2017

商场促销系统

技术实现文档 VERSION 1.0

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目录

1 介绍

1.1 本文档的用意

本文档作为商场促销系统实现部分的说明文档，主要用于在项目的开发过程中，为便于对系统的详细实现和进一步维护、对系统的实现部分进行追踪。为达到上述目标，本文档主要陈述实现系统的构建环境、主要接口、核心算法以及尚未完全解决的问题。

1.2 定义与缩写词

1. BUYFREE：买 X 件减 Y 元优惠类型；
2. BUYCOUNT：买 X 件打 Y 折优惠类型；
3. BUYSPECIAL：买 X 件享受特价优惠类型；
4. BUYPRESENT：买 X 件赠送 Y 件商品或优惠券优惠类型；
5. FULLFREE：满 X 元减 Y 元优惠类型；
6. FULLCOUNT：满 X 元打 Y 折优惠类型；
7. FULLPRESENT：满 X 元赠送 Y 件商品或优惠券优惠类型。

1.3 参考资料

1. AJAX 与 spring mvc 交互（http://blog.csdn.net/yangtang_newton/article/details/7525800）
2. Spring security 实现权限管理(http://blog.csdn.net/zmx729618/article/details/51096593)
3. 最新 SpringMVC 4，如何解决@ResponseBody 时，String 类型乱码(http://bbs.csdn.net/topics/391855872?page=1)
4. Spring Security 4.2.2.RELEASE API(http://docs.spring.io/spring-security/site/docs/current/apidocs/index.html?index-all.html)

1.4 阅读指南

1.4.1 本文档已涵盖的内容

1. 促销系统对于商品信息、促销规则、订单信息和员工信息的 REST 风格 Web API，其中包含有经过测试的 API；

2. 系统对促销进行支持的用户接口以及其视图控制器；
3. 促销系统进行促销的业务流程；
4. 部分核心促销规则的匹配、实现算法。

1.4.2本系统将要实现但尚未实现的内容

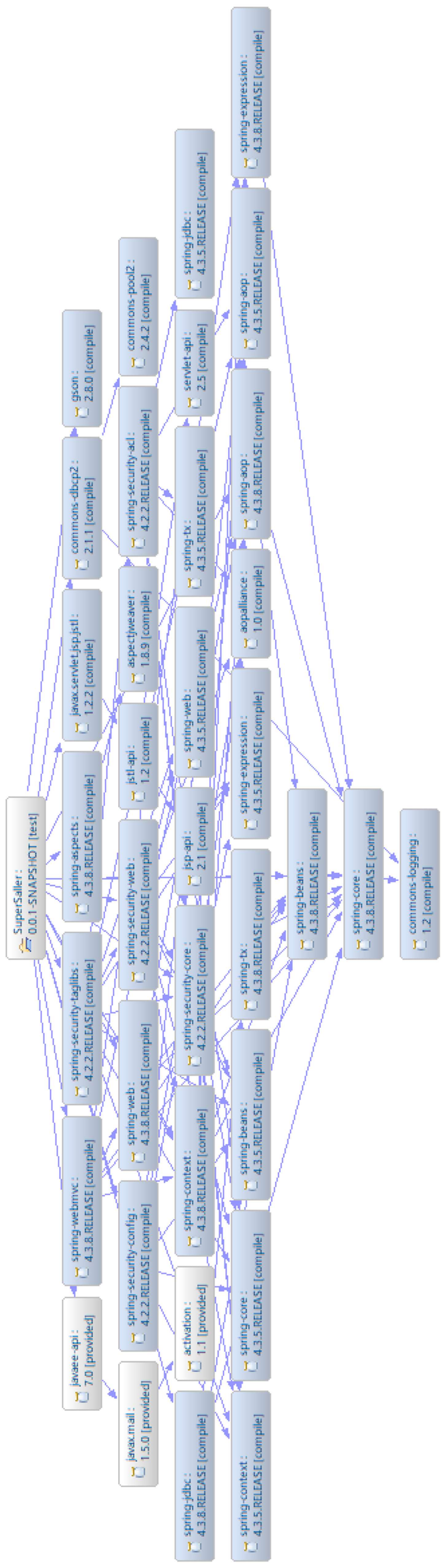
1. 促销规则的维护功能；
2. 促销侧员工的维护；
3. 取消订单的功能；
4. 重新读取非归档态（未结算且未取消）订单的功能；
5. 订单的支付功能；
6. 订单打印的支持。

2 构建环境

2.1 构建所采用的软硬件环境

环境项	内容
实现语言	JAVA
JDK Version	jdk1.8.0_91
JVM Version	jre1.8.0_91
JAVA EE Version	JAVA EE 7 - Web 3.1
JSTL Version	1.2.2
服务器环境	Apache Tomcat 8.0.39
数据库	Oracle 12c 12.1.0

2.2 本系统实现所采用的外部框架

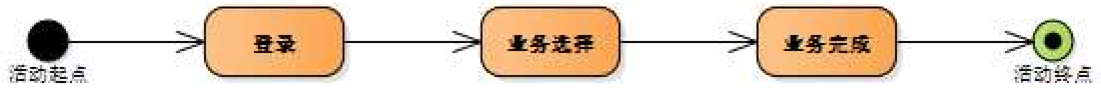

SuperSaller : 0.0.1-SNAPSHOT [test]
gson : 2.8.0 [compile]
commons-dbcp2 : 2.1.1 [compile]
javax.servlet.jsp.jstl : 1.2.2 [compile]
spring-aspects : 4.3.8.RELEASE [compile]
spring-security-taglibs : 4.2.2.RELEASE [compile]
spring-webmvc : 4.3.8.RELEASE [compile]
javaee-api : 7.0 [provided]
commons-pool2 : 2.4.2 [compile]
spring-security-acl : 4.2.2.RELEASE [compile]
aspectjweaver : 1.8.9 [compile]
jstl-api : 1.2 [compile]
spring-security-web : 4.2.2.RELEASE [compile]
spring-web : 4.3.8.RELEASE [compile]
spring-security-config : 4.2.2.RELEASE [compile]
javax.mail : 1.5.0 [provided]
spring-jdbc : 4.3.5.RELEASE [compile]
servlet-api : 2.5 [compile]
spring-tx : 4.3.5.RELEASE [compile]
spring-web : 4.3.5.RELEASE [compile]
jsp-api : 2.1 [compile]
spring-security-core : 4.2.2.RELEASE [compile]
spring-context : 4.3.8.RELEASE [compile]
activation : 1.1 [provided]
spring-jdbc : 4.3.8.RELEASE [compile]
spring-expression : 4.3.8.RELEASE [compile]
spring-aop : 4.3.5.RELEASE [compile]
spring-aop : 4.3.8.RELEASE [compile]
aopalliance : 1.0 [compile]
spring-expression : 4.3.5.RELEASE [compile]
spring-tx : 4.3.8.RELEASE [compile]
spring-beans : 4.3.5.RELEASE [compile]
spring-core : 4.3.5.RELEASE [compile]
spring-context : 4.3.5.RELEASE [compile]
spring-beans : 4.3.8.RELEASE [compile]
spring-core : 4.3.8.RELEASE [compile]
commons-logging : 1.2 [compile]

框架名	版本号	从属包全名	说明
Commons-dbcp2	2.1.1	org.apache.commons	DBCP 连接池 V2
Gson	2.8.0	com.google.code.gson	Google json
Spring-core	4.3.8-RELEASE	org.springframework	Spring 4 框架
Spring-context	4.3.8-RELEASE	org.springframework	
Spring-aop	4.3.8-RELEASE	org.springframework	
Spring-beans	4.3.8-RELEASE	org.springframework	
Spring-aspect	4.3.8-RELEASE	org.springframework	
Spring-jdbc	4.3.8-RELEASE	org.springframework	
Spring-web	4.3.8-RELEASE	org.springframework	
Spring-webmvc	4.3.8-RELEASE	org.springframework	
Spring-security-core	4.2.2-RELEASE	org.springframework.security	Spring Security 4 框架
Spring-security-web	4.2.2-RELEASE	org.springframework.security	
Spring-security-config	4.2.2-RELEASE	org.springframework.security	
Spring-security-taglibs	4.2.2-RELEASE	org.springframework.security	
JQuery	v3.2.1		

3 主要业务流程

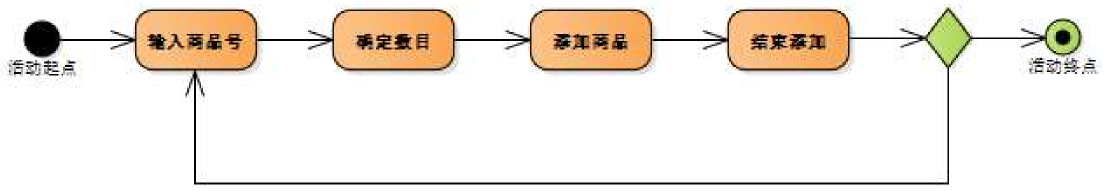
3.1 系统使用主要业务流程

3.1.1 使用系统的主要过程



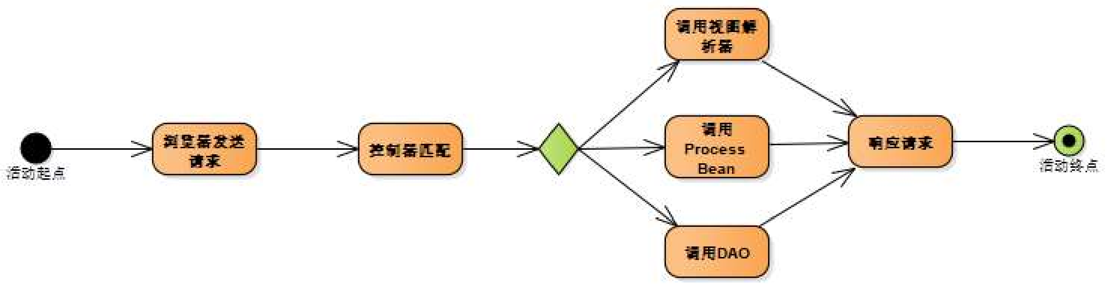
说明：用户使用系统时，应当遵循此过程。任何功能的使用都需要进行登录验证。

3.1.2 进行促销的业务流程



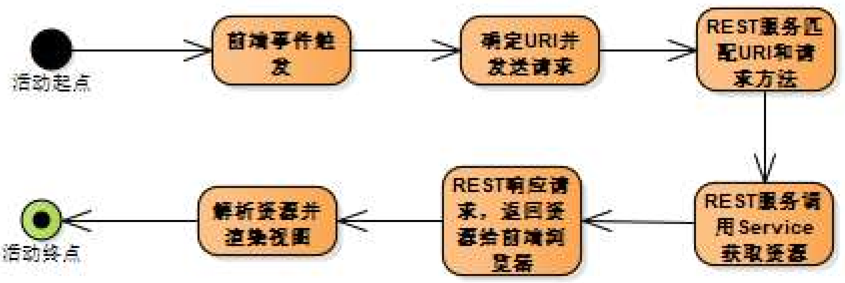
说明：收银员在使用系统时，首先输入商品号，通过商品号索引得出具体商品，再选择数目并添加到已购清单。在此过程中，促销规则的匹配会在后台服务器自动完成，匹配后的商品条目会被打上规则 ID 的标签。

3.1.3 后台业务执行流程



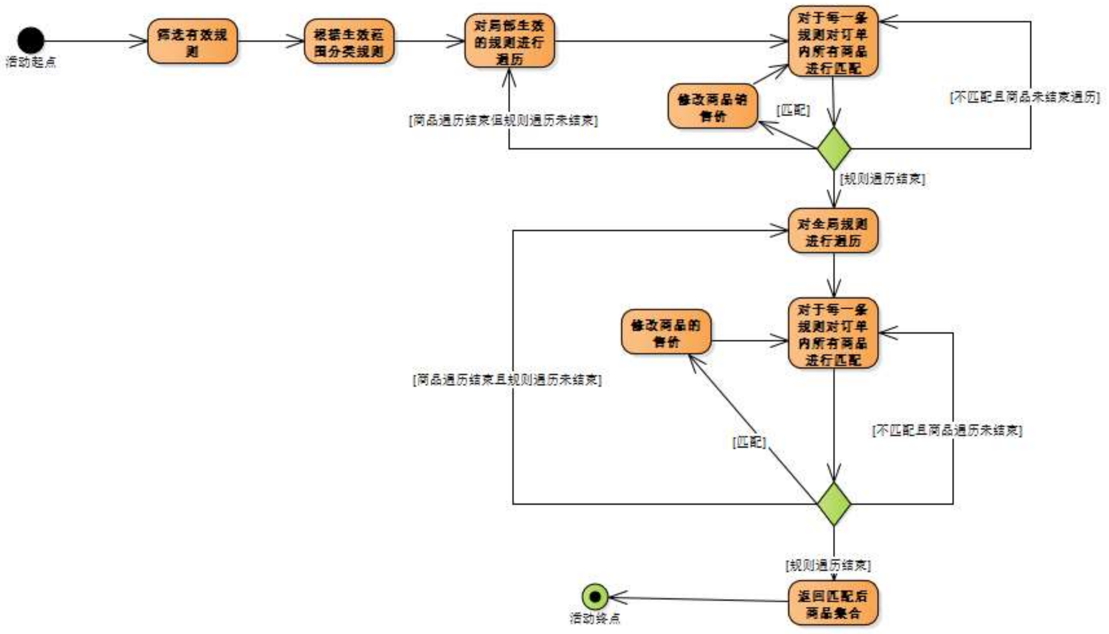
说明：前端浏览器在发送任何一个请求后，后台服务器接收并匹配其对应的资源，控制器通过其请求类型和 URI 确定具体业务。业务确定后调用 Service 进行资源的获取并及时响应请求。

3.1.4异步传输业务流程


活动起点
前端事件触发
确定URI并发送请求
REST服务匹配URI和请求方法
REST服务调用Service获取资源
REST响应请求，返回资源给前端浏览器
解析资源并渲染视图
活动终点

说明：异步传输返回数据全部采用 JSON 格式，服务器接收的请求不允许采用 GET 方法，允许表单类型和 JSON 类型的参数值传递。为配合 Spring Security CSRF，所有 AJAX 请求都应当在 Request Header 中放入 X-CSRF-TOKEN 验证报头。

3.1.5促销规则匹配的主要业务流程



4 核心接口

4.1 REST API

位置：com.superSaller.controller.REST

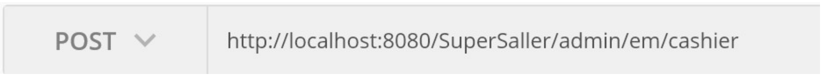
注解：@RestController
约束：所有接口不允许 GET 方法，所有接口需要有效的 X-CSRF-TOKEN 报头

4.1.1 员工资源

总览：

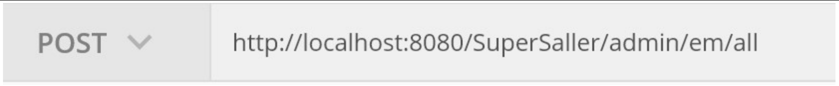
位置	com.superSaller.controller.REST.AdminRESTController.java
URI	hostname:8080/SuperSaller/admin/
Annotation	@RequesetMapping" /admin")

详细内容：

用途	获取指定员工信息	版本	1.0	状态	测试通过
URI	hostname:8080/SuperSaller/admin/em/{emid}				
允许的方法	POST	允许的参数类型	路径变量		
调用示例	 POST http://localhost:8080/SuperSaller/admin/em/cashier				

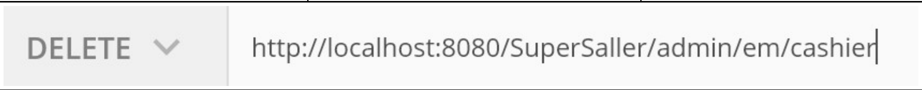
返回值示例	{
	"emRole": "cashier",
	"emID": "cashier"
	}				

控制器方法体	@RequestMapping(value = "/em/{emid}", method = RequestMethod.*POST*)
	public CashSideEmployee getCashSideEmployee(@PathVariable(value = "emid") String emid) {
	return dao.queryEmployeeByID(emid);
	}				

用途	获取所有员工信息	版本	1.0	状态	测试通过
URI	hostname:8080/SuperSaller/admin/em/all				
允许的方法	POST	允许的参数类型	null		
调用示例	 POST http://localhost:8080/SuperSaller/admin/em/all				
返回值示例	[{ "emRole": "quit",				

	″emID″: ″________″
	},
	{
	″emRole″: ″cashier″,
	″emID″: ″cashier″
	},
	{
	″emRole″: ″systemAdmin″,
	″emID″: ″jimi″
	}
	]

控制器
方法体
	@RequestMapping(value = "/em/all", method = RequestMethod.***POST***)
	public List<CashSideEmployee> getAllEm() {
	    return dao.queryAllEm();
	}

用途	删除员工	版本	1.0	状态	测试通过
URI	hostname:8080/SuperSaller/admin/em/{emid}				
允 许 的方法	DELETE	允许的参数类型	路径变量		
调 用 示例	 DELETE http://localhost:8080/SuperSaller/admin/em/cashier				

返回数据示例	{
	″status″: true,
	}				

控制器
方法体
	@RequestMapping(value = "/em/{emid}", method = RequestMethod.***DELETE***)
	public Map<String, Boolean> deleteEmByID(@PathVariable("emid") String emID) {
	    Map<String, Boolean> status = **new** HashMap<String, Boolean>();
	    status.put("status", dao.deleteEm(emID));
	    return status;
	}				

4.1.2商品资源

总览:

位置	com.superSaller.controller.REST. GoodsRESTController.java
URI	hostname:8080/SuperSaller/goods/

Annotation	@RequesetMapping” /goods”)

详细内容:

用途	商品号模糊查询	版本	1.0	状态	测试通过
URI	hostname:8080/SuperSaller/goods/fuzzyQuery				
允许的方法	POST	允许的参数类型	表单类型		
调用参数示例	{goodID:2}				
返回数据示例	[{ ″goodID″: ″2119008″, ″goodName″: ″味全活性乳酸菌饮品（芦荟味）″, ″goodSpecifications″: ″330ml″, ″goodPrice″: 6.5, ″goodType″: ″饮料″, ″goodBrand″: ″味全″, ″goodProducer″: ″杭州味全食品有限公司″ },]					

控制器方法体	@RequestMapping(value = "/fuzzyQuery", method = RequestMethod.***POST***)
	public List<Good> fuzzyQueryGoods(String goodID) {
	    return goodsSupport.fuzzyQuery(goodID);
	}				

用途	单个商品精确查询	版本	1.0	状态	测试通过
URI	hostname:8080/SuperSaller/goods/query				
允许的方法	POST	允许的参数类型	表单类型		
调用参数示例	{″goodID″: ″2119008″}				
返回数据示例	{ ″goodID″: ″2119008″, ″goodName″: ″味全活性乳酸菌饮品（芦荟味）″, ″goodSpecifications″: ″330ml″, ″goodPrice″: 6.5, ″goodType″: ″饮料″, ″goodBrand″: ″味全″, ″goodProducer″: ″杭州味全食品有限公司″					

	}

控制器
方法体
	@RequestMapping(value = "/query", method = RequestMethod.POST)
	public Good queryGood(String goodID) {
	    Good good = goodsSupport.getGood(goodID);
	    return good;
	}

用途	模糊查询商品号	版本	1.0	状态	测试通过
URI	hostname:8080/SuperSaller/goods/fuzzyQueryID				
允许的方法	POST		允许的参数类型		表单类型
调用参数示例	{goodID:″211″}				
返回数据示例	[″2119008″, ″2119029″]				

控制器
方法体
	@RequestMapping(value = "/fuzzyQueryID", method = RequestMethod.POST)
	public List<String> fuzzyQueryGoodsID(String goodID) {
	    List<Good> goods = goodsSupport.fuzzyQuery(goodID);
	    List<String> possibleID = new ArrayList<String>();
	    for (Good good : goods) {
	        possibleID.add(good.getGoodID());
	    }
	    return possibleID;
	}				

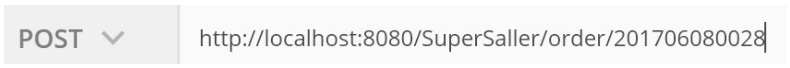
4.1.3订单资源

总览:

位置	com.superSaller.controller.REST. OrderRESTController.java
URI	hostname:8080/SuperSaller/order/
Annotation	@RequesetMapping” /order”)

详细内容:

用途	订单模糊	版本	1.0	状态	测试通过

	查询				
URI	hostname:8080/SuperSaller/order/{orderid}				
允许的方法	POST		允许的参数类型	路径变量	
调用参数示例	 POST http://localhost:8080/SuperSaller/order/201706080028				

返回数据示例	[
	  {
	    "orderID": "20170608002821000000000000000285",
	    "orderSum": 0,
	    "sumMoney": 0,
	    "employee": {
	      "emRole": "systemAdmin",
	      "emID": "jimi"
	    },
	    "status": "inited"
	  }
	]				

控制器方法体	@RequestMapping(value = "/{orderid}", method = RequestMethod.*POST*)
	public List<Order> fuzzyQueryOrders(@PathVariable("orderid") String id) {
	    return orderDAO.fuzzyQueryOrders(id);
	}				

用途	向指定订单添加商品	版本	1.0	状态	测试通过
URI	hostname:8080/SuperSaller/order/ /good/add/{orderid}/{quantity}				
允许的方法	PUT		允许的参数类型	路径变量+JSON 请求体	
调用参数示例	Request uri: http://localhost:8080/SuperSaller/order/good/add/20170608121226000000000000000330/1 request body: {"goodID":"9787508672069","goodName":"未来简史","goodSpecifications":"16 开平装","goodPrice":50.9,"goodType":"图书","goodBrand":"中信出版（Citic Press）","goodProducer":"中信出版社"}				
返回数	[{"saledGood":{"goodID":"10138758607","saledDate":{"date":{"year":2017,"month":6,"day":8				

据示例	},"time":{"hour":12,"minute":17,"second":10,"nano":0}},"sum":1.0,"price":58.0,"orderID":"20170608121226000000000000000330","RuleID":[]},"goodID":"10138758607","goodName":"52 度泸州老窖醉美泸州酒","goodSpecifications":"50ml","goodPrice":58.0,"goodType":"白酒","goodBrand":"泸州老窖系列酒","goodProducer":"泸州老窖股份有限公司"}]

控制器方法体	`@RequestMapping(value = "/good/add/{orderid}/{quantity}", method = RequestMethod.PUT)`
	`public List<ViewSideGood> addGoodToOrder(@RequestBody ViewSideGood good, @PathVariable("orderid") String orderID,`
	`@PathVariable("quantity") double quantity) {`
	`good.setSaledDate(LocalDateTime.now());`
	`good.setSaledPrice(good.getGoodPrice());`
	`good.setOrderID(orderID);`
	`good.setSum(quantity);`
	`List<ViewSideGood> viewSideGoods = orderProcess.addGoodAndMatch(good);`
	`return viewSideGoods;`
	`}`

用途	从指定订单中删除商品	版本	1.0	状态	测试通过
URI	hostname:8080/SuperSaller/order/good/delete				
允许的方法	DELETE	允许的参数类型	请求体		
调用参数示例	Uri: http://localhost:8080/SuperSaller/order/good/delete Request body: {"saledGood":{"goodID":"9787508672069","saledDate":{"date":{"year":2017,"month":6,"day":8},"time":{"hour":12,"minute":12,"second":41,"nano":0}},"sum":2,"price":50.9,"orderID":"20170608121226000000000000000330","RuleID":[]},"goodID":"9787508672069","goodName":"未来简史","goodSpecifications":"16 开平装","goodPrice":50.9,"goodType":"图书","goodBrand":"中信出版（Citic Press）","goodProducer":"中信出版社"}				
返回数据示例	[{"saledGood":{"goodID":"10138758607","saledDate":{"date":{"year":2017,"month":6,"day":8},"time":{"hour":12,"minute":17,"second":10,"nano":0}},"sum":1.0,"price":58.0,"orderID":"20170608121226000000000000000330","RuleID":[]},"goodID":"10138758607","goodName":"52 度泸州老窖醉美泸州酒","goodSpecifications":"50ml","goodPrice":58.0,"goodType":"白酒","goodBrand":"泸州老窖系列酒","goodProducer":"泸州老窖股份有限公司"}]				

控制器方法体	`@RequestMapping(value = "/good/delete", method = RequestMethod.DELETE)`
	`public List<ViewSideGood> removeFromOrder(@RequestBody ViewSideGood good) {`				

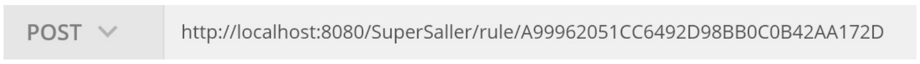
	`return orderProcess.removeGoodAndMatch(good);`
	`}`

4.1.4促销规则资源

总览：

位置	com.superSaller.controller.REST. RuleRESTController.java
URI	hostname:8080/SuperSaller/rule/
Annotation	@RequesetMapping”/rule”)

详细内容：

用途	通过UUID索引规则	版本	1.0	状态	测试通过
URI	hostname:8080/SuperSaller/rule/{uuid}				
允许的方法	POST	允许的参数类型	路径变量		
调用示例	 POST http://localhost:8080/SuperSaller/rule/A99962051CC6492D98BB0C0B42AA172D				

返回数据示例	{
	  "UUID": "A99962051CC6492D98BB0C0B42AA172D",
	  "Type": "FULLFREE",
	  "Name": "满200减20",
	  "emID": "jimi",
	  "discountRate": 100,
	  "freeMoney": 20,
	  "specialPrice": -1,
	  "conditionValue": 200,
	  "datePeriodEnd": {
	    "date": {
	      "year": 2017,
	      "month": 6,
	      "day": 30
	    },
	    "time": {
	      "hour": 0,
	      "minute": 0,
	      "second": 0,				

	```
	      "nano": 0
	    }
	  },
	  "datePeriodStart": {
	    "date": {
	      "year": 2017,
	      "month": 6,
	      "day": 6
	    },
	    "time": {
	      "hour": 0,
	      "minute": 0,
	      "second": 0,
	      "nano": 0
	    }
	  },
	  "dayPeriodEnd": 1439,
	  "dayPeriodStart": 540,
	  "priority": 0,
	  "weekPeriodEnd": 7,
	  "weekPeriodStart": 1
	}
	```

控制器方法体	
	```
	@RequestMapping(value = "/{uuid}", method = RequestMethod.POST)
	public DiscountRule qureyRuleByID(@PathVariable(value = "uuid") String uuid) {
	    return ruleDAO.queryRuleByID(uuid);
	}
	```

用途	新增规则	版本	1.0	状态	测试通过
URI	hostname:8080/SuperSaller/rule/new				
允许的方法	POST	允许的参数类型	请求体		

调用示例	
	```
	{
	  "UUID": "",
	  "Type": "FULLFREE",
	  "Name": "满 200 减 20",
	  "emID": "jimi",
	  "discountRate": 100,
	  "freeMoney": 20,
	  "specialPrice": -1,
	  "conditionValue": 200,
	  "datePeriodEnd": {
	```

	"date": {
	"year": 2017,
	"month": 6,
	"day": 30
	},
	"time": {
	"hour": 0,
	"minute": 0,
	"second": 0,
	"nano": 0
	}
	},
	"datePeriodStart": {
	"date": {
	"year": 2017,
	"month": 6,
	"day": 6
	},
	"time": {
	"hour": 0,
	"minute": 0,
	"second": 0,
	"nano": 0
	}
	},
	"dayPeriodEnd": 1439,
	"dayPeriodStart": 540,
	"priority": 0,
	"weekPeriodEnd": 7,
	"weekPeriodStart": 1
	}

返回数据示例	{
	"UUID": "A99962051CC6492D98BB0C0B42AA172D",
	"Type": "FULLFREE",
	"Name": "满 200 减 20",
	"emID": "jimi",
	"discountRate": 100,
	"freeMoney": 20,
	"specialPrice": -1,
	"conditionValue": 200,
	"datePeriodEnd": {

	```
	    "date": {
	      "year": 2017,
	      "month": 6,
	      "day": 30
	    },
	    "time": {
	      "hour": 0,
	      "minute": 0,
	      "second": 0,
	      "nano": 0
	    }
	  },
	  "datePeriodStart": {
	    "date": {
	      "year": 2017,
	      "month": 6,
	      "day": 6
	    },
	    "time": {
	      "hour": 0,
	      "minute": 0,
	      "second": 0,
	      "nano": 0
	    }
	  },
	  "dayPeriodEnd": 1439,
	  "dayPeriodStart": 540,
	  "priority": 0,
	  "weekPeriodEnd": 7,
	  "weekPeriodStart": 1
	}
	```

控制器方法体	
	```
	    @RequestMapping(value = "/new", method = RequestMethod.POST)
	    public DiscountRule addRule(@RequestBody DiscountRule rule) {
	        String uuid = UUID.randomUUID().toString().replaceAll("-",
	"").toUpperCase();
	        rule.setUUID(uuid);
	        return ruleDAO.addRule(rule);
	    }
	```

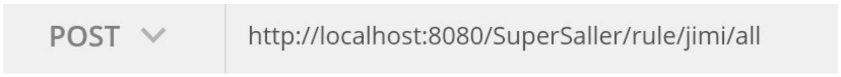
用途	向规则	版本	1.0	状态	测试通过

	添加绑定的商品				
URI	hostname:8080/SuperSaller/rule/{uuid}/good/				
允许的方法	PUT	允许的参数类型	路径变量+表单数据		

调用示例	URI:
	http://localhost:8080/SuperSaller/rule/A99962051CC6492D98BB0C0B42AA172D/good/
	Form data:
	{
	    “goodID”: “9787508672069”,
	   Sum:1
	}				

返回数据示例	{
	    “status”:true,
	}				

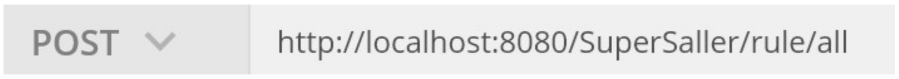
控制器方法体	`@RequestMapping(value = "/{uuid}/good/", method = RequestMethod.PUT)`
	`public Map<String, Boolean> addGoodToRule(@PathVariable("uuid") String ruleUUID, String goodID, double sum) {`
	`boolean flag = discountGoodsDAO.addGoodToRule(ruleUUID, goodID, sum);`
	`Map<String, Boolean> status = new HashMap<String, Boolean>();`
	`status.put("status", flag);`
	`return status;`
	`}`				

用途	显示指定员工创建的所有规则	版本	1.0	状态	测试通过
URI	hostname:8080/SuperSaller/rule/{emid}/all				
允许的方法	POST	允许的参数类型	路径变量		
调用示例	 POST http://localhost:8080/SuperSaller/rule/jimi/all				
返回数据示例	[{ "UUID": "A99962051CC6492D98BB0C0B42AA172D", "Type": "FULLFREE",3 "Name": "满 200 减 20", "emID": "jimi",				

	```
	    "discountRate": 100,
	    "freeMoney": 20,
	    "specialPrice": -1,
	    "conditionValue": 200,
	    "datePeriodEnd": {
	      "date": {
	        "year": 2017,
	        "month": 6,
	        "day": 30
	      },
	      "time": {
	        "hour": 0,
	        "minute": 0,
	        "second": 0,
	        "nano": 0
	      }
	    },
	    "datePeriodStart": {
	      "date": {
	        "year": 2017,
	        "month": 6,
	        "day": 6
	      },
	      "time": {
	        "hour": 0,
	        "minute": 0,
	        "second": 0,
	        "nano": 0
	      }
	    }
	]
	```

控制器方法体	
	```
	    @RequestMapping(value = "/{emid}/all", method = RequestMethod.POST)
	    public List<DiscountRule> queryAllRulesByEm(@PathVariable("emid") String emID) {
	        System.out.println(emID);
	        return ruleDAO.queryRulesByEm(emID);
	    }
	```

用途	获取所有规则	版本	1.0	状态	测试通过

URI	hostname:8080/SuperSaller/rule/all		
允许的方法	POST	允许的参数类型	null
调用示例	 POST http://localhost:8080/SuperSaller/rule/all		
返回数据示例	(见下)		

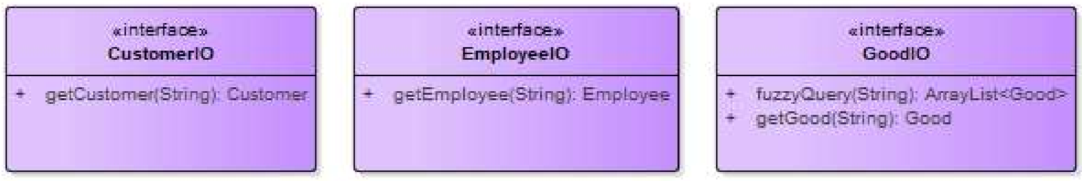
```
[
  {
    "UUID": "A99962051CC6492D98BB0C0B42AA172D",
    "Type": "FULLFREE",3
    "Name": "满 200 减 20",
    "emID": "jimi",
    "discountRate": 100,
    "freeMoney": 20,
    "specialPrice": -1,
    "conditionValue": 200,
    "datePeriodEnd": {
      "date": {
        "year": 2017,
        "month": 6,
        "day": 30
      },
      "time": {
        "hour": 0,
        "minute": 0,
        "second": 0,
        "nano": 0
      }
    },
    "datePeriodStart": {
      "date": {
        "year": 2017,
        "month": 6,
        "day": 6
      },
      "time": {
        "hour": 0,
        "minute": 0,
        "second": 0,
        "nano": 0
      }
    }
```

	]

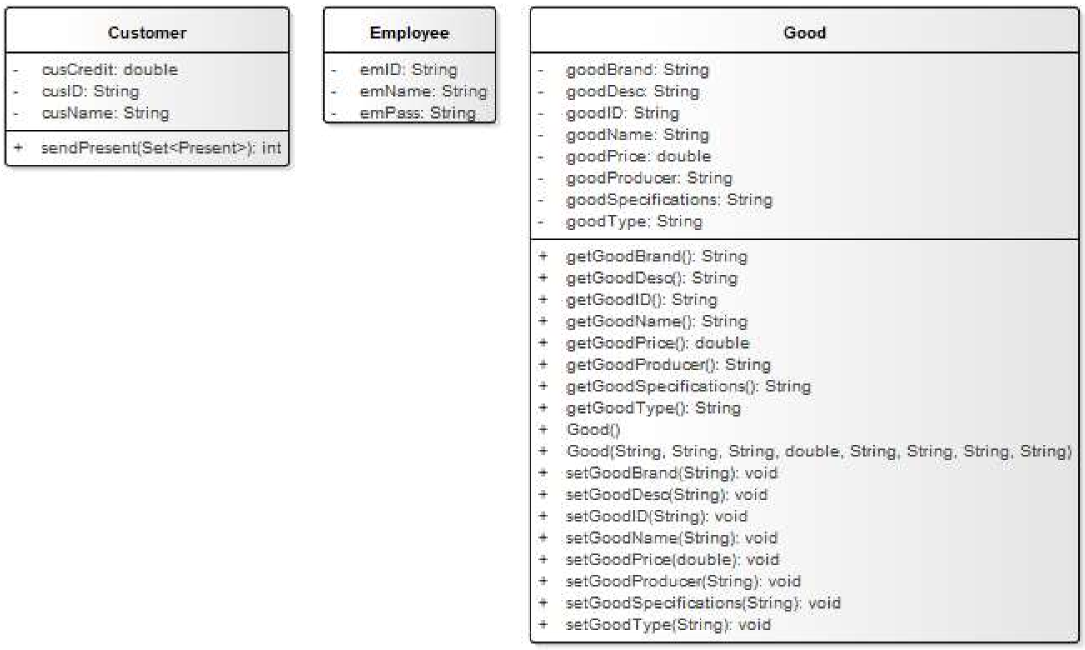
控制器方法体	`@RequestMapping(value = "/all", method = RequestMethod.POST)`
	`public List<DiscountRule> queryAllRules() {`
	`return ruleDAO.queryAllRules();`
	`}`

4.2 业务接口类

4.2.1外部支持系统

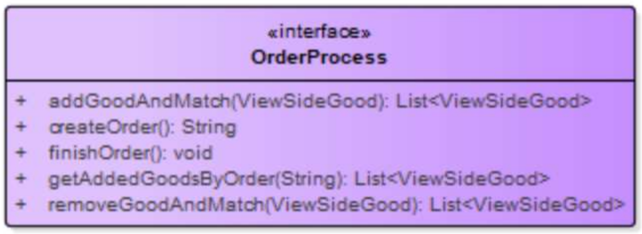

«interface»
CustomerIO
+ getCustomer(String): Customer
«interface»
EmployeeIO
+ getEmployee(String): Employee
«interface»
GoodIO
+ fuzzyQuery(String): ArrayList<Good>
+ getGood(String): Good

本系统正常运行所需要的外部支持系统包含有三类，主要负责非本系统边界内的资源的读写，其中最为常用的接口应当为GoodIO，应该尽可能提高其并发性能。

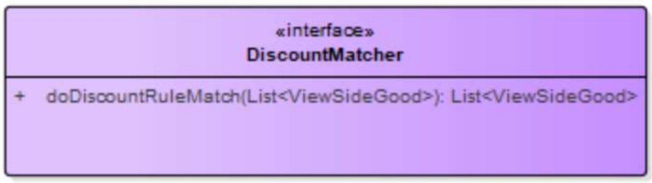

Customer
- cusCredit: double
- cusID: String
- cusName: String
+ sendPresent(Set<Present>): int
Employee
- emID: String
- emName: String
- emPass: String
Good
- goodBrand: String
- goodDesc: String
- goodID: String
- goodName: String
- goodPrice: double
- goodProducer: String
- goodSpecifications: String
- goodType: String
+ getGoodBrand(): String
+ getGoodDesc(): String
+ getGoodID(): String
+ getGoodName(): String
+ getGoodPrice(): double
+ getGoodProducer(): String
+ getGoodSpecifications(): String
+ getGoodType(): String
+ Good()
+ Good(String, String, String, double, String, String, String, String)
+ setGoodBrand(String): void
+ setGoodDesc(String): void
+ setGoodID(String): void
+ setGoodName(String): void
+ setGoodPrice(double): void
+ setGoodProducer(String): void
+ setGoodSpecifications(String): void
+ setGoodType(String): void

外部支持系统实现时，需要根据上图所示的实体类进行相关实体的构建或转换以保持与本系统的相容性。

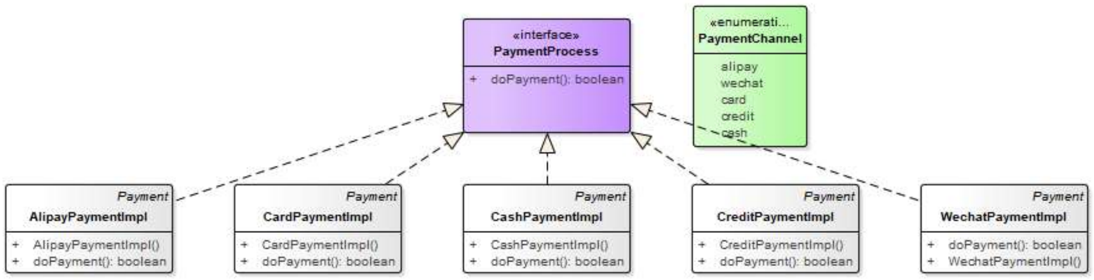
4.2.2 订单处理接口


«interface»
OrderProcess
+ addGoodAndMatch(ViewSideGood): List<ViewSideGood>
+ createOrder(): String
+ finishOrder(): void
+ getAddedGoodsByOrder(String): List<ViewSideGood>
+ removeGoodAndMatch(ViewSideGood): List<ViewSideGood>

4.2.3 促销规则匹配接口


«interface»
DiscountMatcher
+ doDiscountRuleMatch(List<ViewSideGood>): List<ViewSideGood>

4.2.4 支付接口



5 核心功能算法实现

5.1 订单处理器

```
package com.superSaller.beans.checkout.Impl;


import java.util.ArrayList;
import java.util.List;


import javax.annotation.Resource;
```

```java
import org.springframework.stereotype.Service;

import com.superSaller.beans.checkout.DiscountMatcher;
import com.superSaller.beans.checkout.OrderProcess;
import com.superSaller.beans.checkout.entities.ViewSideGood;
import com.superSaller.beans.payment.PaymentProcess;
import com.superSaller.dao.OrderDAO;
import com.superSaller.dao.SaledGoodDAO;

@Service("orderProcess")
public class OrderProcessImpl implements OrderProcess {
	@Resource(name = "orderDAO")
	private OrderDAO orderDAO;

	@Resource(name = "saledGoodDAO")
	private SaledGoodDAO saledGoodDAO;

	@Resource(name = "ruleMatcher")
	private DiscountMatcher matcher;
	private PaymentProcess paymentProcess;

	@Override
	public String createOrder() {
		return orderDAO.createOrder();
	}

	@Override
	public List<ViewSideGood> addGoodAndMatch(ViewSideGood good) {
		List<ViewSideGood> viewSideGoods = addGood(good);
		matcher.doDiscountRuleMatch(viewSideGoods);
		// return viewSideGoods;
		return batchUpdateGood(viewSideGoods);
	}

	@Override
	public List<ViewSideGood> removeGoodAndMatch(ViewSideGood good) {
		List<ViewSideGood> viewSideGoods = removeGood(good);
		if (viewSideGoods.size() > 0) {
			matcher.doDiscountRuleMatch(viewSideGoods);
			// return viewSideGoods;
```

```
				return batchUpdateGood(viewSideGoods);
			} else {
				return new ArrayList<ViewSideGood>();
			}

	}

	private List<ViewSideGood> addGood(ViewSideGood good) {
		if (orderDAO.queryOrder(good.getOrderID()) == null) {
			good.setOrderID(createOrder());
		}
		saledGoodDAO.addSaledGood(good.getSaledGood());
		return saledGoodDAO.getGoodsInsameOrder(good);
	}

	private List<ViewSideGood> removeGood(ViewSideGood good) {
		saledGoodDAO.removeSaledGood(good.getSaledGood());
		return saledGoodDAO.getGoodsInsameOrder(good);
	}

	private List<ViewSideGood> batchUpdateGood(List<ViewSideGood> goods) {
		// not set rule that matched
		return saledGoodDAO.batchUpdateGoods(goods);
	}

	@Override
	public List<ViewSideGood> getAddedGoodsByOrder(String orderID) {
		// TODO Auto-generated method stub
		return null;
	}

	@Override
	public void finishOrder() {
		// TODO Auto-generated method stub
	}
}
```

5.2 规则匹配

5. 2. 1 规则匹配器控制器

```
package com.superSaller.beans.checkout.Impl;

import java.time.LocalDateTime;
import java.util.ArrayList;
import java.util.List;
import javax.annotation.Resource;
import org.springframework.stereotype.Service;
import com.superSaller.beans.checkout.DiscountMatcher;
import com.superSaller.beans.checkout.entities.DiscountRule;
import com.superSaller.beans.checkout.entities.Present;
import com.superSaller.beans.checkout.entities.ViewSideGood;
import com.superSaller.dao.RuleDAO;

@Service(value = "ruleMatcher")
public class DiscountRuleMatcherImpl implements DiscountMatcher {
	private List<ViewSideGood> goods;
	private List<DiscountRule> rules;
	private List<Present> presents;

	@Resource(name = "ruleDAO")
	private RuleDAO ruleDAO;

	public DiscountRuleMatcherImpl() {
	}

	@Override
	public List<ViewSideGood> doDiscountRuleMatch(List<ViewSideGood> goods) {
		this.goods = goods;
		doRuleValidity();
		rules = ruleDAO.queryAllRules(); // for test
		doRuleMatch();
		goods = this.goods;
		return goods;
	}
	/**
	 *
```

```
     * @param customer
     * @param rules
     */
    private void doRuleMatch() {
        List<DiscountRule> partlyRules = new ArrayList<DiscountRule>();
        List<DiscountRule> globalRule = new ArrayList<DiscountRule>();
        for (DiscountRule rule : rules) {
            if (rule.getBundleGoods().size() == 0) {
                globalRule.add(rule);
            } else {
                partlyRules.add(rule);
            }
        }
        for (DiscountRule rule : partlyRules) {
            doDetailMatch(rule);
        }
        for (DiscountRule rule : globalRule) {
            doDetailMatch(rule);
        }
    }

    private void doDetailMatch(DiscountRule rule) {
        switch (rule.getType()) {
        case "FULLFREE":
            new FULLFREEMatcher().match(rule, goods);
            break;
        case "FULLCOUNT":
            new FULLCOUNTMatcher().match(rule, goods);
            break;
        case "FULLPRESENT":
            break;
        case "FULLVOUCHER":
            break;
        case "BUYPRESENT":
            break;
        case "BUYPRESET":
            break;
        case "BUYSPECIAL":
            break;
        case "BUYFREE":
            new BUYFREEMatcher().match(rule, goods);
```

```
                break;
            case "BUYCOUNT":
                break;
            case "BUYVOUCHER":
                break;
            }
    }

    // valid rules
    private void doRuleValidity() {
        List<DiscountRule> rules = ruleDAO.queryAllRules();
        List<DiscountRule> filteDiscountRules = new ArrayList<DiscountRule>();
        for (DiscountRule discountRule : rules) {
            boolean flag = true;
            LocalDateTime now = LocalDateTime.now();
            int miniteOfDayOfNow = now.getHour() * 60 + now.getMinute();
            if (discountRule.getDatePeriodStart().isAfter(LocalDateTime.now())) {
                // DATE NOT BEGIN
                flag = false;
            } else if (discountRule.getDatePeriodEnd().isBefore(LocalDateTime.now())) {
                // DATE ALREADY PASSED
                flag = false;
            } else if (discountRule.getDayPeriodStart() > miniteOfDayOfNow) {
                // TIME NOT BEGIN
                flag = false;
            } else if (discountRule.getDayPeriodEnd() < miniteOfDayOfNow) {
                // TIME ALREADY PASSED
                flag = false;
            }
            if (flag) {
                filteDiscountRules.add(discountRule);
            }
        }
        this.rules = filteDiscountRules;
    }

}
```

5.2.2基础匹配处理器

```
package com.superSaller.beans.checkout.Impl;
```

```
import java.util.Map;
import java.util.Set;

public class BasicGoodsMatcher {

	public boolean matchBundle(Map<String, Double> toCantain, Map<String, Double>
toBeCotained) {
		// TODO might happen that goods in chart is zero
		boolean matched = false;
		Set<String> keysToBeContained = toBeCotained.keySet();
		if (toCantain.keySet().containsAll(keysToBeContained)) {
			matched = true;
			for (String string : keysToBeContained) {
				if (toCantain.get(string) < toBeCotained.get(string)) {
					matched = false;
					break;
				}
			}
		}
		return matched;
	}

}
```

5.2.3FULLFREE 匹配处理器

```
package com.superSaller.beans.checkout.Impl;

import java.util.ArrayList;
import java.util.List;
import java.util.Map;
import java.util.Set;
import java.util.TreeMap;

import com.superSaller.beans.checkout.entities.DiscountRule;
import com.superSaller.beans.checkout.entities.ViewSideGood;

public class FULLFREEMatcher extends BasicGoodsMatcher {
    public List<ViewSideGood> match(DiscountRule rule, List<ViewSideGood> goods) {
        if (matchedFilter(rule, goods)) {
            return goods;
        }
        double totalMoney = 0, sum = 0, averageFreeMoney;
        Map<String, Double> goodsNums = new TreeMap<String, Double>();
        for (ViewSideGood viewSideGood : goods) {
            sum += viewSideGood.getSum();
            totalMoney += viewSideGood.getSaledPrice() * viewSideGood.getSum();
            goodsNums.put(viewSideGood.getGoodID(), viewSideGood.getSum());
        }
        if (rule.getBundleGoods().size() == 0) {
            if (totalMoney >= rule.getConditionValue()) {
                double discountMoney = (totalMoney - rule.getFreeMoney()) * (100 -
rule.getDiscountRate()) / 100;
                averageFreeMoney = (discountMoney + rule.getFreeMoney()) / sum;
                for (ViewSideGood viewSideGood : goods) {
                    viewSideGood.setSaledPrice(viewSideGood.getSaledPrice() -
averageFreeMoney);
                    List<String> list = viewSideGood.getRuleID();
                    list.add(rule.getUUID());
                }
            }
        } else if (matchBundle(goodsNums, rule.getBundleGoods())) {
            Set<String> ids = rule.getBundleGoods().keySet();
            totalMoney = sum = averageFreeMoney = 0;
            List<ViewSideGood> bundleGoods = new ArrayList<ViewSideGood>();
            for (ViewSideGood viewSideGood : goods) {
                if (ids.contains(viewSideGood.getGoodID())) {
                    bundleGoods.add(viewSideGood);
                }
            }
            for (ViewSideGood viewSideGood : bundleGoods) {
                sum += viewSideGood.getSum();
                totalMoney += viewSideGood.getSaledPrice() * viewSideGood.getSum();
            }
            double discountMoney = (totalMoney - rule.getFreeMoney()) * (100 -
rule.getDiscountRate()) / 100;
            averageFreeMoney = (discountMoney + rule.getFreeMoney()) / sum;
            for (ViewSideGood viewSideGood : bundleGoods) {
                    viewSideGood.setSaledPrice(viewSideGood.getSaledPrice() - averageFreeMoney);
                    List<String> list = viewSideGood.getRuleID();
                    list.add(rule.getUUID());
                }
            }
            return goods;
        }

        private boolean matchedFilter(DiscountRule rule, List<ViewSideGood> goods) {
            // TODO when saled goods rules and orders dao finished, add real filter.
            boolean flag = false;
            for (ViewSideGood viewSideGood : goods) {
                if (rule.getUUID().equals(viewSideGood.getRuleID())) {
                    flag = true;
                    break;
                }
            }
            return flag;
        }

}
```

5.2.4FULLCOUNT 匹配处理器

```
package com.superSaller.beans.checkout.Impl;

import java.util.ArrayList;
import java.util.List;
import java.util.Map;
import java.util.Set;
import java.util.TreeMap;

import com.superSaller.beans.checkout.entities.DiscountRule;
import com.superSaller.beans.checkout.entities.ViewSideGood;

public class FULLCOUNTMatcher extends BasicGoodsMatcher {

        public List<ViewSideGood> match(DiscountRule rule, List<ViewSideGood> goods) {
            double totalMoney = 0, sum = 0, averageFreeMoney;
        Map<String, Double> goodsNums = new TreeMap<String, Double>();
        for (ViewSideGood viewSideGood : goods) {
            sum += viewSideGood.getSum();
            totalMoney += viewSideGood.getSaledPrice() * viewSideGood.getSum();
            goodsNums.put(viewSideGood.getGoodID(), viewSideGood.getSum());
        }
        if (rule.getBundleGoods().size() == 0) {
            if (totalMoney >= rule.getConditionValue()) {
                double discountMoney = totalMoney * (100 - rule.getDiscountRate()) / 100;
                averageFreeMoney = discountMoney / sum;
                for (ViewSideGood viewSideGood : goods) {
                    viewSideGood.setSaledPrice(viewSideGood.getSaledPrice() -
averageFreeMoney);
                    List<String> list = viewSideGood.getRuleID();
                    list.add(rule.getUUID());
                }
            }
        } else if (matchBundle(goodsNums, rule.getBundleGoods())) {
            Set<String> ids = rule.getBundleGoods().keySet();
            totalMoney = sum = averageFreeMoney = 0;
            List<ViewSideGood> bundleGoods = new ArrayList<ViewSideGood>();
            for (ViewSideGood viewSideGood : goods) {
                if (ids.contains(viewSideGood.getGoodID())) {
                    bundleGoods.add(viewSideGood);
                }
            }
            for (ViewSideGood viewSideGood : bundleGoods) {
                sum += viewSideGood.getSum();
                totalMoney += viewSideGood.getSaledPrice() * viewSideGood.getSum();
            }
            double discountMoney = totalMoney * (100 - rule.getDiscountRate()) / 100;
            averageFreeMoney = discountMoney / sum;
            for (ViewSideGood viewSideGood : bundleGoods) {
                viewSideGood.setSaledPrice(viewSideGood.getSaledPrice() - averageFreeMoney);
                List<String> list = viewSideGood.getRuleID();
                list.add(rule.getUUID());
            }
        }
        return goods;
    }
}
```

5.2.5BUYFREE 匹配处理器

```
package com.superSaller.beans.checkout.Impl;

import java.util.ArrayList;
import java.util.List;
import java.util.Map;
import java.util.Set;
import java.util.TreeMap;

import com.superSaller.beans.checkout.entities.DiscountRule;
import com.superSaller.beans.checkout.entities.ViewSideGood;

public class BUYFREEMatcher extends BasicGoodsMatcher {

    public List<ViewSideGood> match(DiscountRule rule, List<ViewSideGood> goods) {
        double totalMoney = 0, sum = 0, averageFreeMoney = 0, freeMoney = Double.MAX_VALUE;
        Map<String, Double> goodsNums = new TreeMap<String, Double>();
        for (ViewSideGood viewSideGood : goods) {
            sum += viewSideGood.getSum();
            totalMoney += viewSideGood.getSaledPrice() * viewSideGood.getSum();
            goodsNums.put(viewSideGood.getGoodID(), viewSideGood.getSum());
            freeMoney = viewSideGood.getSaledPrice() < freeMoney ?
viewSideGood.getSaledPrice() : freeMoney;
        }

        if (rule.getBundleGoods().size() == 0) {
            if (sum >= rule.getConditionValue()) {
                freeMoney = rule.getFreeMoney() > 0 ? rule.getFreeMoney() : freeMoney;
                double discountMoney = (totalMoney - freeMoney) * (100 -
rule.getDiscountRate()) / 100;
                averageFreeMoney = (discountMoney + freeMoney) / sum;
                for (ViewSideGood viewSideGood : goods) {
                    viewSideGood.setSaledPrice(viewSideGood.getSaledPrice() -
averageFreeMoney);
                    List<String> list = viewSideGood.getRuleID();
                    list.add(rule.getUUID());
                }
```

```
                        }
                } else if (matchBundle(goodsNums, rule.getBundleGoods())) {
                        Set<String> ids = rule.getBundleGoods().keySet();
                        totalMoney = sum = averageFreeMoney = 0;
                        freeMoney = Double.MAX_VALUE;
                        int minMatchTimes = Integer.MAX_VALUE;
                        List<ViewSideGood> bundleGoods = new ArrayList<ViewSideGood>();
                        for (ViewSideGood viewSideGood : goods) {
                                if (ids.contains(viewSideGood.getGoodID())) {
                                        bundleGoods.add(viewSideGood);
                                }
                        }
                        for (ViewSideGood viewSideGood : bundleGoods) {
                                sum += viewSideGood.getSum();
                                totalMoney += viewSideGood.getSaledPrice() * viewSideGood.getSum();
                                int min = (new Double(viewSideGood.getSum())).intValue();
                                minMatchTimes = min < minMatchTimes ? min : minMatchTimes;
                                freeMoney = viewSideGood.getSaledPrice() < freeMoney ?
viewSideGood.getSaledPrice() : freeMoney;
                        }
                        int min = (new Double(rule.getConditionValue())).intValue();
                        minMatchTimes = min < minMatchTimes ? min : minMatchTimes;

                        System.out.println(freeMoney + "    " + minMatchTimes);
                        freeMoney = freeMoney * minMatchTimes;

                        double discountMoney = (totalMoney - freeMoney) * (100 - rule.getDiscountRate()) /
100;
                        averageFreeMoney = (discountMoney + freeMoney) / sum;
                        for (ViewSideGood viewSideGood : bundleGoods) {
                                viewSideGood.setSaledPrice(viewSideGood.getSaledPrice() - averageFreeMoney);
                                List<String> list = viewSideGood.getRuleID();
                                list.add(rule.getUUID());
                        }
                }
                return goods;
        }
}
```

6 尚未解决的问题

1. 收银功能；
2. 规则管理功能；
3. 员工管理；
4. 规则匹配可能出现多次重复优惠；
5. 订单的取消功能；
6. 未完成订单读取功能；
7. 规则的编辑；
8. 用户账户登录次数保护。