

Chapter 5 – Distributed Elements

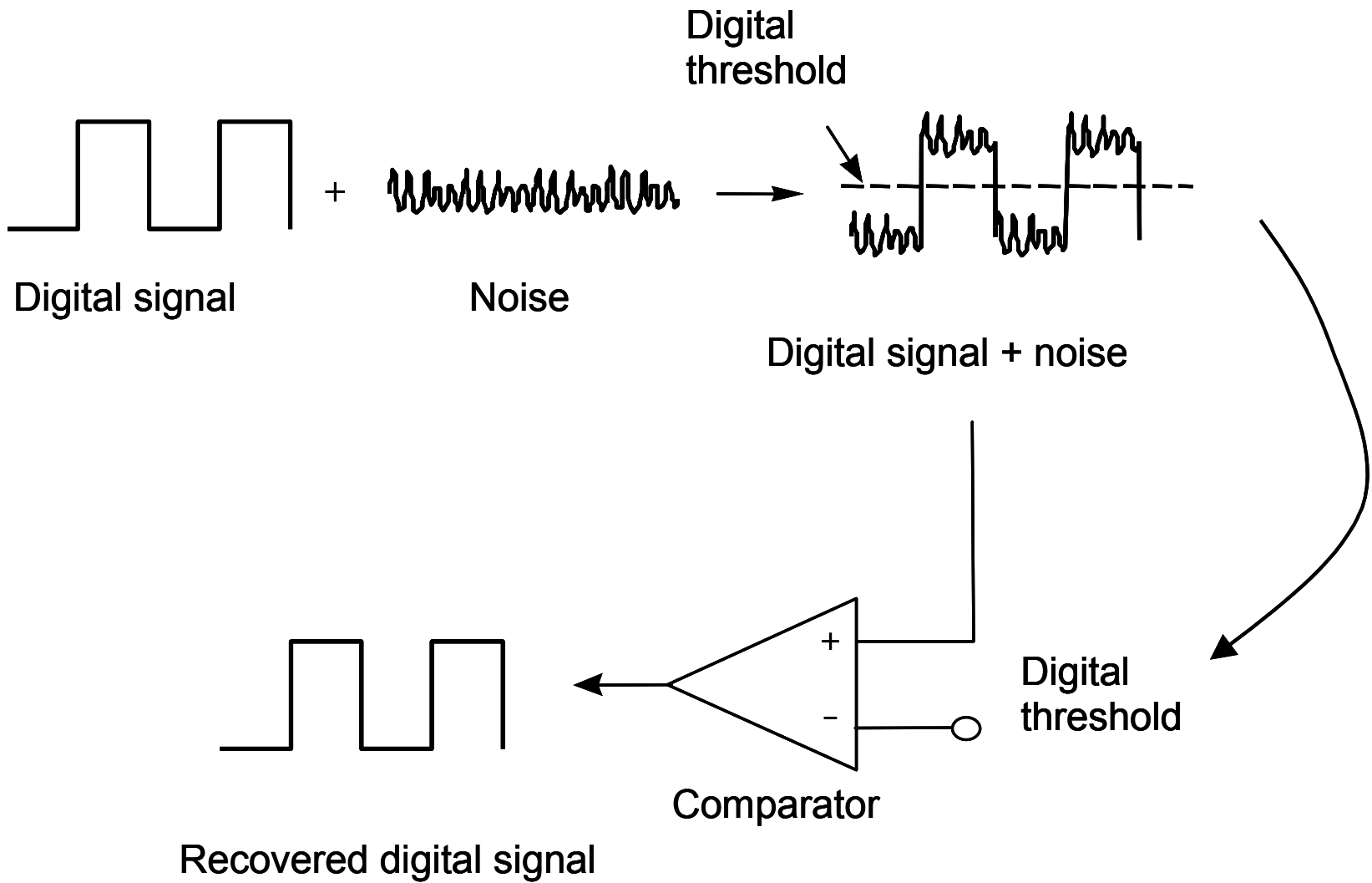
Aims:

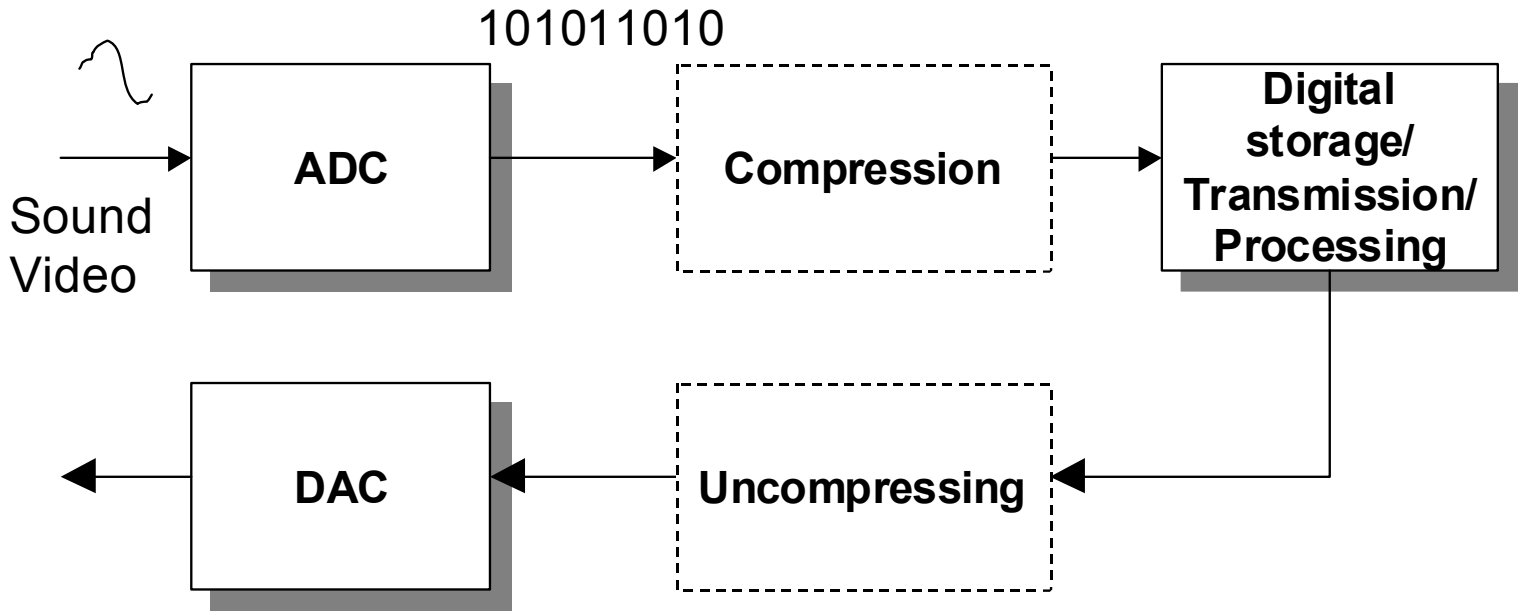
- ▶ Define some of the basic elements of a communication system.
- ▶ Contrast analogue and digital systems.
- ▶ Define differing communication channels.
- ▶ Define client-server and peer-to-peer connections.

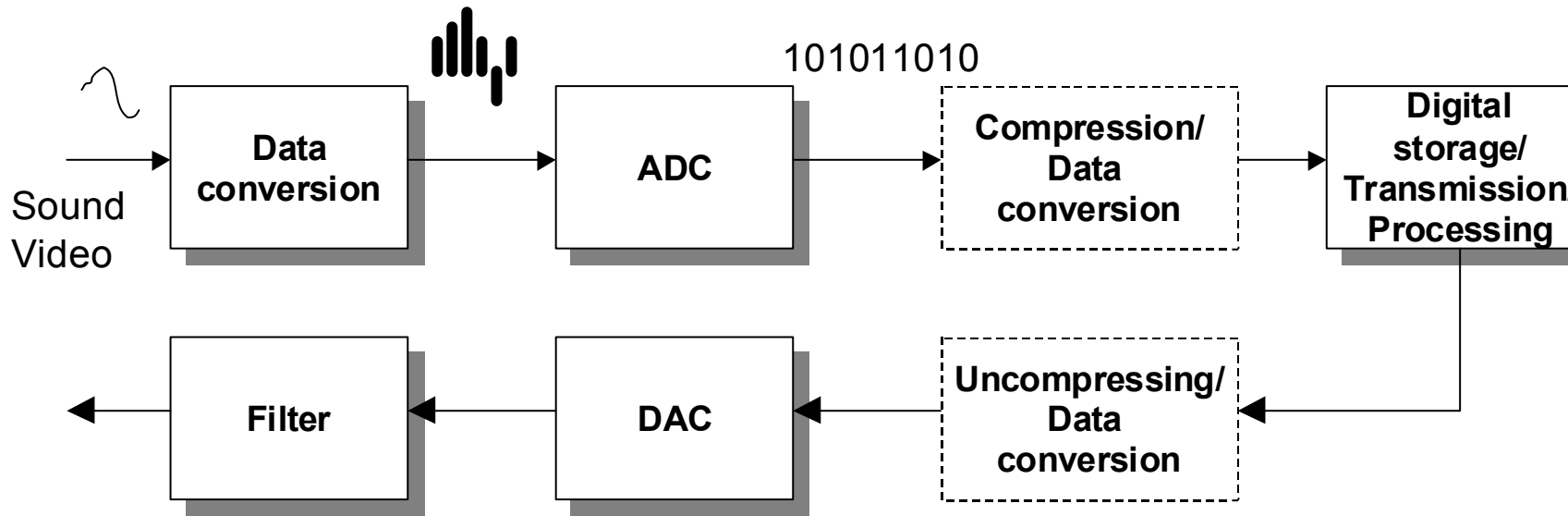


- **More dependable and predictable.** A digital system has a more dependable response, whereas an analogue system's accuracy depends on its operating parameters and its design characteristics such as its component tolerance, its operating temperature, power supply variations, and so on.
- **Easier to upgrade.** Digital systems are more adaptable and can be reprogrammed with software. Analogue systems normally require a change of hardware for any functional changes (although programmable analogue devices are now available). This makes upgrades and bug fixes easier, as all that is required is a change of software.

- **Less susceptible to noise.** Digital data is less affected by noise. Noise is any unwanted signal and has many causes, such as static pick-up, poor electrical connections, electronic noise in components, cross-talk, and so on. It makes the reception/storage of a data more difficult and can produce unwanted distortion on the received/stored data.
- **Less error prone.** Extra information can be added to digital data so that errors can either be detected or corrected.
- **Digital data tends not to degrade over time.**
- **Easier processing.** Processing of digital data is relatively easy, either in real time (on-line processing) or non real time (off-line processing).
- **Easier to store.** A single type of storage media can be used to store many different types of information (such as video, speech, audio and computer data being stored on tape, hard disk or CD-ROM). This is more difficult in an analogue media. For example in an analogue environment, images are stored on photographic paper, video and audio are stored on magnetic tape, temperatures are stored as numerical values, and so on.





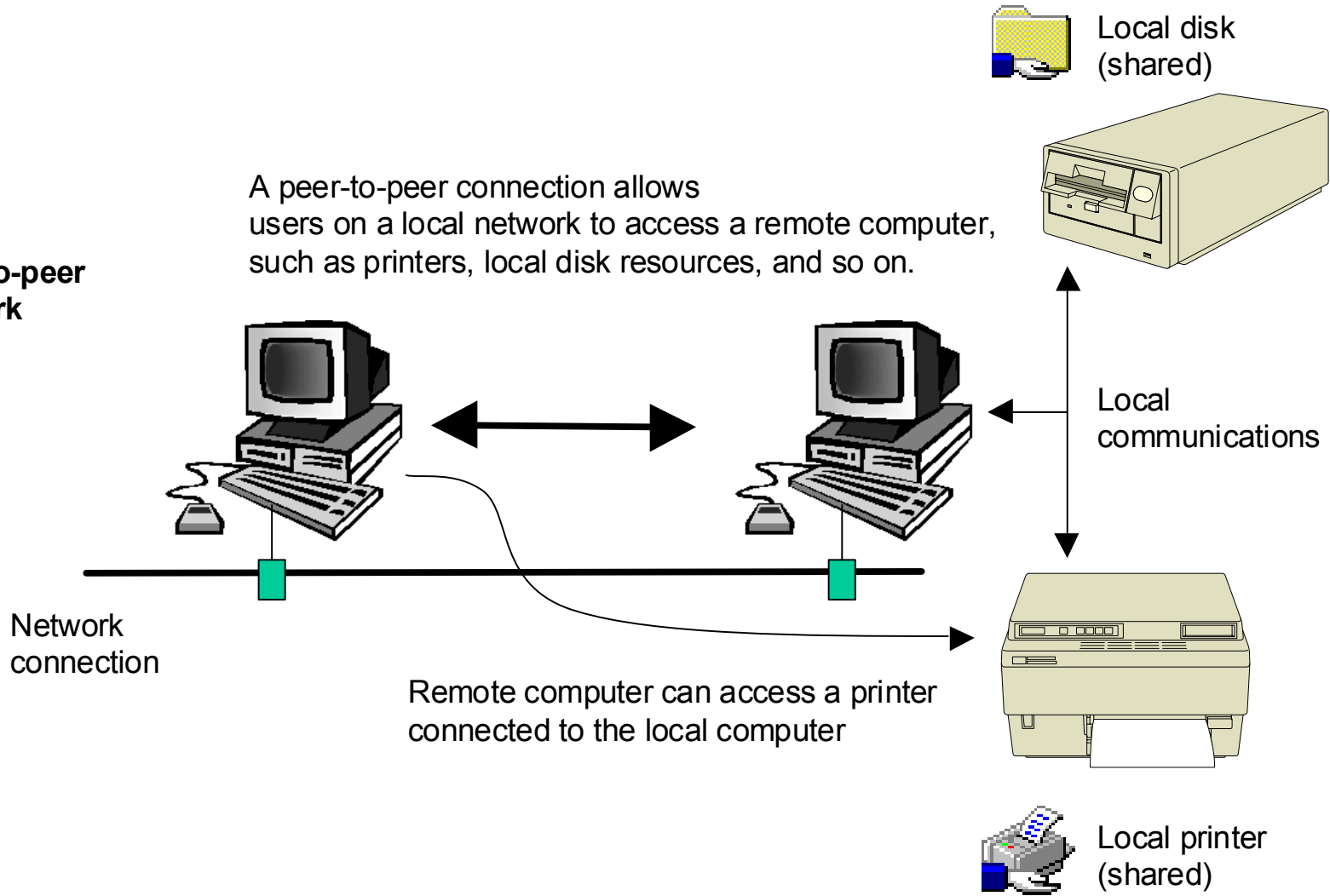


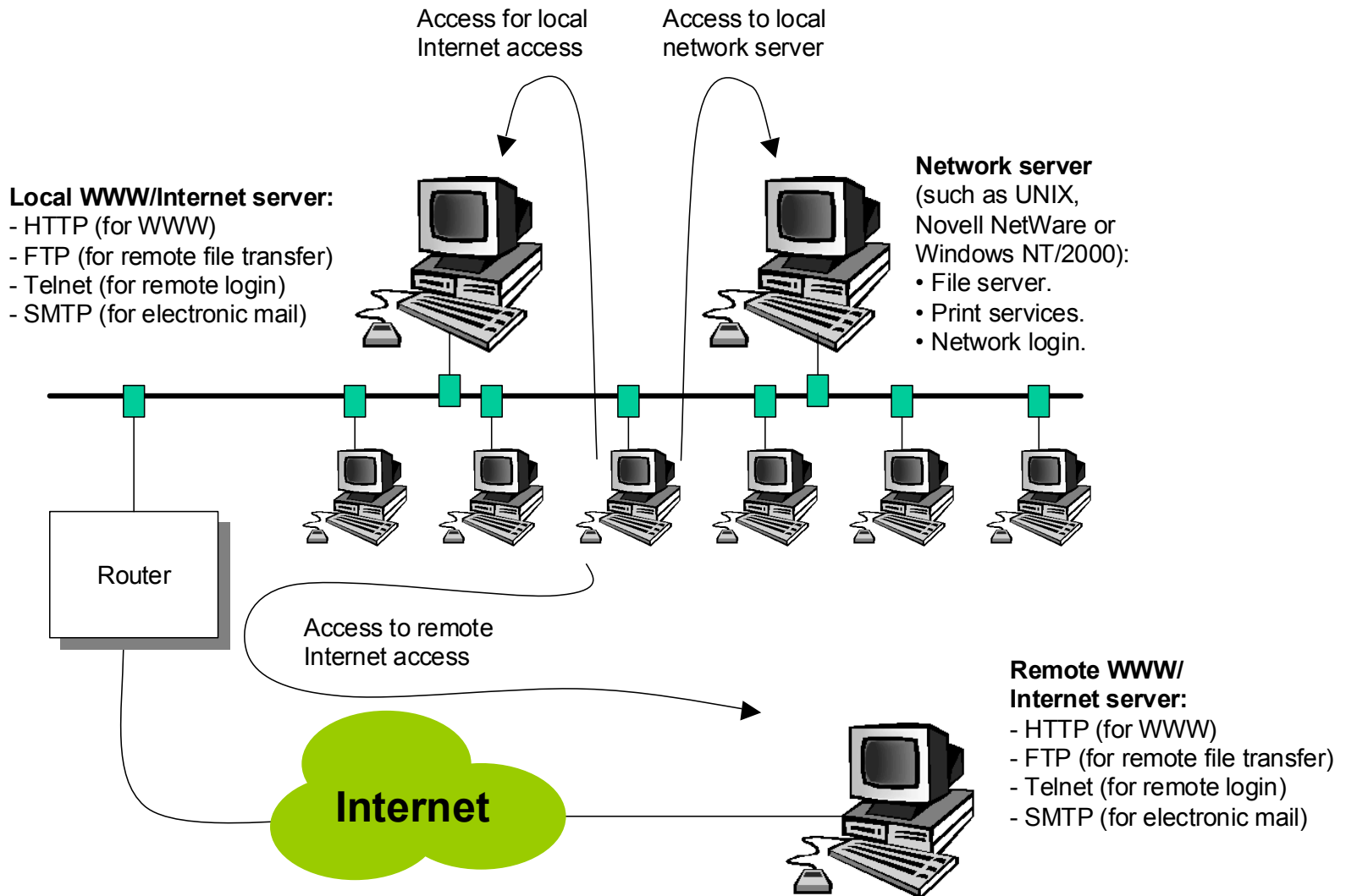
- **Radio waves.** The lower the frequency of a radio wave the more able it is to bend around objects.
- **Microwaves.** Microwaves have the advantage over optical waves (light, infrared and ultraviolet) in that they propagate reasonably well through water and thus can be transmitted through clouds, rain, and so on.
- **Infrared.** Infrared is used in optical communications, and allows for a much greater amount of data to be sent, than radio and microwaves. It is possible to get many billions of bits to be transmitted, in each second.
- **Light.** Light is the only part of the electromagnetic spectrum that humans can 'see' (although we can feel the affect of infrared radiation on the air around us).
- **Ultraviolet.** As with infrared, ultraviolet is used in optical communications (typically with fibre optic communications).

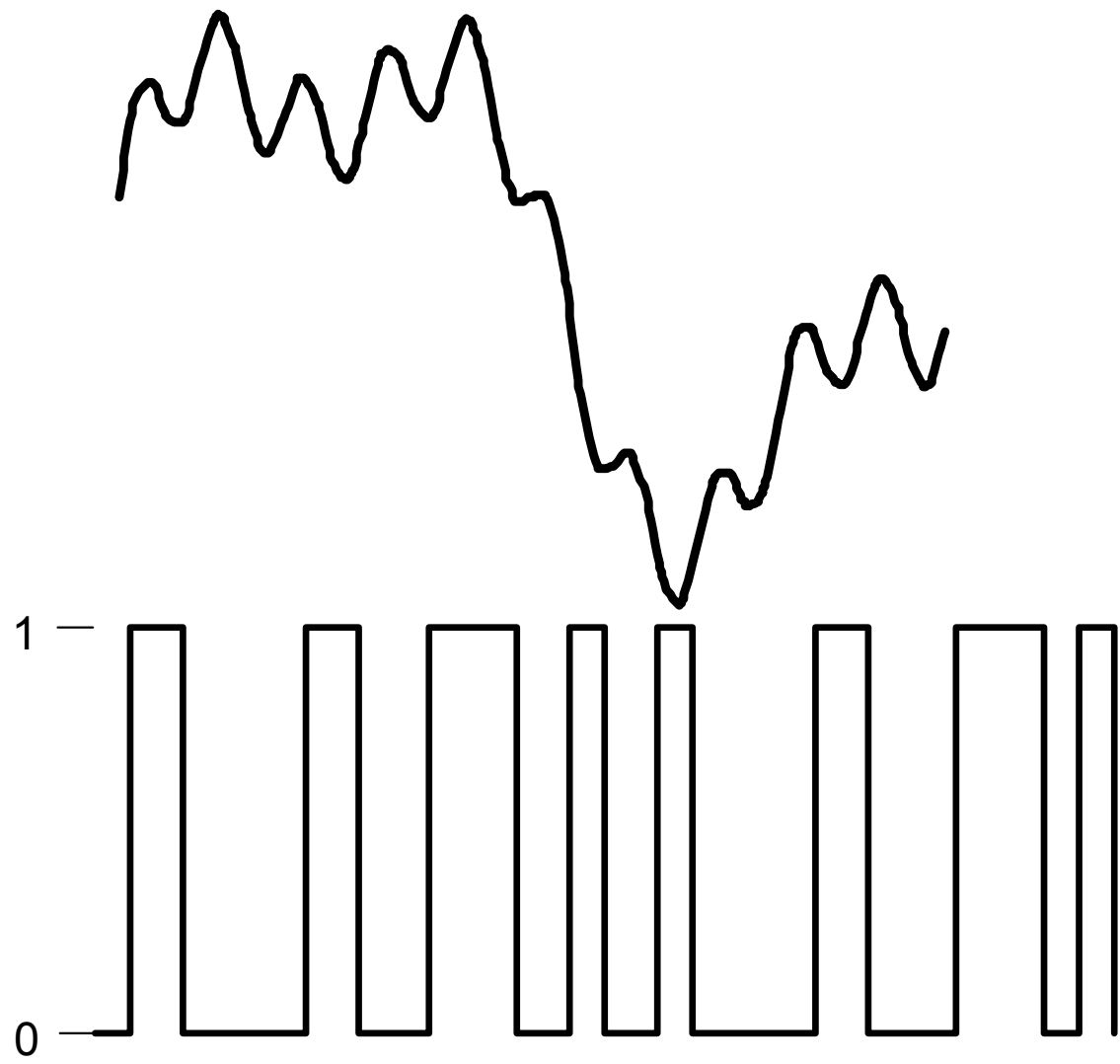
- The **reliability** of the cable, and the maximum **length** between nodes.
- The possibility of electrical **hazards**, and the **power** loss in the cables.
- Tolerance to **harsh** conditions, and **expense** and general **availability** of the cable.
- Ease of **connection** and **maintenance**, and the ease of **running** cables, and so on.
- The signal **bandwidth**. The amount of information that can be sent directly relates to the bandwidth of the system, and typically the main limitation on the bandwidth is the channel between the transmitter and the receiver. With this, the lowest bandwidth of all the connected elements defines the overall bandwidth of the system (unless there are alternative paths for the data).

Peer-to-peer network

A peer-to-peer connection allows users on a local network to access a remote computer, such as printers, local disk resources, and so on.







Analogue
form

Digital
form