Data Transmission

Parallel Transmission

This is **multiple wires** sending a number of bits at the same time.

This is used in buses in the CPU but can only be used for **short distances** due to interference.

This is much **faster** than serial transmssion, but may have **synchronization problems**.

Serial Transmission

Bits are sent **serially** across a single wire.

This is used for **longer distances** and is frequently used in computer cables.

There are three types of serial transmission:

1. Simplex - Transmission in one direction only.

2. Half-Duplex - Transmission in both directions, but only one at a time.

3. Full-Duplex - Transmission in both directions simultaneously.

Bandwidth

Bandwidth is the amount of data that can be transmitted at a time along a **single communication channel**.

This is related to the **range of frequencies** available on the carrier wave.

Multiplexing

Multiplexing involves combining more than one signal through a single communications channel.

When the signal reaches its destination, it has to be **demultiplexed** or **demuxed**. This involves decoding the multiplexed signal to extract the original data.

Inverse multiplexing breaks one data stream into several data streams to be sent seperately over multiple chnanels, where it can be re-assembled at the destination.

Bit Rate

The **speed** at which a transmission is taking place. This is proportional to **bandwidth**, since bandwidth can determine how many bits can be transmitted at a time.

This is measured in **bits per second** or **bps**.

Baud Rate

One **baud** represents one electronic state change per second.

In a system where one bit is sent per each state change, **one baud** would equate to **one bit per second**.

However, it is possible to store multiple voltages as representing **combinations of bits**.

For example, **1Hz** might represent "**1010**", **2Hz** might represent "**1111**", etc.

This way the number of state changes can remain constant while bits per second increases.

Types of Switching

Circuit Switching

This is when a specific route of switches is determined and data is sent only down that specific path. This path is maintained for the duration of the transmission.

Packet Switching

Data is split into **packets**. Each packet contains **data**, the **source address**, the **destination address**, and a **checksum**.

Each packet may take a different route around the network.

This means that if one computer fails, the message can still be sent. Also, it is more difficult to intercept.