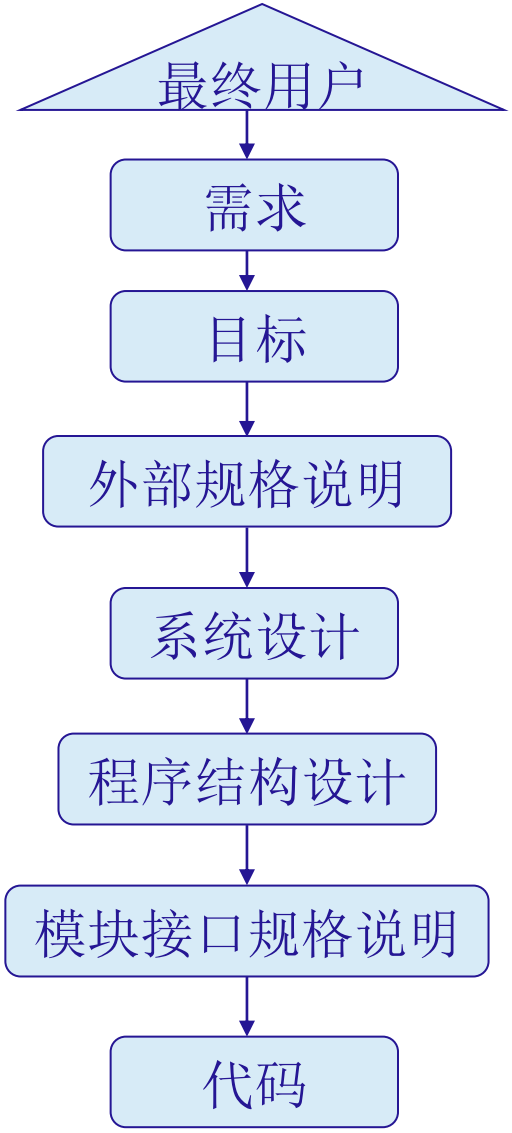
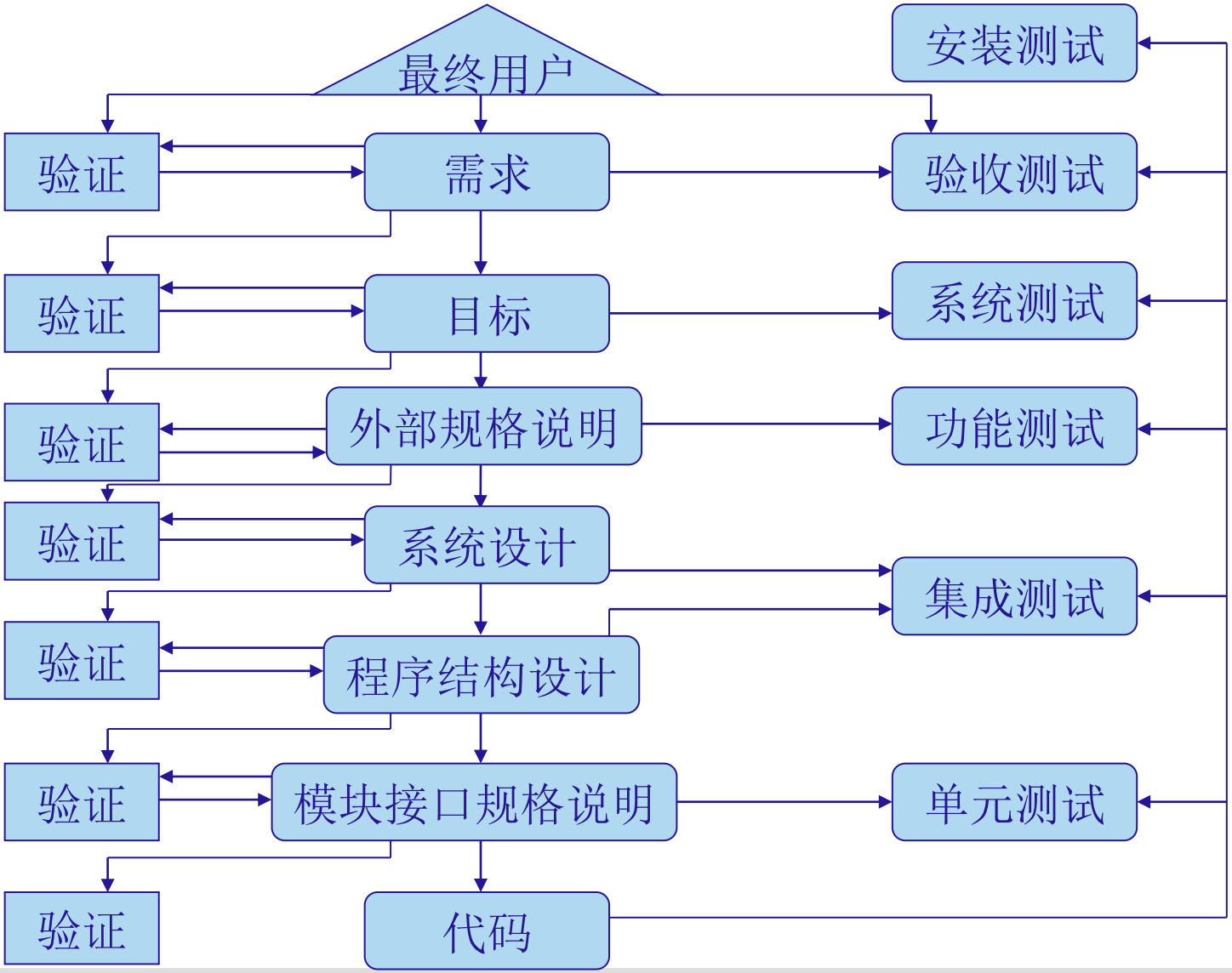
SOFTWARE TESTING

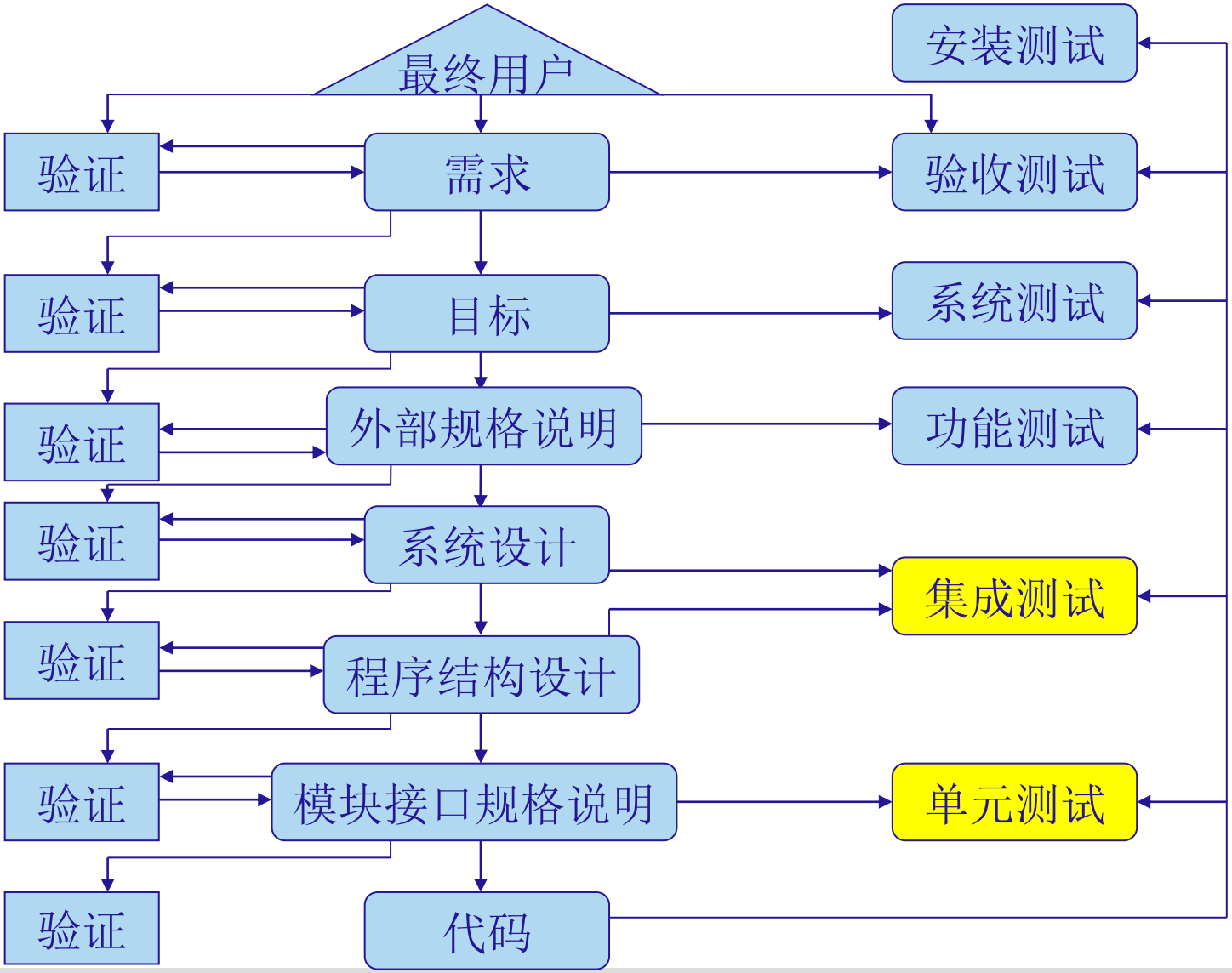
苏临之

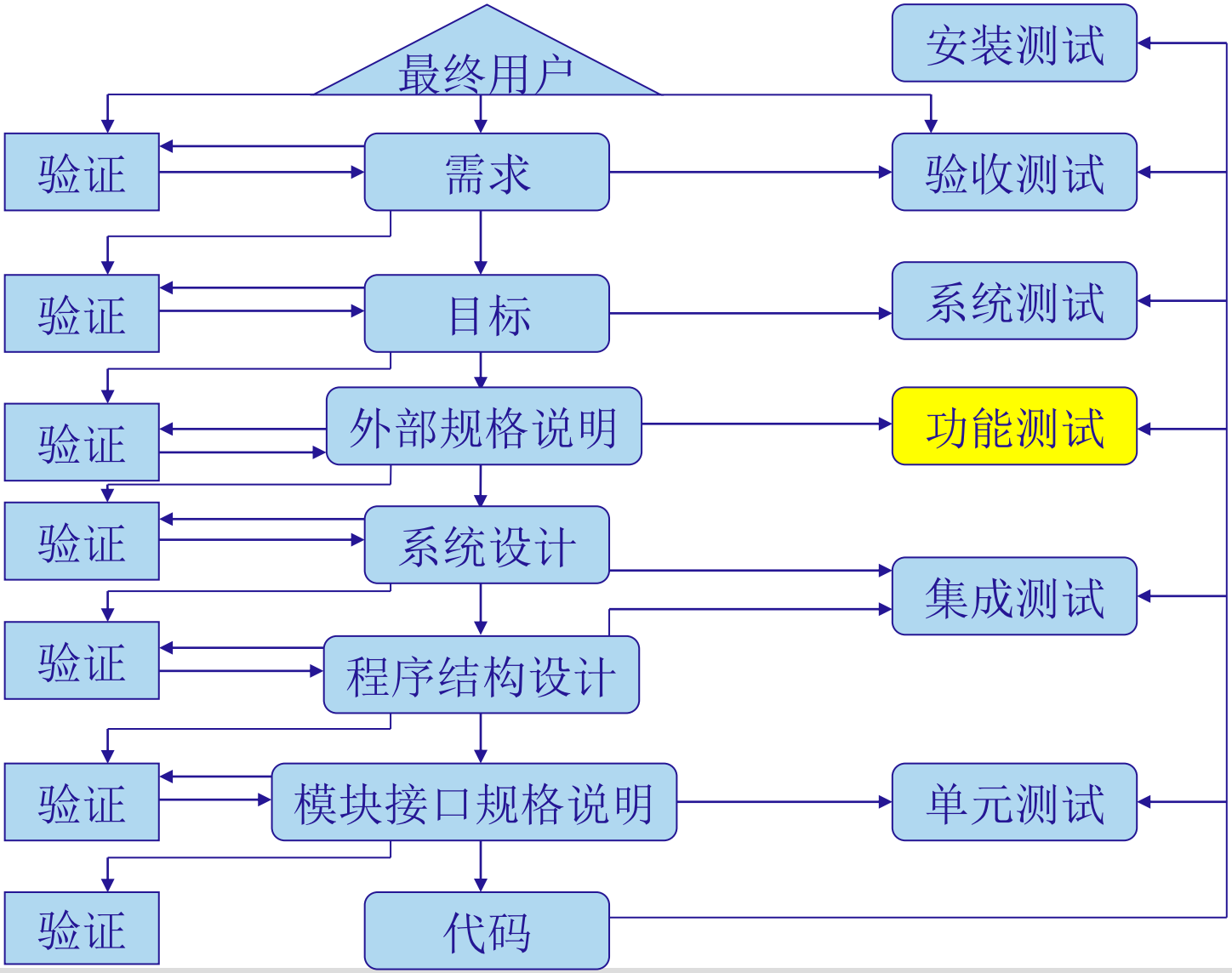
sulinzhi029@nwu.edu.cn

Development of Software



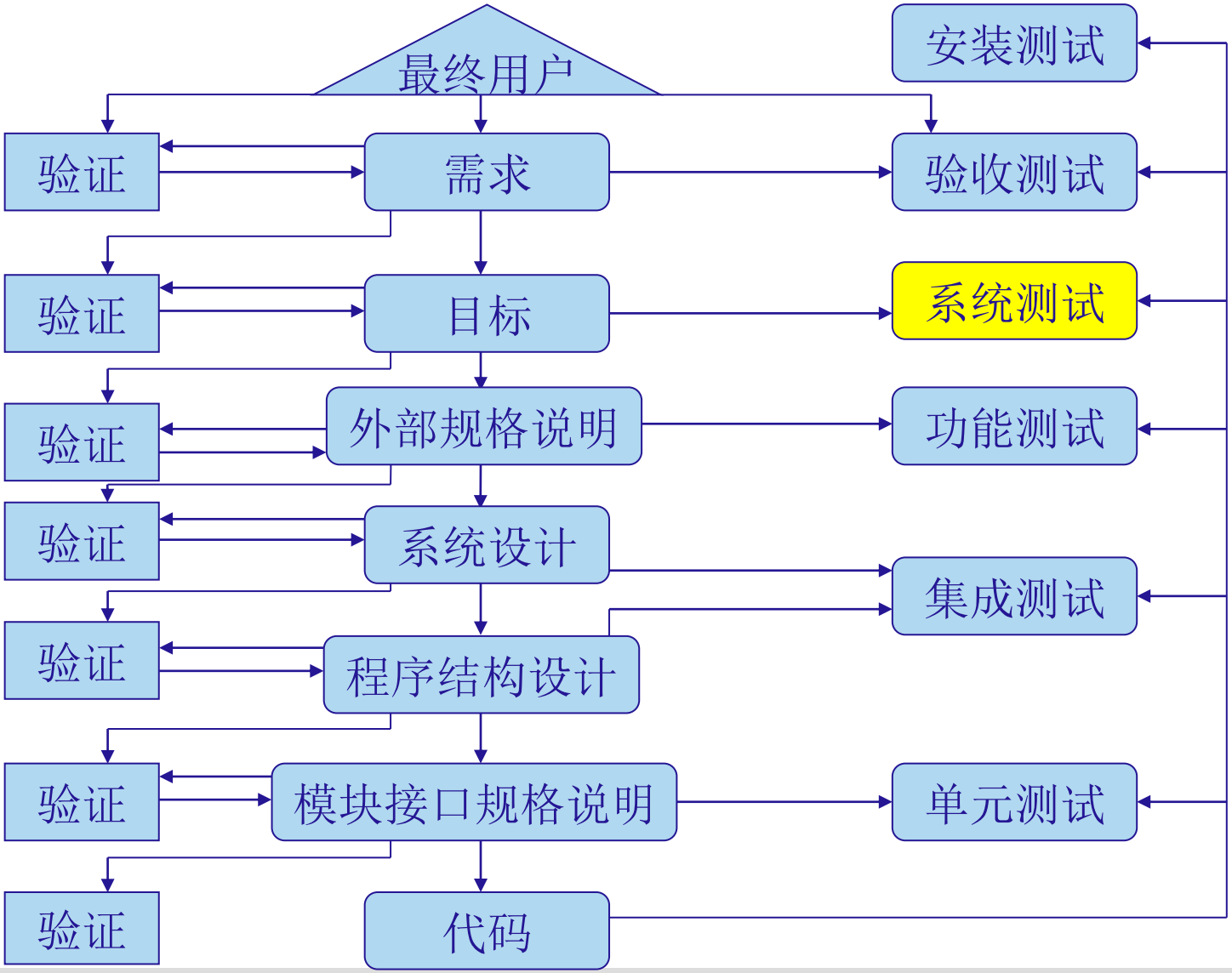

最终用户
安装测试
验证
需求
验收测试
验证
目标
系统测试
验证
外部规格说明
功能测试
验证
系统设计
集成测试
验证
程序结构设计
验证
模块接口规格说明
单元测试
验证
代码


最终用户
安装测试
验证
需求
验收测试
验证
目标
系统测试
验证
外部规格说明
功能测试
验证
系统设计
集成测试
验证
程序结构设计
验证
模块接口规格说明
单元测试
验证
代码


最终用户
安装测试
验证
需求
验收测试
验证
目标
系统测试
验证
外部规格说明
功能测试
验证
系统设计
集成测试
验证
程序结构设计
验证
模块接口规格说明
单元测试
验证
代码

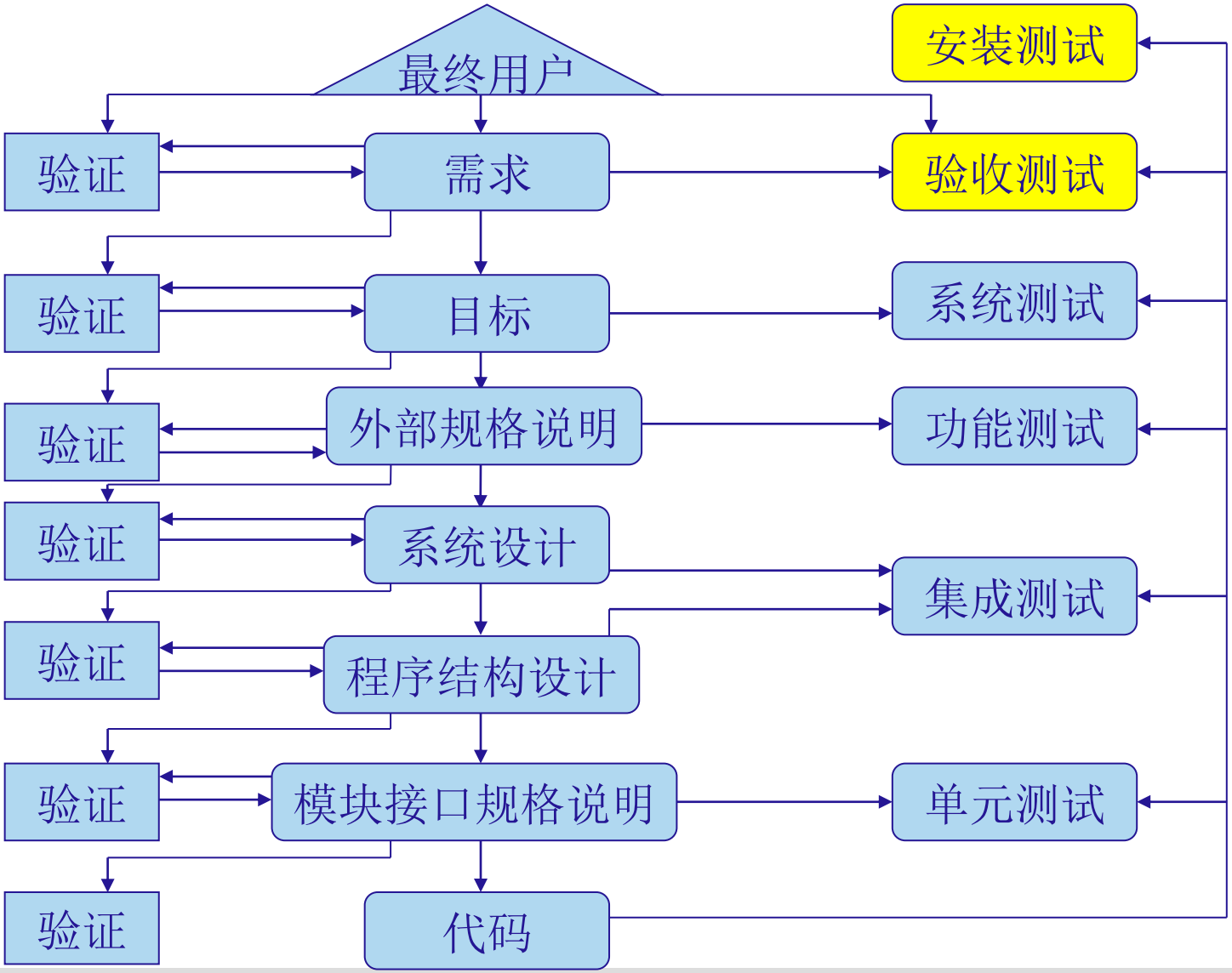
Functional Testing

- In the functional testing, one tries to find out the difference between the actual function of the program and its specification. Upon the analysis of the specification, one will get a set of test cases.
- Except for some very small programs, the black-box testing techniques are usually applied, and the techniques, such as equivalence partitioning, boundary value analysis, decision table and cause-effect diagram, are especially applicable here.


最终用户
安装测试
验证
需求
验收测试
验证
目标
系统测试
验证
外部规格说明
功能测试
验证
系统设计
集成测试
验证
程序结构设计
验证
模块接口规格说明
单元测试
验证
代码

System Testing

- System testing, whose aim is to compare the entire system with the initial goals, is a process to find out whether the system is not capable of meeting the goals. So without these goals, one can never executing the system testing.
- It is worth noting that the system testing is not to test the function of the system because it is not based on the specification. Actually the system testing can be viewed as a non-functional testing.
- It is crucial to determine who will be in charge of system testing because the testers here must know customers' attitude and the circumstance for using. Those who develop the software can not act as the system tester.


最终用户
安装测试
验证
需求
验收测试
验证
目标
系统测试
验证
外部规格说明
功能测试
验证
系统设计
集成测试
验证
程序结构设计
验证
模块接口规格说明
单元测试
验证
代码

Acceptance and Installation Testing

- The acceptance testing is the process to compare the program with the initial requirement and the customers' final requirement. It is process executed by customers or the end users, so it is not the duty of those who developed the software.
- The aim of installation testing is not to find the error in the software, but to find the error in the installation process in which many options should be determined by the users and valid configurations should be involved.

Common Issues in System Testing

- Ability Testing
- Load Testing
- Stress Testing
- Performance Testing
- Memory Testing

Ability Testing

- The ability testing aims to check whether every ability item has been realized or not.
- The ability testing is not the functional testing, which focuses on whether the software can realize the corresponding functions. The ability testing focuses more on the specific quality to realize a function, such as stability or compatibility.

Load Testing & Stress Testing

- The load testing makes the system experience large amount of data, aiming to check whether the software can cope with the load as demonstrated. It will occupy much source. For example, the popular artificial neural networks need load testing when they are run in a computer.
- The stress testing aims to test whether the system can handle high stress, which means that in a short time the data or operations reach their maximum. For example, the actual power source supply will consider the maximum power transfer, so the stress testing is indispensable.

Performance & Memory Testing

- Performance testing corresponds to the specific goal, such as the accuracy, operating speed, etc. Its aim is to show whether the system can reach its specified performance.
- The memory testing is to check the hardware where the software will be run, such as the storage of the main memory, the hit rate of cache and the structure of virtual memory.

Specific Issues in System Testing

- Configuration Testing
- Compatibility Testing
- Foreign Language Testing
- Usability Testing
- Documentation Testing
- Safety Testing

Specific Issues in System Testing

- **Configuration Testing**
- Compatibility Testing
- Foreign Language Testing
- Usability Testing
- Documentation Testing
- Safety Testing

Configuration Testing

- A process for various hardware to run a software.
- 配置测试是必不可少的，原因是硬件的生产厂商并没有执行严格的标准，有时候仅执行松散的规范，这样导致软件使用某种硬件配置无法正常工作。
- 如何判断缺陷是由配置问题产生而不仅仅是一个普通缺陷？最可靠的方法是：在另外一台由完全不同硬件配置的机器上执行导致问题的相同操作。
- 配置测试的工作量可能是巨大的，因此可以使用等价类划分的方法来减少工作量。

Specific Issues in System Testing

- Configuration Testing
- **Compatibility Testing**
- Foreign Language Testing
- Usability Testing
- Documentation Testing
- Safety Testing

Compatibility Testing

- 软件经常需要向其他程序导入和导出数据，在各种操作系统和网络浏览器上运行，与同时运行在同一硬件上的其他软件交叉操作。
- 软件兼容性测试的目标是保证软件按照用户期望的方式与其它软件进行交互。
- 一些泛性兼容软件的例子：
  - 从某程序保存账目数据，在另一程序中读入
  - 软件在同一操作系统的不同版本中工作
  - 升级到新的数据库程序，是否能够导入现有的程序

Compatibility Testing

- 几个具体的例子：

- Microsoft Office系列办公软件的Visio画图软件，可以使用复制粘贴的方法保存到Word或PowerPoint里，同时保持画出来的图仍是矢量图，因此这同一个系列的软件是有兼容性的；
- Visio软件同样可以通过复制粘贴的方式将图粘贴到Adobe系列的作图软件上，如Photoshop或Illustrator，仍然可以保持矢量图的精度，其具有兼容性；
- MATLAB导出的矢量图可以通过“编辑 - Copy Figure”功能将矢量图导入Visio中，说明它们也有兼容性。

Compatibility Testing

- 如果对新软件进行兼容性测试，就需要通过各种静态测试解答以下问题：
  - 软件设计要求与何种其他平台（操作系统、网络浏览器或者操作环境）和应用软件保持兼容？
  - 如果要测试的软件是一个平台，那么设计要求什么应用程序在其上运行？
  - 应遵守何种定义软件之间交互的标准或者规范？
  - 软件使用何种数据与其他平台和软件交互和共享信息？

Compatibility Version

- 选择目标平台或者兼容的应用程序实际上是程序管理或市场定位的任务。要由熟悉客户基本情况的人来决定。
- Forward Compatibility: Being able to use the versions in the **future**.
- Backward Compatibility: Being able to use the versions in the **past**.
- 需要对向前兼容和向后兼容有一个正确理解和认识

Standards and Regulations

- 实施兼容性测试的第一步是研究可能适用于软件或者平台的现有标准和规范。最终保证软件之间的信息交换与共享。
- 高级、低级标准规范：

- 高级标准和规范：产品普遍遵守的规则，例如外观、感觉、支持的特性等。如果某个应用程序声称与某平台兼容，就必须遵守该平台自身的标准和规范。
- 低级标准和规范：本质细节，例如文件格式和网络通信协议等。例如某软件把图形文件保存为.png格式，而该软件不符合该.png文件的标准，用户就无法用其他程序查看该文件，因此该软件与标准不兼容，很可能成为短命产品。

Specific Issues in System Testing

- Configuration Testing
- Compatibility Testing
- **Foreign Language Testing**
- Usability Testing
- Documentation Testing
- Safety Testing

Foreign Language Testing

- One should at least master his mother tongue as well as English, and some other languages are also necessary.
- Before testing foreign language in the software, one should also, more or less, get acquainted with some knowledge of languages and linguistics.
- Foreign language testing is very important in that nearly anywhere in the software: specification, documentation and code comments. A bad translation will lead to severe misunderstanding or even destruction.

Various Languages

- The existing languages are various in many aspects.
  - Pronunciation system
  - Vocabulary system
  - Grammar system
  - Users and their regions
  - ……

Pronunciation System

- Compare the pronunciations of the red parts in each group. Do they pronounce the same? Why or why not?

  - stay day
  - spell bell
  - skate gate

Pronunciation System

- Chinese people usually fail to discriminate the unvoiced and the voiced sound, whereas Japanese people fail to tell the difference between aspirated and unaspirated sound.

  - stay day
  - spell bell
  - skate gate

Pronunciation System

- Besides, pronunciation conventions also differ from each other. Try to figure out the difference among these three.

  - /el/ (English)
  - /el/ (French)
  - /el/ (Spanish)

Vocabulary System

- Vocabulary systems vary from language to language. For example, Chinese vocabulary is based on the individual characters, while English vocabulary is based on the spelling of letters.
- Sometimes the same word appearance may correspond to different meaning in several languages. For example, the word same "red" in English and Spanish means totally differently. There are more cases that can be found in Chinese and Japanese.

Grammar System

- It is obvious that the grammar systems differ a lot between Chinese and English. Nevertheless, the languages in European countries also differ greatly. For example, the definite articles in English, Spanish and German are as follows.

the

English

el	la
los	las

Spanish

der	die	das	die
des	der	des	der
dem	der	dem	den
den	die	das	die

German

Grammar System

- Besides, the conjugations may lead to great confusion for the learner or even the skilled persons. A simple comparison between English and Spanish is as follows.

	single	plural
1st	eat	eat
2nd	eat	eat
3rd	eats	eat

English (Present)

	single	plural
1st	como	comemos
2nd	comes	coméis
3rd	come	comen

Spanish (Present)

Grammar System

- Besides, the conjugations may lead to great confusion for the learner or even the skilled persons. A simple comparison between English and Spanish is as follows.

	single	plural
1st	ate	ate
2nd	ate	ate
3rd	ate	ate

English (Past)

	single	plural
1st	comí	comimos
2nd	comiste	comisteis
3rd	comió	comieron

Spanish (Past)

Localization & Internationalization

- 逐字直译单词是容易的，但要想使整个操作提示意思明确、实用，就需要投入更多的时间和精力。好的翻译要是外文翻译得读起来和原文一样。
- 做到这一点非常困难，如把英语翻译成西班牙语理论是可以做到的。那么是指那个国家的西语？西班牙的西语还是拉丁美洲诸国的西语呢？
- 软件适应特定地域特征，照顾到语言、方言、地区习俗和文化的过程称为本地化（Localization）或国际化（Internationalization）

Translation Issues

- Although translation is just a part of the overall localization effort, it's an important one from a test standpoint.
- The most obvious problem is how to test something that's in another language.
  - It's important that you or someone on your test team be at least a little familiar with the language you're testing. Another solution is to contract out this work to a localization testing company.
  - Many things can be checked without knowing what the words say. It would be helpful, sure, to know a bit of the language, but you'll see that you might be able to do a fair amount of the testing without being completely fluent.

Translation Issues

- 文本扩展
- ASCII等编码问题
- 热键和快捷键
- 扩展字符
- 字符计算
- 阅读方向
- 图形中的文字
- 文本和代码脱离

Problems Encountered

- 内容：除了代码以外，软件里的内容在本地化时是否会出现和本地的文化、习俗不兼容的情况。例如先前某国外考试报名系统里要求输入的姓和名不能是单字母，以防止恶意注册，结果导致了中国有一位姓鄂的学生无法报名。此外，还有类似于“芳芳”这样的中国本地品牌在在外国无法注册等事件。
- 数据格式：例如日期显示顺序、门牌号、度量衡、姓名顺序问题。

THANK YOU!