本文系一位 14 届 CST 的 IT 得 A 的同学在临考复习的时候整理的，笔者认为重点的内容这里都进行了加粗。当时是手写版，难免有错误，且每学期考试均有变化，因此本文的内容仅供大家参考。笔者个人感觉进制转换的部分写的有点乱。如果有疑问记得咨询你的 IT 老师或者助教，并以他们的说法为准~

2015 年 2 月

IT for Success of Everyday Work and Life – Lecture Topics

BASIC CONCEPTS IN COMPUTER SCIENCE

1 Introduction to Computers

1.1 Computer Literacy （计算机知识）

"Have knowledge and understanding of computers and their uses."

1.2 **Computer is an electronic machine (device) EXCUTING（执行）the INSTRUCTIONS in a program.【执行程序中的指令】**

"A computer can Accept (Data) → Process (Data) → Output (Results)→ Store (Results) → Accept → … "

1.3 Computer Hardware （计算机硬件）

1.3.1 Input Devices (A→D): Mouse, Keyboard, Microphone, Camera, Touchscreen, etc.

1.3.2 Output Devices (D→A): Monitor, Speaker, Printer, etc.

1.3.3 System Units: CPU, Mainboard, Memory（内存，不是硬盘）

1.3.4 Storage Devices: HDD (Hard Disk Device, 硬盘), USB Disk, Floppy Disk （软盘）, Option Disk（光盘）, Memory Card (SD, CF, etc.), etc.

1.4 Computer Software （计算机软件）

Programs give INSTRUCTIONS to HARDWARE what to do and how to do. 【程序给予指令】

1.4.1 *Software includes* Application Software（应用软件）

1.4.2 *Software includes* System Software（系统软件）

E.g. DOS, Windows, OS X, Linux

Manage hardware resources; provide common services for other software.

1.5 **WHY COMPUTER POWERFUL *Speed, Accuracy, Storage, Communication***

2 Algorithm（算法）and History

2.1 Definition and Features

2.1.1 Finiteness（限制性）: *Must terminate after (very) finite number of steps.*

2.1.2 Definiteness（明确定义）: *Each steps must be precisely defined (rigorous, unambiguous).*

2.1.3 Effectiveness（高效性）: *Operations must be sufficiently basic they can be done exactly and in a finite length of time.*

2.2 Computer History

2.2.1 Charles Babbage's difference engine（差分机）

2.2.2 Ada Lovelace: the first programmer.

2.2.3 Boolean Logic（布尔逻辑代数）

2.2.4 Alan Turing: Universal Turing Machine（通用图灵机）

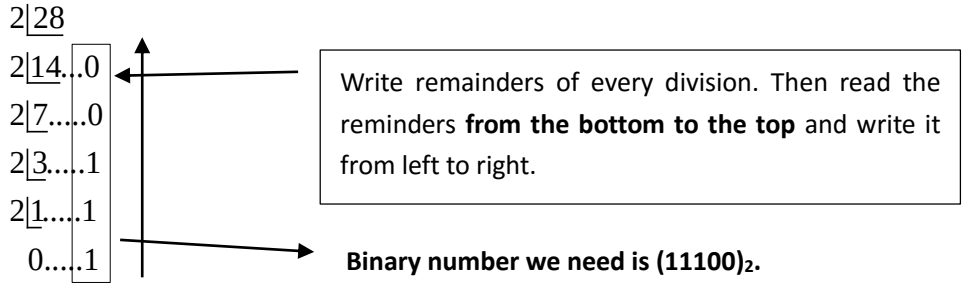
3 Number System

3.1 Conversions between number systems

$$(d_{n-1} \cdot d_n \cdot \ldots \cdot d_0)_r = \sum_{i=0}^{n-1} d_i \cdot r^i$$

e.g. CONVERT decimal number $(28)_{10}$ to binary.

Divide 28 by 2 continuously



Use the same idea to convert decimal number to octal numbers or hexadecimal numbers.

3.2 Conversations Between *Power-of-2* rule

The power of number 2: $2^4 = 16$ and $2^3 = 8$

Convert between **Binary and Hexadecimal or Octal**.

$(2A9F)_{16}$ = 0010 1010 1001 1111

$(4726)_8$ = 100 111 010 110

3.3 Basic Computation （基础运算）

*Subtraction（减法）

1-0=1；1-1=0；0-0=0；0-1=1 …

3.4 **Bit and Byte （位与字节）**

Bit = **B**inary Digi**t** = “0”/”1”. The smallest unit of computer capacity. (Patterson & Hennessy, 2008)

Byte（字节）Basic unit of **addressable**（可寻址的）memory.

1 Byte = 8 bits

MSB = Most **S**ignificant **B**it

MSB							**LSB**

Last **S**ignificant **B**it = **LSB**

IF this number represented by this **byte** is **positive** or **zero**, **MSB = 1;**

IF this number represented by this **byte** is **negative**, **MSB = 0.**

3.5 **Binary Representation of Numbers（二进制数字表示）**

Positive or zero（自然数）

- Directly convert numbers to binary.
- **Range from 1 to 127.**
- E.g. $(28)_{10}$ = (**000**1 1100)$_2$ **Keep the binary number has 8 digits.**
- **$(0)_{10}$ = (0000 0000)$_2$**

Negative Numbers（负数）

- Convert the **absolute value**（绝对值）to binary.
- Invert the digits. (1→0; 0→1)
- Add 1 from the right.

4 Data Representation

4.1 Principles of representing data

4.1.1 Capture the **ESSENCE** of the information.

4.1.2 Convenient for computer to process.

4.2 Two type of data

4.2.1 Analogue（模拟）Continuous, actual.

4.2.2 Digital（数字）Discrete（分离的）, break information into separate elements.

4.3 **In general, n bits can represent 2^n things.**

4.4 Text representing

- To assign each characters a binary code.
- Character sets（字符集）:

  ASCII (**American Standard Code for Information Interchange**). Representing in 7-bits and 8-bits.

  Unicode represents in 16-bits. Including Chinese, Japanese and other Asian languages.

4.5 Audio representing

- Method: To **digitize** the audio signal periodically（周期性地）by measuring the voltage of the signal and record the appropriate numeric value. Known as sampling.

  方法：周期性地测量音频信号的电压值，并取一个接近的数值记录这个时刻的音频信号的电压值。这个过程可以称为“采样”。
- Formats（格式）: WAV, AU, AIFF, VQF, MP3, MP4…
- **MP3 (MPEG 1 Layer 3)** MPEG = **Moving Picture Experts Group（运动图像专家组）**

  Lossy（有损的）compress by psychoacoustics（心理声学）

4.6 Color Representing

- RGB value from 0-255
- Color depth（色彩深度）number of bits that used to representing color.

  Hi-color: 16-bits（称为 65535 色）

  True Color（真彩色）24-bits, each number of RGB 8-bits.
- **A digitized picture is a collection of individual “Pixels”（像素）**
- **The number of pixels used to represent a picture is called the**

“Resolution”（分辨率）.

- Formats: BMP, GIF, JPEG [pixels-by-pixels，基于像素的]

5 The Internet

5.1 Network from local to worldwide

5.1.1 **Network**: a collection of computers and devices connected to share information and resources.

5.1.2 **LAN = Local Area Network（局域网）:** A network in a limited geographical area.

5.1.3 **WAN = Wide Area Network（广域网）**: A network covers a large geographical area.

5.1.4 **Internet:** The network of computer worldwide.

Also called Information highway, the net, and cyberspace.

5.2 History APRANET **Advanced Research Project Agency NETwork**.

5.3 Connect to the Internet

- Wired
  - Phone Modem（调制解调器，俗称“猫”）
  - DSL/ADSL **(Asymmetric) Digital Subscriber Line,（非对称）数字用户线路**
  - Cable Modem（有线电视“猫”）
  - LAN
- Wireless
  - Hotspots（无线热点）
- Connect with ISP (**Internet Service Provider, 网络运营商**)

5.4 Composition of Internet (Sort by OSI Model)

**The Open Systems Interconnection model (OSI Model) is a conceptual model that characterizes and standardizes the communication functions of a telecommunication or computing system without regard of their underlying internal structure and technology.*

TOP ↑ Bottom	*Level*	*Level Name*	**Protocol Name**	
			Abbreviation	**Full Title**
	7	*Application* *应用层*	**DNS**	**Domain Name Services 域名服务**
			FTP	**File Transfer Protocol 文件传输协议**
			HTTP	**Hyper Text Transfer Protocol 超文本传输协议**
			POP	**Post Office Protocol 邮局协议（收件）**
			SMTP	**Simple Mail Transfer Protocol** **简单邮件传输协议（发件）**
			Telnet	**一种访问远程计算机的协议**
	4	*Transfer* *传输层*	**TCP**	**Transmission Control Protocol**
			UDP	**User Datagram Protocol**
	3	*Network* *网络层*	**IP** **IPv4 32bit** **IPv6 128bit**	**Internet Protocol**
			Router **路由器**	**Determine the path between you and an Internet server.**

6 Could Computing and Big Data

6.1 What is could computing?

Universal access → Scalable（可扩展的）Service → Elasticity（弹性的）

6.2 Three types of could services

Virtualization 虚拟化程度	Type Name		Examples	Flexibility 灵活程度
	Abbr.	Full Title		
High ↑ Low	SaaS	Software as a Services 软件即服务	Google Apps Office 365	Low ↓ High
	PaaS	Platform as a Services 平台即服务	Sina App Engine Ali Cloud ACE	
	IaaS	Infrastructure as a Services 基础设施即服务	DigitalOcean, Ali Cloud VPS	

6.3 Advantages of could computing

- Lower computer hardware and software cost.
- Instant software update.
- Unlimited storage space.
- Universal document access.
- Latest version availability.

6.4 Disadvantages of could computing

- Require an Internet connection.
- Privacy issues.

6.5 **3 “V” on big data**

Volume（体积）; Velocity（速度）; Variety（多样性）

7 E-commerce（电子商务）

7.1 Types of e-commerce

- B2B: Business to Business
- B2C: Business to Consumer
- C2C: Consumer to Consumer
- C2B: Consumer to Business
- O2O: Online to Offline

8 Computer Security and Ethics