**Temasek Junior College**

**2023 JC2 H2 Computing**

**Networking 1 – Network Basics**

## 1 Introduction

A **network** is a group of devices connected together so they can communicate with each other and share resources.

Networks can vary hugely in terms of size and complexity. At one end of the scale, you create a network when you create a hotspot with your mobile phone, maybe to connect your laptop when you are away from home. At the other end of the scale is the internet, an ever-expanding global network connecting many billions of devices.

## 2 Reasons to Use a Network

The purpose of a communications system is to **allow the exchange of data between two entities**. There are many different communication systems, for example, text message, email, instant messaging, internet telephony etc. All of these systems require networks.

The table below gives the advantages and disadvantages of networking:

| Advantages | Disadvantages |
|---|---|
| • Shared resources: A network allows a group of computers to make use of shared resources such as printers or files.<br>• Shared Internet access: Depending on the network's configuration, every user who logs on to the network may have access to the Internet.<br>• Shared software: Software can be stored on the central server of a network and deployed to other computers over a network.<br>• Shared storage: Data files can be stored on a central server for ease of access and backup purposes.<br>• Communication: Computers in the same network are often able to share instant messages and emails for communication. | • Initial costs: Installing a network could be costly due to the high setup and equipment costs.<br>• Maintenance costs: There are also subsequent costs associated with administering and maintaining the network.<br>• Security risks: As files are shared through a network, there is the risk of virus or worm attacks spreading throughout the network even with just one infected computer.<br>• Risk of data loss: Data may become lost due to hardware failures or errors. Using a network means regular data backups are needed.<br>• Server outage: If the server fails, the network will not be able to function, thus affecting work processes. |

## 3 Types of Network – Classified by Geographical Size

There are many different types of network, classified by geographical size:

- A personal area network (PAN) is the term given to connected devices that are located within a few metres of each other.
- A local area network (LAN) is a single network that is located in a small geographical area such as someone's home, an office, or to cover a school site.
- A wide area network (WAN) is a network that connects two or more networks over a wider geographical area.

### 3.2 Personal Area Network (PAN)

A personal area network (PAN) is used to connect personal devices over a very small area. The most common technology used is Bluetooth, which uses short-range radio signals, and limited transmission power, giving it a very short range of up to 10 metres.

You will create a PAN when you connect a smart watch to a mobile phone, or a wireless headset to your laptop.

### 3.2 Local Area Network (LAN)

A Local Area Network (LAN) is a network of computing devices connected within a small geographical area, typically within the same building, such as a home, school or office.

The network may consist of a number of PCs, other devices such as printers and scanners, and a central server. Users on the network can communicate with each other, as well as sharing data and hardware devices such as printers and scanners.

Due to the small number of connections supported and the close proximity of the devices, LANs typically provide faster data transfer than the other networks.

One characteristic of a local area network is that the infrastructure (cabling and network communication devices) will be owned and maintained by the organisation (or they may employ someone to do this for them).

The benefits of computers connected by LAN:

- The expense of installing application software on each individual PC could be saved by installing the software on an application server attached to the LAN instead.
- A file server could be attached to the LAN that allowed users to store larger files and also allowed files to be shared between users.
- Instead of supplying individual devices such as printers to be connected to a user's PC, one or more printers could be attached to a print server that was connected to the LAN; these could be higher quality printers.
- Digitization of documents and emails to be stored in file servers made possible.

### 3.3 Wide Area Network (WAN)

A Wide Area Network (WAN) is a network of computing devices covering a large-scale geographical area, typically across multiple geographical locations. A WAN generally consists of multiple smaller networks such as LANs.

There are many examples of WANs, such as a bank connecting all of its cash machines together across the country, or regional police stations connecting together to share information. The largest example of a WAN is the internet.

Many wide area networks will make use of telecommunication links owned and managed by other companies. Organisations that run their own WANs will often lease bandwidth from telecommunications companies. Technologies exist to allow different organisations to transmit securely across shared or public communication links.

The benefits of computers connected by WAN:

- a 'job' could be run on a remote computer that had the required application software
- a data archive that was stored on a remote computer can be accessed
- a message could be transmitted electronically to a user on a remote computer

### 3.4 Comparison between LAN and WAN

| **LAN** | **WAN** |
|---|---|
| Covers small geographic areas and can be used by an organization to connect devices within a site or branch | Covers broad areas and can be used by an organization to connect different sites and branches |
| The transmission medium is twisted pair cabling or Wi-Fi | The transmission medium is generally fibre-optic cabling |
| Faster data transfer rate, because they span less distance and have less congestion. | Slower data transfer rate |
| Design and maintenance is easy | Design and maintenance is difficult |
| Might be cheaper compared to WAN | Might be more costly compared to LAN |