Operating Systems

(운영체제)

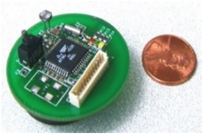
Spring 2020

차호정

연세대학교 컴퓨터과학과

Lecture 1: Introduction

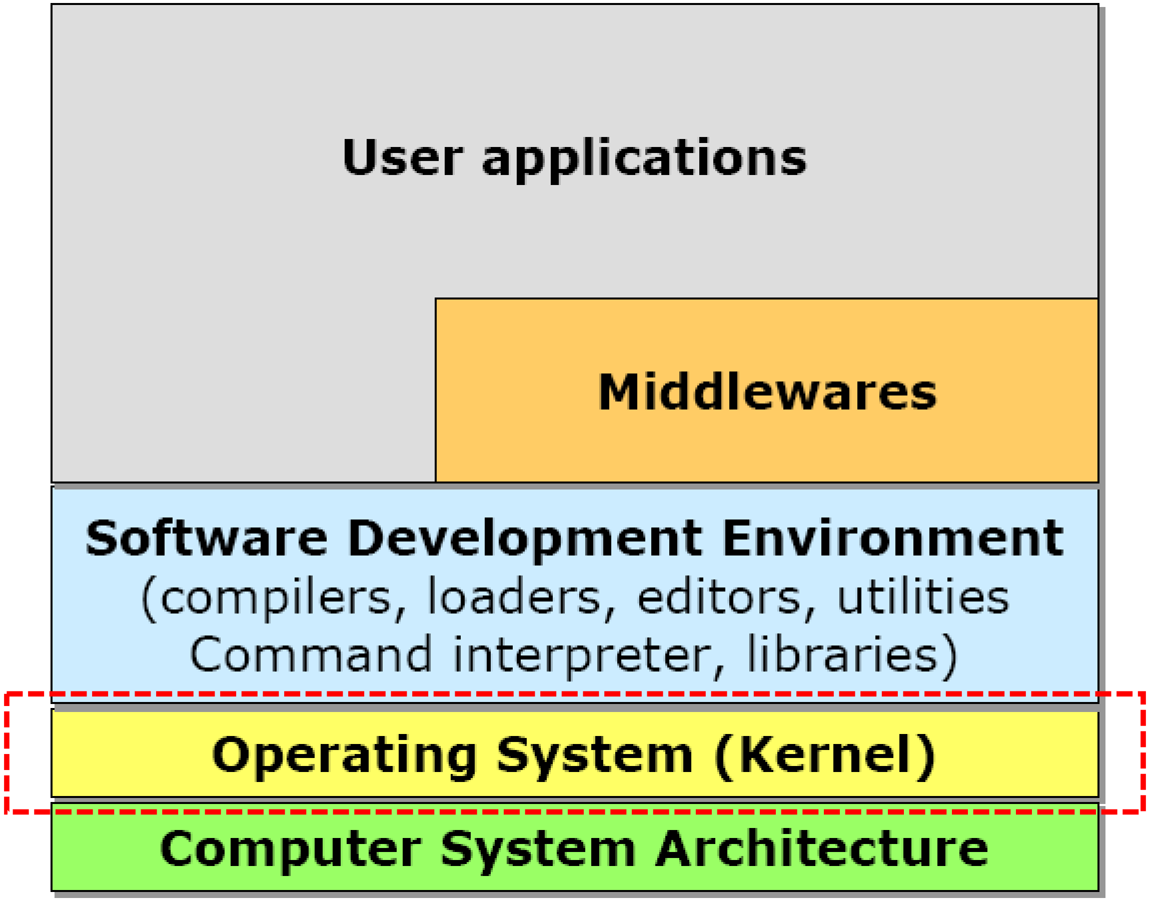
Servers, Desktop, Mobile, Embedded System, …



Artificial Intelligence at home
Open Source Code Robot & Linux OS
Some of Qbo's skills:
Stereoscopic vision,
Speech Recognition System,
Speech Synthesis System,
Qbo's API & WEB control panel,
WIFI & BLUETOOTH connections,
obstacles; the robot avoids crashes and falls thanks to ultrasound sensors,
AND MUCH MORE...
Qbo
The characteristics and/or functions of the robot are subject to changes without prior notice.

VM/MVS, DOS, Win95/98/2000/XP/Vista/7/8/9/10/11, Minix, FreeBSD, Linux, Solaris, MacOS, Mach, PalmOS, uCOS, TinyOS, RETOS, Symbian, iOS, Android, Tizen, NuttX, ChibiOS, Contiki, QNX, …

Hardware & Software: a Big Picture



User applications

Middlewares

Software Development Environment
(compilers, loaders, editors, utilities
Command interpreter, libraries)

Operating System (Kernel)

Computer System Architecture

What is the Operating System ?

- Definition
  - A. Silberschatz: *“A program that acts as an intermediary between a user of a computer and the computer hardware.”*
  - Dietel: *“Programs that make the hardware usable.”*

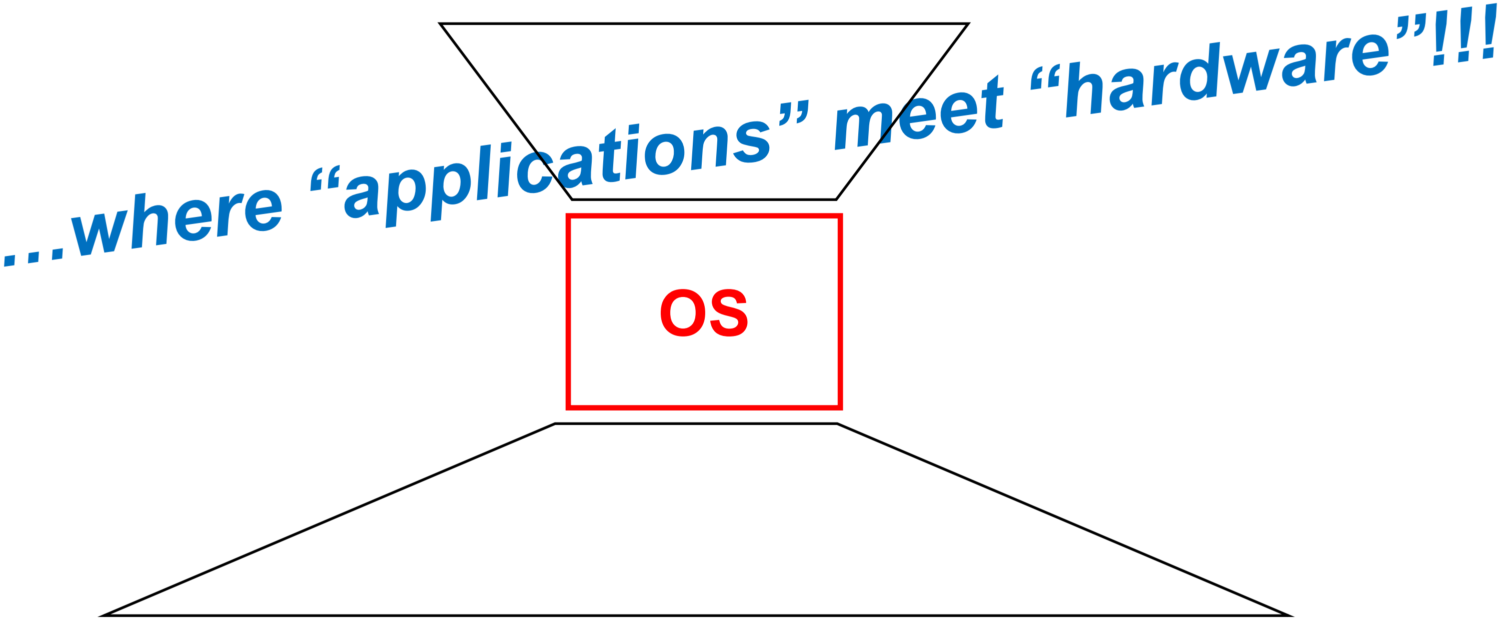
- Why learn OS?
  - To make a new hardware up and running.
  - To add, modify, and enhance a functionality
  - To fine-tune the performance

Operating Systems Goals

- Efficient Use of Resources
  - Avoid bottlenecks that affect performance
  - Keep all components as busy as possible
- Convenience and Productivity for Users
  - The user costs more than the machine
  - Deliver function as efficiently as possible
- Availability and Reliability
  - Computer systems are critical
  - A failed system can mean a failed company

Operating Systems: Abstract View

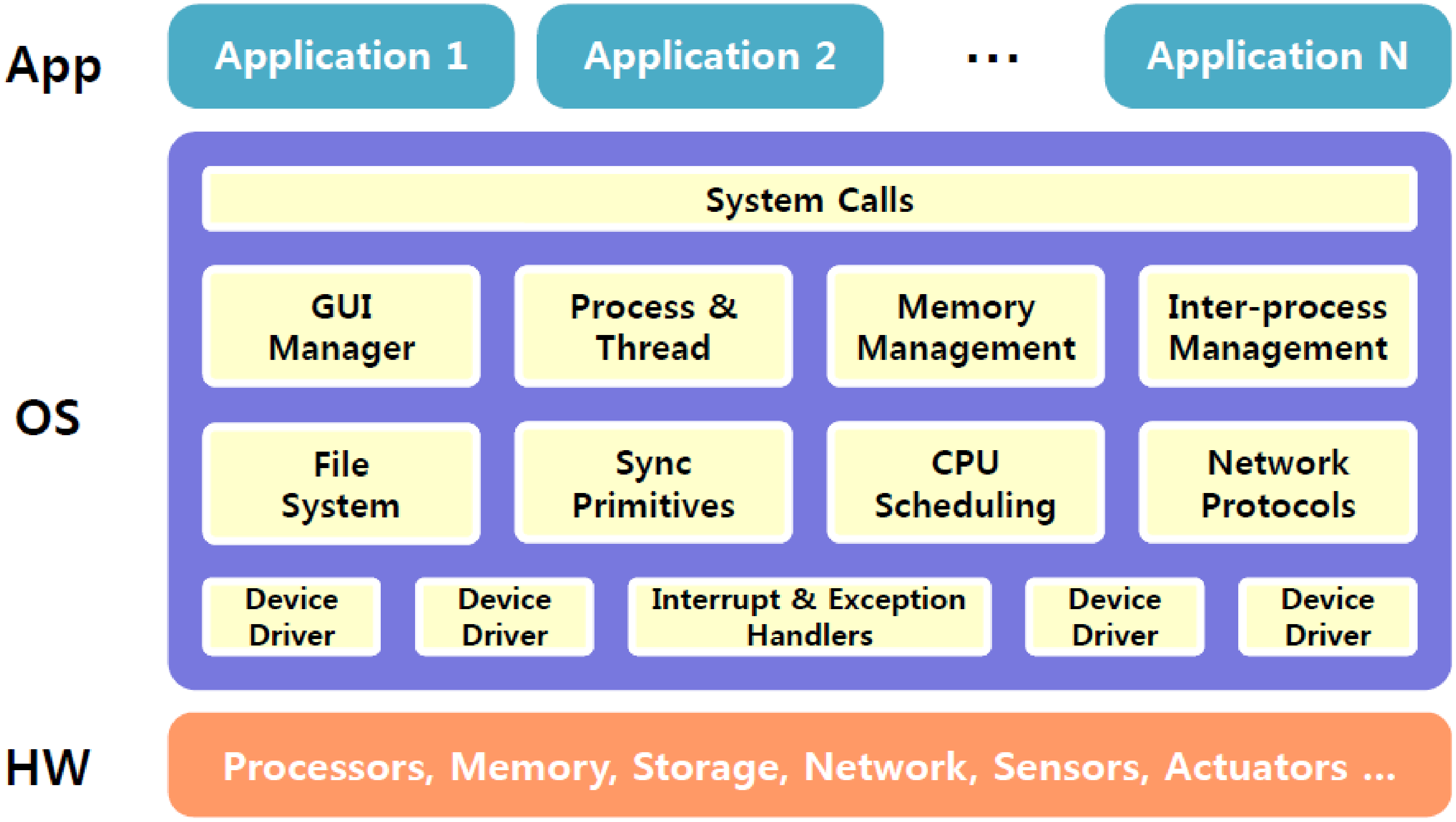
Applications……..



…where "applications" meet "hardware"!!!

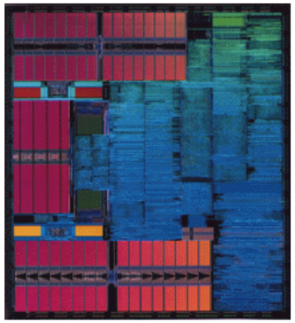
Hardware: CPU/Memory/HD/DVD/Wireless…

Operating Systems: Detailed View



Operating Systems should provide "*Abstraction*"

Physical



Logical

CPU

CPU

CPU

Processes, CPU Scheduling, Process Synchronization

Physical

Logical

Memory with infinite capacity

Memory Management, Virtual Memory

Physical

Logical

File system, I/O system, Storage System

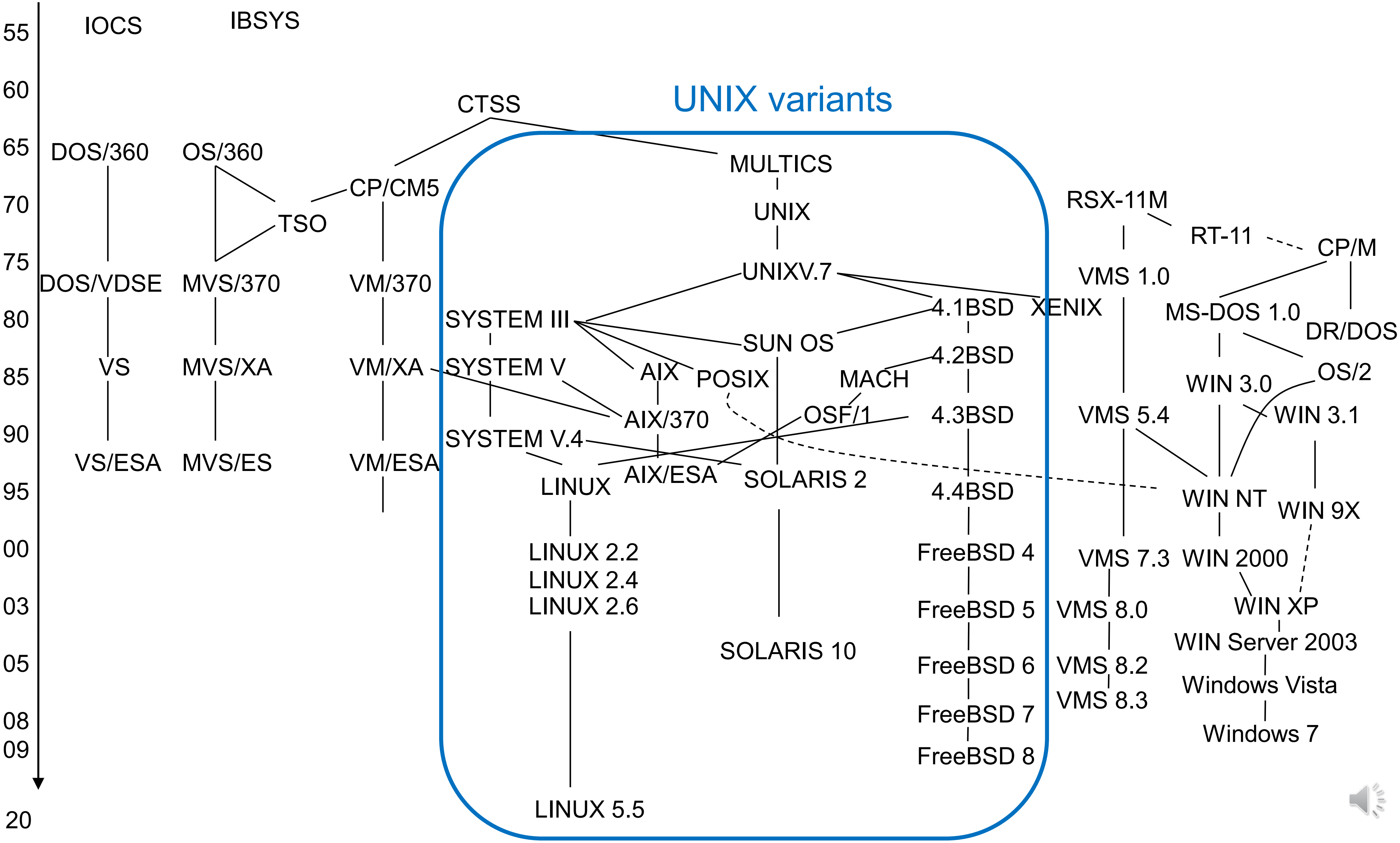
Automobile

Handle, brake, accelerator, ...

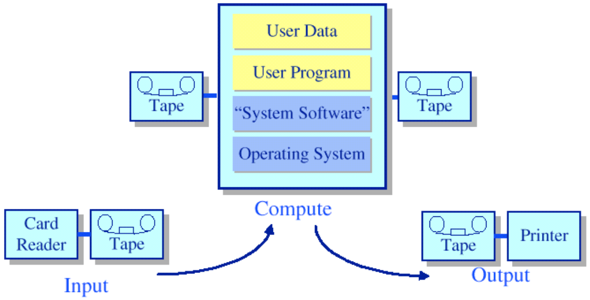
Computer

A set of well-defined system functions

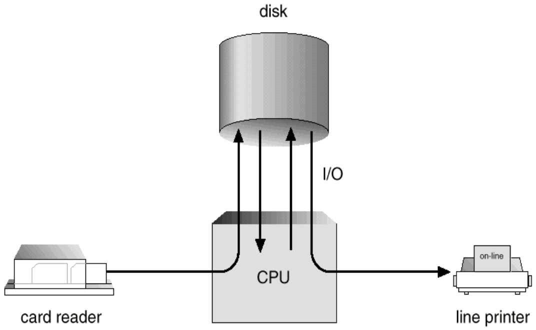
Brief History of Operating Systems



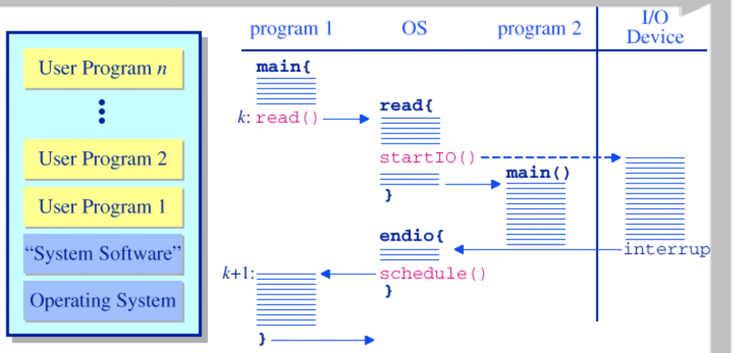
Evolution of Operating Systems



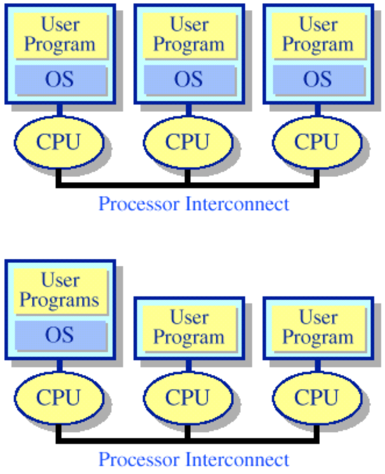
Simple Batch Systems



Batch with spooling

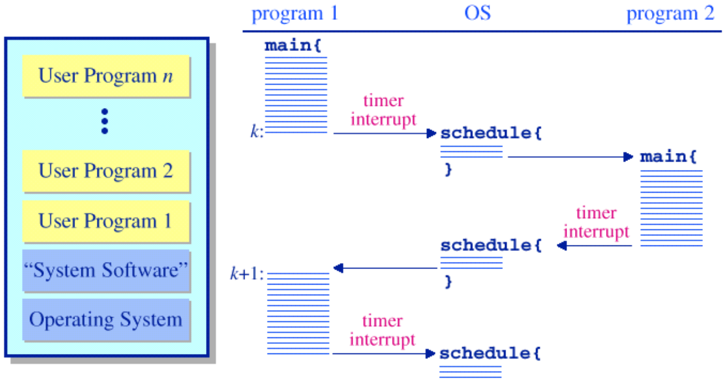


Multiprogrammed Batch Systems



Parallel Systems

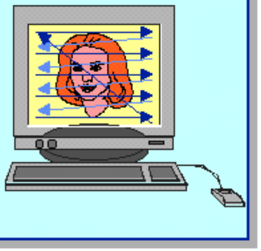
Personal Computer Systems



Time-Sharing Systems

Example: Digital video playout

```
/* Main processing loop */
  loop
    data         = read( network)
    video_frame  = decompress(data)
    write( frame_buffer, video_frame)
  end loop
```



Timing constraint: Execute loop once every 33 ms.

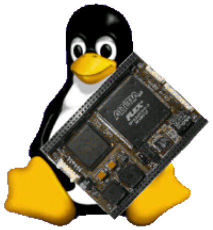
Real-Time Systems

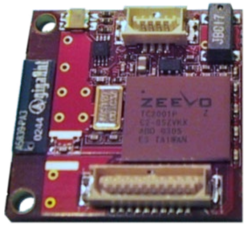
Modern Computing Paradigms

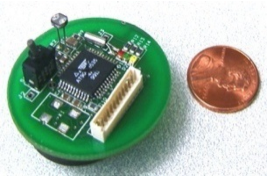
- Traditional computing
  - Number crunching
- Web-based computing
  - Information processing
- Embedded computing
  - Target-specific Hardware/Software systems
  - Example: handheld mobile devices
    - Limited memory
    - Slow processors
    - Small display screens
    - Battery

Embedded Systems

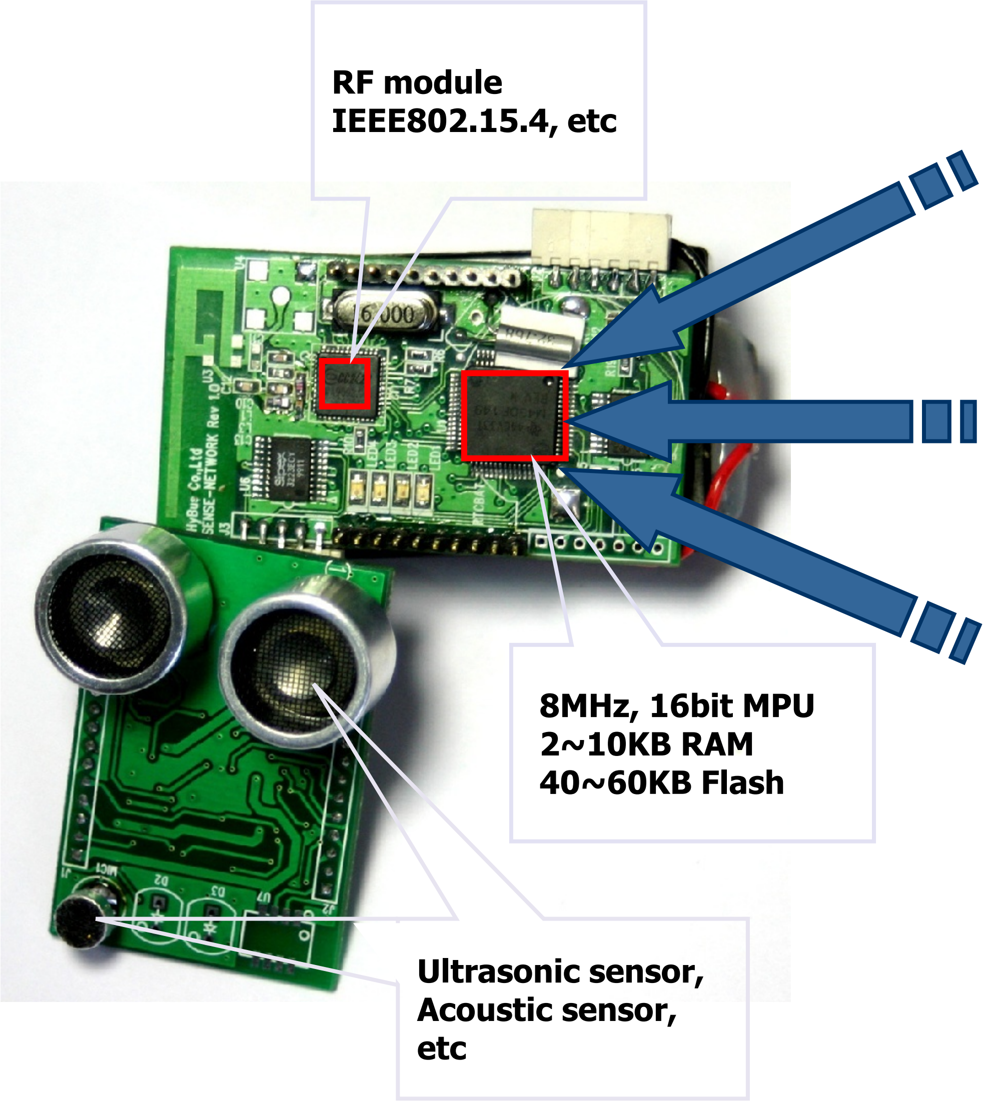
- Mobile & Wearable devices
- Gaming and entertainment systems
- Infrastructure
  - Monitoring and sensing equipment
- Transportation
  - Cars, planes, trains
- Medical devices / implants







Deeply Embedded/Networked Systems



RF module
IEEE802.15.4, etc

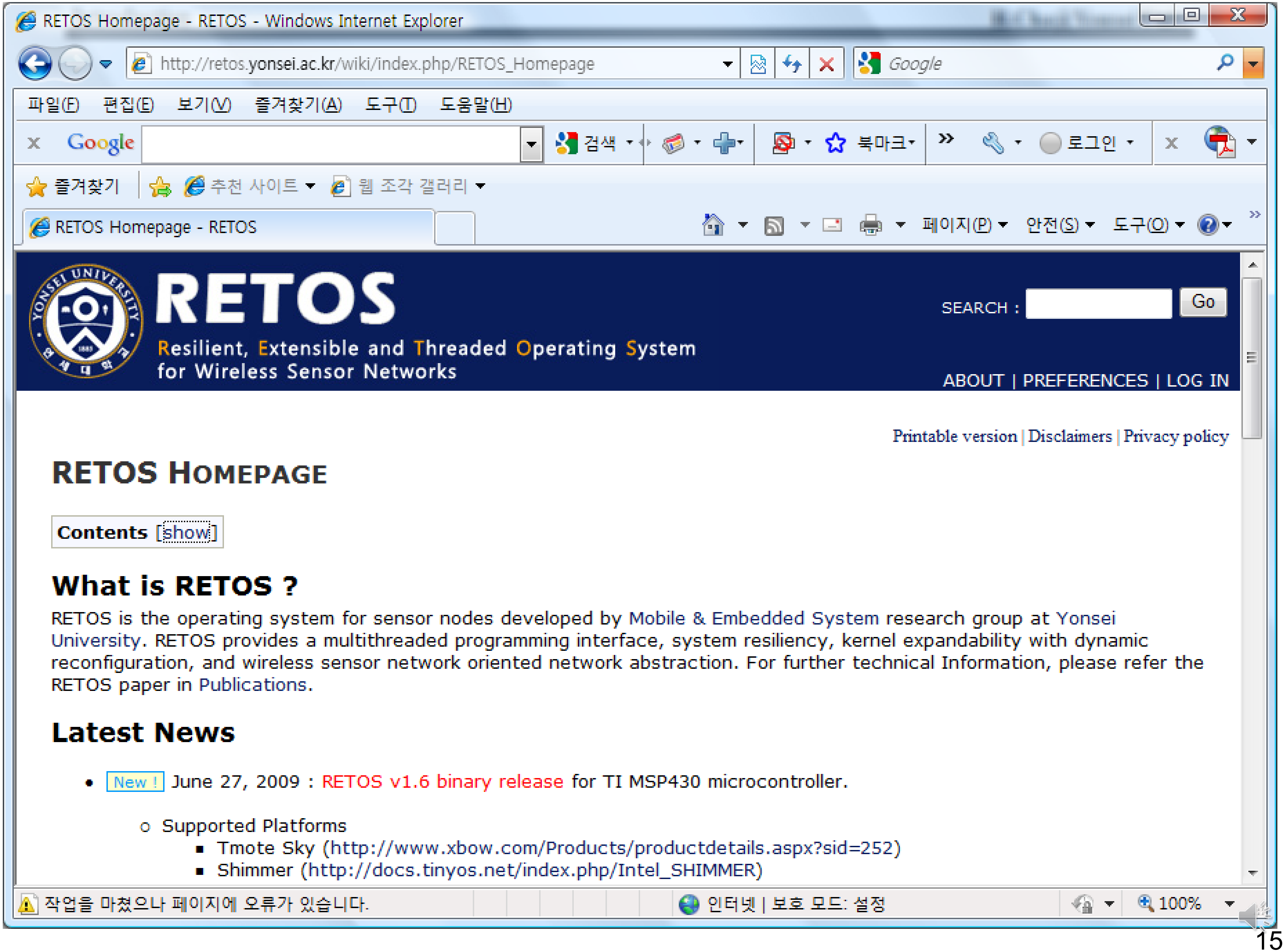
8MHz, 16bit MPU
2~10KB RAM
40~60KB Flash

Ultrasonic sensor,
Acoustic sensor,
etc

센서네트워크 응용

- 저전력 무선통신 소프트웨어 모듈
- 센서제어 소프트웨어 모듈
- 시스템 소프트웨어 라이브러리

- 센서노드 운영체제
  "초경량 운영체제"
  "초소형 운영체제"
  "스마트센서 운영체제"
  "나노 임베디드 운영체제"


RETOS Homepage - RETOS - Windows Internet Explorer
http://retos.yonsei.ac.kr/wiki/index.php/RETOS_Homepage
Google
파일(F) 편집(E) 보기(V) 즐겨찾기(A) 도구(T) 도움말(H)
Google
검색
북마크
로그인
즐겨찾기
추천 사이트
웹 조각 갤러리
RETOS Homepage - RETOS
페이지(P) 안전(S) 도구(O)
YONSEI UNIVERSITY
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ABOUT | PREFERENCES | LOG IN
Printable version | Disclaimers | Privacy policy
작업을 마쳤으나 페이지에 오류가 있습니다.
인터넷 | 보호 모드: 설정
100%

RETOS

Resilient, Extensible and Threaded Operating System for Wireless Sensor Networks

RETOS Homepage

Contents [show]

What is RETOS ?

RETOS is the operating system for sensor nodes developed by Mobile & Embedded System research group at Yonsei University. RETOS provides a multithreaded programming interface, system resiliency, kernel expandability with dynamic reconfiguration, and wireless sensor network oriented network abstraction. For further technical Information, please refer the RETOS paper in Publications.

Latest News

- New ! June 27, 2009 : RETOS v1.6 binary release for TI MSP430 microcontroller.
    - Supported Platforms
        - Tmote Sky (http://www.xbow.com/Products/productdetails.aspx?sid=252)
        - Shimmer (http://docs.tinyos.net/index.php/Intel_SHIMMER)

Mobile Phones

- **Basic phone**
  - Basic voice communication + SMS

- **Feature phone**
  - Marketing phones featuring specific functionalities
  - Application development is not possible, or limited

- **Smartphone**
  - Voice + PDA functionality
  - Ability to download application and run it!
  - Operating System (Symbian, Windows Mobile, Android, iPhone, Blackberry, Tizen, WebOS, …)

Smartphone OS (*2020*)

OS	Developer	Kernel	Latest Release	Source	License	Application Store	Programming
Android	**Google, Open Handset Alliance**	**Linux**	**2019.9 (10.0)**	**Free and Open Source**	**Apache 2.0 GPLv2**	**Google Play**	**C/C++ Java Kotlin**
iPhone (iOS)	Apple	Hybrid (Apple Darwin)	2020.1 (13.3.1)	Closed	Proprietary Software	App Store	C/C++ Objective C Swift
~~Symbian~~	~~Nokia~~	~~EPOC Kernel Architecture 2 (EKA2)~~	~~2012.10 (Nokia Belle)~~	~~Closed~~	~~Proprietary Software~~	~~Ovi Store~~	~~C/C++~~
Windows 10 Mobile	Microsoft	Hybrid (Windows NT)	2020.1 (10.0.15254.603)	Closed	Microsoft EULA	Microsoft Store	C/C++ C#
WebOS	~~HP palm~~ LG Electronics (2013.02)	**Linux**	2012.1 (3.0.5)	Open	Apache 2.0 GPLv2	HP App Catalog	C/C++ Qt
Blackberry 10	BlackBerry Limited	Real-time microkernel (QNX)	2018.4 (10.3.3.3216)	Closed	Proprietary	BlackBerry World	C/C++ Qt
Tizen	Linux Foundation, Tizen Association, Samsung, Intel	**Linux**	2019.9 (4.0.0.7)	Open Source and Proprietary	Apache License, BSD, LGPL, Flora License,GPLv2 (SDK: Freeware)	Tizen Store	HTML5 C/C++

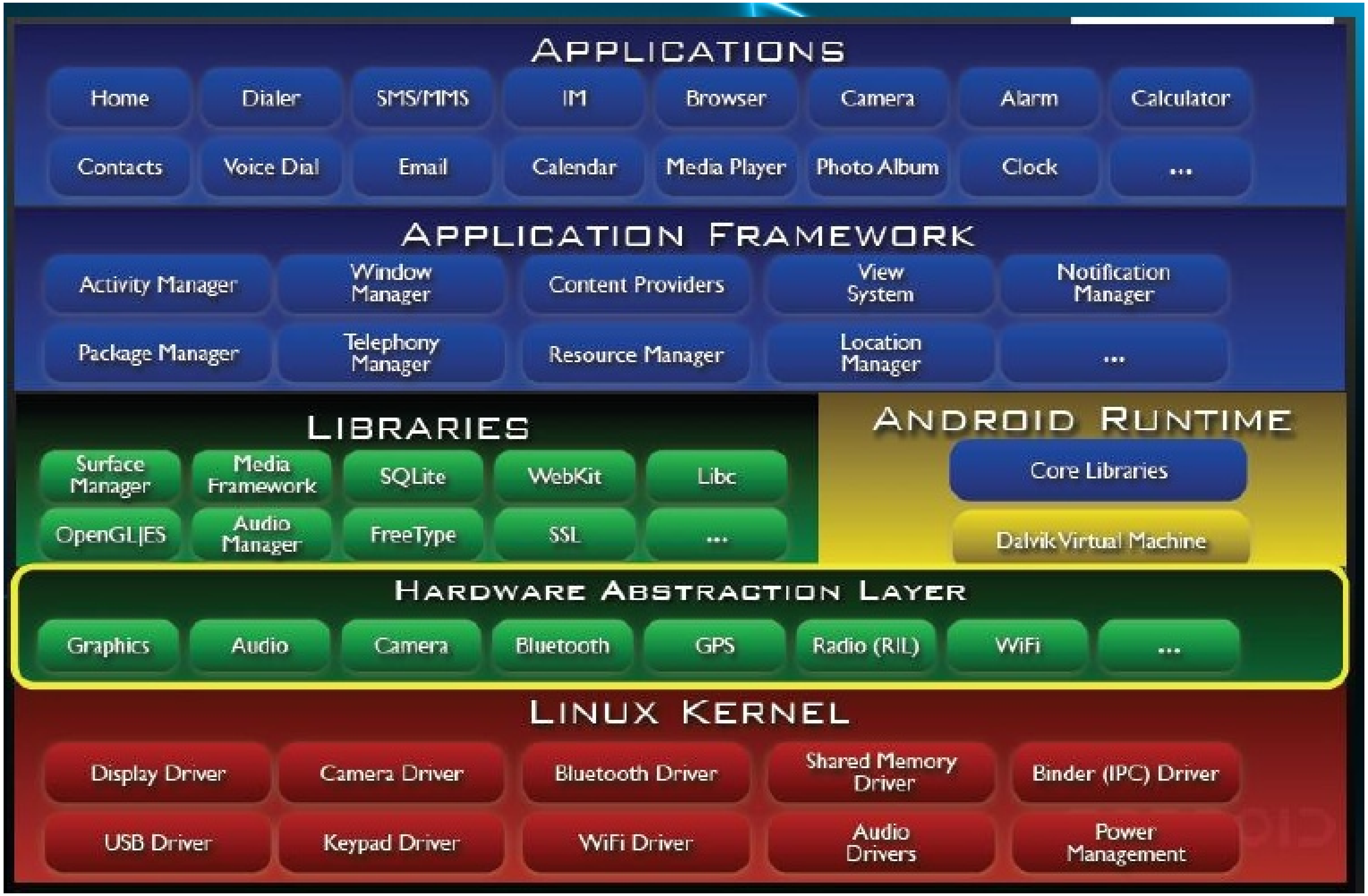
The Android Stack

Phone users (JAVA)

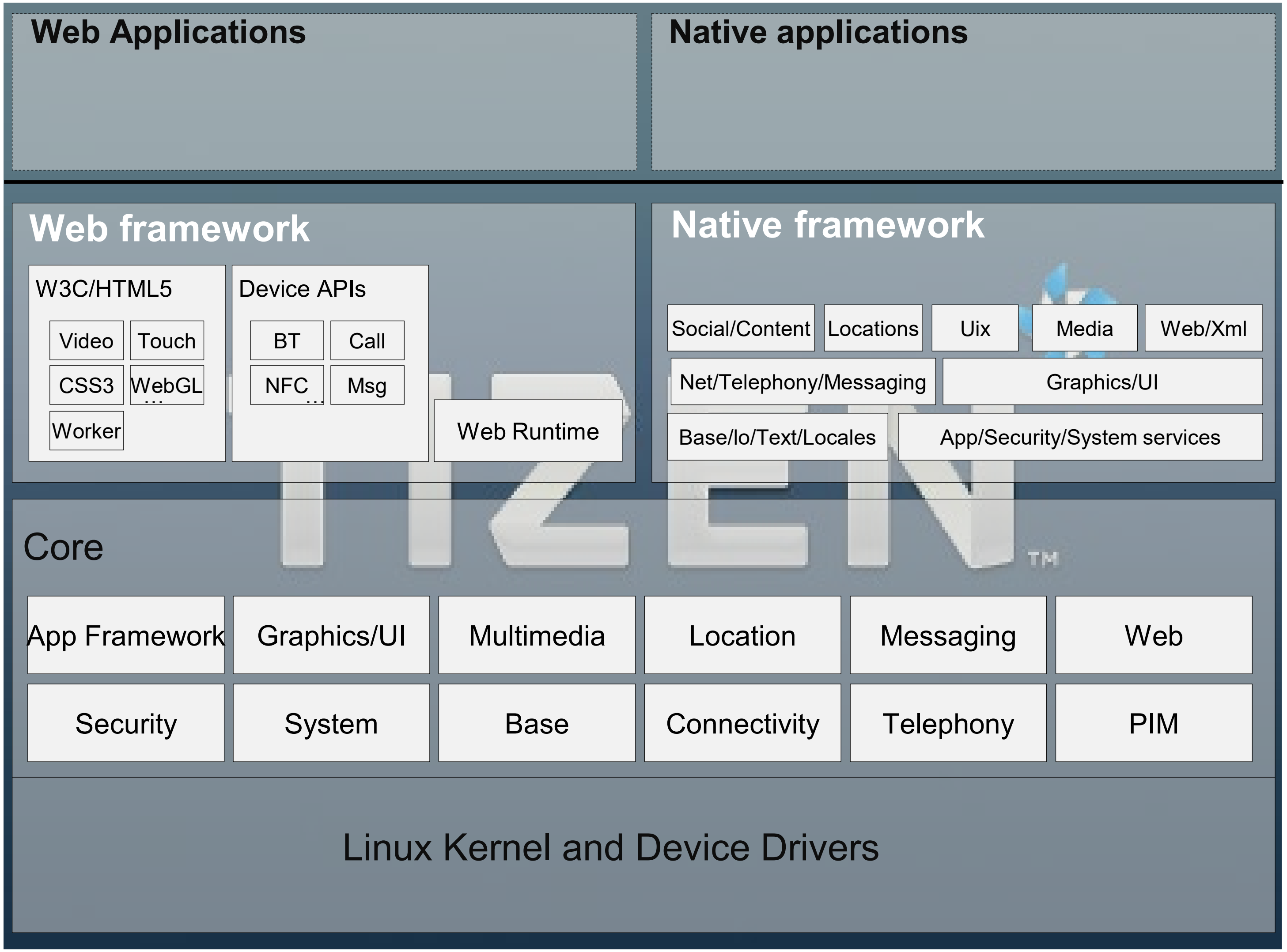
Application Developers (JAVA)

Programmers (C, C++)

Hardware Developers (Kernel, C)



The TIZEN Stack



Web Applications

Native applications

Web framework

W3C/HTML5

- Video
- Touch
- CSS3
- WebGL …
- Worker

Device APIs

- BT
- Call
- NFC …
- Msg

Web Runtime

Native framework

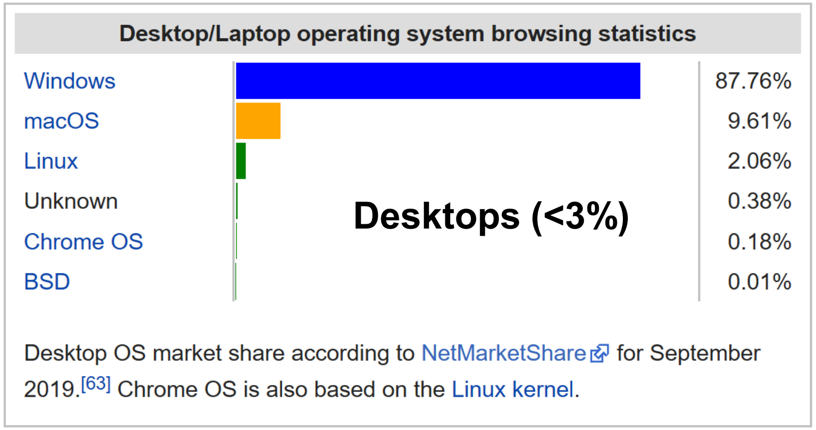
- Social/Content
- Locations
- Uix
- Media
- Web/Xml
- Net/Telephony/Messaging
- Graphics/UI
- Base/Io/Text/Locales
- App/Security/System services

Core

App Framework	Graphics/UI	Multimedia	Location	Messaging	Web
Security	System	Base	Connectivity	Telephony	PIM

Linux Kernel and Device Drivers

Linux Usage Share

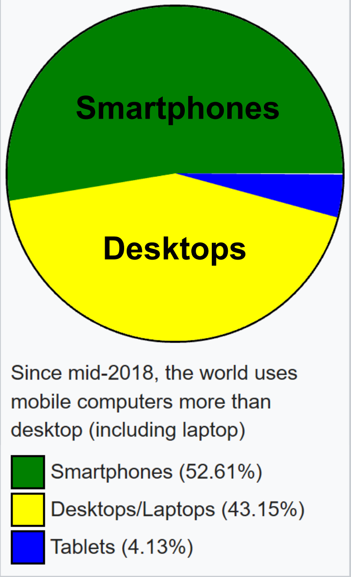


Desktop/Laptop operating system browsing statistics

Windows	87.76%
macOS	9.61%
Linux	2.06%
Unknown	0.38%
Chrome OS	0.18%
BSD	0.01%

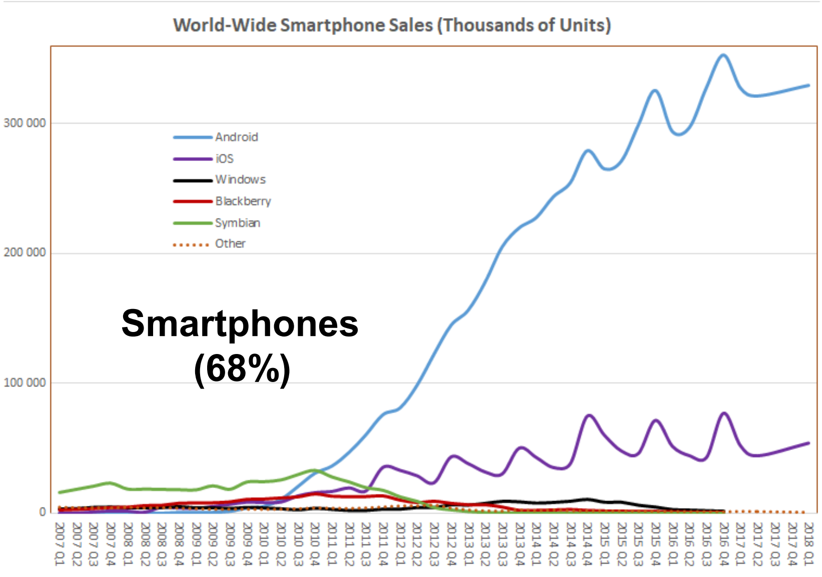
Desktops (<3%)

Desktop OS market share according to NetMarketShare for September 2019.[63] Chrome OS is also based on the Linux kernel.



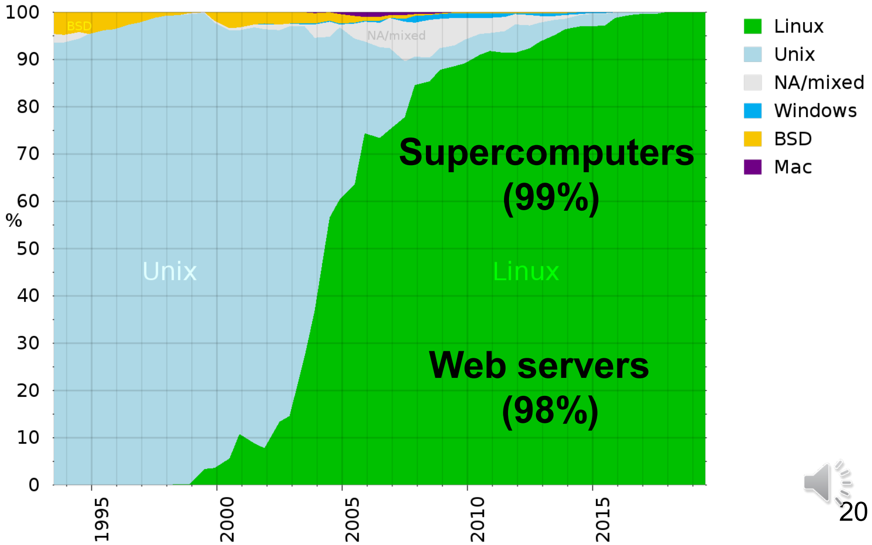
Since mid-2018, the world uses mobile computers more than desktop (including laptop).

- 🟩 Smartphones (52.61%)
- 🟨 Desktops/Laptops (43.15%)
- 🟦 Tablets (4.13%)



World-Wide Smartphone Sales (Thousands of Units)

Smartphones (68%)



Supercomputers (99%)

Web servers (98%)

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

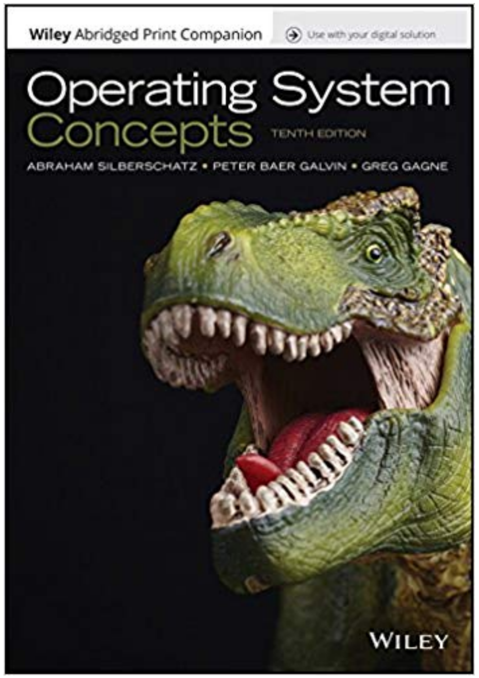
Course Information (1)

- Goals
  - The aim of this course is to learn various aspects of modern computer operating systems. Topics will include operating system structures, process management, memory management, storage management and I/O subsystems.
  - A good background on computer architecture, algorithms, and programming languages will be helpful.
  - *The principles of the Linux operating system will be covered as supplementary topics in the course.*

Course Information (2)

- Course Outline
  - Computer Systems & Operating System
  - Processes and Threads
  - CPU Scheduling
  - Process Synchronization
  - Deadlocks
  - Memory Management
  - Virtual Memory
  - File System Interface
  - File System Implementation
  - Mass-storage systems

Materials


Wiley Abridged Print Companion
Use with your digital solution
Operating System Concepts
TENTH EDITION
ABRAHAM SILBERSCHATZ • PETER BAER GALVIN • GREG GAGNE
WILEY

- Lecture slides
- Main textbook
  - A. Silberschatz, P. Galvin and G. Gagne *Operating System Principles*, 10th edition, Wiley Asia Student Edition, 2018.
- References
  - William Stallings, *Operating Systems*, 9th Edition, Prentice Hall, 2017.
  - Remzi Arpaci-Dusseau, *Operating Systems: Three Easy Pieces*, 2014, pdf.
  - Tanenbaum, Bos, *Modern Operating Systems*, 4rd Edition, 2014
  - Daniel P. Bovet and Marco Cesati, *Understanding the Linux Kernel*, O'Reilly, 3rd Edition (2006)

Administrivia

- Professor
  - Hojung Cha, Dept. of Computer Science
  - hjcha@yonsei.ac.kr
- Teaching Assistant
  - **박성훈, 박준범** (D814)
- Lecture Hours
  - Monday 4:00 P.M. ~ 5:50 P.M. (C040)
  - Wednesday 12:00 P.M. ~ 1:50 P.M. (B040)
- Copies of the slides will be available in YSCEC

Assessments

- Exams (60%)
  - Midterm: May 4, 2019 (tentative)
  - Final: June 22, 2019 (tentative)
- Programming Assignments (30%)
  - 3 programming assignments on the Linux platform
  - Although the programming projects are accounted 30% of the final grade, unsatisfactory achievements will impose penalty. *(You will not get 'A' grade without fulfilling the programming projects.)*
- Class Participation (10%)
  - Missing more than 1/3 of class will mandate 'F' grade.

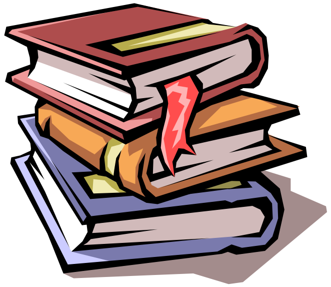
Academic Dishonesty Policy

- Plagiarism and Cheating: very serious academic offences!!!
  - Copying all or part of another person's work are forms of cheating and will not be tolerated.
  - A student involved in an incident of cheating will be notified by the instructor and the following policy will apply:
    - 'zero' grade to the subject work,
    - For serious offenses, F grade for the course.
- Rules
  - Can discuss lectures, tools, concepts with your classmates
  - Cannot discuss “solutions” with your classmates

Expectation from Students

- Get motivated!
  - Learn the details by yourself.
    - Read books on OS (there are many good books on OS)
    - Get real knowledge with hand-on experience.
  - Do not wait till the last minute to start the assignment.
    - The assignments will *require* your efforts.

Work hard!



자기소개서 (free form)

- 내용
  - 이름, 학번, 소속, 사진
  - 자기소개
  - 기타 하고 싶은 얘기 아무거나 (본인의 컴퓨터 지식 backgrounds, 수강하면서 걱정되는 부분, …)
- 제출일
  - 3월 30일, 조교 연구실 앞 박스

Assignment #1

- Install the Linux operating system on your desktop/notebook
  - Choose any Linux distribution (Ubuntu, Fedora, …)
  - Upgrade the kernel to the *latest longterm release*
  - Learn how to use shell, makefile, editor, …
  - Detailed description on the assignment: course homepage
  - You will learn:
    - Kernel compilation & application porting
    - UNIX system management
- Project deadline
  - April 1, 6:00P.M.
  - Deadline will strictly be enforced.