



上海外国语大学
SHANGHAI INTERNATIONAL STUDIES UNIVERSITY

New Media Data Analytics and Application

Lecture 2: Software Engineering

Ting Wang

- The Process of Software Development
- Foundations of Data Base





a management approach to software engineering

The Process of Software Development

The Process of Software Development

Software Crisis

- The First NATO Software Engineering Conference in 1968, Germany.
- How to cope with the difficulty of writing useful and efficient computer programs in the required time.



The Process of Software Development

Difficulties in Software Development

1. Projects running over-budget
2. Projects running over-time
3. Software was very inefficient
4. Software was of low quality
5. Software often did not meet requirements
6. Projects were unmanageable and code difficult to maintain
7. Software was never delivered



The Process of Software Development

What is Software Engineering

- Software engineering is the application of engineering to the **design, development, implementation, testing and maintenance** of software in a systematic method.

From Wikipedia

The Process of Software Development

Basic Elements in Software Engineering

- Development Stages
- Management Pipeline
- Demands Changing
- Cooperative Team Work
- Professional Expert Participation



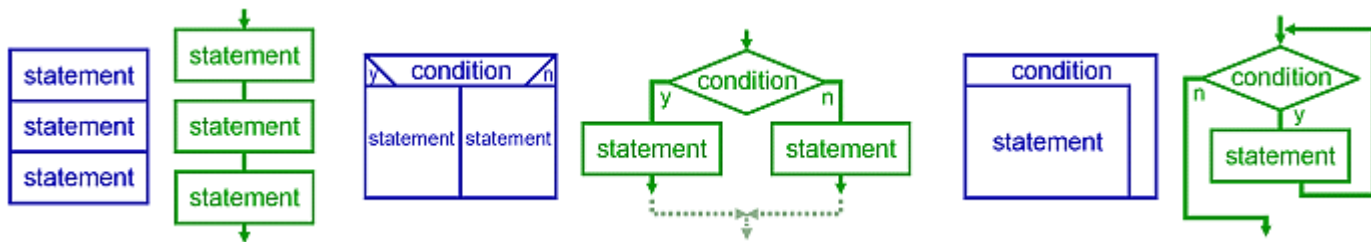
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Programming Paradigm 编程范式

• Structured Programming (1) 结构化编程

– Control Structure

1. Sequence
2. Selection: *if..then..else..endif*, *switch*
3. Iteration: *while*, *repeat*, *for*, *do...until*



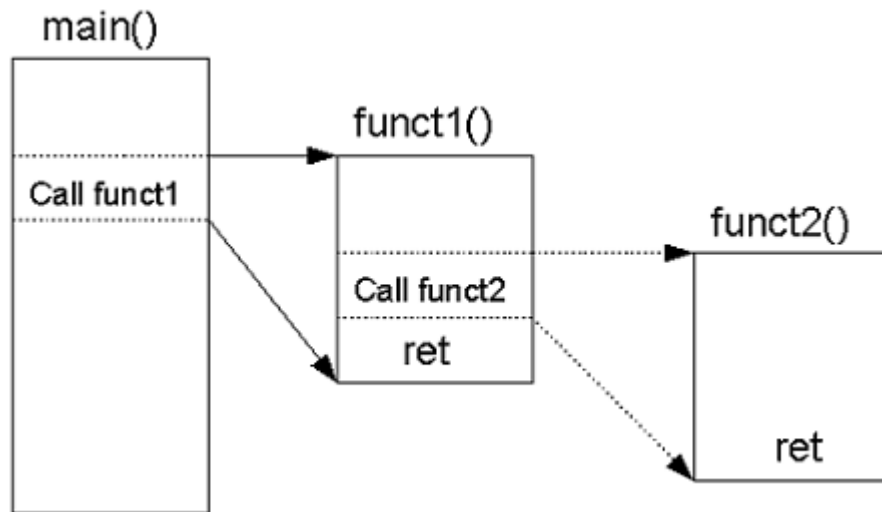
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Programming Paradigm 编程范式

- Structured Programming (2) 结构化编程

 - Subroutines

 - 子程序



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Programming Paradigm 编程范式

- Object Oriented Programming(1)

面向对象编程 针对物件的编程

- Object 对象

- Class 类

- Attribute 属性

- Method 方法



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Programming Paradigm 编程范式

- Object Oriented Programming(2)

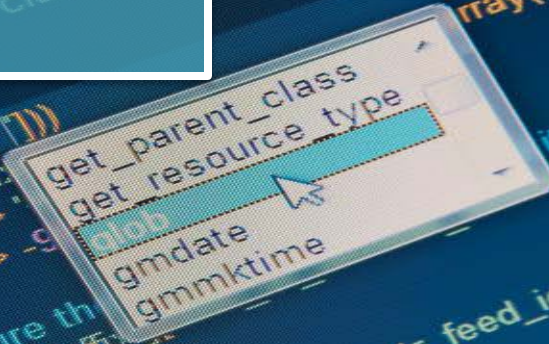
面向对象编程

- Encapsulation 封装
- Inheritance 继承
- Polymorphism 多态



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EXAMPLE 1:
Class



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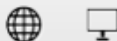





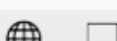

```
1 class Customer(object):
2
3     name = ''
4     password = ''
5
6
7     def __init__(self, name, password):
8         self.__name = name
9         self.__password = password
10        print('Name: %s' %self.__name)
11
12    def get_validation(self, password):
13        if password=='sisu':
14            return 1
15        else:
16            return 0
17
18 class Student(Customer):
19
20     name = ''
21     password = ''
22     studentID = ''
23
24    def __init__(self, name, password, studentID):
25        Customer.__init__(self, name, password)
26        self.studentID = studentID
27
28    def print_studentID(self):
29        return self.studentID
30
31    def get_validation(self, password):
32        if password=='shisu':
33            return 'Passed'
34        else:
35            return 'Failed'
36
37 Thomas = Customer('Thomas Edison', 'sisu')
38 print('Thomas.get_validation() =', Thomas.get_validation('sisu'))
39 Albert = Student('Albert Einstein', 'sisu', '20160001')
40 print('Albert.print_studentID() =', Albert.print_studentID())
41 print('Albert.get_validation() =', Albert.get_validation('sisu'))
```



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IEEE Spectrum

<http://spectrum.ieee.org/computing/software/the-2016-top-programming-languages>

Language Rank	Types	Spectrum Ranking
1. C		100.0
2. Java		98.1
3. Python		98.0
4. C++		95.9
5. R		87.9
6. C#		86.7
7. PHP		82.8
8. JavaScript		82.2
9. Ruby		74.5
10. Go		71.9



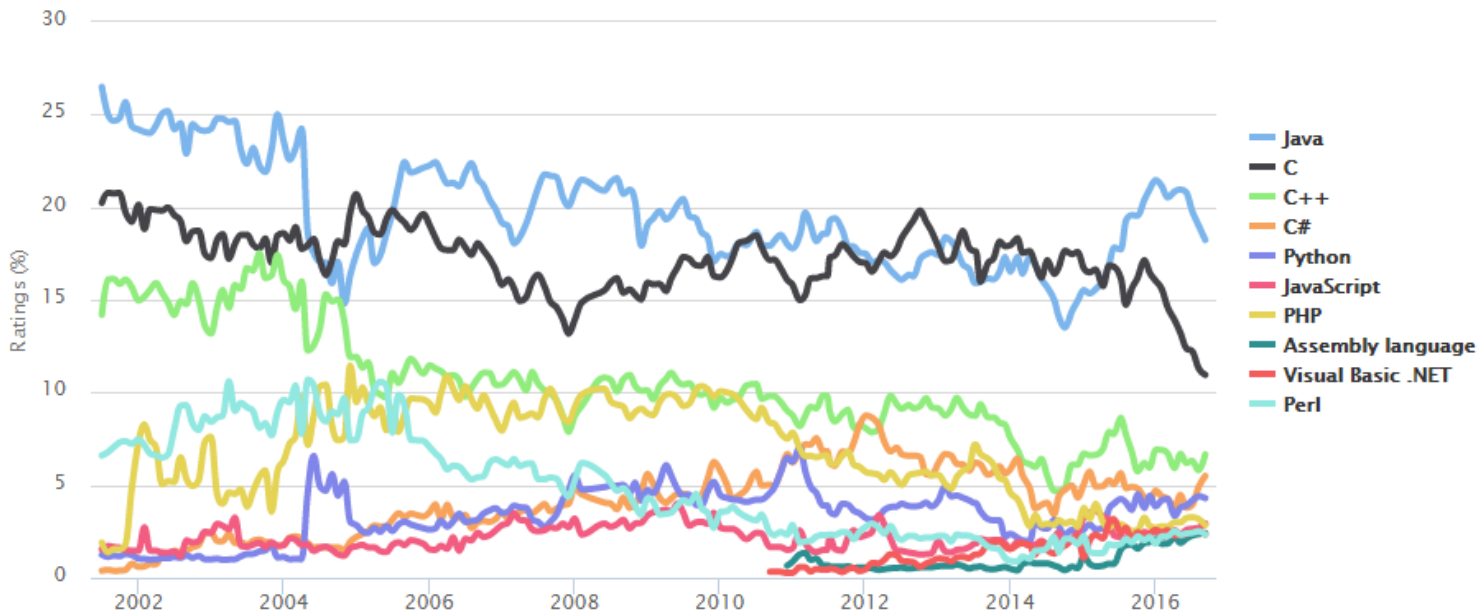
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TIOBE

<http://www.tiobe.com/tiobe-index/>

TIOBE Programming Community Index

Source: www.tiobe.com



The Process of Software Development

- Water Fall Model

System Analysis
Customer Demand Analyzer

Structure Design
Structure Designer

Coding
Programmer

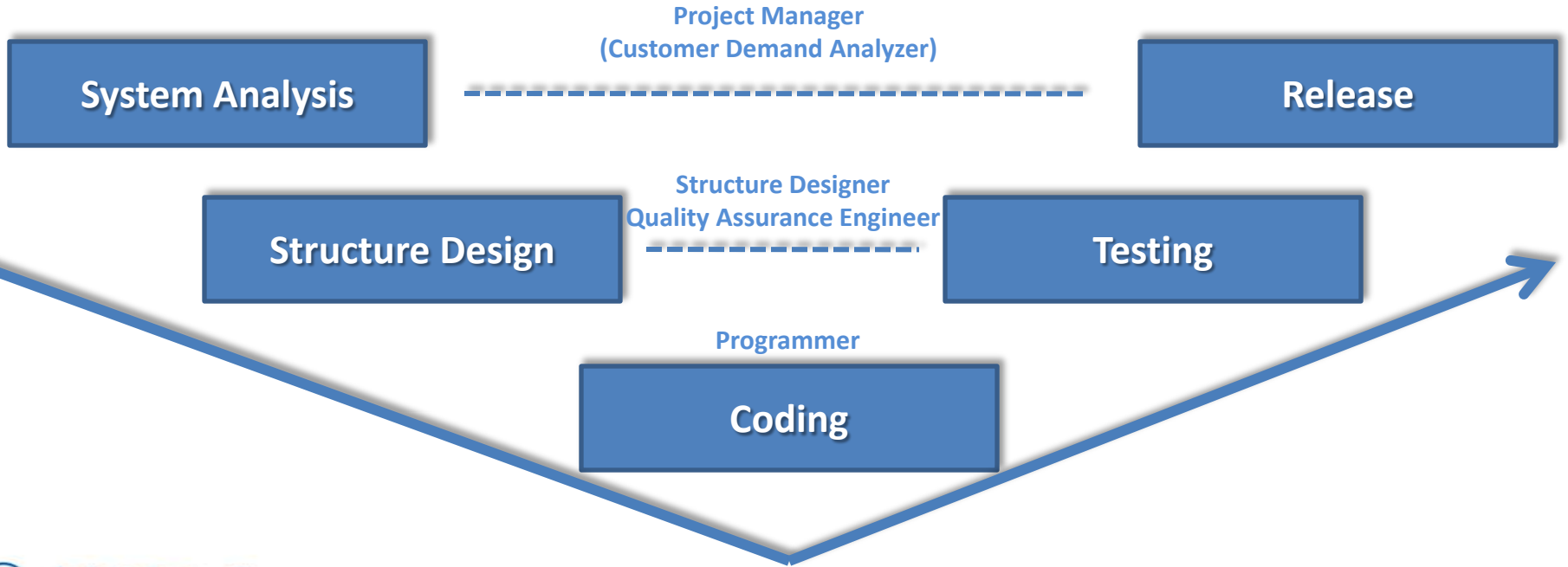
Testing
Quality Assurance Engineer

Release
Project Manager



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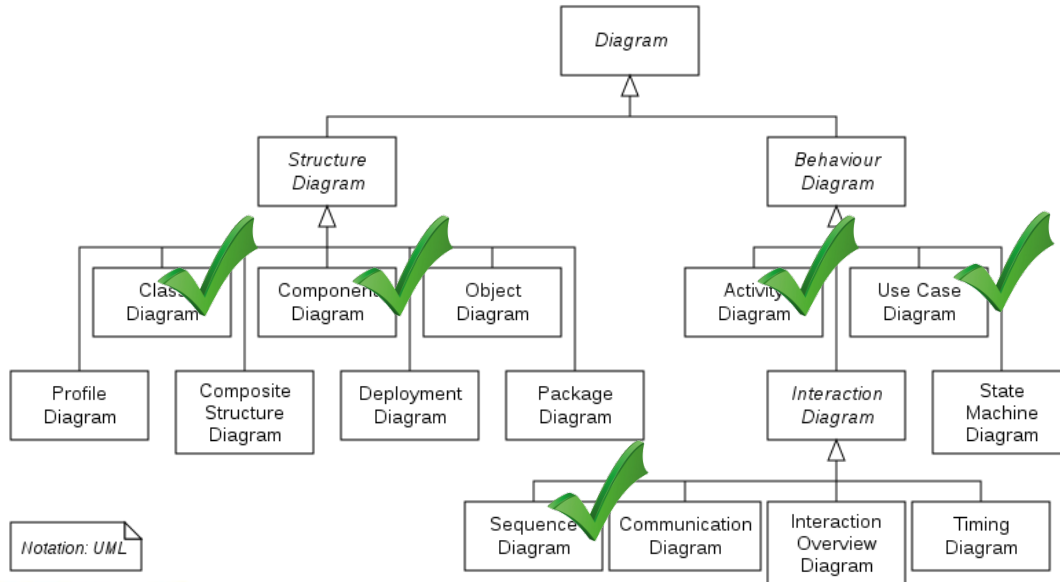
- V-Model



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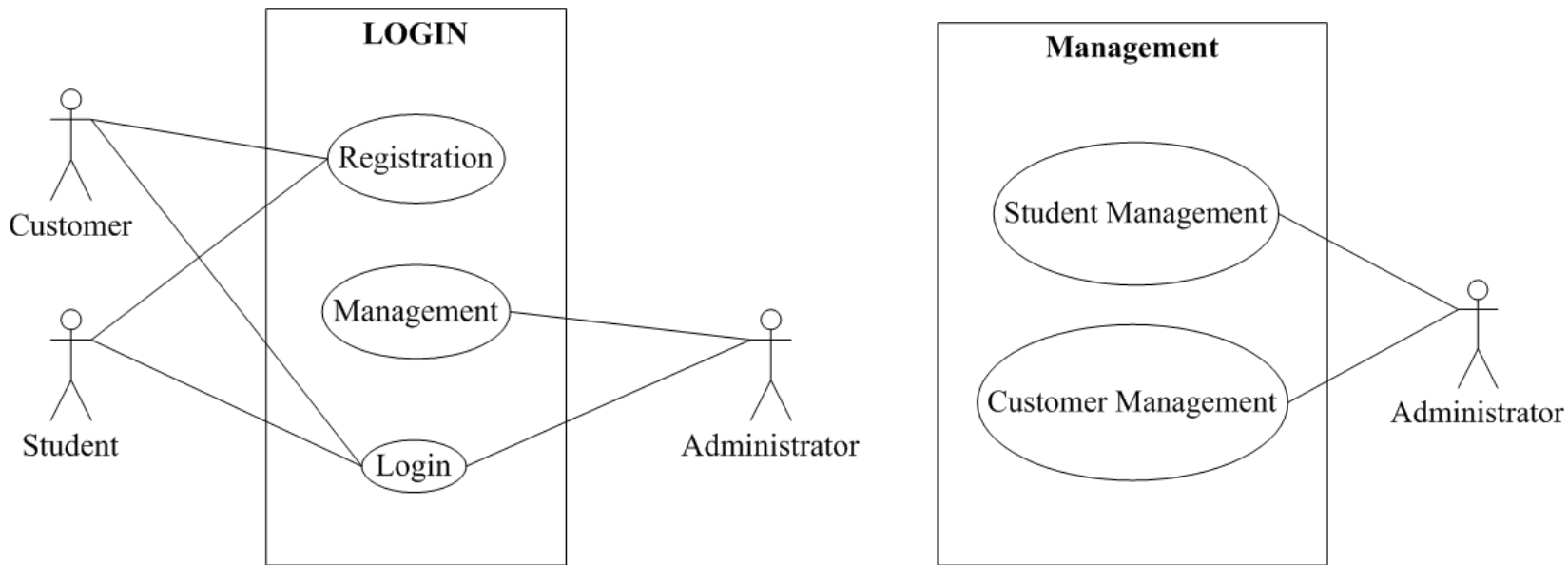
Unified Modeling Language (UML)

A general-purpose, developmental, modeling language in the field of software engineering, that is intended to provide a standard way to visualize the design of a system



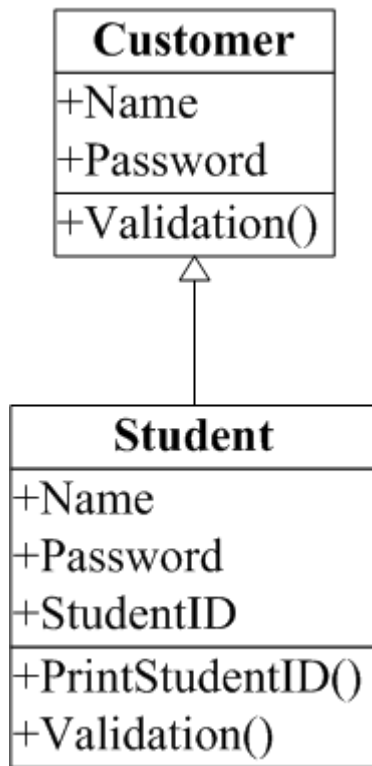
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- Use Case Diagram



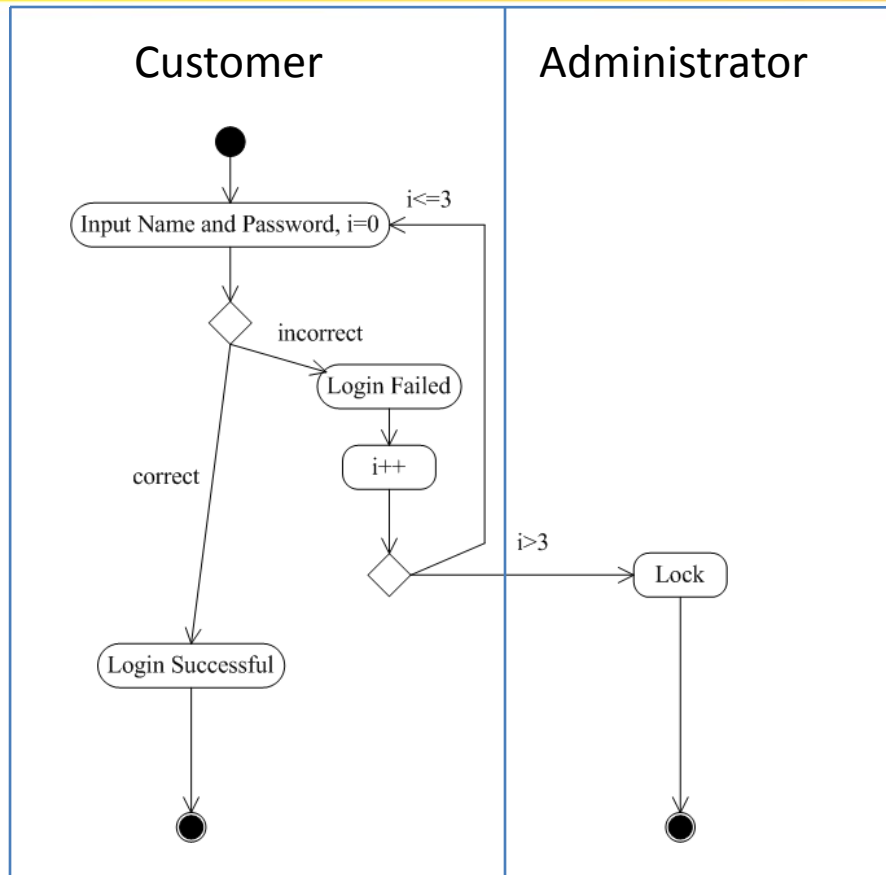
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- Class Diagram



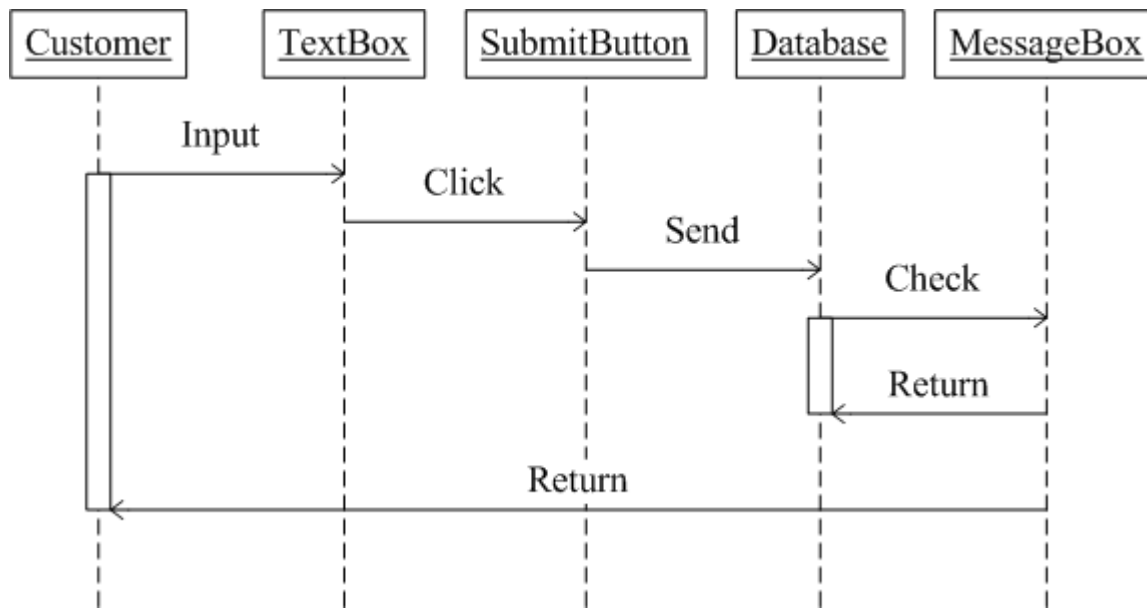
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- Activity Diagram



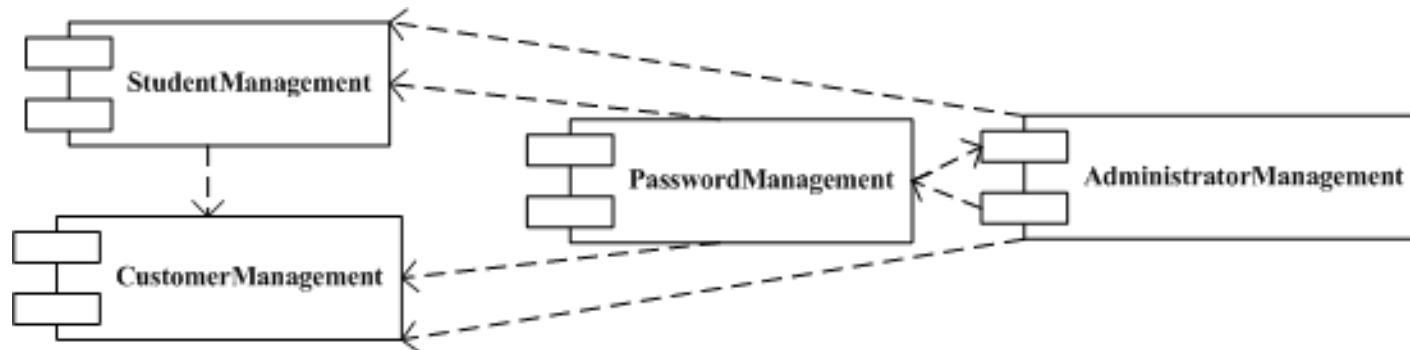
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- Sequence Diagram



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- Component Diagram



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- Function Structure Diagram



The Process of Software Development

Time Estimation for Software Projects

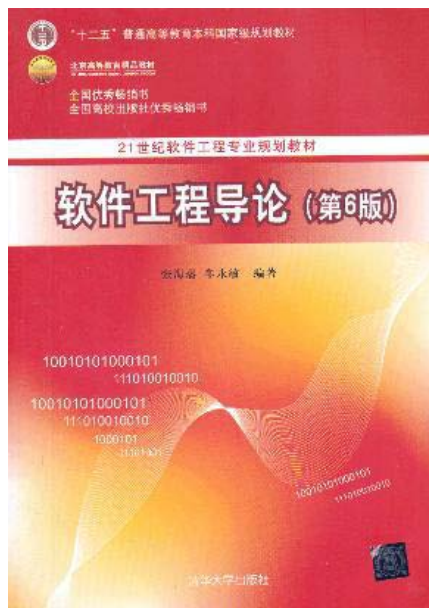
- Man-Month
- Man-Day
- Basic Function: Insert, Delete, Update, Select
 - Slow: *1 Basic Function per day*
 - Common: *2 Basic Functions per day*
 - Fast: *4 Basic Functions per day*



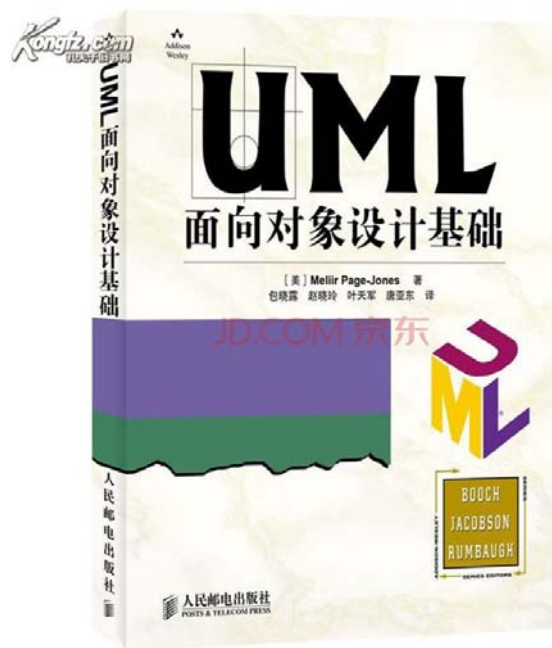
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References

软件工程导论（第6版）



UML面向对象设计基础





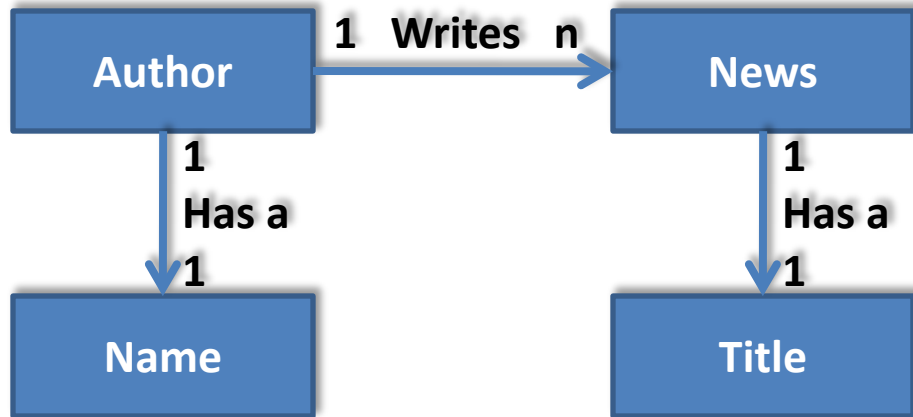
an approach to store data

Foundations of Data Base

Foundations of Data Base

Relational Database

a digital database whose organization is based on the **relational model** of data



Foundations of Data Base

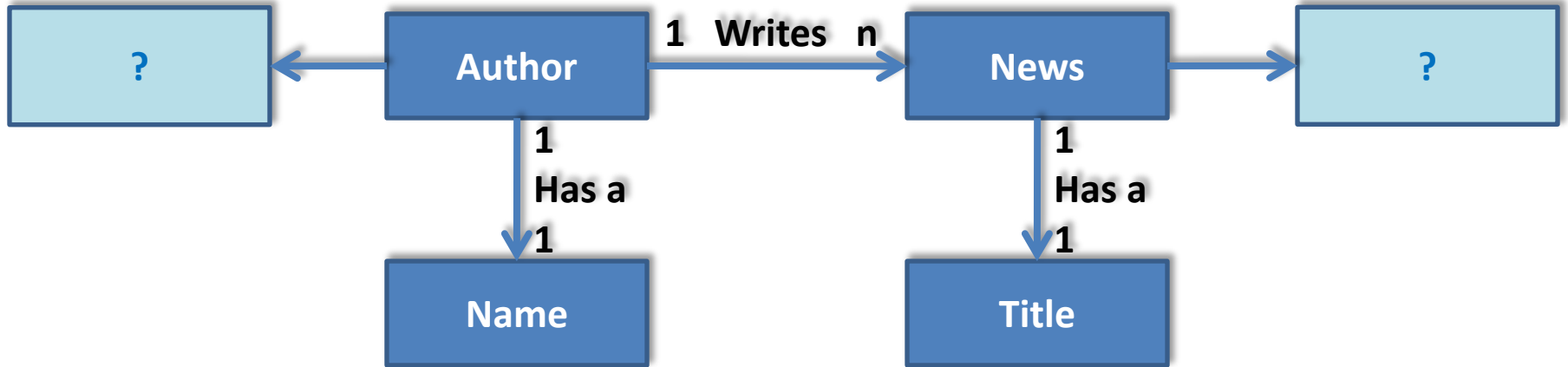
Widely Used Data Base

- MySQL
- SQL Server
- Oracle



Foundations of Data Base

ER Diagram



Foundations of Data Base

Structure Design of Data Base

- 1:1, in the same table
- 1:n, mark “1” in “n” ’s table
- n:m, create a new table to store



Constraints

1. Primary Key: Unique ID
2. Foreign Key: The same thing
3. Index: a quicker access to data



Foundations of Data Base

Structured Query Language (SQL)

a special-purpose programming language designed for managing data held in a relational database management system (RDBMS), or for stream processing in a relational data stream management system (RDSMS).



Create

CREATE TABLE *TABLE_NAME*

```
CREATE TABLE CUSTOMER
(
  CUSTOMER_ID          INT          IDENTITY(1, 1)      PRIMARY KEY CLUSTERED,
  CUSTOMER_NAME        CHAR(100)    NOT NULL,
  CUSTOMER_PWD         CHAR(100)    NOT NULL,
)
```



Drop

`DROP TABLE TABLE_NAME`

```
DROP TABLE CUSTOMER|
```



Insert

INSERT INTO

TABLE_NAME(COLUMN1, COLUMN2,...)

VALUES('STRING',NUMBER)

```
INSERT INTO CUSTOMER(CUSTOMER_NAME, CUSTOMER_PWD) VALUES('Thomas Edison', 'sisu')
INSERT INTO CUSTOMER(CUSTOMER_NAME, CUSTOMER_PWD) VALUES('Albert Einstein', 'sisu')
INSERT INTO CUSTOMER(CUSTOMER_NAME, CUSTOMER_PWD) VALUES('Marie Curie', 'shisu')
```



Foundations of Data Base

Delete

DELETE FROM *TABLE_NAME* WHERE *CONDITION*

```
DELETE FROM CUSTOMER WHERE CUSTOMER_NAME='Marie Curie'
```



Foundations of Data Base

Update

UPDATE *TABLE_NAME* SET
COLUMN=COLUMN_VALUE WHERE
CONDITION

```
UPDATE CUSTOMER SET CUSTOMER_PWD='shisu' WHERE CUSTOMER_NAME='Albert Einstein'
```



Foundations of Data Base

Select

SELECT - FROM - WHERE

SELECT *COLUMN_NAME* FROM *TABLE_NAME* **WHERE *CONDITION***
GROUP BY *CONDITION*
ORDER BY *CONDITION*

```
SELECT CUSTOMER_NAME FROM CUSTOMER WHERE CUSTOMER_PWD='sisu'
```



Foundations of Data Base

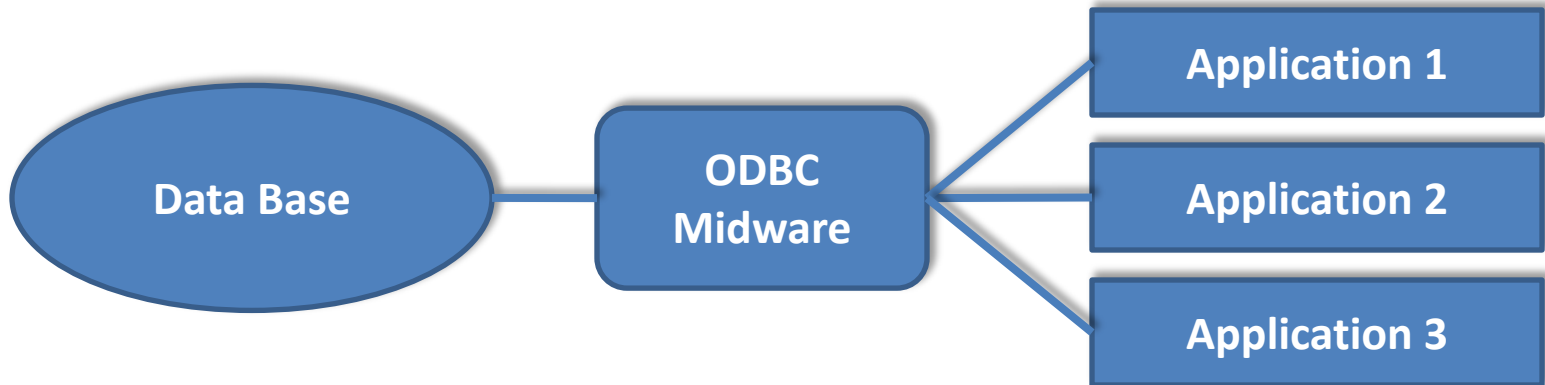
EXAMPLE 2:
Data Base



Foundations of Data Base

Open Database Connectivity (ODBC)

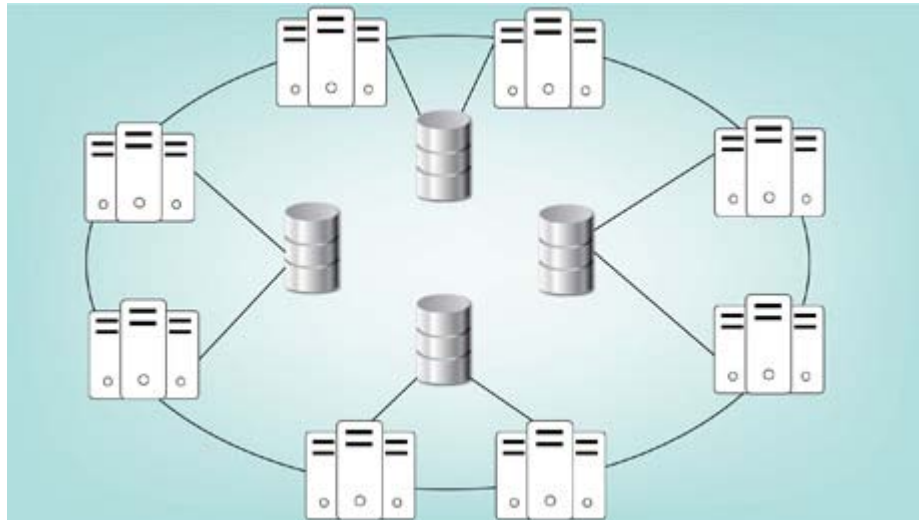
a standard application programming interface (API) for accessing database management systems (DBMS). The designers of ODBC aimed to make it independent of database systems and operating systems. An application written using ODBC can be ported to other platforms, both on the client and server side, with few changes to the data access code.



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Distributed Data Base

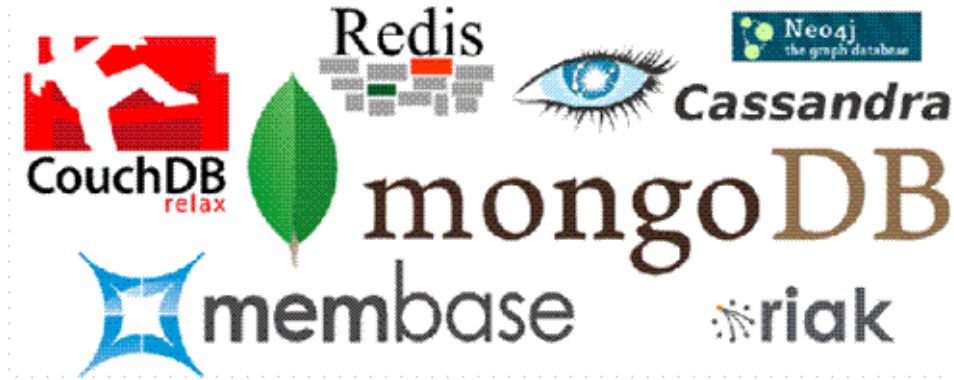
a database in which data are stored in multiple computers, located in the same physical location; or may be dispersed over a network of interconnected computers.



Foundations of Data Base

NoSQL (Not Only SQL)

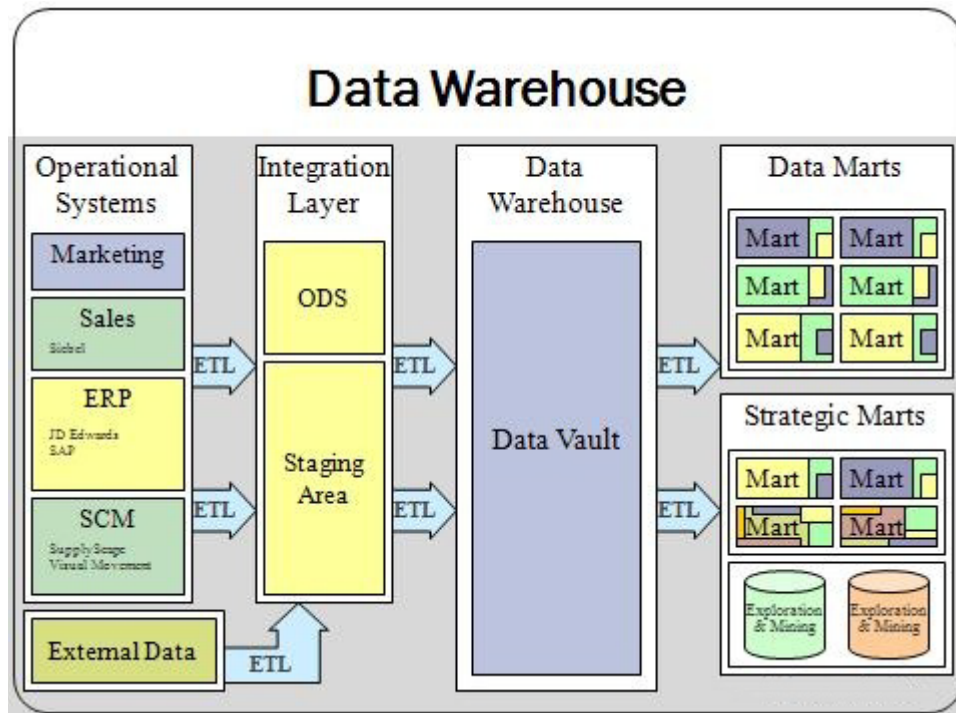
triggered by the needs of Web 2.0 companies such as Facebook, Google, and Amazon.com, NoSQL databases are increasingly used in big data and real-time web applications.



Foundations of Data Base

Data Warehouse 数据仓库

a system used for reporting and data analysis, and is considered as a core component of **business intelligence** environment



Foundations of Data Base

Reference

数据库系统概论（第5版）

王珊，萨师焯 著

高等教育出版社





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Home Work

Design a data base for customer login system with login and registration. (1 Week)

- Functions:
 - New customer information registration
 - Customer login

- 1. A Report with:
 - Team Member and Everyone's Position
 - ER Diagrams
 - Data Base Description
 - Innovation

- 2. A Data Base (MySQL, SQL Server, Oracle)





The End of Lecture 2

Thank You

<http://www.wangting.ac.cn>

