

Cambridge Ordinary Level Notes
Computer Science 2210

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1 Data transmission

1.1 Types and methods of data transmission

- 1.1.1. (a) *Understand that data is broken down into packets to be transmitted*
 (b) *Describe the structure of a packet*
 (c) *Describe the process of packet switching*

A data packet consists of the following:

- Packet header: Consisting of three further pieces of information:
 - Destination address: Address of the recipient of the packet.
 - Packet number: A number used reshuffle the packets back into sequence.
 - Originator's address: Address of the sender.
- Payload: Consisting of the actual data contents of the packet.
- Trailer: Consists of some data required in error checking, and a signal to indicate the ending of the packet.

- 1.1.2. (a) *Describe how data is transmitted from one device to another using different methods of data transmission*
 (b) *Explain the suitability of each method of data transmission, for a given scenario*

The methods of data transmission can be largely separated into two, based on amount of data transmitted and direction of data being transmitted. Based on amount of data transmission:

- Serial: Data is transmitted *one bit at a time, down a single wire*. Such transmission is time consuming, but safer in that data will always arrive in order and has less chance of being skewed as, due to the fewer amount of wires, there is less chance of interference. The usage of a single wire also makes this method relatively less expensive.
- Parallel: Data is transmitted *multiple bits at a time, down multiple wires*. Here, due to there being multiple wires and each of them transmitting at different speeds, data does not always arrive in order and may even be skewed due to interference across long distances. Yet, the fact that data travels parallelly, makes the transmission faster. However, the usage of multiple wires makes parallel transmission expensive. Internally, a computer transmits in parallel, so transmitting in parallel requires no extra processing for conversion.

Based on direction of data transmission:

- Simplex: Data is transmitted in *only one direction*.

- Half duplex: Data is transmitted in *both directions, but not at the same time*.
- Duplex: Data is transmitted in *both directions at the same time*.

1.1.3. *Understand the universal serial bus (USB) interface and explain how it is used to transmit data*

The universal serial bus (USB) is an industry standard of data transmission. Flash drives, mouse connectors are all subsets of this interface. Advantages of the USB interface follow:

- A USB cable fits only one way, meaning no wrong connections can be made.
- USB transmission is relatively high, so data can be transferred quickly.
- Since USB is an industry standard, a USB port is included on almost all devices.
- USB insertion is always automatically detected, which begins the installation of required drivers.
- USB connections can also be used to power a device, which can be used to charge devices (mobile phones).

Conversely, the disadvantages of the interface are:

- The length of a USB cable is always limited, upto 5 metres.
- The transmission speed for USB, though it is high, it is not as high ethernet.

1.2 Methods of error detection

1.2.1. *Understand the need to check for errors after data transmission and how these errors can occur*

During transmission, due to factors such as interference, errors may arise in the data transmitted, such as loss of data, gain of data and change of data. Using data with errors will cause problems, hence data must be checked for errors.

1.2.2. *Describe the processes involved in each of the following error detection methods for detecting errors in data after transmission: parity check (odd and even), checksum and echo check*