



Data Communications and Networking

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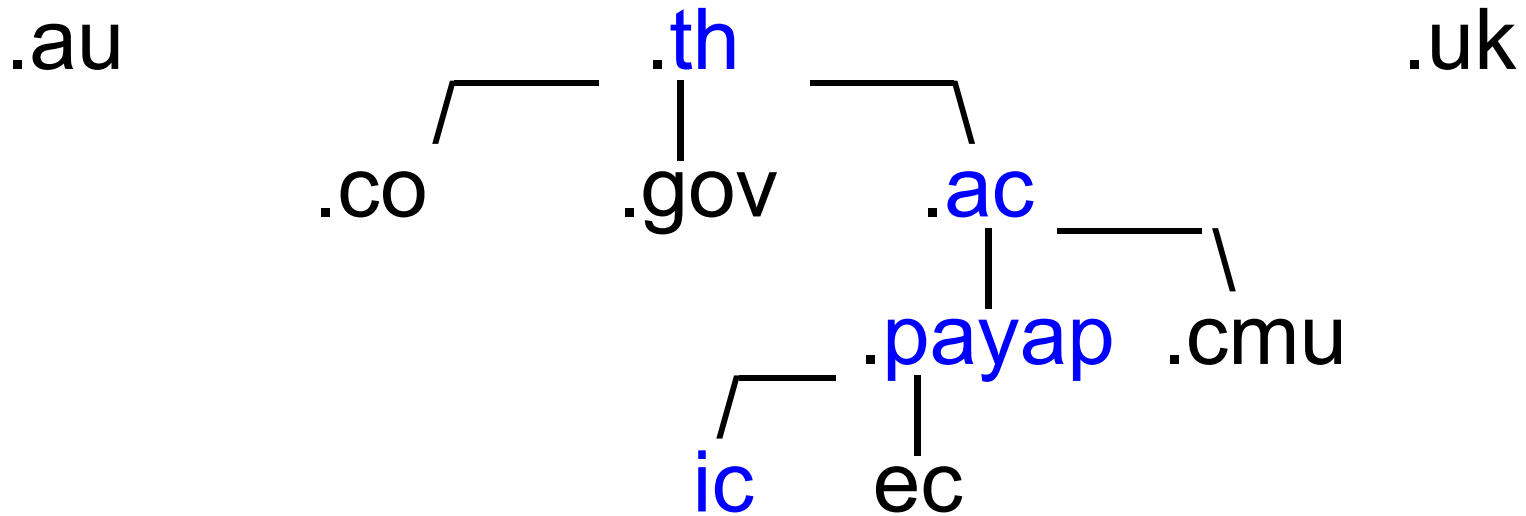
Peer-to-Peer & Client/Server Networks

- Local Area Networks can be organised in a number of different ways.
- We have already looked at physical layout (cables) and topology.
- Another way to organise and categorise LANs is using hierarchy.

Hierarchy:

- *a series of ordered groupings within a system, ranked according to their importance or value*

Example of Name Hierarchy



ic.payap.ac.th

Peer-to-Peer

- Peer-to-peer networks are by their nature **non**-hierarchical.
 - A **peer** is a computer that is equal to another computer (equal importance, equal function)
- A peer-to-peer network is a LAN whose computers participate in similar roles, and are therefore peers to each other.
- Peer-to-peer is thought of as a **decentralized** network architecture.

Peer-to-Peer Networks

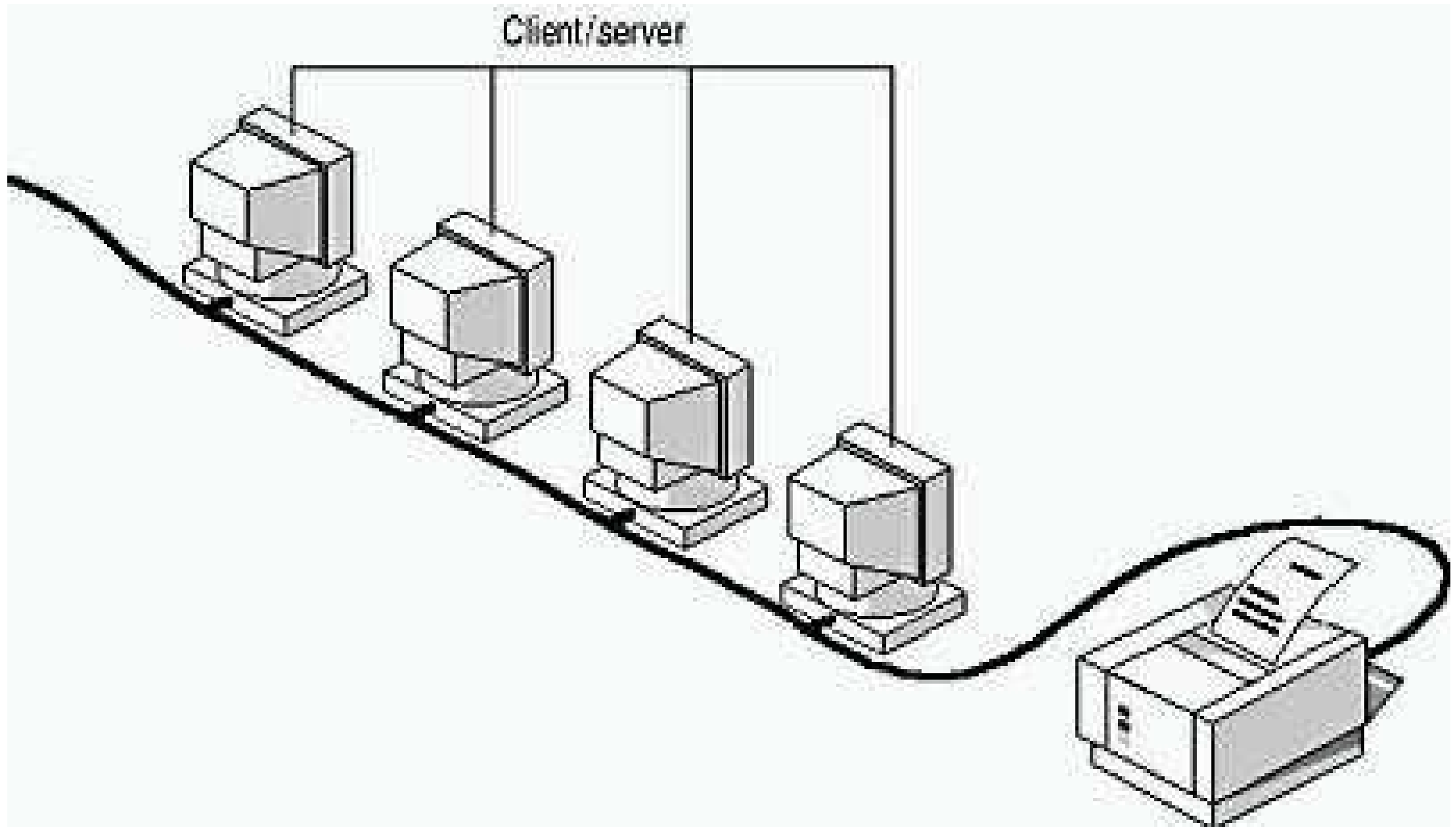
- In its simplest form, a peer-to-peer network is created when two or more computers are connected and share resources.
- Each computer acts as a **Client** and a **Server**.
 - Clients access remote services on other computers.
 - Servers share resources to other computers.
- Neither computer is more important than the other. Both computers control access and security to resources on their own hard drive.

Peer-to-Peer Networks

- A peer-to-peer network can be a temporary connection. For example a couple of computers connected to transfer files.
- A peer-to-peer network also can be a permanent infrastructure that links a half-dozen computers in a SOHO* network. These computers may share folders/files on each others hard drives and share a printer.

* SOHO = Small Office / Home Office

SOHO Peer-to-Peer Network



SOHO Peer-to-Peer Network

Advantages:

- Computers are located at users' desks.
- Users act as their own administrators and plan their own security.
- Computers in the network are connected using a simple LAN topology.
- Cheap (don't need to buy dedicated servers)

SOHO Peer-to-Peer Network

Disadvantages:

- Weak security.
- No centralised planning/control (software upgrades, anti-virus, illegal software, etc.)
- All computers must be on all the time.
- Not easily expandable.

When to use Peer-to-Peer

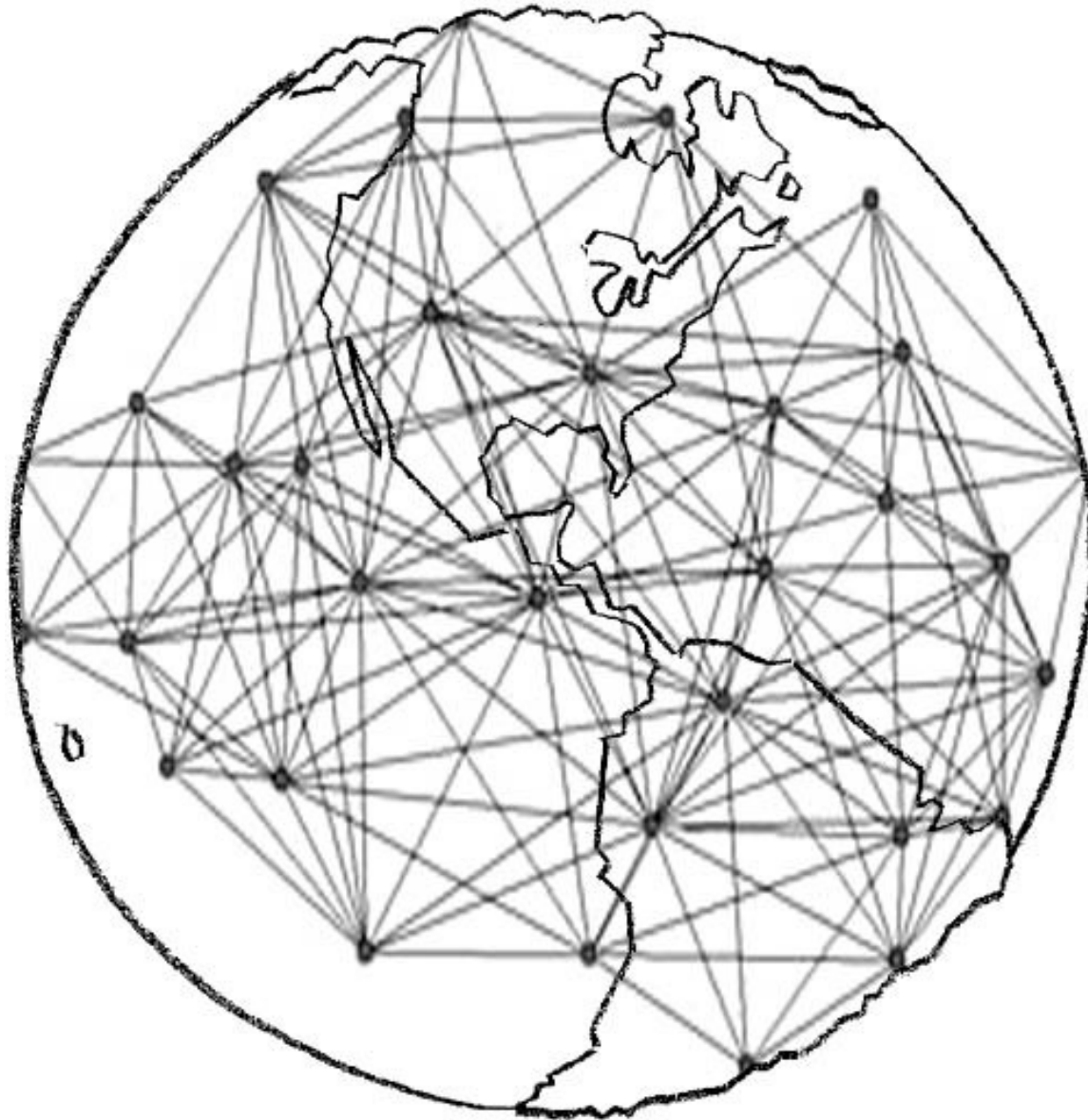
Peer-to-peer networks are good choices for environments where:

- There are 10 users or fewer.
- Users share resources, such as files and printers, but no specialized servers exist.
- Security is not an issue.
- The organization and the network will experience only limited growth within the foreseeable future.

Global Peer-to-Peer Networks

- A peer-to-peer network can also be a network on a much larger scale (world wide!).
- These networks use special protocols and applications to set up direct relationships among users over the Internet.
- These are called P2P networks and are popular as a way to share files without using a central storage location.
- On a P2P network all computers can:
 - store files
 - search for files
 - share/serve files
 - download files

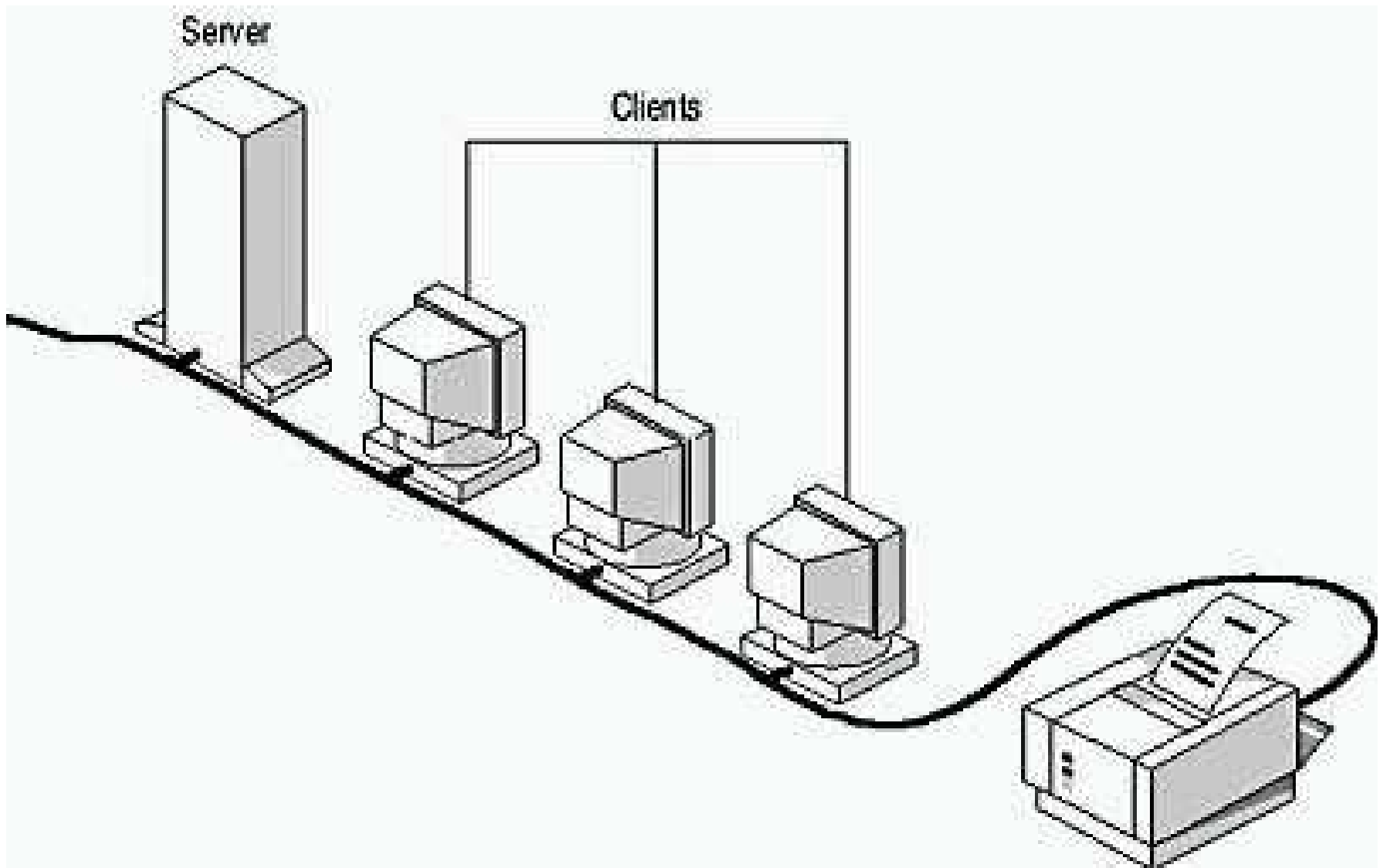
Global P2P Networks



Client/Server Networks

- In a peer-to-peer network with 10 or more computers acting as both servers and clients it becomes difficult to manage and maintain.
- In situations with 10 or more computers it is usual to install one or more **Dedicated Server**.
 - A Dedicated Server is a computer that functions just as a server and is not used as a desktop computer.
 - Dedicated Servers are not clients and are configured to service requests from network clients quickly and efficiently.

Client/Server Network



Server Types

- File servers
- Print servers
- Database servers
- Application servers
- Web servers
- Mail servers
- Directory Services servers

File Server

- A file server replaces the need to have documents stored and shared on client computers
- It provides a central point of access for all computers
- It allows sharing and security of who can read/write/delete the documents
- Only this server computer needs to remain turned on to allow file access to all clients
- A single backup policy can be configured

Print Server

- A print server can queue multiple print jobs at one time without slowing down someone's client computer.
- It can monitor/log who printed what and when.
- It can be configured with accounts to charge specific customers for different print jobs

Database Servers

- A centralised database is usually installed on a database server.
- Similar to a file server in that it provides access to the data to all clients.
- Database servers run DBMS software.
- DBMS – Database Management System
- More secure than client based data
- A single backup policy can be configured

Application Servers

- Software applications, usually for specific purposes, that run on a server rather than on individual client computers.
- Applications servers provide the memory, storage and processing and return the results to the client.
- Application servers are used a lot in “Thin Client” networks – these are networks that have client computers with reduced hardware (for example: no hard drive, small processor etc.)

Web Servers

- These are servers that store and serve web pages.
- The web servers may be networked to the Internet to provide a public web site.
- Web servers can be connected to a LAN only. These provide an Intranet (private web site).
- Web servers can include server-side modules that are able to access database servers and send the results back to clients as web pages.

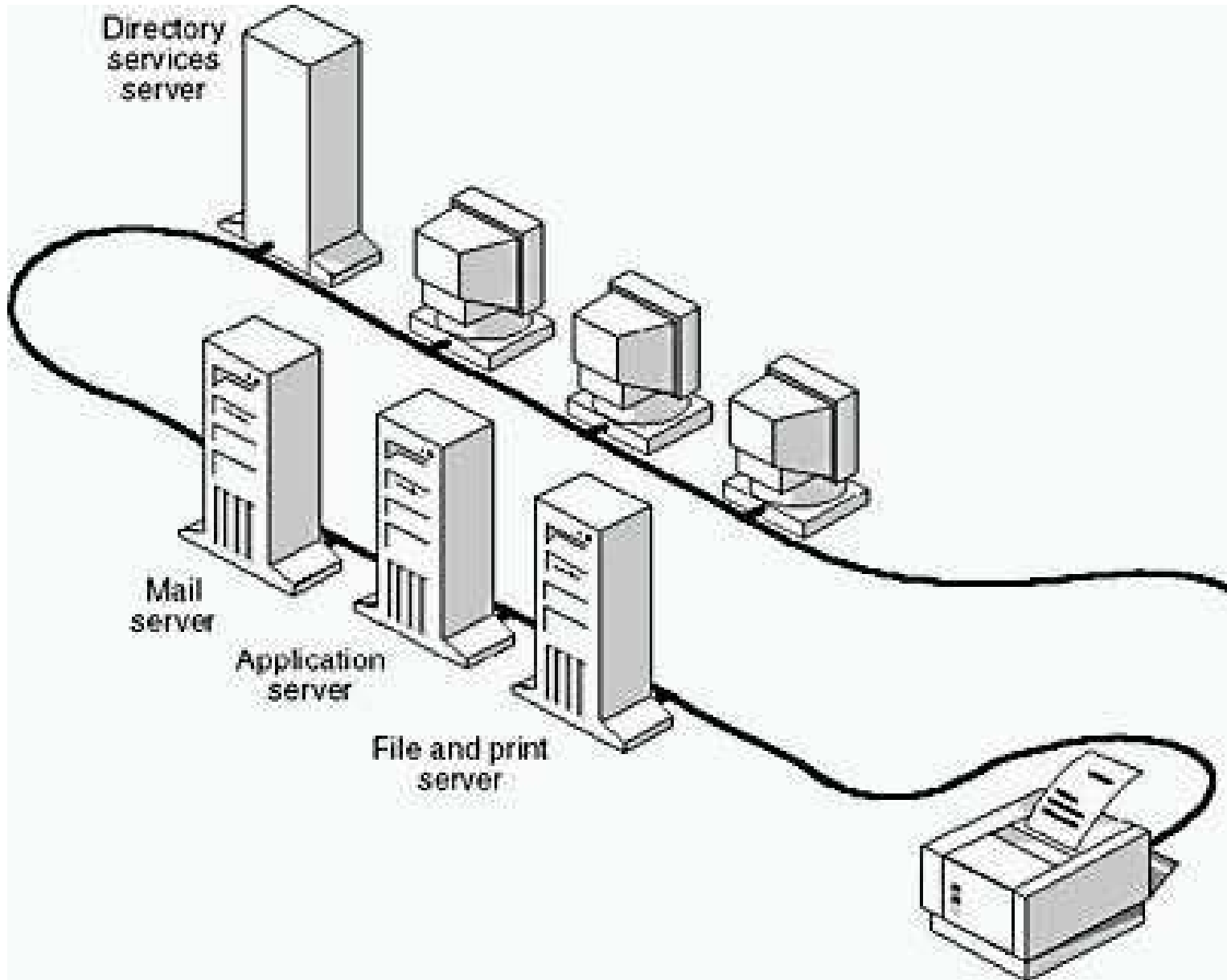
Mail Servers

- Mail servers operate like application servers.
- The mail server software acts as a post office, collecting emails and sending it to the correct client computers.
- When a client sends an email, it is uploaded to the mail server which forwards it to the appropriate mail server on the destination address.

Directory Services Servers

- Directory services servers enable users to locate, store, and secure information on the network.
- Many client/server networks combine computers into logical groupings (called **Domains**) that allow any user on the network to be given access to any resource on the network.
- This provides centralised management of the **Domain** and control of user accounts and security.

Client/Server Domain



NOS

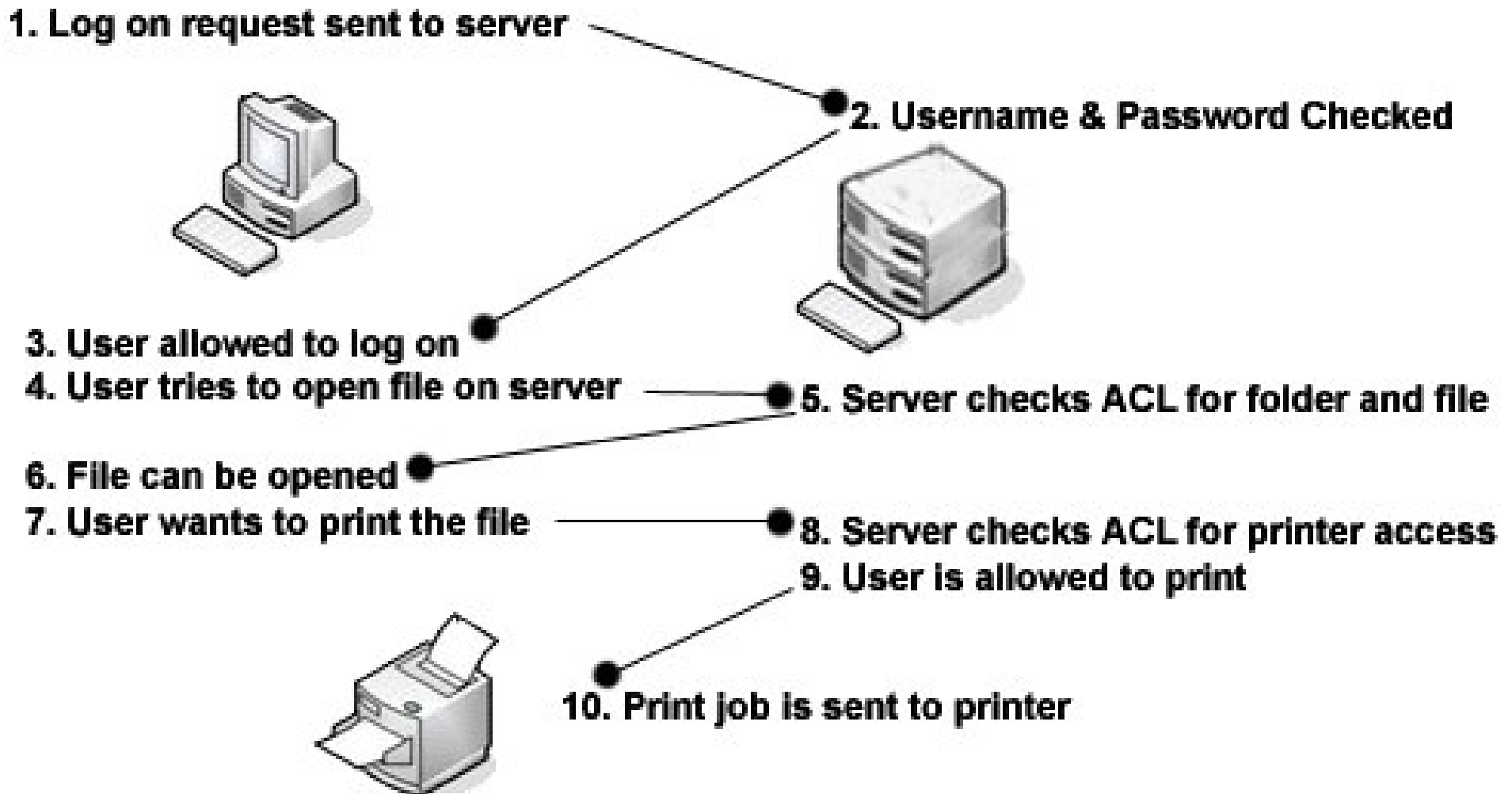
Network Operating Systems

- The software that connects all the devices on a network so that resources can be shared and files can be transferred.
- It handles administration of all network functions.
- Network operating systems are usually in two parts; server and client.

NOS

- The server part of a NOS can have any/all of the dedicated server types we have studied.
- In addition it will provide centralised account / logon authentication.
- Authentication of users based on accounts gives centralised security and administration.
- Access Control Lists (ACL) are maintained by the server NOS to control access to any resources on the domain (files, printing, Internet, applications, installation, etc.)

NOS Client/Server Interaction



Common Server/Client NOS

Server

- Windows 2000 server
- Windows 2003 server
- Windows 2008 server
- MAC OS X server
- Novell Netware server

Client

- Windows 2000 pro
- Windows XP pro
- Windows Vista
- MAC OS
- Netware client on:
 - Windows Clients
 - MAC Clients
 - Linux Clients
 - Sun Solaris workstations