CHANDIGARH UNIVERSITY

Discover. Learn. Empower.

UNIVERSITY INSTITUTEOF ENGINEERING

Bachelor of Engineering (Computer Science & Engineering)

Operating System (20CST/ITT-313)

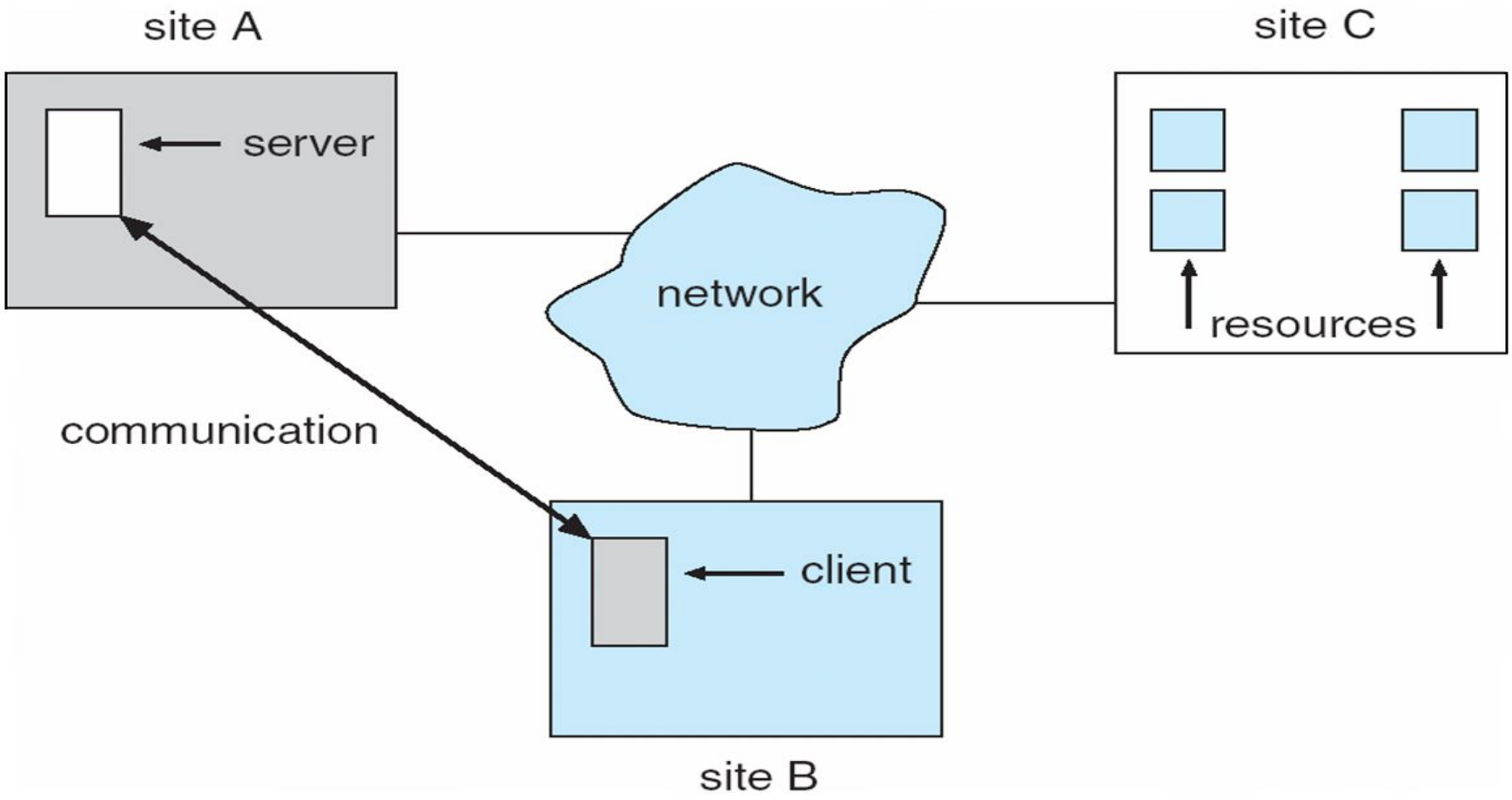
Subject Coordinator: Er. Puneet Kaur(E6913)

Distributed and Network Operating Systems

Introduction

- **Distributed system** is collection of loosely coupled processors interconnected by a communications network
- Processors variously called *nodes, computers, machines, hosts*
  - *Site* is location of the processor
- Reasons for distributed systems
  - Resource sharing
    - sharing and printing files at remote sites
    - processing information in a distributed database
    - using remote specialized hardware devices
  - Computation speedup – **load sharing**
  - Reliability – detect and recover from site failure, function transfer, reintegrate failed site
  - Communication – message passing

A Distributed System



Types of Distributed Operating Systems

- Network Operating Systems
- Distributed Operating Systems

Network-Operating Systems

- Users are aware of multiplicity of machines. Access to resources of various machines is done explicitly by:
  - Remote logging into the appropriate remote machine (telnet, ssh)
  - Remote Desktop (Microsoft Windows)
  - Transferring data from remote machines to local machines, via the File Transfer Protocol (FTP) mechanism

Distributed-Operating Systems

- Users not aware of multiplicity of machines
  - Access to remote resources similar to access to local resources

- Data Migration – transfer data by transferring entire file, or transferring only those portions of the file necessary for the immediate task

- Computation Migration – transfer the computation, rather than the data, across the system

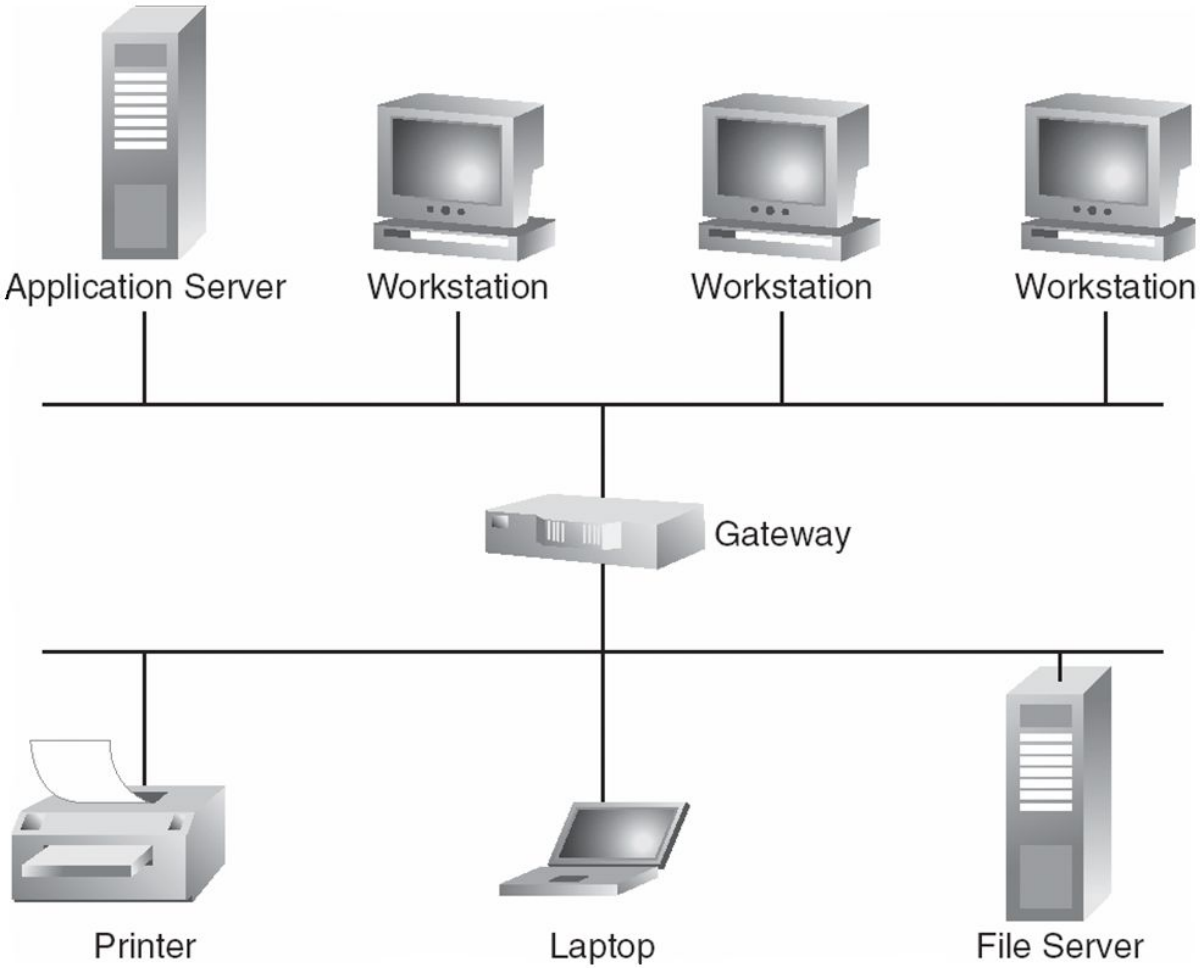
Distributed-Operating Systems (Cont.)

- Process Migration – execute an entire process, or parts of it, at different sites
  - **Load balancing** – distribute processes across network to even the workload
  - **Computation speedup** – subprocesses can run concurrently on different sites
  - **Hardware preference** – process execution may require specialized processor
  - **Software preference** – required software may be available at only a particular site
  - **Data access** – run process remotely, rather than transfer all data locally

Network Structure

- **Local-Area Network** (**LAN**) – designed to cover small geographical area.
  - Multiaccess bus, ring, or star network
  - Speed ≈ 10 – 100 megabits/second
  - Broadcast is fast and cheap
  - Nodes:
    - usually workstations and/or personal computers
    - a few (usually one or two) mainframes

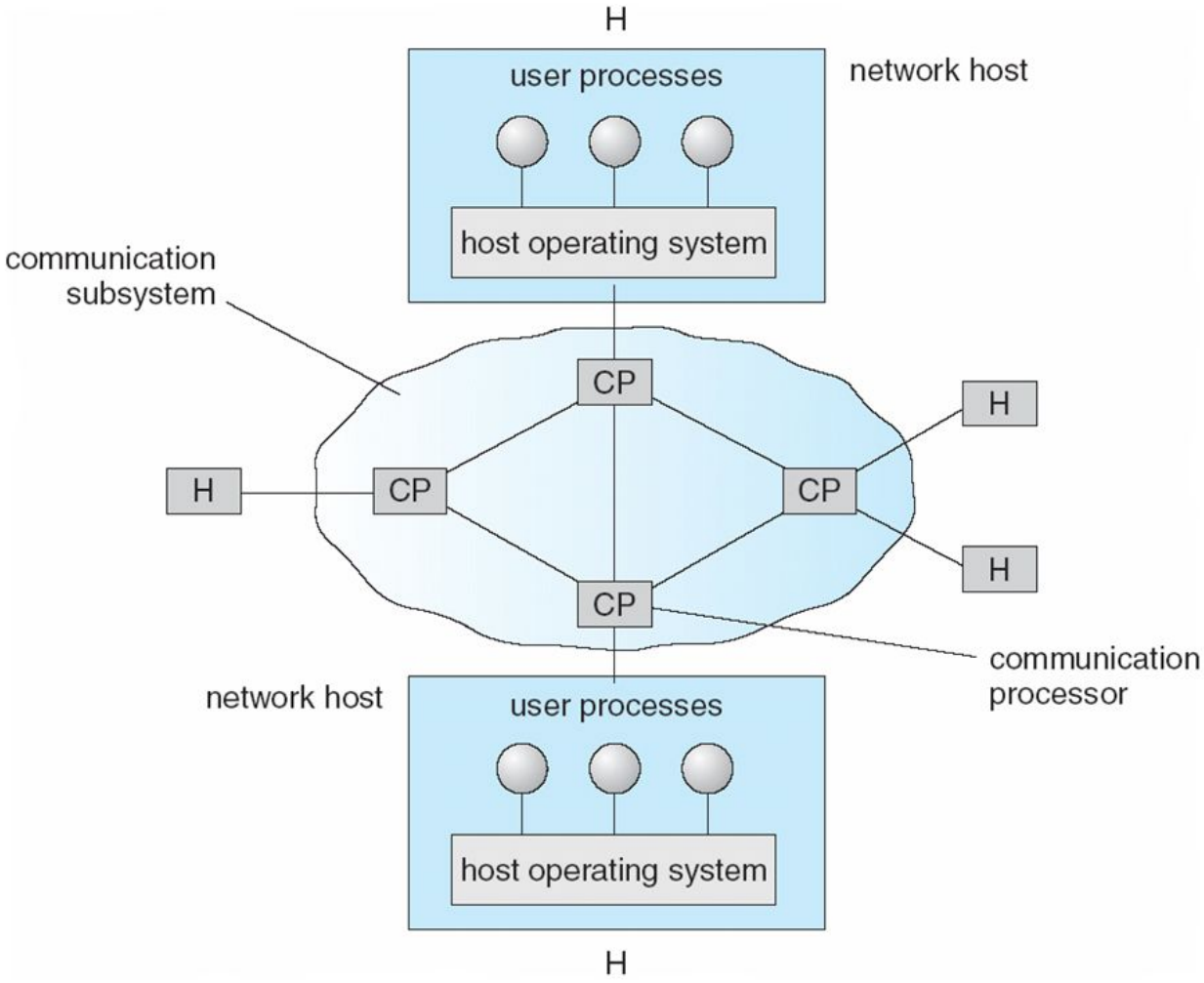
Depiction of typical LAN



Network Types (Cont.)

- **Wide-Area Network** (**WAN**) – links geographically separated sites
  - Point-to-point connections over long-haul lines (often leased from a phone company)
  - Speed ≈ 1.544 – 45 megbits/second
  - Broadcast usually requires multiple messages
  - Nodes:
    - usually a high percentage of mainframes

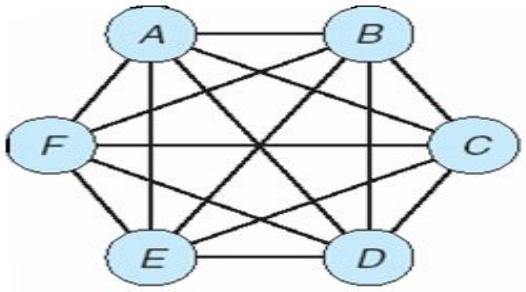
Communication Processors in a Wide-Area Network



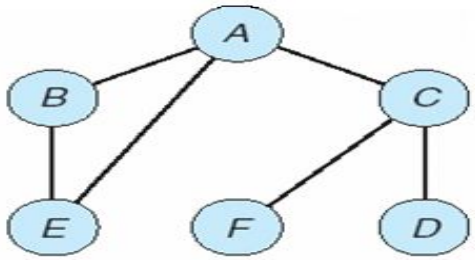
Network Topology

- Sites in the system can be physically connected in a variety of ways; they are compared with respect to the following criteria:
  - **Installation cost** - How expensive is it to link the various sites in the system?
  - **Communication cost** - How long does it take to send a message from site *A* to site *B*?
  - **Reliability** - If a link or a site in the system fails, can the remaining sites still communicate with each other?
- The various topologies are depicted as graphs whose nodes correspond to sites
  - An edge from node *A* to node *B* corresponds to a direct connection between the two sites
- The following six items depict various network topologies

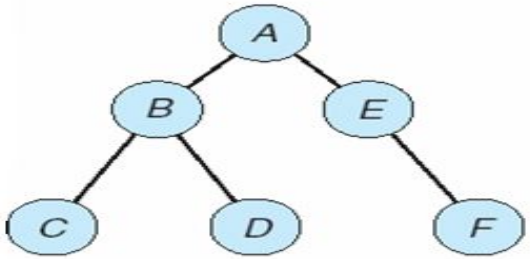
Network Topology



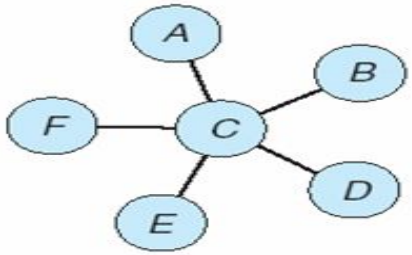
fully connected network



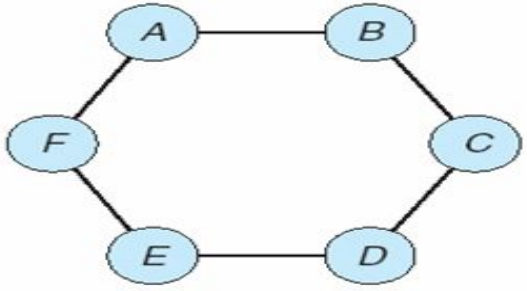
partially connected network



tree-structured network



star network



ring network

Video Links

https://www.youtube.com/watch?v=MtrcTjJfWSY

https://www.youtube.com/watch?v=-OTP2O-UHhI

References

- https://www.unf.edu/public/cop4610/ree/Notes/PPT/PPT8E/CH15-OS8e.pdf
- https://www.tutorialspoint.com/operating_system/os_security.htm
- https://www.coursehero.com/file/19323929/Operating-System-Threats-and-Vulnerabilities/
- https://www.cs.uic.edu/~jbell/CourseNotes/OperatingSystems/15_Security.html
- https://devqa.io/security-threats-attack-vectors/
- https://www.geeksforgeeks.org/system-security/
- https://www.javatpoint.com/os-security-management