

# Lecture 4: Information Networks

## 1) LAN, WAN

*Understand the terms, local area network (LAN), wide area network (WAN).  
Understand the term client/server.*

### 1.1 Networks

A set of computers connected together so that they can communicate is called a computer network. This involves installing **network cards** in each computer. Each computer is then connected through cabling to a central device called a **hub**. Operating systems contain components that are dedicated to the task of enabling computers to communicate over a network. This software makes use of special rules of communication called **protocols**. There are many different types of protocols used for a variety of purposes. The most commonly used protocol for establishing and maintaining communication across a network is called **TCP/IP** or **Transmission Control Protocol / Internet Protocol**.

### 1.2 Client-server and peer-to-peer networks

Networks on which all computers have equal status are called **peer-to-peer** networks.

On most networks, certain computers have special dedicated tasks. Since these machines provide **services** to other computers, they are called **servers**. The computers that make use of the services or servers are called **clients** or **workstations**. A network such as this is called a **client-server** network.

A server which is used for the central storage of files is called a **file server**. Using a file server, users can access their work from anywhere on the network. They can also make these files available to users on other computers. File servers also enable users to co-operate on a task by centralizing the results of their work.

A computer attached to a printer which users can access is called a **print server**. Having a single printer rather than a printer attached to each computer obviously saves capital.

An increasingly important type of server is an **applications server**. In the case of applications servers, application packages are not installed on the workstations but on the applications server.

A **communications server** is a computer dedicated to connecting a network to the outside world. These are often called **proxy servers**.

As the case of print servers illustrates, one of the values of having a network is that it enables **resources to be shared**.

### **1.3 LAN**

A **LAN** or **Local Area Network** is a group of computers within the same building, or within a group of buildings that are in close proximity, that are connected together.

### **1.4 WAN**

A **WAN** or **Wide Area Network** is a group of widely dispersed computers that are connected together. These could be across the same town, or across a country or even across the world. Apart from distance, the other feature that distinguishes a WAN from a LAN is that the WAN would make use of a range of communication technologies such as telephone, microwave and satellite links.

*List some of the advantages associated with group working such as: sharing printers, applications, and files across a network.*

### **1.5 Advantages of sharing printers and files**

A peer-to-peer network is where two or more computers are linked together in order to share information and hardware.

It is a major advantage to be able to share printers, plotters and scanners. When computers are networked together, there can be many pc's sharing a printer as opposed to each one having to have its own printer which is much costlier.

It is also possible to share data files across the network by creating a share on the hard drive and allowing other people access to that information.

If you want to share applications you would need to investigate a client/server network solution and some of the advantages are listed below.

### **1.6 Advantages of file servers**

- Users can access their work from any workstation connected to the network.
- Users can easily exchange work with colleagues.
- Users can easily co-operate on tasks.
- Backing up is centralized and can be placed under the control of experts who will follow the correct procedures.

### **1.7 Advantages of print servers**

- Instead of having printers attached to each computer, printers only need be purchased for the print servers. This results in financial savings.
- As there are fewer printers to look after, there is lower maintenance.
- As far fewer printers need to be purchased better quality printers with advanced features can be purchased.

### **1.8 Advantages of applications servers**

- Software only needs to be installed on the applications server instead of each workstation.
- The software is configured in the same way for all users.
- Upgrading of software only needs to be done on the server.
- Cost of licensing software for an applications server is less than the cost of many stand-alone versions.
- Centralizing applications software simplifies the process of implementing software policies in an organization. Software policies refer to what software may be installed on computers and how it may be used.

### **1.9 Advantages of proxy servers**

Proxy servers contain a repository of internet sites recently visited and cached for quicker access at a future date.

- Proxy servers can be configured with **firewall** software. This helps protect the network from attack by hackers.

- Files can be filtered for computer viruses before being passed on to the network.
- Organizations can control access of users to outside sites.
- Since there is only one point of communication, there is a large saving on line costs.

## **2) Internet, Intranet, Extranet**

*Understand what an intranet is and understand the distinction between the Internet and an intranet.*

### **2.1 Internet**

The internet is the collection of all computers across the world which can access each other in some way. The links between computers might include telephone, fiber optic cable, radio, microwave or satellite. Today tens of millions of computers are able to access each other. The Internet has no central organization which controls its use. Because the Internet knows no borders, many governments have tried to control the flow of information across the Internet. However, communications technology is so varied and so widespread that this is a near impossible task.

### **2.2 Intranet**

An intranet is similar to the Internet in operation. However, it is limited to an organization. Users may browse computers within an intranet using a browser but will usually not be able to access the wider Internet. In the same way, outsiders will not be able to access the intranet of an organization. An intranet can be thought of as a private Internet.

*Understand what an extranet is and understand the distinction between an intranet and an extranet.*

### **2.3 Extranets**

An **extranet** is an extension of an organization's intranet to include outside users. In an extranet, outside organizations or individuals are allowed access to certain parts of the intranet. This access is usually controlled by means of passwords and access rights. These restrict which users can access the extranet and what they can do once they have access. The purpose of the extranet is to facilitate business transactions with other organizations.

### 3) The Internet

*Understand what the Internet is and know some of its main uses.*

The Internet was described in section 2.1.

Some of its main uses are to:

- Integrate the operations of multinational corporations.
- Provide access to and share information and databases.
- Transfer and share files between computers.
- Facilitate business transactions.
- Share resources.
- Promote scientific co-operation between research institutions.
- Provide a communications channel for the military.

*Understand what the World Wide Web (WWW) is and distinguish it from the Internet.*

#### **World Wide Web**

The **World Wide Web** or **WWW** is a part of the Internet. The WWW consists of all the sites that can be accessed using a **web browser** such as Mozilla, Chrome, Microsoft Edge, Netscape, Internet Explorer or Opera. In order for a browser to access a web site, the web site must contain files that have a particular format constructed using **HyperText Markup Language** or **HTML**. These sites are developed using special web development applications. It is possible to create simple web sites using a word processor by saving the document in HTML format.

The HTML documents are stored as **web pages** on special servers known as **web servers**. These run special web server software such as **Apache Web Server** or **Internet Information Services**.

The WWW enables the free flow of information across the world. Developments in technology have made access easier and faster. As a result, the WWW also became known as the **Information Superhighway**.

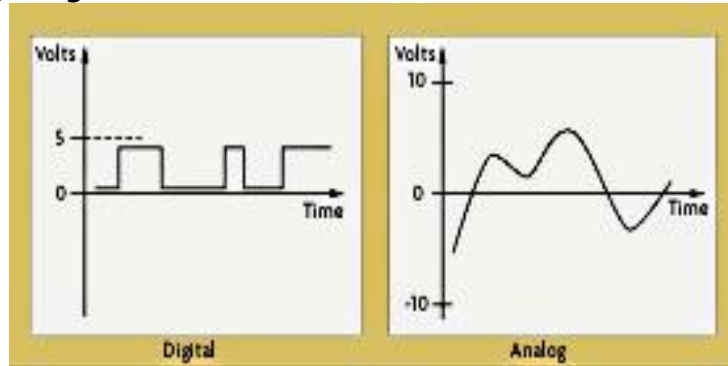
Most of the activities listed under the Internet in the previous section are now actually carried out using the Internet. In other words, the sites are created in HTML, or a similar format, are installed on web servers and are accessed by web browsers.

## 4) Signals (Analog vs. Digital)

Understand the terms analogue, digital, modem, transfer rate, (measured in bps – bits per second).

### 4.1 Analogue signals

Analogue signals are used on the Public Switched Telephone Network (PSTN) as well as for normal AM and FM radio transmissions. An analogue signal is one which varies continuously as, for example, in ordinary speech. An analogue signal has a graphical form as shown in the following diagram.



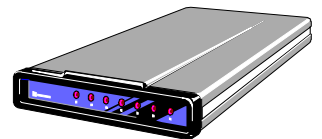
### 4.2 Digital signals

Digital signals are two state signals corresponding to a switch which is on or off. The same two state signal can also represent TRUE and FALSE or 1 and 0.

Graphically a digital signal is represented as in the diagram above.

### 4.3 Modems

A **modem** or **modulator-demodulator** is a device connected between a computer and a telephone line. Its function is to convert the digital signals of the computer into a form suitable for transmission over a telephone line. It must also do the reverse and convert the telephone line signals into a form suitable for the computer.



### 4.4 Data transfer rates

Each 1 or 0 that is transferred is referred to as a **bit**. The speed of a data transfer is measured by the number of bits that can be transferred

each second or **bps** (bits per second). This is also sometimes called the **baud rate** or **bandwidth**.

High speed lines have their speed measured in Mbps or Gbps.

1 kbps = 1 024 bps (roughly 1 000 bps)

1 Mbps = 1 024 kbps = 1 048 576 bps (roughly 1,000,000 bps)

1 Gbps = 1024 Mbps = 1,073,741,824 bps (roughly 1,000,000,000 bps)