Operating system

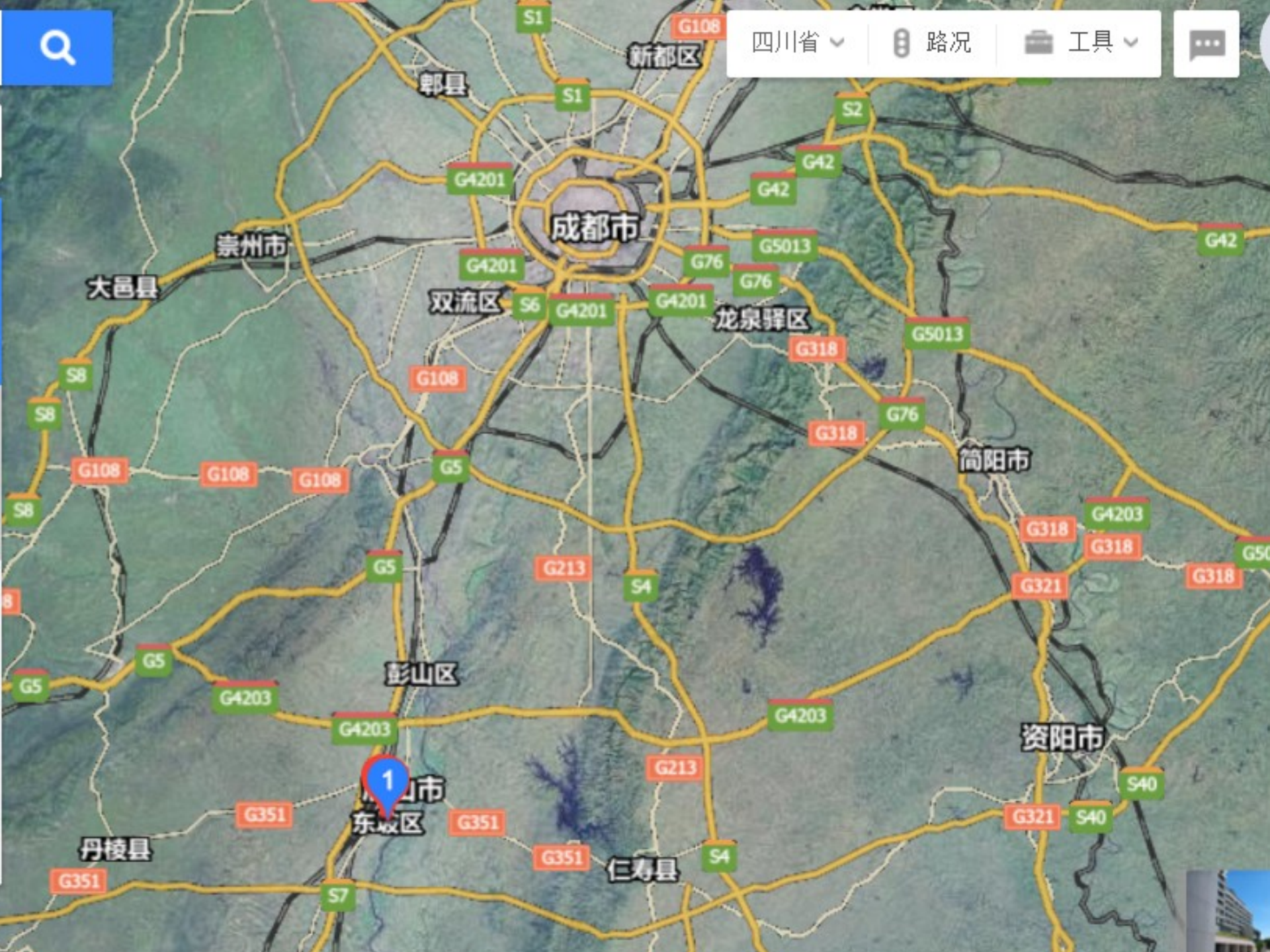
Part I: Introduction

By **KONG** LingBo (**孔令波**)

Introduction

- About me [孔令波 , 76 代]
- Examination & Resources
- Why should we learn this course?
  - Learning from classics is always the best way!
  - The simple view about OS: The repetition structure controlled by user’ s choices

2017.1.23. SanSu Temple, MeiShan county
四川，眉山，三苏祠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G351

Contact me

- You can find me here:

  Yifu Building, West Wing **811**
  School of Software Engineering,
  Beijing JiaoTong University (BJTU), Hai Dian District
  Beijing 100044, China

- Or email me:
  - mlinking@126.com

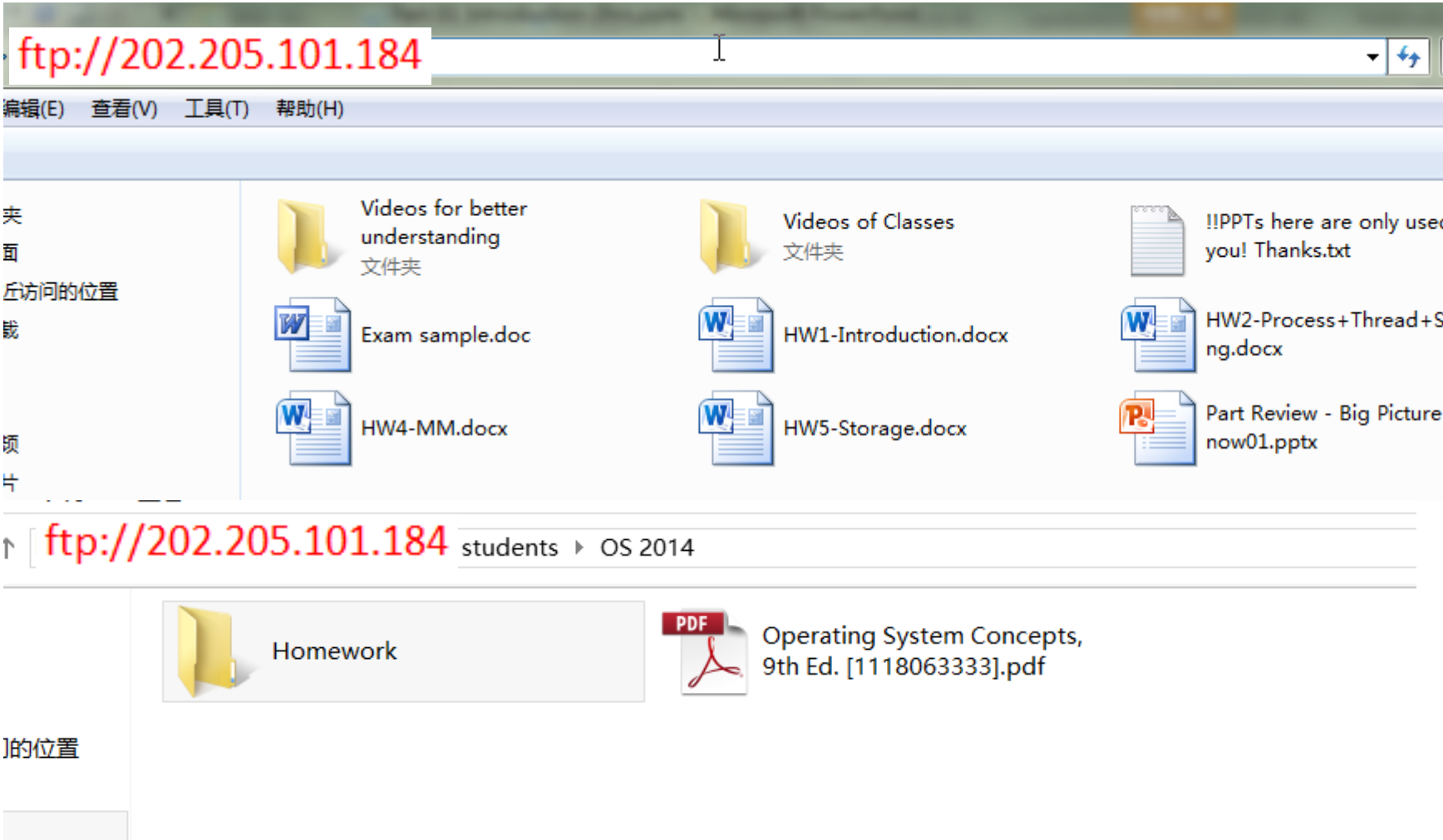
- Our FTP:
  - ftp://202.205.101.184/

  Usr & Psd: students

- Tel:
  - 15010255486

I hope you remember our FTP server!

- ftp://202.205.101.184
  - students



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Reform!

- This course contains two separate parts (credits too)
  - **Lecture** part 🡆 My responsibility
    - 32 hours for **8 weeks** from 1st (28 Feb) week to 8th week (18 April)
    - Two classes per week (both are at **YF307**)
      - Tue 16:20 ~ 18:10
      - Fri: 10:10 ~ 12:00
  - **Training** part 🡆 My responsibility
    - 64 hours for **16 weeks** from 1st week to 16th week (14 Jun)
    - One afternoon per week (at **YF408**)
      - Wed 14:10 ~ 18:10
    - 3 checkpoints from OS (6 in total)
      - Process synchronization
      - Main Memory
      - IO + File
    - 2 training projects

Examination for **Lecture part**

- **100 pts**
  - **Final exam (50)**
    - **2 hrs, close**
    - **Blank filling question, T/F, Multi-choice, Explanation, Short answer, Computation, Programming etc.**
  - **5 assignments (40)**
    - **5 Homeworks**
  - **Bonus (10)**
    - **5 random checks for your attendance**

How to earn the bonus?

- **Attend all the classes** (5 random checks)
- Help me to ameliorate this course
  - Good advices
  - To find some special pictures (Norman E. Gibbs)
  - To download the similar courses (in English) wi th better slides & materials (say why)
  - etc.

Examination for **Training part**

- **100 pts**
  - **Bonus (10)**
    - **5 chances**
  - **Basic checkpoints (40)**
    1. **File + Index for large data mana**
    2. **Simulate multiple users**
    3. **Try a Syntax parsing example**
    4. **Debug HyperSQL**
  - **1 final Web-based application project (30)**
    - **Java/JSP+HyperSQL or C/C++ - R.D.I.P**
  - **Advanced checkpoints (40)**
    - **Understanding [transaction mechanism]/[SQL executio n] in HyperSQL**

More details later in practice part

HyperSQL

HyperSQL
http://hsqldb.org/
HSQLDB - 100% Java Database

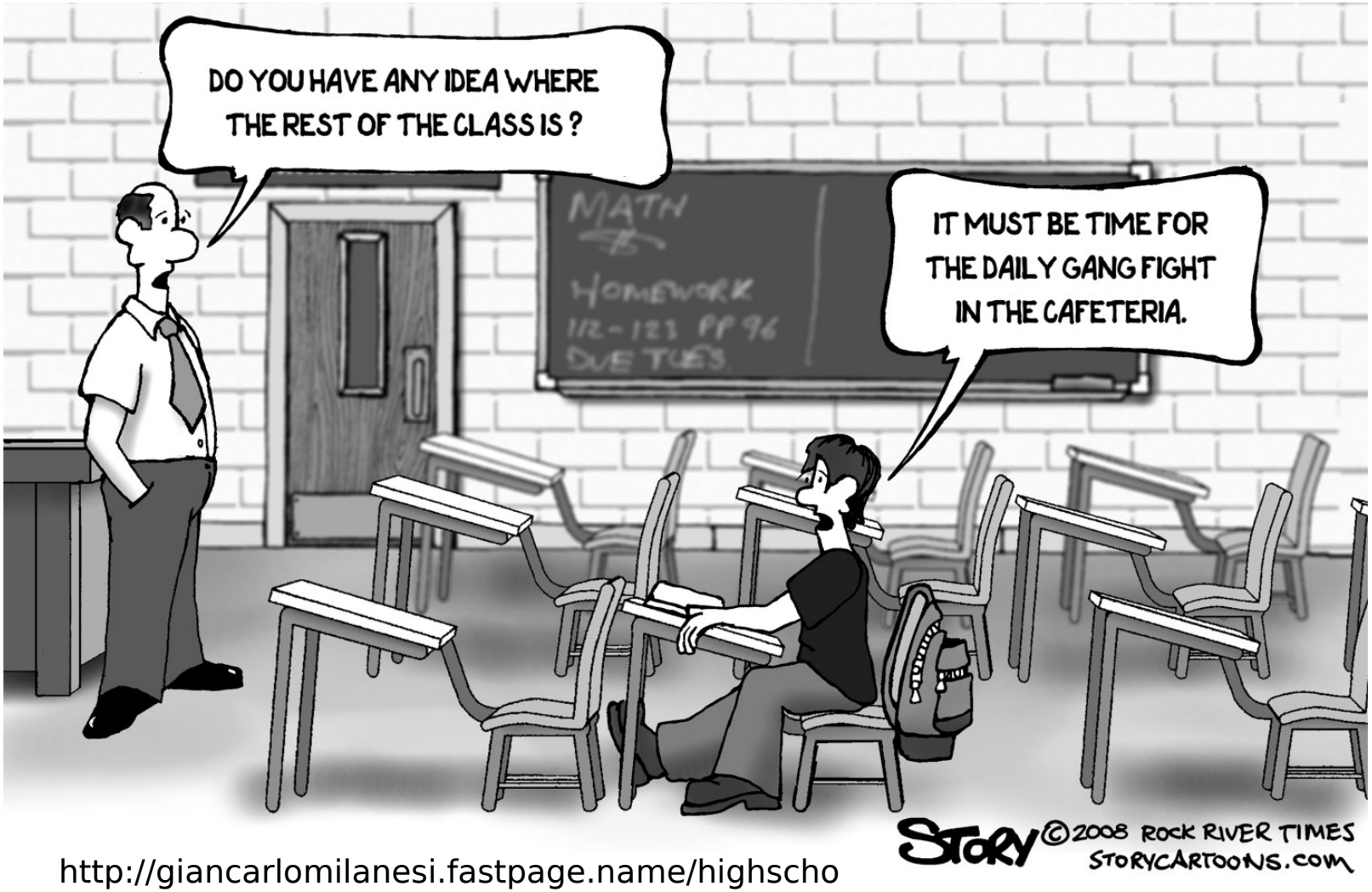
- http://www.hsqldb.org/web/hsqlPerformance.html
  - HyperSQL has multiple deployment and persistence options which influence its performance.
    - The table type, **MEMORY**, **CACHED** or **TEXT**, indicates how the table row data is stored and accessed by the database engine.
  - HyperSQL supports **MVCC** (Multi-Version Concurrency Control) and **two phased locking** transaction models.
  - HSQLDB is the only SQL open source database that supports a dedicated **LOB** (Large OBject) store .
  - …

NO CHEATING!

Even FAILING is better than CHEATING !

YOUR RESPONSIBILITIES!

- **ATTEND ALL THE CLASSES!!!**



http://giancarlomilanesi.fastpage.name/highscho

YOUR RESPONSIBILITIES!

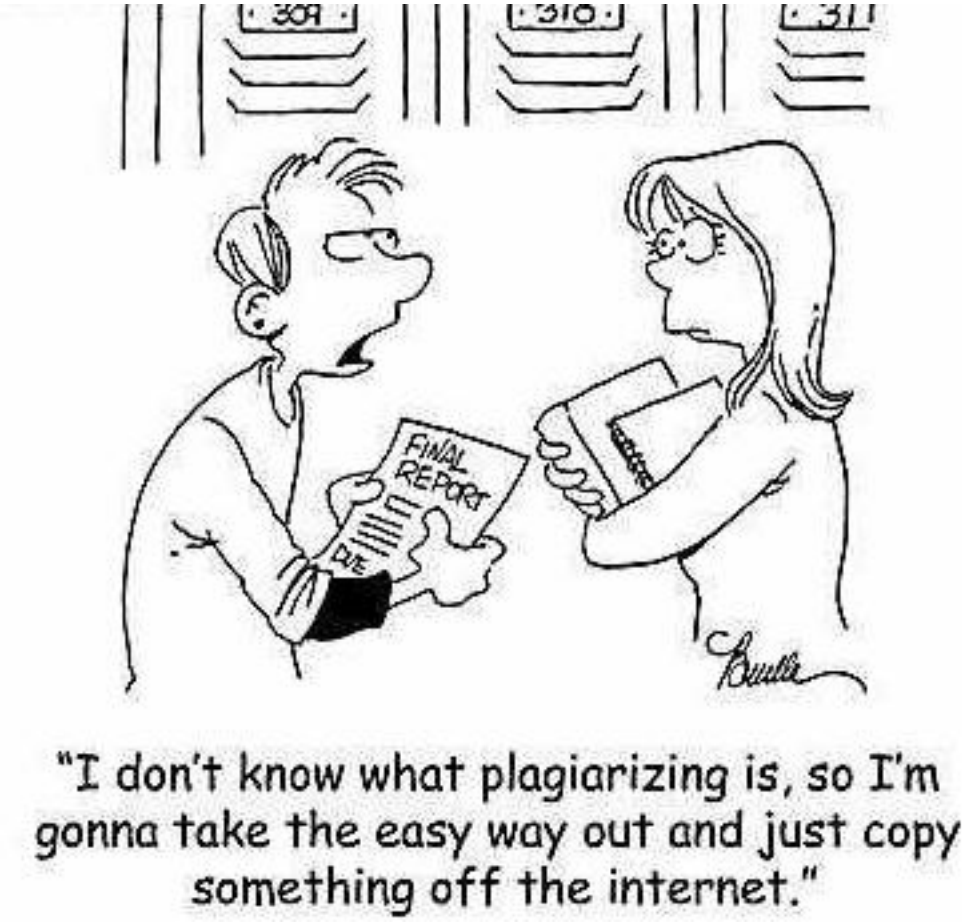
- **CLOSE YOUR LAPTOP IF YOU COULD NOT ANSWER MY IN-CLASS QUESTIONS**

http://stay-away-from-internet-is-impossible-funny-cartoon.funnyfunny1.blogspot.com/?q=Keep%20away%20from%20computer%20cartoon|||

Signs of the social networking times.

YOUR RESPONSIBILITIES!

- Hand in your **assignments** on time
- **Uphold** academic **honesty**



"I don't know what plagiarizing is, so I'm gonna take the easy way out and just copy something off the internet."

Help Available

- **Me**:
  - **Come to my office** (when necessary)
    - Always available by email, if I don’ t reply in 24 hours, sen d again and complain 🏝

- **Your classmates**
  - Two heads are always better then one [三人行必有我师]

- **Web site & FTP server**:
  - ***Most*** goes on the web, you should visit it often
    - ftp://202.205.101.168

To see or not to see me

- We are not psychics

Please let us know if…

- Class is too hard
- You don’t have the background
- Class can be improved in certain ways
- ……

When in doubt, email me …

If you behavior well, you could enjoy the study and life here 🏝!

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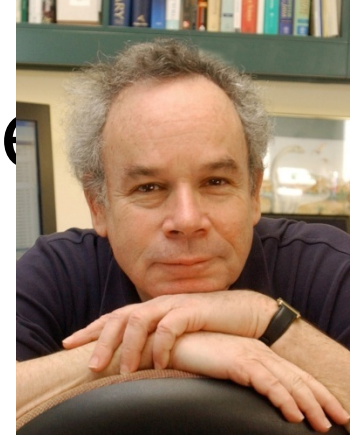
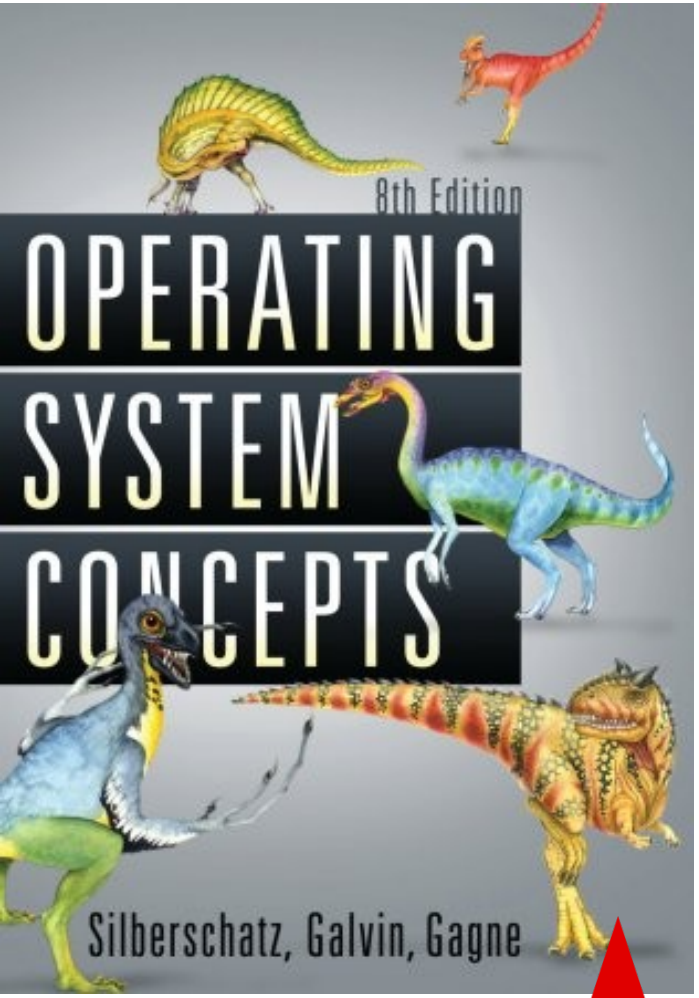
“OS Concepts” by Silberschatz, e



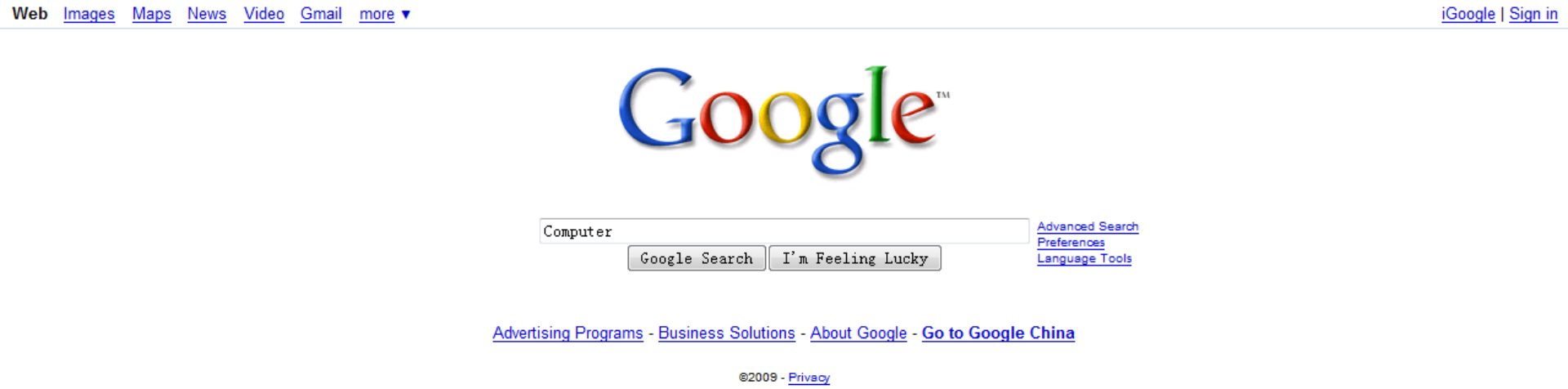


A. Silberschatz, P. B. Galvin, and G. Gagne, “**Operating Systems Concepts** (with Java)”, **8th Edition**, John Wiley & Sons, 2008.

http://cs-www.cs.yale.[illegible]omes/avi/os-book/index.html

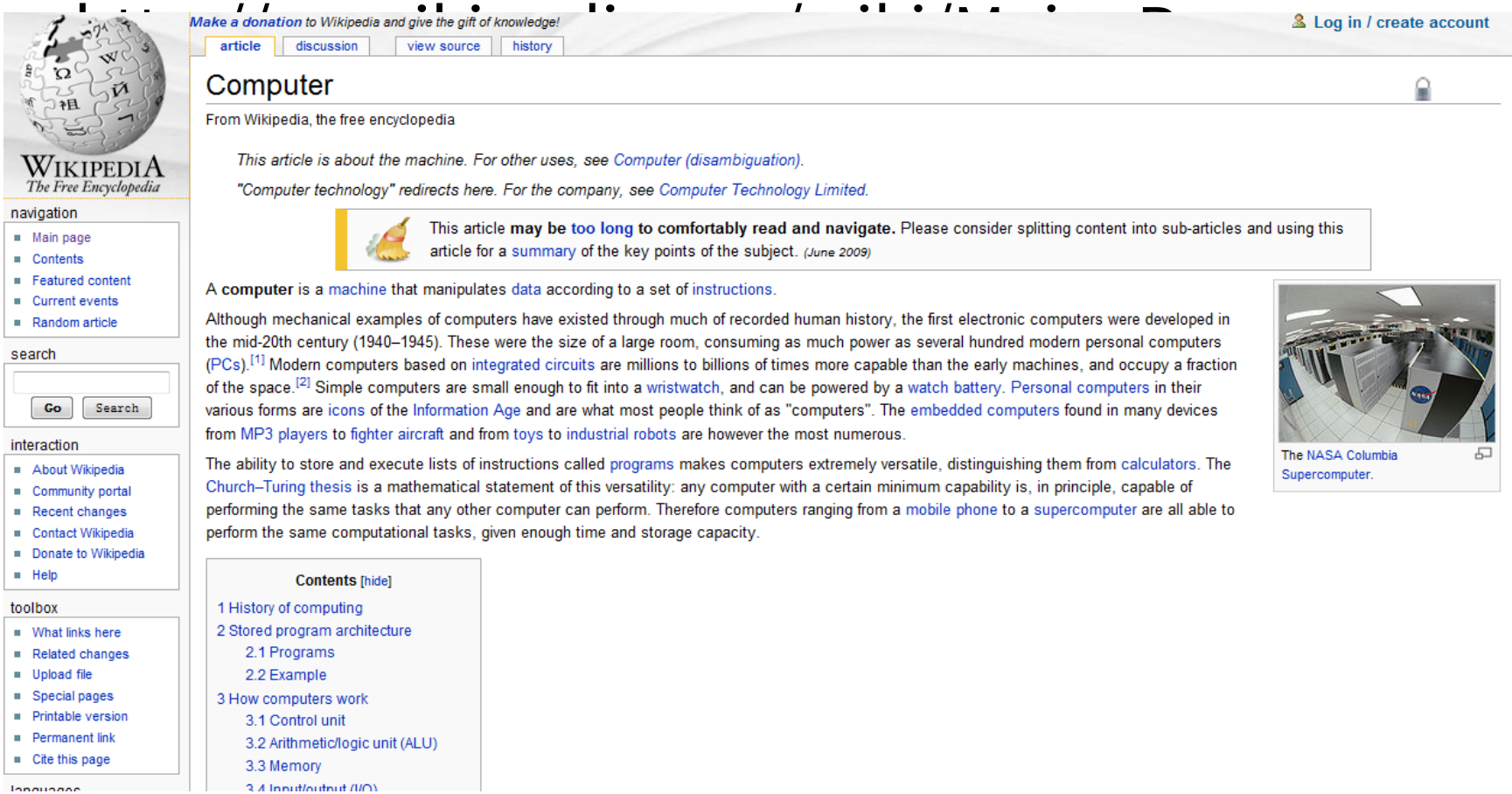
Web resources

- Internet is always the source of rich informati on: Google
  - www.google.com, www.google.com.hk



Web resources

- Internet is always the source of rich inform ation



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languages

Computer

From Wikipedia, the free encyclopedia

This article is about the machine. For other uses, see Computer (disambiguation).

"Computer technology" redirects here. For the company, see Computer Technology Limited.

This article **may be too long to comfortably read and navigate.** Please consider splitting content into sub-articles and using this article for a summary of the key points of the subject. *(June 2009)*

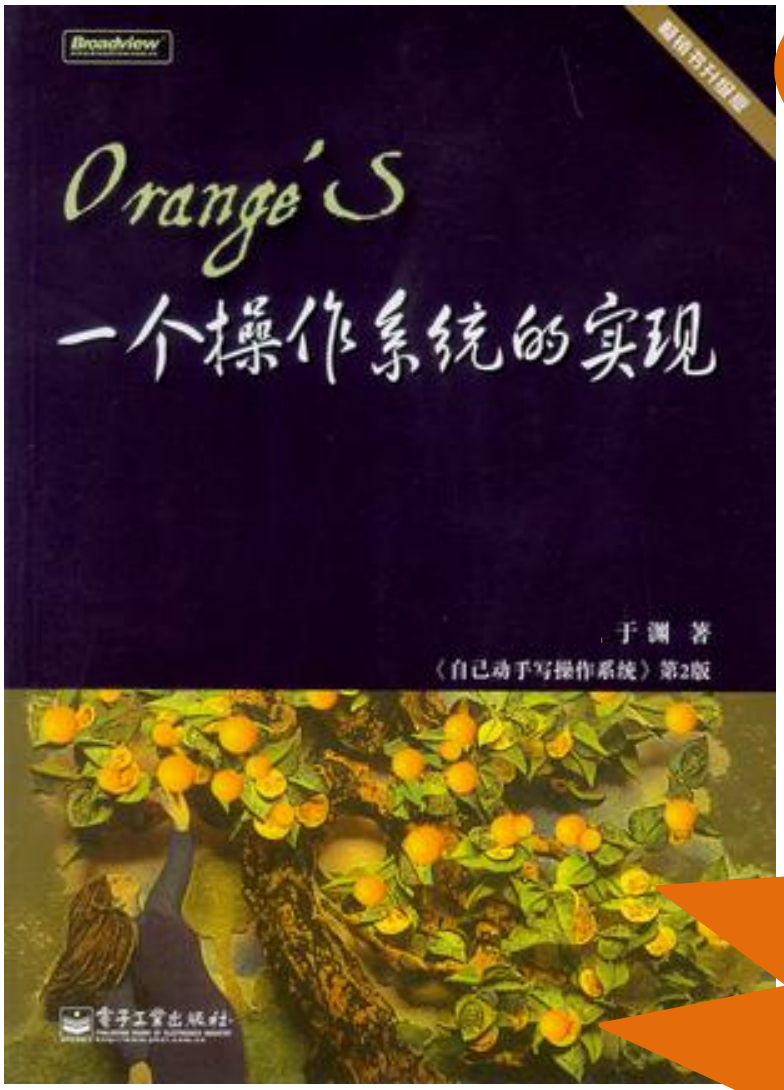
A **computer** is a machine that manipulates data according to a set of instructions.

Although mechanical examples of computers have existed through much of recorded human history, the first electronic computers were developed in the mid-20th century (1940–1945). These were the size of a large room, consuming as much power as several hundred modern personal computers (PCs).[1] Modern computers based on integrated circuits are millions to billions of times more capable than the early machines, and occupy a fraction of the space.[2] Simple computers are small enough to fit into a wristwatch, and can be powered by a watch battery. Personal computers in their various forms are icons of the Information Age and are what most people think of as "computers". The embedded computers found in many devices from MP3 players to fighter aircraft and from toys to industrial robots are however the most numerous.

The ability to store and execute lists of instructions called programs makes computers extremely versatile, distinguishing them from calculators. The Church–Turing thesis is a mathematical statement of this versatility: any computer with a certain minimum capability is, in principle, capable of performing the same tasks that any other computer can perform. Therefore computers ranging from a mobile phone to a supercomputer are all able to perform the same computational tasks, given enough time and storage capacity.

The NASA Columbia Supercomputer.

Contents [hide]
1 History of computing
2 Stored program architecture
2.1 Programs
2.2 Example
3 How computers work
3.1 Control unit
3.2 Arithmetic/logic unit (ALU)
3.3 Memory
3.4 Input/output (I/O)

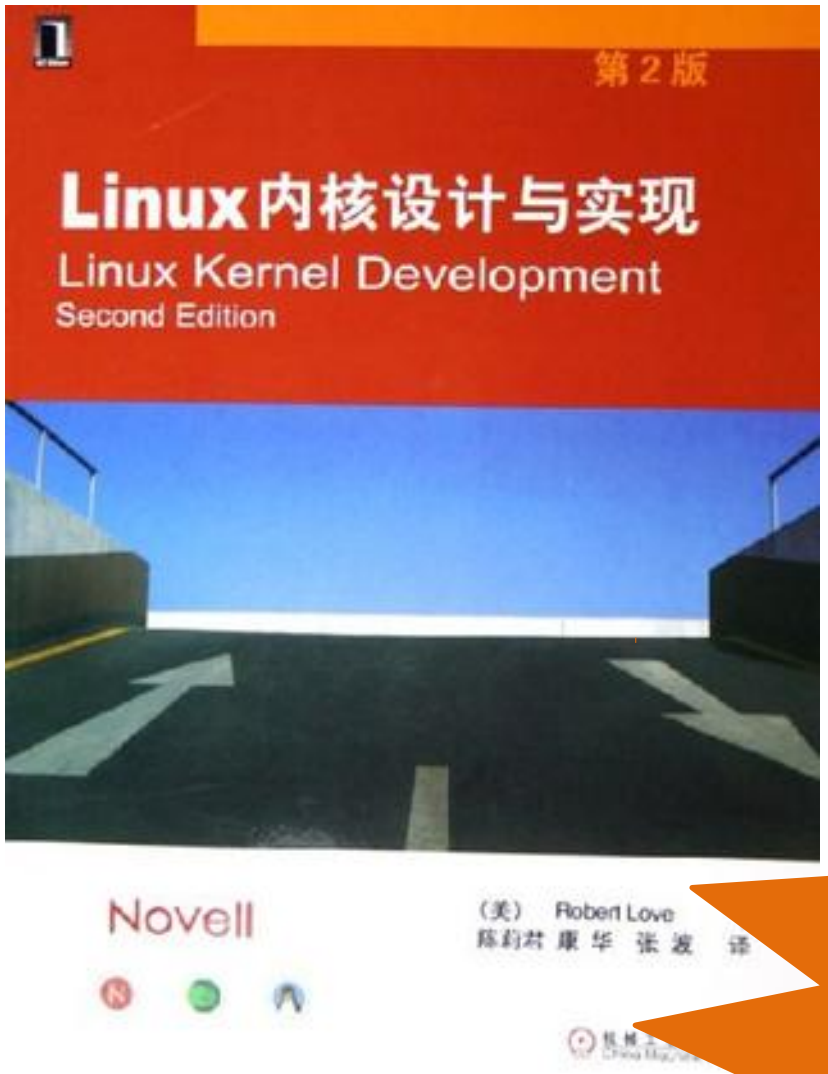


Try to know the evil details to construct OS – have to control the devices!

– 出版社 : 电子工业出版社
– 出版年 : 2009-6
– 页数 : 469
– 定价 : 69.00 元
– 装帧 : 平装
– ISBN : 9787121084423

Read it as you want

http://book.douban.com/subject/3735641



- Linux 内核设计与实现
  - 作者： 拉芙
  - 出版社： 机械工业
  - 出版年 : 2006-1
  - 页数 : 289
  - 定价 : 38.00 元
  - ISBN: 978711117865 1

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Ope on

Introduction

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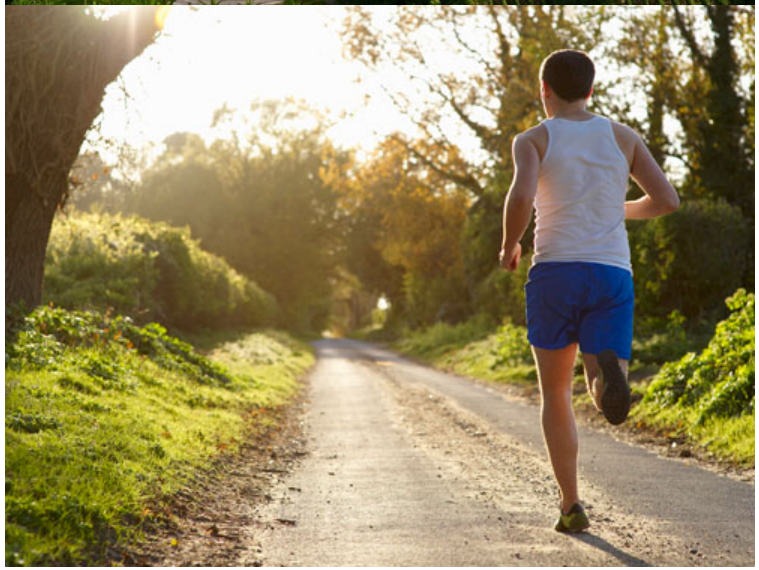
Do you know the top goals of this S.S.E for you?

你们知道我们对你们的期望吗？

- **BECOME MORE CIVILIZED**!
  - Polite, enjoying nature, good habits, 。。。

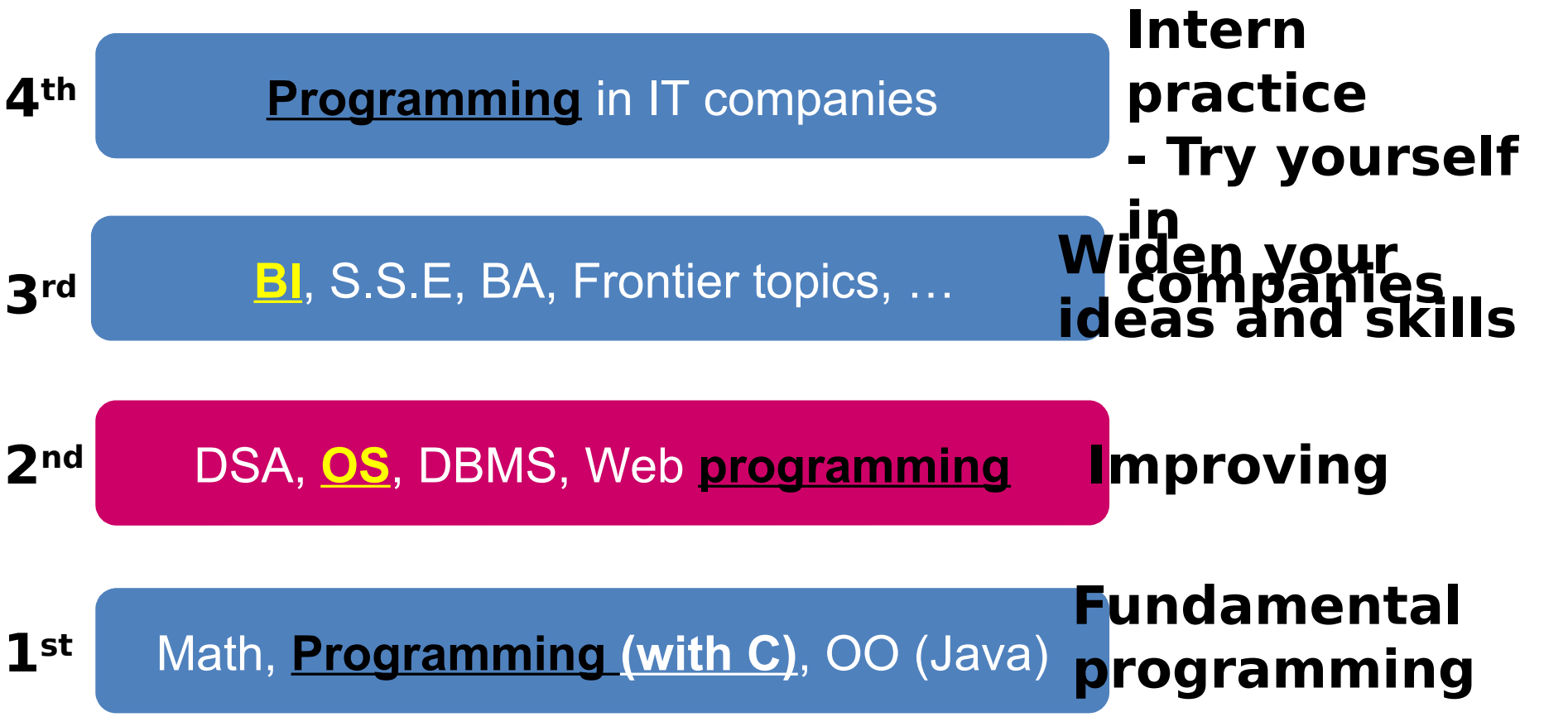
computer geek：计算机迷



Do you know the top goals of this S.S.E?

你们知道我们对你们的期望吗？

- **SHOWING YOU SOME LIFE-MAKING SKILLS (PROGRAMMING IS ONE)!**

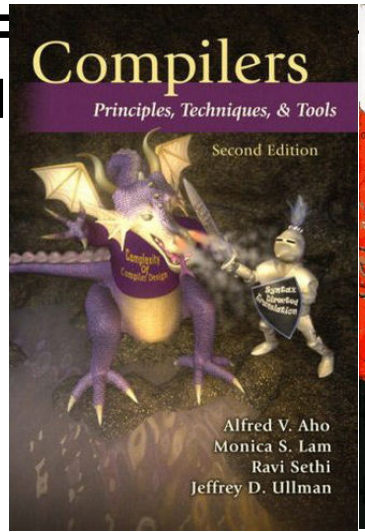


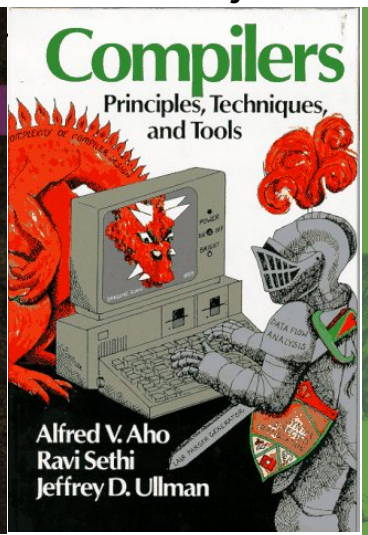
- The understanding of the design and implementation of those classic softwares is helpful for us to improve our programming skills
  - OS is one!

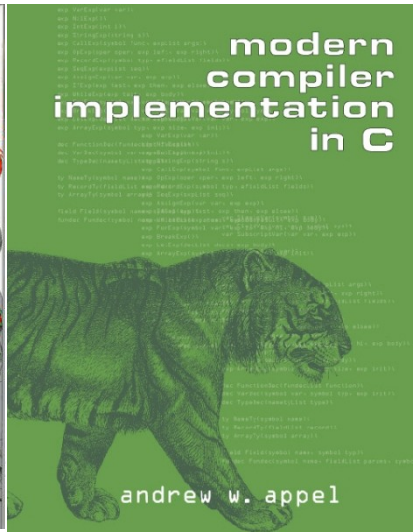
- Many problems
  ly to cope with
  - Even you seems
    ng facts

Learning from classics!

- OS is one of the three classic softwares/programs for Computer Science
  - **Compiler**
    - Translator to convert source code into executable code
      - EXE is popular for Windows
      - **a.out** （assembler and link editor output 汇编器和链接编辑器的输出）、**COFF**（Common Object File Format 通用对象文件格式）、**ELF** for UNIX/LINUX



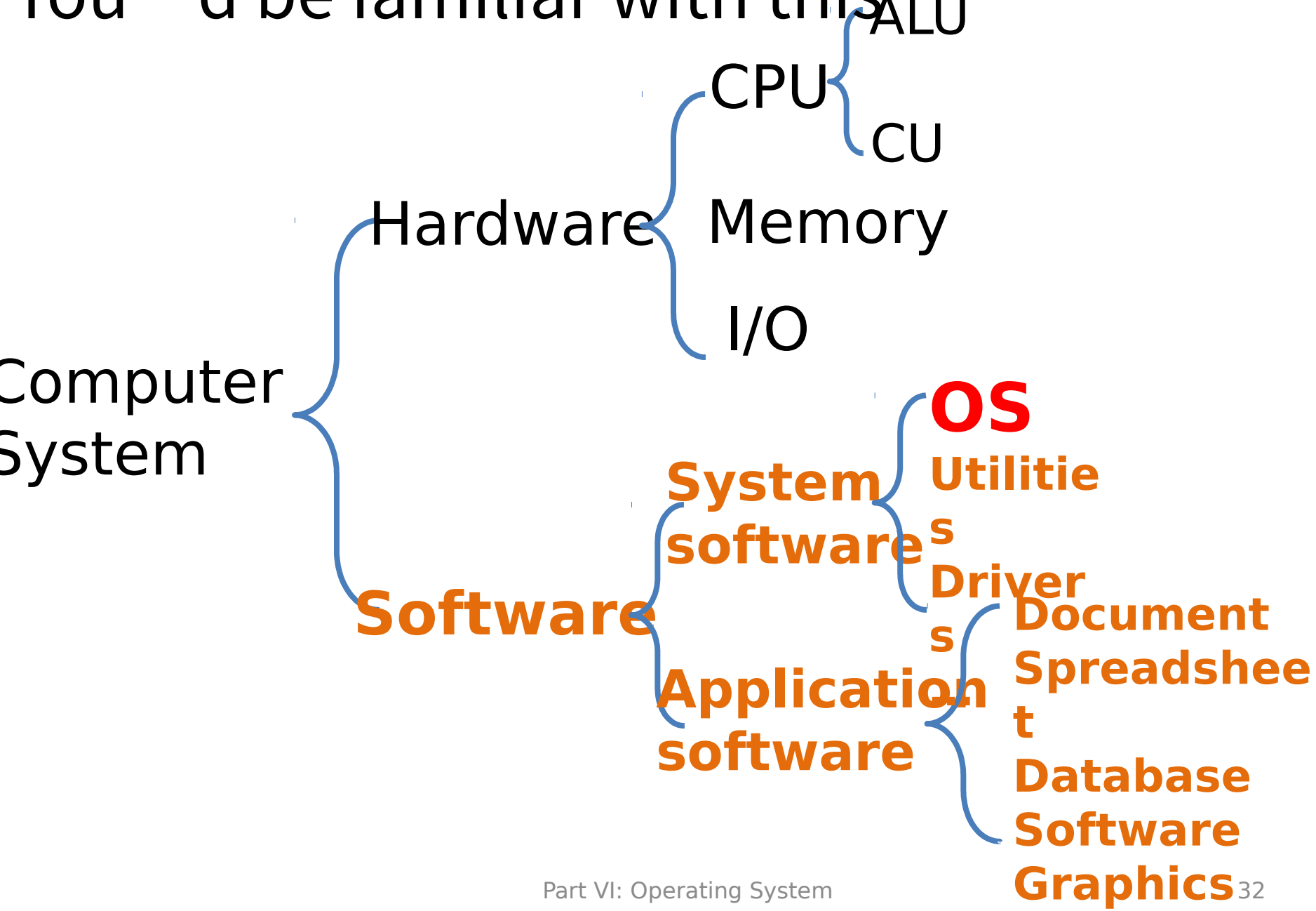




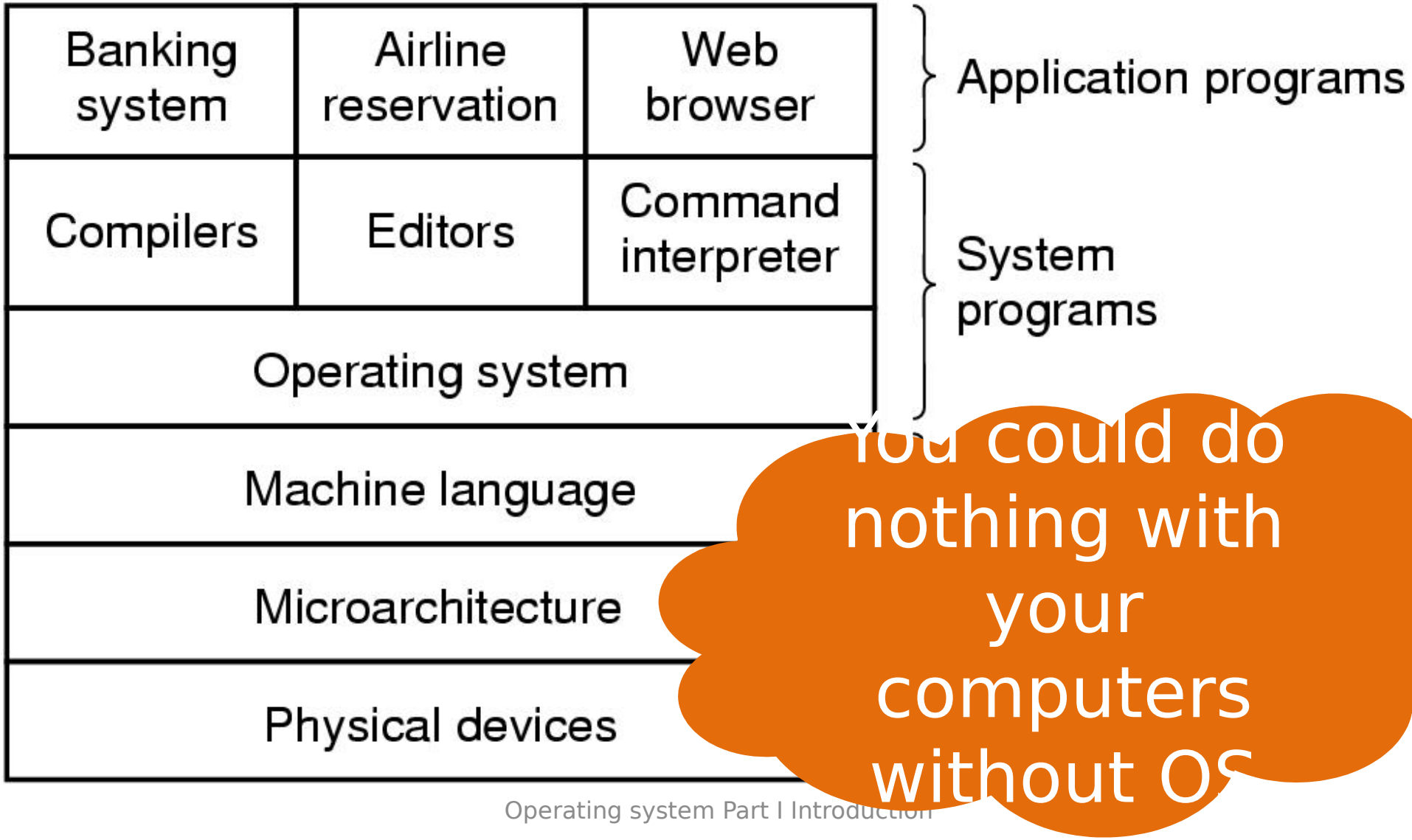
Learning from classics!

- OS is one of the three classic softwares/programs for Computer Science
  - **DBMS** (Database Management System)
    - An important software to ease the management of the mass data for users

You’ d be familiar with this

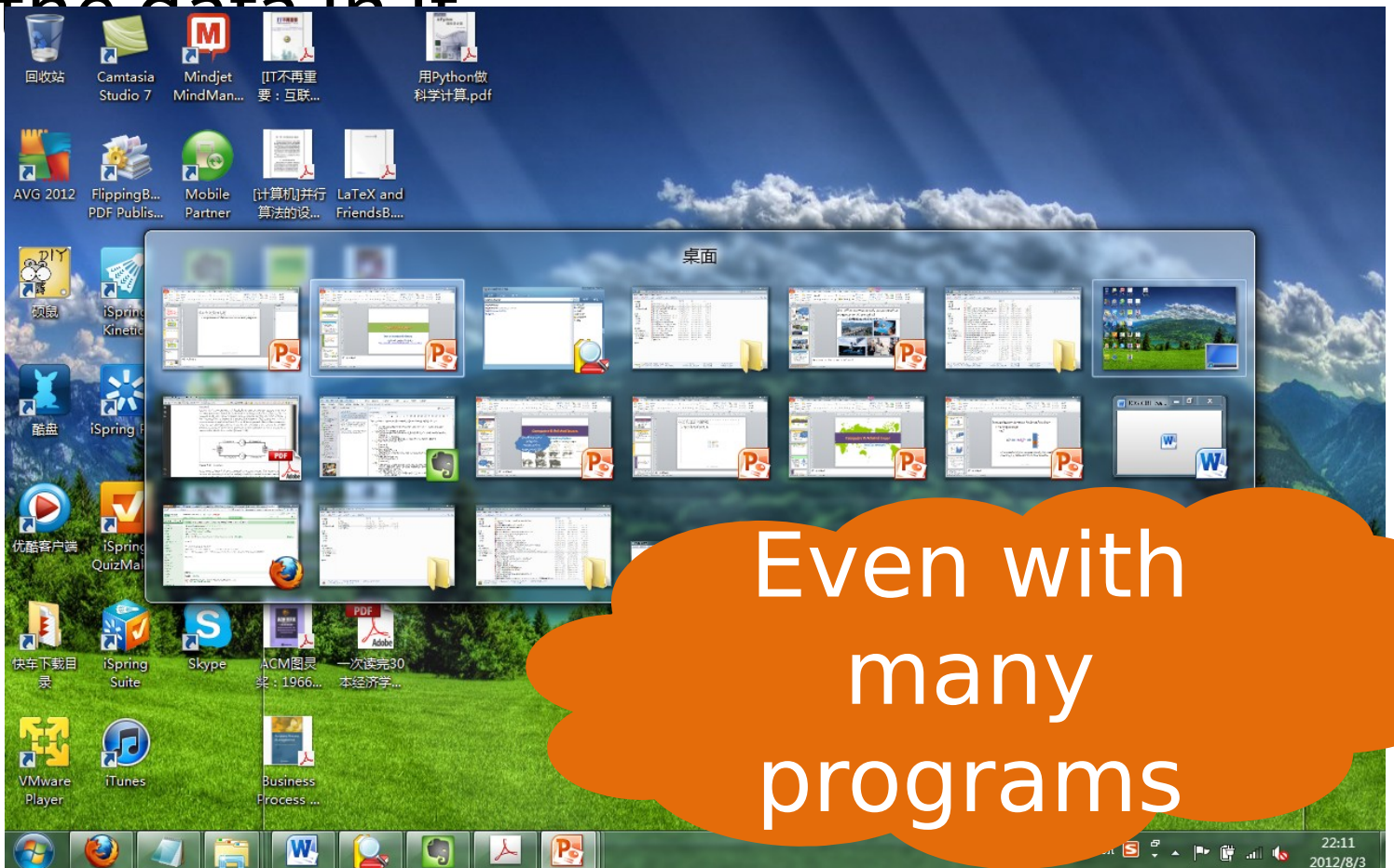


OS as an **INTERFACE** between Hardware and other softwares



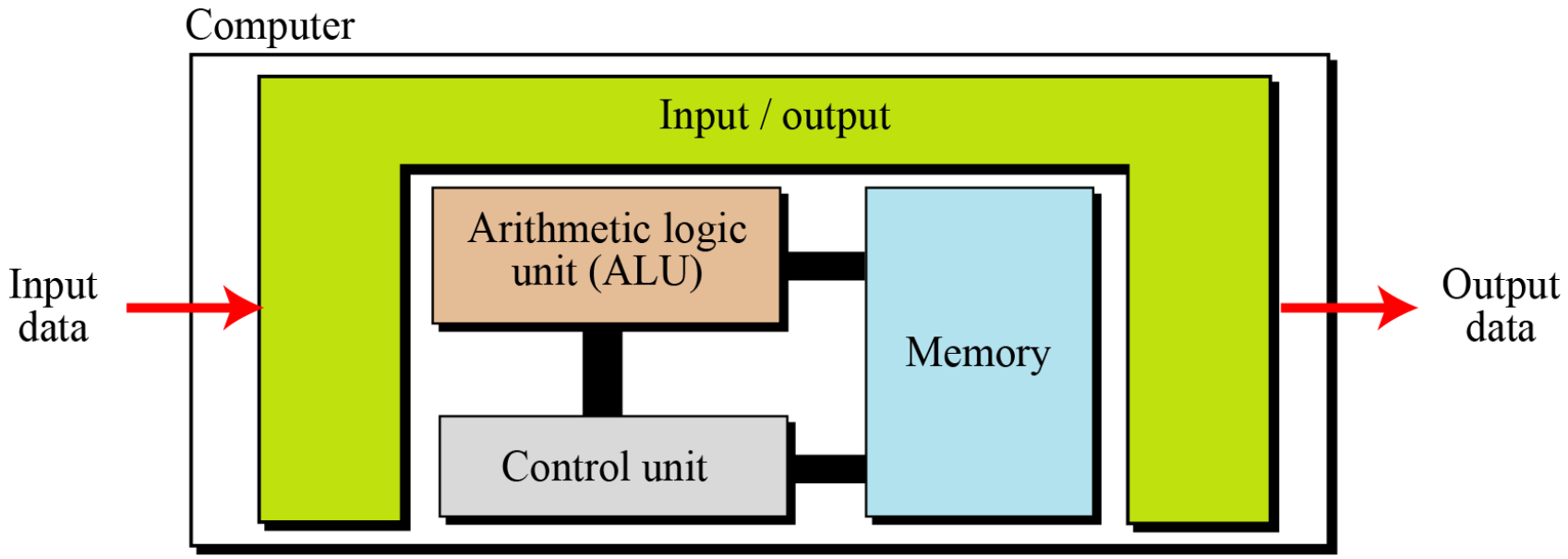
You may have known

- The **POWER** of the modern computers is th at you could execute your programs to pro cess the data in it



And you also have known

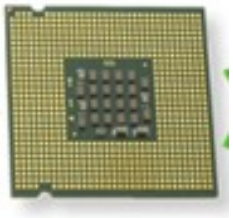
- **von Neumann architecture (1:1:M)** is the basis of modern computers
  - **1** CPU
  - **1** addressed space
  - **M**any IO devices



And many facts

- A program exists first as **FILE** in **HARD DISK (OR CD, U-DISK ETC.)**
  - How to represent file (no matter your program or data – image, statistical data, audio, text, …) in the HD?
    - We should know the HD space and ? – sectors, tracks, …
- Instructions and Data should be stored in **MAIN MEMORY** to run

  - We should know the used and available space of MM
  - How to allocate space for a program?
- **ONE CPU**, One program
  - Put the starting instruction into corresponding registers
    - You’ ve learned this in a course named like “Computer Organization”



Situation of running a program

Programs are stored as Files in storage media

Program

X=1;

Y= 2;

Z= X

File

Compiler

[编译器]

Machine code

156C 000101010110 1100

166D 000101100110 1101

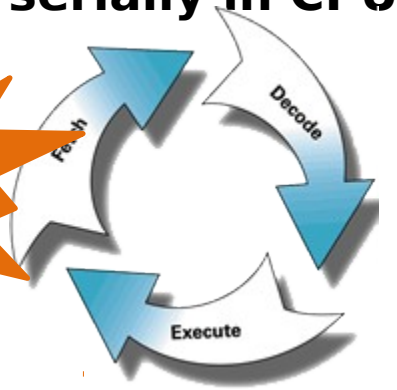
5056 010100000101 0110

306E 001100001 1110

File

Executable codes also stored as Files

execute instructions serially in CPU



Put executable codes into the memory of the computer

1	6C
2	6D
	6E
15	A0
6C	A1
16	A2
6D	A3
50	A4
56	A5
30	A6
6E	A7
C0	A8
00	A9

Instructions are mapped into the address space of

However, you may not know

- How are those programs **automaticall**

  y carried out in a von Neumann computer (1:1:M)?
  - If you want to run a program, you just click an i con or a menu item.
  - How is this carried out?
- The system software for this task is **called**

  OS (Operating System)
  - Also a collection of many programs

Short conclusion

- Programming is the fundamental skill for CS/SE students

- **To learn the construction of the OS, one classic software, definitely is worth**
  - **Many complicated problems you should consider carefully to process**

Ⓟ This is the way to understand the theories, and improve your skills

- No matter for math, physics, literature, astronomy, etc.

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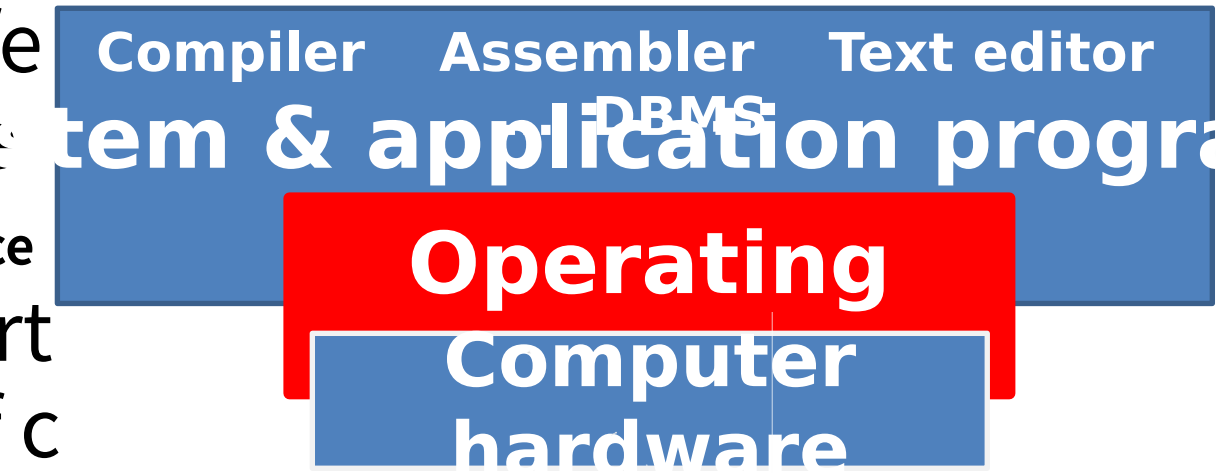
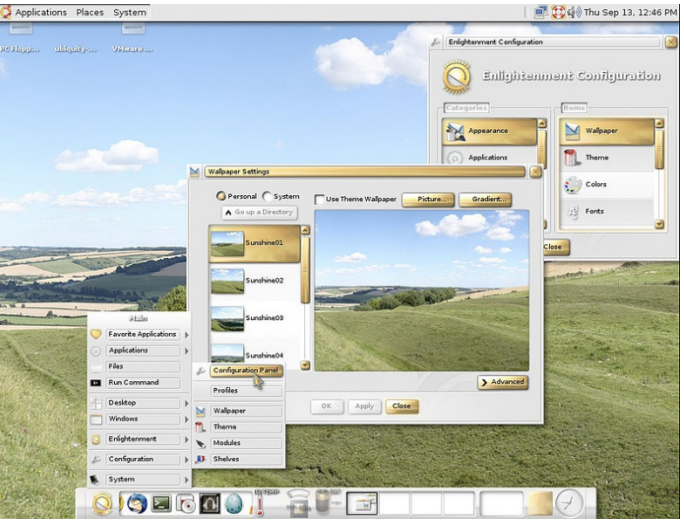
2 roles of OS

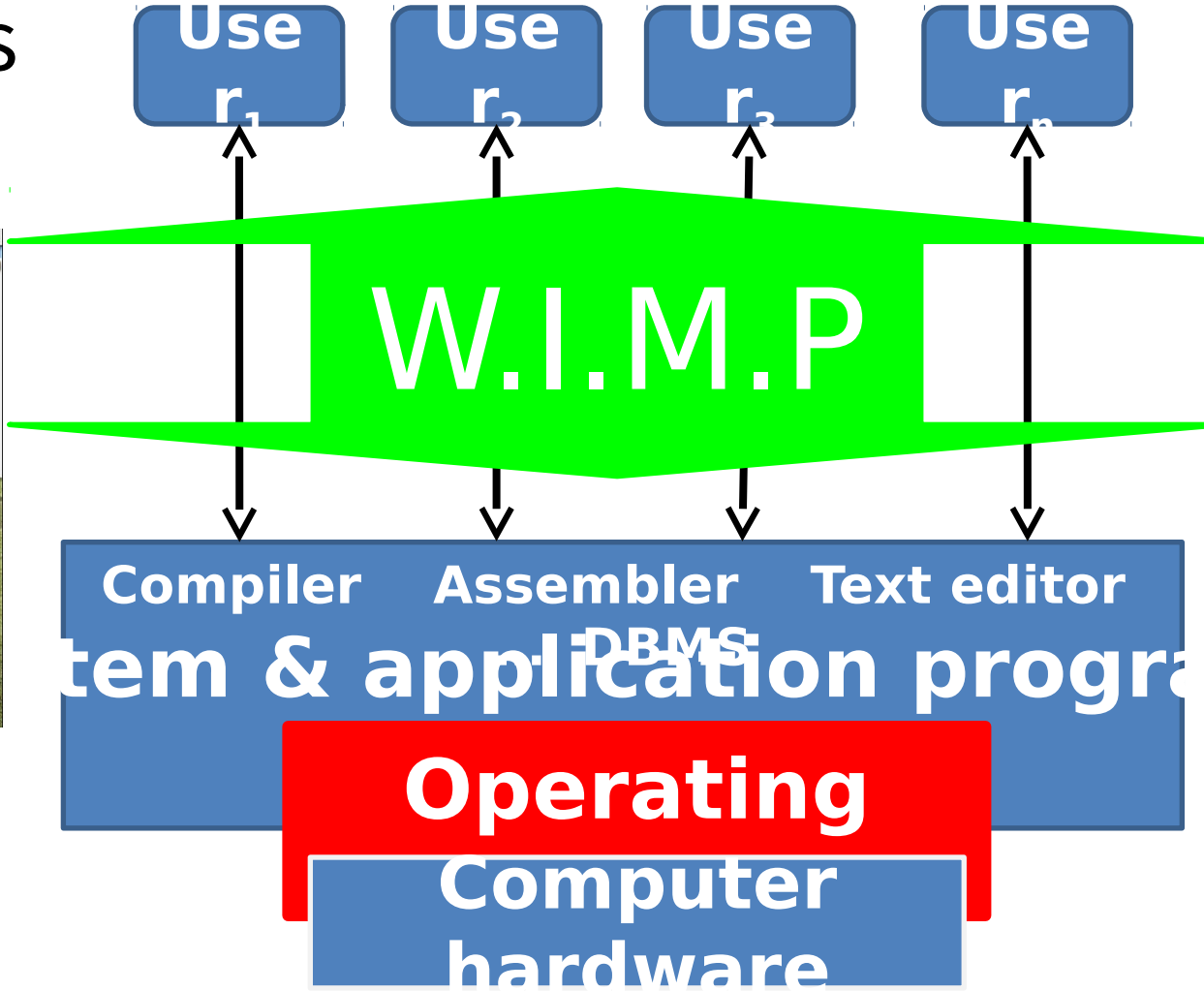
- Efficient and safe **manager** for the resources [**Resource Manager**] to support the execution of c oncurrent progra ms
  - Storage media
    - I/O de
  - Memor
  -



2 roles of OS

- Friendly **interfa ce** for the users
  - Files, GUI



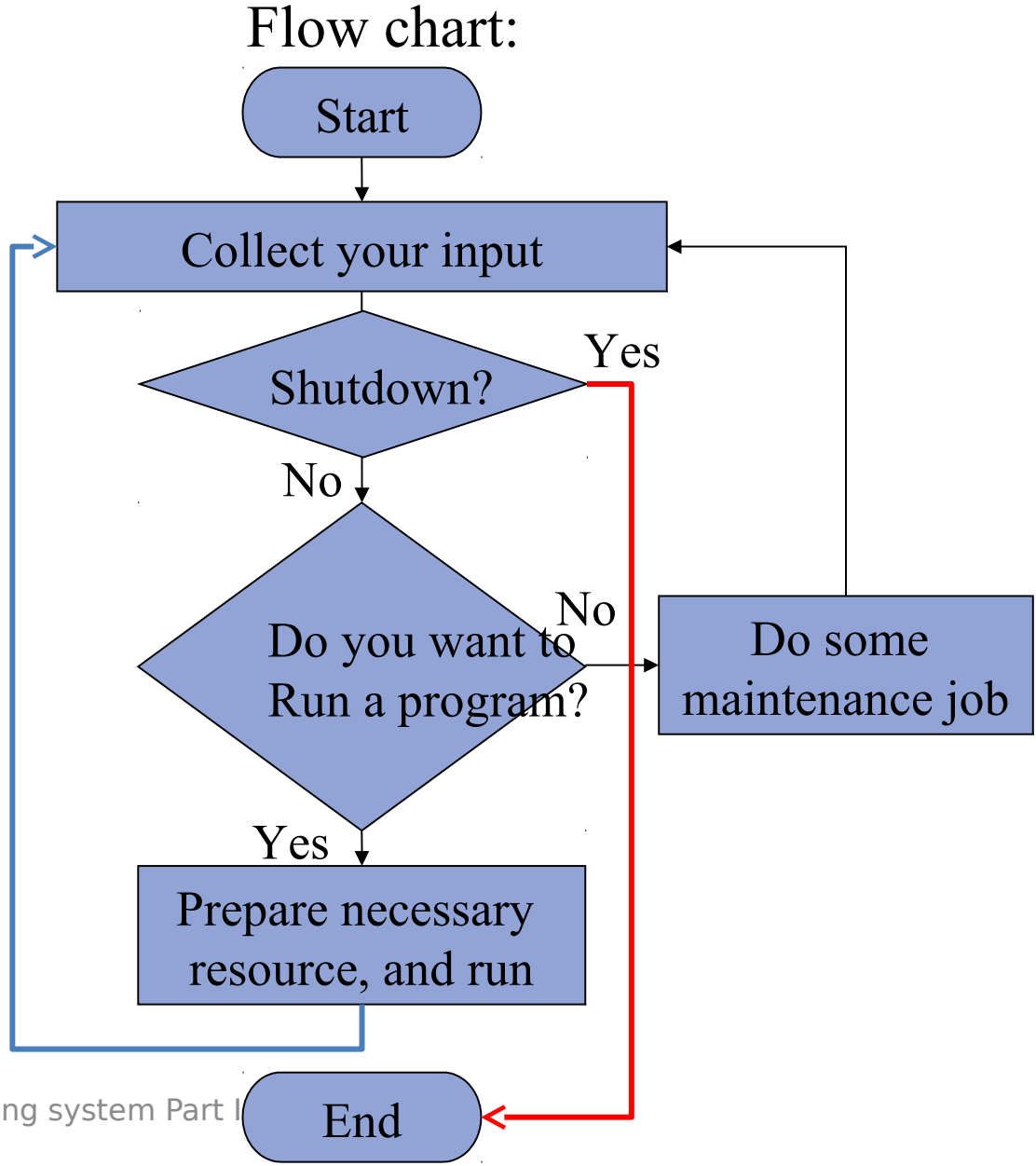


http://en.wikipedia.org/wiki/WIMP_%28computing%29

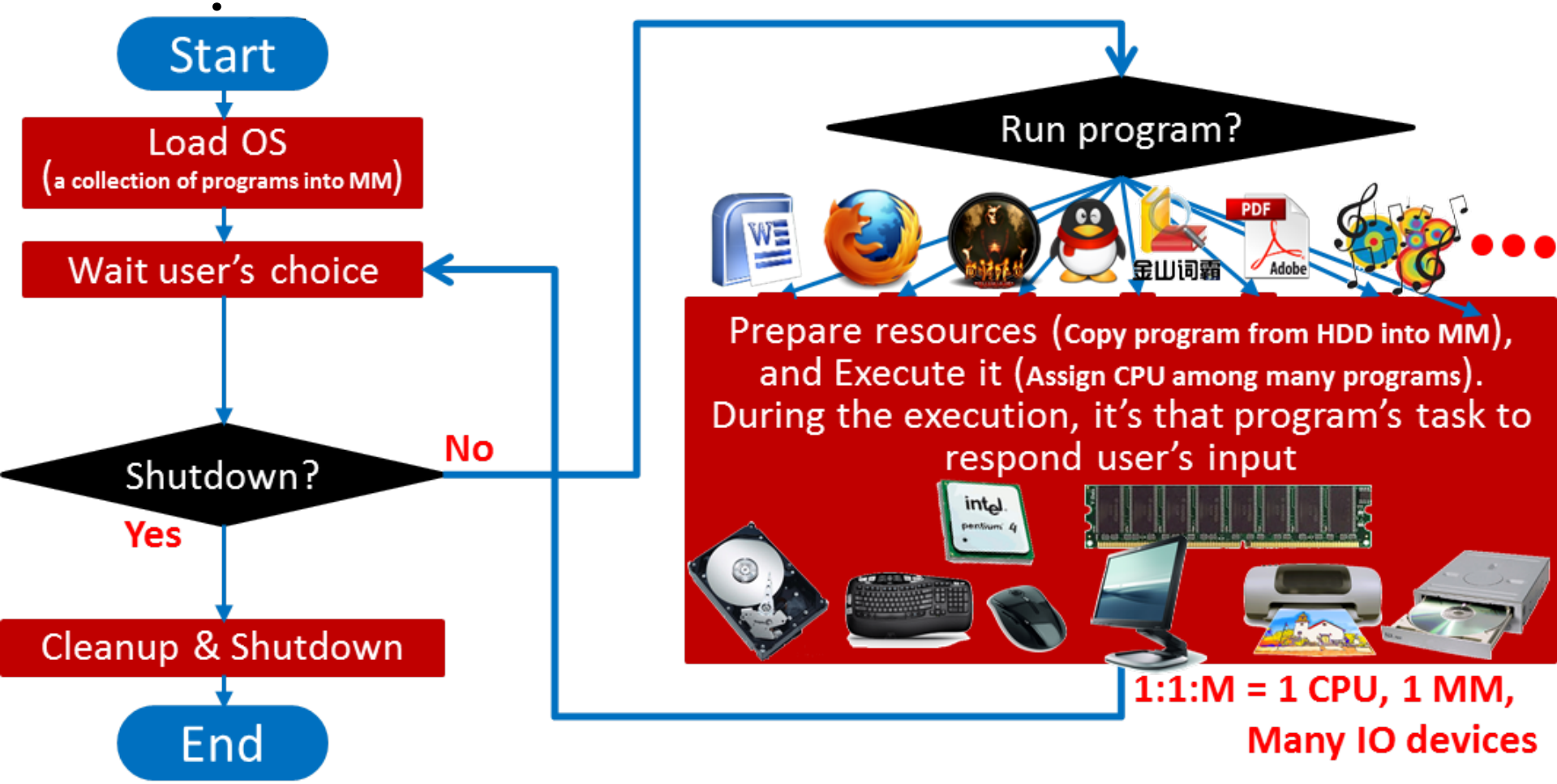
- So the questions are
  - How to control devices through software?
    - Digital logic, Computer organization, …
  - How exactly is the OS constructed to support t he execution of many concurrent programs?
    - We should analyze the problems the OS should con sider first!
    - We’ ll learn this in later chapters

A simple view for the OS

- The first unde rstanding of O S is that
  - We could see OS as an **REP ETITION** prog ram structure
- It seems

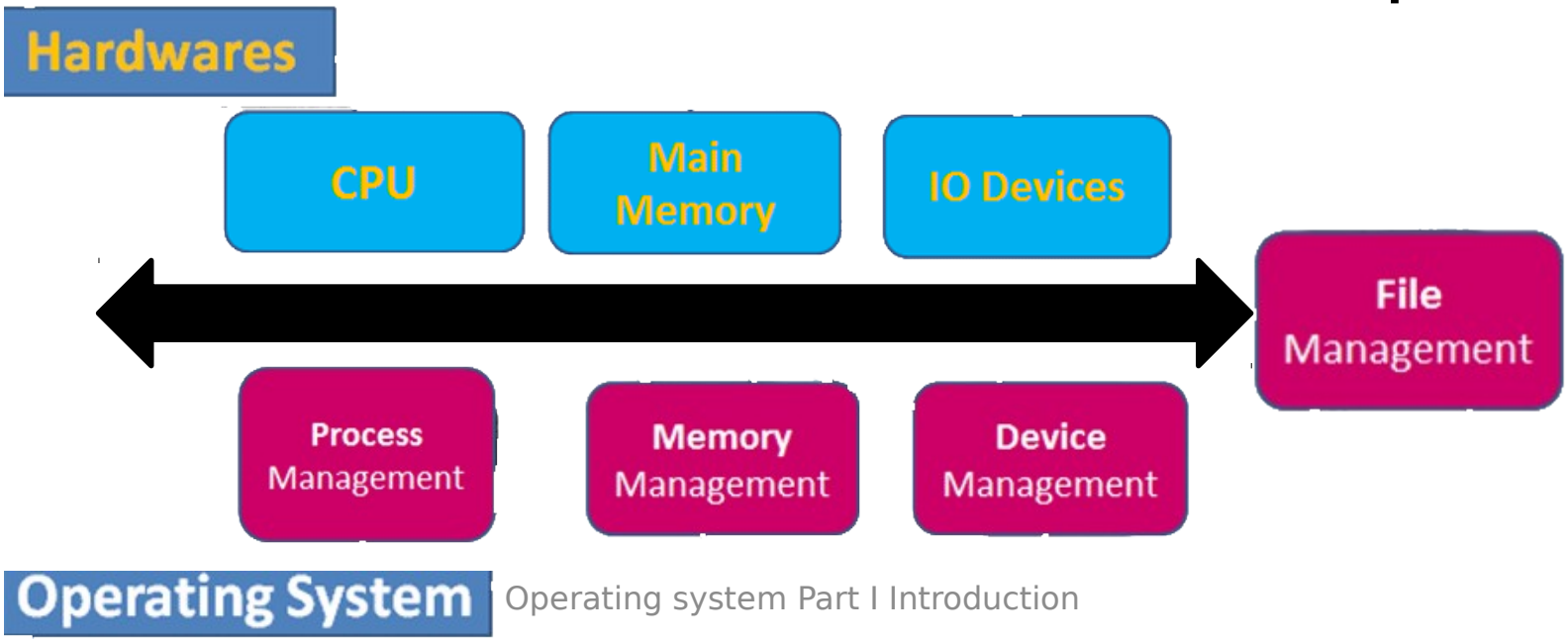


- A more detailed diagram looks like as follo



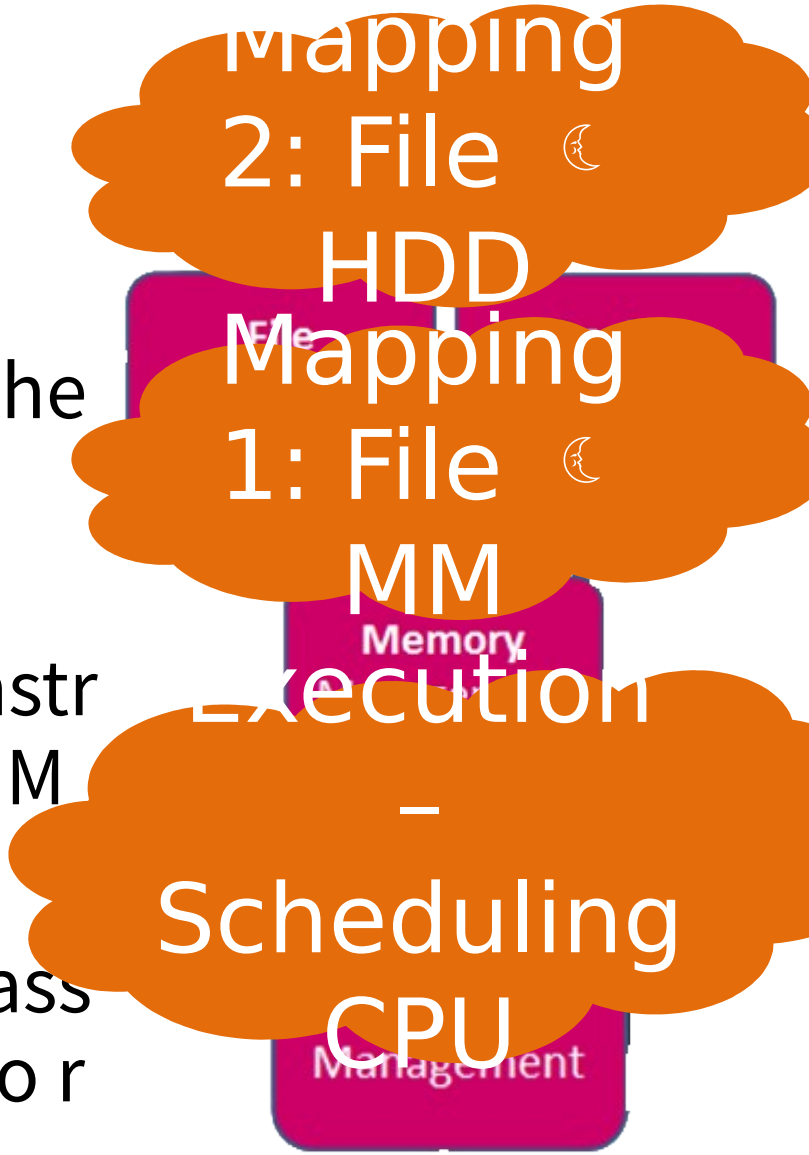
How do you think about the internal relationship of those programs in OS?

- We have known the kernel resources of modern computers could be categorized into 4 kinds of resources / concepts
  - **CPU**, **Main Memory**, **Hard Disk**, **File**
- Modern OS has 4 fundamental component

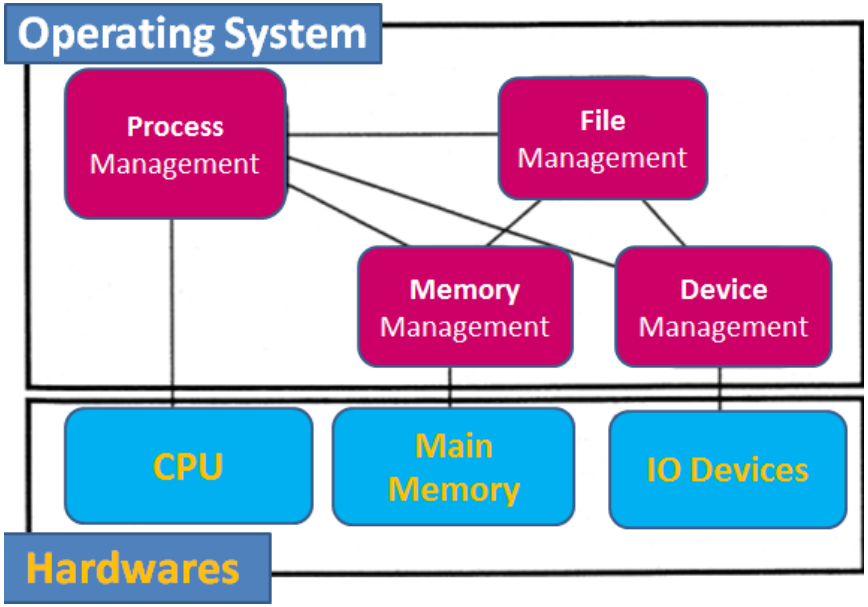


And according to the understanding of the execution of a program

- The OS should know first where your program is stored.
- Then OS should copy the instructions and the data into MM
- After the copy finishes, OS assigns CPU to your program to run



- And we can infer the **FILE** concept is the hing e to combine them as a whole
  - Programs (including those of OS’ s) exist as FILEs, which are stored in secondary storage media first, H DD, CD, etc.
  - The identification used to indicate the execution of a program is based on FILE concept
  - Copying programs into MM to run is also symbolized with FILE



OS is far complicated than those simple view

- The core and hint to understand OS’ s comple xity is
  - How to support the **concurrent execution of many programs** with **limited resources** (von Neumann architecture)
    - The troubles leading to OS’ this!
  - I hope you could reme nd this to connect all t se together

We’ll talk about this more in next class

You can benefit from this course

- Many advanced softwares are benefitting fr om the D&I of OS
  - There are many softwares/servers which are th e basis of our IT age, such as **DBMS**, **web serve r**, FTP server, email server, **SAN** (Storage Area N etwork), **Big Data** (Hadoop + Spark), and all of them need support of OS

® **System programming!**