Operating Systems

Introduction

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(based on slides of Le Thanh Van)

2020-2021/Semester 2

Outline

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Which ones are OS?

- Microsoft Office
- Microsoft Windows
- Google Mail
- Google Drive
- iCloud
- Firmware on home wifi routers
- UNIX
- Dropbox
- Android
- iOS
- Amazon Web Services
- tinyOS
- Mac OSX
- Cisco Internetwork Operating System

Which ones are OS?

- Microsoft Office
- Microsoft Windows
- Dropbox
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Which ones can be considered as an operating system (in non-IT context) ?

- A traffic policeman?
- A government?

- routers
- UNIX
- Cisco Internetwork Operating System

Which ones are OS?

- Microsoft Office
- Microsoft Windows
- Dropbox
- Android

Which ones can be considered as an operating system (in non-IT context) ?

- A traffic policeman? (only a security function)
- A government? (full of functions)

- routers
- UNIX
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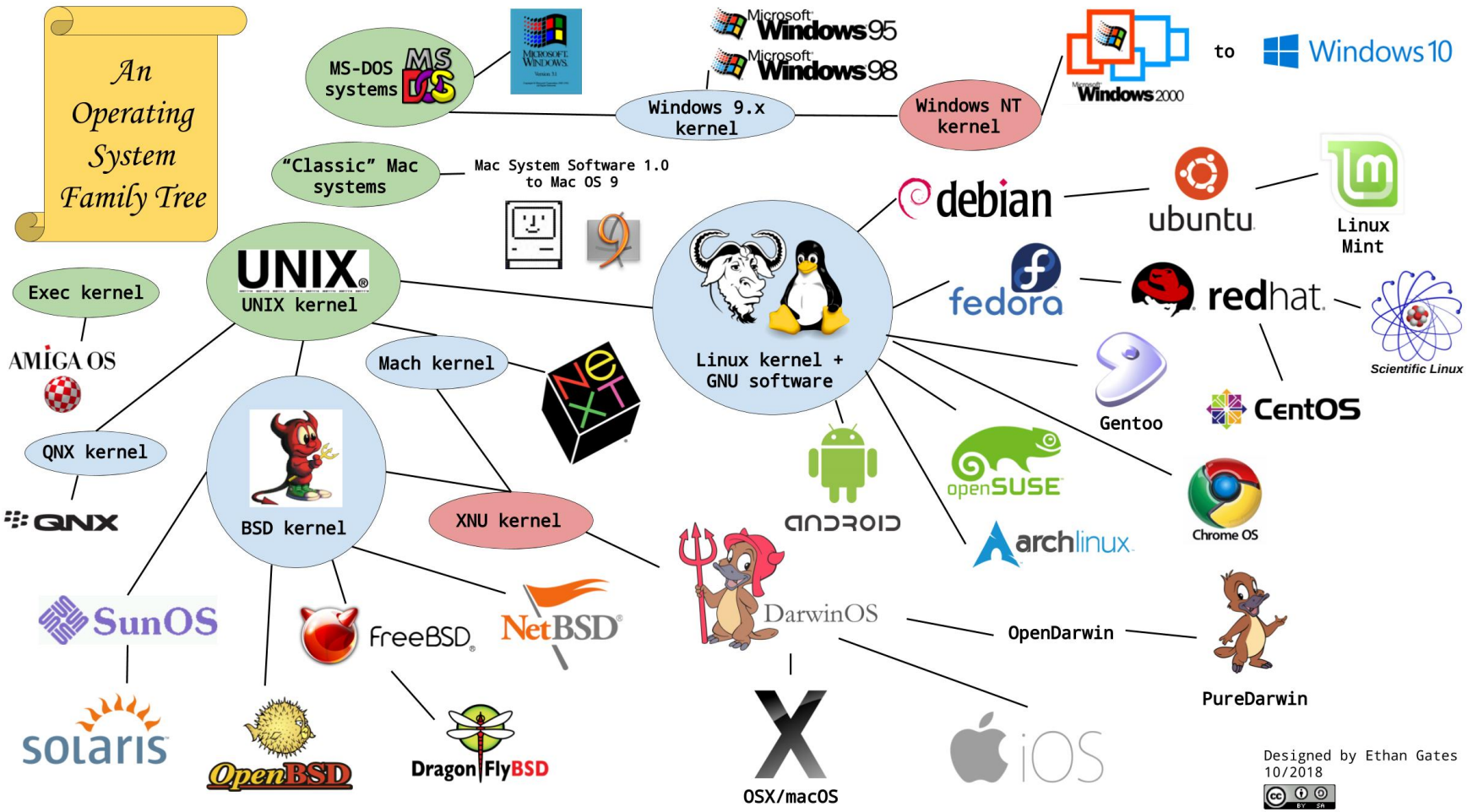
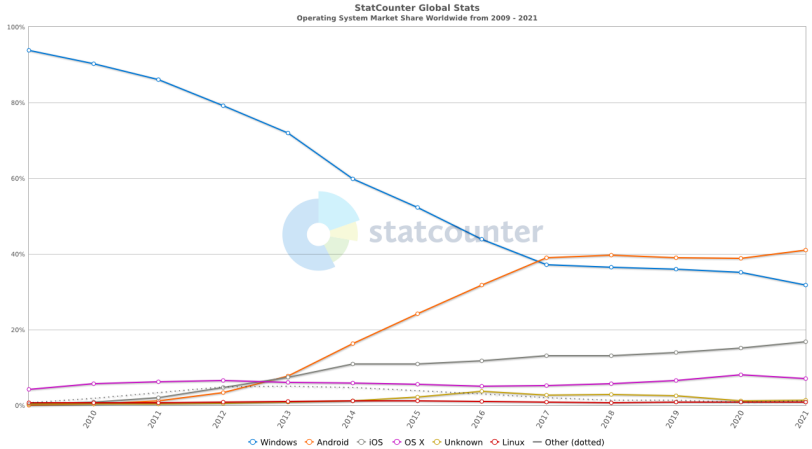
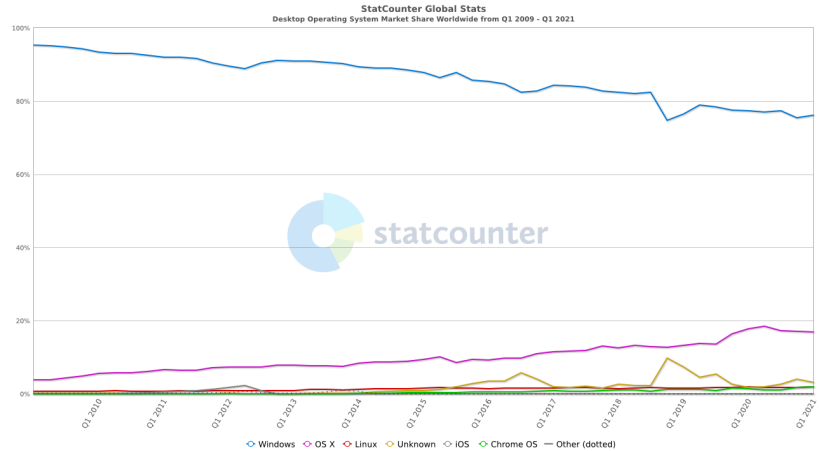
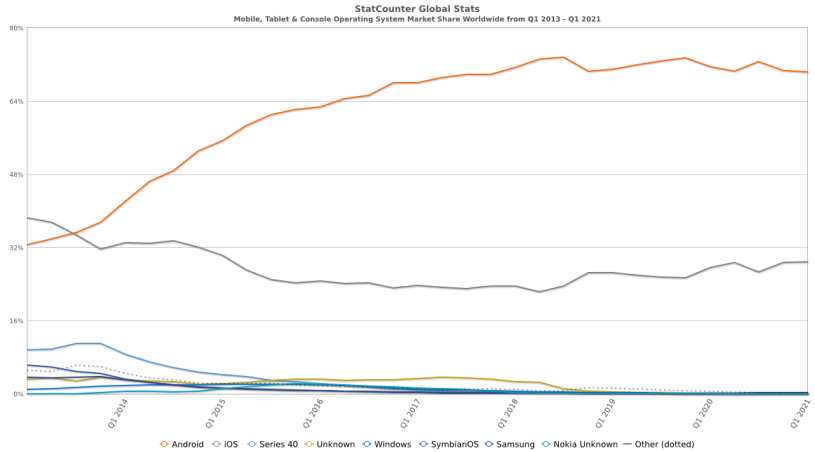
OS tree

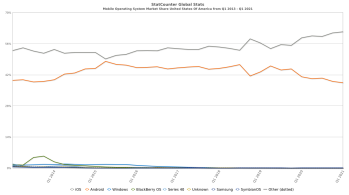

An Operating System Family Tree
MS-DOS systems
Windows 9.x kernel
Windows NT kernel
to
Windows 10
"Classic" Mac systems
Mac System Software 1.0 to Mac OS 9
UNIX
UNIX kernel
Exec kernel
AMIGA OS
QNX kernel
QNX
Mach kernel
BSD kernel
XNU kernel
Linux kernel + GNU software
debian
ubuntu
Linux Mint
fedora
redhat
Scientific Linux
Gentoo
CentOS
openSUSE
Chrome OS
archlinux
ANDROID
SunOS
solaris
FreeBSD
NetBSD
OpenBSD
DragonFlyBSD
DarwinOS
OpenDarwin
PureDarwin
OSX/macOS
iOS
Designed by Ethan Gates
10/2018

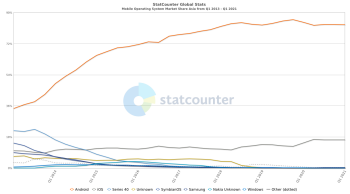
OS Market Share











Outline

Course objectives

To convey the knowledges and skills of computer operating systems to those who attend the course, including

- Basic structure, main functions of operating systems of a modern computer
- Concurrent Processes, Mutual Exclusion and Synchronization of concurrent process, Process scheduling, Memories, Virtual Memory, Pages, Segmentation, Pages Replacement, Files systems, journaling, Virtual Machine Monitor, Security and Protection.
- Lab works will strengthen the theory given by lectures (C/C++, Python)

Course content (1)

Ch.1: Introduction to operating systems

Ch.2: Process management

- Concepts
- Process scheduling
- Interprocess communication

Ch.3: Process synchronization

- Synchronization
- Deadlock handling

Ch.4: Memory management

- Virtual memory

Ch.5: I/O management

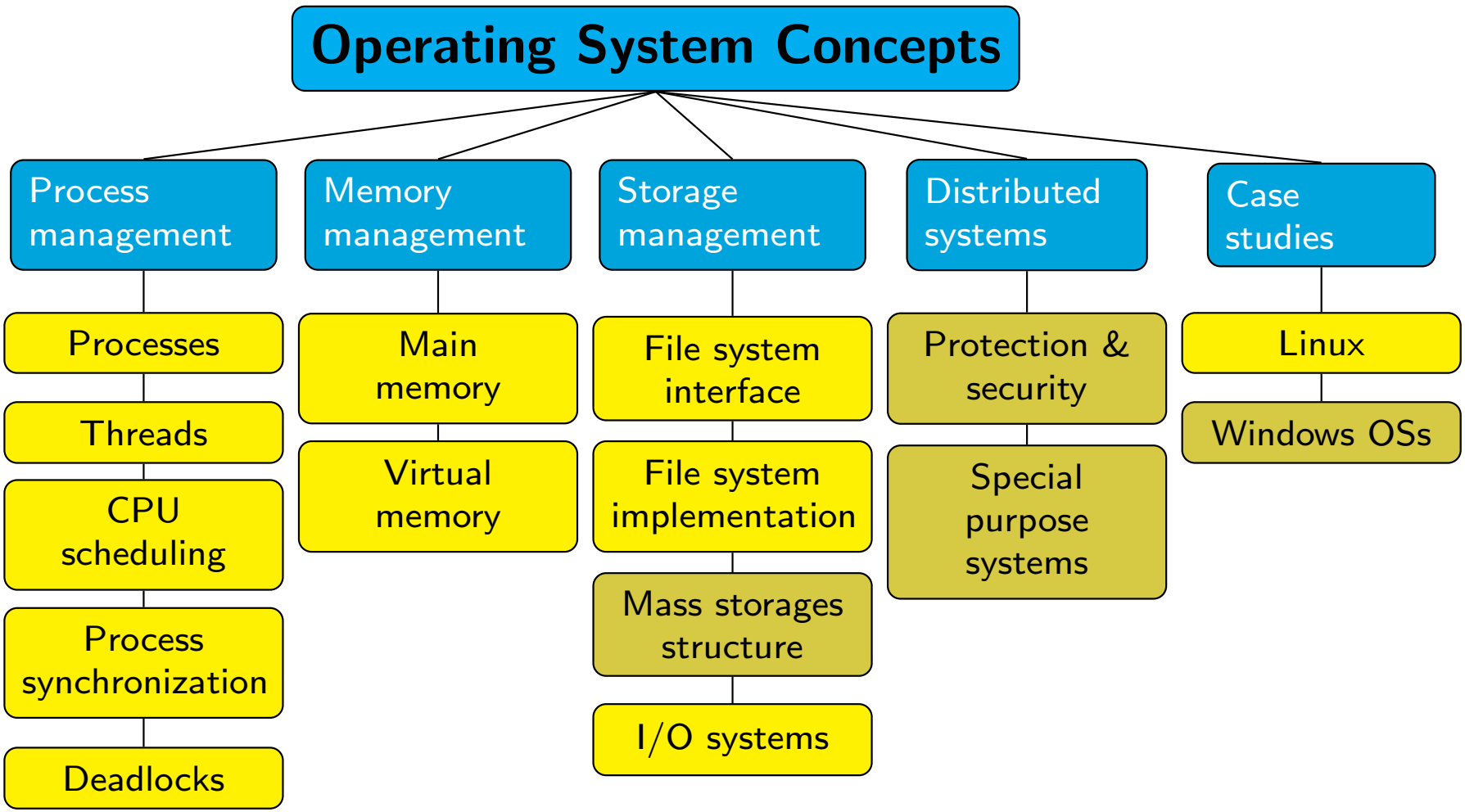
Ch.6: File systems

Ch.7: Security and Protection

Ch.8: Advanced topics

- Some modern OS examples
- Computer networks and distributed systems

Course content (2)



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L.O.4 Explain virtual memory and its realization in hardware and software.

L.O.5 Compare and contrast different approaches to file organization, recognizing the strengths and weaknesses of each.

What are you expected ?

Your knowledge will be measured in a quantitative manner.

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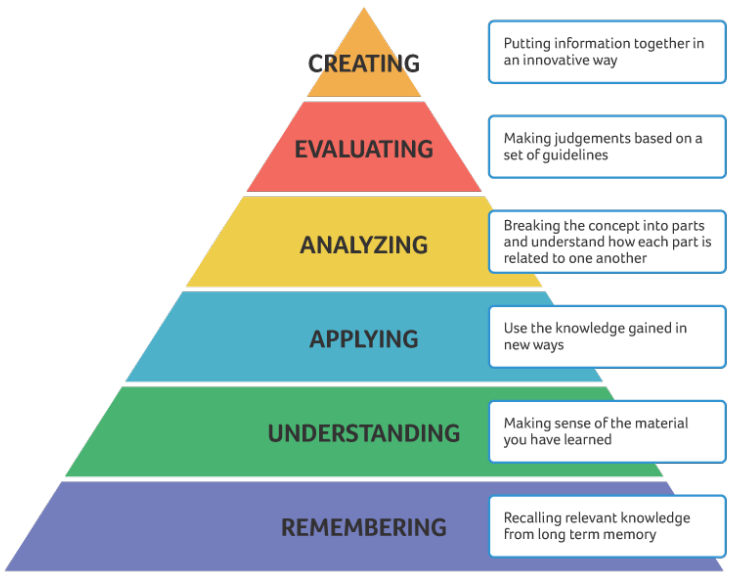
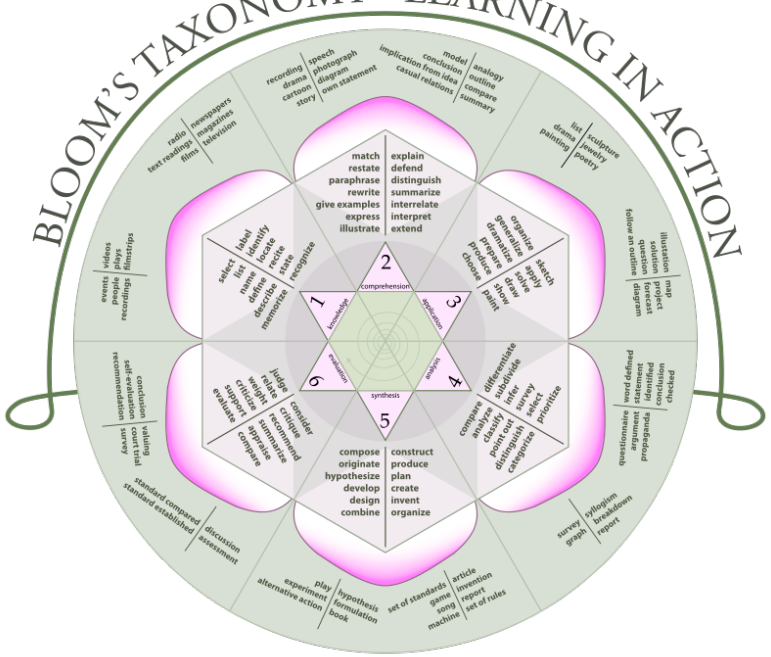


source: blog.newsela.com



source: wikipedia.org

Required/Applied by this course

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- Hardware aspects: Computer architecture?!?!?!
- Software aspects: C/C++ programming is recommended!

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Which ones to be applied by this course ?

- Computer network
- Advanced OS, mobile systems
- High performance computing
- Distributed systems
- Software engineering
- Big Data
- Security
- Real-time systems
- Web programming
- ...

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Course materials

- Silberschatz et al, “Operating System Concepts”, 9th Ed., 2012 (Electronic Version).

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- Remzi H. Arpaci-Dusseau and Andrea C. Arpaci-Dusseau, "Operating Systems: Three Easy Pieces", 0.91v, 2014. Website: `http://pages.cs.wisc.edu/~remzi/OSTEP/`

Course evaluation

Final Exam	50%	80-90 Minutes, multiple-choices *(tentative)*
Assig. & Project	30%	
Lab	10%	
Quiz	10%	15 Minutes (could be many times)

Important course notice

Presence checks

5 times or more randomly course presence checks: absence for more than 3 times will be prohibited (Grade F)

University regulation

"24.1 Các hình thức kỷ luật :

.....

c. Cấm thi và nhận điểm cấm ....., áp dụng với một trong các lỗi sau:
- Vi phạm các quy định trong quá trình học: ...Vắng mặt (có lý do hoặc không có lý do) quá 20% số giờ lên lớp của môn học.

.....

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An assemblage of objects so combined by nature or human as to form an integral unit

A regularly interacting or interdependent group of objects forming a unified whole

Webster's Dictionary

A combination of components/objects that act together to perform a function not possible with any of the individual parts

IEEE Standard Dictionary of Electrical and Electronic Terms

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IEEE Standard Dictionary of Electrical and Electronic Terms

Two major features

1. A system consists of interacting objects/components
2. A system is associated with a function/work that it performs

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Common questions

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- How to be used in engineering ?

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- to be used in engineering tasks ?
- to earn much money ?
- to be used in research ?
- How to be used in engineering ?
- How to achieve economical benefits ?
- ...

Experiences of professionals around the world

Prof. John Regehr, University of Utah, USA

- Some students are incapable of or uninterested in implementing new OS
- But they can learn from OS course: *concurrency, resource management, contention resolution, computer system design*

Happy new lunar year and let's work hard :-)