ATDD验收测试驱动开发：软件开发的可视化快速反馈

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2013.11.23

TDD / ATDD / BDD: 如何解决**需求二义性、文档总过期、成果非预期**这三大顽疾

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议程

- 了解概念
  - 什么是TDD/ATDD/BDD？它们之间是什么关系？为什么要用它们？
  - TDD/ATDD/BDD的工作方法是什么？
  - 有哪些工具可以支持TDD/ATDD/BDD开发？
  - TDD/ATDD/BDD适合什么项目？不适合什么项目？
- TDD与三种类型的ATDD/BDD的代码对比
- 总结

疑问

- 如何解决传统瀑布式开发的问题：需求总变化、文档总过时、成果非预期？
  - 目前项目中，有一部分开发人员着重关注开发前的需求分析，希望能讨论出明确的需求之后再开发；而领导与客户着重提出，先开发，做出一部分功能之后，再现有基础之上再完善需求。做为中间层很为难。
  - 开发过程中，文档跟不上，老是事后补文档，开发过程中注重文档的话，开发进程又保证不了。
  - 如何较好的解决文档总过时的问题？
- 如果组织没有要求，是否自己先搭建后，如何影响组织？
  - 对于研发牵着测试鼻子走,怎么驱动(除了高层沟通)？如何驱动研发工作？
  - 如何从传统方式顺利过渡到TDD，请从管理上和个人思想及工作流程上给予解答。如何保证开发效率？
- 哪些项目适于采用TDD？哪些不适应TDD？
- **现在主流的开发模式？**

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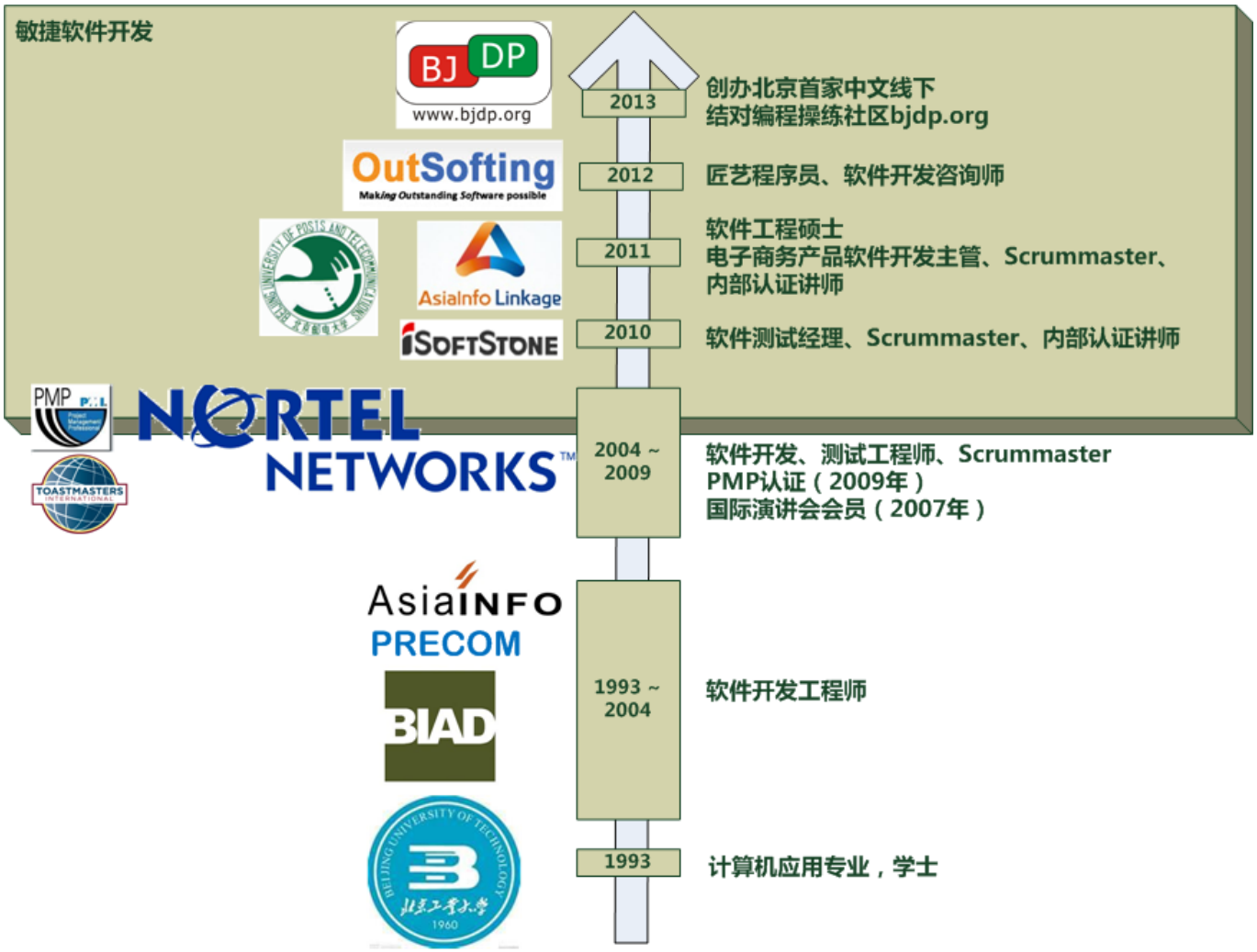
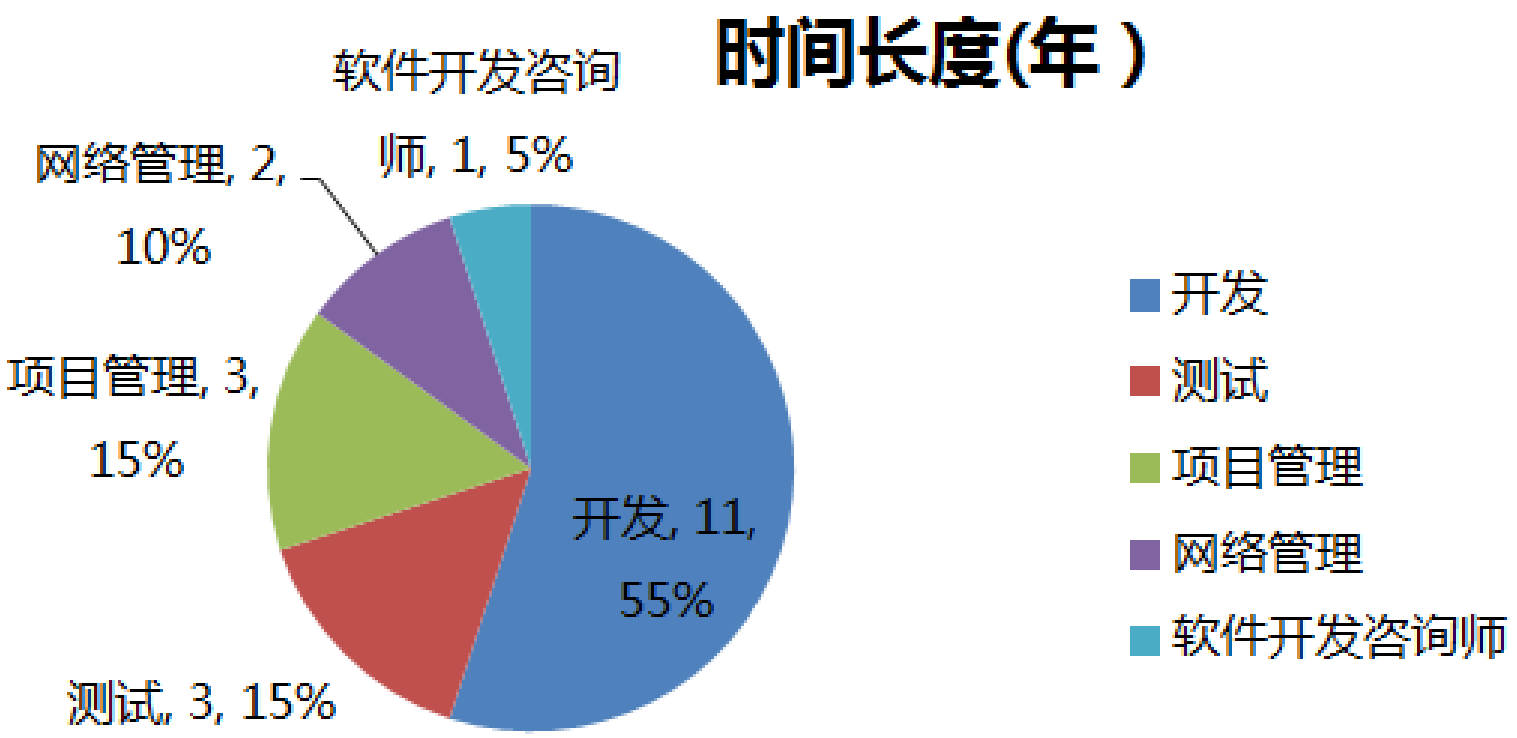
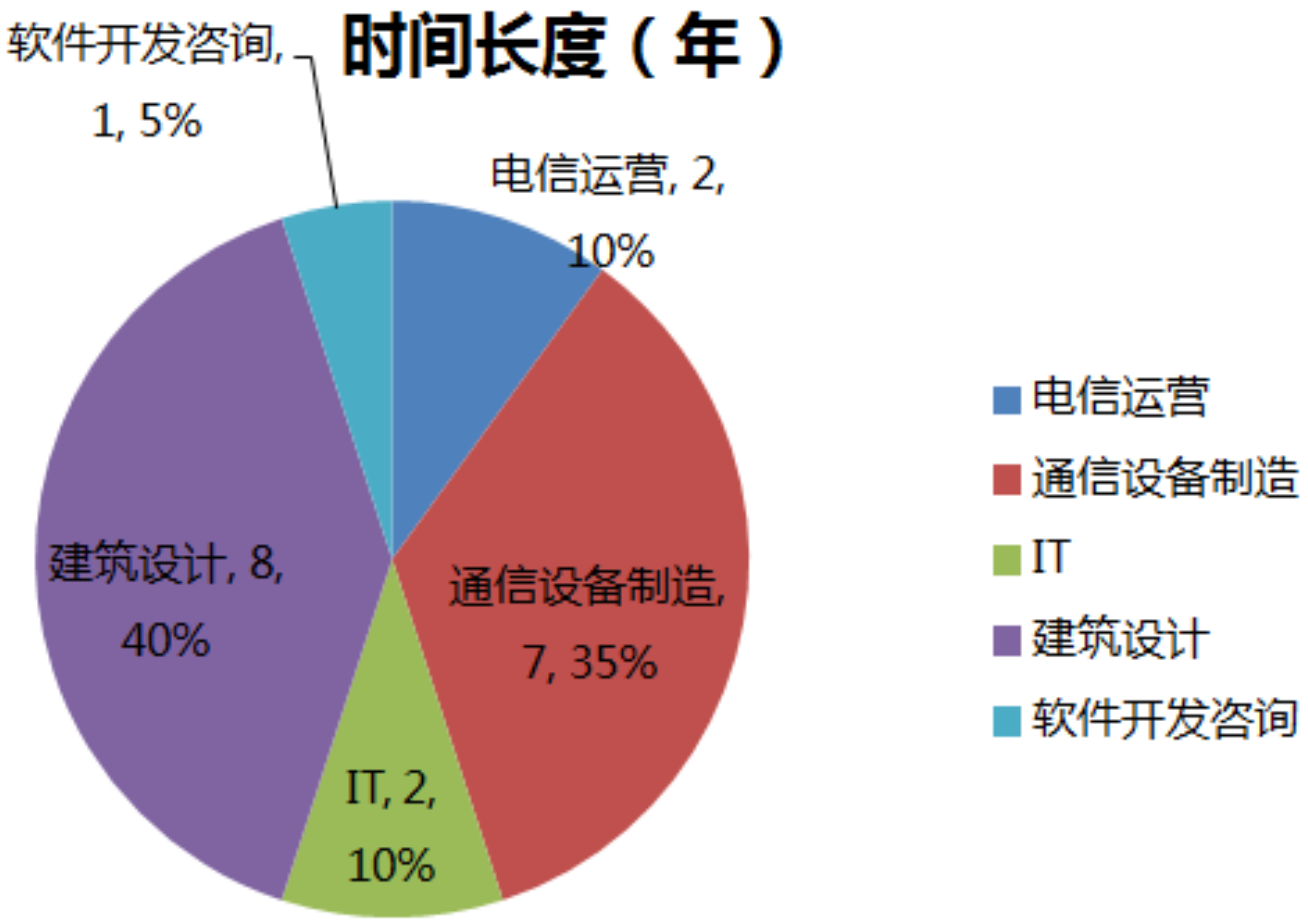


工作内容与时间长度


时间长度(年)
软件开发咨询师, 1, 5%
网络管理, 2, 10%
项目管理, 3, 15%
测试, 3, 15%
开发, 11, 55%
开发
测试
项目管理
网络管理
软件开发咨询师

行业领域与时间长度



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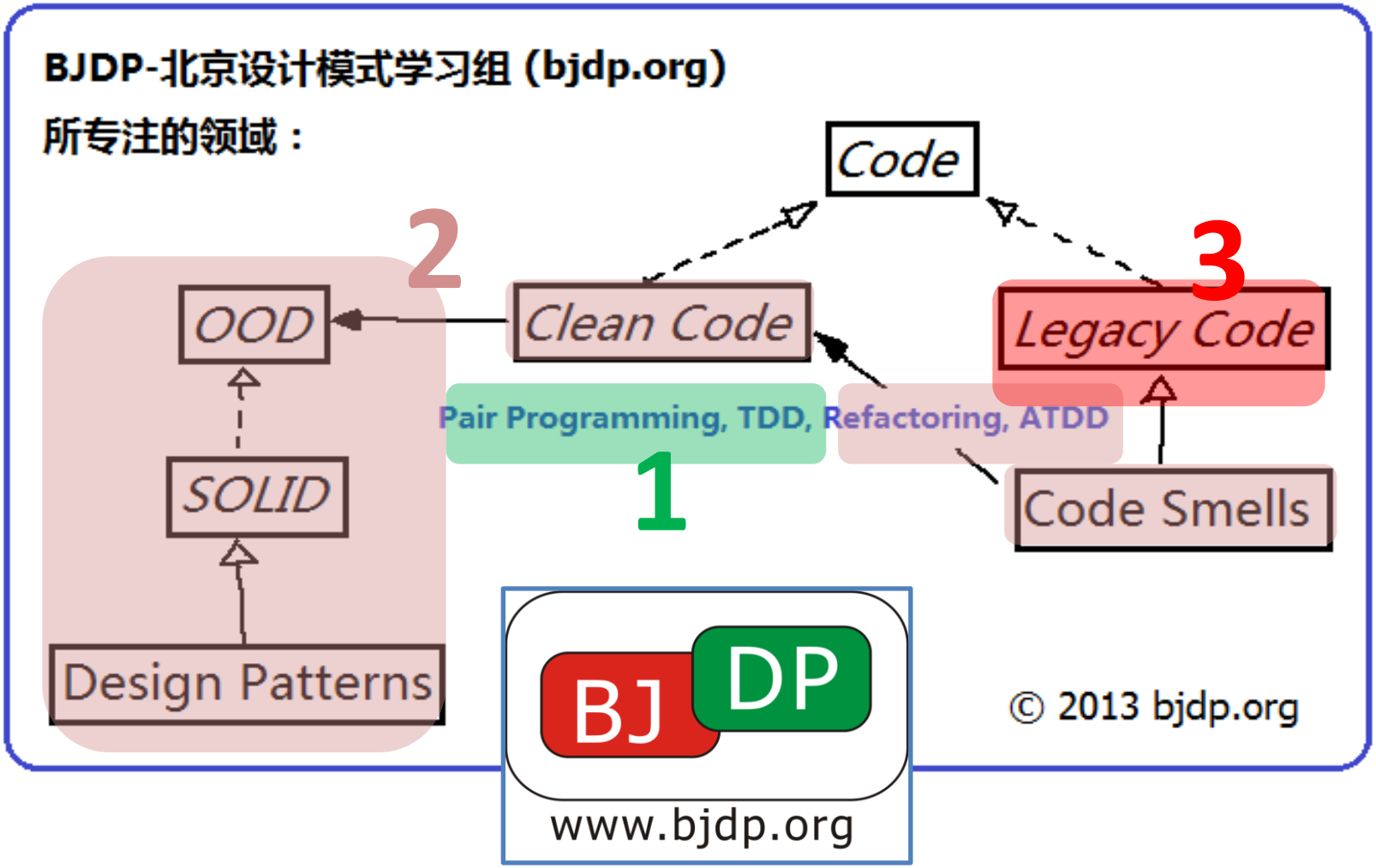
专注领域——编程匠艺(Software Craftsmanship)



如何解决传统瀑布式开发的问题

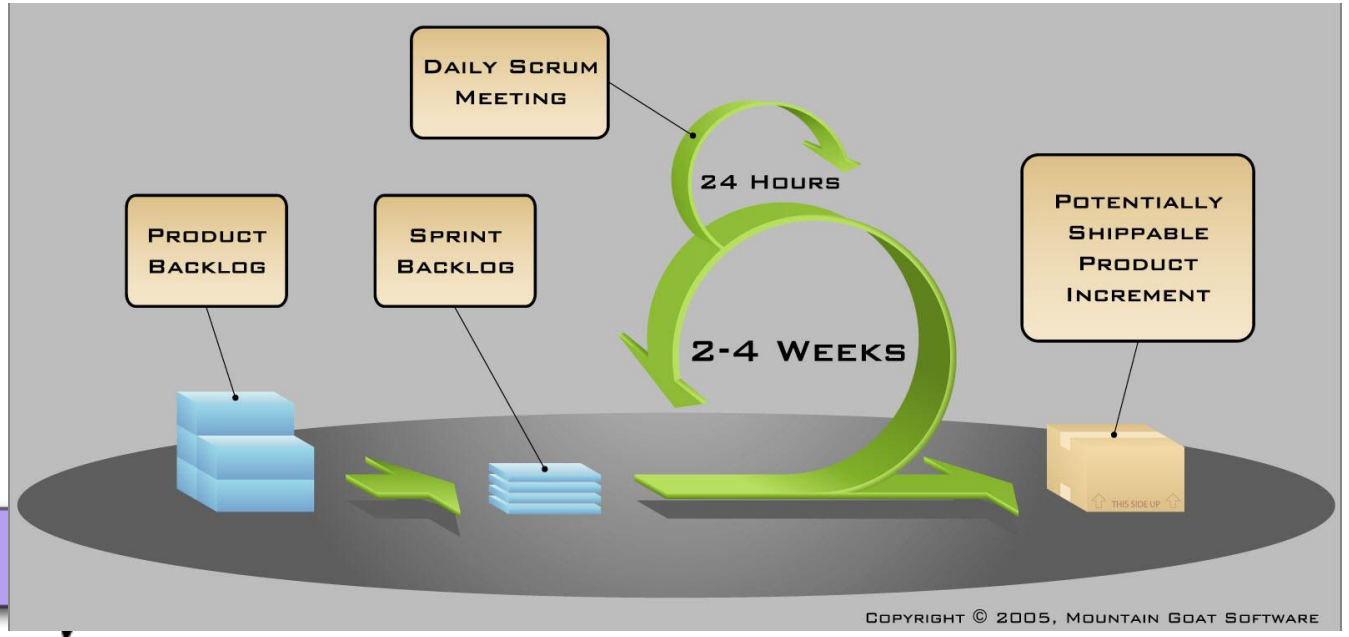
- 需求总变化
  - 世界是不可控制、不可预测的
  - 即使需求暂时不变，其描述的二义性会造成变化的效果
- 文档总过时
  - 其根本原因是文档（包括注释）与代码的分离
  - 能否将文档与代码合二为一？
- 成果非预期
  - 其根本原因也是需求描述的二义性
  - 如何解决需求描述的二义性问题？

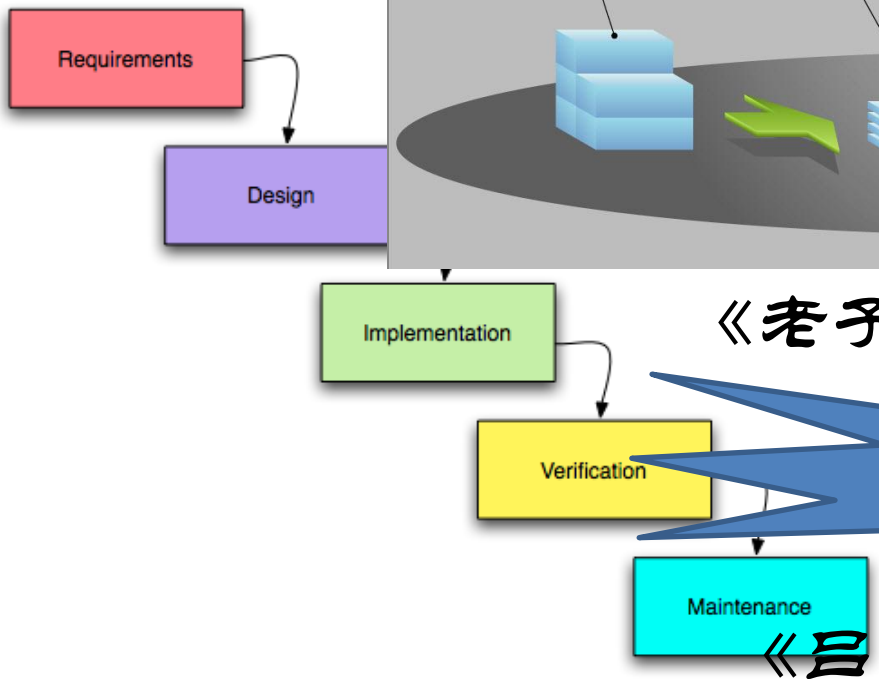
当今两种主流软件开发模式

计划驱动(Plan-Driven)	敏捷（Agile）
预测性的规划 （Predictive Planning）	自适应的规划 （Adaptive Planning）
过程优先 （Process-first）	以人为本 （People-first）

——引自Martin Folwer的2013年11月4日中关村演讲
http://martinfowler.com/articles/newMethodology.html

两种看世界的思维模式



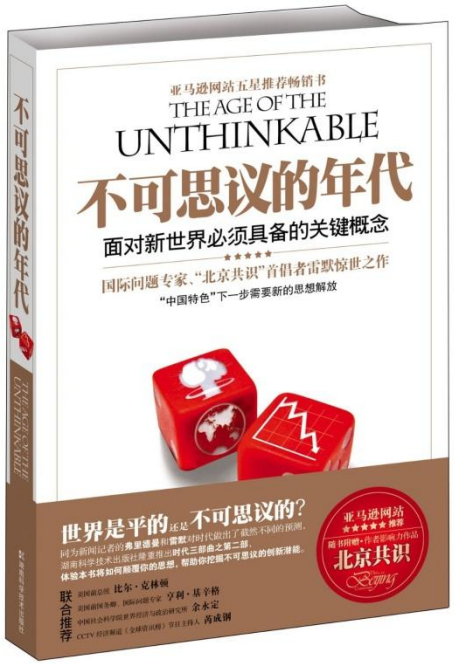


《老子》：道可道，非常道

TDD同时适应于上述两种开发模式

《吕氏春秋》：人定胜天

这个世界不可预测，
这个世界不可控制



乔舒亚•库珀•雷默 (Joshua Cooper Ramo) 、 何帆 湖南科学技术出版社 (2010-09)

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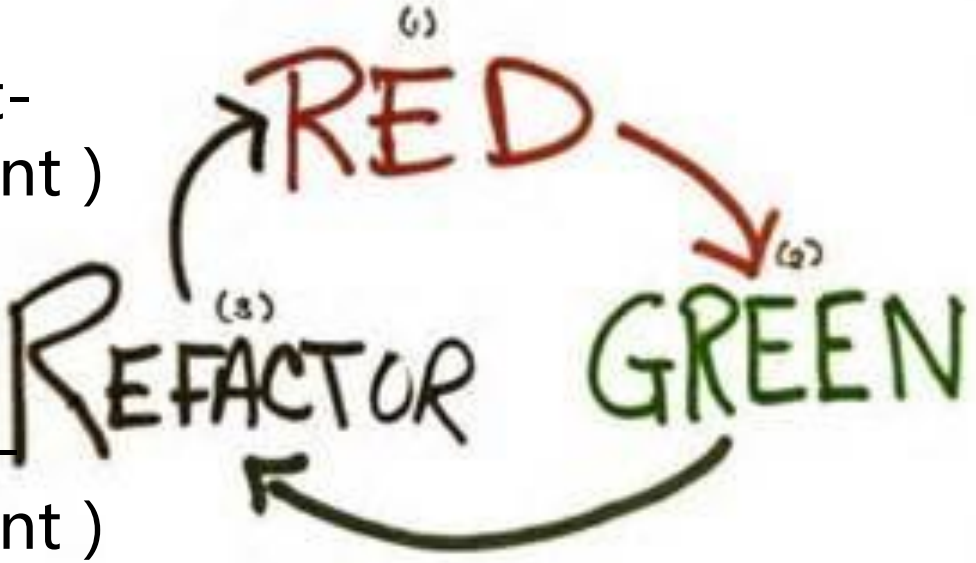
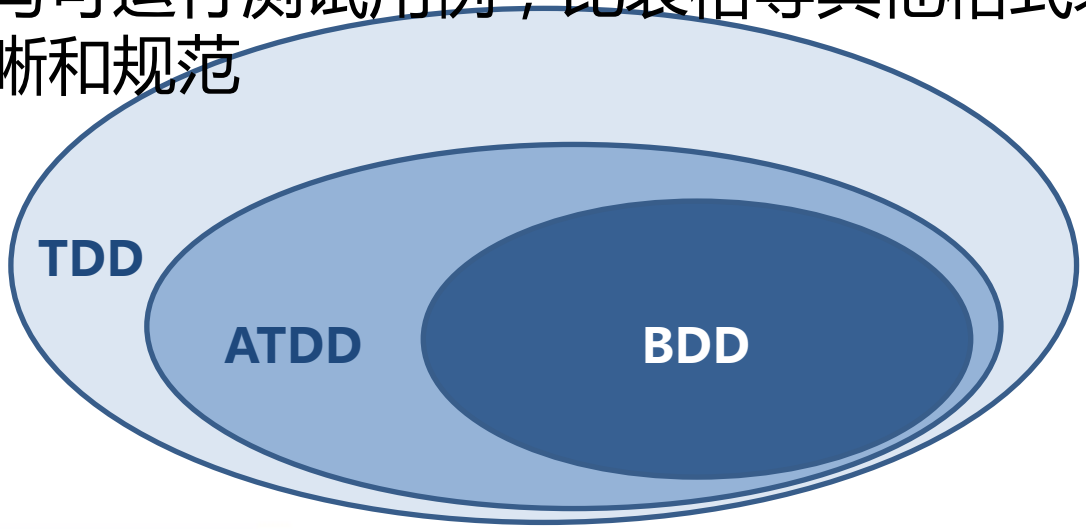
什么是TDD/ATDD/BDD？

- TDD
  - 测试驱动开发（Test-Driven Development）
- ATDD
  - 验收测试驱动开发（Acceptance Test-Driven Development）
- BDD
  - 行为驱动开发（Behavior Driven Development）



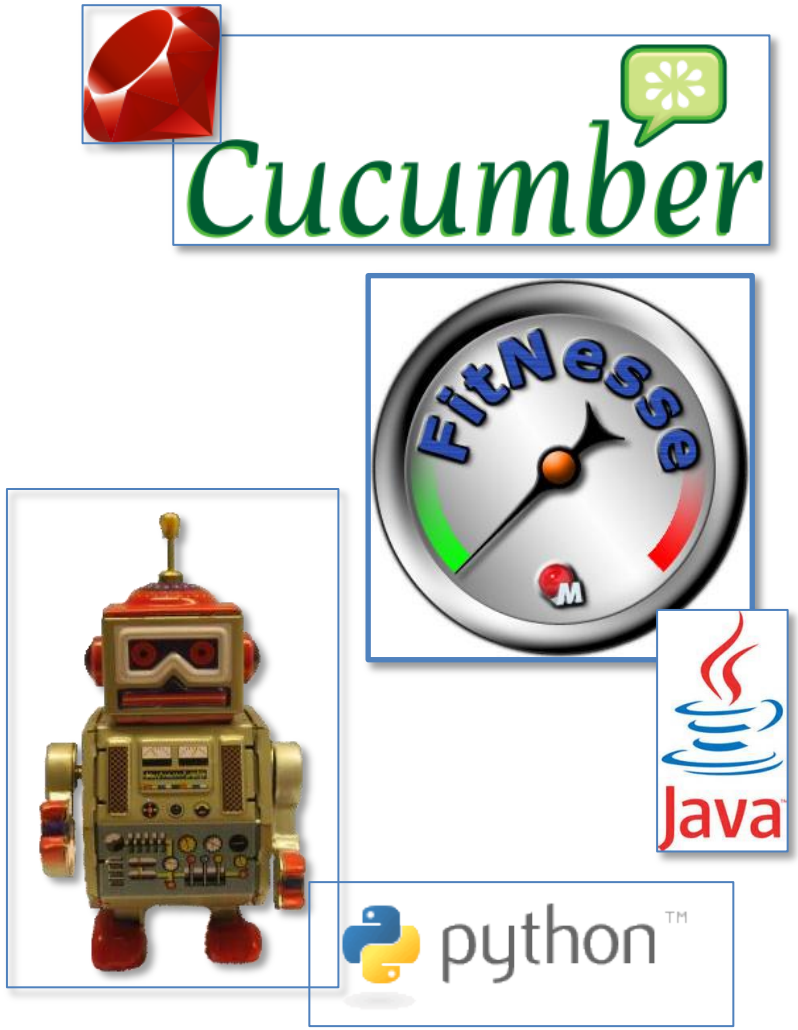
TDD/ATDD/BDD之间的关系？

- TDD：使用编程语言书写可运行测试用例，仅适于程序员阅读
- ATDD：使用自然语言（英文、中文等等）书写可运行测试用例，适于QA、业务人员和程序员阅读
- BDD：使用“Given-when-then”（假如-当-那么）格式编写可运行测试用例，比表格等其他格式表达需求更加清晰和规范

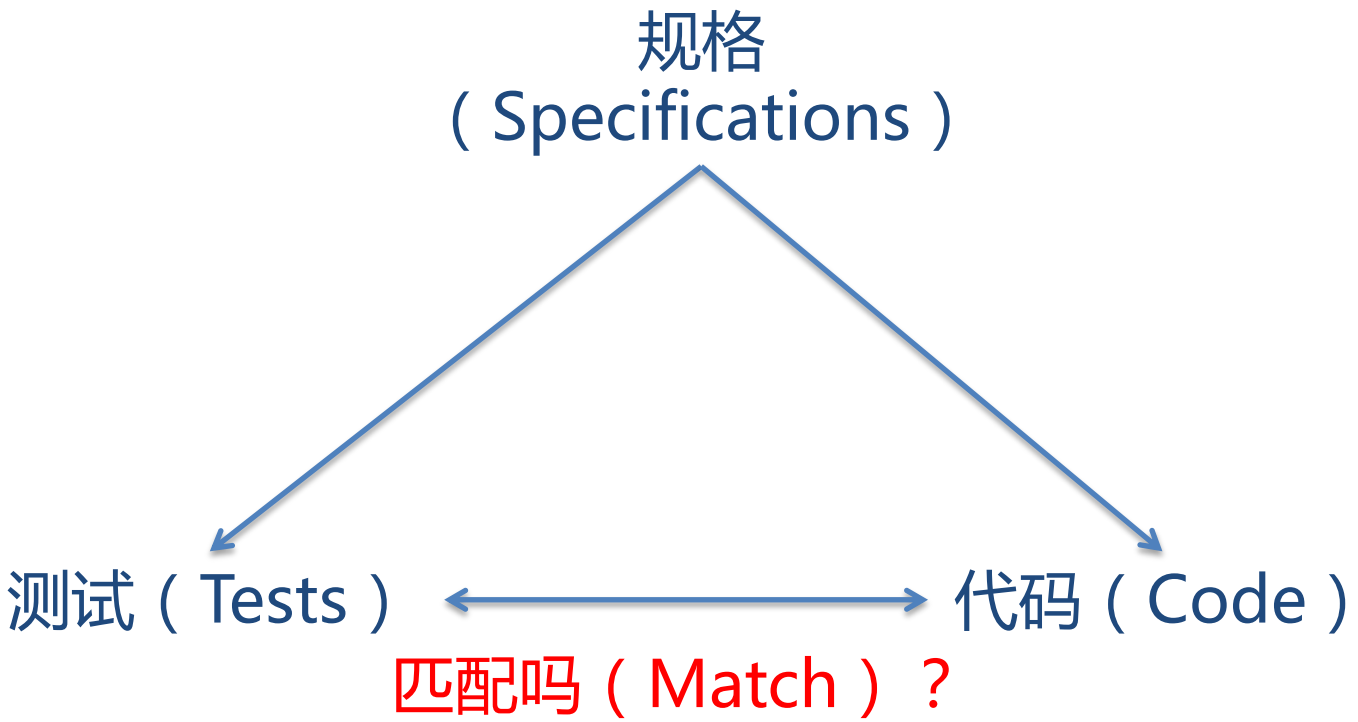


ATDD按实例化需求格式分为3类

- BDD (Given-when-then)
  - 代表框架：基于Ruby的Cucumber
- 表格
  - 代表框架：基于Java的FitNesse
    - Fit, FitLibrary, SLiM
- 关键字
  - 代表框架：基于Python的RobotFramework

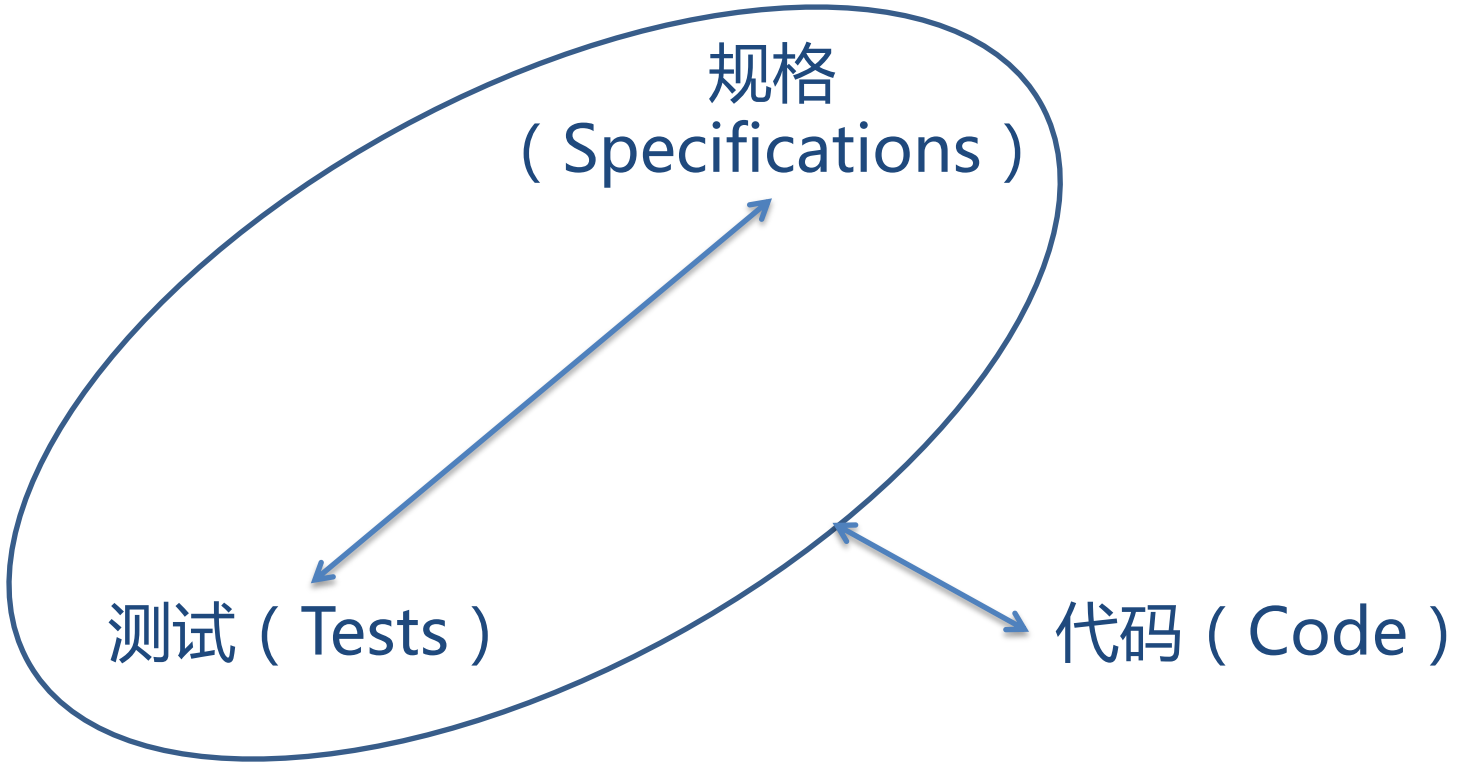


为什么要用TDD？



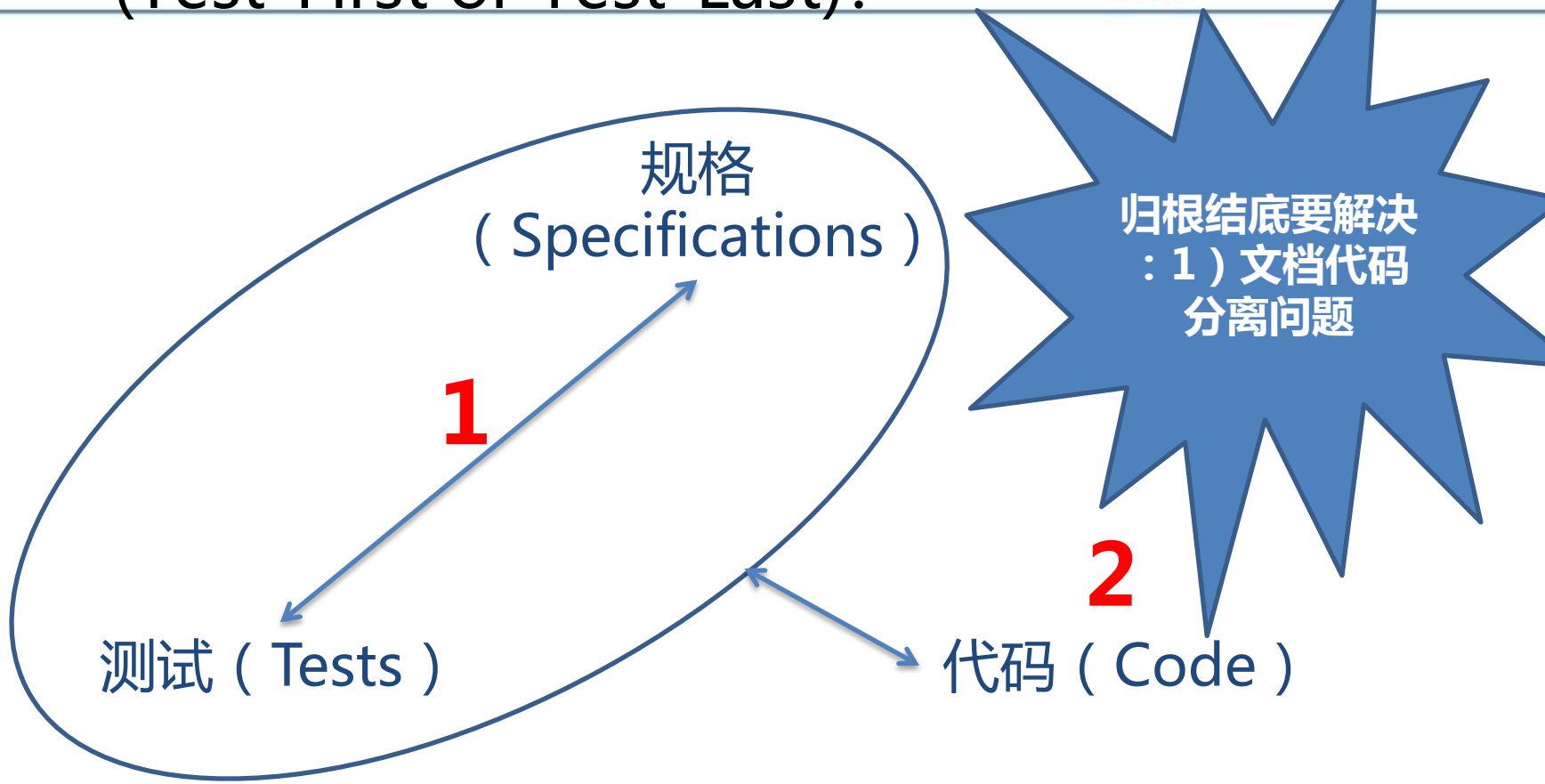
——引自Mary Poppendieck的2013年6月13日北京ScrumGathering演讲

为什么要用TDD？

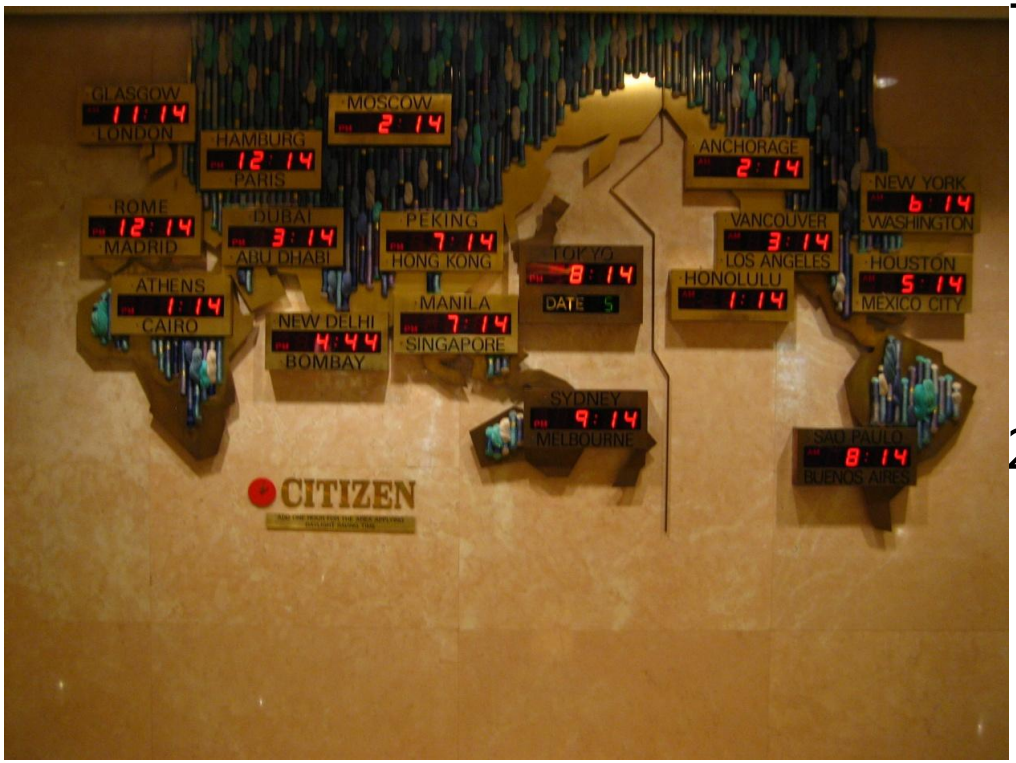


——引自Mary Poppendieck的2013年6月13日北京ScrumGathering演讲

测试先行还是后补测试
(Test-First or Test-Last)?



用BDD实现FizzBuzz编码招式



编写程序，实现如下需求：

1）目前先显示5个城市的当前时间，需要考虑当地时间是否实行夏时制：北京、伦敦（夏时制加1小时）、莫斯科、悉尼、纽约（夏时制加1小时）。以后会增加更多的城市时间。

2）若时钟走时不准或要结束或开始夏时制，需要调整时间时，只需调整相应的一个城市的时间，其余4个城市的时间能够自动根据该城市的时间调整准确。

3）试着重构到Observer模式。

规格与测试合一：用Junit(TDD)写的测试代码

```java
@Test
public void testAdjustIncorrectTimeOfBeijing() {
    // Arrange (Given)
    this.hotelWorldClocksFacade.testInitialization();
    this.hotelWorldClocksFacade.addACityWithDstStatus("London", DaylightSavingTime.ACTIVE);
    this.hotelWorldClocksFacade.addACityWithDstStatus("New York", DaylightSavingTime.ACTIVE);
    this.hotelWorldClocksFacade.addACityWithDstStatus("Beijing", DaylightSavingTime.INACTIVE);
    this.hotelWorldClocksFacade.addACityWithDstStatus("Moscow", DaylightSavingTime.INACTIVE);
    this.hotelWorldClocksFacade.addACityWithDstStatus("Sydney", DaylightSavingTime.INACTIVE);

    // Act (When)
    this.hotelWorldClocksFacade.adjustIncorrectTimeOfCity(9, "Beijing");

    // Assert (Then)
    assertEquals("The result hour is not the same with the expected hour", Integer.toString(9),
            this.hotelWorldClocksFacade.getResultHour("Beijing"));
    assertEquals("The result hour is not the same with the expected hour", Integer.toString(2),
            this.hotelWorldClocksFacade.getResultHour("London"));
    assertEquals("The result hour is not the same with the expected hour", Integer.toString(5),
            this.hotelWorldClocksFacade.getResultHour("Moscow"));
    assertEquals("The result hour is not the same with the expected hour", Integer.toString(11),
            this.hotelWorldClocksFacade.getResultHour("Sydney"));
    assertEquals("The result hour is not the same with the expected hour", Integer.toString(21),
            this.hotelWorldClocksFacade.getResultHour("New York"));
}
```

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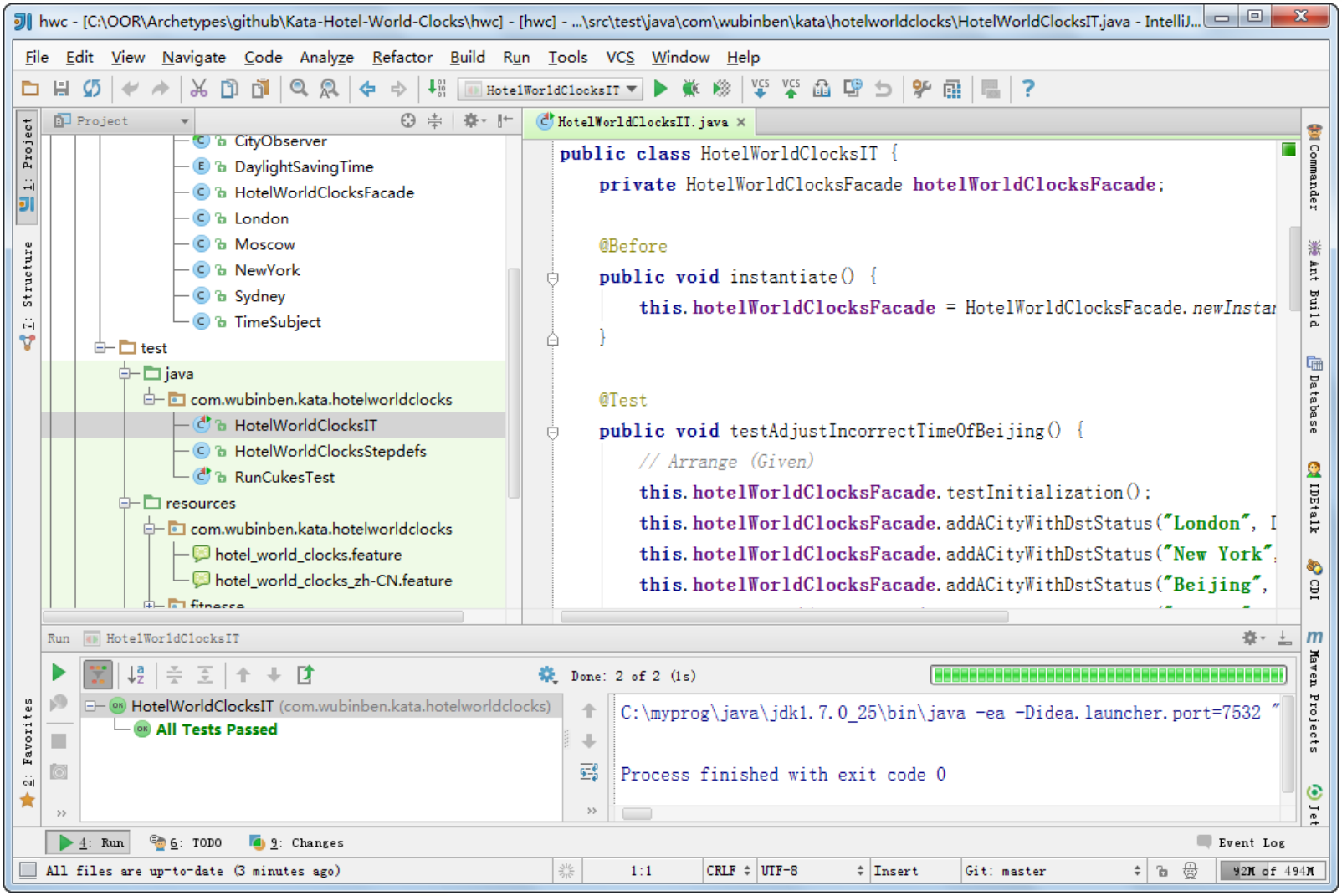
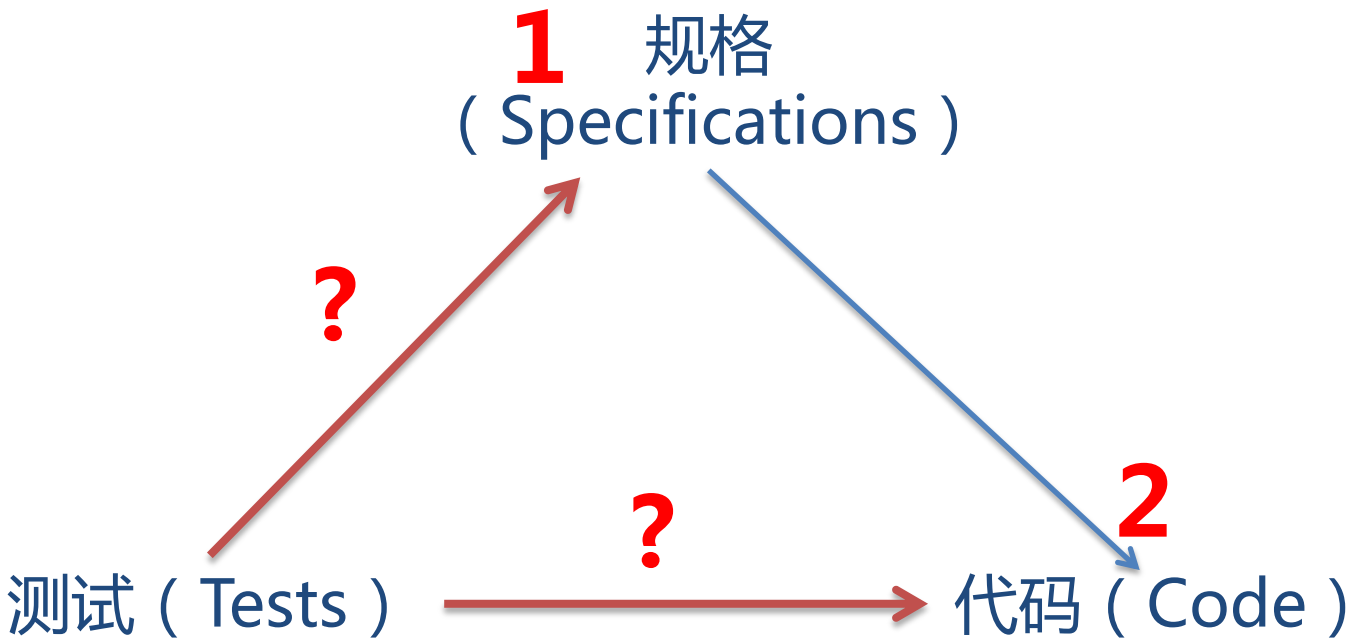
运行结果：用Junit(TDD)写的测试代码



测试先行还是后补测试
(Test-First or Test-Last)?



为什么要用ATDD？Junit写的规格好读吗？

```java
@Test
public void testAdjustIncorrectTimeOfBeijing() {
    // Arrange (Given)
    this.hotelWorldClocksFacade.testInitialization();
    this.hotelWorldClocksFacade.addACityWithDstStatus("London", DaylightSavingTime.ACTIVE);
    this.hotelWorldClocksFacade.addACityWithDstStatus("New York", DaylightSavingTime.ACTIVE);
    this.hotelWorldClocksFacade.addACityWithDstStatus("Beijing", DaylightSavingTime.INACTIVE);
    this.hotelWorldClocksFacade.addACityWithDstStatus("Moscow", DaylightSavingTime.INACTIVE);
    this.hotelWorldClocksFacade.addACityWithDstStatus("Sydney", DaylightSavingTime.INACTIVE);

    // Act (When)
    this.hotelWorldClocksFacade.adjustIncorrectTimeOfCity(9, "Beijing");

    // Assert (Then)
    assertEquals("The result hour is not the same with the expected hour", Integer.toString(9),
            this.hotelWorldClocksFacade.getResultHour("Beijing"));
    assertEquals("The result hour is not the same with the expected hour", Integer.toString(2),
            this.hotelWorldClocksFacade.getResultHour("London"));
    assertEquals("The result hour is not the same with the expected hour", Integer.toString(5),
            this.hotelWorldClocksFacade.getResultHour("Moscow"));
    assertEquals("The result hour is not the same with the expected hour", Integer.toString(11),
            this.hotelWorldClocksFacade.getResultHour("Sydney"));
    assertEquals("The result hour is not the same with the expected hour", Integer.toString(21),
            this.hotelWorldClocksFacade.getResultHour("New York"));
}
```

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好读多了吧？用FitNesse(ATDD)写的测试代码

JavaKatas

KataHotelWorldClocks

Tests Executed OK | Test | Edit | Add | Tools

Assertions: 10 right, 0 wrong, 0 ignored, 0 exceptions (0.256 seconds)

Precompiled Libraries | Expand All | Co... ...ll

variable defined: TEST_SYSTEM=slim
classpath: fitnesse-standalone.jar
classpath: C:\OOR\Archetypes\github\Kata-Hotel-World-Clocks\hwc\target\hwc-1.0.jar

import
com.wubinben.kata.hotelworldclocks.fitnesse

Kata Hotel World Clocks
"In order to adjust the time of clocks of different cities in the lobby of a hotel as easily as possible
As a employee of the hotel
I want to adjust the time of any one clock and the time of all other clocks will be adjusted automatically.
"

Adjust the incorrect time of Beijing

script	a hotel lobby has five clocks		
Set city to be in the DST period	London		
Set city to be in the DST period	New York		
Set city to be not using the DST	Beijing		
Set city to be not using the DST	Moscow		
Set city to be not using the DST	Sydney		
Adjust the incorrect time of the clock of city	Beijing	to be the correct hour	9
Check	the time of the clock of city	Beijing	should be 9
Check	the time of the clock of city	London	should be 2
Check	the time of the clock of city	Moscow	should be 5
Check	the time of the clock of city	Sydney	should be 11
Check	the time of the clock of city	New York	should be 21

归根结底要解决：2）需求描述二义性问题

软件三兄弟ATDD工作坊

为什么要用BDD？ATDD语义格式规范化吗？

- 编写一个测试代码的三步骤
  - 设定测试前的准备条件（Arrange, Given）
  - 执行一个待测行为（Act, When）
  - 检查结果是否符合预期（Assert, Then）

为什么要用BDD？ATDD语义格式规范化吗？

JavaKatas

KataHotelWorldClocks

Tests Executed OK | Test | Edit | Add | Tools

Assertions: 10 right, 0 wrong, 0 ignored, 0 exceptions (0.256 seconds)

Precompiled Libraries | Expand All | Collapse All

variable defined: TEST_SYSTEM=slim
classpath: fitnesse-standalone.jar
classpath: C:\OOR\Archetypes\github\Kata-Hotel-World-Clocks\hwc\target\hwc-1.0.jar

import
com.wubinben.kata.hotelworldclocks.fitnesse

Kata Hotel World Clocks
"In order to adjust the time of clocks of different cities in the lobby of a hotel as easily as possible
As a employee of the hotel
I want to adjust the time of any one clock and the time of all other clocks will be adjusted automatically.
"

Adjust the incorrect time of Beijing

script	a hotel lobby has five clocks			
Set city to be in the DST period	London			
Set city to be in the DST period	New York			
Set city to be not using the DST	Beijing			
Set city to be not using the DST	Moscow			
Set city to be not using the DST	Sydney			
Adjust the incorrect time of the clock of city	Beijing	to be the correct hour	9	
Check	the time of the clock of city	Beijing	should be	9
Check	the time of the clock of city	London	should be	2
Check	the time of the clock of city	Moscow	should be	5
Check	the time of the clock of city	Sydney	should be	11
Check	the time of the clock of city	New York	should be	21

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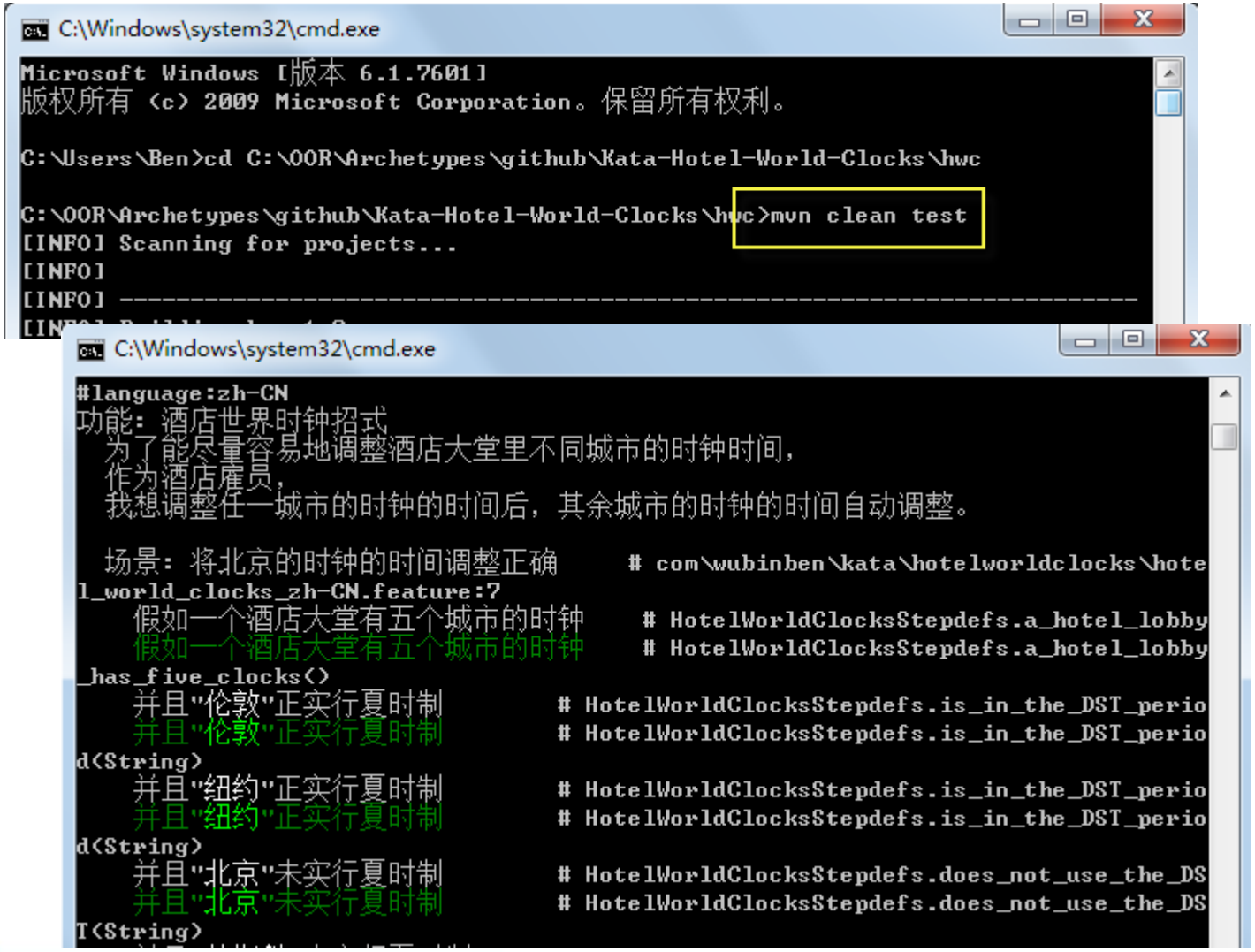
语义格式规范化：用Cucumber(BDD)写的中文测试代码

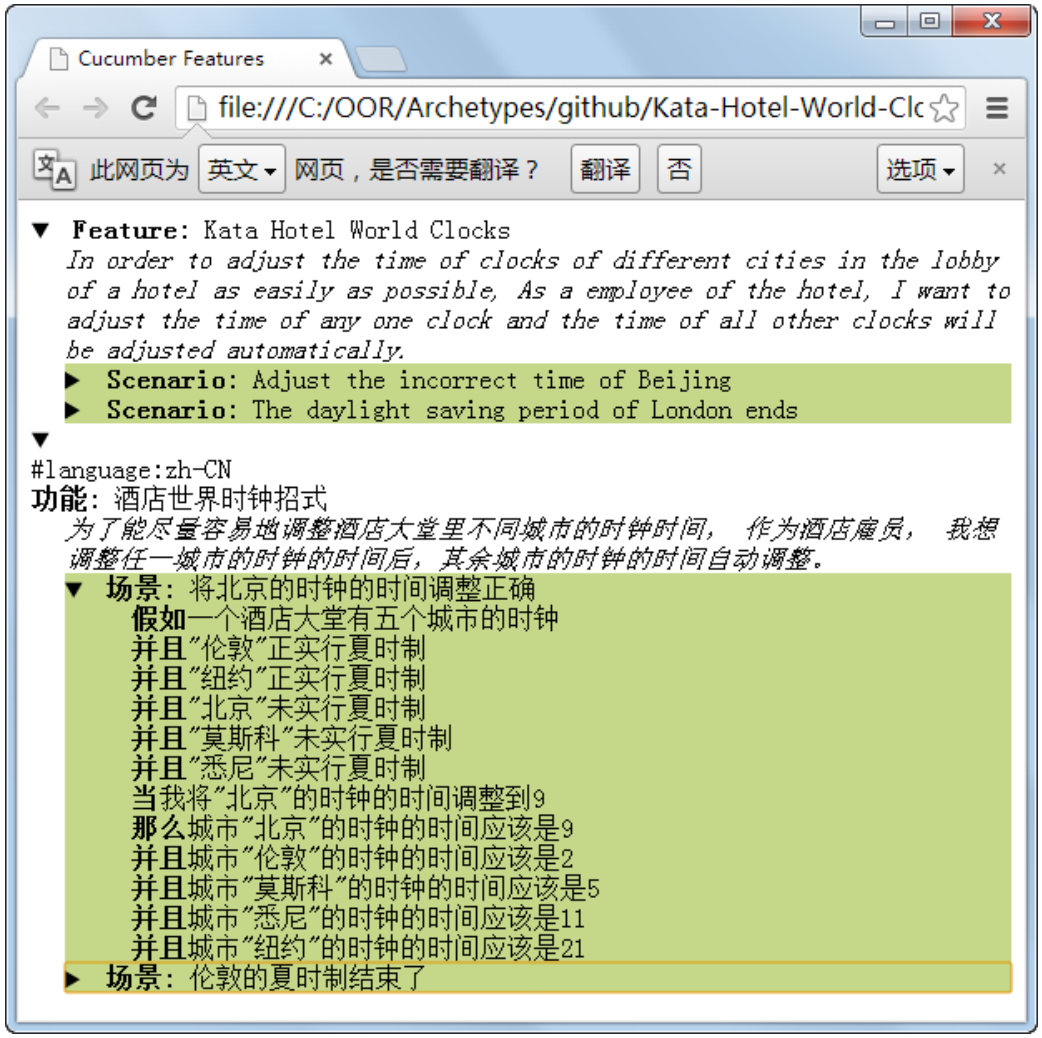
```
#language:zh-CN
功能: 酒店世界时钟招式
  为了能尽量容易地调整酒店大堂里不同城市的时钟时间，
  作为酒店雇员，
  我想调整任一城市的时钟的时间后，其余城市的时钟的时间自动调整。

  场景: 将北京的时钟的时间调整正确
    假如 一个酒店大堂有五个城市的时钟
    并且 "伦敦"正实行夏时制
    并且 "纽约"正实行夏时制
    并且 "北京"未实行夏时制
    并且 "莫斯科"未实行夏时制
    并且 "悉尼"未实行夏时制
    当 我将"北京"的时钟的时间调整到9
    那么 城市"北京"的时钟的时间应该是9
    并且 城市"伦敦"的时钟的时间应该是2
    并且 城市"莫斯科"的时钟的时间应该是5
    并且 城市"悉尼"的时钟的时间应该是11
    并且 城市"纽约"的时钟的时间应该是21
```

运行结果：用Cucumber(BDD)写的中文测试代码



运行结果：用Cucumber(BDD)写的中文测试代码



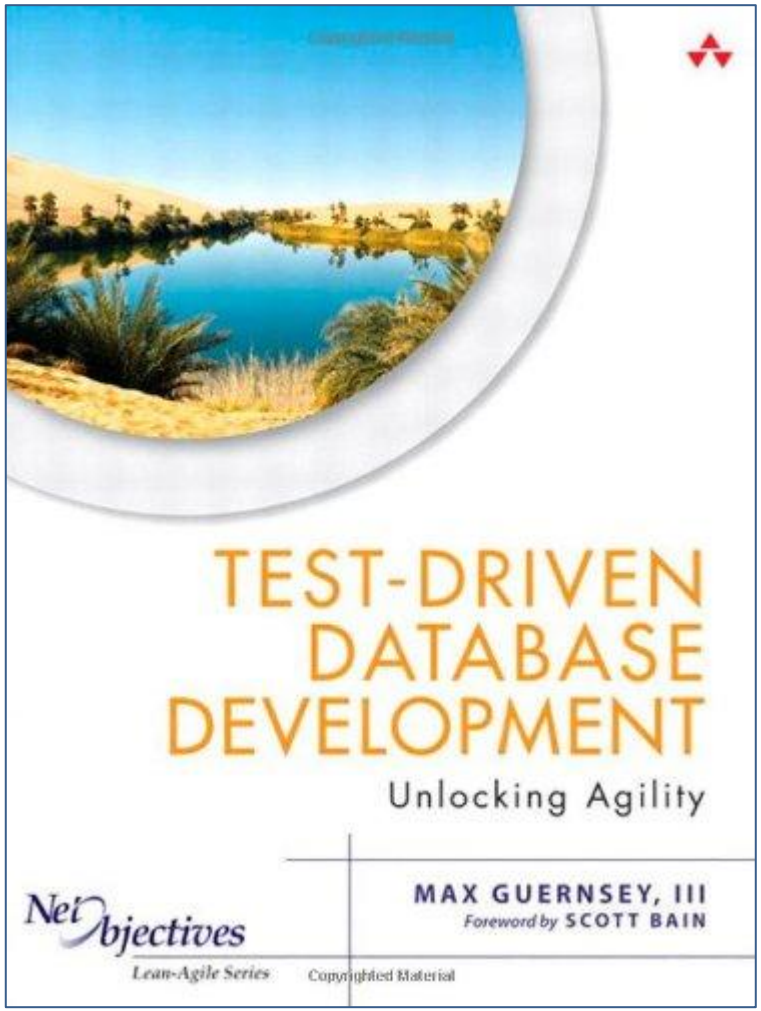
哪些工具可以支持DD/ATDD/BDD?

开发方法	主要免费开源工具
TDD	Junit(Java), Nunit(C#), CppUnitLite(C++), xUnit…
ATDD/BDD	Cucumber(原生语言Ruby), RobotFramework(原生语言Python), FitNesse(原生语言Java), …

TDD/ATDD/BDD适合什么项目？不适合什么项目？

- TDD适合数据结构和黑盒算法开发，但不适合那些经常变化、调整和微调的算法开发。
- TDD适合中间层的开发，但不适合表现层的开发，对于持久化层的TDD需要学习特殊的手法；
- TDD适合那些团队大部分成员都具备测试先行的理念并且能动手写正确和整洁的测试代码的那些项目。“这需要团队舍得投入2年左右时间培养人才”（引自ThoughtWorks老马前一段时间在中关村的演讲）。

持久化层的TDD要考虑历史数据



ATDD/BDD的工作方法

软件三兄弟ATDD工作坊

1

```
Feature: Kata Hotel World Clocks
  In order to adjust the time of clocks of different cities in the lobby of a hotel as easily as possible,
  As a employee of the hotel,
  I want to adjust the time of any one clock and the time of all other clocks will be adjusted automatically.

  Scenario: Adjust the incorrect time of Beijing
    Given a hotel lobby has five clocks
    And "London" is in the DST period
    And "New York" is in the DST period
    And "Beijing" does not use the DST
    And "Moscow" does not use the DST
    And "Sydney" does not use the DST
    When I adjust the incorrect time of the clock of "Beijing" to be 9
    Then the time of the clock of "Beijing" should be 9
    And the time of the clock of "London" should be 2
    And the time of the clock of "Moscow" should be 5
    And the time of the clock of "Sydney" should be 11
    And the time of the clock of "New York" should be 21
```

实例化需求（TXT, Wiki）

2

产品代码

Java Production Code

yourProduction.jar

3

Stepdefs.java

粘合代码

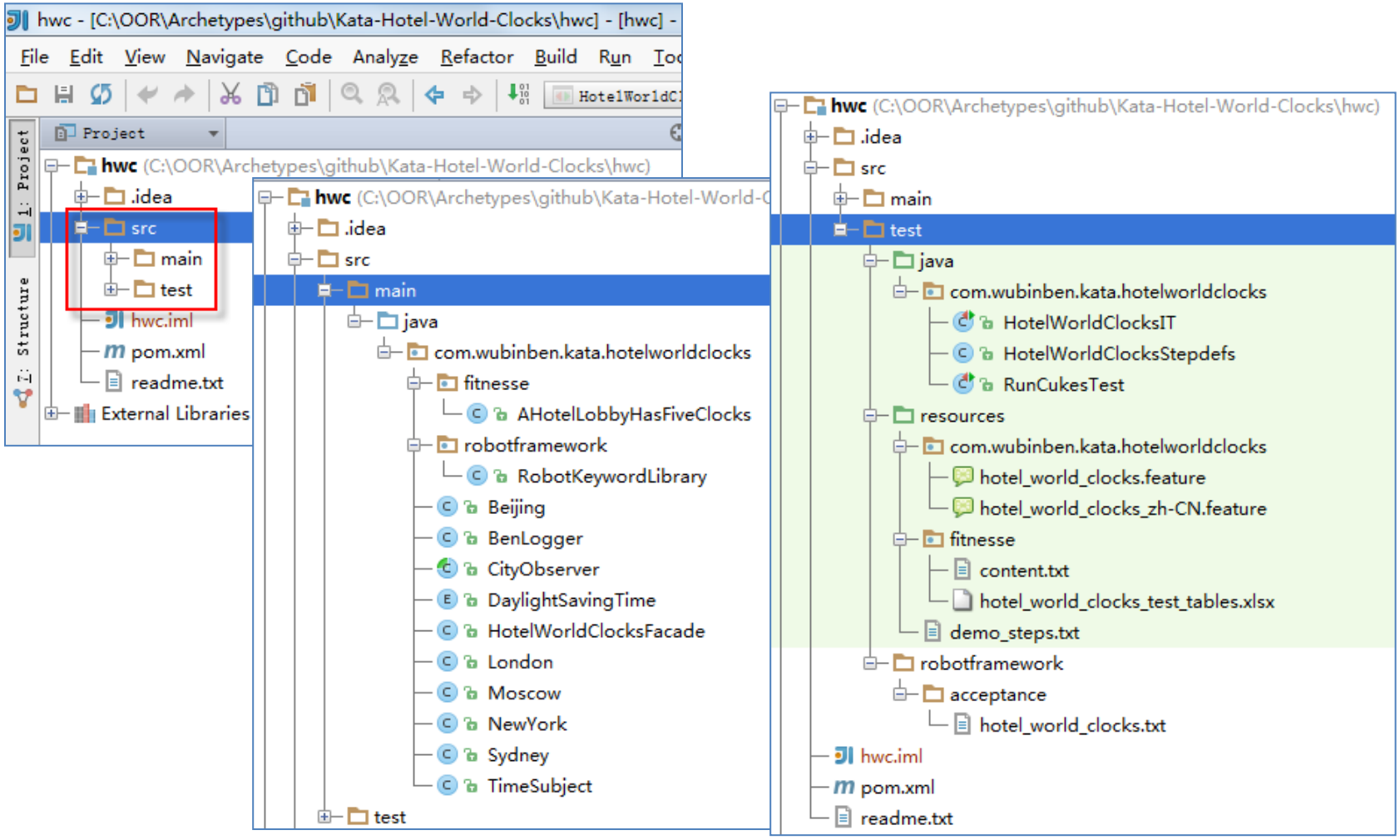
归根结底要解决：2）需求描述二义性问题

归根结底要解决：1）文档代码分离问题

看看源文件

- 本次分享所有可运行代码可从github上下载：
  - https://github.com/wubin28/Kata-Hotel-World-Clocks

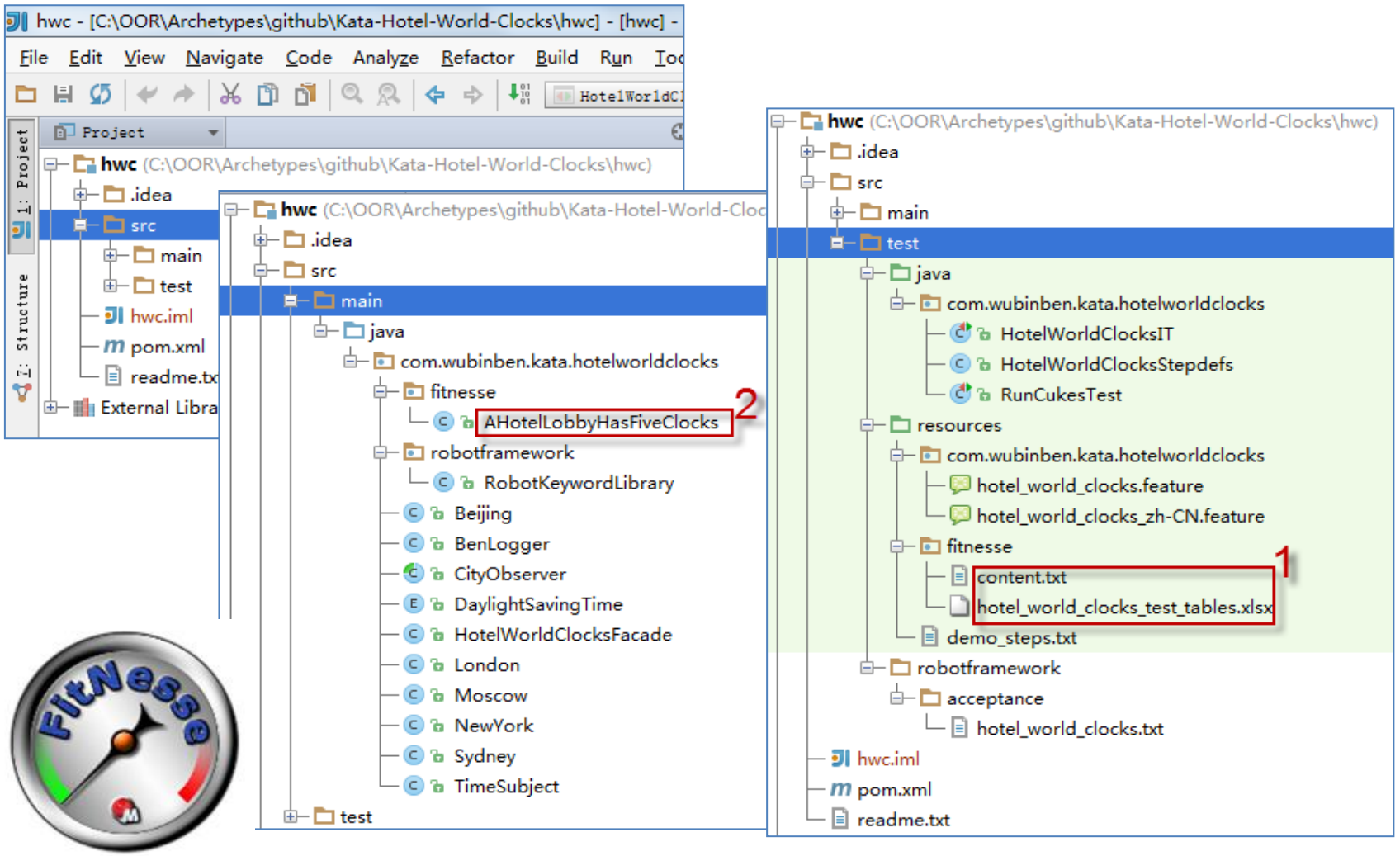
找到源文件


hwc - [C:\OOR\Archetypes\github\Kata-Hotel-World-Clocks\hwc] - [hwc] -
File Edit View Navigate Code Analyze Refactor Build Run
Project
hwc (C:\OOR\Archetypes\github\Kata-Hotel-World-Clocks\hwc)
.idea
src
main
test
hwc.iml
pom.xml
readme.txt
External Libraries
java
com.wubinben.kata.hotelworldclocks
fitnesse
AHotelLobbyHasFiveClocks
robotframework
RobotKeywordLibrary
Beijing
BenLogger
CityObserver
DaylightSavingTime
HotelWorldClocksFacade
London
Moscow
NewYork
Sydney
TimeSubject
HotelWorldClocksIT
HotelWorldClocksStepdefs
RunCukesTest
resources
hotel_world_clocks.feature
hotel_world_clocks_zh-CN.feature
content.txt
hotel_world_clocks_test_tables.xlsx
demo_steps.txt
acceptance
hotel_world_clocks.txt

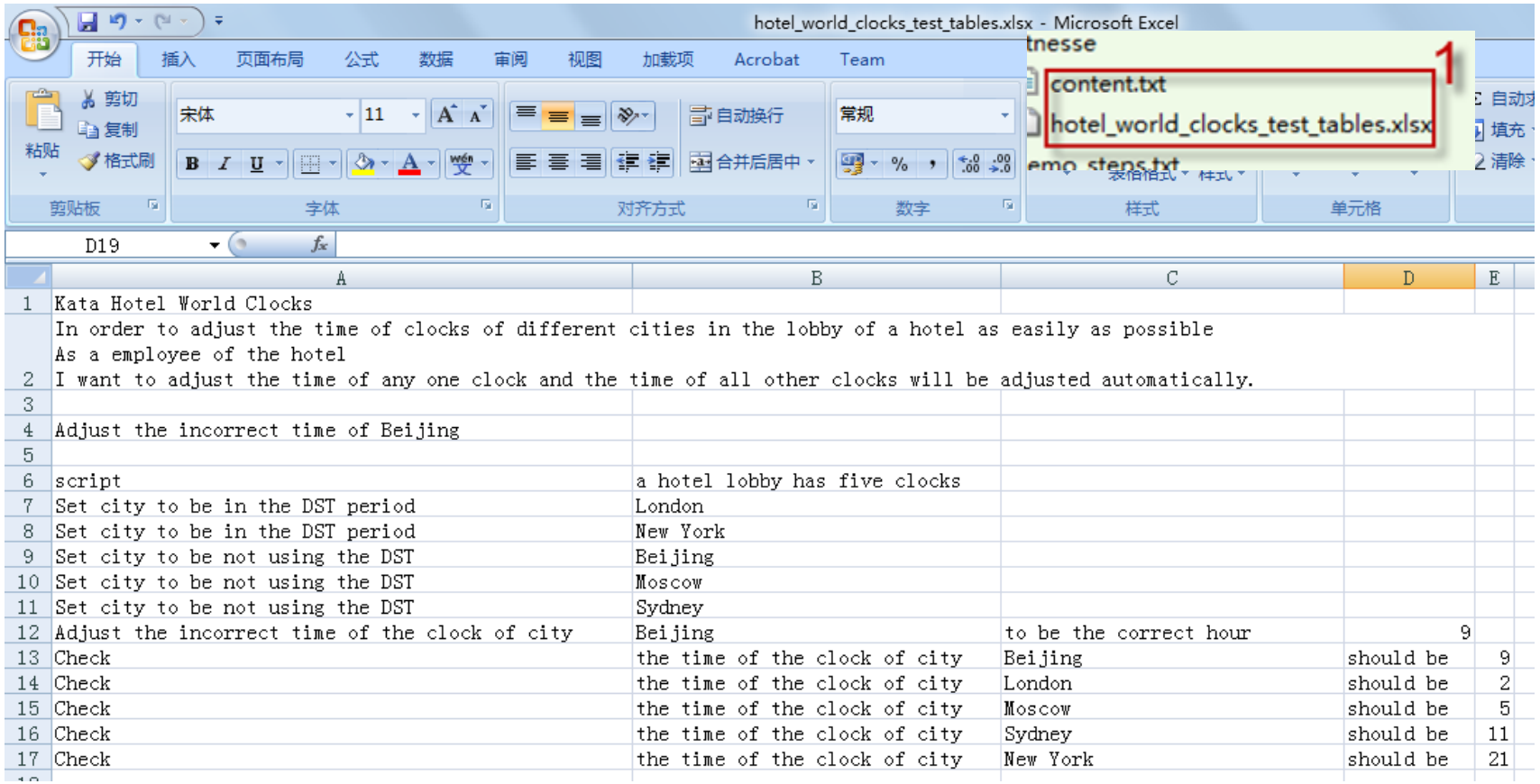
编码操练之一

- 用Java和FitNesse实现“酒店世界时钟”编码招式

用FitNesse开发

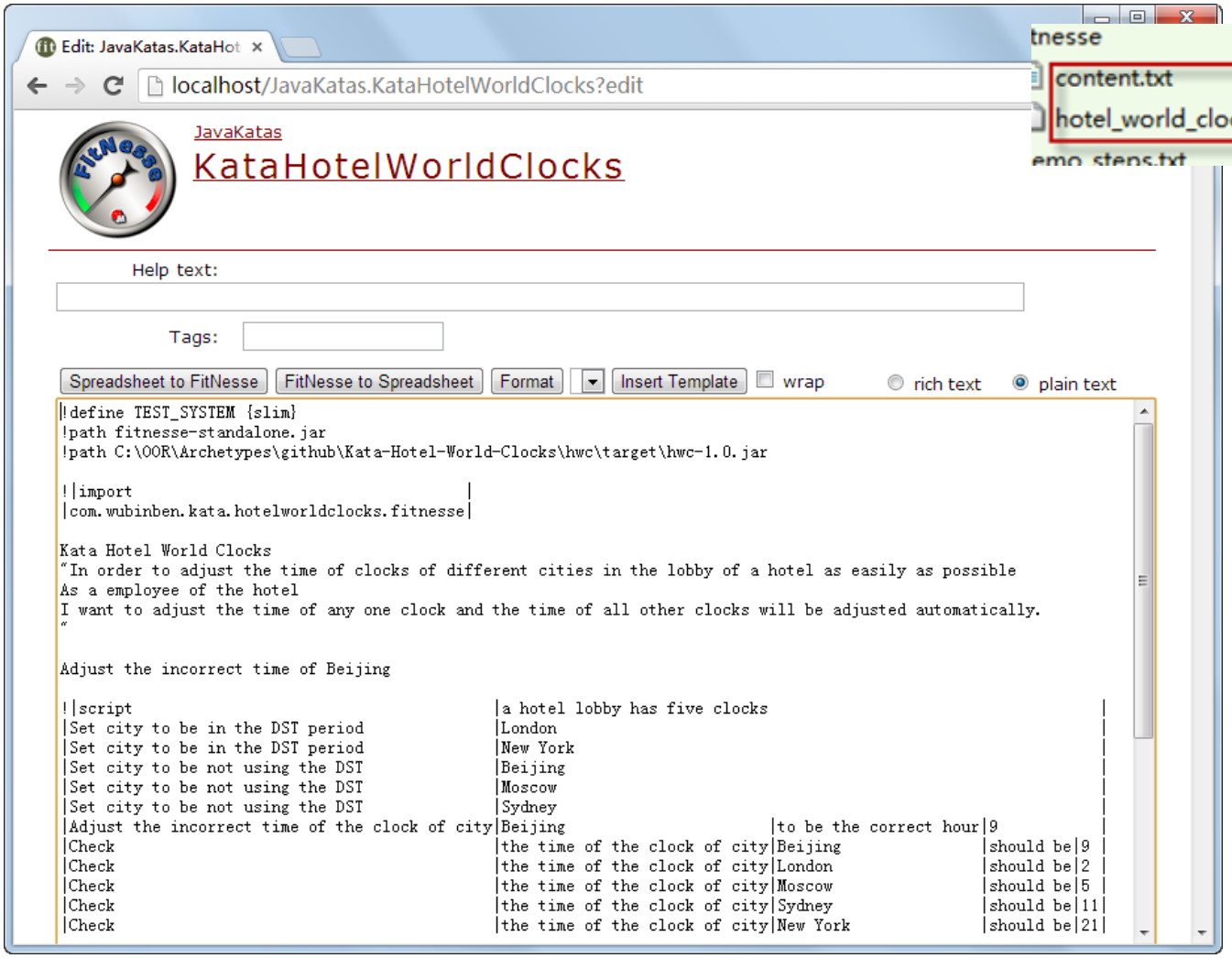


用FitNesse开发

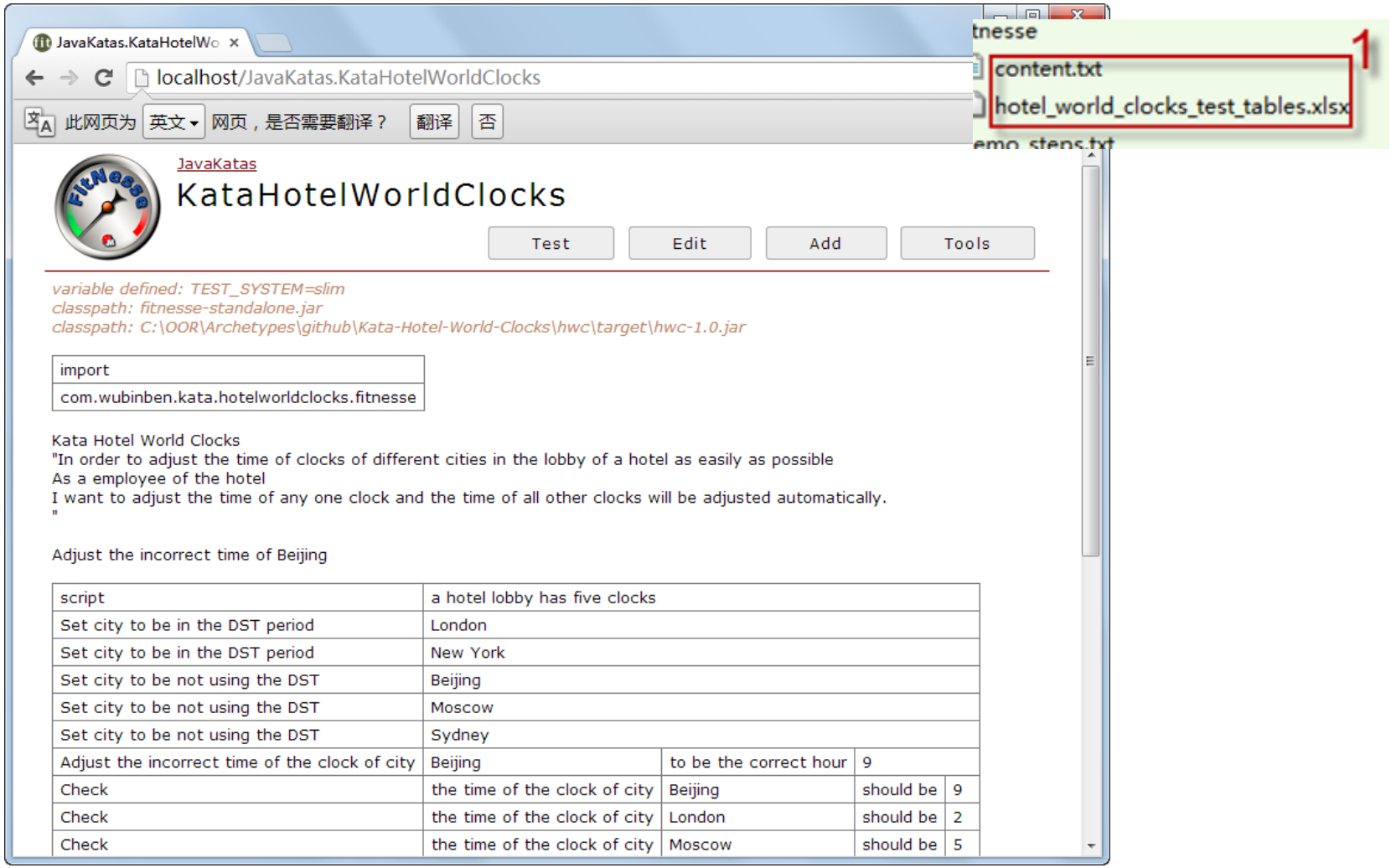


	A	B	C	D	E
1	Kata Hotel World Clocks				
2	In order to adjust the time of clocks of different cities in the lobby of a hotel as easily as possible As a employee of the hotel I want to adjust the time of any one clock and the time of all other clocks will be adjusted automatically.				
3					
4	Adjust the incorrect time of Beijing				
5					
6	script	a hotel lobby has five clocks			
7	Set city to be in the DST period	London			
8	Set city to be in the DST period	New York			
9	Set city to be not using the DST	Beijing			
10	Set city to be not using the DST	Moscow			
11	Set city to be not using the DST	Sydney			
12	Adjust the incorrect time of the clock of city	Beijing	to be the correct hour	9	
13	Check	the time of the clock of city	Beijing	should be	9
14	Check	the time of the clock of city	London	should be	2
15	Check	the time of the clock of city	Moscow	should be	5
16	Check	the time of the clock of city	Sydney	should be	11
17	Check	the time of the clock of city	New York	should be	21

用FitNesse开发



用FitNesse开发



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用FitNesse开发

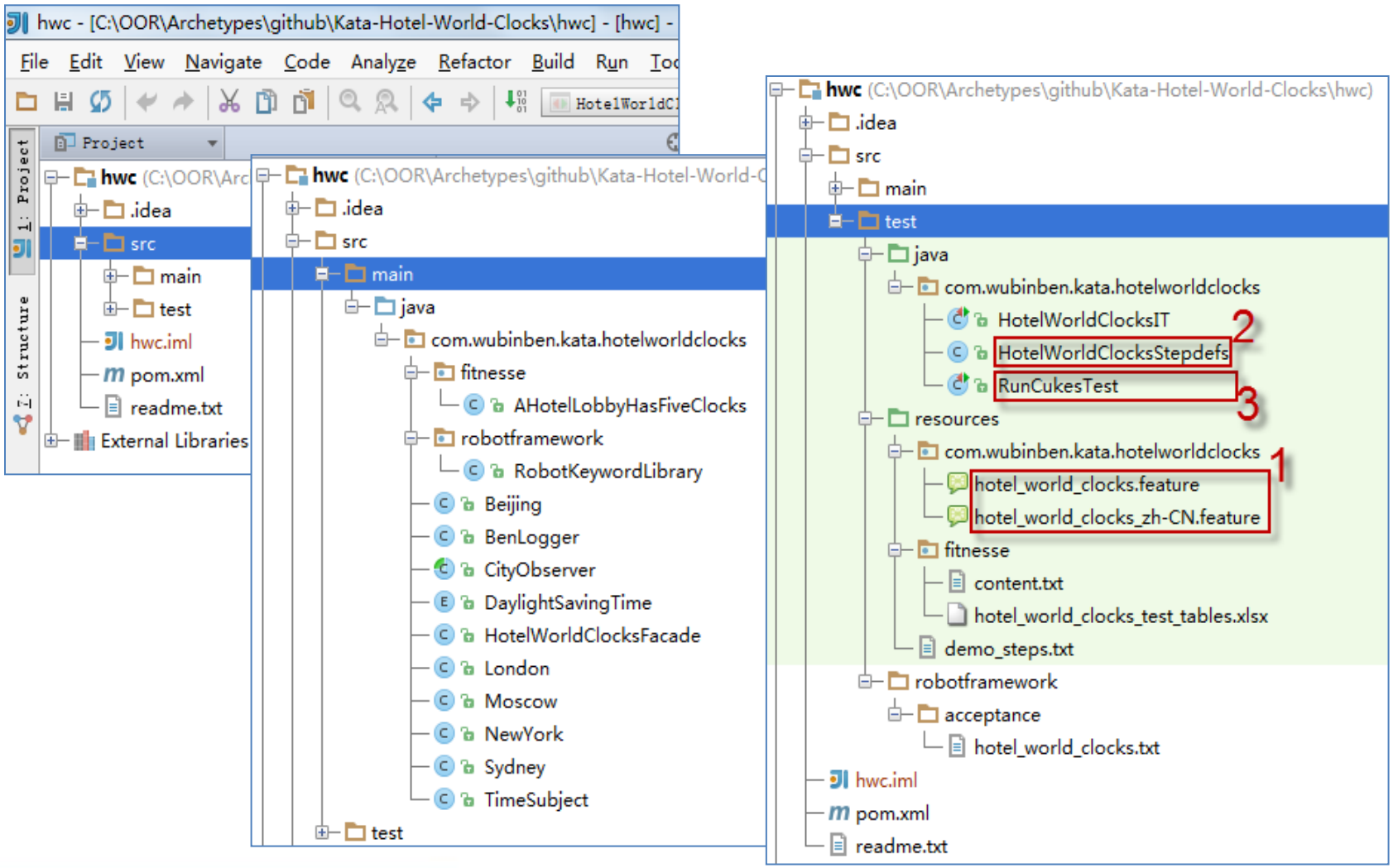
```
public class AHotelLobbyHasFiveClocks {

    private HotelWorldClocksFacade hotelWorldClocksFacade;

    public AHotelLobbyHasFiveClocks() {
        this.hotelWorldClocksFacade = HotelWorldClocksFacade.newInstance();
        this.hotelWorldClocksFacade.testInitialization();
    }

    public void SetCityToBeInTheDSTPeriod(String cityName) {
        this.hotelWorldClocksFacade.addACityWithDstStatus(cityName, DaylightSavingTime.ACTIVE);

    }

    public void SetCityToBeNotUsingTheDST(String cityName) {
        this.hotelWorldClocksFacade.addACityWithDstStatus(cityName, DaylightSavingTime.INACTIVE);
    }

    public void AdjustTheIncorrectTimeOfTheClockOfCityToBeTheCorrectHour(String cityName, int hour) {
        this.hotelWorldClocksFacade.adjustIncorrectTimeOfCity(hour, cityName);
    }
```

编码操练之二

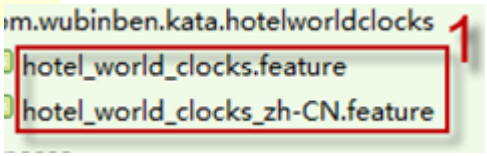
- 用Java和Cucumber-jvm实现“酒店世界时钟”编码招式

cucumber-jvm

用Cucumber-jvm开发



用Cucumber-jvm开发




```
#language:zh-CN
功能：酒店世界时钟招式
  为了能尽量容易地调整酒店大堂里不同城市的时钟时间，
  作为酒店雇员，
  我想调整任一城市的时钟的时间后，其余城市的时钟的时间自动调整。

  场景：将北京的时钟的时间调整正确
    假如 一个酒店大堂有五个城市的时钟
    并且 "伦敦"正实行夏时制
    并且 "纽约"正实行夏时制
    并且 "北京"未实行夏时制
    并且 "莫斯科"未实行夏时制
    并且 "悉尼"未实行夏时制
    当 我将"北京"的时钟的时间调整到9
    那么 城市"北京"的时钟的时间应该是9
    并且 城市"伦敦"的时钟的时间应该是2
    并且 城市"莫斯科"的时钟的时间应该是5
    并且 城市"悉尼"的时钟的时间应该是11
    并且 城市"纽约"的时钟的时间应该是21
```

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用Cucumber-jvm开发

```
public class HotelWorldClocksStepdefs {
    private HotelWorldClocksFacade hotelWorldClocksFacade;

    public HotelWorldClocksStepdefs() {
        this.hotelWorldClocksFacade = HotelWorldClocksFacade.newInstance();
    }

    @Given("^a hotel lobby has five clocks|一个酒店大堂有五个城市的时钟$")
    public void a_hotel_lobby_has_five_clocks() throws Throwable {
        this.hotelWorldClocksFacade.testInitialization();
    }

    @Given("^\"([^\"]*)\"(?: is in the DST period|正实行夏时制)$")
    public void is_in_the_DST_period(String cityName) throws Throwable {
        this.hotelWorldClocksFacade.addACityWithDstStatus(cityName, DaylightSavingTime.ACTIVE);
    }

    @Given("^\"([^\"]*)\"(?: does not use the DST|未实行夏时制)$")
    public void does_not_use_the_DST(String cityName) throws Throwable {
        this.hotelWorldClocksFacade.addACityWithDstStatus(cityName, DaylightSavingTime.INACTIVE);
    }
```

HotelWorldClocksIT
HotelWorldClocksStepdefs 2

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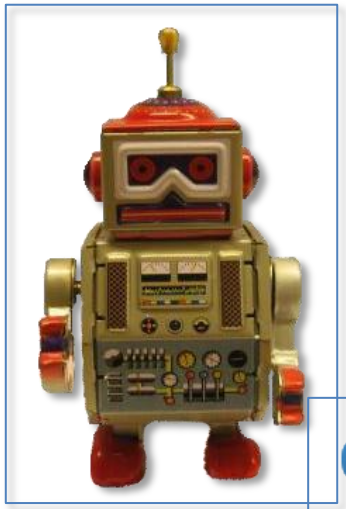
编码操练之三

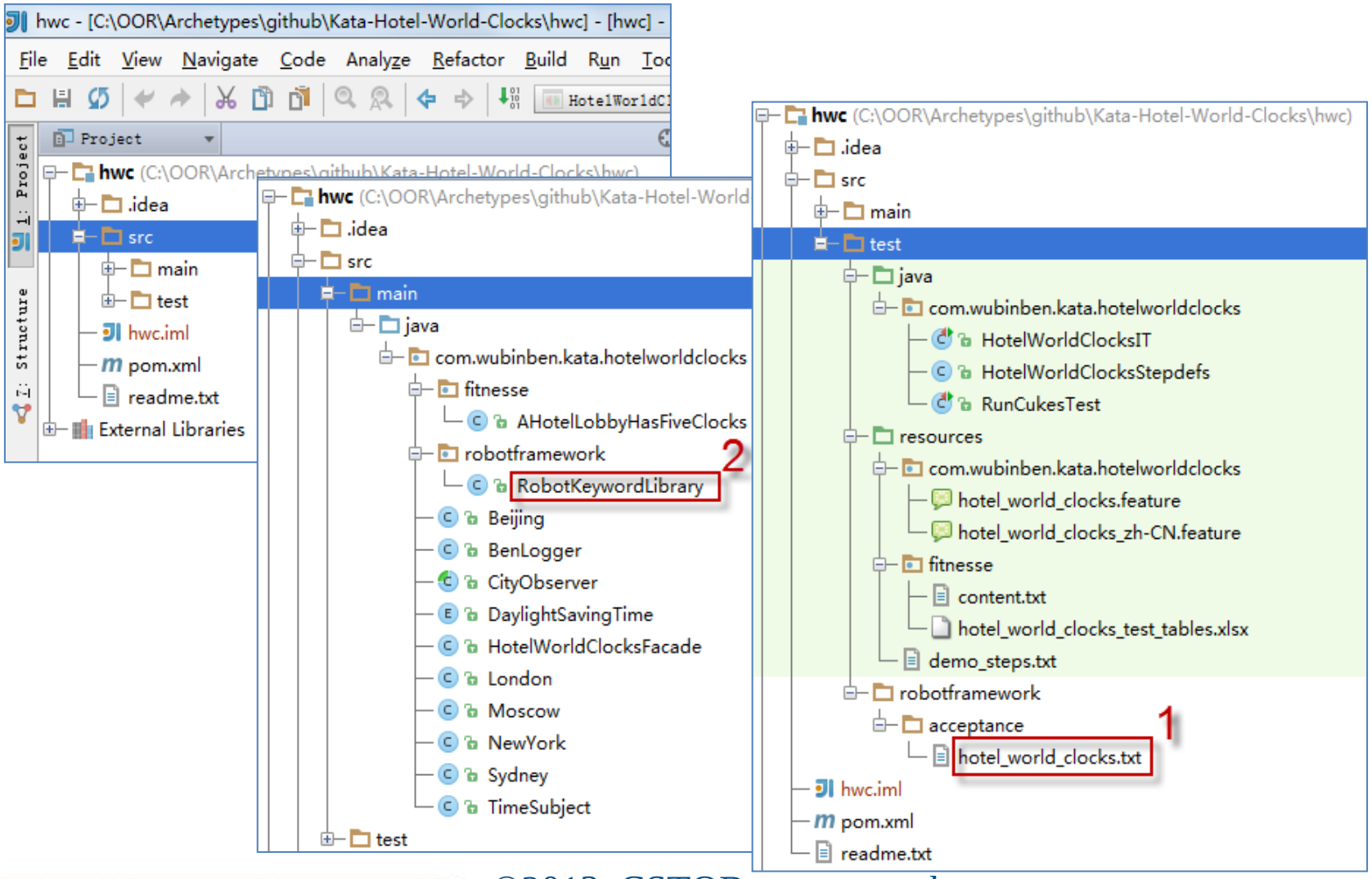
- 用Java和Robot Framework Maven Plugin实现“酒店世界时钟”编码招式

Robot Framework Maven Plugin

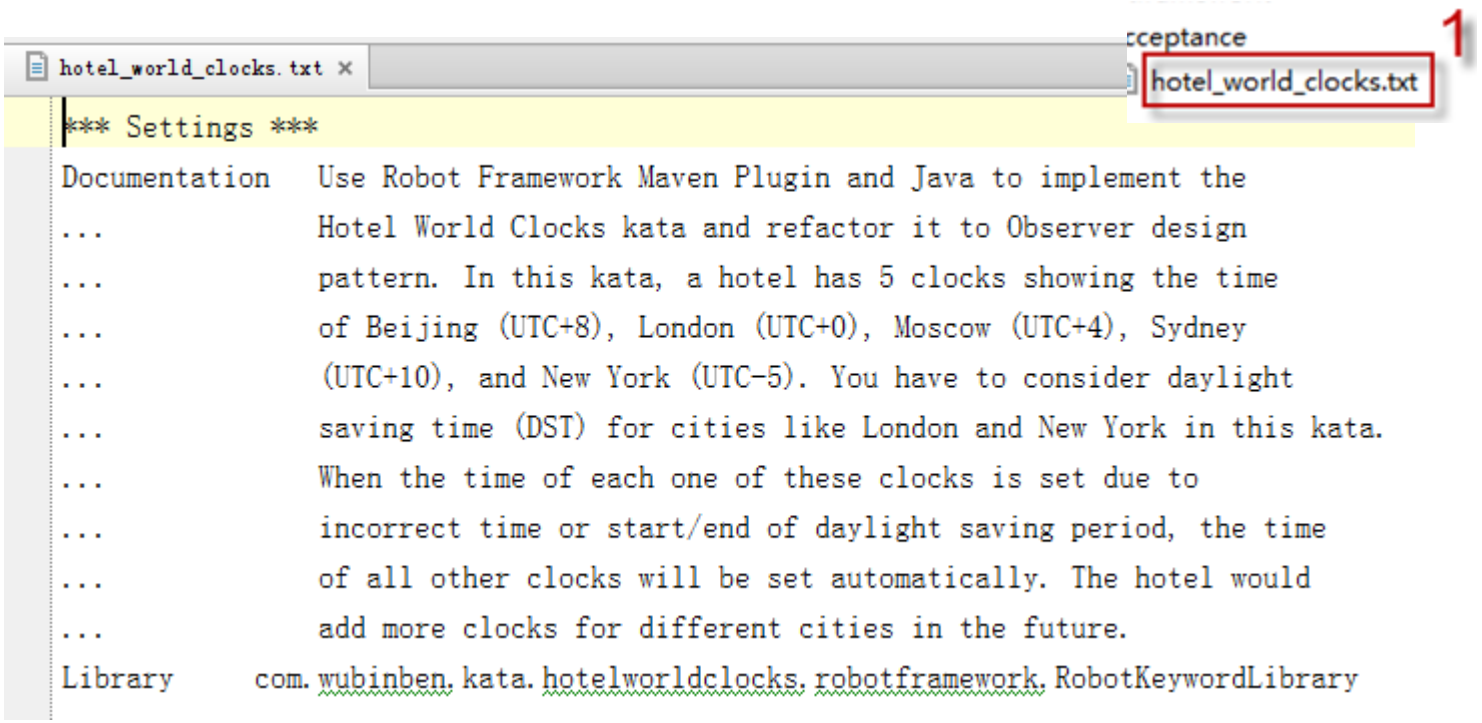


python™

用Robot Framework Maven Plugin开发



用Robot Framework Maven Plugin开发



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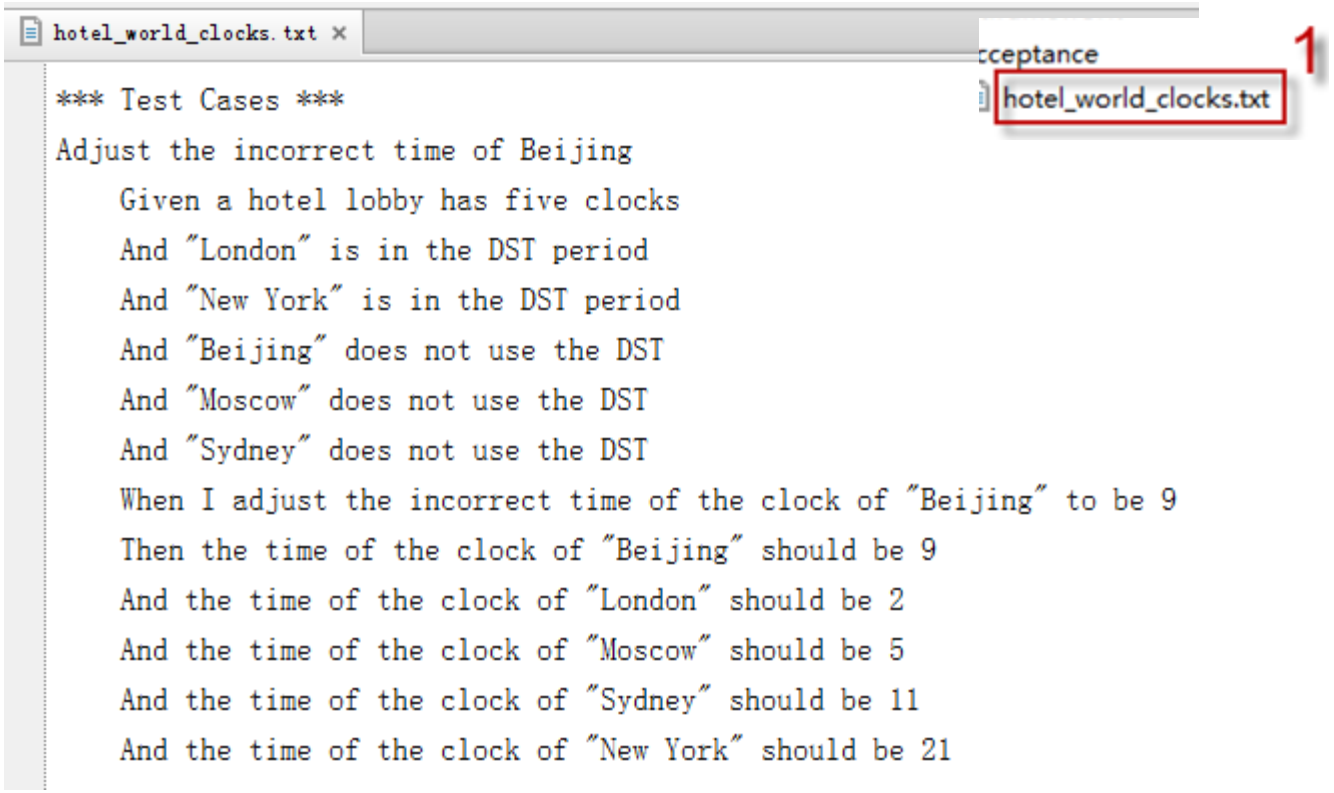
用Robot Framework Maven Plugin开发



用Robot Framework Maven Plugin开发

hotel_world_clocks.txt

```
*** Keywords ***
a hotel lobby has five clocks
    Test Initialization

"${city}" is in the DST period
    Set City DST active and Add to City List    ${city}

"${city}" does not use the DST
    Set City DST inactive and Add to City List    ${city}

I adjust the incorrect time of the clock of "${city}" to be ${hour}
    Adjust Incorrect Time of City    ${hour}    ${city}

the time of the clock of "${city}" should be ${expected hour}
    ${result hour}=    Get Result Hour    ${city}
    Should Be Equal    ${expected hour}    ${result hour}

the DST period of "${city}" ends
    Set City DST inactive and Add to City List    ${city}

the DST period of "${city}" does not end
    Set City DST active and Add to City List    ${city}
```

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用Robot Framework Maven Plugin开发

RobotKeywordLibrary.java

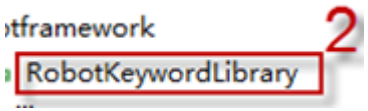
```java
public class RobotKeywordLibrary {
    private static final BenLogger LOGGER = BenLogger.getLogger(BenLogger.LEVEL_OFF);
    /**
     * Means that that this instance of the class well be used
     * for whole lifecycle of test execution.
     */
    public static final String ROBOT_LIBRARY_SCOPE = "GLOBAL";
    private HotelWorldClocksFacade hotelWorldClocksFacade;

    public RobotKeywordLibrary() {
        this.hotelWorldClocksFacade = HotelWorldClocksFacade.newInstance();
    }

    public void testInitialization() {
        this.hotelWorldClocksFacade.testInitialization();
    }

    public void setCityDstActiveAndAddToCityList(String cityName) {
        this.hotelWorldClocksFacade.addACityWithDstStatus(cityName, DaylightSavingTime.ACTIVE);
    }

    public void setCityDstInactiveAndAddToCityList(String cityName) {
        this.hotelWorldClocksFacade.addACityWithDstStatus(cityName, DaylightSavingTime.INACTIVE);
```



FitNesse vs Cucumber vs Robot Framework

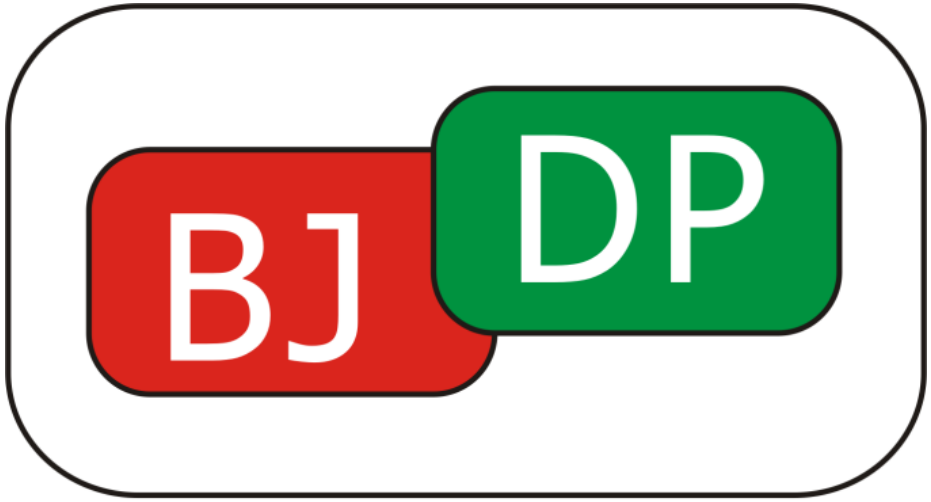
框架	优势	劣势
FitNesse	用Wiki页面作为实例化需求表格，方便团队浏览和修改	维护wiki server与持续集成系统之间的协同增加了复杂性
Cucumber	纯文本的实例化需求表格能轻易纳入持续集成系统；Given-when-then便于理解	纯文本的实例化需求表格不如wiki页面那样方便团队浏览和修改
Robot Framework	纯文本的实例化需求表格能轻易纳入持续集成系统；支持TXT、Given-When-Then、HTML格式	

总结

- TDD通过将规格（需求）与测试合二为一，有助于解决文档与代码的分离问题。
- ATDD通过QA、业务人员、程序员三方在ATDD工作坊中共同讨论需求，并用自然语言编写可运行规格，解决了需求描述二义性问题。
- BDD通过使用Given-when-then(测试前准备、行为的触发、检查结果是否符合期望)来规范规格的描述方式
- TDD/ATDD/BDD有机的结合，可以解决“需求总变化、文档总过时、成果非预期”的问题

答疑

- 如何解决传统瀑布式开发的问题：需求总变化、文档总过时、成果非预期？
  - **目前项目中，有一部分开发人员着重关注开发前的需求分析，希望能讨论出明确的需求之后再开发；而领导与客户着重提出，先开发，做出一部分功能之后，再现有基础之上再完善需求。做为中间层很为难。**
  - 开发过程中，文档跟不上，老是事后补文档，开发过程中注重文档的话，开发进程又保证不了。
  - 如何较好的解决文档总过时的问题？
- **如果组织没有要求，是否自己先搭建后，如何影响组织？**
  - 对于研发牵着测试鼻子走,怎么驱动(除了高层沟通)？如何驱动研发工作？
  - 如何从传统方式顺利过渡到TDD，请从管理上和个人思想及工作流程上给予解答。如何保证开发效率？
- 哪些项目适于采用TDD？哪些不适应TDD？
- **现在主流的开发模式？**



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Q&A

Thank you

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