



Operating Systems and Applications

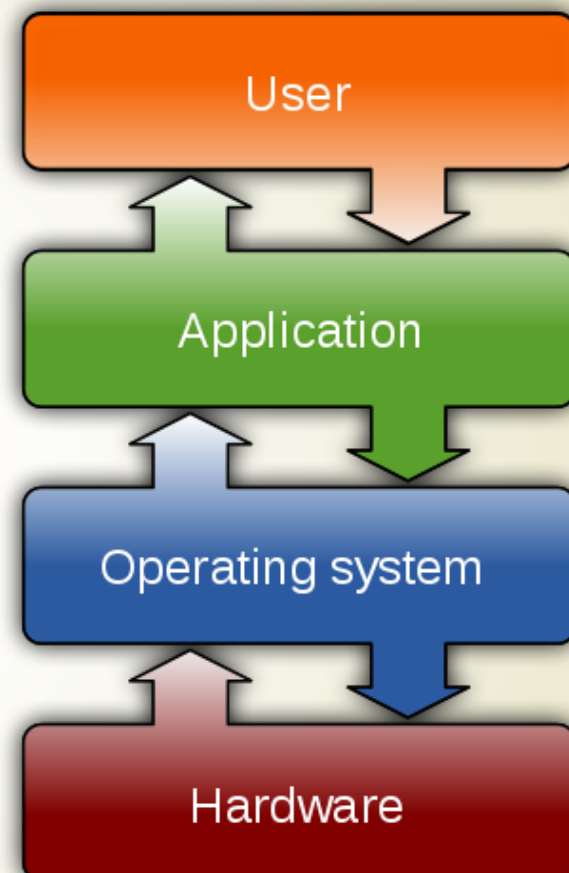
Subject: 805-182 Computer: the Internet and Society

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Courtesy to: Dr. Jirawat Thaenthong

What is an operating system?

- ▶ An **operating system (OS)** is system software that manages computer hardware and software resources and provides common services for computer programs.
 - ▶ Wikipedia, [Online]. Available: https://en.wikipedia.org/wiki/Operating_system



Common Features



Process
Management



Interrupt



Memory
Management



File System



Device Drivers



Networking



Security

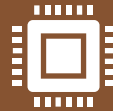


I/O

Process Management



Process \approx part of Program



OS allocates resources (e.g., memory, control input/output data) for each process



Multiple programs can run at the same time. This is managed by **OS**.



For example, open Microsoft Word to make a report while using Firefox to surf the Internet.



Task: 10 Minutes

Explain the steps how to list all programs running in the memory on your PC/laptop/smartphone.

Steps:

1. _____
2. _____
3. _____
4. _____
5. _____



Interrupt



- ▶ An **interrupt** is a signal to the processor emitted by hardware or software indicating an event that needs immediate attention
- ▶ For example:
 - ▶ pressing a key on the keyboard
 - ▶ moving the mouse
 - ▶ These triggers hardware interrupts that cause the processor to read the keystroke or mouse position.



Press Ctrl + Alt + Delete

- ▶ This command shortcut is an example of an interrupt?
- ▶ What happens?

Lock

Switch user

Sign out

Change a password

Task Manager

Cancel





Memory Management

Allocate memory
for program


Clear memory

Reuse memory
when no longer
needed.

High speed
memory is good for
CPU to process and
run program

Large memory is
good for multiple
programs running
at the same times.

Graphic
application
program requires
more memory
space.



Task (5-minute)

What is the difference between memory (RAM) and Storage Units?



File System



File system controls how data is stored and retrieved.



Without a file system, information placed in a storage medium would be one large body of data.



It has no way how to tell where the information starts and stops on the storage.



Let's think about without file system you cannot find files that you created and you cannot use program to view/edit file.

File System Analogy



Task: 10 Minutes

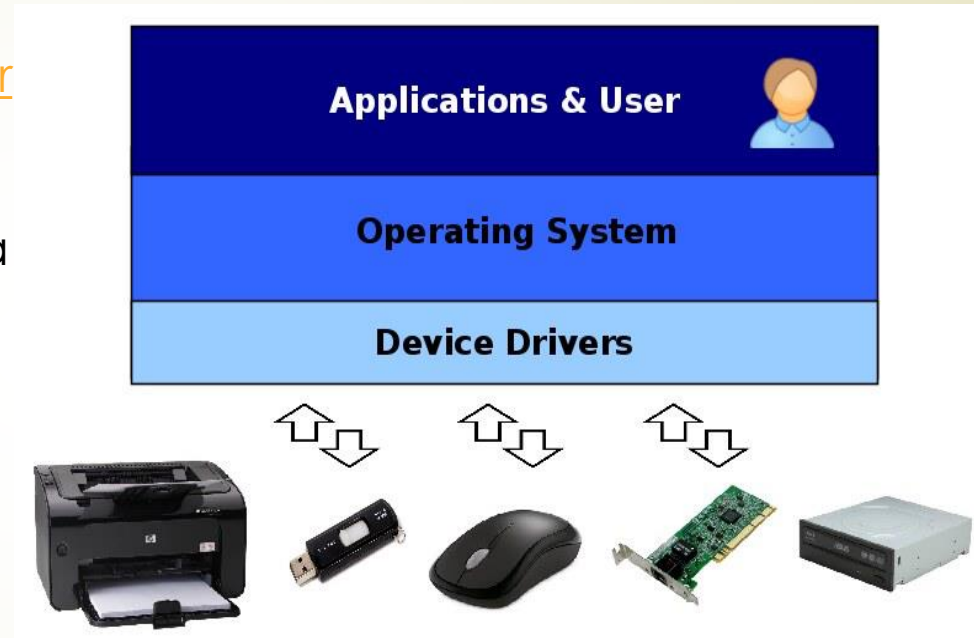
- Give the name of the file system.

Operating System	File system
<u>HarmonyOS/Hongmeng OS</u>	EROFS
Ubuntu	NTFS, ext3, ext4, and others
Microsoft Windows	
MacOS	
Android	

- What is the file system on a flash drive?

Device Drivers

- ▶ Device drivers is a computer program that operates or controls a particular type of device that is attached to a computer.



Have you ever installed printer driver?




Networking

- Networking is a module that support to share resources and provide data exchange with the other computers using connections between devices.

Networking Interfaces:

- WiFi
- Bluetooth
- Ethernet
- NFC
- Etc.

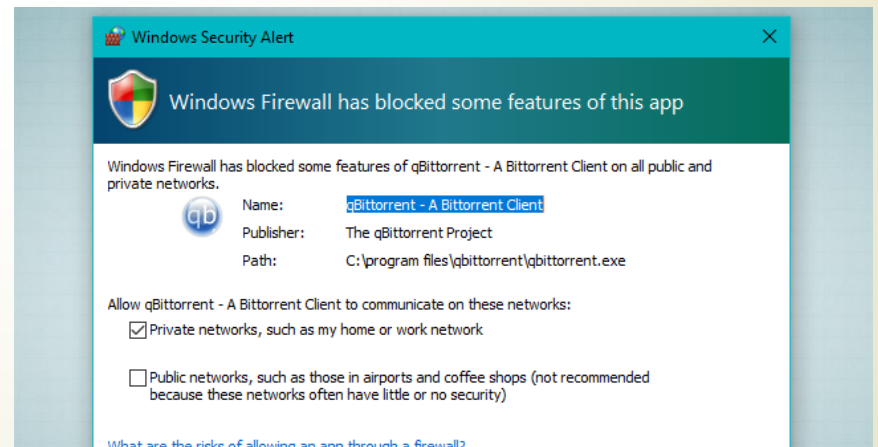
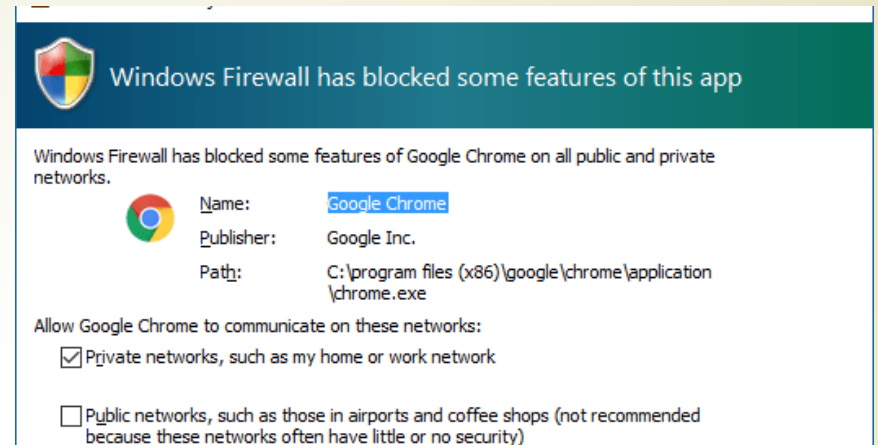


Task: Find
a solution
(5 Mins)

How can we check
whether your computer is
connected to the
Internet?

Security

- All OS support personal firewall to controls network traffic to and from a computer.
- With a good policy, you can use a firewall to prevent attacks.





I/O




Operating System controls input/output devices. It uses drivers to connect, read/write data from/to device.



I/O devices are the pieces of used by a human (or other systems) to communicate with a computer

The operating
system hang



Task: Find
Solutions
(15 mins)

You want to run
several operating
systems on the
same PC/laptop


- ▶ Windows Server
- ▶ Ubuntu Server
- ▶ FreeBSD Server
- ▶ Debian Server
- ▶ CentOS
- ▶ RedHat
- ▶ Etc.

Network Operating Systems





Group Presentation

- ▶ Check attendance for all team members before the presentation
 - ▶ Say who you are (your name is ok) before speaking
- 



Group Presentation



- 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



Reminder

- ▶ Proposal is due on July 10th, the end of the day
 - ▶ At most one page, containing: the topic name, your plan/timeline for finishing this project
 - ▶ **One** person per team submits the proposal
 - ▶ Submission via PSU LMS under “Final Project” / “Proposal”
-
- ▶ **No class on July, 7**



Update: Course Evaluation

Before

- ▶ Midterm **25%**
- ▶ Final **20%**
- ▶ Attendances 10%
- ▶ Homework 20%
- ▶ Final Project 25%

After

- ▶ Midterm **20%**
- ▶ Final **15%**
- ▶ Attendances 10%
- ▶ Homework 20%
- ▶ Final Project 25%
- ▶ **Quiz 10%**



Quiz




- ▶ 2 quizzes for the entire course
- ▶ 1 quiz before the midterm (5%)
- ▶ 1 quiz before the final (5%)

- ▶ Take-home quiz using PSU LMS
- ▶ I have added all students to PSU LMS
- ▶ **Let me know ASAP if you cannot access PSU LMS**

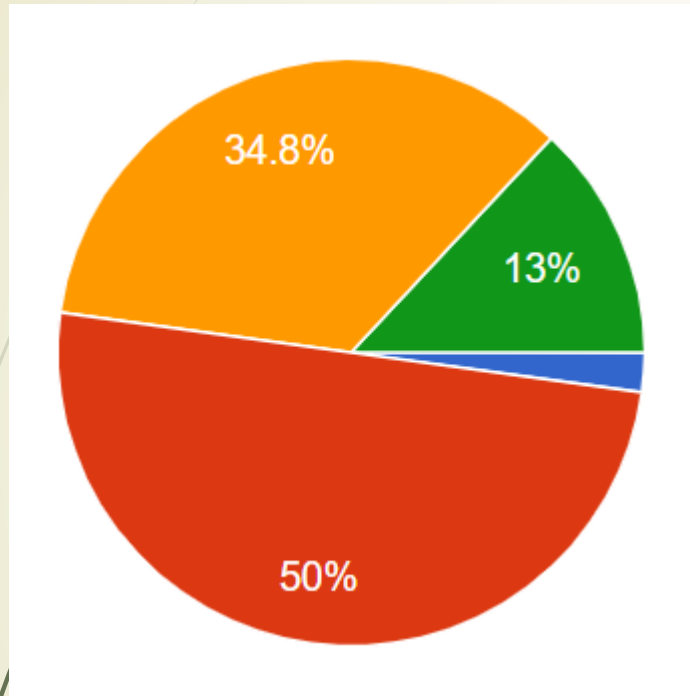


Survey Results

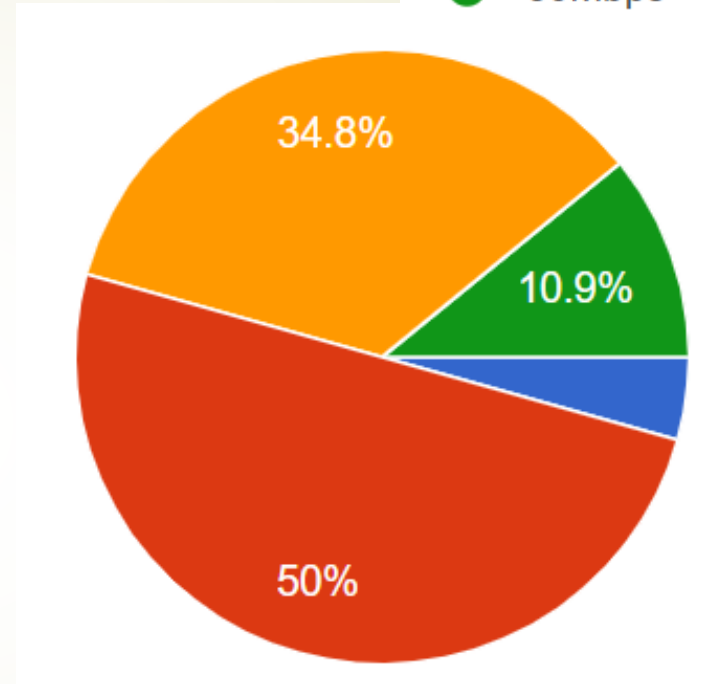
- ▶ Only 21 out of 47 students have laptops/computers.
 - ▶ Question: Do we need computers in this course?
 - ▶ Not required but might be good to have when taking an exam/quiz
- 

Internet Speed

- <1Mbps
- 1-10Mbps
- 10-50Mbps
- >50Mbps



Download

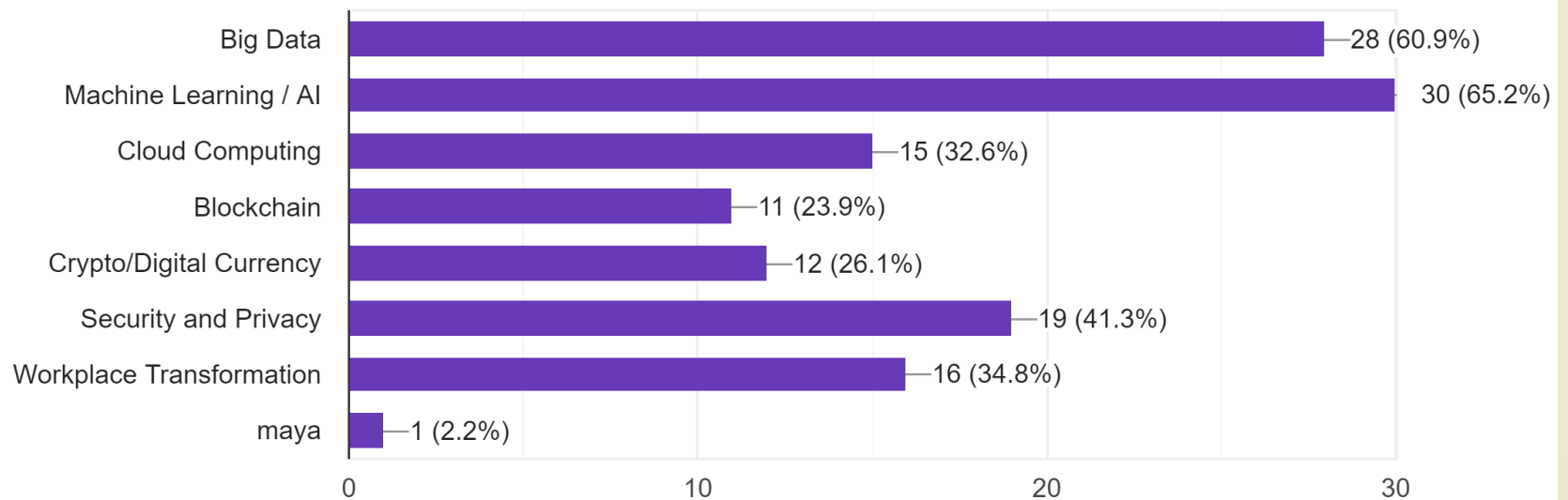


Upload

Feel free to interrupt me if you experience internet/connection issues.


Which topics of information technology would you like to learn from this course?

46 responses



Software Applications





Type of Software (Based on how it can be obtained)

Custom Software

- The software is designed and written specifically for a company.

Proprietary/Commercial Software

- Software is protected by copyright.
- We pay to get software license.

Public-Domain Software

- Has no legal or copyright.

Pirated Software

- It is software obtained illegally, such as downloaded from the Internet (underground website)

Type of Software License



Site license

Allows the software to be used on all computers at a specific location



Concurrent-use license

Allows a certain number of copies of the software to be used at the same time.



Multiple-user license

Specifies the number of people who may use the software.



Single-user license

Best value: up to 6 people on PC or
Mac

Microsoft 365 Family

(formerly Office 365 Home)

\$99.99
/ year

Up to 6 people

Microsoft 365 Personal

(formerly Office 365 Personal)

\$69.99
/ year

1 person

<https://www.microsoft.com/en-us/microsoft-365/compare-all-microsoft-365-products>

Q/A

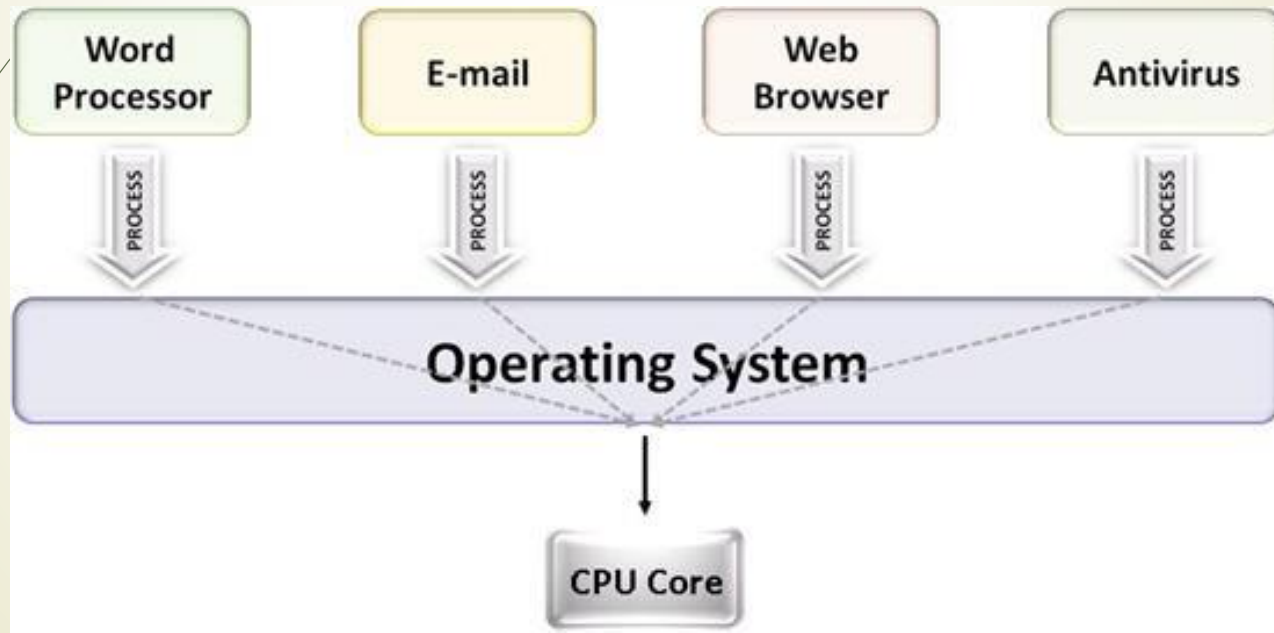


Advanced Topic

Scheduling

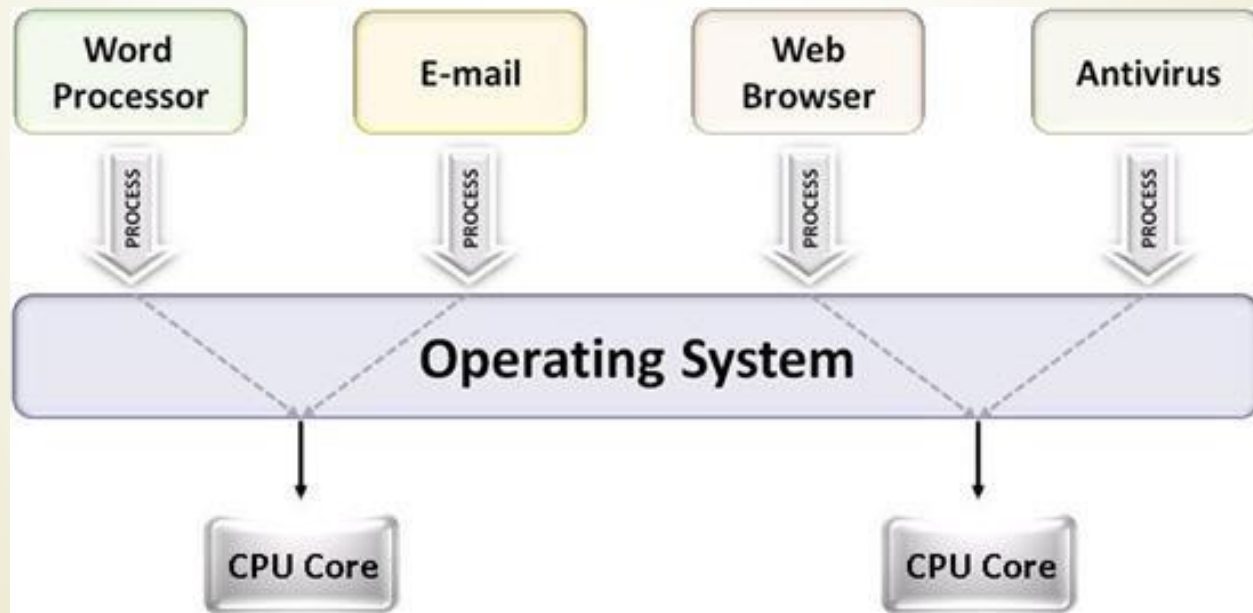
Multi-task: Single-Core

- OS chooses which task (program) to run at a given time and when another waiting task gets a turn.



Multi-task: Multicore

- ▶ Number of programs being executed at a single time = number of cores
- ▶ OS chooses which task to run





How to choose which program to run?

It is called a “scheduling problem”. Use policies to solve this problem.

Policies:

- ▶ First come, first served
- ▶ Priority based
- ▶ Round-robin
- ▶ Etc.

[https://en.wikipedia.org/wiki/Scheduling_\(computing\)](https://en.wikipedia.org/wiki/Scheduling_(computing))



Example

You click 3 programs in the following order: Firefox, Spotify, and VPN client.

Assuming VPN client has the **highest** priority, Firefox has **medium** priority and Spotify has the *lowest* priority.

Which program will show up first?

- ▶ First come, first served policy: Firefox will start first; Spotify will be second and VPN client will be last.
- ▶ Priority-based: VPN client -> Firefox -> Spotify

Scheduling in Windows

- Priority-based
- Lets say you want to improve Chrome's performance, how would you change its priority?

