Computer and Information Technologies

Subject: 805-182 Computer: the Internet and Society

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Courtesy of: Dr. Jirawat Thaenthong

Update

- PDF slides are posted before class

- Make sure to check the slide again after class

- I might update them during class

- PPT slides will be posted after class

Penalty for Turning in Work Late

- Deduct 25% of the original full score

- This information is updated and shown on the course's website.

Everyone has found a team…

…But one person hasn't completed the survey

- No penalty for the first homework assignment

- Please finish it ASAP

Covid-19 Update

- Phuket airport is open for domestic flights

- Beaches in Phuket are also open

- No nation-wide curfew in Thailand

Outline

COMPUTER
SYSTEMS

TASKS

INFORMATION
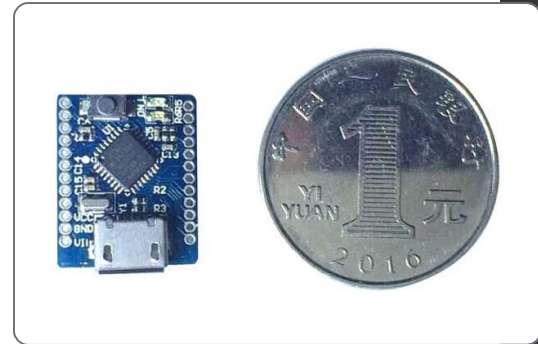TECHNOLOGIES

TASKS

Q & A

What are Computer Systems?

- Technology for making people's lives **more convenient**

- Consisting of hardware and software working together

- Computer system in our daily activities: perform **calculation**, play **games**, watch **movies** from Netflix, drive **cars**, launch **rockets**, provide mobile communication, etc.

How do computers look?

What about these?

Computer Size

- Supercomputers

- Mainframes

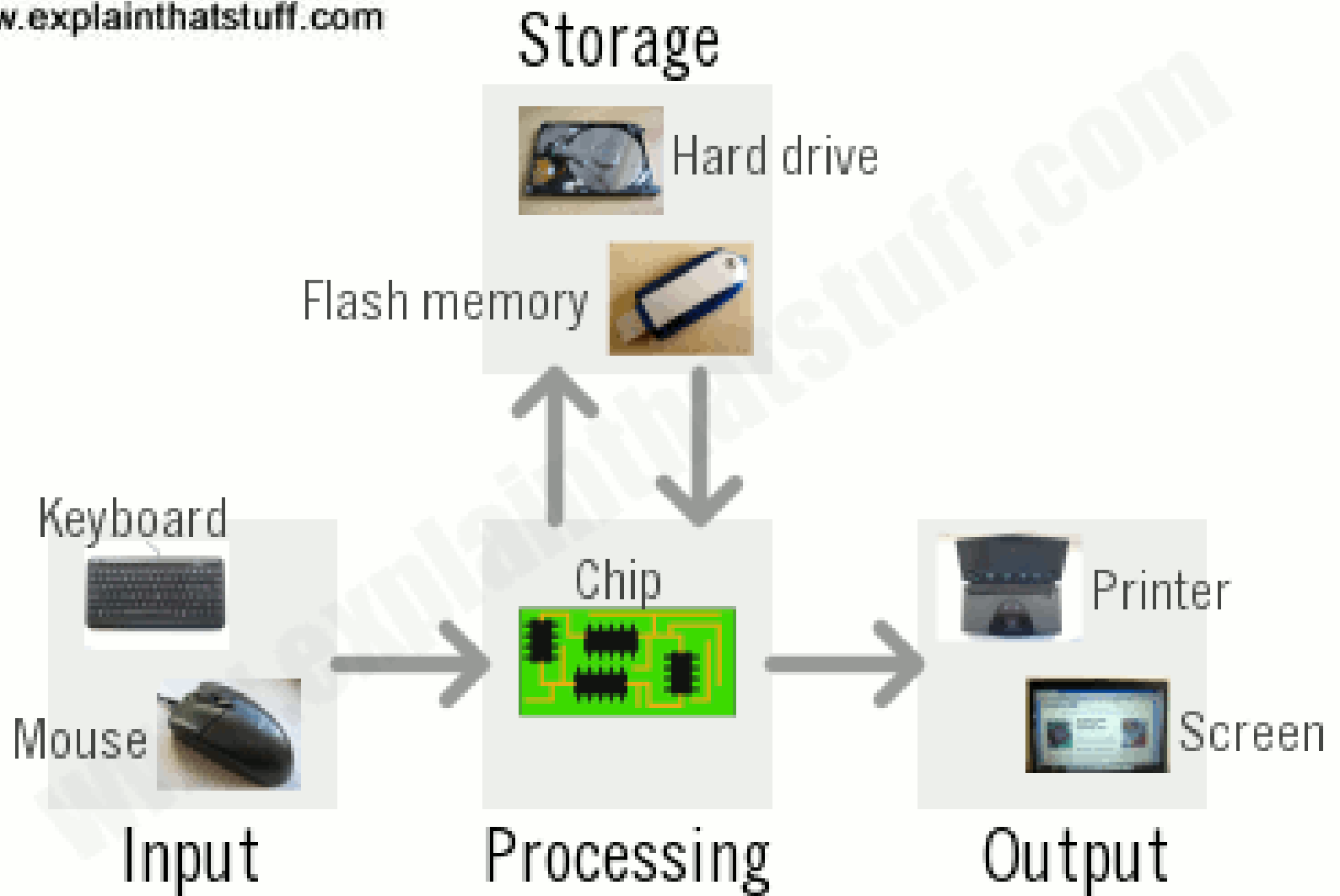- Workstations

- Servers

- Microcontroller

Storage

Hard drive

Flash memory

Keyboard

Chip

Printer

Mouse

Screen

Input

Processing

Output

Computer System Components

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Computer System Components

HARDWARE   SOFTWARE

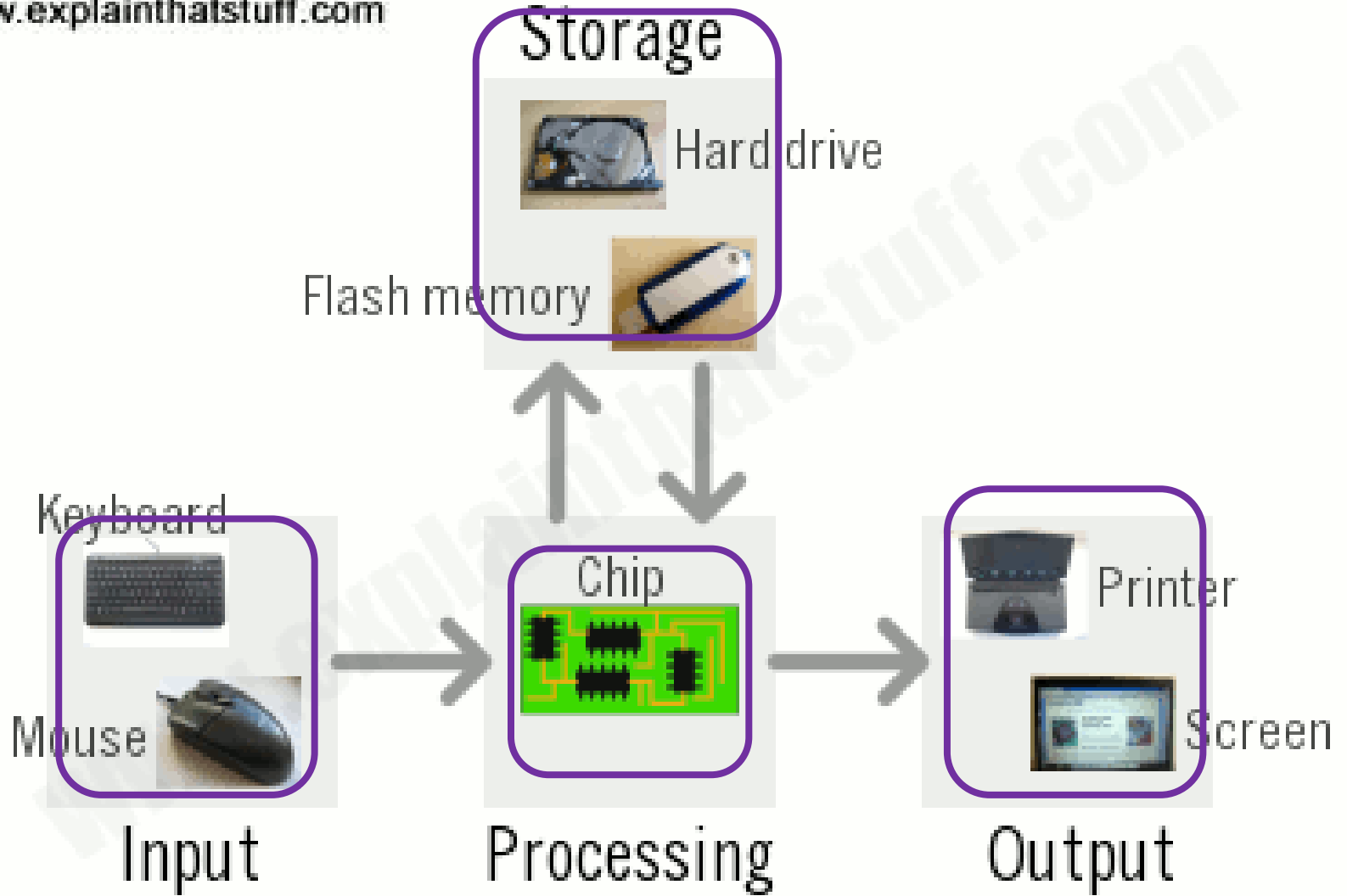Storage

Hard drive

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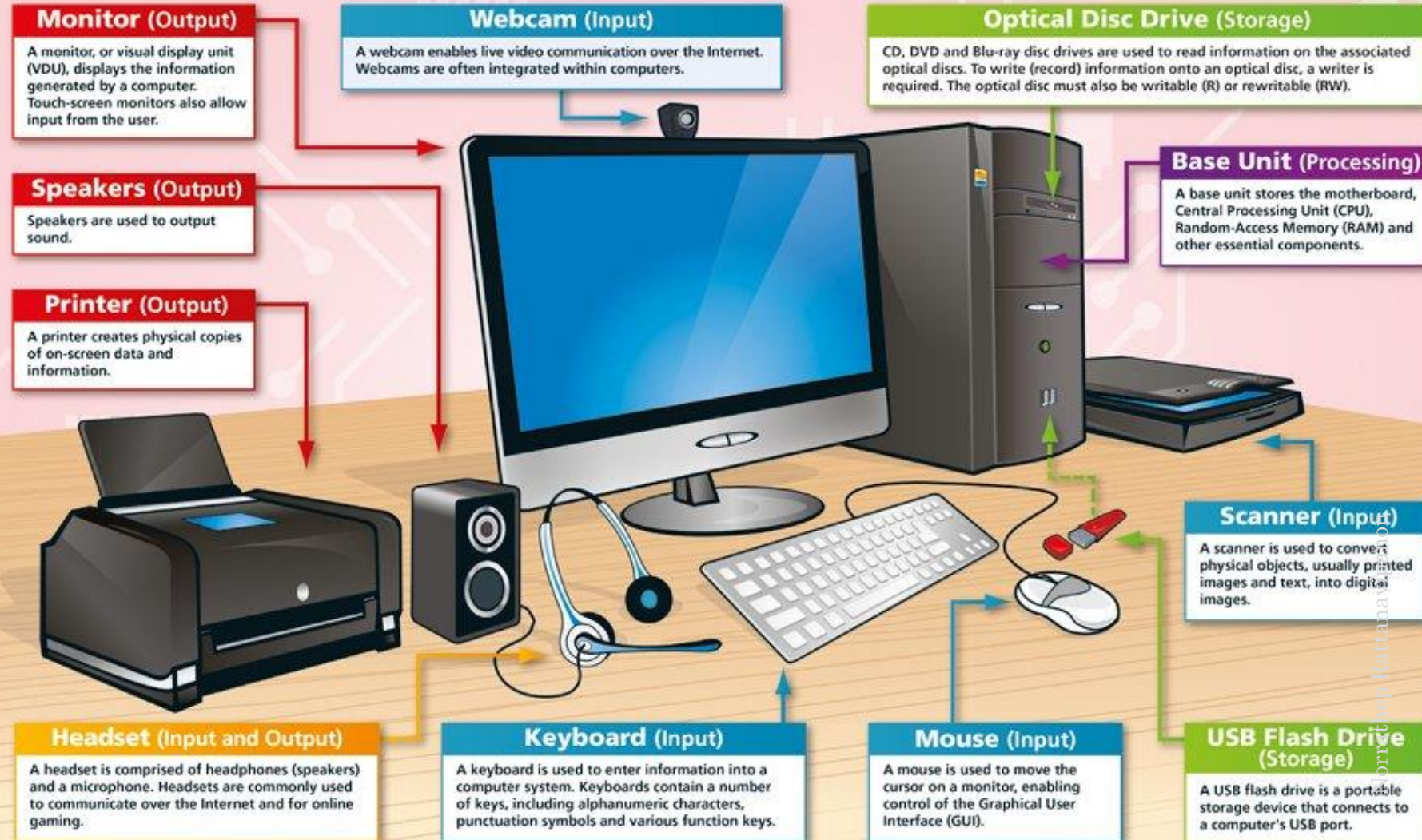
Output

A Computer System

All the different parts of a computer, including the devices you plug into it, are known collectively as 'a computer system'.

Monitor (Output)

A monitor, or visual display unit (VDU), displays the information generated by a computer. Touch-screen monitors also allow input from the user.

Webcam (Input)

A webcam enables live video communication over the Internet. Webcams are often integrated within computers.

Optical Disc Drive (Storage)

CD, DVD and Blu-ray disc drives are used to read information on the associated optical discs. To write (record) information onto an optical disc, a writer is required. The optical disc must also be writable (R) or rewritable (RW).

Speakers (Output)

Speakers are used to output sound.

Base Unit (Processing)

A base unit stores the motherboard, Central Processing Unit (CPU), Random-Access Memory (RAM) and other essential components.

Printer (Output)

A printer creates physical copies of on-screen data and information.

Scanner (Input)

A scanner is used to convert physical objects, usually printed images and text, into digital images.

Headset (Input and Output)

A headset is comprised of headphones (speakers) and a microphone. Headsets are commonly used to communicate over the Internet and for online gaming.

Keyboard (Input)

A keyboard is used to enter information into a computer system. Keyboards contain a number of keys, including alphanumeric characters, punctuation symbols and various function keys.

Mouse (Input)

A mouse is used to move the cursor on a monitor, enabling control of the Graphical User Interface (GUI).

USB Flash Drive (Storage)

A USB flash drive is a portable storage device that connects to a computer's USB port.

Hardware: Central Processing Unit (CPU)

- Perform computation based on a command (a series of instructions)

- Instructions: add/mult, comp, read/write, etc.

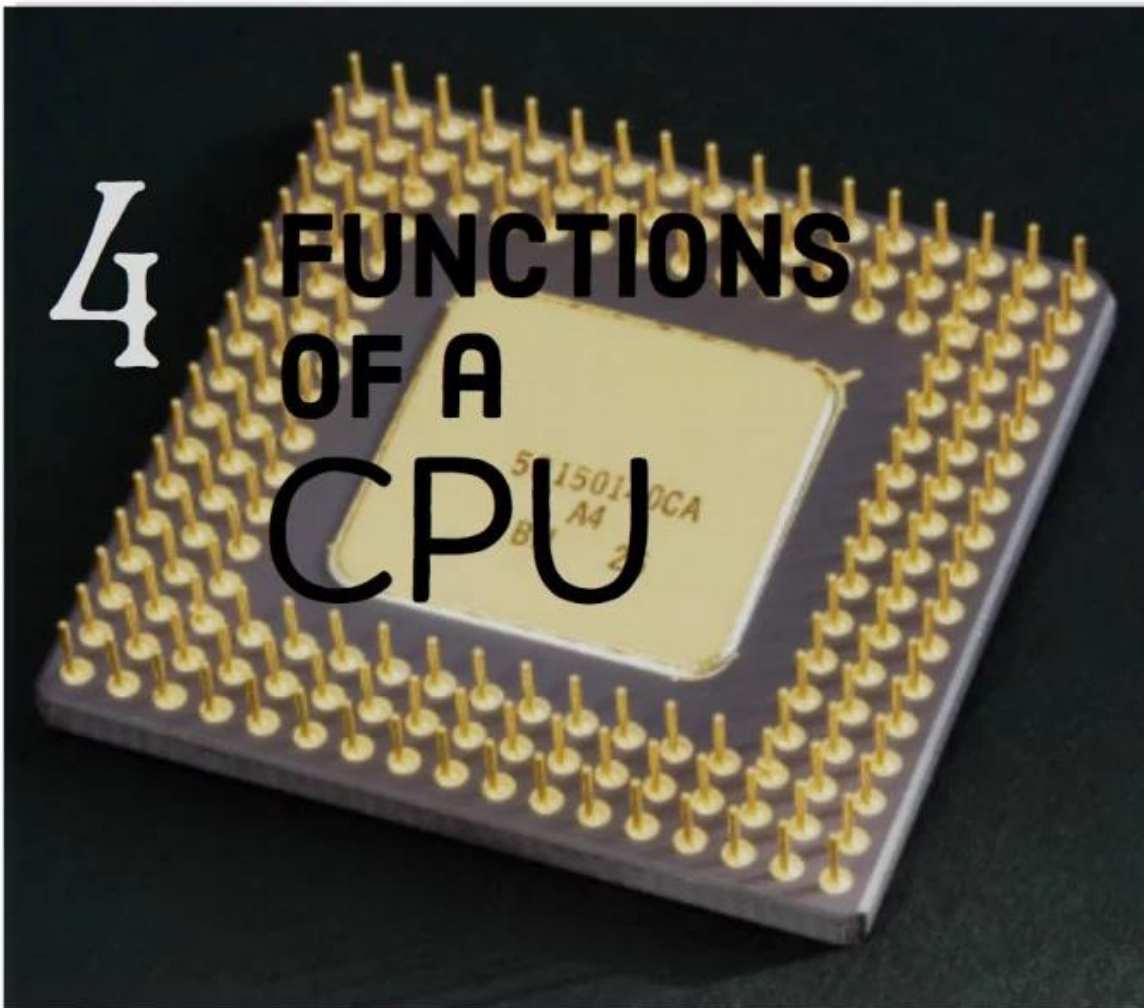- Cooperate with memory and storage and input/output unit.

Example

Command: Opening Firefox browser

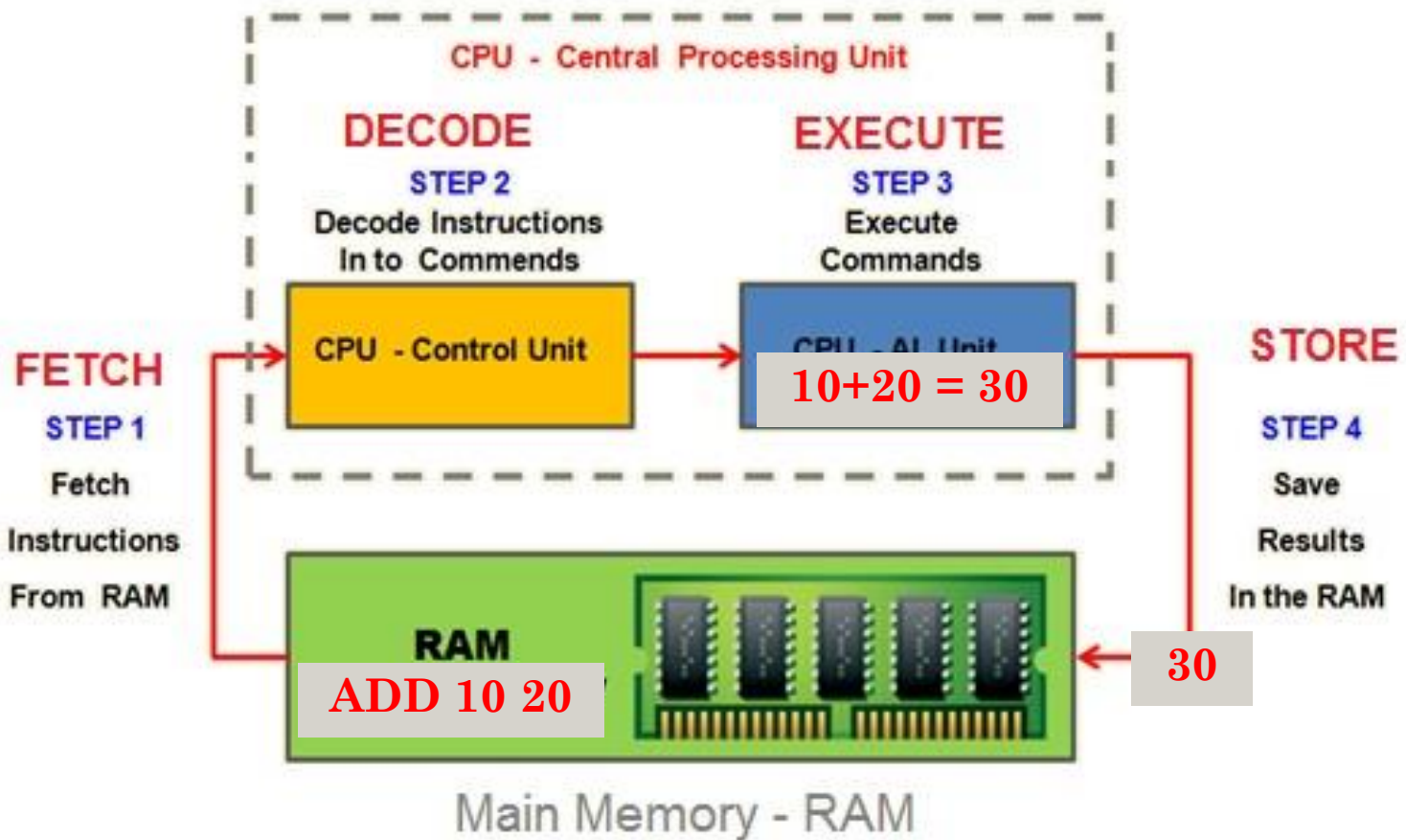- Consist of millions of instructions (e.g., add/mult/read)

4 Steps of CPU Process

FETCH instructions from memory

DECODE into binary instructions
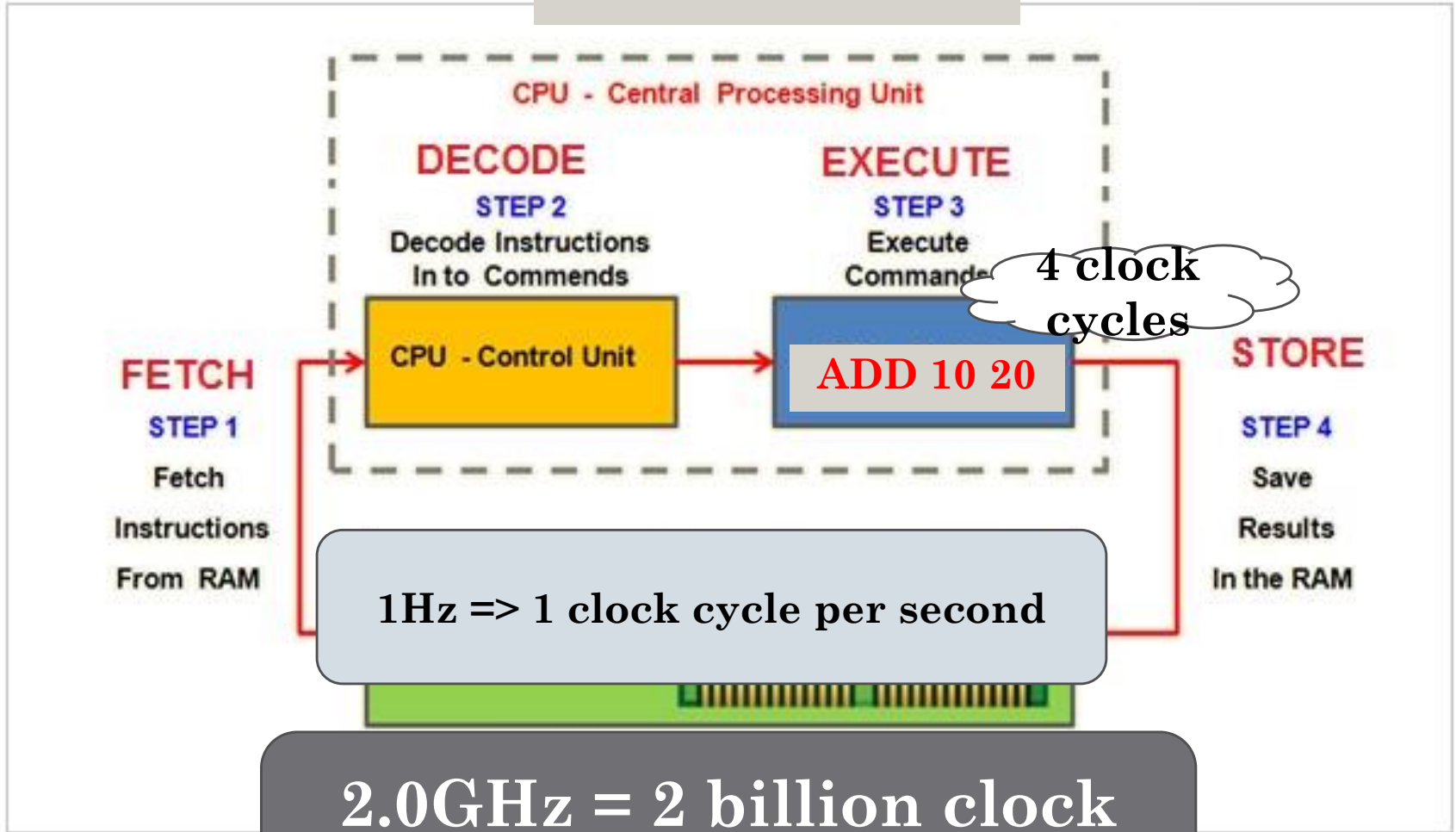
EXECUTE action and move to next step

STORE write output to memory

Central Processing Unit - Machine / Instruction Cycle

CPU - Central Processing Unit

DECODE
STEP 2
Decode Instructions
In to Commends

EXECUTE
STEP 3
Execute
Commands

CPU - Control Unit

CPU - AL Unit

10+20 = 30

FETCH
STEP 1
Fetch
Instructions
From RAM

STORE
STEP 4
Save
Results
In the RAM

RAM

ADD 10 20

30

Main Memory - RAM

www.learncomputerscienceonline.com

Central Processing Instruction Cycle

2.0GHz CPU

CPU - Central Processing Unit

DECODE
STEP 2
Decode Instructions
In to Commends

EXECUTE
STEP 3
Execute
Commands

4 clock cycles

CPU - Control Unit

ADD 10 20

FETCH
STEP 1
Fetch
Instructions
From RAM

STORE
STEP 4
Save
Results
In the RAM

1Hz => 1 clock cycle per second

2.0GHz = 2 billion clock cycles per second

Central Processing Unit - Machine / Instruction Cycle

Multi-core?

CPU - Central Processing Unit

DECODE
STEP 2
Decode Instructions
In to Commends

EXECUTE
STEP 3
Execute
Commands

FETCH
STEP 1
Fetch
Instructions
From RAM

CPU - Control Unit

CPU - AL Unit

STORE
STEP 4
Save
Results
In the RAM

RAM
Random Access Memory
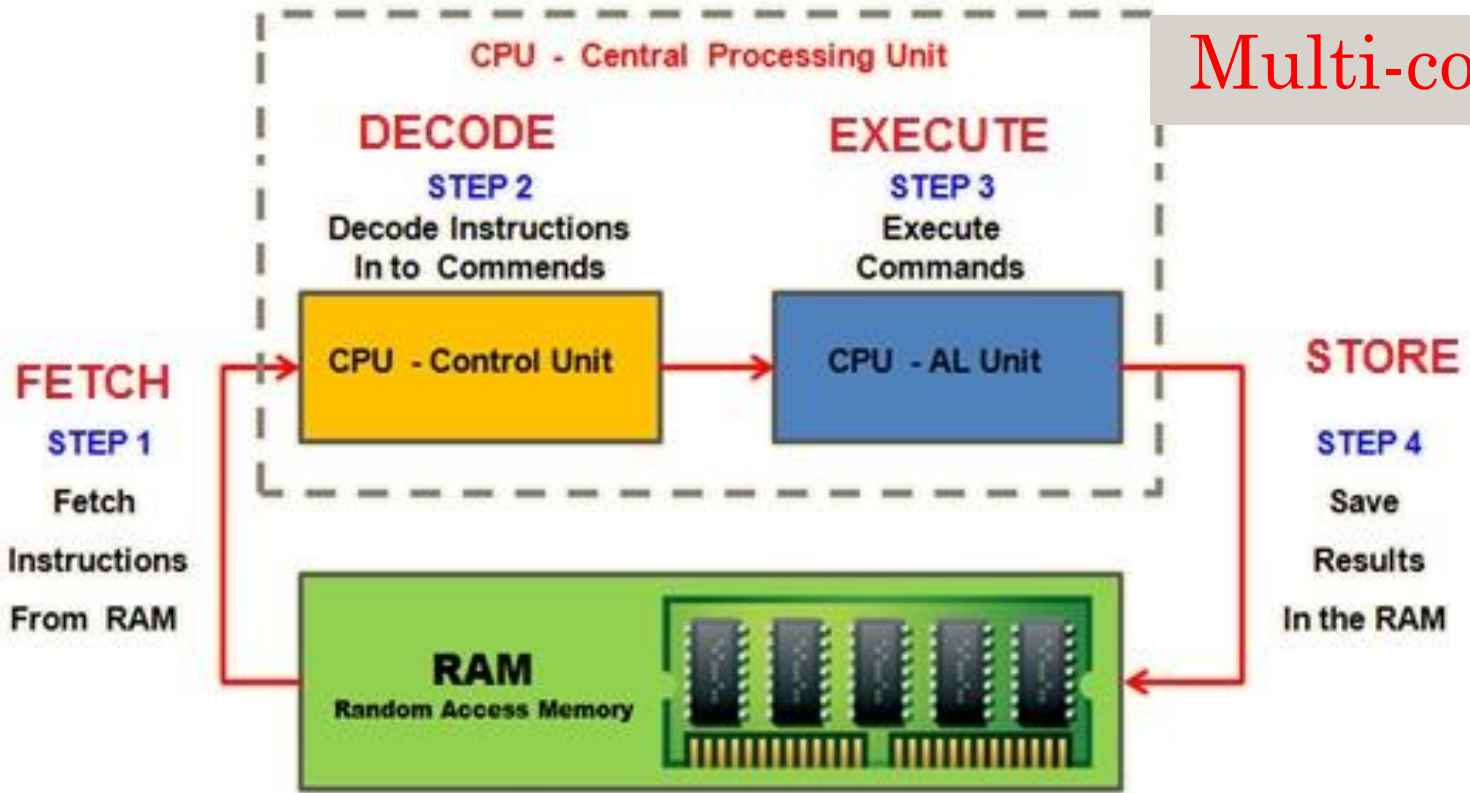
Main Memory - RAM

www.learncomputerscienceonline.com

Hardware: Memory (RAM)

- Store data, command of CPU, and set of codes while the computer is running

- Volatile: erased upon reset

- DRAM, SRAM
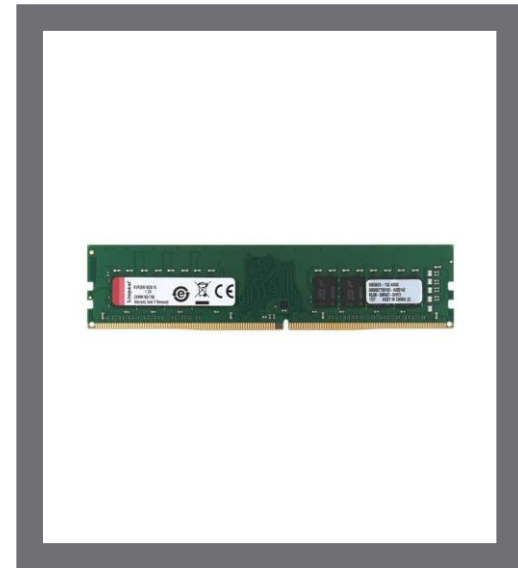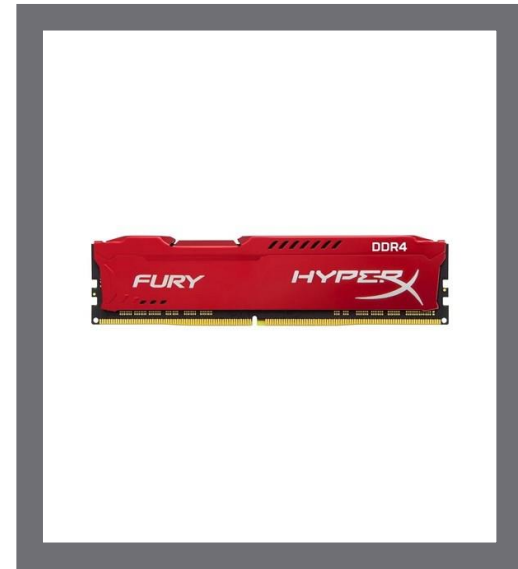
Hardware: Storage Units

Non-volatile memory

- Hard disk drive

- Solid State Drive (SSD)

- External Hard drive

- Flash Drive

Internal vs External Storage
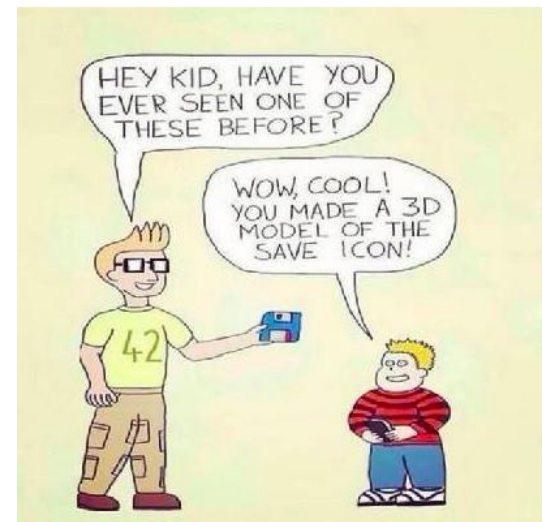
RAM vs Storage Units

RAM

- Volatile

- Faster access time

- More expensive (32GB)

- Low-capacity RAM: programs will be running slowly

Storage Units

- Non-Volatile

- 4x Slower access time

- Much cheaper (1000GB)

- Low-speed storage units: it will be slow to start programs

Hardware: Input/Output Units (I/O Units)

- Input Units
  - Can "input" data (or command) to computer

- Output Units
  - Can receive "output" data from computer

- Both Input and Output Units
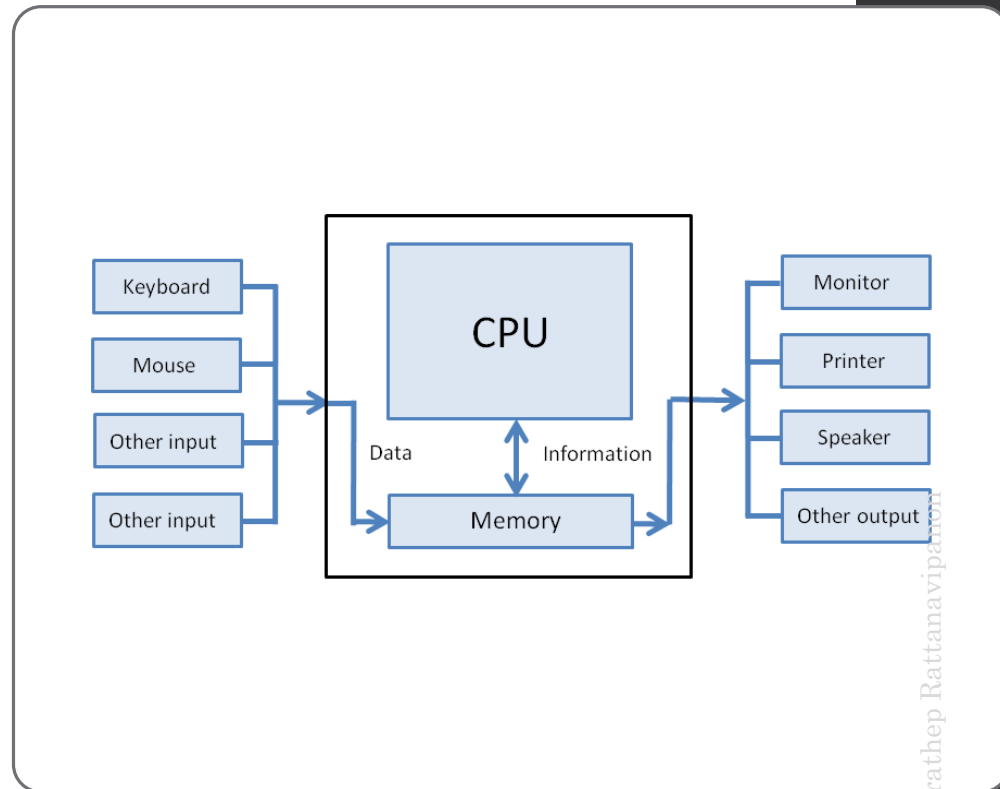
Special Hardware: GPU

- Similar to CPU

- Lower speed than CPU but…

- **700-4000** cores vs 8 cores in CPU

- Specific purpose: performing many complex math calculations at the same time
  - Mainly for rendering graphics
  - Other use-cases: training machine learning model, bitcoin mining

- Has its own memory (RAM)
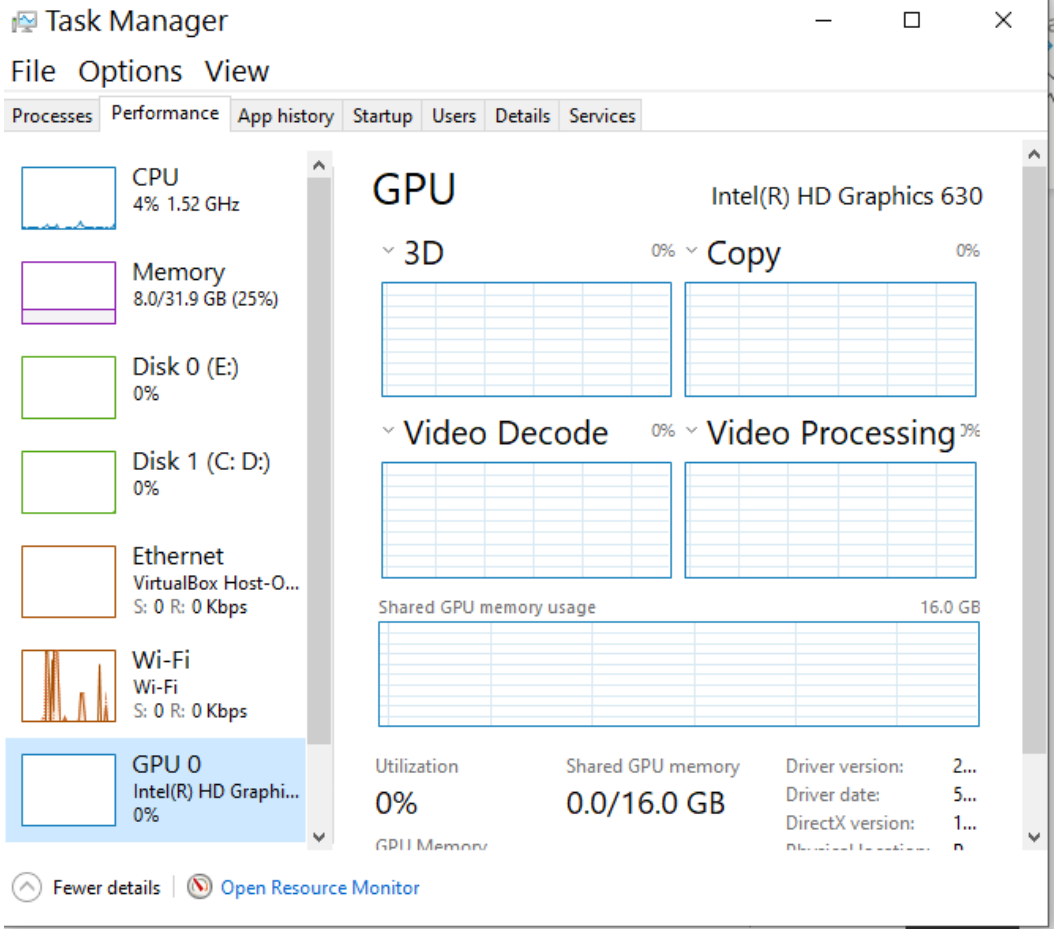
How to check current hardware utilization?

Recap:

- Computer Systems: hardware and software

- Consist of 4 components

- Processing Unit: CPU
  - Perform computations
  - Interface with other components
  - CPU speed, multi-core

- Memory: RAM
  - Volatile memory
  - What happens if RAM has low-capacity (e.g., <1GB)?

- Storage Units
  - Non-volatile memory
  - What happens if Storage Units have low-speed (slow)?

- Input/Output Units (Devices)
  - Receive data from physical world
  - Output data to physical world

- (Optional Component) Graphic Processing Unit (GPU)

Activity: Kahoot Time!

www.kahoot.it

Q11: Kahoot

How many ADD instructions can 2.1GHz CPU execute in one second? (Assume executing one ADD instruction takes 4 clock cycles)

Answer:

1GHz = 1000 million Hz

1Hz = CPU can execute 1 clock cycle per second

2.1GHz = CPU can execute 2100 million clock cycles per second

Executing one ADD instruction takes 4 clock cycles

So, 2.1GHz CPU can execute 2100/4 = 525 millions ADD instructions per second

Software

- System Software

- Application Software

Key Differences

System Software

- Necessary for computer to work

- Operate hardware

- Run in background

- Run independently

Application Software

- Can be uninstalled without causing computer to fail

- Used by users to perform task

- Direct interaction with users

- Depend on system software

System Software

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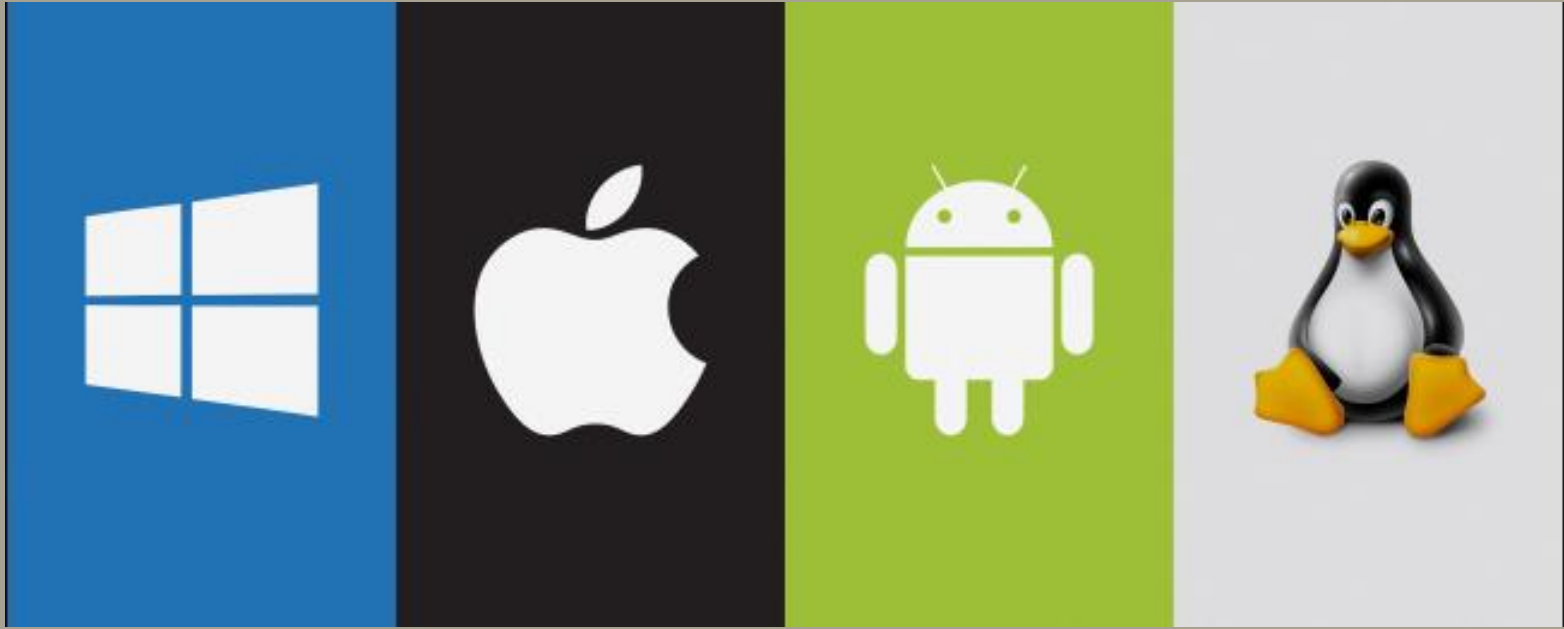
Windows 10

Device Requirement Specification

- Processor: **1 gigahertz (GHz)** or faster processor.
- RAM: 1 gigabyte (GB) for 32-bit or 2 GB for 64-bit.
- Hard disk space: 16 GB for 32-bit OS 20 GB for 64-bit OS.
- Graphics card: DirectX 9 or later with WDDM 1.0 driver.
- Display: 1024 x 600 or above.

How to check your PC specification

Team Task (10-minute): Can the following laptop install Windows 10?

Laptop 1 Specification:
    CPU: Intel Core i7 2.4 GHz
    Ram: 8 GB
    Storage: SSD 128 GB
    Display: Full HD 1920 x 1080

Yes/No?   Is it OK in real life?

Laptop 2 Specification:
    CPU: Intel Core i5 2.0 GHz
    Ram: 2 GB
    Storage: Hard disk 1 TB
    Display: Full HD 1920 x 1080

Yes/No?   Is it OK in real life?

Team Task (10-minute): Answer the questions

1. **Find the specification of the cheapest android phone?**

   Answer:
   CPU: 1.3GHz
   RAM: 1GB
   Storage Unit: 8GB
   Display: 800 x 600

2. **Find the specification of the cheapest iPhone?**

   Answer:
   CPU: 1.84GHz dual(2)-core
   RAM: 2GB
   Storage Unit: 16GB
   Display: 640 x 1136

System Software: Utility Software

- Utility software is the program that was developed to support application software.

- Examples: compress file program, anti-virus program.

- Anti-virus software is a utility software (Avast, Norton, Bitdefender, Windows defender, Malwarebytes, etc.)

- **Why do we need anti-virus software for your PC/laptop?**

- **Do we need anti-virus software for MacBook Pro?**

- What is the anti-virus software installed on your computer?
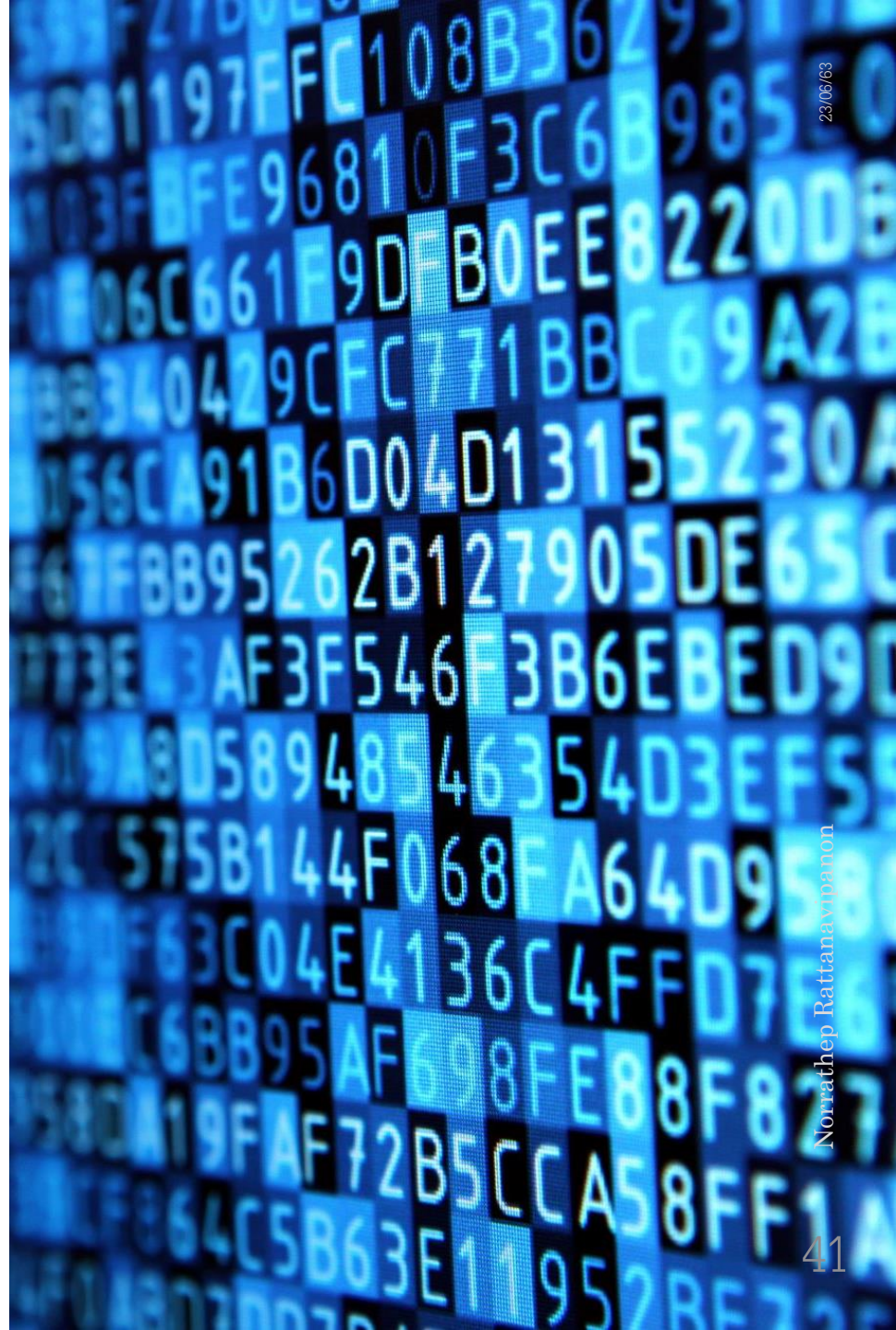
Application Software

- Microsoft Office 365

- Firefox browser

- Google Suite (Google Form, Google Sheet, Google Docs, etc.)

- Anything else?

1. ABC: Photoshop_____
2. Boom: Adobe Acrobat Reader_____
3. Flowers: Twitter_____
4. HopeStar: Teamviewer _____
5. InformationAge: Final Cut Pro X_____
6. ReturnOfTheKing: Steam _____
7. Storm: Zoom_____
8. ZBC: Tantan_____

Information Technologies (IT)

Two Parts of IT

Computer Technology

How information is stored and processed

Communications/Telecommunications Technology

How information is transmitted and received

The technology that accepts data (raw data, raw images) and processes, or manipulates into information we can use, such as summaries, reports.

Computer Technology

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Communications/Telecommunication Technology

Consist of electronic devices and system for communicating over any distance.

- The computer network is needed for the communications technology.

Two Parts of IT

Computer Technology

How information is stored and processed

Communications/Telecommunications Technology

How information is transmitted and received

What can you do with IT?

Education Technology (EdTech)

Online Learning

1). Learning Management System (LMS)
- ❑ https://lms2.psu.ac.th
- ❑ Google Classroom

2). Massive Open Online Course (MOOC),
https://en.wikipedia.org/wiki/Massive_open_online_course
- ❑ It is an online course aimed at unlimited participation and open access via the web

Initiatives	Nonprofit	Free to access	Certification fee	Institutional credits
edX	Yes	Partial	Yes	Partial
Coursera	No	Partial	Yes	Partial
Udacity	No	Partial	Yes	Partial
Udemy	No	Partial	Yes	Partial
P2PU	Yes	Yes	No	No

MOOC Providers

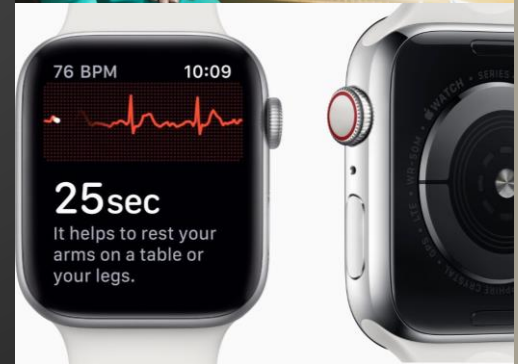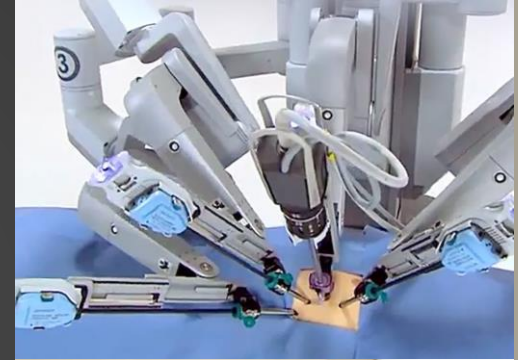# What are the popular communication software for education?

- Email

- Line/WeChat

- Facebook

- Skype/Zoom

- etc

Healthcare

- Telemedicine

- Robot medicine
  - Robot surgeons

- Mobile Health Tech
  - Apple watch/Smart watch

- etc.

Money & Business

- Online shopping
  - LAZADA
  - SHOPEE
  - ALIEXPRESS
  - EBAY

Online Payment
  - PromptPay
  - WeChat/Alipay
  - etc.

Anything else?

1. Taobao.com_____

2. Meituan _____

3. Amazon _____

4. Grab

5. JD

6. Unionpay

Jobs & Careers

Can you list some websites/applications or technologies related to finding jobs?

1. _www.jobtopgun.com _____

2. _Indeed.com_____

3. _Linkedln.com_____

4. _58.com_____

5. _CareerBuilder_____

6. _Beyond.com_____

Social Networking

Meaning:

- Social Networking is an online platform which people use to build social networks or social relationship with other people who share similar personal or career interests, activities, backgrounds or real-life connections.

  - Wikipedia, [Online]. Available:
    https://en.wikipedia.org/wiki/Social_networking_service

- Facebook

- Instagram

- WeChat

- Pinterest

- etc.

Do you know Cybersecurity?

Cybersecurity is the practice of protecting systems, networks, and programs from digital attacks.

Activity: Kahoot!

www.kahoot.it

Q/A

Homework (5-10 Mins Presentation)

Pick an operating system:

- HarmonyOS/Hongmeng OS

- Ubuntu

- Microsoft Windows

- MacOS

- Android

- FreeBSD

- Raspberry Pi OS

- Fedora

Research and present using PowerPoint:

1. Who made this OS? When was it made? (25%) [If your team has 4 members, you can skip this question]
2. What kind of devices (e.g., mobile phones, laptops, embedded devices, servers) can use this OS? (25%)
3. What are the highlight features? (25%)
4. What is the competitive OS? Why? Give some explanation. (25%)

Team Selection:

- ReturnOfTheKing -> macOS

- InformationAge -> macOS Big Sur focusing on what is new and different from previous macOS

- Storm -> Windows

- HopeStar -> Android

- ABC -> FreeBSD

- Boom -> Raspberry PI OS

- Flowers -> HarmonyOS/HongmengOS

- ZBC -> Fedora