CSE111 Introduction to Computer Applications

Lecture 1

Introduction to Computer System

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Revised and presented by Asst. Prof. Dr. Samsun M. BAŞARICI

Learning Objectives

- Understand what is a computer.
- Understand the relationship between computer hardware and software.
- Know the main components of hardware.
- Understand the difference between the different types of software.
- Understand the binary/octal/hexadecimal numbering systems and learn how to convert to/from a decimal numbering system.
- Distinguish between primary and secondary storage devices along the dimensions of speed, cost, and capacity.
- Understand the difference between the different techniques used to represent the binary system in electronic, magnetic, and optical storage devices.

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Outlines

- Computers
  - Computer Hardware
  - Computer Software
  - Computer Speed
  - Basic Types of Computers
  - Inside a Computer
  - Basic Parts of a Computer
  - Buttons and Ports on a Computer
- Digits and Numbers
  - Decimal Numbering System.
  - Binary Numbering System.
  - Octal Numbering System.
  - Hexadecimal Numbering System.
- Classification of Storage Devices
- Primary Storage Devices
  - ROM
  - RAM
  - Cache Memory
- Secondary Storage Devices
  - Hard Disc
  - CD
  - DVD
  - Blu-ray
  - HD DVD
  - USB Flash Memory.

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Computers

- **Computers** are electronic devices that manipulate information, or data. They have the ability to **store**, **retrieve**, and **process** data.
- You probably already know that you can use a computer to **type documents**, **send email**, **play games**, and **browse the Web**.
- You can also use it to edit or create **spreadsheets**, **presentations**, and even **videos.**
- A computer system is composed of **hardware** and **software**.

Source:http://www.gcflearnfree.org/computers/computerbasics/1.2

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Computer Hardware

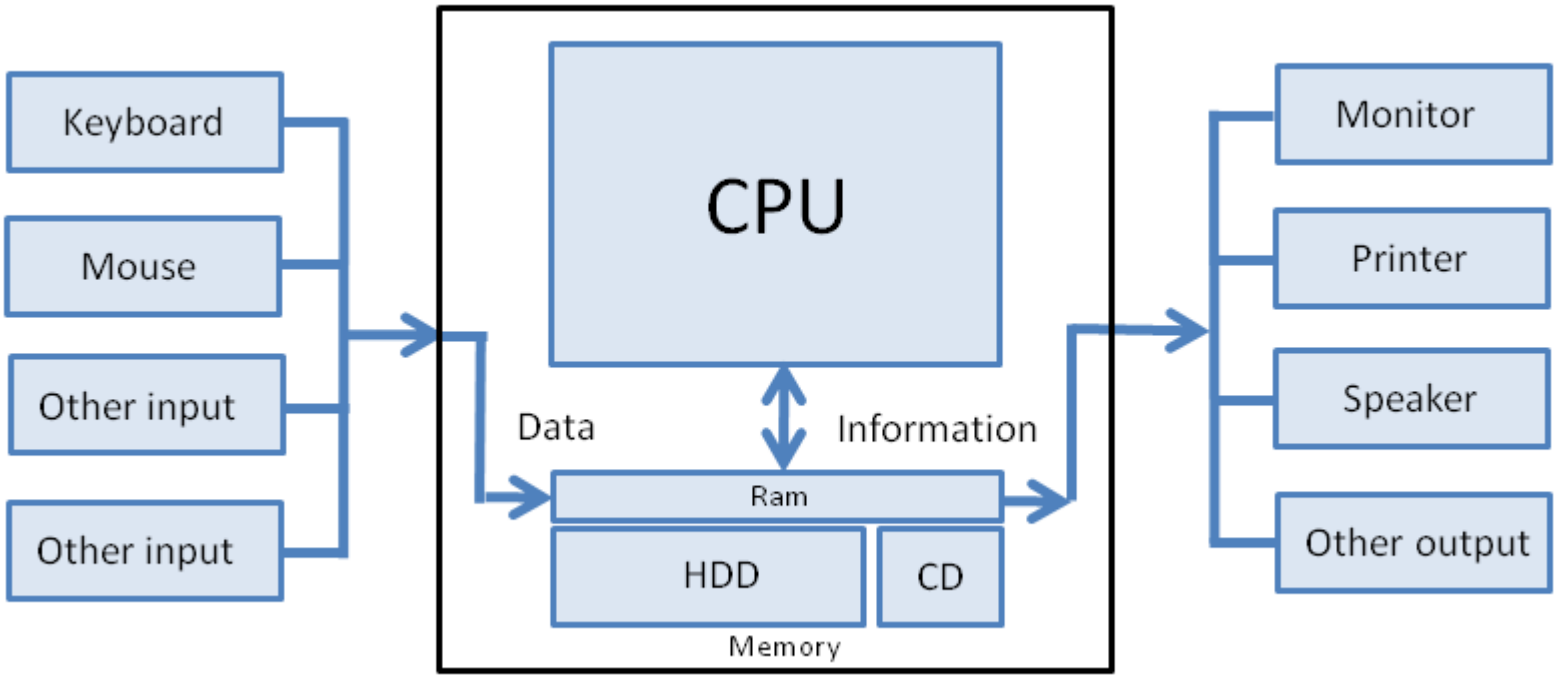
- Hardware components are the physical, tangible pieces that we can see and touch.
- A basic computer hardware consists of 4 components:

1. **Input units**: send things (data) to the computer such as keyboard and mouse.
2. **Output units**: retrieve things (information) from the computer, such as monitor, printer, speaker, etc.
3. **CPU (Central Processing Unit)**: performs arithmetical and logical operations of the computer system.
4. **Memory**: allows a computer to remember data and information. Similarly to human memory, there is a short term memory (RAM) and a long term memory (Hard Disk Drive (HDD) or Compact Disk Drive (CDD)).

Source: http://en.wikiversity.org/wiki/Hardware#Input_unit_and_Output_unit_.28I.2FO.29

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Computer Hardware



http://upload.wikimedia.org/wikipedia/commons/6/60/Computer2.png

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Computer Software

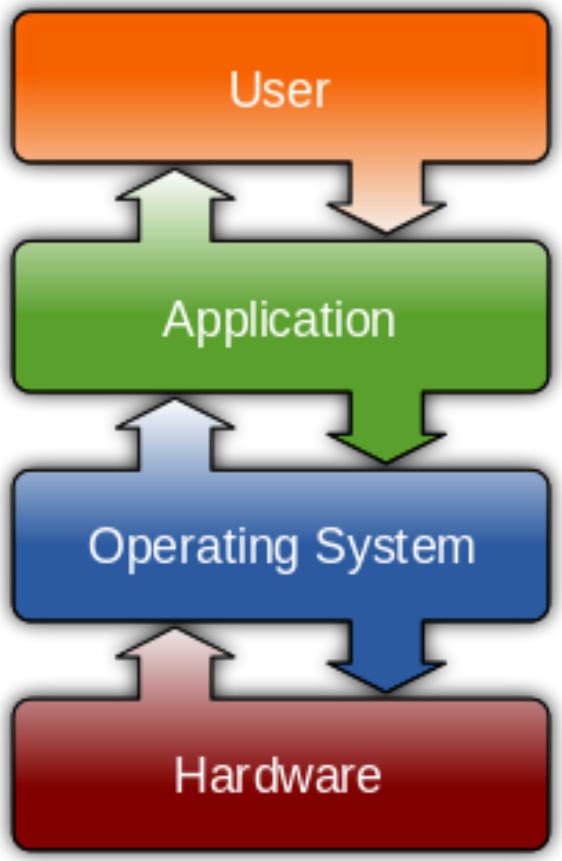
- **Software** is any **set of instructions** that tells the hardware what to do.
- It is what guides the hardware and tells it how to accomplish each task.
- Some examples of software include web browsers, games, and word processors.
- There are three broad classifications for software:

1. ***Application software*** are the computer programs for performing user tasks such as word processing and web browsers.
2. ***System software*** are used to start and run computer systems and networks. This includes operating systems such as Windows, Linux, and Android.
3. ***Computer programming software*** (also known as development software) are used to create application and system software.

Source:http://simple.wikipedia.org/wiki/Computer_software

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Computer System



https://en.wikipedia.org/wiki/Software

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Computer Speed

- One of the factors that affects the computer speed is the **CPU frequency**.

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- A **clock cycle** is the time between two adjacent pulses of the oscillator that sets the tempo of the computer processor.

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- The **number of these pulses per second** is known as the **CPU frequency** (also called the **clock speed**).
- **CPU frequency** is measured in **Hz.**

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Computer Speed

- **Hz (**which is an abbreviation for **h**ert**z) = 1** cycle per second.

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Computer Speed

- **Hz (**which is an abbreviation for **h**ert**z) = 1** cycle per second.
- **KHz (**which is an abbreviation for **K**ilo**h**ert**z)** = **1000** cycles per second.

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Computer Speed

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- **FLOPS** is an abbreviation for **fl**oating-**p**oint **o**perations **p**er **s**econd.
- A floating-point operation is any mathematical operation (such as +, -, *, /) or assignment that involves floating-point numbers.

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- One FLOPS usually needs few clock cycles.
- Similarly:
  - GigaFLOPS=1000 000 000 FLOPS.
  - TeraFLOPS = 1000 0000 000 000 FLOPS
  - PetaFLOPS = 1000 0000 000 000 000 FLOPS

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Basic Types of Computers

We can divide computers on the basis of size, cost, and speed as follows:

- Supercomputer
- Mainframe computer
- Minicomputer
- Microcomputer
  - Workstation
  - Personal Computer
    - Desktop computers
    - Laptop /Note Books
  - Mobile Computer & Devices
    - PDA
    - Tablet PC
    - Handheld Computer
    - Smart Phones

Source: http://edutry.blogspot.com.tr/2014/07/types-of-computer-analogdigitalhybrid.html

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Basic Types of Computers

- Supercomputers:
  - Speed: fastest (33.6 petaFLOPS)
  - Size: largest (a whole building)
  - Cost: up to $100 million.
  - Usage: Space Exploration, Nuclear weapons testing, Weather Forecasting, Earthquake studies.



Titan Supercomputer, Cray Inc.

Source: http://www.byte-notes.com/four-types-computers

Source: http://edutry.blogspot.com.tr/2014/07/types-of-computer-analogdigitalhybrid.html

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  - Usage: Space Exploration, Nuclear weapons testing, Weather Forecasting, Earthquake studies.



Source: http://www.byte-notes.com/four-types-computers

- Mainframe computers:
  - Speed: very fast (few petaFLOPS), can be used by thousands of people at once.
  - Size: large enough (a whole room)
  - Cost: $100,000 - $2,000,000
  - Usage: banks, educational institutions, and insurance companies.



Source: http://edutry.blogspot.com.tr/2014/07/types-of-computer-analogdigitalhybrid.html

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Basic Types of Computers

- Minicomputer
  - Speed: medium, many GHz, can be used by hundreds of people at once.
  - Size: can be placed on a desk.
  - Cost: $10,000 - $ 100,000
  - Usage: small businesses & firms.



http://hnd-unit-2-assignment-1.wikia.com/wiki/Mini_computers

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http://hnd-unit-2-assignment-1.wikia.com/wiki/Mini_computers

- Microcomputer:
  - Speed: the slowest, few GHz, can be used by one user.
  - Size: the smallest.
  - Cost: $200 - $15,000
  - Usage: science, education, entertainment, industry, agriculture, science, home, etc.



Source: http://edutry.blogspot.com.tr/2014/07/types-of-computer-analogdigitalhybrid.html

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Basic Parts of a Computer

Computer Case

- The **computer case** is the metal and plastic box that **contains the main components** of the computer.
- It houses the motherboard, central processing unit (CPU), power supply, and more.
- Computer cases come in different shapes and sizes.
  - A **desktop case** lies flat on a desk, and the monitor usually sits on top of it.
  - A **tower case** is tall and sits next to the monitor or on the floor.



- The front of the case usually has an **on/off switch** and one or more **optical drives** and **USB ports**.

Source:http://www.gcflearnfree.org/computers/computerbasics/5

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Basic Parts of a Computer

Monitor

- The monitor works with a video card, located inside the computer case, to display images and text on the screen.
- Most monitors have control buttons that allow you to change your monitor's display settings, and recent monitors also have built-in speakers.



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http://www.gcflearnfree.org/computers/computerbasics/5.2

Basic Parts of a Computer

Keyboard

- The **keyboard** is one of the primary ways we communicate with the computer and enter data.
- There are many different types of computer keyboards, including wired, wireless, ergonomic, and multimedia.



http://www.gcflearnfree.org/computers/computerbasics/5.3

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Basic Parts of a Computer

Mouse

- The mouse is a peripheral that is known as a pointing device. It lets you point to objects on the screen, click on them, and move them.
- There are two main types of mouse:
  - Optical: uses an electronic eye to detect movement and is easier to clean.
  - Mechanical: uses a rolling ball to detect movement. It is less expensive, but it may require regular cleaning to keep it working properly.



http://www.gcflearnfree.org/computers/computerbasics/5.3

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Buttons and Ports on a Computer

Back of a Computer Case

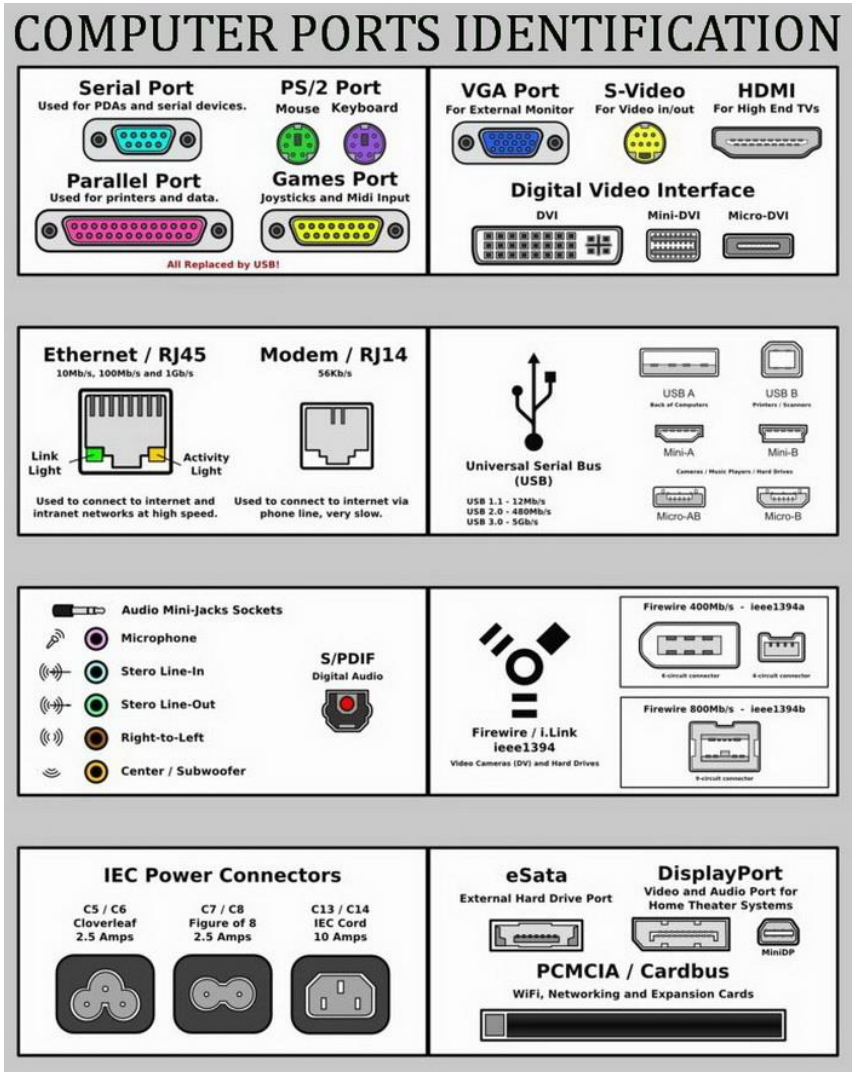


http://cdn.computerhope.com/connect.jpg

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Buttons and Ports on a Computer

Common Buttons and Ports



Source: http://removeandreplace.com/2013/04/13/computer-ports-learn-the-name-and-location-of-the-connections-on-your-desktop-computer-or-laptop/

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Inside a Computer Case
CPU



- The central processing unit (CPU), also called a processor, is located inside the computer case on the motherboard.
- It is sometimes called the brain of the computer, and its job is to carry out commands. Whenever you press a key, click the mouse, or start an application, you're sending instructions to the CPU.
- A processor's speed is measured in megahertz (MHz), or millions of instructions per second; and gigahertz (GHz), or billions of instructions per second.
- A faster processor can execute instructions more quickly. However, the actual speed of the computer depends on the speed of many different components—not just the processor.
- There are many processor manufacturers for personal computers, but the most well-known ones are **Intel** and **AMD**.

Source:http://www.gcflearnfree.org/computers/computerbasics/7

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Inside a Computer Case

Motherboard

- The **motherboard** is the computer's **main circuit board**.
- It's a thin plate that holds the CPU, memory, connectors for the hard drive and optical drives, expansion cards to control the video and audio, and connections to your computer's ports (such as USB ports).
- The motherboard connects directly or indirectly to every part of the computer.



Source:http://www.gcflearnfree.org/computers/computerbasics/7

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Inside a Computer Case

Power Supply Unit

- The power supply unit **converts the power** from the wall outlet (220/110 V) to the type of power needed by the computer (3/5/12 V).
- It sends power through cables to the motherboard and other components.



Source:http://www.gcflearnfree.org/computers/computerbasics/7

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Inside a Computer Case

RAM

- RAM (random access memory) is your system's **short-term memory**. Whenever your computer performs calculations, it temporarily stores the data in the RAM.
- Its content **disappears** when the computer is turned off. If you're working on a document, spreadsheet, or other type of file, you'll need to **save** it to avoid losing it. When you save a file, the data is written to the **hard drive**, which acts as **long-term storage**.
- RAM is measured in **megabytes (MB) or gigabytes (GB)**. The **more RAM** you have, the more things your computer can do at the same time.



Source:http://www.gcflearnfree.org/computers/computerbasics/7.2

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Inside a Computer Case

Hard drive

- The **hard drive** on your computer is where the software is installed, and it's also where your documents and other files are stored.
- The hard drive is **long-term storage**, which means the data is still saved even if you turn the computer off or unplug it.
- When you run a program or open a file, the computer copies some of the data from the **hard drive** onto the **RAM**. When you **save** a file, the data is copied back to the **hard drive**. The faster the hard drive is, the faster your computer can **start up** and **load programs**.



Source:http://www.gcflearnfree.org/computers/computerbasics/7.2

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Digits and Numbers

- **Digits:** Are Symbols (or shapes) that represent the numbering system elements.

  Ex:

  Arabic : 0, 1, 2, 3, 4, 5, 6, 7, 8, 9

  Hindi : ٠, ١, ٢, ٣, ٤, ٥, ٦, ٧, ٨, ٩

  Latin : ??, I, II, III, IV, V, VI, VII, VIII, IX, X, ...

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Digits and Numbers

- **Numbers:** are compositions of one or more digits.

  Ex:

Arabic	: 3	55	100	2014
Hindi	: ٣	٥٥	١٠٠	٢٠١٤
Latin	: III	LV	C	MMXIV

2014 (Arabic) = MMXIV(Latin)

(This is very complicated !!)

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Decimal Numbering System

- Digits: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9

- Numbers: 0, 1, 2, 3, 4, ... 9, 10, 11, 12 ... 19, 20, 21, ... 99, 100, 101, ... 199, 200, 201, ...

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Why people use the base-10 system?

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Why people use the base-10 system?



http://fivestarlearning.homestead.com/contact.html

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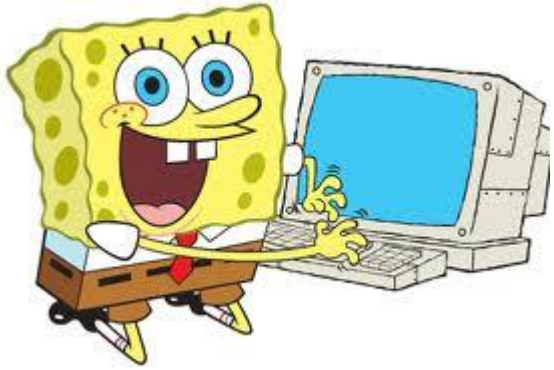
Binary Numbering System

- Digits: 0, 1
- Numbers: 0, 1, 10, 11, 100, 101, 110, 111, 1000, 1001, ...
- Where the base-2 system is used?

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Binary Numbering System

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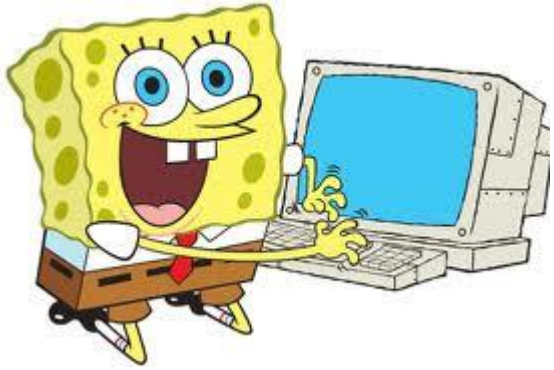


http://images.techhive.com/images/idge/imported/article/cio/2012/07/18/spongebob-100342468-orig.jpg

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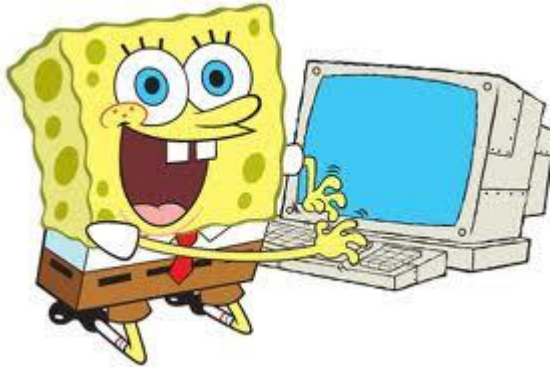
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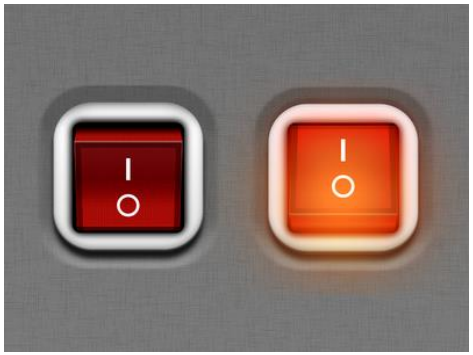
Binary Numbering System

- Digits: 0, 1
- Numbers: 0, 1, 10, 11, 100, 101, 110, 111, 1000, 1001, ...
- Where the base-2 system is used? Why?

Becasue computers understand only two numbers: 1 and 0.



http://images.techhive.com/images/idge/imported/article/cio/2012/07/18/spongebob-100342468-orig.jpg



https://dribbble.com/shots/770756-Switch-O-I-UI-elements?list=tags&tag=oi&offset=6

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Binary Numbering System

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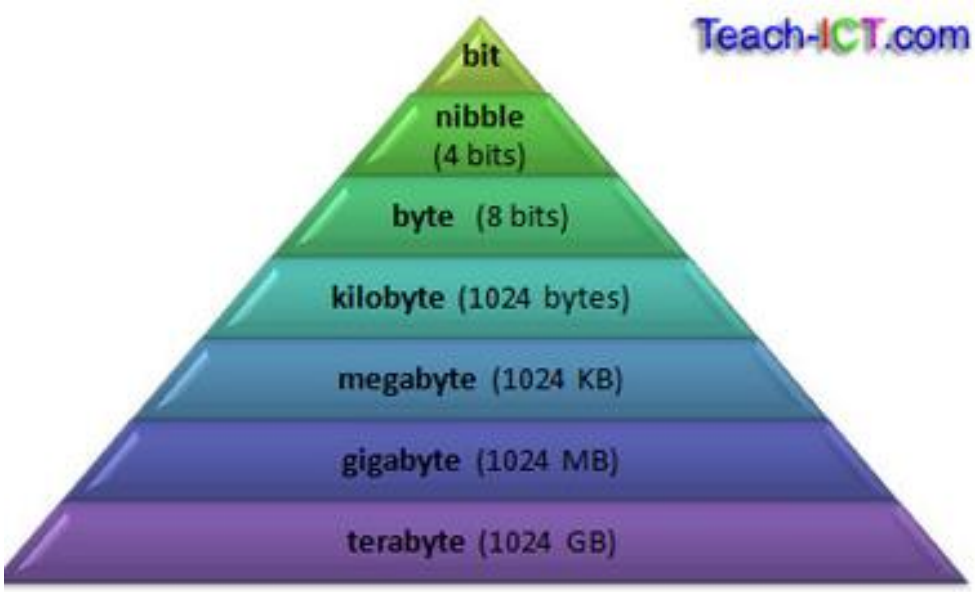
A single binary number is called a Binary digit, or bit.

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Binary Numbering System

- Digits: 0, 1
- Numbers: 0, 1, 10, 11, 100, 101, 110, 111, 1000, 1001, ...

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http://images.rapgenius.com/8539c6823392ffoe969723176 7f52ba5.390x245x1.jpg

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Binary Numbering System

Decimal	Binary	Counting Items
0	0	-
1	1	X
2	10	XX
3	11	XXX
4	100	XXXX
5	101	XXXXX
6	110	XXXXXX
7	111	XXXXXXX
8	1000	XXXXXXXX
9	1001	XXXXXXXXX

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Decimal to Binary Conversion

$$(97)_{10}=(?)_{2}$$

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Decimal to Binary Conversion

$$(97)_{10}=(?)_2$$

97 ÷ 2 ➔ quotient = 48, remainder = 1. (LSB)

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Decimal to Binary Conversion

$$(97)_{10}=(?)_2$$

97 ÷ 2 ➔ quotient = 48, remainder = 1. (LSB)

48 ÷ 2 ➔ quotient = 24, remainder = 0.

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Decimal to Binary Conversion

$$(97)_{10}=(?)_2$$

$97 \div 2 \rightarrow$	quotient = 48,	remainder = 1. (LSB)
$48 \div 2 \rightarrow$	quotient = 24,	remainder = 0.
$24 \div 2 \rightarrow$	quotient = 12,	remainder = 0.

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Decimal to Binary Conversion

$(97)_{10}=(?)_2$

97 ÷ 2 ➔	quotient = 48,	remainder = 1. (LSB)
48 ÷ 2 ➔	quotient = 24,	remainder = 0.
24 ÷ 2 ➔	quotient = 12,	remainder = 0.
12 ÷ 2 ➔	quotient = 6,	remainder = 0.

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Decimal to Binary Conversion

$(97)_{10}=(?)_2$

97 ÷ 2 ➔	quotient = 48,	remainder = 1. (LSB)
48 ÷ 2 ➔	quotient = 24,	remainder = 0.
24 ÷ 2 ➔	quotient = 12,	remainder = 0.
12 ÷ 2 ➔	quotient = 6,	remainder = 0.
6 ÷ 2 ➔	quotient = 3,	remainder = 0.

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Decimal to Binary Conversion

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24 ÷ 2 ➔	quotient = 12,	remainder = 0.
12 ÷ 2 ➔	quotient = 6,	remainder = 0.
6 ÷ 2 ➔	quotient = 3,	remainder = 0.
3 ÷ 2 ➔	quotient = 1,	remainder = 1.

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Decimal to Binary Conversion

$(97)_{10}=(?)_2$

$97 \div 2 \rightarrow$	quotient = 48,	remainder = 1. (LSB)
$48 \div 2 \rightarrow$	quotient = 24,	remainder = 0.
$24 \div 2 \rightarrow$	quotient = 12,	remainder = 0.
$12 \div 2 \rightarrow$	quotient = 6,	remainder = 0.
$6 \div 2 \rightarrow$	quotient = 3,	remainder = 0.
$3 \div 2 \rightarrow$	quotient = 1,	remainder = 1.
$1 \div 2 \rightarrow$	quotient = 0 (Stop)	remainder = 1. (MSB)

$(97)_{10} = (1\ 1\ 0\ 0\ 0\ 0\ 1)_2$

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Decimal to Binary Conversion

$(87)_{10}=(?)_2$

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Decimal to Binary Conversion

$$(87)_{10}=(?)_2$$

87 ÷ 2 ➔ quotient = 43, remainder = 1. (LSB)

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Decimal to Binary Conversion

$$(87)_{10}=(?)_2$$

87 ÷ 2 ➔ quotient = 43, remainder = 1. (LSB)

43 ÷ 2 ➔ quotient = 21, remainder = 1.

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Decimal to Binary Conversion

$(87)_{10}=(?)_2$

87 ÷ 2 ➔ quotient = 43, remainder = 1. (LSB)

43 ÷ 2 ➔ quotient = 21, remainder = 1.

21 ÷ 2 ➔ quotient = 10, remainder = 1.

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Decimal to Binary Conversion

$(87)_{10}=(?)_2$

87 ÷ 2 ➔ quotient = 43, remainder = 1. (LSB)

43 ÷ 2 ➔ quotient = 21, remainder = 1.

21 ÷ 2 ➔ quotient = 10, remainder = 1.

10 ÷ 2 ➔ quotient = 5, remainder = 0.

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Decimal to Binary Conversion

$(87)_{10}=(?)_2$

$87 \div 2 \rightarrow$	quotient = 43,	remainder = 1. (LSB)
$43 \div 2 \rightarrow$	quotient = 21,	remainder = 1.
$21 \div 2 \rightarrow$	quotient = 10,	remainder = 1.
$10 \div 2 \rightarrow$	quotient = 5,	remainder = 0.
$5 \div 2 \rightarrow$	quotient = 2,	remainder = 1.

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Decimal to Binary Conversion

$(87)_{10}=(?)_2$

87 ÷ 2 ➔	quotient = 43,	remainder = 1. (LSB)
43 ÷ 2 ➔	quotient = 21,	remainder = 1.
21 ÷ 2 ➔	quotient = 10,	remainder = 1.
10 ÷ 2 ➔	quotient = 5,	remainder = 0.
5 ÷ 2 ➔	quotient = 2,	remainder = 1.
2 ÷ 2 ➔	quotient = 1,	remainder = 0.

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Decimal to Binary Conversion

$(87)_{10}=(?)_2$

$87 \div 2 \rightarrow$	quotient = 43,	remainder = 1. (LSB)
$43 \div 2 \rightarrow$	quotient = 21,	remainder = 1.
$21 \div 2 \rightarrow$	quotient = 10,	remainder = 1.
$10 \div 2 \rightarrow$	quotient = 5,	remainder = 0.
$5 \div 2 \rightarrow$	quotient = 2,	remainder = 1.
$2 \div 2 \rightarrow$	quotient = 1,	remainder = 0.
$1 \div 2 \rightarrow$	quotient = 0 (Stop)	remainder = 1. (MSB)

$(87)_{10}= (1\ 0\ 1\ 0\ 1\ 1\ 1)_2$

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Binary to Decimal Conversion

$(1\ 1\ 0\ 0\ 0\ 0\ 1)_2 = (?)_{10}$

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Binary to Decimal Conversion

(MSB) (LSB)

$(1\ 1\ 0\ 0\ 0\ 0\ 1)_2 = (?)_{10}$

6 5 4 3 2 1 0

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Binary to Decimal Conversion

(MSB) (LSB)

$(1\ 1\ 0\ 0\ 0\ 0\ 1)_2 = (?)_{10}$

6 5 4 3 2 1 0

$(1\ 1\ 0\ 0\ 0\ 0\ 1)_2 = 1 \times 2^6$

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Binary to Decimal Conversion

(MSB) (LSB)

$(1\ 1\ 0\ 0\ 0\ 0\ 1)_2 = (?)_{10}$

6 5 4 3 2 1 0

$(1\ 1\ 0\ 0\ 0\ 0\ 1)_2 = 1\times2^6 + 1\times2^5$

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Binary to Decimal Conversion

(MSB) (LSB)

$(1\ 1\ 0\ 0\ 0\ 0\ 1)_2 = (?)_{10}$

6 5 4 3 2 1 0

$(1\ 1\ 0\ 0\ 0\ 0\ 1)_2 = 1\times2^6 + 1\times2^5 + 0\times2^4 +$

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Binary to Decimal Conversion

(MSB) (LSB)

$(1\ 1\ 0\ 0\ 0\ 0\ 1)_2 = (?)_{10}$

6 5 4 3 2 1 0

$(1\ 1\ 0\ 0\ 0\ 0\ 1)_2 = 1\times2^6 + 1\times2^5 + 0\times2^4 + 0\times2^3$

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Binary to Decimal Conversion

(MSB) (LSB)

$(1\ 1\ 0\ 0\ 0\ 0\ 1)_2 = (?)_{10}$

6 5 4 3 2 1 0

$$(1\ 1\ 0\ 0\ 0\ 0\ 1)_2 = 1\times2^6 + 1\times2^5 + 0\times2^4 + 0\times2^3 + 0\times2^2$$

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Binary to Decimal Conversion

(MSB) (LSB)

$(1\ 1\ 0\ 0\ 0\ 0\ 1)_2 = (?)_{10}$

6 5 4 3 2 1 0

$$(1\ 1\ 0\ 0\ 0\ 0\ 1)_2 = 1\times2^6 + 1\times2^5 + 0\times2^4 + 0\times2^3 + 0\times2^2 + 0\times2^1$$

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Binary to Decimal Conversion

(MSB) (LSB)

$(1\ 1\ 0\ 0\ 0\ 0\ 1)_2 = (?)_{10}$

6 5 4 3 2 1 0

$$(1\ 1\ 0\ 0\ 0\ 0\ 1)_2 = 1\times2^6 + 1\times2^5 + 0\times2^4 + 0\times2^3 + 0\times2^2 + 0\times2^1 + 1\times2^0$$

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Binary to Decimal Conversion

(MSB) (LSB)

$(1\ 1\ 0\ 0\ 0\ 0\ 1)_2 = (?)_{10}$

6 5 4 3 2 1 0

$$(1\ 1\ 0\ 0\ 0\ 0\ 1)_2 = 1\times2^6 + 1\times2^5 + 0\times2^4 + 0\times2^3 + 0\times2^2 + 0\times2^1 + 1\times2^0$$

$$= 64 + 32 + 1$$

$$= (97)_{10}$$

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Binary to Decimal Conversion

$(1\ 0\ 1\ 0\ 1\ 1\ 1)_2 = (?)_{10}$

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Binary to Decimal Conversion

(MSB) (LSB)

$(1\ 0\ 1\ 0\ 1\ 1\ 1)_2 = (?)_{10}$

6 5 4 3 2 1 0

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Binary to Decimal Conversion

(MSB) (LSB)

$(1\ 0\ 1\ 0\ 1\ 1\ 1)_2 = (?)_{10}$

6 5 4 3 2 1 0

$(1\ 0\ 1\ 0\ 0\ 1\ 1)_2 = 1 \times 2^6$

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Binary to Decimal Conversion

(MSB) (LSB)

$(1\ 0\ 1\ 0\ 1\ 1\ 1)_2 = (?)_{10}$

6 5 4 3 2 1 0

$(1\ 0\ 1\ 0\ 0\ 1\ 1)_2 = 1\times2^6 + 0\times2^5$

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Binary to Decimal Conversion

(MSB) (LSB)

$(1\ 0\ 1\ 0\ 1\ 1\ 1)_2 = (?)_{10}$

6 5 4 3 2 1 0

$(1\ 0\ 1\ 0\ 0\ 1\ 1)_2 = 1\times2^6 + 0\times2^5 + 1\times2^4$

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Binary to Decimal Conversion

(MSB) (LSB)

$(1\ 0\ 1\ 0\ 1\ 1\ 1)_2 = (?)_{10}$

6 5 4 3 2 1 0

$(1\ 0\ 1\ 0\ 0\ 1\ 1)_2 = 1\times2^6 + 0\times2^5 + 1\times2^4 + 0\times2^3$

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Binary to Decimal Conversion

(MSB) (LSB)

$(1\ 0\ 1\ 0\ 1\ 1\ 1)_2 = (?)_{10}$

6 5 4 3 2 1 0

$(1\ 0\ 1\ 0\ 0\ 1\ 1)_2 = 1\times2^6 + 0\times2^5 + 1\times2^4 + 0\times2^3 + 1\times2^2$

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Binary to Decimal Conversion

(MSB) (LSB)

$(1\ 0\ 1\ 0\ 1\ 1\ 1)_2 = (?)_{10}$

6 5 4 3 2 1 0

$$(1\ 0\ 1\ 0\ 0\ 1\ 1)_2 = 1\times2^6 + 0\times2^5 + 1\times2^4 + 0\times2^3 + 1\times2^2 + 1\times2^1$$

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Binary to Decimal Conversion

(MSB) (LSB)

$(1\ 0\ 1\ 0\ 1\ 1\ 1)_2 = (?)_{10}$

6 5 4 3 2 1 0

$$(1\ 0\ 1\ 0\ 0\ 1\ 1)_2 = 1\times2^6 + 0\times2^5 + 1\times2^4 + 0\times2^3 + 1\times2^2 + 1\times2^1 + 1\times2^0$$

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Binary to Decimal Conversion

(MSB) (LSB)

$(1\ 0\ 1\ 0\ 1\ 1\ 1)_2 = (?)_{10}$

6 5 4 3 2 1 0

$$(1\ 0\ 1\ 0\ 0\ 1\ 1)_2 = 1\times2^6 + 0\times2^5 + 1\times2^4 + 0\times2^3 + 1\times2^2 + 1\times2^1 + 1\times2^0$$

$$= 64 + 16 + 4 + 2 + 1$$

$$= (87)_{10}$$

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Octal Numbering System

Digits: 0, 1, 2, 3, 4, 5, 6, 7

Numbers: 0, 1, 2, 3, 4, 5, 6, 7, 10, 11, 12, ...

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Octal Numbering System

Decimal	Octal	Counting Items
0	0	-
1	1	X
2	2	XX
3	3	XXX
4	4	XXXX
5	5	XXXXX
6	6	XXXXXX
7	7	XXXXXXX
8	10	XXXXXXXX
9	11	XXXXXXXXX

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Decimal to Octal Conversion

$$(97)_{10}=(?)_{8}$$

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Decimal to Octal Conversion

$$(97)_{10}=(?)_{8}$$

97 ÷ 8 ➔ quotient = 12, remainder = 1. (LSB)

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Decimal to Octal Conversion

$$(97)_{10}=(?)_{8}$$

97 ÷ 8 ➔ quotient = 12, remainder = 1. (LSB)

12 ÷ 8 ➔ quotient = 1, remainder = 4.

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Decimal to Octal Conversion

$(97)_{10}=(?)_{8}$

$97 \div 8 \rightarrow$	quotient = 12,	remainder = 1. (LSB)
$12 \div 8 \rightarrow$	quotient = 1,	remainder = 4.
$1 \div 8 \rightarrow$	quotient = 0,(Stop)	remainder = 1. (MSB)

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Decimal to Octal Conversion

$(97)_{10}=(?)_8$

$97 \div 8 \rightarrow$	quotient = 12,	remainder = 1. (LSB)
$12 \div 8 \rightarrow$	quotient = 1,	remainder = 4.
$1 \div 8 \rightarrow$	quotient = 0,(Stop)	remainder = 1. (MSB)

$(97)_{10}=(141)_8$

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Octal to Decimal Conversion

(MSB)(LSB)

$(141)_8 = (?)_{10}$

2 1 0

$$(141)_8 = 1\times8^2 + 4\times8^1 + 1\times8^0$$

$$= 64 + 32 + 1$$

$$= 97$$

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Hexadecimal Numbering System

Digits : 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F

Numbers : 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F, 10, 11, 12, ..., 1E, 1F, 20

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Hexadecimal Numbering System

Decimal	Hexadecimal	Items
0	0	-
1	1	X
2	2	XX
3	3	XXX
4	4	XXXX
5	5	XXXXX
6	6	XXXXXX
7	7	XXXXXXX
8	8	XXXXXXXX
9	9	XXXXXXXXX
10	A	XXXXXXXXXX
11	B	XXXXXXXXXXX
12	C	XXXXXXXXXXXX
13	D	XXXXXXXXXXXXX
14	E	XXXXXXXXXXXXXX
15	F	XXXXXXXXXXXXXXX

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Decimal to Hexadecimal Conversion

$$(197)_{10}=(?)_{16}$$

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Decimal to Hexadecimal Conversion

$$(197)_{10}=(?)_{16}$$

197 ÷ 16 ➔ quotient = 12, remainder = 5=5 (LSB)

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Decimal to Hexadecimal Conversion

$(197)_{10}=(?)_{16}$

197 ÷ 16 ➔ quotient = 12, remainder = 5=5 (LSB)

12 ÷ 16 ➔ quotient = 0,(Stop) remainder = 12=C (MSB)

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Decimal to Hexadecimal Conversion

$(197)_{10}=(?)_{16}$

197 ÷ 16 ➔ quotient = 12, remainder = 5=5 (LSB)

12 ÷ 16 ➔ quotient = 0,(Stop) remainder = 12=C (MSB)

$(197)_{10}=(C5)_{16}$

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Hexadecimal to Decimal Conversion

$$(C5)_{16} = (?)_{10}$$

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Hexadecimal to Decimal Conversion

(MSB) (LSB)

$(C5)_{16} = (?)_{10}$

1 0

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Hexadecimal to Decimal Conversion

(MSB) (LSB)

$(C5)_{16} = (?)_{10}$

1 0

$(C5)_{16} = 12 \times 16^1 + 5 \times 16^0$

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Hexadecimal to Decimal Conversion

(MSB) (LSB)

$(C5)_{16} = (?)_{10}$

1 0

$(C5)_{16} = 12 \times 16^1 + 5 \times 16^0$

$= 192 + 5$

$= (197)_{10}$

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Storage Devices
Introduction

- Computers use the binary system to store and process all kinds of data (movies, photos, books, games, etc.).



http://4.bp.blogspot.com/-YclabLQADrE/UxvXigzO54I/AAAAAAAAAYQ/T7tvLHKgN2E/s1600/7.jpg

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Storage Devices
Introduction

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http://4.bp.blogspot.com/-YclabLQADrE/UxvXigzO54I/AAAAAAAAAYQ/T7tvLHKgN2E/s1600/7.jpg

- Storage devices use different techniques and formats to use the binary system and represent the 0,1 digits.

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Classification of Storage Devices

- They can be classified into:

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Classification of Storage Devices

- They can be classified into:
  - Primary storage devices
    - Electronic: like ROM, RAM ,and cache memory.

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Classification of Storage Devices

- They can be classified into:
  - Primary storage devices
    - Electronic: like ROM, RAM ,and cache memory.
  - Secondary storage devices
    - Magnetic: like hard disk.
    - Optical: like CD,DVD, Blu-Ray ,and HD DVD.
    - Electronic: USB flash memory.

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Primary Storage Devices

ROM (Read Only Memory)

- An electronic memory that is filled with data and fixed on the motherboard during the manufacturing process.



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Primary Storage Devices

ROM (Read Only Memory)



- An electronic memory that is filled with data and fixed on the motherboard during the manufacturing process.
- It can be read, but it can not be written unless this process is supported by the manufacturing company (usually for upgrading to a newer version).

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Primary Storage Devices

ROM (Read Only Memory)



- An electronic memory that is filled with data and fixed on the motherboard during the manufacturing process.
- It can be read, but it can not be written unless this process is supported by the manufacturing company (usually for upgrading to a newer version).
- Contains the instructions required for starting (booting) the computer when it is first turned on:

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Primary Storage Devices

ROM (Read Only Memory)



- An electronic memory that is filled with data and fixed on the motherboard during the manufacturing process.
- It can be read, but it can not be written unless this process is supported by the manufacturing company (usually for upgrading to a newer version).
- Contains the instructions required for starting (booting) the computer when it is first turned on:
  - How CPU can access the hard disk.
  - Where to find the operating system on the hard disk.
  - Load the operating system into the RAM.

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Primary Storage Devices

ROM (Read Only Memory)



- An electronic memory that is filled with data and fixed on the motherboard during the manufacturing process.
- It can be read, but it can not be written unless this process is supported by the manufacturing company (usually for upgrading to a newer version).
- Contains the instructions required for starting (booting) the computer when it is first turned on:
  - How CPU can access the hard disk.
  - Where to find the operating system on the hard disk.
  - Load the operating system into the RAM.
- It has a small capacity (1/2/4/8 megabyte), and it is non-volatile, i.e. it stores its data permanently and keeps its content after switching off.

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Primary Storage Devices

RAM (Random Access Memory)

- Connected directly to CPU.



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Primary Storage Devices

RAM (Random Access Memory)

- Connected directly to CPU.
- Used to store data temporarily.



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Primary Storage Devices

RAM (Random Access Memory)



- Connected directly to CPU.
- Used to store data temporarily.
- Used to store data that are currently processed, or waiting for processing.

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Primary Storage Devices

RAM (Random Access Memory)



- Connected directly to CPU.
- Used to store data temporarily.
- Used to store data that are currently processed, or waiting for processing.
- Fast read/write operations (low access time).

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Primary Storage Devices

RAM (Random Access Memory)



- Connected directly to CPU.
- Used to store data temporarily.
- Used to store data that are currently processed, or waiting for processing.
- Fast read/write operations (low access time).
- It is a volatile memory and does not keep its content after switching off.

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Primary Storage Devices

RAM (Random Access Memory)



- Connected directly to CPU.
- Used to store data temporarily.
- Used to store data that are currently processed, or waiting for processing.
- Fast read/write operations (low access time).
- It is a volatile memory and does not keep its content after switching off.
- Expensive.

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Primary Storage Devices

RAM (Random Access Memory)



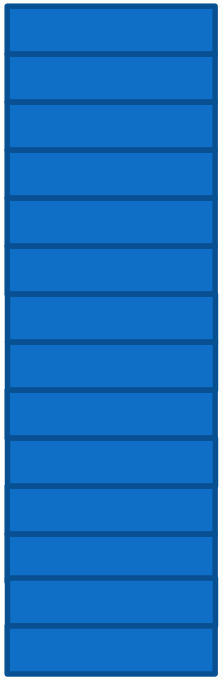
- Connected directly to CPU.
- Used to store data temporarily.
- Used to store data that are currently processed, or waiting for processing.
- Fast read/write operations (low access time).
- It is a volatile memory and does not keep its content after switching off.
- Expensive.
- Small capacity (2/4/8/16 gigabyte) compared to the secondary storage devices.

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Primary Storage Devices

RAM (Random Access Memory)

- Composed of consecutive cells.

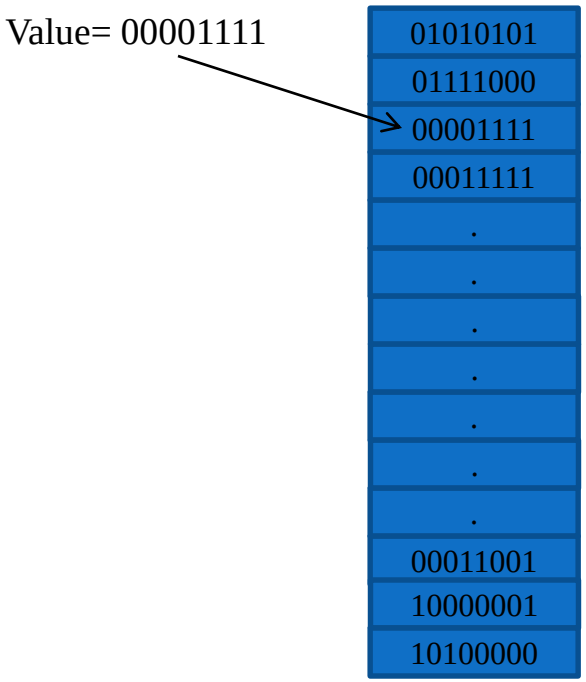


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Primary Storage Devices

RAM (Random Access Memory)

- Composed of consecutive cells.
- Each cell is composed of a sequence of one bit memory.
- Each bit is usually an electronic circuit composed of a very tiny capacitor and transistor.

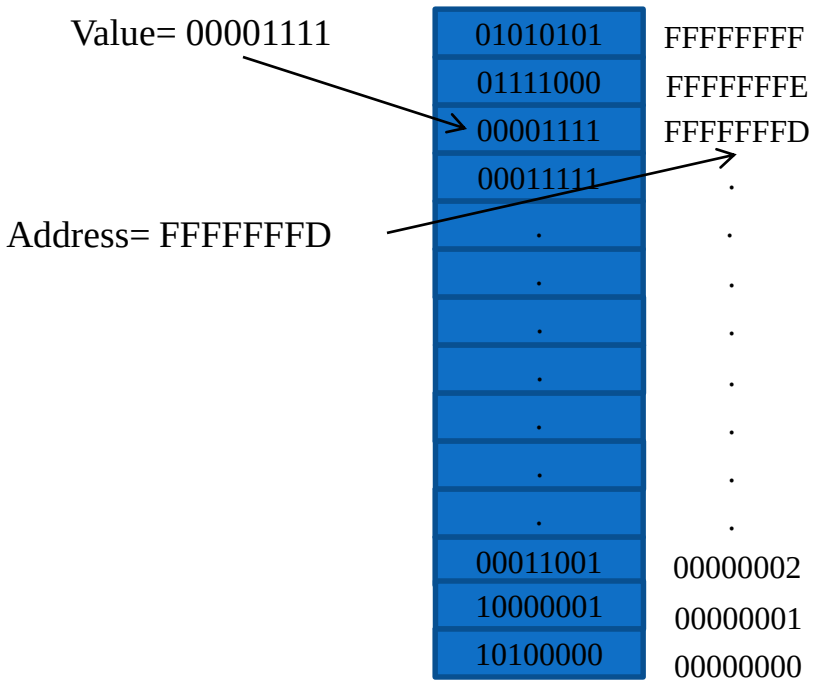


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Primary Storage Devices

RAM (Random Access Memory)

- Composed of consecutive cells.
- Each cell is composed of a sequence of one bit memory.
- Each bit is usually an electronic circuit composed of a very tiny capacitor and transistor.
- Each cell has a unique address.

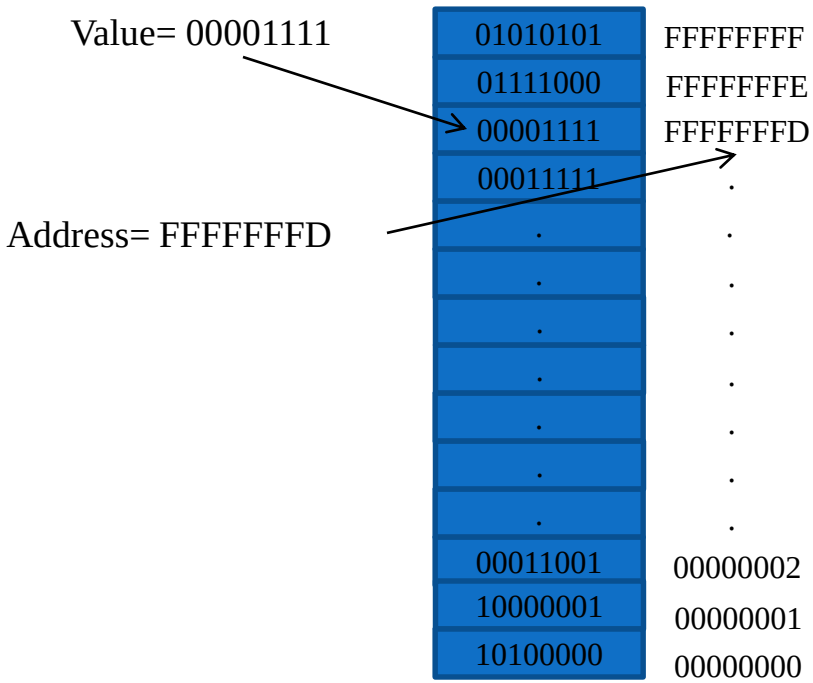


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Primary Storage Devices

RAM (Random Access Memory)

- Composed of consecutive cells.
- Each cell is composed of a sequence of one bit memory.
- Each bit is usually an electronic circuit composed of a very tiny capacitor and transistor.
- Each cell has a unique address.
- Bigger data are stored by using consecutive cells.



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Primary Storage Devices

Cache Memory

- A very small size RAM memory (1/2/4/.../128 megabyte) that is installed between the main RAM and CPU.

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Primary Storage Devices

Cache Memory

- A very small size RAM memory (1/2/4/.../128 megabyte) that is installed between the main RAM and CPU.
- Very expensive, and very fast (very short access time).

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Primary Storage Devices

Cache Memory

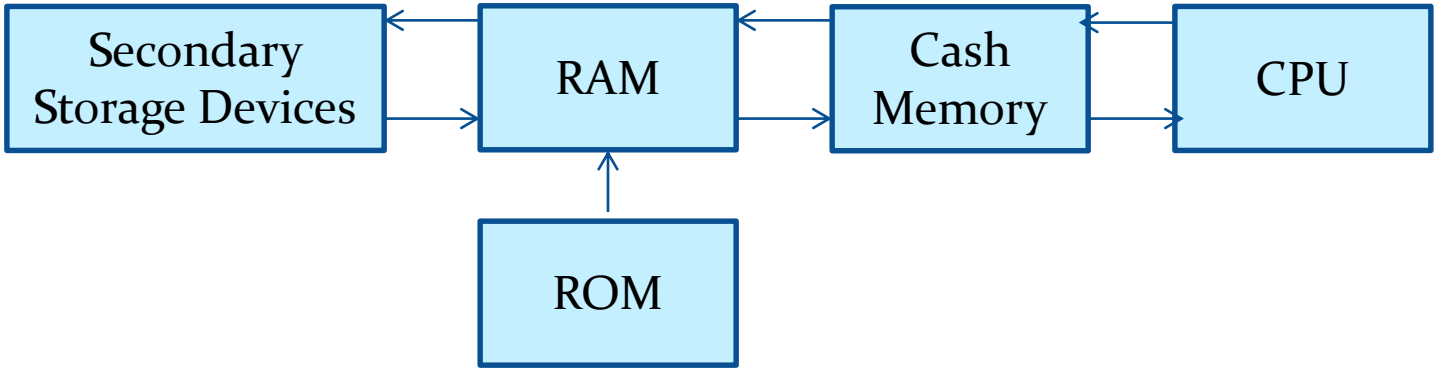
- A very small size RAM memory (1/2/4/.../128 megabyte) that is installed between the main RAM and CPU.
- Very expensive, and very fast (very short access time).
- Its function is reducing the time needed by the CPU to access the data stored on the main RAM.

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Primary Storage Devices

Cache Memory

- A very small size RAM memory (1/2/4/.../128 megabyte) that is installed between the main RAM and CPU.
- Very expensive, and very fast (very short access time).
- Its function is reducing the time needed by the CPU to access the data stored on the main RAM.

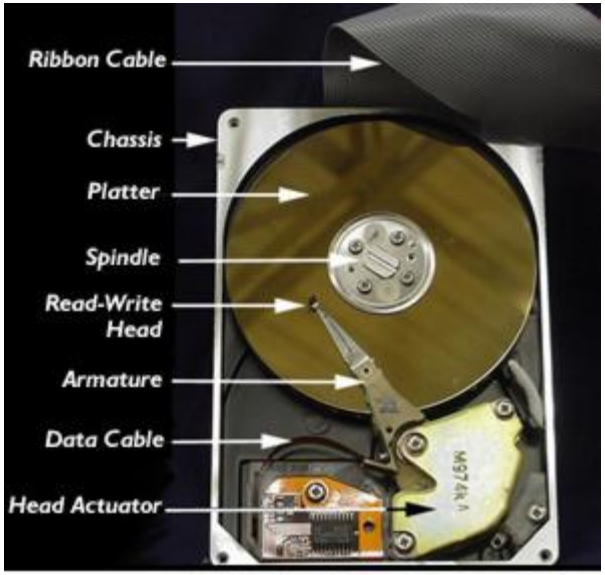


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Secondary Storage Devices

Hard Disk Drives

- A reliable and permanent magnetic storage device.



Inside a Hard Drive

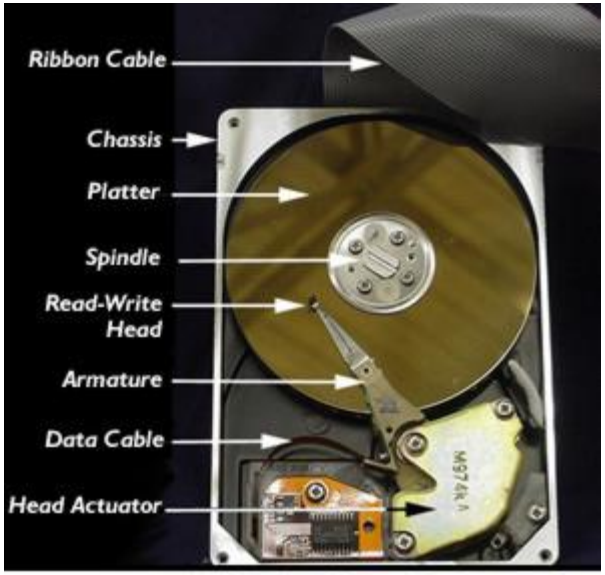
http://silver-fox.ca/harddisk.html

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Secondary Storage Devices

Hard Disk Drives

- A reliable and permanent magnetic storage device.
- Data can be eliminated and rewritten again.



Inside a Hard Drive

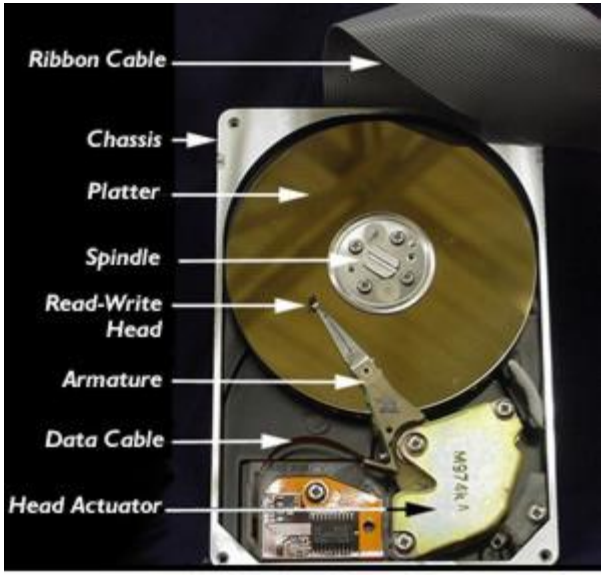
http://silver-fox.ca/harddisk.html

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Secondary Storage Devices

Hard Disk Drives

- A reliable and permanent magnetic storage device.
- Data can be eliminated and rewritten again.
- Biggest capacity (Terabyte).



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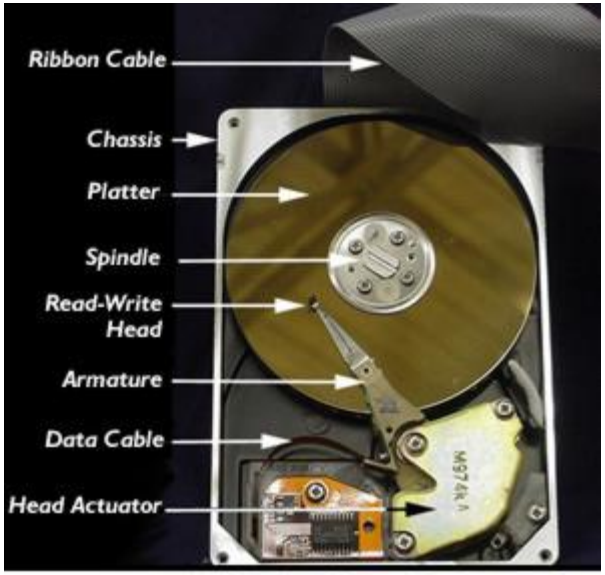
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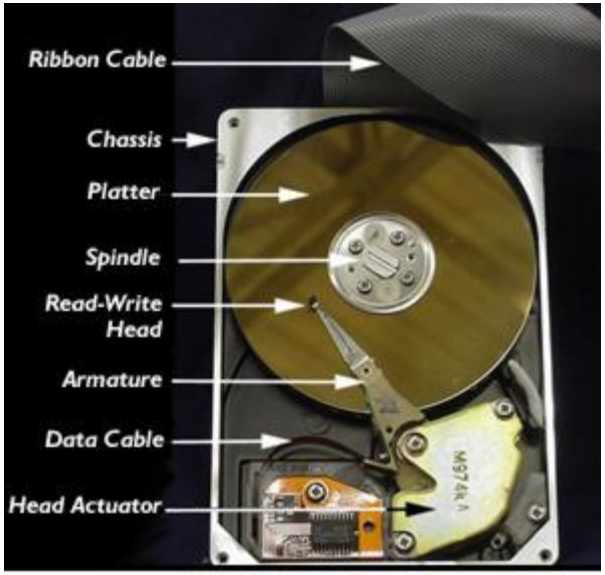
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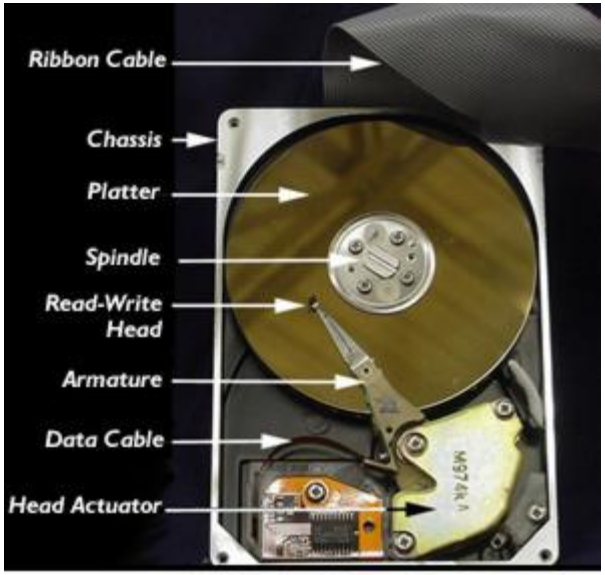
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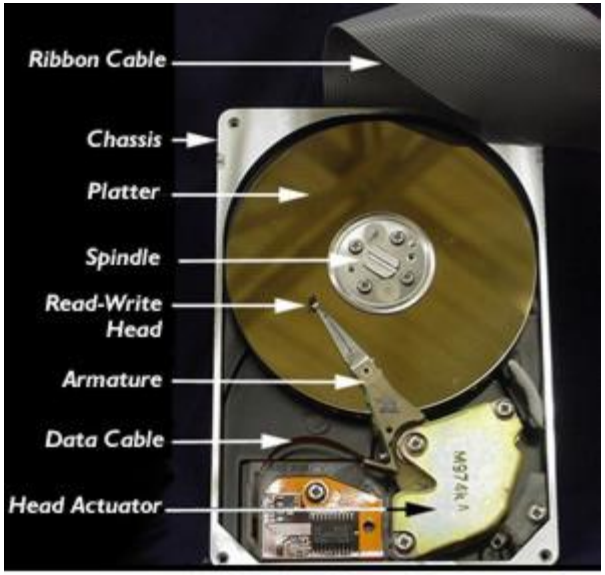
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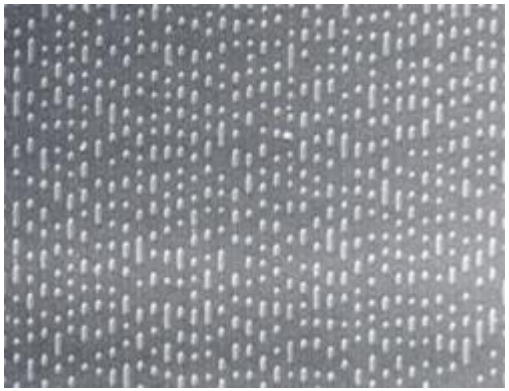
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Secondary Storage Devices

Optical Storage Technology

- Data are saved as patterns of dots that can be read using light. A laser beam is the usual light source.



This is a magnified view of the dots on the surface of a CD. The different patterns of dots correspond to the data stored on the disc.

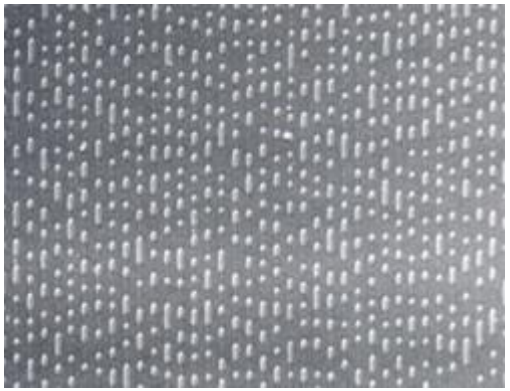
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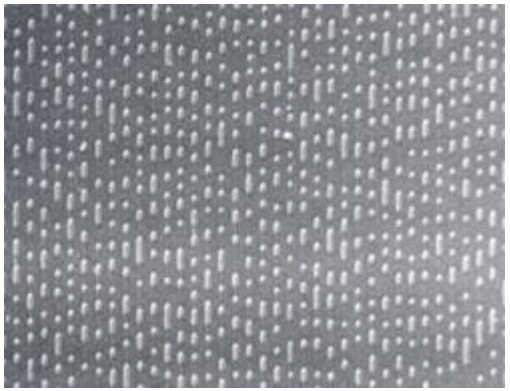
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- Dots can be created using the laser beam (for media that is writable such as CD-Rs). The beam is used in a high-power mode to actually mark the surface of the medium, making a dot. This process is known as 'burning' data onto a disc.



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CD-ROM,R, and RW

- **CD** (Compact Disc) can hold around **800MB** of data, usually used to store softwares, music, ebooks, etc.



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- **DVD** (Digital Versatile Disc) can hold around **4.7GB** of data (a dual-layer DVD can hold twice that), it is used in the same way as CD but, since it can hold more data, it is also used to store high-quality video.



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  - DVD-R (DVD recordable): can store data, but can not delete.
  - DVD-RW (DVD rewritable): can store and delete data repeatedly.
  - DVD-RAM (DVD-Random Access Memory):
    - Re-writable.
    - Comes in a floppy-disc style case (to protect the disc).
    - Usually used in video recording cameras
    - More reliable than normal DVD-RWs



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Secondary Storage Devices

Blu-ray

- A recent replacement for DVDs.



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- Used to store very high-quality, high-definition (HD) video.



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Secondary Storage Devices
HD DVD

- HD-DVD (High-density DVD) discs can hold around 15GB of data (a dual-layer HD-DVD can hold twice that).



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- HD-DVD discs are used in the same way as DVD-ROMs (see above) but, since they can hold more data, they are also used to store very high-quality, high-definition (HD) video



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- The HD-DVD format was launched at the same time as Blu-Ray. For about a year they competed to be the 'next DVD'. For various reasons, Blu-Ray won the fight, and the HD-DVD format has been abandoned.



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USB Flash Memory

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- A portable electronic storage device.
- Non-volatile, acts like a portable external hard disk.
- Easy to use.
- Less storage capacity compared with hard disk.



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Next Lecture

Introduction to Windows 7

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References

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