G.C.E. O/L Grade 10 ICT · Lesson 2

2.5 Computer Networks: LAN, MAN, WAN and Devices

A **computer network** is two or more computers or devices connected to share data and resources. Your school lab, your home Wi-Fi and the Internet are all networks. In this note you will learn why we use networks, the cables and wireless media, network devices (NIC, modem, hub, switch, router), types of networks (PAN, LAN, MAN, WAN) and staying safe online.

1. Why do we use networks?

- **Data communication** – send messages, emails and files (WhatsApp, Gmail).
- **Resource sharing** – share one printer, one Internet connection or files in a school lab.
- **Collaboration** – work together online with Google Docs, Zoom, Microsoft Teams or Google Meet.
- **Central storage and backup** – keep files on a server or in the cloud.

2. Transmission media

Data travels through a **medium**. **Guided (wired)** media use cables. **Unguided (wireless)** media send signals through the air.

Medium	Type	Features / use
Twisted pair (UTP, Cat6)	Guided	Cheap, easy; LAN cables in labs and offices with RJ45 plugs
Coaxial cable	Guided	Thick copper core with shield; cable TV, CCTV
Fibre optic	Guided	Light through glass; fastest, long distance, no electrical noise; fibre broadband
Wi-Fi (radio)	Unguided	Home and school wireless LAN; Wi-Fi 6 is faster and handles many devices
Bluetooth	Unguided	Short range (about 10 m); earbuds, smart watch, file sharing
Mobile 4G / 5G	Unguided	Mobile data from towers; 5G is very fast with low delay
Microwave / satellite	Unguided	Long-distance links, TV broadcast, satellite Internet

3. Network devices

NIC (Network Interface Card)
Lets a computer join a network. **Internal** NIC is built into the motherboard; **external** NIC plugs into USB (e.g. USB Wi-Fi adapter).

Modem
Changes digital computer signals to signals for the phone line/fibre/mobile network and back (modulate–demodulate).

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Hub
Connects computers in a LAN but sends data to **all** ports. Simple, old, slower.

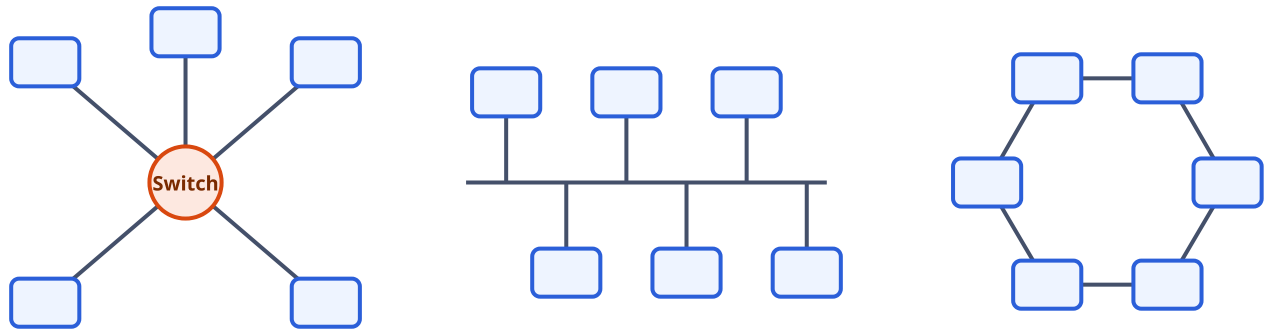
Switch
Connects computers in a LAN and sends data **only** to the correct computer. Faster and safer than a hub.

Router
Connects different networks (e.g. home LAN to the Internet) and finds the best path for data. Home routers often include Wi-Fi and a modem.

A **Network Operating System (NOS)** manages users, security, files and printers on a network server – for example Windows Server or Linux server.

4. Types of networks by area

Type	Area	Example
PAN – Personal Area Network	A few metres around one person	Phone + Bluetooth earbuds + smart watch
LAN – Local Area Network	One building or campus	School computer lab, home Wi-Fi
MAN – Metropolitan Area Network	A city	Network linking bank branches or university campuses across Colombo
WAN – Wide Area Network	Country or world	The Internet; a bank network across Sri Lanka



Common LAN layouts (topologies): star (all computers to a switch – most common today), bus (one shared cable) and ring.

5. Advantages and disadvantages of networks

Advantages	Disadvantages
Share printers, files and Internet – saves money	Viruses and malware can spread quickly
Fast communication (email, chat, video calls)	Hacking and data theft risk
Central backup and security control	Cost of cables, devices and skilled staff

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Online learning and collaboration	If the server or router fails, many users are affected

NEW 2026 Sri Lanka 2026: fibre broadband (FTTH) reaches many homes, 4G covers most of the island and 5G trials are running in cities. Wi-Fi 6 routers are common. Students use Zoom, Teams and Google Meet for classes and Google Drive / OneDrive for shared work.

6. Stay safe on networks

- **Phishing** – fake messages or websites that trick you into giving passwords or bank details. Check the link; never share OTPs.
- **Ransomware** – malware that locks your files and asks for money. Keep backups and update software.
- Use strong Wi-Fi passwords (WPA3/WPA2), a firewall and two-step verification.

Key Words

Computer network – Two or more connected devices that share data and resources.	**Resource sharing** – Using one printer, file or Internet connection from many computers.
NIC – Network Interface Card – hardware that connects a computer to a network.	**Guided media** – Wired media such as twisted pair, coaxial and fibre optic cable.
Unguided media – Wireless media such as Wi-Fi, Bluetooth, 4G/5G and satellite.	**Fibre optic** – Cable that carries data as light; fastest and long distance.
Modem – Converts digital signals to line signals and back.	**Switch** – Connects LAN devices and sends data only to the right one.
Router – Connects different networks and chooses the best path.	**LAN** – Local Area Network in one building, e.g. a school lab.
WAN – Wide Area Network covering a country or the world, e.g. the Internet.	**Phishing** – A trick using fake messages to steal passwords or bank details.

Sample Q&A

1. What is a computer network?

Answer: Two or more computers or devices connected to share data and resources.

2. Give two purposes of a network.

Answer: Data communication and resource sharing (also collaboration, central backup).

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3. What is the difference between a hub and a switch?

> **Answer:** A hub sends data to all computers; a switch sends data only to the correct computer.

4. Name two guided and two unguided media.

> **Answer:** Guided: twisted pair, fibre optic (coaxial). Unguided: Wi-Fi, Bluetooth (4G/5G, satellite).

5. Give an example of a PAN, LAN and WAN.

> **Answer:** PAN – phone with Bluetooth earbuds; LAN – school computer lab; WAN – the Internet.

6. What is phishing and how can you avoid it?

> **Answer:** Fake messages/websites that steal passwords. Check links, never share OTPs or passwords, use two-step verification.

MCQ

1. The main purpose of a computer network is to:

A. Stop using printers
B. Make computers heavier
C. Replace the CPU
D. Share data and resources

2. Which hardware lets a computer connect to a network?

A. Monitor
B. ALU
C. NIC
D. ROM

3. Which cable carries data as pulses of light?

A. Fibre optic
B. Coaxial
C. Power cable
D. Twisted pair

4. Which is an unguided (wireless) medium?

A. Twisted pair
B. Bluetooth
C. Coaxial cable
D. Fibre optic

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5. Which device sends data ONLY to the correct computer in a LAN?

A. Switch
B. Modem
C. Speaker
D. Hub

6. Which device connects a home network to the Internet and chooses the best path?

A. Printer
B. Keyboard
C. Router
D. Hub

7. A modem is used to:

A. Store files permanently
B. Print documents
C. Convert digital signals to line signals and back
D. Do calculations

8. A school computer lab network in one building is a:

A. WAN
B. Satellite
C. MAN
D. LAN

9. The Internet is the best example of a:

A. LAN
B. PAN
C. WAN
D. Hub

10. A phone connected to Bluetooth earbuds and a smart watch forms a:

A. PAN
B. MAN
C. Mainframe
D. WAN

11. A network linking bank branches across Colombo city is a:

A. Bluetooth
B. MAN
C. LAN
D. PAN

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12. Which is a disadvantage of computer networks?

A. Messages are sent fast
B. Viruses can spread quickly
C. Printers can be shared
D. Files can be backed up centrally

13. You get an SMS: 'Your bank account is blocked. Click this link and enter your PIN.' This is:

A. Phishing
B. Resource sharing
C. A software update
D. Data backup

14. Malware that locks files and asks for payment is called:

A. Router
B. Firewall
C. Cloud
D. Ransomware

15. Which software manages users, files and security on a network server?

A. Word processor
B. Network Operating System
C. Web browser only
D. Photo editor

Structured Questions

1. (i) Define a computer network. (2 marks)
(ii) Give two advantages and two disadvantages of networks. (4 marks) *(6 marks)*

> (i) Two or more computers/devices connected by a medium to share data and resources.
> (ii) Advantages: share printers/Internet/files; fast communication; central backup; collaboration.
> Disadvantages: virus spread; hacking; setup cost; server failure affects all.

2. Compare twisted pair, coaxial and fibre optic cables under speed and one use each. *(6 marks)*

> Twisted pair – moderate speed; LAN in labs. Coaxial – moderate; cable TV / CCTV. Fibre optic – fastest, long distance; fibre broadband / backbone links.

3. State the function of: (i) NIC (ii) switch (iii) router (iv) modem. *(4 marks)*

> (i) Connects a computer to a network. (ii) Connects LAN devices, sends data only to the destination. (iii) Connects different networks, chooses best path (home to Internet). (iv) Converts digital ↔ line signals.

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4. Classify these as PAN, LAN, MAN or WAN: (a) school lab (b) Internet (c) smart watch with phone (d) university campuses linked across Kandy city. *(4 marks)*

> (a) LAN (b) WAN (c) PAN (d) MAN.

5. Explain two ways a student can stay safe from phishing and ransomware. (4 marks) *(4 marks)*

> Check links/sender before clicking and never share passwords or OTPs; use two-step verification; keep regular backups (cloud/external); update OS and antivirus; don't open unknown attachments.

6. Give two ways new technologies (Wi-Fi 6, 5G, fibre, cloud) help students in Sri Lanka. (3 marks) *(3 marks)*

> Faster, stable Internet for Zoom/Teams/Meet online classes; many devices in a home/lab work together (Wi-Fi 6); share and edit projects in Google Drive/OneDrive; access e-learning (e-thaksalawa) anywhere.

Summary

- A network connects devices to share data and resources.
- Guided media: twisted pair, coaxial, fibre optic (fastest).
- Unguided media: Wi-Fi (Wi-Fi 6), Bluetooth, 4G/5G, microwave, satellite.
- Devices: NIC (internal/external), modem, hub, switch, router; NOS manages the server.
- Hub sends to all; switch sends only to the right computer.
- By area: PAN < LAN < MAN < WAN (Internet).
- Advantages: sharing, communication, backup; disadvantages: viruses, hacking, cost.
- Stay safe: spot phishing, back up against ransomware, use strong passwords.

MCQ answer key – 2.5

1. **D** – Networks let devices communicate and share.
2. **C** – Network Interface Card.
3. **A** – Fibre uses light through glass.
4. **B** – Bluetooth uses radio waves.
5. **A** – A switch learns addresses.
6. **C** – Routers join different networks.
7. **C** – Modulator–demodulator.
8. **D** – Local Area Network.
9. **C** – It covers the whole world.
10. **A** – Personal Area Network.
11. **B** – Metropolitan Area Network = city.
12. **B** – Malware spreads over networks.

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13. **A** – Fake messages asking for secrets are phishing.
14. **D** – Ransom = payment demand.
15. **B** – A NOS such as Windows Server or Linux.

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