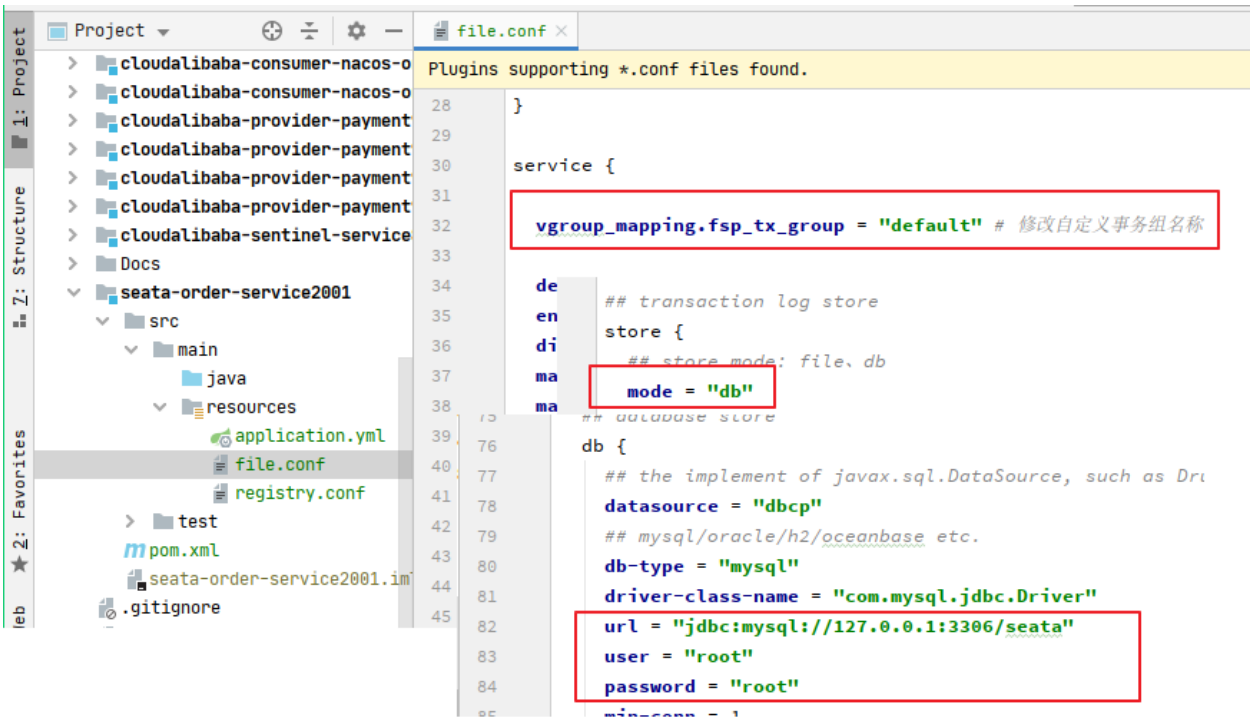
```yaml
server:
  port: 2001

spring:
  application:
    name: seata-order-service
  cloud:
    alibaba:
      seata:
        #自定义事务组名称需要与seata-server中的对应
        tx-service-group: fsp_tx_group
    nacos:
      discovery:
        server-addr: localhost:8848
  datasource:
    driver-class-name: com.mysql.jdbc.Driver
    url: jdbc:mysql://localhost:3306/seata_order
    username: root
    password: root

feign:
  hystrix:
    enabled: false

logging:
  level:
    io:
      seata: info

mybatis:
  mapperLocations: classpath:mapper/*.xml
```

5.2.4. file.conf

```
transport {
  # tcp udt unix-domain-socket
  type = "TCP"
  #NIO NATIVE
  server = "NIO"
  #enable heartbeat
  heartbeat = true
  #thread factory for netty
  thread-factory {
    boss-thread-prefix = "NettyBoss"
    worker-thread-prefix = "NettyServerNIOWorker"
    server-executor-thread-prefix = "NettyServerBizHandler"
    share-boss-worker = false
    client-selector-thread-prefix = "NettyClientSelector"
    client-selector-thread-size = 1
    client-worker-thread-prefix = "NettyClientWorkerThread"
    # netty boss thread size,will not be used for UDT
    boss-thread-size = 1
    #auto default pin or 8
    worker-thread-size = 8
  }
  shutdown {
    # when destroy server, wait seconds
    wait = 3
  }
  serialization = "seata"
  compressor = "none"
}

service {

  vgroup_mapping.fsp_tx_group = "default" # 修改自定义事务组名称

  default.grouplist = "127.0.0.1:8091"
  enableDegrade = false
  disable = false
  max.commit.retry.timeout = "-1"
  max.rollback.retry.timeout = "-1"
  disableGlobalTransaction = false
}


client {
  async.commit.buffer.limit = 10000
  lock {
    retry.internal = 10
    retry.times = 30
  }
  report.retry.count = 5
```

```
  tm.commit.retry.count = 1
  tm.rollback.retry.count = 1
}

## transaction log store
store {
  ## store mode: file、db
  mode = "db"

  ## file store
  file {
    dir = "sessionStore"

    # branch session size , if exceeded first try compress lockkey, still exceeded throws exceptions
    max-branch-session-size = 16384
    # globe session size , if exceeded throws exceptions
    max-global-session-size = 512
    # file buffer size , if exceeded allocate new buffer
    file-write-buffer-cache-size = 16384
    # when recover batch read size
    session.reload.read_size = 100
    # async, sync
    flush-disk-mode = async
  }

  ## database store
  db {
    ## the implement of javax.sql.DataSource, such as DruidDataSource(druid)/BasicDataSource(dbcp) etc.
    datasource = "dbcp"
    ## mysql/oracle/h2/oceanbase etc.
    db-type = "mysql"
    driver-class-name = "com.mysql.jdbc.Driver"
    url = "jdbc:mysql://127.0.0.1:3306/seata"
    user = "root"
    password = "root"
    min-conn = 1
    max-conn = 3
    global.table = "global_table"
    branch.table = "branch_table"
    lock-table = "lock_table"
    query-limit = 100
  }
}
lock {
  ## the lock store mode: local、remote
  mode = "remote"

```

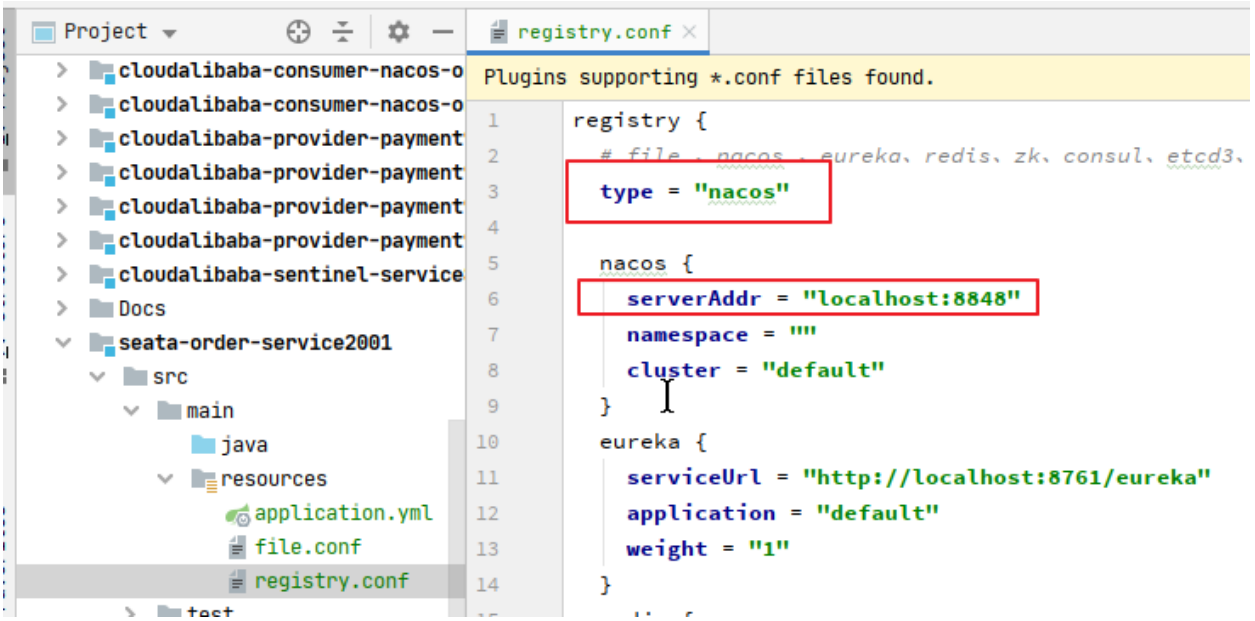
```
  local {
    ## store locks in user's database
  }

  remote {
    ## store locks in the seata's server
  }
}
recovery {
  #schedule committing retry period in milliseconds
  committing-retry-period = 1000
  #schedule asyn committing retry period in milliseconds
  asyn-committing-retry-period = 1000
  #schedule rollbacking retry period in milliseconds
  rollbacking-retry-period = 1000
  #schedule timeout retry period in milliseconds
  timeout-retry-period = 1000
}

transaction {
  undo.data.validation = true
  undo.log.serialization = "jackson"
  undo.log.save.days = 7
  #schedule delete expired undo_log in milliseconds
  undo.log.delete.period = 86400000
  undo.log.table = "undo_log"
}

## metrics settings
metrics {
  enabled = false
  registry-type = "compact"
  # multi exporters use comma divided
  exporter-list = "prometheus"
  exporter-prometheus-port = 9898
}

support {
  ## spring
  spring {
    # auto proxy the DataSource bean
    datasource.autoproxy = false
  }
}
```



5.2.5. registry.conf

```
registry {
  # file 、nacos 、eureka、redis、zk、consul、etcd3、sofa
  type = "nacos"

  nacos {
    serverAddr = "localhost:8848"
    namespace = ""
    cluster = "default"
  }
  eureka {
    serviceUrl = "http://localhost:8761/eureka"
    application = "default"
    weight = "1"
  }
  redis {
    serverAddr = "localhost:6379"
    db = "0"
  }
  zk {
    cluster = "default"
    serverAddr = "127.0.0.1:2181"
    session.timeout = 6000
    connect.timeout = 2000
  }
  consul {
    cluster = "default"
    serverAddr = "127.0.0.1:8500"
  }
  etcd3 {
    cluster = "default"
    serverAddr = "http://localhost:2379"
  }
  sofa {
    serverAddr = "127.0.0.1:9603"
    application = "default"
    region = "DEFAULT_ZONE"
    datacenter = "DefaultDataCenter"
    cluster = "default"
    group = "SEATA_GROUP"
    addressWaitTime = "3000"
  }
  file {
    name = "file.conf"
  }
}

config {
  # file、nacos 、apollo、zk、consul、etcd3
  type = "file"
```

```
50.
51.    nacos {
52.      serverAddr = "localhost"
53.      namespace = ""
54.    }
55.    consul {
56.      serverAddr = "127.0.0.1:8500"
57.    }
58.    apollo {
59.      app.id = "seata-server"
60.      apollo.meta = "http://192.168.1.204:8801"
61.    }
62.    zk {
63.      serverAddr = "127.0.0.1:2181"
64.      session.timeout = 6000
65.      connect.timeout = 2000
66.    }
67.    etcd3 {
68.      serverAddr = "http://localhost:2379"
69.    }
70.    file {
71.      name = "file.conf"
72.    }
73.  }
```



5.2.6. domain

5.2.6.1. CommonResult

```java
package cn.sitedev.springcloud.alibaba.domain;


import lombok.AllArgsConstructor;
import lombok.Data;
import lombok.NoArgsConstructor;

@Data
@AllArgsConstructor
@NoArgsConstructor
public class CommonResult<T> {
    private Integer code;
    private String message;
    private T data;

    public CommonResult(Integer code, String message) {
        this(code, message, null);
    }
}
```

5.2.6.2. Order

```java
package cn.sitedev.springcloud.alibaba.domain;

import lombok.AllArgsConstructor;
import lombok.Data;
import lombok.NoArgsConstructor;

import java.math.BigDecimal;

@Data
@AllArgsConstructor
@NoArgsConstructor
public class Order {
    private Long id;

    private Long userId;

    private Long productId;

    private Integer count;

    private BigDecimal money;

    private Integer status; //订单状态：0：创建中；1：已完结
}
```

5.2.7. Dao接口及实现

5.2.7.1. OrderDao

```java
package cn.sitedev.springcloud.alibaba.dao;

import cn.sitedev.springcloud.alibaba.domain.Order;
import org.apache.ibatis.annotations.Mapper;
import org.apache.ibatis.annotations.Param;

@Mapper
public interface OrderDao {
    //新建订单
    void create(Order order);

    //修改订单状态，从零改为1
    void update(@Param("userId") Long userId, @Param("status") Integer status);
}
```

5.2.7.2. OrderMapper.xml

resources文件夹下新建mapper文件夹后添加

```xml
<?xml version="1.0" encoding="UTF-8" ?>
<!DOCTYPE mapper PUBLIC "-//mybatis.org//DTD Mapper 3.0//EN" "http://mybatis.org/dtd/mybatis-3-mapper.dtd" >

<mapper namespace="cn.sitedev.springcloud.alibaba.dao.OrderDao">

    <resultMap id="BaseResultMap" type="cn.sitedev.springcloud.alibaba.domain.Order">
        <id column="id" property="id" jdbcType="BIGINT"/>
        <result column="user_id" property="userId" jdbcType="BIGINT"/>
        <result column="product_id" property="productId" jdbcType="BIGINT"/>
        <result column="count" property="count" jdbcType="INTEGER"/>
        <result column="money" property="money" jdbcType="DECIMAL"/>
        <result column="status" property="status" jdbcType="INTEGER"/>
    </resultMap>

    <insert id="create">
        insert into t_order (id,user_id,product_id,count,money,status)
        values (null,#{userId},#{productId},#{count},#{money},0);
    </insert>


    <update id="update">
        update t_order set status = 1
        where user_id=#{userId} and status = #{status};
    </update>

</mapper>
```

5.2.8. Service接口及实现

5.2.8.1. OrderService

```java
package cn.sitedev.springcloud.alibaba.service;

import cn.sitedev.springcloud.alibaba.domain.Order;

public interface OrderService {
    void create(Order order);
}
```

5.2.8.2. OrderServiceImpl

```java
package cn.sitedev.springcloud.alibaba.service.impl;

import cn.sitedev.springcloud.alibaba.dao.OrderDao;
import cn.sitedev.springcloud.alibaba.domain.Order;
import cn.sitedev.springcloud.alibaba.service.AccountService;
import cn.sitedev.springcloud.alibaba.service.OrderService;
import cn.sitedev.springcloud.alibaba.service.StorageService;
import io.seata.spring.annotation.GlobalTransactional;
import lombok.extern.slf4j.Slf4j;
import org.springframework.stereotype.Service;

import javax.annotation.Resource;

@Service
@Slf4j
public class OrderServiceImpl implements OrderService {
    @Resource
    private OrderDao orderDao;
    @Resource
    private StorageService storageService;
    @Resource
    private AccountService accountService;

    /**
     * 创建订单->调用库存服务扣减库存->调用账户服务扣减账户余额->修改订单状态
     */

    @Override
    @GlobalTransactional(name = "fsp-create-order", rollbackFor = Exception.class)
    public void create(Order order) {
        log.info("----->开始新建订单");
        //新建订单
        orderDao.create(order);

        //扣减库存
        log.info("----->订单微服务开始调用库存，做扣减Count");
        storageService.decrease(order.getProductId(), order.getCount());
        log.info("----->订单微服务开始调用库存，做扣减end");

        //扣减账户
        log.info("----->订单微服务开始调用账户，做扣减Money");
        accountService.decrease(order.getUserId(), order.getMoney());
        log.info("----->订单微服务开始调用账户，做扣减end");


        //修改订单状态，从零到1代表已经完成
        log.info("----->修改订单状态开始");
        orderDao.update(order.getUserId(), 0);
```

```
        log.info("----->修改订单状态结束");

        log.info("----->下订单结束了");

    }
}
```

5.2.8.3. StorageService

```
package cn.sitedev.springcloud.alibaba.service;

import cn.sitedev.springcloud.alibaba.domain.CommonResult;
import org.springframework.cloud.openfeign.FeignClient;
import org.springframework.web.bind.annotation.PostMapping;
import org.springframework.web.bind.annotation.RequestParam;


@FeignClient(value = "seata-storage-service")
public interface StorageService {
    @PostMapping(value = "/storage/decrease")
    CommonResult decrease(@RequestParam("productId") Long productId, @RequestParam("count") Integer count);
}
```

5.2.8.4. AccountService

```
package cn.sitedev.springcloud.alibaba.service;

import cn.sitedev.springcloud.alibaba.domain.CommonResult;
import org.springframework.cloud.openfeign.FeignClient;
import org.springframework.web.bind.annotation.PostMapping;
import org.springframework.web.bind.annotation.RequestParam;

import java.math.BigDecimal;

@FeignClient(value = "seata-account-service")
public interface AccountService {
    @PostMapping(value = "/account/decrease")
    CommonResult decrease(@RequestParam("userId") Long userId, @RequestParam("money") BigDecimal money);
}
```

5.2.9. Controller

```java
package cn.sitedev.springcloud.alibaba.controller;

import cn.sitedev.springcloud.alibaba.domain.CommonResult;
import cn.sitedev.springcloud.alibaba.domain.Order;
import cn.sitedev.springcloud.alibaba.service.OrderService;
import org.springframework.web.bind.annotation.GetMapping;
import org.springframework.web.bind.annotation.RestController;

import javax.annotation.Resource;

@RestController
public class OrderController {
    @Resource
    private OrderService orderService;

    @GetMapping("/order/create")
    public CommonResult create(Order order) {
        orderService.create(order);
        return new CommonResult(200, "订单创建成功");
    }
}
```

5.2.10. config配置

5.2.10.1. MyBatisConfig

```java
package cn.sitedev.springcloud.alibaba.config;

import org.mybatis.spring.annotation.MapperScan;
import org.springframework.context.annotation.Configuration;

@Configuration
@MapperScan({"cn.sitedev.springcloud.alibaba.dao"})
public class MyBatisConfig {

}
```

5.2.10.2. DataSourceProxyConfig

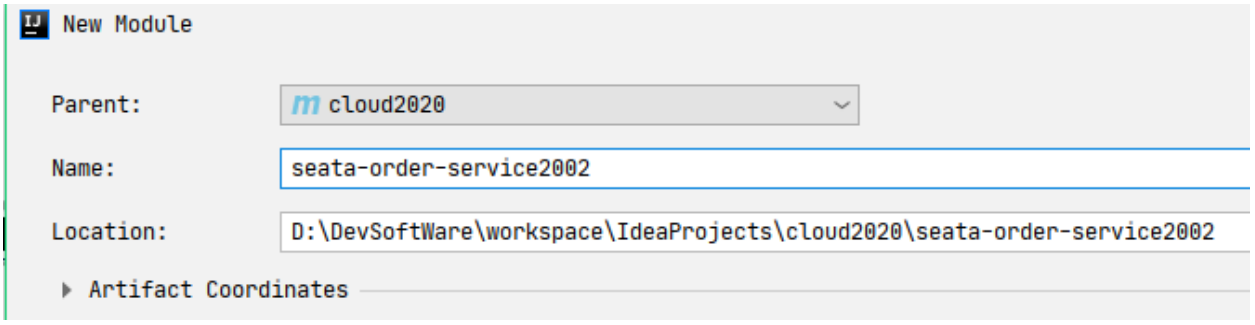
```java
package cn.sitedev.springcloud.alibaba.config;

import com.alibaba.druid.pool.DruidDataSource;
import io.seata.rm.datasource.DataSourceProxy;
import org.apache.ibatis.session.SqlSessionFactory;
import org.mybatis.spring.SqlSessionFactoryBean;
import org.mybatis.spring.transaction.SpringManagedTransactionFactory;
import org.springframework.beans.factory.annotation.Value;
import org.springframework.boot.context.properties.ConfigurationProperties;
import org.springframework.context.annotation.Bean;
import org.springframework.context.annotation.Configuration;
import org.springframework.core.io.support.PathMatchingResourcePatternResolver;

import javax.sql.DataSource;


@Configuration
public class DataSourceProxyConfig {

    @Value("${mybatis.mapperLocations}")
    private String mapperLocations;

    @Bean
    @ConfigurationProperties(prefix = "spring.datasource")
    public DataSource druidDataSource() {
        return new DruidDataSource();
    }

    @Bean
    public DataSourceProxy dataSourceProxy(DataSource dataSource) {
        return new DataSourceProxy(dataSource);
    }

    @Bean
    public SqlSessionFactory sqlSessionFactoryBean(DataSourceProxy dataSourceProxy) throws Exception {
        SqlSessionFactoryBean sqlSessionFactoryBean = new SqlSessionFactoryBean();
        sqlSessionFactoryBean.setDataSource(dataSourceProxy);
        sqlSessionFactoryBean.setMapperLocations(new PathMatchingResourcePatternResolver().getResources(mapperLocations));
        sqlSessionFactoryBean.setTransactionFactory(new SpringManagedTransactionFactory());
        return sqlSessionFactoryBean.getObject();
    }

}
```

5.2.11. 主启动

```java
package cn.sitedev.springcloud.alibaba;

import org.springframework.boot.SpringApplication;
import org.springframework.boot.autoconfigure.SpringBootApplication;
import org.springframework.boot.autoconfigure.jdbc.DataSourceAutoConfiguration;
import org.springframework.cloud.client.discovery.EnableDiscoveryClient;
import org.springframework.cloud.openfeign.EnableFeignClients;

@EnableDiscoveryClient
@EnableFeignClients
@SpringBootApplication(exclude = DataSourceAutoConfiguration.class)//取消数据源自动创建的配置
public class SeataOrderMainApp2001 {

    public static void main(String[] args) {
        SpringApplication.run(SeataOrderMainApp2001.class, args);
    }
}
```

5.3. 新建库存Storage-Module

5.3.1. 新建seata-order-service2002



5.3.2. POM

```xml
<?xml version="1.0" encoding="UTF-8"?>
<project xmlns="http://maven.apache.org/POM/4.0.0"
         xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
         xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 http://maven.apache.org/xsd/maven-4.0.0.xsd">
    <parent>
        <artifactId>cloud2020</artifactId>
        <groupId>cn.sitedev.springcloud</groupId>
        <version>1.0-SNAPSHOT</version>
    </parent>
    <modelVersion>4.0.0</modelVersion>

    <artifactId>seata-order-service2002</artifactId>

    <dependencies>
        <!--nacos-->
        <dependency>
            <groupId>com.alibaba.cloud</groupId>
            <artifactId>spring-cloud-starter-alibaba-nacos-discovery</artifactId>
        </dependency>
        <!--seata-->
        <dependency>
            <groupId>com.alibaba.cloud</groupId>
            <artifactId>spring-cloud-starter-alibaba-seata</artifactId>
            <exclusions>
                <exclusion>
                    <artifactId>seata-all</artifactId>
                    <groupId>io.seata</groupId>
                </exclusion>
            </exclusions>
        </dependency>
        <dependency>
            <groupId>io.seata</groupId>
            <artifactId>seata-all</artifactId>
            <version>0.9.0</version>
        </dependency>
        <!--feign-->
        <dependency>
            <groupId>org.springframework.cloud</groupId>
            <artifactId>spring-cloud-starter-openfeign</artifactId>
        </dependency>
        <dependency>
            <groupId>org.springframework.boot</groupId>
            <artifactId>spring-boot-starter-web</artifactId>
        </dependency>
        <dependency>
            <groupId>org.springframework.boot</groupId>
            <artifactId>spring-boot-starter-test</artifactId>
```

```
            <scope>test</scope>
        </dependency>
        <dependency>
            <groupId>org.mybatis.spring.boot</groupId>
            <artifactId>mybatis-spring-boot-starter</artifactId>
            <version>2.0.0</version>
        </dependency>
        <dependency>
            <groupId>mysql</groupId>
            <artifactId>mysql-connector-java</artifactId>
            <version>5.1.37</version>
        </dependency>
        <dependency>
            <groupId>com.alibaba</groupId>
            <artifactId>druid-spring-boot-starter</artifactId>
            <version>1.1.10</version>
        </dependency>
        <dependency>
            <groupId>org.projectlombok</groupId>
            <artifactId>lombok</artifactId>
            <optional>true</optional>
        </dependency>
    </dependencies>

</project>
```

5.3.3. YML

```yaml
server:
  port: 2002

spring:
  application:
    name: seata-storage-service
  cloud:
    alibaba:
      seata:
        tx-service-group: fsp_tx_group
    nacos:
      discovery:
        server-addr: localhost:8848
  datasource:
    driver-class-name: com.mysql.jdbc.Driver
    url: jdbc:mysql://localhost:3306/seata_storage
    username: root
    password: root

logging:
  level:
    io:
      seata: info

mybatis:
  mapperLocations: classpath:mapper/*.xml
```

5.3.4. file.conf

```
transport {
  # tcp udt unix-domain-socket
  type = "TCP"
  #NIO NATIVE
  server = "NIO"
  #enable heartbeat
  heartbeat = true
  #thread factory for netty
  thread-factory {
    boss-thread-prefix = "NettyBoss"
    worker-thread-prefix = "NettyServerNIOWorker"
    server-executor-thread-prefix = "NettyServerBizHandler"
    share-boss-worker = false
    client-selector-thread-prefix = "NettyClientSelector"
    client-selector-thread-size = 1
    client-worker-thread-prefix = "NettyClientWorkerThread"
    # netty boss thread size,will not be used for UDT
    boss-thread-size = 1
    #auto default pin or 8
    worker-thread-size = 8
  }
  shutdown {
    # when destroy server, wait seconds
    wait = 3
  }
  serialization = "seata"
  compressor = "none"
}

service {
  #vgroup->rgroup
  vgroup_mapping.fsp_tx_group = "default"
  #only support single node
  default.grouplist = "127.0.0.1:8091"
  #degrade current not support
  enableDegrade = false
  #disable
  disable = false
  #unit ms,s,m,h,d represents milliseconds, seconds, minutes, hours, days, default permanent
  max.commit.retry.timeout = "-1"
  max.rollback.retry.timeout = "-1"
  disableGlobalTransaction = false
}

client {
  async.commit.buffer.limit = 10000
  lock {
    retry.internal = 10
```

```
      retry.times = 30
    }
    report.retry.count = 5
    tm.commit.retry.count = 1
    tm.rollback.retry.count = 1
  }

  transaction {
    undo.data.validation = true
    undo.log.serialization = "jackson"
    undo.log.save.days = 7
    #schedule delete expired undo_log in milliseconds
    undo.log.delete.period = 86400000
    undo.log.table = "undo_log"
  }

  support {
    ## spring
    spring {
      # auto proxy the DataSource bean
      datasource.autoproxy = false
    }
  }
```

5.3.5. registry.conf

```
registry {
  # file 、nacos 、eureka、redis、zk
  type = "nacos"

  nacos {
    serverAddr = "localhost:8848"
    namespace = ""
    cluster = "default"
  }
  eureka {
    serviceUrl = "http://localhost:8761/eureka"
    application = "default"
    weight = "1"
  }
  redis {
    serverAddr = "localhost:6381"
    db = "0"
  }
  zk {
    cluster = "default"
    serverAddr = "127.0.0.1:2181"
    session.timeout = 6000
    connect.timeout = 2000
  }
  file {
    name = "file.conf"
  }
}

config {
  # file、nacos 、apollo、zk
  type = "file"

  nacos {
    serverAddr = "localhost"
    namespace = ""
    cluster = "default"
  }
  apollo {
    app.id = "fescar-server"
    apollo.meta = "http://192.168.1.204:8801"
  }
  zk {
    serverAddr = "127.0.0.1:2181"
    session.timeout = 6000
    connect.timeout = 2000
  }
  file {
    name = "file.conf"
```

```
    }
}
```

5.3.6. domain

5.3.6.1. CommonResult

```
package cn.sitedev.springcloud.alibaba.domain;


import lombok.AllArgsConstructor;
import lombok.Data;
import lombok.NoArgsConstructor;

@Data
@AllArgsConstructor
@NoArgsConstructor
public class CommonResult<T> {
    private Integer code;
    private String message;
    private T data;

    public CommonResult(Integer code, String message) {
        this(code, message, null);
    }
}
```

5.3.6.2. Storage

```java
package cn.sitedev.springcloud.alibaba.domain;

import lombok.Data;

@Data
public class Storage {

    private Long id;

    // 产品id
    private Long productId;

    //总库存
    private Integer total;

    //已用库存
    private Integer used;

    //剩余库存
    private Integer residue;
}
```

5.3.7. Dao接口及实现

5.3.7.1. StorageDao

```java
package cn.sitedev.springcloud.alibaba.dao;

import org.apache.ibatis.annotations.Mapper;
import org.apache.ibatis.annotations.Param;

@Mapper
public interface StorageDao {
    //扣减库存信息
    void decrease(@Param("productId") Long productId, @Param("count") Integer count);
}
```

5.3.7.2. StorageMapper.xml

resources文件夹下新建mapper文件夹后添加

```xml
<?xml version="1.0" encoding="UTF-8" ?>
<!DOCTYPE mapper PUBLIC "-//mybatis.org//DTD Mapper 3.0//EN" "http://mybatis.org/dtd/mybatis-3-mapper.dtd" >


<mapper namespace="cn.sitedev.springcloud.alibaba.dao.StorageDao">

    <resultMap id="BaseResultMap" type="cn.sitedev.springcloud.alibaba.domain.Storage">
        <id column="id" property="id" jdbcType="BIGINT"/>
        <result column="product_id" property="productId" jdbcType="BIGINT"/>
        <result column="total" property="total" jdbcType="INTEGER"/>
        <result column="used" property="used" jdbcType="INTEGER"/>
        <result column="residue" property="residue" jdbcType="INTEGER"/>
    </resultMap>

    <update id="decrease">
        UPDATE
            t_storage
        SET
            used = used + #{count},residue = residue - #{count}
        WHERE
            product_id = #{productId}
    </update>

</mapper>
```

5.3.8. Service接口及实现

5.3.8.1. StorageService

```java
package cn.sitedev.springcloud.alibaba.service;

public interface StorageService {
    // 扣减库存
    void decrease(Long productId, Integer count);
}
```

5.3.8.2. StorageServiceImpl

```java
package cn.sitedev.springcloud.alibaba.service.impl;

import cn.sitedev.springcloud.alibaba.dao.StorageDao;
import cn.sitedev.springcloud.alibaba.service.StorageService;
import org.slf4j.Logger;
import org.slf4j.LoggerFactory;
import org.springframework.stereotype.Service;

import javax.annotation.Resource;

@Service
public class StorageServiceImpl implements StorageService {

    private static final Logger LOGGER = LoggerFactory.getLogger(StorageServiceImpl.class);

    @Resource
    private StorageDao storageDao;

    // 扣减库存
    @Override
    public void decrease(Long productId, Integer count) {
        LOGGER.info("------->storage-service中扣减库存开始");
        storageDao.decrease(productId, count);
        LOGGER.info("------->storage-service中扣减库存结束");
    }
}
```

5.3.9. Controller

```java
package cn.sitedev.springcloud.alibaba.controller;

import cn.sitedev.springcloud.alibaba.domain.CommonResult;
import cn.sitedev.springcloud.alibaba.service.StorageService;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.web.bind.annotation.RequestMapping;
import org.springframework.web.bind.annotation.RestController;

@RestController
public class StorageController {

    @Autowired
    private StorageService storageService;

    //扣减库存
    @RequestMapping("/storage/decrease")
    public CommonResult decrease(Long productId, Integer count) {
        storageService.decrease(productId, count);
        return new CommonResult(200, "扣减库存成功！");
    }
}
```

5.3.10. Config配置

5.3.10.1. MyBatisConfig

```java
package cn.sitedev.springcloud.alibaba.config;

import org.mybatis.spring.annotation.MapperScan;
import org.springframework.context.annotation.Configuration;

@Configuration
@MapperScan({"cn.sitedev.springcloud.alibaba.dao"})
public class MyBatisConfig {

}
```

5.3.10.2. DataSourceProxyConfig

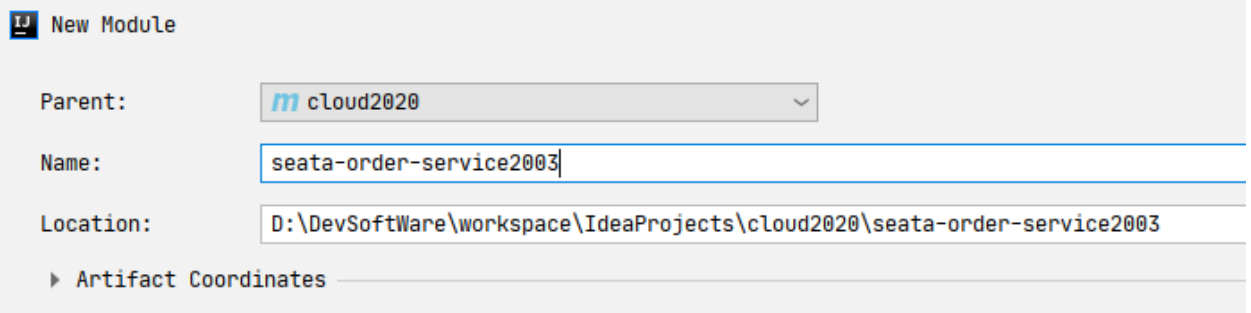
```java
package cn.sitedev.springcloud.alibaba.config;

import com.alibaba.druid.pool.DruidDataSource;
import io.seata.rm.datasource.DataSourceProxy;
import org.apache.ibatis.session.SqlSessionFactory;
import org.mybatis.spring.SqlSessionFactoryBean;
import org.mybatis.spring.transaction.SpringManagedTransactionFactory;
import org.springframework.beans.factory.annotation.Value;
import org.springframework.boot.context.properties.ConfigurationProperties;
import org.springframework.context.annotation.Bean;
import org.springframework.context.annotation.Configuration;
import org.springframework.core.io.support.PathMatchingResourcePatternResolver;

import javax.sql.DataSource;


@Configuration
public class DataSourceProxyConfig {

    @Value("${mybatis.mapperLocations}")
    private String mapperLocations;

    @Bean
    @ConfigurationProperties(prefix = "spring.datasource")
    public DataSource druidDataSource() {
        return new DruidDataSource();
    }

    @Bean
    public DataSourceProxy dataSourceProxy(DataSource dataSource) {
        return new DataSourceProxy(dataSource);
    }

    @Bean
    public SqlSessionFactory sqlSessionFactoryBean(DataSourceProxy dataSourceProxy) throws Exception {
        SqlSessionFactoryBean sqlSessionFactoryBean = new SqlSessionFactoryBean();
        sqlSessionFactoryBean.setDataSource(dataSourceProxy);
        sqlSessionFactoryBean.setMapperLocations(new PathMatchingResourcePatternResolver().getResources(mapperLocations));
        sqlSessionFactoryBean.setTransactionFactory(new SpringManagedTransactionFactory());
        return sqlSessionFactoryBean.getObject();
    }

}
```

5.3.11. 主启动

```java
package cn.sitedev.springcloud.alibaba;

import org.springframework.boot.SpringApplication;
import org.springframework.boot.autoconfigure.SpringBootApplication;
import org.springframework.boot.autoconfigure.jdbc.DataSourceAutoConfiguration;
import org.springframework.cloud.client.discovery.EnableDiscoveryClient;
import org.springframework.cloud.openfeign.EnableFeignClients;

@SpringBootApplication(exclude = DataSourceAutoConfiguration.class)
@EnableDiscoveryClient
@EnableFeignClients
public class SeataStorageServiceApplication2002 {
    public static void main(String[] args) {
        SpringApplication.run(SeataStorageServiceApplication2002.class, args);
    }
}
```

5.4. 新建账户Account-Module

5.4.1. 新建seata-order-service2003



5.4.2. POM

```xml
<?xml version="1.0" encoding="UTF-8"?>
<project xmlns="http://maven.apache.org/POM/4.0.0"
         xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
         xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 http://maven.apache.org/xsd/maven-4.0.0.xsd">
    <parent>
        <artifactId>cloud2020</artifactId>
        <groupId>cn.sitedev.springcloud</groupId>
        <version>1.0-SNAPSHOT</version>
    </parent>
    <modelVersion>4.0.0</modelVersion>

    <artifactId>seata-order-service2003</artifactId>

    <dependencies>
        <!--nacos-->
        <dependency>
            <groupId>com.alibaba.cloud</groupId>
            <artifactId>spring-cloud-starter-alibaba-nacos-discovery</artifactId>
        </dependency>
        <!--seata-->
        <dependency>
            <groupId>com.alibaba.cloud</groupId>
            <artifactId>spring-cloud-starter-alibaba-seata</artifactId>
            <exclusions>
                <exclusion>
                    <artifactId>seata-all</artifactId>
                    <groupId>io.seata</groupId>
                </exclusion>
            </exclusions>
        </dependency>
        <dependency>
            <groupId>io.seata</groupId>
            <artifactId>seata-all</artifactId>
            <version>0.9.0</version>
        </dependency>
        <!--feign-->
        <dependency>
            <groupId>org.springframework.cloud</groupId>
            <artifactId>spring-cloud-starter-openfeign</artifactId>
        </dependency>
        <dependency>
            <groupId>org.springframework.boot</groupId>
            <artifactId>spring-boot-starter-web</artifactId>
        </dependency>
        <dependency>
            <groupId>org.springframework.boot</groupId>
            <artifactId>spring-boot-starter-test</artifactId>
```

```
            <scope>test</scope>
        </dependency>
        <dependency>
            <groupId>org.mybatis.spring.boot</groupId>
            <artifactId>mybatis-spring-boot-starter</artifactId>
            <version>2.0.0</version>
        </dependency>
        <dependency>
            <groupId>mysql</groupId>
            <artifactId>mysql-connector-java</artifactId>
            <version>5.1.37</version>
        </dependency>
        <dependency>
            <groupId>com.alibaba</groupId>
            <artifactId>druid-spring-boot-starter</artifactId>
            <version>1.1.10</version>
        </dependency>
        <dependency>
            <groupId>org.projectlombok</groupId>
            <artifactId>lombok</artifactId>
            <optional>true</optional>
        </dependency>
    </dependencies>

</project>
```

5.4.3. YML

```yaml
server:
  port: 2003

spring:
  application:
    name: seata-account-service
  cloud:
    alibaba:
      seata:
        tx-service-group: fsp_tx_group
    nacos:
      discovery:
        server-addr: localhost:8848
  datasource:
    driver-class-name: com.mysql.jdbc.Driver
    url: jdbc:mysql://localhost:3306/seata_account
    username: root
    password: root

feign:
  hystrix:
    enabled: false

logging:
  level:
    io:
      seata: info

mybatis:
  mapperLocations: classpath:mapper/*.xml
```

5.4.4. file.conf

```
transport {
  # tcp udt unix-domain-socket
  type = "TCP"
  #NIO NATIVE
  server = "NIO"
  #enable heartbeat
  heartbeat = true
  #thread factory for netty
  thread-factory {
    boss-thread-prefix = "NettyBoss"
    worker-thread-prefix = "NettyServerNIOWorker"
    server-executor-thread-prefix = "NettyServerBizHandler"
    share-boss-worker = false
    client-selector-thread-prefix = "NettyClientSelector"
    client-selector-thread-size = 1
    client-worker-thread-prefix = "NettyClientWorkerThread"
    # netty boss thread size,will not be used for UDT
    boss-thread-size = 1
    #auto default pin or 8
    worker-thread-size = 8
  }
  shutdown {
    # when destroy server, wait seconds
    wait = 3
  }
  serialization = "seata"
  compressor = "none"
}

service {

  vgroup_mapping.fsp_tx_group = "default" #修改自定义事务组名称

  default.grouplist = "127.0.0.1:8091"
  enableDegrade = false
  disable = false
  max.commit.retry.timeout = "-1"
  max.rollback.retry.timeout = "-1"
  disableGlobalTransaction = false
}


client {
  async.commit.buffer.limit = 10000
  lock {
    retry.internal = 10
    retry.times = 30
  }
  report.retry.count = 5
```

```
  tm.commit.retry.count = 1
  tm.rollback.retry.count = 1
}

## transaction log store
store {
  ## store mode: file、db
  mode = "db"

  ## file store
  file {
    dir = "sessionStore"

    # branch session size , if exceeded first try compress lockkey, still exceeded throws exceptions
    max-branch-session-size = 16384
    # globe session size , if exceeded throws exceptions
    max-global-session-size = 512
    # file buffer size , if exceeded allocate new buffer
    file-write-buffer-cache-size = 16384
    # when recover batch read size
    session.reload.read_size = 100
    # async, sync
    flush-disk-mode = async
  }

  ## database store
  db {
    ## the implement of javax.sql.DataSource, such as DruidDataSource(druid)/BasicDataSource(dbcp) etc.
    datasource = "dbcp"
    ## mysql/oracle/h2/oceanbase etc.
    db-type = "mysql"
    driver-class-name = "com.mysql.jdbc.Driver"
    url = "jdbc:mysql://127.0.0.1:3306/seata"
    user = "root"
    password = "root"
    min-conn = 1
    max-conn = 3
    global.table = "global_table"
    branch.table = "branch_table"
    lock-table = "lock_table"
    query-limit = 100
  }
}
lock {
  ## the lock store mode: local、remote
  mode = "remote"

```

```
  local {
    ## store locks in user's database
  }

  remote {
    ## store locks in the seata's server
  }
}
recovery {
  #schedule committing retry period in milliseconds
  committing-retry-period = 1000
  #schedule asyn committing retry period in milliseconds
  asyn-committing-retry-period = 1000
  #schedule rollbacking retry period in milliseconds
  rollbacking-retry-period = 1000
  #schedule timeout retry period in milliseconds
  timeout-retry-period = 1000
}

transaction {
  undo.data.validation = true
  undo.log.serialization = "jackson"
  undo.log.save.days = 7
  #schedule delete expired undo_log in milliseconds
  undo.log.delete.period = 86400000
  undo.log.table = "undo_log"
}

## metrics settings
metrics {
  enabled = false
  registry-type = "compact"
  # multi exporters use comma divided
  exporter-list = "prometheus"
  exporter-prometheus-port = 9898
}

support {
  ## spring
  spring {
    # auto proxy the DataSource bean
    datasource.autoproxy = false
  }
}
```

5.4.5. registry.conf

```
registry {
  # file 、nacos 、eureka、redis、zk、consul、etcd3、sofa
  type = "nacos"

  nacos {
    serverAddr = "localhost:8848"
    namespace = ""
    cluster = "default"
  }
  eureka {
    serviceUrl = "http://localhost:8761/eureka"
    application = "default"
    weight = "1"
  }
  redis {
    serverAddr = "localhost:6379"
    db = "0"
  }
  zk {
    cluster = "default"
    serverAddr = "127.0.0.1:2181"
    session.timeout = 6000
    connect.timeout = 2000
  }
  consul {
    cluster = "default"
    serverAddr = "127.0.0.1:8500"
  }
  etcd3 {
    cluster = "default"
    serverAddr = "http://localhost:2379"
  }
  sofa {
    serverAddr = "127.0.0.1:9603"
    application = "default"
    region = "DEFAULT_ZONE"
    datacenter = "DefaultDataCenter"
    cluster = "default"
    group = "SEATA_GROUP"
    addressWaitTime = "3000"
  }
  file {
    name = "file.conf"
  }
}

config {
  # file、nacos 、apollo、zk、consul、etcd3
  type = "file"
```

```
50.
51.   nacos {
52.     serverAddr = "localhost"
53.     namespace = ""
54.   }
55.   consul {
56.     serverAddr = "127.0.0.1:8500"
57.   }
58.   apollo {
59.     app.id = "seata-server"
60.     apollo.meta = "http://192.168.1.204:8801"
61.   }
62.   zk {
63.     serverAddr = "127.0.0.1:2181"
64.     session.timeout = 6000
65.     connect.timeout = 2000
66.   }
67.   etcd3 {
68.     serverAddr = "http://localhost:2379"
69.   }
70.   file {
71.     name = "file.conf"
72.   }
73. }
```

5.4.6. domain

5.4.6.1. CommonResult

```java
package cn.sitedev.springcloud.alibaba.domain;


import lombok.AllArgsConstructor;
import lombok.Data;
import lombok.NoArgsConstructor;

@Data
@AllArgsConstructor
@NoArgsConstructor
public class CommonResult<T> {
    private Integer code;
    private String message;
    private T data;

    public CommonResult(Integer code, String message) {
        this(code, message, null);
    }
}
```

5.4.6.2. Account

```java
package cn.sitedev.springcloud.alibaba.domain;

import lombok.AllArgsConstructor;
import lombok.Data;
import lombok.NoArgsConstructor;

import java.math.BigDecimal;

@Data
@AllArgsConstructor
@NoArgsConstructor
public class Account {

    private Long id;

    /**
     * 用户id
     */
    private Long userId;

    /**
     * 总额度
     */
    private BigDecimal total;

    /**
     * 已用额度
     */
    private BigDecimal used;

    /**
     * 剩余额度
     */
    private BigDecimal residue;
}
```

5.4.7. Dao接口及实现

5.4.7.1. AccountDao

```java
package cn.sitedev.springcloud.alibaba.dao;

import org.apache.ibatis.annotations.Mapper;
import org.apache.ibatis.annotations.Param;

import java.math.BigDecimal;

@Mapper
public interface AccountDao {

    /**
     * 扣减账户余额
     */
    void decrease(@Param("userId") Long userId, @Param("money") BigDecimal money);
}
```

5.4.7.2. AccountMapper.xml

resources文件夹下新建mapper文件夹后添加

```xml
<?xml version="1.0" encoding="UTF-8" ?>
<!DOCTYPE mapper PUBLIC "-//mybatis.org//DTD Mapper 3.0//EN" "http://mybatis.org/dtd/mybatis-3-mapper.dtd" >

<mapper namespace="cn.sitedev.springcloud.alibaba.dao.AccountDao">

    <resultMap id="BaseResultMap" type="cn.sitedev.springcloud.alibaba.domain.Account">
        <id column="id" property="id" jdbcType="BIGINT"/>
        <result column="user_id" property="userId" jdbcType="BIGINT"/>
        <result column="total" property="total" jdbcType="DECIMAL"/>
        <result column="used" property="used" jdbcType="DECIMAL"/>
        <result column="residue" property="residue" jdbcType="DECIMAL"/>
    </resultMap>

    <update id="decrease">
        UPDATE t_account
        SET
          residue = residue - #{money},used = used + #{money}
        WHERE
          user_id = #{userId};
    </update>

</mapper>
```

5.4.8. Service接口及实现

5.4.8.1. AccountService

```java
package cn.sitedev.springcloud.alibaba.service;

import org.springframework.web.bind.annotation.RequestParam;

import java.math.BigDecimal;

public interface AccountService {

    /**
     * 扣减账户余额
     */
    void decrease(@RequestParam("userId") Long userId, @RequestParam("money") BigDecimal money);
}
```

5.4.8.2. AccountServiceImpl

```java
package cn.sitedev.springcloud.alibaba.service;

import cn.sitedev.springcloud.alibaba.dao.AccountDao;
import org.slf4j.Logger;
import org.slf4j.LoggerFactory;
import org.springframework.stereotype.Service;

import javax.annotation.Resource;
import java.math.BigDecimal;
import java.util.concurrent.TimeUnit;

/**
 * 账户业务实现类
 */
@Service
public class AccountServiceImpl implements AccountService {

    private static final Logger LOGGER = LoggerFactory.getLogger(AccountServiceImpl.class);

    @Resource
    AccountDao accountDao;

    /**
     * 扣减账户余额
     */
    @Override
    public void decrease(Long userId, BigDecimal money) {

        LOGGER.info("------->account-service中扣减账户余额开始");
        try {
            TimeUnit.SECONDS.sleep(20);
        } catch (InterruptedException e) {
            e.printStackTrace();
        }
        accountDao.decrease(userId, money);
        LOGGER.info("------->account-service中扣减账户余额结束");
    }
}
```

5.4.9. Controller

```java
package cn.sitedev.springcloud.alibaba.controller;

import cn.sitedev.springcloud.alibaba.domain.CommonResult;
import cn.sitedev.springcloud.alibaba.service.AccountService;
import org.springframework.web.bind.annotation.RequestMapping;
import org.springframework.web.bind.annotation.RequestParam;
import org.springframework.web.bind.annotation.RestController;

import javax.annotation.Resource;
import java.math.BigDecimal;

@RestController
public class AccountController {

    @Resource
    AccountService accountService;

    /**
     * 扣减账户余额
     */
    @RequestMapping("/account/decrease")
    public CommonResult decrease(@RequestParam("userId") Long userId, @RequestParam("money") BigDecimal money) {
        accountService.decrease(userId, money);
        return new CommonResult(200, "扣减账户余额成功！");
    }
}
```

5.4.10. Config配置

5.4.10.1. MyBatisConfig

```java
package cn.sitedev.springcloud.alibaba.config;

import org.mybatis.spring.annotation.MapperScan;
import org.springframework.context.annotation.Configuration;

@Configuration
@MapperScan({"cn.sitedev.springcloud.alibaba.dao"})
public class MyBatisConfig {

}
```

5.4.10.2. DataSourceProxyConfig

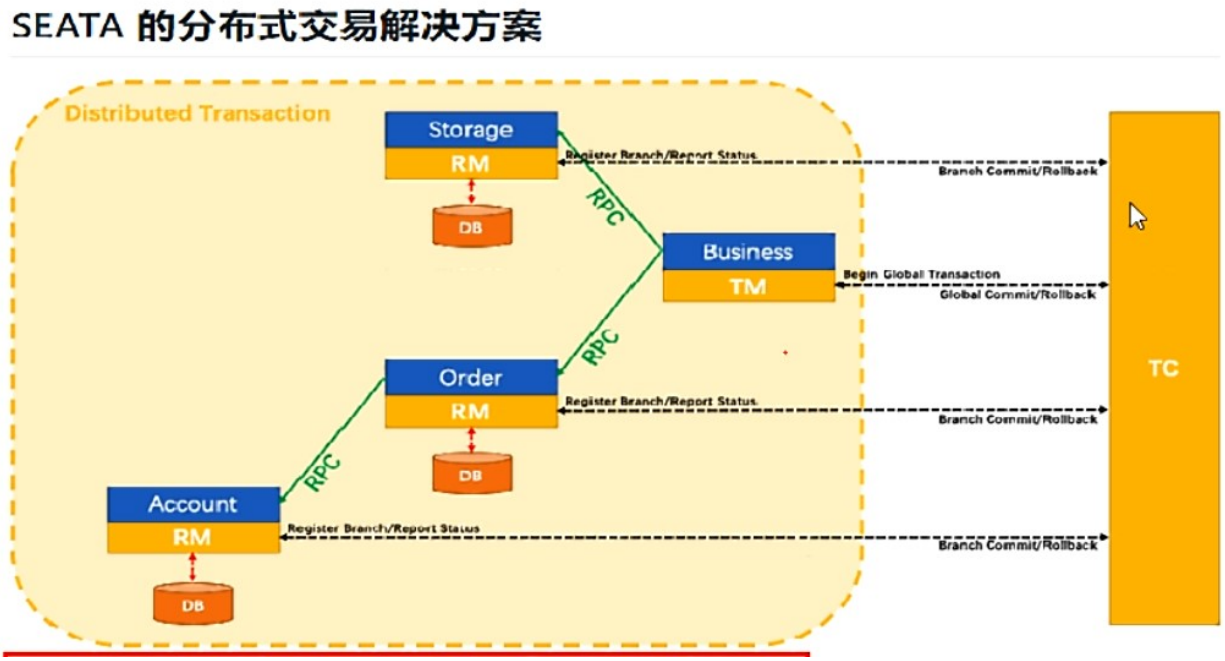
```java
package cn.sitedev.springcloud.alibaba.config;

import com.alibaba.druid.pool.DruidDataSource;
import io.seata.rm.datasource.DataSourceProxy;
import org.apache.ibatis.session.SqlSessionFactory;
import org.mybatis.spring.SqlSessionFactoryBean;
import org.mybatis.spring.transaction.SpringManagedTransactionFactory;
import org.springframework.beans.factory.annotation.Value;
import org.springframework.boot.context.properties.ConfigurationProperties;
import org.springframework.context.annotation.Bean;
import org.springframework.context.annotation.Configuration;
import org.springframework.core.io.support.PathMatchingResourcePatternResolver;

import javax.sql.DataSource;


@Configuration
public class DataSourceProxyConfig {

    @Value("${mybatis.mapperLocations}")
    private String mapperLocations;

    @Bean
    @ConfigurationProperties(prefix = "spring.datasource")
    public DataSource druidDataSource() {
        return new DruidDataSource();
    }

    @Bean
    public DataSourceProxy dataSourceProxy(DataSource dataSource) {
        return new DataSourceProxy(dataSource);
    }

    @Bean
    public SqlSessionFactory sqlSessionFactoryBean(DataSourceProxy dataSourceProxy) throws Exception {
        SqlSessionFactoryBean sqlSessionFactoryBean = new SqlSessionFactoryBean();
        sqlSessionFactoryBean.setDataSource(dataSourceProxy);
        sqlSessionFactoryBean.setMapperLocations(new PathMatchingResourcePatternResolver().getResources(mapperLocations));
        sqlSessionFactoryBean.setTransactionFactory(new SpringManagedTransactionFactory());
        return sqlSessionFactoryBean.getObject();
    }

}
```

5.4.11. 主启动

```java
package cn.sitedev.springcloud.alibaba;

import org.springframework.boot.SpringApplication;
import org.springframework.boot.autoconfigure.SpringBootApplication;
import org.springframework.boot.autoconfigure.jdbc.DataSourceAutoConfiguration;
import org.springframework.cloud.client.discovery.EnableDiscoveryClient;
import org.springframework.cloud.openfeign.EnableFeignClients;

@SpringBootApplication(exclude = DataSourceAutoConfiguration.class)
@EnableDiscoveryClient
@EnableFeignClients
public class SeataAccountMainApp2003 {
    public static void main(String[] args) {
        SpringApplication.run(SeataAccountMainApp2003.class, args);
    }
}
```

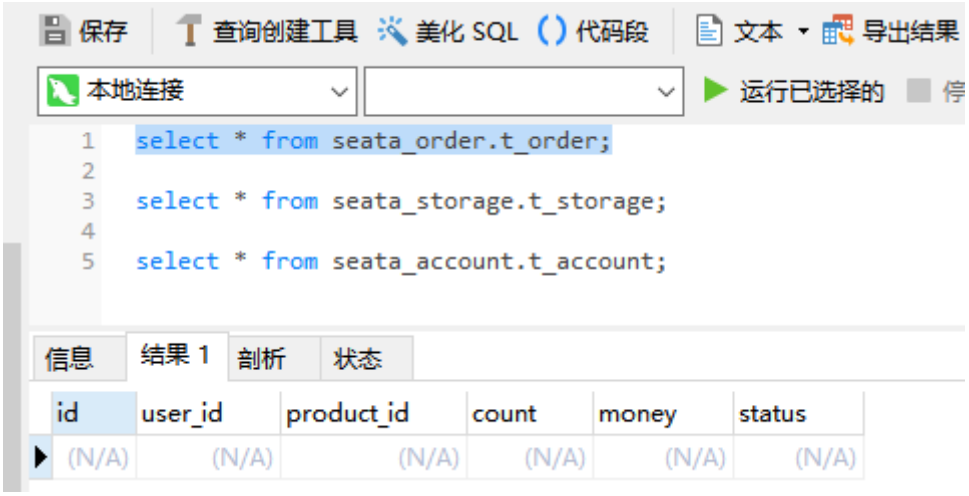
6. 测试

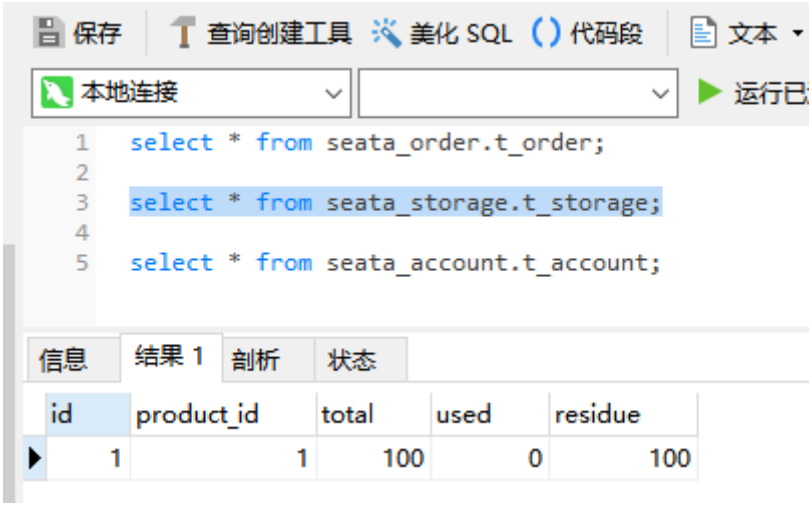
6.1. 下订单->减库存->扣余额->改（订单）状态

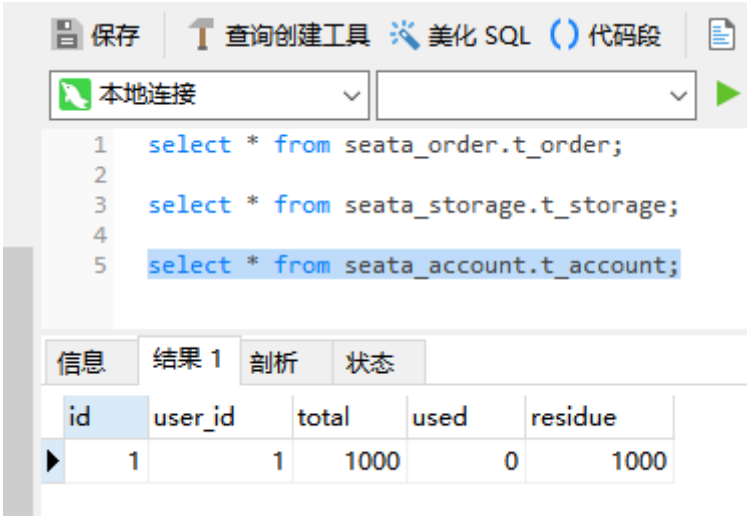


我们只需要使用一个@GlobalTransactional 注解在业务方法上

6.2. 数据库初始情况







6.3. 正常下单

1) seata-order-service2001模块OrderServiceImpl去除seata事务

```
1. public class OrderServiceImpl implements OrderService {
2.     @Override
3. //    @GlobalTransactional(name = "fsp-create-order", rollbackFor = Exception.class)
4.     public void create(Order order) {
```

```
Window  Help    cloud2020 - OrderServiceImpl.java [seata-order-service2001]
ccountService   SeataAccountMainApp2003   Git:
AccountServiceImpl.java   OrderServiceImpl.java
27      @Override
28  //    @GlobalTransactional(name = "fsp-create-order", rollbackFor = Exception
    .class)
29      public void create(Order order) {
30          log.info("----->开始新建订单");
```

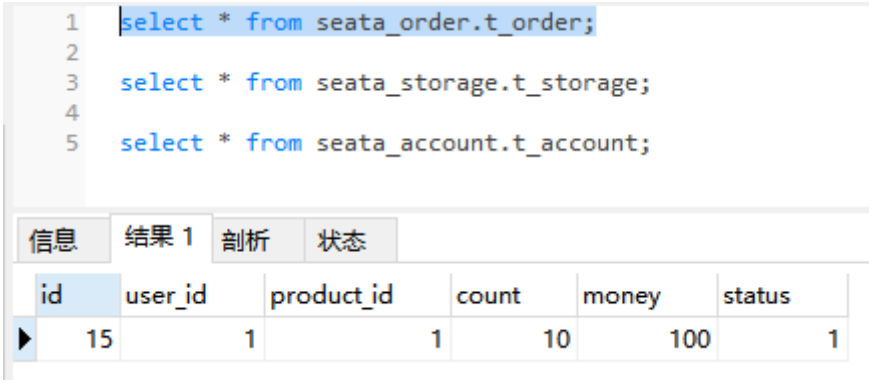
2) seata-order-service2003模块AccountServiceImpl去除超时代码

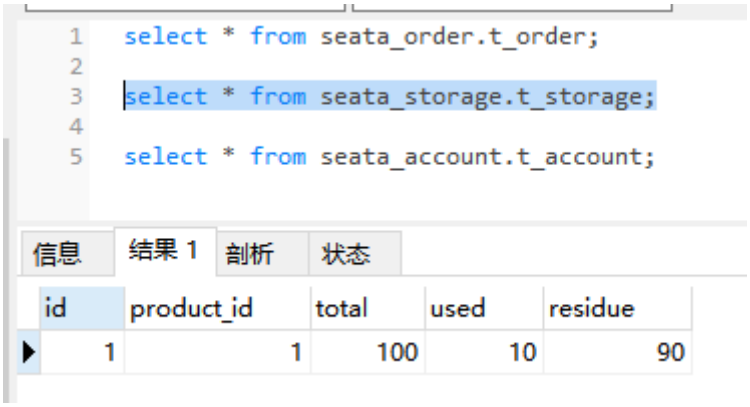
```
1.  public class AccountServiceImpl implements AccountService {
2.      @Override
3.      public void decrease(Long userId, BigDecimal money) {
4.
5.          LOGGER.info("------->account-service中扣减账户余额开始");
6.  //          try {
7.  //              TimeUnit.SECONDS.sleep(20);
8.  //          } catch (InterruptedException e) {
9.  //              e.printStackTrace();
10. //          }
11.         accountDao.decrease(userId, money);
12.         LOGGER.info("------->account-service中扣减账户余额结束");
13.     }
```

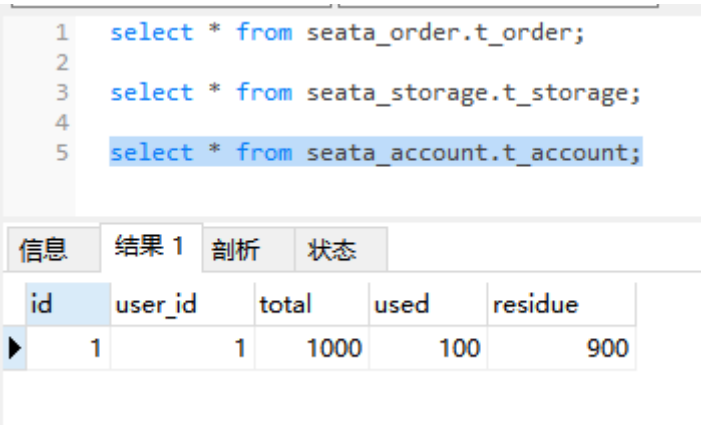
```
Window  Help    cloud2020 - AccountServiceImpl.java [seata-order-service2003]
decrease   SeataAccountMainApp2003   Git:
AccountServiceImpl.java   OrderServiceImpl.java
24      */
25      @Override
26      public void decrease(Long userId, BigDecimal money) {
27
28          LOGGER.info("------->account-service中扣减账户余额开始");
29  //          try {
30  //              TimeUnit.SECONDS.sleep(20);
31  //          } catch (InterruptedException e) {
32  //              e.printStackTrace();
33  //          }
34          accountDao.decrease(userId, money);
35          LOGGER.info("------->account-service中扣减账户余额结束");
36      }
37  }
```

3) 浏览器访问http://localhost:2001/order/create?userId=1&productId=1&count=10&money=100

4) 查看数据库记录



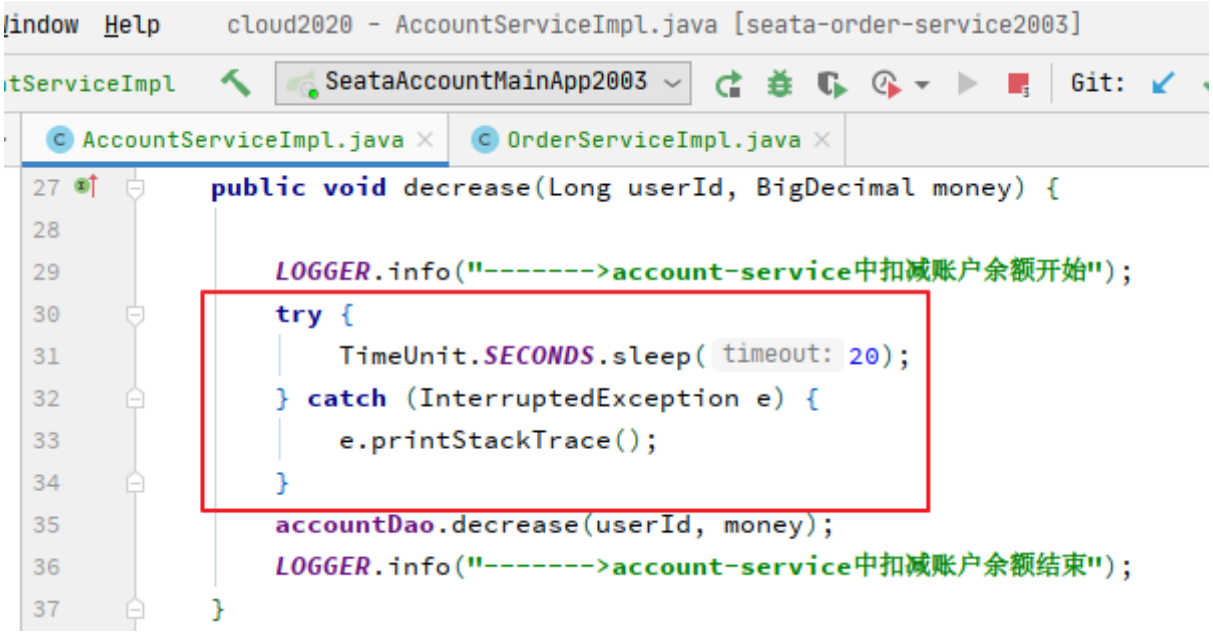




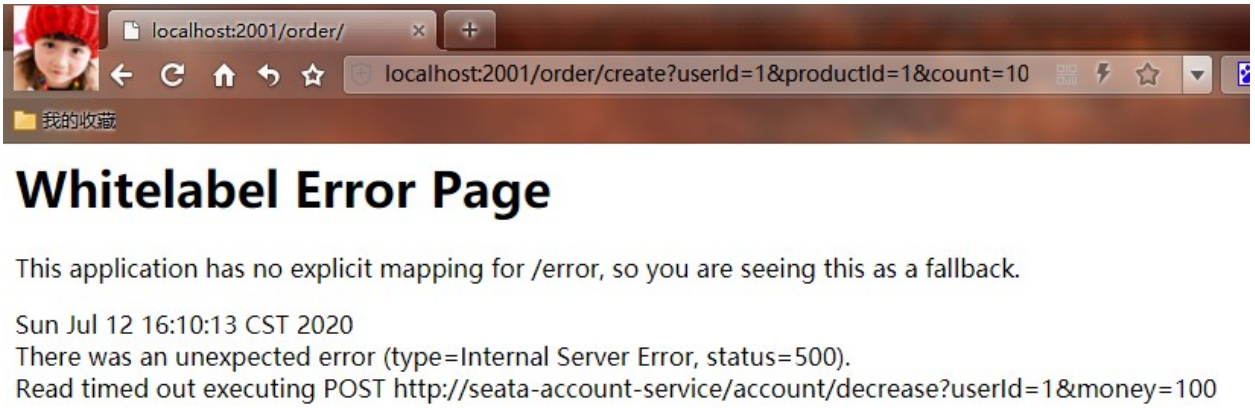
6.4. 超时异常，没加@GlobalTransactional

1) seata-order-service2003模块AccountServiceImpl添加超时代码:

```java
public class AccountServiceImpl implements AccountService {
    @Override
    public void decrease(Long userId, BigDecimal money) {

        LOGGER.info("------->account-service中扣减账户余额开始");
        try {
            TimeUnit.SECONDS.sleep(20);
        } catch (InterruptedException e) {
            e.printStackTrace();
        }
        accountDao.decrease(userId, money);
        LOGGER.info("------->account-service中扣减账户余额结束");
    }
```



2) 浏览器访问http://localhost:2001/order/create?userId=1&productId=1&count=10&money=100



3) 查看数据库记录:

```
select * from seata_order.t_order;

select * from seata_storage.t_storage;

select * from seata_account.t_account;
```

信息 | 结果 1 | 剖析 | 状态

id	user_id	product_id	count	money	status
15	1	1	10	100	1
16	1	1	10	100	0

本地连接

```
select * from seata_order.t_order;

select * from seata_storage.t_storage;

select * from seata_account.t_account;
```

信息 | 结果 1 | 剖析 | 状态

id	product_id	total	used	residue
1	1	100	20	80

本地连接

```
select * from seata_order.t_order;

select * from seata_storage.t_storage;

select * from seata_account.t_account;
```

信息 | 结果 1 | 剖析 | 状态

id	user_id	total	used	residue
1	1	1000	200	800

4) 故障情况:

- 当库存和账户余额扣减后，订单状态并没有设置为已经完成，没有从零改为1
- 而且由于feign的重试机制，账户余额还有可能被多次扣减
- feign的超时时间默认为1s

6.5. 超时异常，添加@GlobalTransactional

1) seata-order-service2001模块OrderServiceImpl添加seata事务

```
public class OrderServiceImpl implements OrderService {
    @Override
    @GlobalTransactional(name = "fsp-create-order", rollbackFor = Exception.class)
    public void create(Order order) {
```

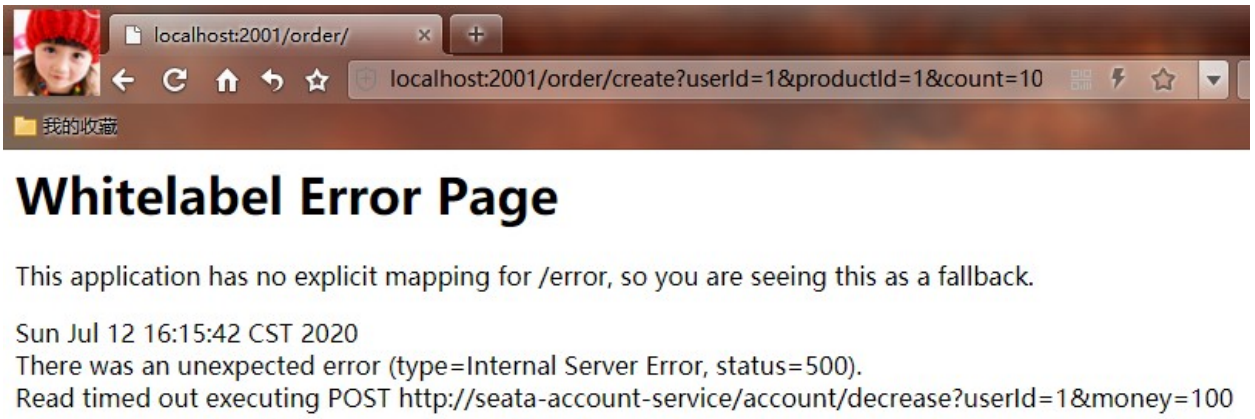
```
Window  Help    cloud2020 - OrderServiceImpl.java [seata-order-service2001]
storageService   SeataAccountMainApp2003   Git:
OrderServiceImpl.java   AccountServiceImpl.java
26          */
27
28          @Override
29          @GlobalTransactional(name = "fsp-create-order", rollbackFor = Exception
.class)
30          public void create(Order order) {
```

2) seata-order-service2003模块AccountServiceImpl添加超时代码

```
1.  public class AccountServiceImpl implements AccountService {
2.      public void decrease(Long userId, BigDecimal money) {
3.
4.          LOGGER.info("------->account-service中扣减账户余额开始");
5.          try {
6.              TimeUnit.SECONDS.sleep(20);
7.          } catch (InterruptedException e) {
8.              e.printStackTrace();
9.          }
10.         accountDao.decrease(userId, money);
11.         LOGGER.info("------->account-service中扣减账户余额结束");
12.     }
```

```
ndow  Help    cloud2020 - AccountServiceImpl.java [seata-order-service2003]
ServiceImpl   SeataAccountMainApp2003   Git:
OrderServiceImpl.java   AccountServiceImpl.java
25          */
26          @Override
27          public void decrease(Long userId, BigDecimal money) {
28
29              LOGGER.info("------->account-service中扣减账户余额开始");
30              try {
31                  TimeUnit.SECONDS.sleep( timeout: 20);
32              } catch (InterruptedException e) {
33                  e.printStackTrace();
34              }
35              accountDao.decrease(userId, money);
```

3) 浏览器访问http://localhost:2001/order/create?userId=1&productId=1&count=10&money=100



4) 下单后数据库数据并没有任何改变, 记录都添加不进来

```
select * from seata_order.t_order;

select * from seata_storage.t_storage;

select * from seata_account.t_account;
```

信息 | 结果 1 | 剖析 | 状态

id	user_id	product_id	count	money	status
15	1	1	10	100	1
16	1	1	10	100	0

```
select * from seata_order.t_order;

select * from seata_storage.t_storage;

select * from seata_account.t_account;
```

信息 | 结果 1 | 剖析 | 状态

id	product_id	total	used	residue
1	1	100	20	80

```
select * from seata_order.t_order;

select * from seata_storage.t_storage;

select * from seata_account.t_account;
```

信息 | 结果 1 | 剖析 | 状态

id	user_id	total	used	residue
1	1	1000	200	800

7. Seata之原理简介

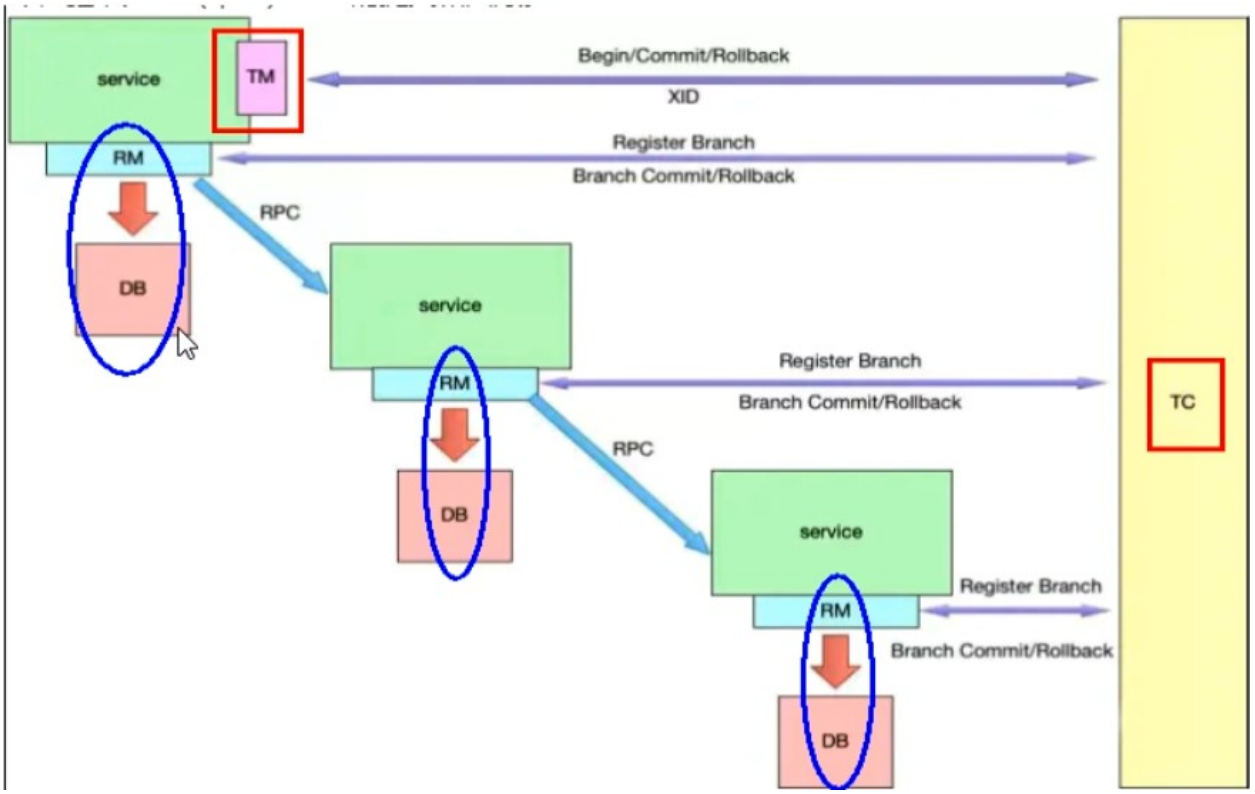
7.1. Seata

2019年1月份蚂蚁金服和阿里巴巴共同开源的分布式事务解决方案

Simple Extensible Autonomous Transaction Architecture,简单可扩展自治事务框架

2020起初，参加工作后用1.0以后的版本

7.2. 再看TC/TM/RM三大组件



7.2.1. 分布式事务的执行流程

TM开启分布式事务(TM向TC注册全局事务记录)

换业务场景，编排数据库，服务等事务内资源（RM向TC汇报资源准备状态）

TM结束分布式事务，事务一阶段结束（TM通知TC提交/回滚分布式事务）

TC汇总事务信息，决定分布式事务是提交还是回滚

TC通知所有RM提交/回滚资源，事务二阶段结束。

7.3. AT模式如何做到对业务的无侵入

7.3.1. 是什么

> http://seata.io/zh-cn/docs/overview/what-is-seata.html

Seata 是一款开源的分布式事务解决方案，致力于提供高性能和简单易用的分布式事务服务。Seata 将为用户提供了 AT、TCC、SAGA 和 XA 事务模式，为用户打造一站式的分布式解决方案。

AT 模式

前提

- 基于支持本地 ACID 事务的关系型数据库。
- Java 应用，通过 JDBC 访问数据库。

整体机制

两阶段提交协议的演变：

- 一阶段：业务数据和回滚日志记录在同一个本地事务中提交，释放本地锁和连接资源。
- 二阶段：
  - 提交异步化，非常快速地完成。
  - 回滚通过一阶段的回滚日志进行反向补偿。

7.3.2. 一阶段加载

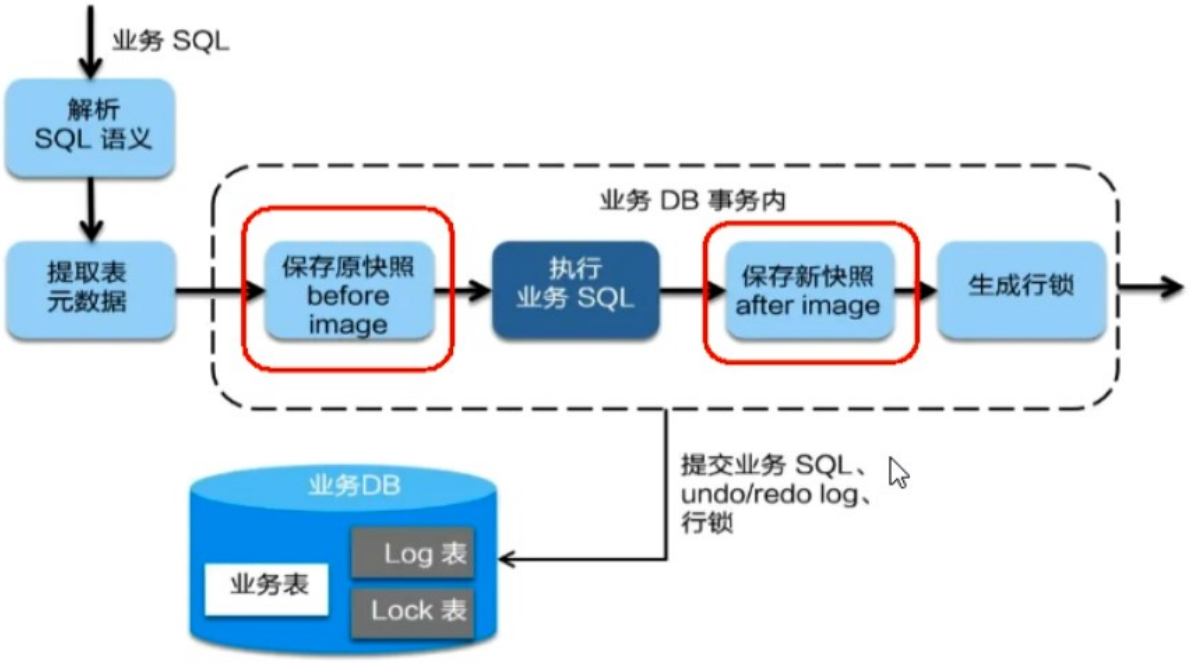
在一阶段，Seata会拦截"业务SQL"，

1.解析SQL语义，找到"业务SQL"要更新的业务数据，在业务数据被更新前，将其保存成"before image"，

2.执行“业务SQL”更新业务数据，在业务数据更新之后，

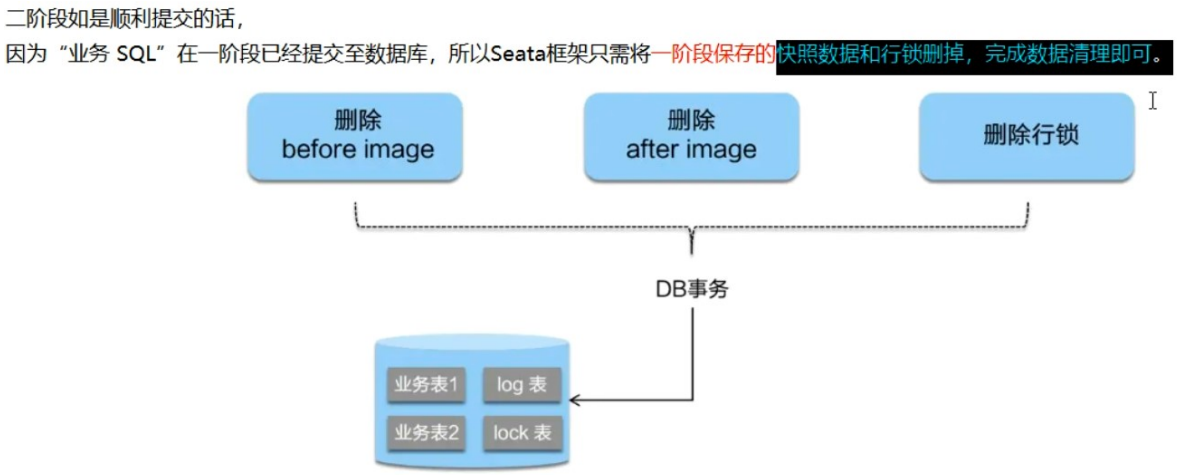
3.其保存成"after image"，最后生成行锁

以上操作全部在一个数据库事务内完成，这样保证了一阶段操作的原子性。



7.3.3. 二阶段提交

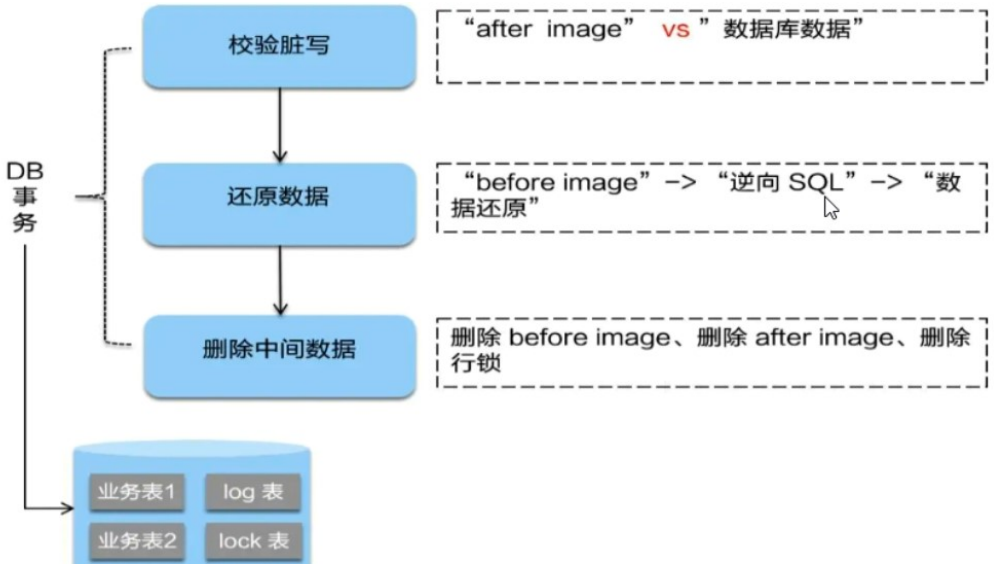
二阶段如是顺利提交的话，因为"业务SQL"在一阶段已经提交至数据库，所以 Seata框架只需将阶段保存快照数据和行锁删掉，完成数据清理即可



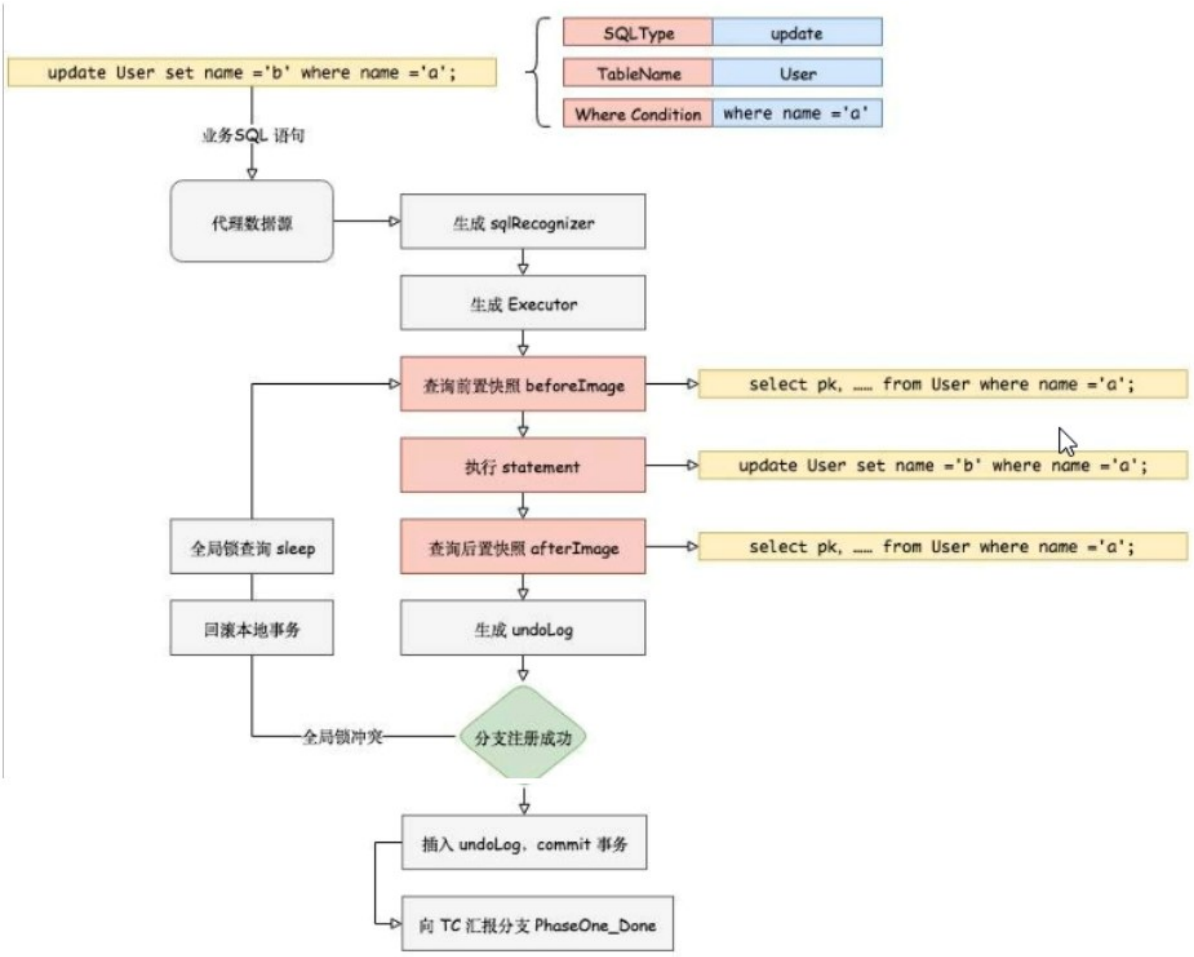
7.3.4. 二阶段回滚

二阶段如果是回滚的话，Seata就需要回滚一阶段已经执行的"业务SQL"，还原业务数据。

回滚方式便是用"before image"还原业务数据；但在还原前要首先要校验脏写，对比“数据库当前业务数据”和"after image”，如果两份数据完全一致就说明没有脏写，可以还原业务数据，如果不一致就说明有脏写，出现脏写就需要转人工处理。


校验脏写
“after image” vs ”数据库数据”
还原数据
“before image” -> “逆向 SQL” -> “数据还原”
删除中间数据
删除 before image、删除 after image、删除行锁
DB 事务
业务表1
log 表
业务表2
lock 表

7.4. 补充


update User set name ='b' where name ='a';
SQLType
update
TableName
User
Where Condition
where name ='a'
业务SQL 语句
代理数据源
生成 sqlRecognizer
生成 Executor
查询前置快照 beforeImage
select pk, ... from User where name ='a';
执行 statement
update User set name ='b' where name ='a';
全局锁查询 sleep
查询后置快照 afterImage
select pk, ... from User where name ='a';
回滚本地事务
生成 undoLog
全局锁冲突
分支注册成功
插入 undoLog，commit 事务
向 TC 汇报分支 PhaseOne_Done