软件工程大作业文档

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1 系统/子系统设计（结构设计）说明（后台部分）

1.1 引言

1.1.1 系统概述

后台分为两个部分，上层是 Controller，是用来处理业务逻辑的，下层是数据库，给上层的 Controller 提供相应的服务。下面会分两块来具体介绍这两部分。详见2和3。

1.1.2 文档概述

本文档将围绕 Spring Boot 架构来介绍后台部分。

1.2 系统级设计决策

本系统后台主要使用 Spring Boot 架构，它支持在开启服务的时候，接受 HttpRequest 或 websocket 并进行后台处理，然后返回相应的结果。系统接受的输入是 HttpRequest 或 websocket，详见2，对于每一个输入的响应，被 Controller 定义，不同的 request 会有不同的 Controller 对其进行处理并返回相应的结果。系统处理的过程中，依赖于两部分的内容：用户的 request 中的具体内容和底层数据库已有的信息。详见**??**。该系统的数据库存在服务器上，服务器的管理人员可以通过 database asdan 来访问数据库并查看当前数据库中的所有信息。该系统对服务器的要求是要求服务器能通过 maven 运行项目，并配有 mysql 数据库。

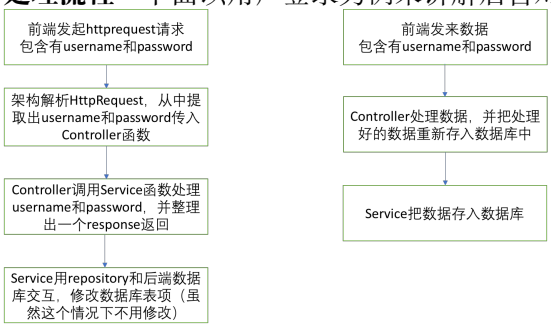
1.3 系统体系结构设计

1.3.1 系统总体设计

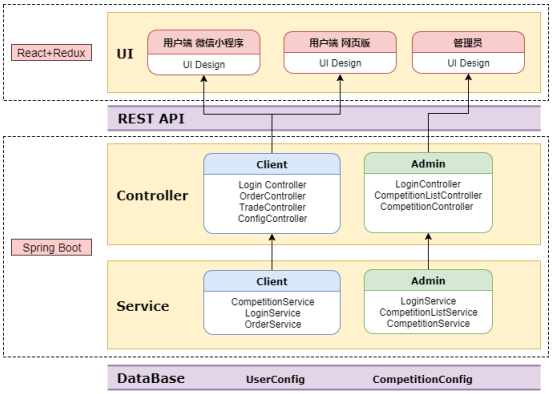
概述 本系统要实现的功能详见《prj9ASDAN 模拟商业竞拍交易大赛系统》。本系统要实现的性能：响应较快、支持并发、有一定的安全性、可在各个平台上运行、可移植等。本系统支持在 Windows、Unix、Linux 环境下运行。

设计思想 本系统顶层核心要处理的两个问题是对于 HttpRequest 的处理和对于 websocket 的处理，而底层核心要处理的问题是数据库的维护等问题。如果直接从头开始开发一套框架，则要实现的内容可能比我们当前写的多得多。所以我们后台根据这个需求找到了 Spring Boot 框架。Spring Boot 很好地通过了 Annotations 来实现我们需要的对于前端 web 端的响应，也实现了我们需要的和数据库的连接、并发的响应等等。本系统并不需要很高深的算法，但是对逻辑上的要求十分的多和细致。

基本处理流程 下面以用户登录为例来讲解后台对于 HttpRequest 的处理流程。



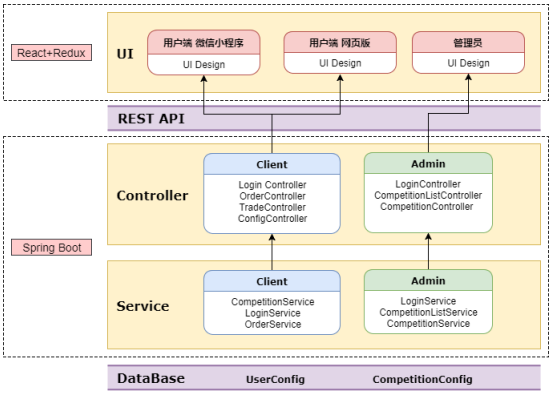
当前端发来 HttpRequest 或 websocket 的时候，Controller 首先会提取出发来的数据内容，然后将根据业务逻辑处理数据，在处理数据的过程中，可能需要访问数据库中已有的数据，如在这个情况下需要对拍数据库中的账号和密码。也有可能需要修改后台数据库，但是图中的例子不需要。在处理完数据之后，Controller 会把数据重新包装，然后根据 API 文档的说明传回前端。整个数据处理的过程可以理解为从前端发来数据，然后 Controller 向数据库 query 数据，然后处理完数据之后又 save 到数据库中，最后返回给前端。



系统体系结构

如图，前端的功能是响应用户的操作，并把用户操作的数据根据 API 文档中的要求进行包装，作为 HttpRequest 或 websocket 发往后端，后端 Controller 对于包装好的数据解码，并 query Service，和数据库交互，完成数据的处理，并完成数据库的更新。最后将 HttpRequest 返回给前端或将 websocket 转发。

1.3.2 接口设计



1.4 系统出错处理设计

系统出错后，后台数据库的内容不会被清空，并且我们是在处理 request 流程中对数据库是实时更新的，宕机之后数据库的内容还是会保留，当下次启动服务器的时候它还能从原数据库中获得原来的数据，并根据这些数据进行处理。

当系统出错后，建议重启服务器。

1.5 尚待解决的问题

微信后端的 websocket 的测试问题。

1.6 需求的可追踪性

1.7 注解

2 接口设计说明

2.1 引言

2.1.1 系统概述

接口主要分为两大类的接口，一类是 Admin 的接口，另一类是 Client 的接口。Client 有两种接口，一种是 web 端的接口，另一类是微信端的接口。Admin 本身是一个 package，两种 Client 公用一个 package，名为 client。Web 端的接口包括了正常 HttpRequest 和 Web 端的 Websocket。Web 端的 Websocket 使用 StompClient 协议，在后端使用 Spring Boot 自带的 Controller，即 @MessageMapping 和 @SendTo 来完成对 socket 内容的转发。而微信端在 HttpRequest 上和 Web 端共用一个 API，并使用裸的 socket 来回复 websocket。

2.1.2 文档概述

文档首先介绍了使用的文献，然后对于每个特定的接口进行了具体的说明。

2.2 引用文件

本文档引用了我们在开发过程中撰写的《RestAPI》文档，详情可查看RestAPI.tex。

2.3 Admin 接口

2.3.1 Login Admin

管理员登录。

Request

```
POST /api/admin/login

Host: localhost:8080
Auth:
```

```
Content-type: application/json
Accept: application/json

{
    "username": "admin",
    "password": "admin",
}
```

Returns

```
HTTP 200 OK
{
    "username": "admin",
    "token": "1283091828021803120",
}
```

Error

```
HTTP 401 NOTAUTHORIZED
{
    "error": "Admin with username admin doesn\'t exist or password is wrong."
}
```

2.3.2 Change Admin Password

更改管理员密码。

Request

```
POST /api/admin/update

Host: localhost:8080
Auth:
Content-type: application/json
Accept: application/json

{
    "username": "admin",
    "prePassword": "admin",
    "newPassword": "newpwd",
}
```

Returns

```
HTTP 200 OK
```

Error

```
HTTP 401 NOTAUTHORIZED
{
   "error": "Wrong password of admin."
}
```

2.3.3 Get All Competitions

列出全部比赛。

Status 是”not_start”, ”auction_not_record”, ”auction_recorded”, ”trade”, ”rest”, ”end”之一。

Request

```
GET /api/admin/competition/getall

Host: localhost:8080
Auth:
Content-type: application/json
Accept: application/json
```

Returns

```
HTTP 200 OK

[
   {
      "id": "competiton1_id",
      "username": "competition1",
      "status": "auction"
   },
   {
      "id": "competiton2_id",
      "username": "competition2",
      "status": "end"
   }
]
```

Error

```
HTTP 204 NO CONTENT
```

2.3.4 Create Competition

新建一场比赛。注意，底层也要生成机器的 id。注意每场比赛的基本配置（比赛名称，参赛人数）只能创建一次，不能修改。

Request

```
POST /api/admin/competition/new

Host: localhost:8080
Auth:
Content-type: application/json
Accept: application/json

{
   "username": "competition_username",
   "round": 2,
   "startWealth": 1000,

   "teamNum": 2,
   "participantNum": 3,
   "team":
   [
      {
         "username": "team1",
         "participant": ["mem11", "mem12", "mem13"],
         "password": "111111",
      },
      {
         "username": "team2",
         "participant": ["mem21", "mem22", "mem23"],
         "password": "222222",
      }
   ]

   "roundParameter":
   [
      {
         "machineStartPrice": [300, 350, 400],
         "machineNum": [1, 1, 1],
         "materialProduceCost": [10, 20, 30],
         "time": 900,
      },
      {
         "machineStartPrice": [300, 350, 400],
         "machineNum": [1, 1, 1],
         "materialProduceCost": [10, 20, 30],
```

```
            "time": 900,
        }
    ]
}
```

Returns

```
HTTP 201 CREATED
```

Error

```
HTTP 404 NOT FOUND
{
    "error":"Unable to delete. Competition with id xxx not found."
}
```

2.3.5 Delete Competition By ID

通过 ID 删除比赛。

Request

```
DELETE /api/admin/competiton/id={competition_id}

Host: localhost:8080
Auth:
Content-type: application/json
Accept: application/json
```

Returns

```
HTTP 200 OK
[
    {
        "id": "competiton2_id",
        "username": "competition2",
        "status": "end"
    }
]
```

Error

```
{
    "error":"Unable to delete. Competition with id xxx not found."
}
```

2.3.6 Update Competition Status

需要进入下一环节时，管理员端会向服务器发送更新比赛状态的请求，服务器返回当前比赛信息以便管理员端更新到最新的比赛状态。

Web Socket

```
MessageMapping: /api/admin/status/update/id=3

SendTo: /api/admin/status/id=3

EndPoint: http://127.0.0.1:8090/competitionStatus

Send JSON Pattern:
{
   "status": "auction"( "not_start", "auction_not_record", "auction_recorded", "trade", "rest", "end" )
   "round": 0/1/2/3
   "timeLeft":227(s)
 }

Get JSON Pattern:
{
   "status": "auction"( "not_start", "auction_not_record", "auction_recorded", "trade", "rest", "end" )
   "round": 0/1/2/3
}
```

Error

```
HTTP 404 NOT FOUND
{
   "error":"Unable to update. Competition with id xxx not found"
}
```

2.3.7 Get Auction Machine

获得某场比赛某一轮拍卖机器的初始信息。

Request

```
GET /api/admin/competition/auction/id={id}/round={round}

Host: localhost:8080
Auth:
Content-type: application/json
Accept: application/json
```

Returns

```
HTTP 200 OK
[
   {
      "machineId": "machine1",
      "type": "Wood",
      "startPrice": 200,
   },
   {
      "machineId": "machine2",
      "type": "Brick",
      "startPrice": 300,
   },
   {
      "machineId": "machine3",
      "type": "Cement",
      "startPrice": 400,
   }
]
```

Error

```
HTTP 404 NOT FOUND
{
   "error": "Competition with id xxx not found." (or Competition with id xxx does not have round xxx)
}
```

2.3.8 Record Auction Result

登记某场比赛某一轮的拍卖结果。

Request

```
POST /api/admin/competition/record/id={id}/round={round}

Host: localhost:8080
Auth:
Content-type: application/json
Accept: application/json
```

Returns

```
HTTP 200 OK
[
   {
      "machineId": "machine1",
```

```
        "teamId": "team1",
        "price": 2000,
    },
    {
        "machineId": "machine2",
        "teamId": "brick",
        "price": 3000,
    },
    {
        "machineId": "machine3",
        "teamId": "cement",
        "price": 4000,
    }
]
```

Error

```
HTTP 404 NOT FOUND
{
    "error": "Competition with id xxx not found." (or Competition with id xxx does not have round xxx)
}
```

2.3.9 Get Competition Property

从服务器按 id 获取某一比赛的各种属性。如果该比赛的属性尚未被设置，则该项为空。属性包括名称、比赛轮数（如果比赛已开始，则不能删除已开始或结束的轮）、比赛各项参数（不能修改已开始或结束的轮的参数）、机器的 id 等等。

Request

```
GET /api/admin/competition/property/id={id}

Host: localhost:8080
Auth:
Content-type: application/json
Accept: application/json
```

Returns

```
HTTP 200 OK
{
    "id": "competition_id",
    "username": "competition_username",
    "status": "not started",
    "teamNum": 1,
```

```
    "participantNum": 2,
    "team":
    [
        {
            "username": "team1",
            "participant": ["member1", "member2", "member2"],
            "password": "password",
        }
    ]
    "round": 1,
    "startWealth": 1000,
    "roundParameter":
    [
        {
            "machineStartPrice": [300, 350, 400],
            "machineNum": [1, 1, 1],
            "materialProduceCost": [10, 20, 30],
            "time": 900,
        }
    ]
}
```

Error

```
HTTP 404 NOT FOUND
{
    "error": "Competition with id xxx not found."
}
```

2.3.10 Update Competition Property

更新比赛的各种属性。属性包括名称、比赛轮数（如果比赛已开始，则不能更改）、比赛各项参数（不能修改已开始或结束的轮的参数）。

Request

```
PUT /api/admin/competition/property/id={id}

Host: localhost:8080
Auth:
Content-type: application/json
Accept: application/json

{
    "round": 2,
    "startWealth": 1000,
```

```
    "round_parameter":
    [
        {
            "machineStartPrice": [300, 350, 400],
            "machineNum": [1, 1, 1],
            "materialProduceCost": [10, 20, 30],
            "time": 900,
        },
        {
            "machineStartPrice": [300, 350, 400],
            "machineNum": [1, 1, 1],
            "materialProduceCost": [10, 20, 30],
            "time": 900,
        }
    ]
}
```

Returns

```
HTTP 201 CREATED
```

Error

```
HTTP 404 NOT FOUND
{
    "error": "Competition with id xxx not found."
}
```

```
HTTP 400 INVALID REQUEST
{
    "error": "Cannot update competition id xxx with given changes."
}
```

2.3.11 Get Competition Information

获取当前比赛信息，包括队伍的数量、资产、交易记录、机器的使用情况等。

Request

```
GET /api/admin/competition/info/id={id}

Host: localhost:8080
Auth:
Content-type: application/json
Accept: application/json
```

Returns

```
HTTP 200 OK
{
   "id": "competition_id",
   "username": "competition_username",
   "status": "not_start",
   "round": 2,
   "presentRound": 0,
   "teamInfo":
   [
      {
         "id": "id1",
         "wealth": 100,
         "material": [30, 40, 50],
         "machine":
         [
             {
                "id": "machine1_id",
                "type": "type1",
                "left": 3
             },
             {
                "id": "machine2_id",
                "type": "type2",
                "left": 2
             }
         ]
      },
      {
         "id": "id2",
         "wealth": 100,
         "material": [30, 40, 50],
         "machine":
         [
             {
                "id": "machine1_id",
                "type": "type1",
                "left": 3
             },
             {
                "id": "machine2_id",
                "type": "type2",
                "left": 2
             }
         ]
      }
   ],
```

```
   "trade_history":
   [
      {
         "time": "yyyy-MM-dd'T'HH:mm:ss.SSS'Z'",
         "sell": "team_id1",
         "buy": "team_id2",
         "content": {"wood": 1},
         "price": 10
      },
       {
         "time": "yyyy-MM-dd'T'HH:mm:ss.SSS'Z'",
         "sell": "team_id1",
         "buy": "team_id2",
         "content": {"machine_wood": 1},
         "price": 20
      }
   ]
}
```

content 中是 wood, brick, cement, machine_wood, machine_brick, machine_cement 中的一个。

Error

```
HTTP 404 NOT FOUND
{
   "error": "Competition with id 1 not found."
}
```

2.3.12 Record machine owner

向服务器发送对比赛的更新信息。增加机器、分配财产之类的。

Request

```
PUT /api/admin/competition/info/id={id}

Host: localhost:8080
Auth:
Content-type: application/json
Accept: application/json

{
   "round": 2,
   "present_round": 0,
   "team_info":
```

```
   [
      {
         "id": "id1",
         "wealth": "100",
         "machine":
         [
             {
                "id": "machine1_id",
                "left": 3
             },
             {
                "id": "machine2_id",
                "left": 2
             }
         ]
      },
      {
         "id": "id2",
         "wealth": "100",
         "machine":
         [
             {
                "id": "machine1_id",
                "left": 3
             },
             {
                "id": "machine2_id",
                "left": 2
             }
         ]
      }
   ]
}
```

Returns

```
HTTP 200 OK
{
   "id": "competition_id",
   "username": "competition_username",
   "status": "not started",
   "round": "2",
   "present_round": "0",
   "team_info":
   [
      {
         "id": "id1",
```

```
        "wealth": 100,
        "material": [30, 40, 50],
        "machine":
        [
            {
              "id": "machine1_id",
              "type": "type1",
              "left": 3
            },
            {
              "id": "machine2_id",
              "type": "type2",
              "left": 2
            }
        ]
    },
    {
        "id": "id2",
        "wealth": 100,
        "material": [30, 40, 50],
        "machine":
        [
            {
              "id": "machine1_id",
              "type": "type1",
              "left": 3
            },
            {
              "id": "machine2_id",
              "type": "type2",
              "left": 2
            }
        ]
    }
],
"trade_history":
[
    {
        "time": "hh:MM:ss",
        "sell": "team_id1",
        "buy": "team_id2",
        "content": {"wood": 1},
        "price": 10
    },
     {
        "time": "hh:MM:ss",
        "sell": "team_id1",
```

```
            "buy": "team_id2",
            "content": {"machine_wood": 1},
            "price": 20
        }
    ]
}
```

content 中是 wood, brick, cement, machine_wood, machine_brick, machine_cement 中的一个。

Error

```
HTTP 404 NOT FOUND
{
    "error": "Competition with id xxx not found."
}
```

```
HTTP 400 INVALID REQUEST
{
    "error": "Cannot update competition id xxx with given information."
}
```

2.4 Client 端接口

首先是 HttpRequest 的接口。

2.4.1 Login Client

用户登录。

Request

```
POST /api/client/login

Host: localhost:8080
Auth:
Content-type: application/json
Accept: application/json

{
    "username": "client",
    "password": "client",
}
```

Returns

```
HTTP 200 OK
{
    "username": "client",
     "id": "3",
    "token": "1283091828021803120",
}
```

Error

```
HTTP 401 NOTAUTHORIZED
{
    "error": "Client with userusername admin doesn\'t exist or password is wrong."
}
```

2.4.2 Get Information

这个接口在用户登录的过程中被使用，当用户登录之后，用户将其 id 发送给服务器，服务器返回用户当前的状态信息，包括队伍中有哪些人，当前比赛状态，队伍排名等信息。

注：若比赛未开始，则 rank 为 0。

Request

```
GET /api/client/info/id={id}

Host: localhost:8080
Auth:
Content-type: application/json
Accept: application/json
```

Returns »»»> 20eb624d3e96976ee93450dcd011364bb4cf34ae

```
HTTP 200 OK

{
  "memberList":
   [
      "member1":"wangmz",
      "member2":"songsh"
   ],
   "username": "team1",
   "id":3,
   "rank": 1,

   "gameStatus": "auction" ( "not_start", "auction_not_record", "auction_recorded", "trade", "rest", "end" )
```

```
   "round": 0/1/2/3 (第 ( round+1 ) 轮)
   "timeLeft":300(s)
}
```

Error

```
HTTP 404 NOT FOUND
```

2.4.3 Get Property

输入 ID，获得与这一 ID 相关的用户的财产信息。包括机器的使用情况和材料的价格。

Request

```
GET /api/client/property/id={id}

Host: localhost:8080
Auth:
Content-type: application/json
Accept: application/json
```

Returns

```
HTTP 200 OK

{
  "wealth": 3000,
  "machine":
   [
      {
         "id": 0073,
         "type": "Cement",
         "left": 3
         "lock":false
      },
      {
         "id": 0793,
         "type": "Brick",
         "left": 0
         "lock":true(正处于出售中的机器和材料 lock == true)
      },
      {
         "id": 8765,
         "type": "Wood",
         "left": 2
         "lock":false
```

```
        }
    ],
    "material":
    [
        {
            "type": "Wood",
            "price": 10,
            "number": 20,
            "lock":true
        },
        {
           "type": "Brick",
            "price": 20,
            "number": 0,
            "lock":false
        },
        {
          "type": "Cement",
            "price": 80,
            "number": 150,
            "lock":false
        }
    ]
}
```

Error

```
HTTP 404 NOT FOUND
```

2.4.4 Get All User

get 所有队伍，(除了发送消息的队伍)，用来发 sell Request 时进行选择

Request

```
GET /api/client/getAllUser/id={id}

Host: localhost:8080
Auth:
Content-type: application/json
Accept: application/json
```

Returns

```
HTTP 200 OK
```

```
{
   [
      {
      "teamId": 889,
         "username": "dddd",
      },
      {
            "teamId": 999,
         "username": "ddfadf",
      },
   ]
}
```

Error

```
HTTP 404 NOT FOUND
```

2.4.5 Get Trade History

交易历史信息。在发订单的时候客户端手动更新 History。

Request

```
GET /api/client/tradehHistory/id={id}

Host: localhost:8080
Auth:
Content-type: application/json
Accept: application/json
```

Returns

```
HTTP 200 OK
       [
          {
          "time": "yyyy-MM-dd'T'HH:mm:ss.SSS'Z'",
          "target": "team1",
          "action": "sell",
          "content": "wood",
          "price": 10,
          "number": 2
          "status": 1,( 完成 )
          "tradeId":44,
          "buyerId":9
          },
```

```
        {
        "time": "yyyy-MM-dd'T'HH:mm:ss.SSS'Z'",
        "target": "team1",
         "action": "buy",
        "content": "1234" (machine.id ==1234)
        "price": 10,
        "number": 1 ( 只能是1 )
        "status": 0, ( 正在进行 )
        "tradeId":44,
        "buyerId":9
        },

        {
        "time": "yyyy-MM-dd'T'HH:mm:ss.SSS'Z'",
        "target": "team1",
        "action": "buy",
        "content": "6666" (machine.id ==1234)
        "price": 10,
        "number": 1 ( 只能是1 )
        "status": -1, ( 失败 )
        "tradeId":44,
        "buyerId":9,
        }
    ]
```

Error

```
HTTP 404 NOT FOUND
```

2.4.6 Get Produce History

生产历史信息。

Request

```
GET /api/client/produceHistory/id={id}

Host: localhost:8080
Auth:
Content-type: application/json
Accept: application/json
```

Returns

```
HTTP 200 OK
      [
```

```
        {
        "time": "yyyy-MM-dd'T'HH:mm:ss.SSS'Z'",
        "machineId":9987
        "content": "Brick",
        "price": 10,
        "number": 2
        },
        {
        "time": "yyyy-MM-dd'T'HH:mm:ss.SSS'Z'",
        "machineId":3457
        "content": "Wood",
        "price": 10,
        "number": 2
        },
        {
        "time": "yyyy-MM-dd'T'HH:mm:ss.SSS'Z'",
        "machineId":5777
        "content": "Cement",
        "price": 10,
        "number": 2
        },
    ]
```

Error

```
HTTP 404 NOT FOUND
```

然后是 websocket 的接口。

2.4.7 交易：发出出售请求，buyer 监听

```
MessageMapping: /api/client/property/sellerId={sellerId}/buyerId={buyerId}

SendTo: /api/client/property/buyerId={buyerId}

EndPoint: http://127.0.0.1:8090/trade

Get JSon Pattern:(卖方发送)
{
  "tradeId": '',
  "sellerId":sellerId,
   "buyerId":buyerId,
   "buyer":"TOMATO"
   "typeOrMachineID":"9987" ("Wood" "Cement" "Brick" OR machineID)
   "price":300,
   "number":7
```

```
    "seller":"Rua"
}
Send JSon Pattern: ( 发给买方 )
 {
   "tradeId": tradeId,
   "sellerId": sellerId,
    "buyerId": buyerId,
    "buyer": "TOMATO"
    "typeOrMachineID": "9987" ("Wood" "Cement" "Brick" OR machineID)
    "price": 300,
    "number": 7
    "seller": "Rua"
 }
```

2.4.8 交易结束给卖家转发账单和现有资产

```
MessageMapping: /api/client/tradeFinish/sellerId={sellerId}

SendTo: /api/client/tradeFinish/id={sellerId}

EndPoint: http://127.0.0.1:8090/tradeFinish

Get JSon Pattern:
{
   "tradeId":tradeId,
   "sellerId":sellerId,
   "buyerId":buyerId,
   "buyer":"TOMATO"
   "typeOrMachineID":"9987" ("Wood" "Cement" "Brick" OR machineID)
   "price":300,
   "number":7
   "seller":"Rua"

    "isAccept":true
}

Send JSon Pattern:
{
   "reply":
   {
   "tradeId":tradeId,
   "sellerId":sellerId,
   "buyerId":buyerId,
   "buyer":"TOMATO"
   "typeOrMachineID":"9987" ("Wood" "Cement" "Brick" OR machineID)
   "price":300,
```

```
   "number":7
   "seller":"Rua"

   "isAccept":true
    }


  "propertyList":
  {
   "wealth":1000,
   "machineList":
      [
      {
         "id": 0073,
         "type": "Wood",
         "left": 3
         "lock":false
      },
      ],
      "materialList":
      [
      {
         "type": "Brick",
         "price": 20,
         "number": 0,
         "lock":false
      },
      ]
   }
}
```

2.4.9 交易结束给队友转发账单和现有资产

```
MessageMapping: /api/client/tradeFinish/buyerId={buyerId}

SendTo: /api/client/tradeFinish/id={buyerId}

EndPoint: http://127.0.0.1:8090/tradeFinish

Get JSon Pattern:
{
   "tradeId":tradeId,
   "sellerId":sellerId,
   "buyerId":buyerId,
   "buyer":"TOMATO"
   "typeOrMachineID":"9987" ("Wood" "Cement" "Brick" OR machineID)
```

```
    "price":300,
    "number":7
    "seller":"Rua"

     "isAccept":true
}

Send JSon Pattern:
{
    "reply":
    {
    "tradeId":tradeId,
    "sellerId":sellerId,
    "buyerId":buyerId,
    "buyer":"TOMATO"
    "typeOrMachineID":"9987" ("Wood" "Cement" "Brick" OR machineID)
    "price":300,
    "number":7
    "seller":"Rua"

    "isAccept":true
     }


   "propertyList":
   {
    "wealth":1000,
    "machineList":
        [
        {
            "id": 0073,
            "type": "Wood",
            "left": 3
            "lock":false
        },
        ],
        "materialList":
        [
        {
            "type": "Brick",
            "price": 20,
            "number": 0,
            "lock":false
        },
        ]
    }
}
```

2.4.10 监听比赛状态改变

```
MessageMapping: /api/client/competition/status/id={id}

SendTo: /api/client/competitionStatus/id={id}

EndPoint: http://127.0.0.1:8090/hhh

Send JSon Pattern:
{
      "gameStatus": "auction"( "not_start", "auction_not_record", "auction_recorded", "trade", "rest", "
           end" )
      "round": 0/1/2/3 (第( round+1 )轮)
      "timeLeft":227(s)

}

Get JSON Pattern:
{
   "gameStatus": "auction"( "not_start", "auction_not_record", "auction_recorded", "trade", "rest",
   "round": 0/1/2/3 (从0开始)
}
```

2.4.11 监听 produce 后资产的改变

```
MessageMapping: /api/client/ListenProperty/id=3

SendTo: /api/client/ListenProperty/receive/id=3

EndPoint: http://127.0.0.1:8090/listenProperty

Send JSon Pattern:
{
  "wealth":1000,
  "machine":
   [
      {
         "id": 0073,
         "type": "Wood",
         "left": 3
         "lock":false
      },
      {
         "id": 0793,
         "type": "Brick",
         "left": 0
```

```
            "lock":true
        },
        {
            "id": 8765,
            "type": "Cement",
            "left": 2
            "lock":false
        }
    ],
    "material":
    [
        {
           "type": "Wood",
            "price": 10,
            "number": 20,
            "lock":false
        },
        {
           "type": "Brick",
            "price": 20,
            "number": 0,
            "lock":false
        },
        {
           "type": "Cement",
            "price": 80,
            "number": 150,
            "lock":false
        }
    ]
}

Get JSON Pattern:
{
   "id":2,
   "times":1,
}
}
```

2.4.12 撤销，卖方监听

```
MessageMapping: /api/client/undo/sendToSeller/sellerId={sellerId}/buyerId={buyerId}

SendTo: /api/client/receiveUndo/id={sellerId}

EndPoint: http://127.0.0.1:8090/undo
```

```
Get JSon Pattern:(卖方发送)
{
   "tradeId": 77,
}
Send JSon Pattern:(发给卖方)
{
   "request":
   {
   "tradeId":77,
   "sellerId":sellerId,
   "buyerId":buyerId,
   "buyer":"TOMATO"
   "typeOrMachineID":"9987" ("Wood" "Cement" "Brick" OR machineID)
   "price":300,
   "number":7
   "seller":"Rua"
    }

  "propertyList":
  {
   "wealth":1000,
   "machineList":
      [
      {
         "id": 0073,
         "type": "Wood",
         "left": 3
         "lock":false
      },
      ],
      "materialList":
      [
      {
         "type": "Brick",
         "price": 20,
         "number": 0,
         "lock":false
      },
      ]
   }
}
```

2.4.13 撤销，买方监听

```
MessageMapping: /api/client/undo/sendToBuyer/sellerId={sellerId}/buyerId={buyerId}
```

SendTo: /api/client/receiveUndo/id={buyerId}

EndPoint: http://127.0.0.1:8090/undo

Get JSon Pattern:(卖方发送)

```
{
   "tradeId": 77,
}
```

Send JSon Pattern:(发给买方)

```
{
   "request":
   {
   "tradeId":77,
   "sellerId":sellerId,
   "buyerId":buyerId,
   "buyer":"TOMATO"
   "typeOrMachineID":"9987" ("Wood" "Cement" "Brick" OR machineID)
   "price":300,
   "number":7
   "seller":"Rua"
    }

  "propertyList":
  {
   "wealth":1000,
   "machineList":
      [
      {
         "id": 0073,
         "type": "Wood",
         "left": 3
         "lock":false
      },
      ],
      "materialList":
      [
      {
         "type": "Brick",
         "price": 20,
         "number": 0,
         "lock":false
      },
      ]
   }
}
```

2.5 需求的可追踪性

2.6 注解

3 数据库（顶层）设计说明

4 软件测试计划

4.1 引言

对于后端我们做了详尽的测试，包括 Controller 正确性的测试，Service 的测试和底层数据库的测试。

4.1.1 系统概述

整个 test 文件包含三种 test，分别是 Controller 的 test，Model 的 test 和 Service 的 test。Controller 中的 test 又分为 Admin 的 test 和 Client 的 test。由于没有找到微信 websocket 的 test 方法，所以微信的 websocket 没有写 test。

4.1.2 文档概述

本文档将介绍测试环境，测试计划以及测试进度。

4.1.3 与其他计划的关系

测试是在接口实现中逐步完善的。与接口的计划相辅相成，可以说是写一个接口就写了一个 test。

4.2 软件测试环境

4.2.1 后端测试

软件项 我们所用的语言是 Java，使用的框架是 Spring Boot，所有的测试都是搭建在这个框架之上的，写测试的方法也是使用了这个框架集成的 test annotations。

参与组织 Tomato 后端开发组。

人员 张慧盟、宋世虹。

要执行的测试 如上所述，需要测试 Controller，Model 和 Service。

4.3 计划

4.4 总体设计

4.4.1 测试过程

4.4.2 Controller

Admin

- AdminLoginControllerTest: 测试了两种情况，Admin 登陆成功和登录失败。
- AuctionControllerTest: 测试了 Auction 的接口，包括当 get auction 的时候应该返回什么，如果发起了错误的 get auction 操作时会返回什么，post auction 的时候 Service 的更新，post auction 错误的时候返回什么等等。
- ChangePasswordControllerTest: 测试了如果 password 输入正确的更新准则和输入错误时的报错。
- CompetitionCreatorControllerTest: 测试了创建比赛，更新比赛和获得比赛具体信息时的返回值，以及上述情况 request 出错时的返回值。
- CompetitionInfomationControllerTest: 测试了请求比赛信息时返回信息的正确性，和请求失败的返回值。
- CompetitionStatusAdminControllerTest: 测试了不同比赛状态时的返回值。
- DeleteCompetitionControllerTest: 测试了删除比赛时：正常删除、没有比赛和获得全部比赛出错的情况。
- GetAllCompetitionControllerTest: 测试了返回全部比赛时：正常返回、没有比赛、获得全部比赛出错的情况。
- UpdateCompetitionStatusControllerTest: 测试了更新比赛状态时的返回值：正常返回、没有比赛、后端没法 update 比赛状态、非法状态等情况。

Client

- BuyMaterialControllerTest: 测试了买东西时：买材料和买机器的正在交易、已经交易完成和交易取消的情况。

- ClientInfoControllerTest: 测试了获取和更新 team 信息时成功和失败时的情况。
- ClientLoginControllerTest: 测试了登陆成功和失败的情况。
- ClientPropertyControllerTest: 测试了 team 获取 property 时成功、失败的情况，测试了 team 生产的时候成功和失败的情况，
- CompetitionStatusControllerTest: 测试了更新比赛状态时 Client 的返回情况。
- GetAllUsersControllerTest: 测试了获取所有 team 的成功和失败的情况。
- GetProduceHistoryControllerTest: 测试了获取生产历史的成功和失败（没有 team, 没有 produce 记录）的情况。
- GetTradeHistoryControllerTest: 测试了获取交易历史的成功和失败（没有 team，没有 produce 记录）的情况。
- ListenPropertyControllerTest: 测试了在 websocket 转发中监听 produce 后资产的改变。
- SellMaterialControllerTest: 测试了卖资产时成功的情况，包括各种材料和机器。
- SendToSellerControllerTest: 测试了将售卖的账单转给买方和卖方的同 team，主要测试了不同账单状态的回复情况。
- UndoTradeControllerTest: 测试了撤销交易的成功情况，主要测试了发给买方和卖方的账单。

4.4.3 Service

- admin.CompetitionServiceTest: 测试了创建比赛、查找比赛、更新比赛、删除比赛的接口，测试了创建队伍、更新队伍、查找队伍的接口，测试了创建机器、查找机器、更新机器的接口，测试了获得所有 Produce 信息和交易信息的接口，测试了更新 Round 的接口。
- admin.LoginServiceTest: 测试了创建 Admin、更新 Admin、查找 Admin 和删除 Admin 的接口。
- user.CompetitionServiceTest: 测试了查找 Competition 和更新 Competition 的成功和失败的情况。
- user.LoginServiceTest: 测试了查找 team、更新 team、创建 team 和删除 team 的 Service 的成功和失败情况。

- user.OrderServiceTest: 测试了创建 Produce、查找 Produce、更新 Produce、删除 Produce 的接口，测试了创建 Trade、查找 Trade、更新 Trade、删除 Trade 的接口。

4.4.4 Model

- AdminTest: 测试了 Admin 表的各 field。
- CompetitionTest: 测试了 Competition 表的各 field，包括 Round。
- MachineTest: 测试了 Machine 表的各 field。
- MaterialTest: 测试了 Material 的 struct 是否正确。
- ProduceTest: 测试了 Produce 表的各 field。
- TeamTest: 测试了 Team 表的各 field。
- TradeTest: 测试了 Trade 表的各 field。

4.5 计划执行的测试

4.5.1 被测试项

Tomato 的整个后端。

4.6 测试进度表

如下图所示。

4.7 需求的可追踪性

本测试计划覆盖了所有后端（除微信 WebSocket 外）的需求（接口）。

4.8 评价

4.8.1 评价准则

Coverage。

4.8.2 数据处理

数据处理由 IntelliJ 自动完成，IntelliJ 将为我们生成完整的 Coverage 报告。

4.8.3 结论

本测试计划十分合理。

4.9 注解

5 软件测试报告

5.1 引言

5.1.1 系统概述

可以参见《4》中的系统概述。

5.1.2 文档概述

本文档将介绍测试的详细结果，主要是 Coverage。

5.2 测试结果概述

5.2.1 对被测试软件的总体评估

97% classes, 80% lines covered in package 'com.java.asdan.tomato.server'

Element	Class, %	Method, %	Line, %
configuration	83% (5/6)	63% (7/11)	86% (33/38)
controller	100% (55/55)	94% (324/342)	75% (1865/2461)
model	100% (13/13)	100% (184/184)	99% (372/373)
repository	100% (0/0)	100% (0/0)	100% (0/0)
security	0% (0/1)	0% (0/1)	0% (0/14)
service	100% (5/5)	98% (50/51)	98% (299/304)
util	100% (1/1)	100% (2/2)	100% (4/4)
ServerApplication	100% (1/1)	50% (1/2)	50% (2/4)

本测试覆盖率很高，可以说是十分到位了。

5.2.2 测试环境的影响

任何平台都可以进行测试，并没有什么影响。

5.2.3 改进建议

如果可以的话，可以绕出架构对微信的 websocket 进行测试。

5.3 详细的测试结果

以下是我们的测试覆盖率：

97% classes, 80% lines covered in package 'com.java.asdan.tomato.server'

Element	Class, %	Method, %	Line, %
configuration	83% (5/6)	63% (7/11)	86% (33/38)
controller	100% (55/55)	94% (324/342)	75% (1865/2461)
model	100% (13/13)	100% (184/184)	99% (372/373)
repository	100% (0/0)	100% (0/0)	100% (0/0)
security	0% (0/1)	0% (0/1)	0% (0/14)
service	100% (5/5)	98% (50/51)	98% (299/304)
util	100% (1/1)	100% (2/2)	100% (4/4)
ServerApplication	100% (1/1)	50% (1/2)	50% (2/4)

83% classes, 86% lines covered in package 'configuration'

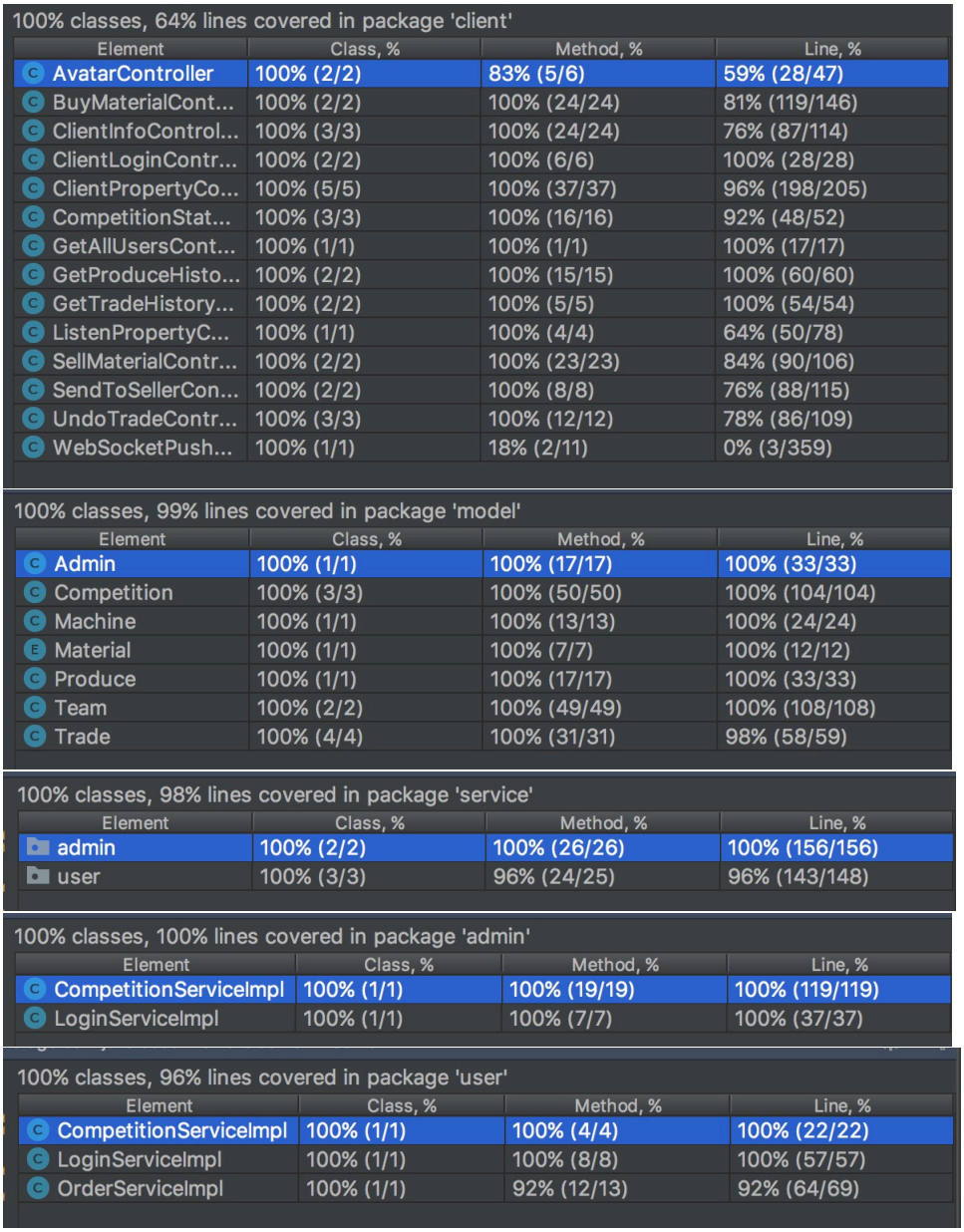
Element	Class, %	Method, %	Line, %
BeanConfiguration	0% (0/1)	0% (0/2)	0% (0/3)
CorsConfigurator	100% (1/1)	100% (1/1)	100% (3/3)
MyWebSocketInt...	100% (1/1)	0% (0/2)	33% (1/3)
SecurityConfigur...	100% (1/1)	100% (2/2)	100% (13/13)
WebSocketConfig	100% (1/1)	100% (2/2)	100% (10/10)
wxWebSocketCo...	100% (1/1)	100% (2/2)	100% (6/6)

100% classes, 75% lines covered in package 'controller'

Element	Class, %	Method, %	Line, %
admin	100% (24/24)	94% (142/150)	93% (909/971)
client	100% (31/31)	94% (182/192)	64% (956/1490)

100% classes, 93% lines covered in package 'admin'

Element	Class, %	Method, %	Line, %
AdminLoginCont...	100% (2/2)	100% (4/4)	100% (24/24)
AuctionController	100% (3/3)	93% (14/15)	91% (136/148)
ChangePasswor...	100% (2/2)	85% (6/7)	93% (28/30)
CompetitionCrea...	100% (5/5)	98% (51/52)	99% (298/300)
CompetitionInfor...	100% (5/5)	97% (41/42)	96% (249/259)
CompetitionStat...	100% (3/3)	93% (15/16)	74% (89/119)
DeleteCompetitio...	100% (1/1)	66% (2/3)	93% (29/31)
GetAllCompetitio...	100% (1/1)	66% (2/3)	89% (17/19)
UpdateCompetiti...	100% (2/2)	87% (7/8)	95% (39/41)



100% classes, 64% lines covered in package 'client'

Element	Class, %	Method, %	Line, %
AvatarController	100% (2/2)	83% (5/6)	59% (28/47)
BuyMaterialCont...	100% (2/2)	100% (24/24)	81% (119/146)
ClientInfoControl...	100% (3/3)	100% (24/24)	76% (87/114)
ClientLoginContr...	100% (2/2)	100% (6/6)	100% (28/28)
ClientPropertyCo...	100% (5/5)	100% (37/37)	96% (198/205)
CompetitionStat...	100% (3/3)	100% (16/16)	92% (48/52)
GetAllUsersCont...	100% (1/1)	100% (1/1)	100% (17/17)
GetProduceHisto...	100% (2/2)	100% (15/15)	100% (60/60)
GetTradeHistory...	100% (2/2)	100% (5/5)	100% (54/54)
ListenPropertyC...	100% (1/1)	100% (4/4)	64% (50/78)
SellMaterialContr...	100% (2/2)	100% (23/23)	84% (90/106)
SendToSellerCon...	100% (2/2)	100% (8/8)	76% (88/115)
UndoTradeContr...	100% (3/3)	100% (12/12)	78% (86/109)
WebSocketPush...	100% (1/1)	18% (2/11)	0% (3/359)

100% classes, 99% lines covered in package 'model'

Element	Class, %	Method, %	Line, %
Admin	100% (1/1)	100% (17/17)	100% (33/33)
Competition	100% (3/3)	100% (50/50)	100% (104/104)
Machine	100% (1/1)	100% (13/13)	100% (24/24)
Material	100% (1/1)	100% (7/7)	100% (12/12)
Produce	100% (1/1)	100% (17/17)	100% (33/33)
Team	100% (2/2)	100% (49/49)	100% (108/108)
Trade	100% (4/4)	100% (31/31)	98% (58/59)

100% classes, 98% lines covered in package 'service'

Element	Class, %	Method, %	Line, %
admin	100% (2/2)	100% (26/26)	100% (156/156)
user	100% (3/3)	96% (24/25)	96% (143/148)

100% classes, 100% lines covered in package 'admin'

Element	Class, %	Method, %	Line, %
CompetitionServiceImpl	100% (1/1)	100% (19/19)	100% (119/119)
LoginServiceImpl	100% (1/1)	100% (7/7)	100% (37/37)

100% classes, 96% lines covered in package 'user'

Element	Class, %	Method, %	Line, %
CompetitionServiceImpl	100% (1/1)	100% (4/4)	100% (22/22)
LoginServiceImpl	100% (1/1)	100% (8/8)	100% (57/57)
OrderServiceImpl	100% (1/1)	92% (12/13)	92% (64/69)

5.4 测试记录

本次测试结果生成于 2018 年 1 月 19 日，测试平台是 Mac，集成开发环境是 IntelliJ。见证者是宋世虹和张慧盟。

5.5 评价

5.5.1 能力

该测试覆盖了几乎所有后台的接口，可以说是很鲁棒，给前端提供了十分稳定的服务。

5.5.2 缺陷和限制

由于没有找到微信的 websocket 的测试方法, 所以我们没有对微信的 websocket 进行测试, 这很遗憾。同时，由于时间的关系，还有极少一部分代码没有被测试到。

5.6 测试活动总结

人力消耗：张慧盟、宋世虹。