COMP3027J
Software Architecture
Modifiability and its Tactics

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Outline

1. The Meaning of modifiability

2. Tactics to Improve Modifiability

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The Meaning of Modifiability

Concerns

- Cost of Modification
- Which parts of the system are modified
- When the modification occurs
- Who performs the modification

The Meaning of Modifiability

Measurement Metrics

- Time Taken to Complete Modification
- Human Resource Cost of Modification
- Economic Cost of Modification
- … …

The Meaning of Modifiability - Scenarios

Source of Stimulus

- Who Performs the Modification (Developers/Administrators/Users)

Stimulus

- Specific Modifications to Be Made

The Meaning of Modifiability - Scenarios

Artifacts

- Modifying the system's functionality or UI or other systems for interaction?

Environment

- When does the modification perform? During design or development or operation?
- The later the modification, the more disadvantageous it is

The Meaning of Modifiability - Scenarios

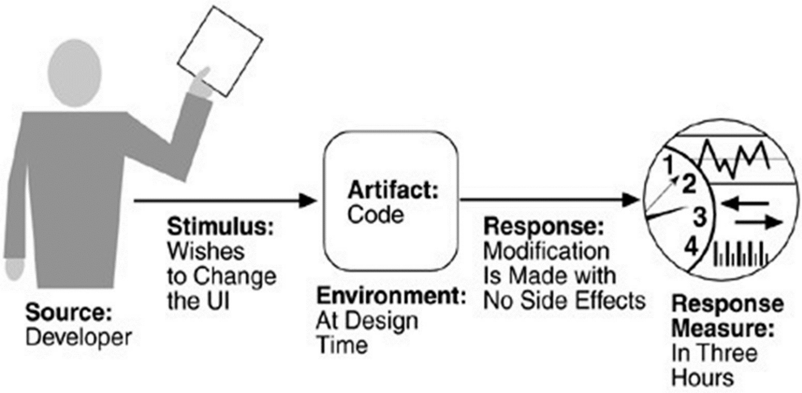
Response

- Operators must understand how to modify, perform modification operations, test, and deploy

Response Measure

- Time & Cost

Modifiability Scenario Example



Source: Developer

Stimulus: Wishes to Change the UI

Artifact: Code

Environment: At Design Time

Response: Modification Is Made with No Side Effects

Response Measure: In Three Hours

Outline

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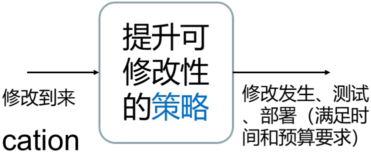
Tactics to Improve Modifiability

-Overview



Target

Reduce the time and cost of modification

Direction 1: Limit the Scope of Modification

Keep the software scope affected by modification as small as possible

Direction 2: Delay Binding Time

Allow software to be flexibly modified during running

Tactics to Improve Modifiability

-Limiting the Scope

High cohesion, low coupling in modules

- Try to control the modification of the program within a single module
- Can leverage frameworks, middleware

Consider potential modifications

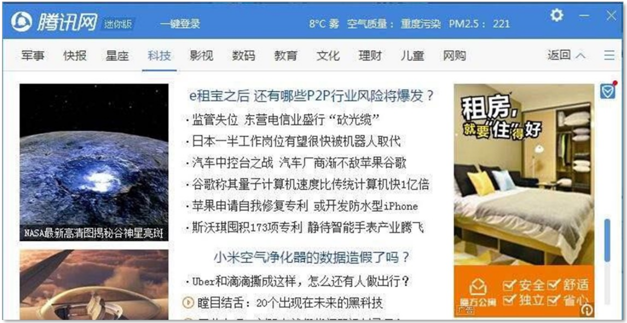
- Helps assess the division of responsibilities between modules
- Ensure that a modification at one point only affects one module
- Avoid unrelated multiple modifications affecting the same module

Tactics to Improve Modifiability

-Limiting the Scope

Make modules generic

- "Interpreter" style approach



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- Uber和滴滴撕成这样，怎么还有人做出行？

瞠目结舌：20个出现在未来的黑科技

Tactics to Improve Modifiability

-Limiting the Scope

Hide information

- Accessibility in object-oriented mechanisms (public/private)

Maintain a consistent interface

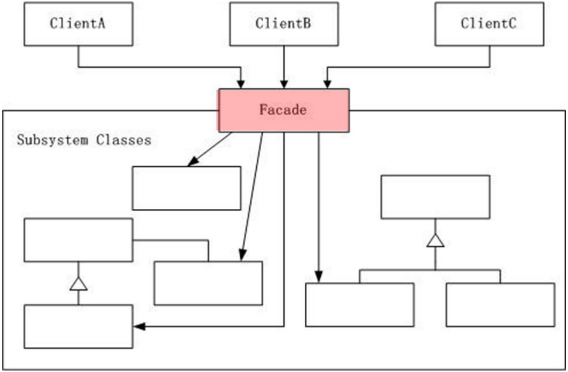
- Allow independent changes on both sides of the interface without changing the interface itself

Tactics to Improve Modifiability

-Limiting the Scope

Limit communication paths

- Façade pattern in design patterns



Tactics to Improve Modifiability

-Limiting the Scope

Use intermediaries

- Data intermediaries: Style for sharing data
- Service intermediaries: Design patterns such as bridge, factory method, etc.

Tactics to Improve Modifiability

-Limiting the Scope

Name server

- Query the location of required resources/objects, resolve location dependencies

Create instances on demand

- Leverage creational patterns in design patterns

Tactics to Improve Modifiability

-Delaying Binding Time

Configuration files

- Modify configuration files without modifying code

```
<?xml version="1.0" encoding="utf-8"?>
<!-- The configuration file for SMSvcHost.exe -->
<configuration>
   <runtime>
      <gcConcurrent enabled="false" />
   </runtime>
   <system.serviceModel>
      <!-- SMSvcHost ETW traces are redirected by
default to an etwProviderId different from WCF's default.
-->
      <diagnostics performanceCounters="Off"
etwProviderId="{f18839f5-27ff-4e66-bd2d-
639b768cf18b}"/>
   </system.serviceModel>
</configuration>
```

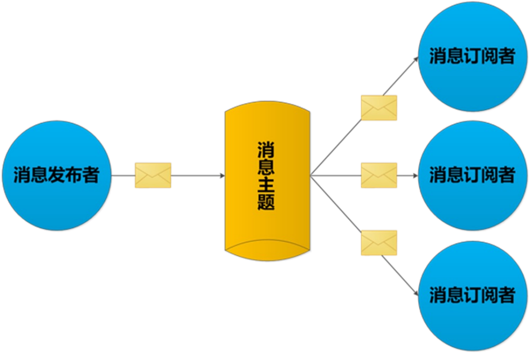
```
[Global]
MessageTitle=智能自制内容工具
Button[0]=确定(&O)
Button[1]=取消(&C)
Button[2]=关闭(&C)
[Project]
Title=新建项目
Button[0]=名称:
Button[1]=位置:
Button[2]=浏览(&B)...
Text[0]=当前目录已经存在，是否覆盖此目录?
[PutCode]
Title=请输入相应数字
Button[0]=编号:
Button[1]=如果存在相同编号直接覆盖
```

Tactics to Improve Modifiability

-Delaying Binding Time

Publish-subscribe style

- Already introduced in the software architecture style part (event-based system)
- Observer Pattern

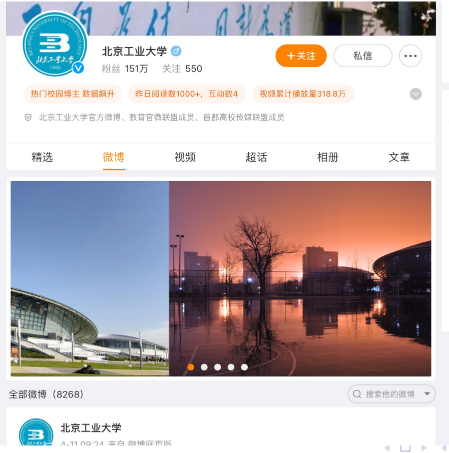


Tactics to Improve Modifiability

-Delaying Binding Time

Publish-subscribe style

- Example of Weibo



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Tactics to Improve Modifiability

-Delaying Binding Time

Polymorphism

- Use different subclasses to implement different functionalities

```
class Animal {
  public void eat() {System.out.println(“进食");}
}
class Dog extends Animal {
  public void eat(){System.out.println("狗吃肉");}
}
class Cat extends Animal {
  public void eat(){System.out.println("猫吃鱼");}
}
```

```
public class Test {
  public static void main(String[] args){
    //定义为狗
    Animal a = new Dog();
    a.eat();
    //变成猫
    a = new Cat();
    a.eat();
```

Modifiability- Summary

Concerns of Modifiability

- Cost of Modification

Tactics to improve Modifiability

- Limiting the Scope of Modification
- Delaying Binding Time

Thank you!