Sistemas Operativos

Based on: Operating System Concepts – 10th Edition (Silberschatz, Galvin and Gagne)

The evolution of Operating Systems

The evolution of Operating Systems

Operating System

What is an Operating System?

- A **program** that
  acts as an **intermediary** between a
  - user of a computer
  - the computer hardware
- Operating system **goals**:
  - **Execute** user programs
    - make solving user problems easier
  - **Make** the **computer system** convenient to use
  - **Use** the **computer hardware** in an efficient manner

Abstract View of Components of Computer

Computer System Structure

- Computer system can be divided into four components:
  - Hardware – provides basic computing resources
    - CPU, memory, I/O devices
  - **Operating system**
    - **Controls and coordinates use of hardware** among various applications and users
  - Application programs – define the ways in which the system resources are used to solve the computing problems of the users
    - Word processors, compilers, web browsers, database systems, video games
  - Users
    - People, machines, other computers

Why study operating systems?

- **Small %** of computer scientists will be involved in
  - **creation or modification** of operating systems

    BUT

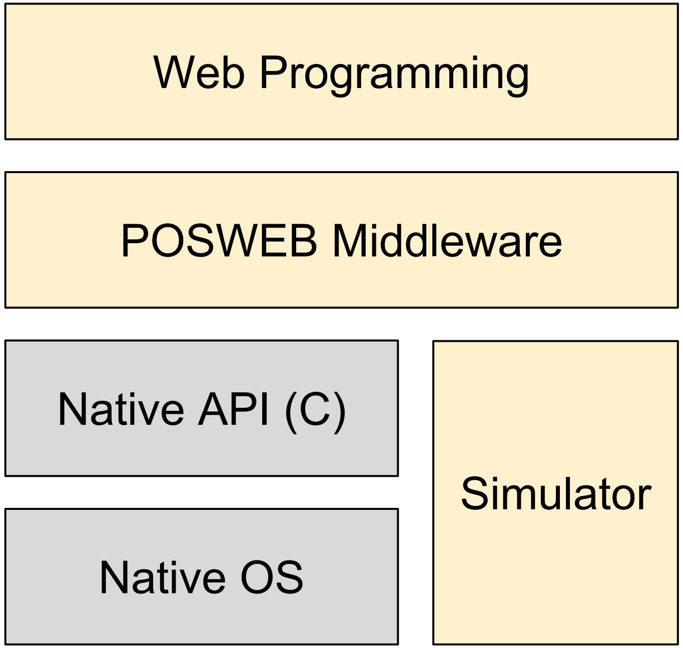
- Knowing OS is crucial for **programmers**
  - efficiency, security, effectiveness
- Great opportunity for new OS and applications

Where OS run?

- Term OS covers **many roles**
  - Because of **myriad designs** and uses of OSes

The Internet of Things

Example



Web Programming

POSWEB Middleware

Native API (C)

Native OS

Simulator

Example

Computer System Environments

Computing Environments

1. Traditional
2. Mobile
3. Client Server
4. Peer-to-Peer
5. Cloud computing
6. Real-time Embedded

Traditional

- Stand-alone **general-purpose** machines
- But blurred as most systems interconnect with others (i.e., the Internet)
- **Portals** provide web access to internal systems
- **Network computers** (**thin clients**) are like Web terminals
- Mobile computers interconnect via **wireless networks**
- Networking becoming ubiquitous – even home systems use **firewalls** to protect home computers from Internet attacks

Mobile

- Handheld smartphones, tablets, etc.
- Difference with “traditional”
  - Extra feature – more OS features (GPS, gyroscope)
- Allows new types of apps like ***augmented reality***
- Use IEEE 802.11 wireless, or cellular data networks for connectivity
- Leaders are **Apple iOS** and **Google Android**

Client Server

- Client-Server Computing
  - Dumb terminals supplanted by smart PCs
  - **Servers** responding to requests generated by **clients**
    - **Compute-server system:** interface to request services (i.e., database)
    - **File-server system:** interface to store and retrieve files

Peer-to-Peer

- Another model of **distributed** system
- P2P does not distinguish clients and servers
  - Instead **all nodes** are considered peers
  - May each act as **client, server or both**
  - Node must join P2P network
    - Registers with central lookup service
    - Broadcast request for service (***discovery protocol***)
  - Examples: Napster, Gnutella, Kazaa, **Voice over IP** (**VoIP**)

Cloud Computing

- Delivers computing, storage, even apps as a service across a network
- Logical extension of virtualization because it uses virtualization as the base for it functionality.
  - Amazon **EC2** has thousands of servers, millions of virtual machines, petabytes of storage available across the Internet, pay based on usage

Cloud Computing (Cont.)

- Many types
  - **Public cloud** – available via Internet to anyone willing to pay
  - **Private cloud** – run by a company for the company's own use
  - **Hybrid cloud** – includes both public and private cloud components
  - Software as a Service (**SaaS**) – one or more applications available via the Internet (i.e., word processor)
  - Platform as a Service (**PaaS**) – software stack ready for application use via the Internet (i.e., a database server)
  - Infrastructure as a Service (**IaaS**) – servers or storage available over Internet (i.e., storage available for backup use)

Cloud Computing (cont.)

- Cloud computing environments composed of traditional OSes, plus VMMs, plus cloud management tools
  - Internet connectivity requires security like firewalls
  - Load balancers spread traffic across multiple applications

Real-Time Embedded Systems

- Real-time embedded systems most prevalent form of computers
  - Vary considerable
  - Special purpose
  - Limited purpose OS
  - **Real-time OS**
  - Use expanding
- Real-time OS has well-defined fixed time constraints
  - Processing ***must*** be done within constraint
  - Correct operation only if constraints met

Free and Open-Source Operating Systems

- **Open source-code** format vs **closed-source** and **proprietary**
- Against **copy protection** and **Digital Rights Management** (**DRM**)
- Started by **Free Software Foundation** (**FSF**)
    - “**Copyleft**” vs **Copyright**
        - **GNU Public License** (**GPL**)
    - **Free software** vs **open-source**
      http://gnu.org/philosophy/open-source-misses-the-point.html/
- Examples: **GNU/Linux, BSD UNIX** (core of **Mac OS X**)
- Can use **VMware** Player (Free on Windows), **Virtualbox** (open source and free on many platforms - http://www.virtualbox.com)
    - Use to run guest operating systems for exploration

Operating System Definition

- No universally accepted definition
- "Everything a vendor ships when you order an operating system" is a good approximation
  - But varies wildly
- "The one program running at all times on the computer" is the **kernel,** part of the operating system
- Everything else is either
  - A ***system program*** (ships with the operating system, but not part of the kernel) , or
  - An ***application program***, all programs not associated with the operating system
- Today's OSes for general purpose and mobile computing also include ***middleware*** – a set of software frameworks that provide addition services to application developers such as databases, multimedia, graphics