

Operating System

CS-2006

Lecture 2

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Process Management

- Program
 - A **Passive entity is called the program.**
- Process
 - A program in running form is called the process.
 - Process is an active entity,
- Process need resources to accomplish a task like
 - CPU, I/O files and Data Initialization
- Process termination requires reclaim the any reusable resources

Security and protection

- Protection
 - any mechanism for controlling access of processes or users to resources defined by the OS
- Security
 - defense of the system against internal and external attacks
- Huge range, including denial-of-service, worms, viruses, identity theft, theft of service

Security and Protection (Cont..)

- Systems generally first distinguish among users, to determine who can do what
 - User identities (user IDs, security IDs) include name and associated number, one per user
 - User ID then associated with all files, processes of that user to determine access control
 - Group identifier (group ID) allows set of users to be defined and controls managed, then also associated with each process, file

Privilege escalation allows user to change to effective ID with more rights

Distributed System

- Collection of separate, possibly heterogeneous, systems networked together

heterogeneous computing system refers to a system that contains different types of computational units, such as multicore CPU, GPUs,

- Network is a communications path, TCP/IP most common
 - Local Area Network (LAN)
 - Wide Area Network (WAN)
 - Metropolitan Area Network (MAN)
 - Personal Area Network (PAN)

Network Operating System

- Network operating system is an operating system that provides *features such as file sharing across the network*, along with a communication scheme that allows different processes on different computers to exchange messages
- Functions of network operating system
 - Creating and managing user accounts on the network.
 - Controlling access to resources on the network.
 - Provide communication services between the devices on the network.
 - Monitor and troubleshoot the network.
 - Configuring and Managing the resources on the network.

Computer System Architecture

- Most systems use a single general-purpose processor
 - General purpose processors, also known as central processing units (CPUs), are processors that are designed to be capable of executing a wide range of tasks
- Most systems have special-purpose processors as well
 - special-purpose processor, (such as a DMA controller) performs a specific function.
- Multiprocessors systems growing in use and importance Also known as parallel systems,
 - tightly-coupled systems
 - (system architecture and computing method in which all hardware and software components are linked together)
- Advantages include:
 - Increased throughput (how many units of information a system can process in a given amount of time)
 - Economy of scale
 - Increased reliability (correctness)

Computing Environment

- Traditional
- Mobile
- Client Server
- Peer-to-Peer
- Cloud computing
- Real-time Embedded

Traditional System

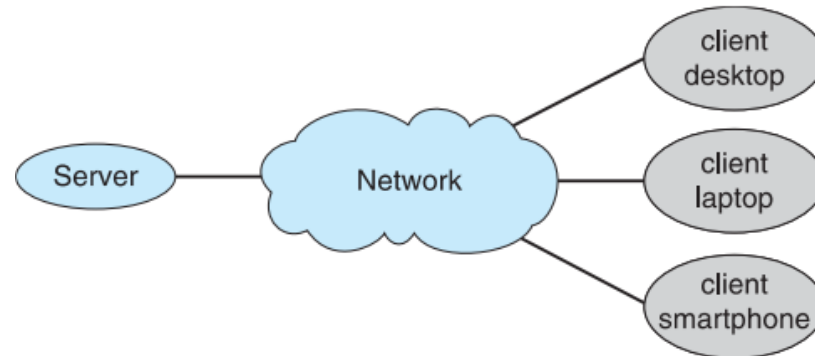
- Stand-alone **general-purpose machines**
- computer that is used on its own without requiring a connection to a local area network (LAN)
- Blurred as **most systems interconnect with others** (i.e., the Internet)
- Portals provide web access to internal systems
- Network computers (thin clients) are **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.
- What is the functional difference between them and a “traditional” laptop?
- 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

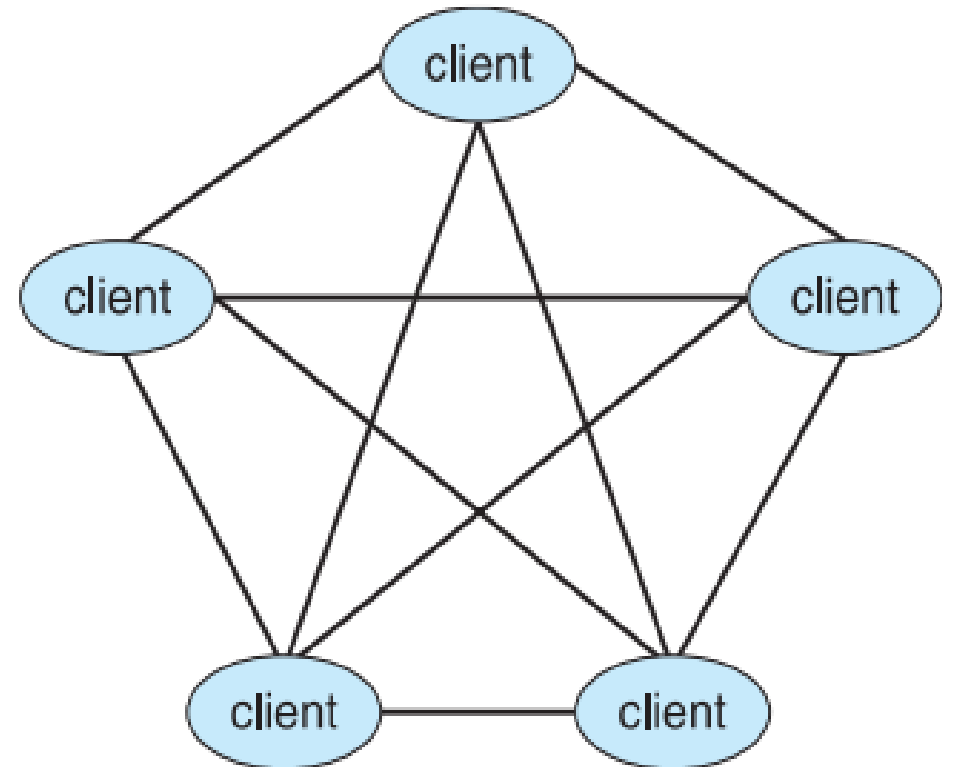
Client Server System

- Client-Server Computing
 - Many systems now servers, responding to requests generated by clients
 - **Compute-server** system provides an interface to client to request services (i.e., database)
 - **File-server** system provides interface for clients to store and retrieve files



Peer to Peer System

- 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 its service with central lookup service on network, or
 - Broadcast request for service and respond to **requests for service via discovery protocol**
- Examples include **Voice over IP (VoIP)** such as Skype



Cloud Computing

Cloud computing is the delivery of different services through the *Internet, including data storage, servers, databases, networking, and software.*

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

Cloud Computing

- **Three types of cloud computing**

1. **Private cloud**

- run by a company for the company's own use
- Example: VMware

2. **Public Cloud**

- available via Internet to anyone willing to pay
- AWS (Amazon Web Services)

3. **Hybird Cloud**

- includes both public and private cloud components
- Nutanix Cloud Clusters, VMware Cloud Foundation

Cloud Computing (Cont...0

Software as a Service (SaaS) (use it)

One or more applications available via the Internet

Example: word processor

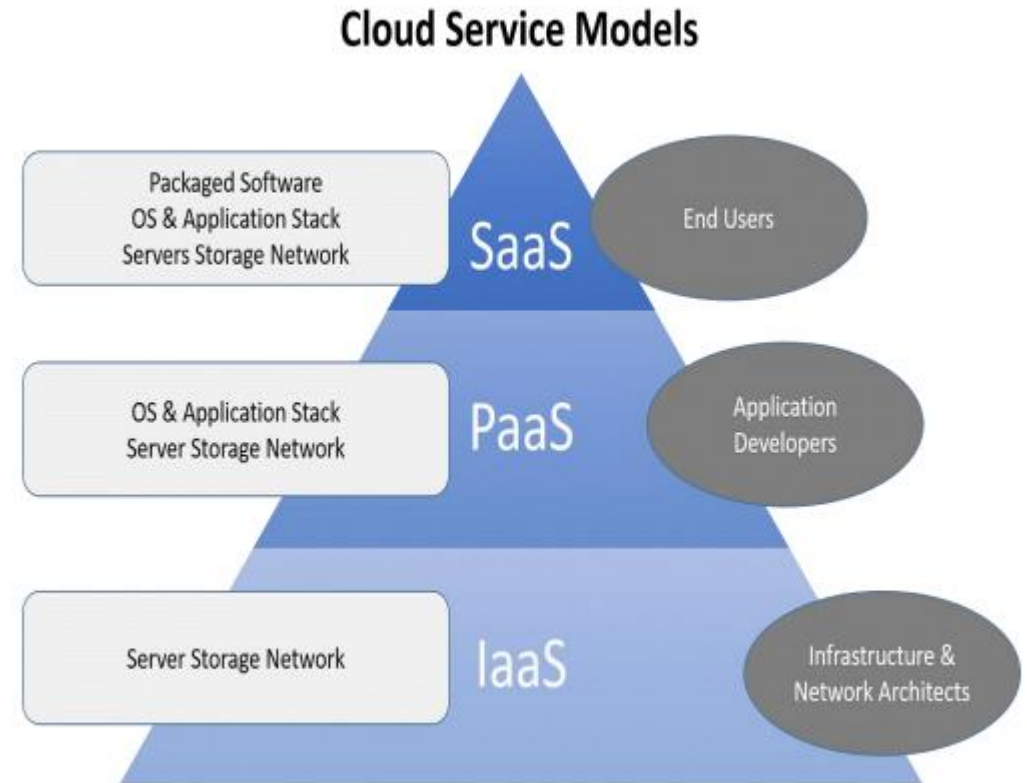
Platform as a Service (PaaS) (Build with it)

Software stack ready for application use via the Internet

Example: database servers

Infrastructure as a Service (IaaS) (Move to it)

Servers or storage available over Internet
storage available for backup use



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
- Many other special computing environments as well
 - Some have OSe, some perform tasks without an OS
- Real-time OS has well-defined fixed time constraints
 - Processing must be done within constraint
 - Correct operation only if constraints met