

Module 1 - Overview of IT Industry

THEORY EXERCISE

What is a Program?

- A program is a set of instructions that are used to execute particular tasks to get particular results. It is required for programmers to learn basic concepts of coding to write programs. For different types of tasks, we have to write different programs. The set of instructions used to perform a specific task to obtain a specific result is termed a computer program. The computer program is generated by programmers or software developers. The code is then processed and executed to provide the output of the program.
- The program is made ready by first understanding the task and then creating its pseudocode i.e. a rough idea and then after finalizing all the conditions for the particular task, a computer program is generated using one of the programming languages.

Explain in your own words what a program is and how it functions.

- A program is a set of instructions that a computer can understand and execute. It's like a recipe that tells the computer exactly what to do, step by step, to achieve a specific goal or task. A program can be thought of as a list of commands, written in a special language that the computer can understand, which tells it how to perform a particular function or set of functions.

How It Functions ? :

- When a program is run, the computer reads the instructions one by one and executes them in a specific order. Here's a simplified overview of how it works:
- **1. Input:** The program receives input from the user, such as data or commands, through devices like keyboards, mice, or touchscreens.
- **2. Processing:** The program processes the input data according to the instructions it contains. This involves performing calculations, making decisions, and manipulating data.
- **3. Execution:** The program executes the instructions, which can include tasks like storing data, retrieving information, or performing actions like printing or displaying output.
- **4. Output:** The program produces output, which can be displayed on a screen, printed on paper, or stored in a file.
- **5. Looping:** The program can repeat certain instructions or loops, allowing it to perform repetitive tasks or respond to changing conditions.
- **6. Termination:** The program terminates when it has completed all the instructions or when the user stops it.

What is Programming?

- Programming is the process of designing, writing, testing, and maintaining the instructions that a computer can understand and execute. It involves creating a set of instructions, called a program, that tells a computer what to do, how to do it, and when to do it.

What are the main differences between high-level and low-level programming languages?

High-Level Programming Languages :

- Easy to learn and use.

- Abstracts away low-level details.
- Portable (can run on multiple platforms).
- Focus on logic and programming concepts.
- Examples: Python, Java, JavaScript.

Low-Level Programming Languages :

- Closer to hardware.
- Provides more control and flexibility.
- Faster execution speeds,
- Requires manual memory management.
- E.g. : Assembly languages, etc.

World Wide Web & How Internet Works :

WORLD WIDE WEB :

- The World Wide Web (WWW) is a system of interlinked hypertext documents that are accessed via the internet. It's like a huge library of information that you can access from your computer or mobile device.

How Internet Works :

- **Devices** : You use devices like computers, smartphones, or tablets to access the Internet.
- **Connection** : Your device connects to the Internet through a service provider (like your home Wi-Fi or mobile data).
- **Data Transfer** : When you want to visit a website, your device sends a request over the Internet. This request travels through various cables and routers (which are like traffic directors) to reach the server where the website is stored.
- **Servers** : A server is a powerful computer that holds the website's data. When it receives your request, it sends back the information needed to display the website on your device.

- **Protocols:** The Internet uses specific rules called protocols to ensure that data is sent and received correctly. The most common ones are HTTP (for web pages) and HTTPS (for secure web pages).
- **Interactivity:** You can interact with websites by clicking links, filling out forms, or watching videos, which sends more requests back to the server.

Explain the function of the TCP/IP model and its layers :

1. Application Layer :

- **Function:** This is where you interact with the Internet. It includes the software applications you use, like web browsers (Chrome, Firefox), email clients (Outlook, Gmail), and messaging apps (WhatsApp, Slack).
- **Purpose:** It helps you send and receive data, like loading a webpage or sending an email.

2. Transport Layer :

- **Function:** This layer is responsible for ensuring that data is sent and received correctly. It breaks down the data into smaller packets and adds information about how to reassemble them at the destination.
- **Protocols:** The main protocols here are TCP (Transmission Control Protocol) and UDP (User Datagram Protocol). TCP ensures reliable delivery (like a phone call where you confirm the other person heard you), while UDP is faster but less reliable (like sending a text message without checking if it was received).

3. Internet Layer :

- **Function:** This layer handles the routing of data packets across different networks. It determines the best path for the data to travel from the source to the destination.
- **Protocols:** The main protocol here is IP (Internet Protocol), which assigns unique addresses (IP addresses) to devices and helps route the packets to the correct destination.

4. Link Layer (or Network Interface Layer) :

- **Function:** This layer deals with the physical connection between devices. It includes the hardware and protocols that allow data to be transmitted over various types of networks, like Ethernet, Wi-Fi, or cellular networks.
- **Purpose:** It ensures that data can be sent over the physical medium, whether it's through cables or wireless signals.

Types of Internet Connections :

1. Dial-Up :

- **What it is:** Think of it like using an old-fashioned phone to connect to the Internet.
- **Speed:** Very slow, like waiting for a page to load forever.
- **When to use it:** Mostly a thing of the past; it was used for basic browsing and emails.

2. DSL (Digital Subscriber Line) :

- **What it is:** This is like using your phone line for the Internet but in a smarter way that lets you talk on the phone and browse at the same time.
- **Speed:** Faster than dial-up, good enough for most everyday activities.
- **When to use it:** Great for homes and small businesses that need reliable Internet.

3. Cable :

- **What it is:** This uses the same cables that bring you cable TV to connect to the Internet.
- **Speed:** Much faster than DSL, so you can stream videos and play games without much buffering.
- **When to use it:** Popular in cities and towns for families and businesses.

4. Fiber Optic :

- **What it is:** Imagine super-fast Internet that uses light to send data through tiny glass strands.
- **Speed:** Extremely fast, perfect for heavy users who stream, game, or work from home.
- **When to use it:** Best for tech-savvy households or businesses that need speed.

5. Satellite :

- **What it is:** This connects to the Internet via satellites in space, which is great for places where other connections aren't available.
- **Speed:** Moderate speed, but it can be a bit slow to respond (like a delayed conversation).
- **When to use it:** Good for rural areas where other options are limited.

6. Wireless (Wi-Fi) :

- **What it is:** This is the Internet you get at home or in cafes without needing a cable. It uses radio waves to connect your devices.
- **Speed:** Depends on what type of wired connection you have (like DSL or cable).
- **When to use it:** Common in homes, coffee shops, and public places.

7. Mobile Data :

- **What it is:** This is the Internet you use on your phone when you're not connected to Wi-Fi. It comes from cell towers.
- **Speed:** Can be fast, especially with newer technologies like 5G, but it might have limits on how much data you can use.
- **When to use it:** Perfect for browsing on the go, but watch out for data limits.

Protocols :

1. HTTP (Hypertext Transfer Protocol) :

- **What it is:** The protocol used for transferring web pages on the Internet.
- **How it works:** When you enter a website address in your browser, HTTP helps your browser request the page from a server and display it for you.
- **Example:** When you see "http://www.example.com," that's using HTTP.

2. HTTPS (Hypertext Transfer Protocol Secure) :

- **What it is:** A secure version of HTTP.
- **How it works:** It encrypts the data exchanged between your browser and the website, making it safer from eavesdroppers.
- **Example:** When you see "https://www.example.com," it means your connection is secure, which is important for online shopping or banking.

3. FTP (File Transfer Protocol) :

- **What it is:** A protocol used to transfer files between computers.
- **How it works:** It allows you to upload or download files from a server, like sharing photos or documents.
- **Example:** If you're using a website to upload your photos, it might be using FTP behind the scenes.

4. SMTP (Simple Mail Transfer Protocol) :

- **What it is:** The protocol used for sending emails.
- **How it works:** When you send an email, SMTP helps your email client (like Gmail or Outlook) send it to the recipient's email server.
- **Example:** When you hit "send" on an email, SMTP is what gets it delivered.

5. TCP (Transmission Control Protocol) :

- **What it is:** A protocol that ensures reliable communication between devices.

- **How it works:** It breaks data into smaller packets, sends them, and makes sure they arrive correctly and in order.
- **Example:** When you stream a video, TCP helps ensure that the video plays smoothly without interruptions.

What are the differences between HTTP and HTTPS protocols?

HTTP and HTTPS are both protocols used for transferring data over the Internet, but they have some important differences. Here's a simple difference:

1. Security :

- **HTTP (Hypertext Transfer Protocol):** This is the standard protocol for transferring data. However, it does not encrypt the data being sent, which means that anyone who intercepts the data can read it. It's like sending a postcard—anyone can see what's written on it.
- **HTTPS (Hypertext Transfer Protocol Secure):** This is the secure version of HTTP. It encrypts the data being sent between your browser and the website, making it much harder for anyone to intercept and read it. It's like sending a sealed letter—only the sender and the recipient can read its contents.

2. Data Integrity :

- **HTTP:** Since there's no encryption, data can be altered during transmission without anyone knowing. This means that someone could potentially change the information you receive.
- **HTTPS:** The encryption helps ensure that the data remains intact and unaltered during transmission. If someone tries to change the data, your browser will know something is wrong.

3. Authentication :

- **HTTP:** There's no way to verify if the website you're connecting to is actually the one you think it is. This can lead to phishing attacks, where a fake website tries to trick you into giving away personal information.
- **HTTPS:** Websites using HTTPS have a security certificate that verifies their identity. This means you can trust that you're communicating with the legitimate website, not an imposter.

4. Performance :

- **HTTP:** Generally, HTTP can be slightly faster because it doesn't have the overhead of encryption. However, the difference is often negligible with modern technology.
- **HTTPS:** While HTTPS may have a tiny bit of extra processing due to encryption, improvements in technology have made it very fast, and many users won't notice a difference in speed.

5. SEO (Search Engine Optimization) :

- **HTTP:** Websites using HTTP may not rank as well in search engines compared to those using HTTPS.
- **HTTPS:** Search engines like Google give preference to secure websites, so using HTTPS can help improve your website's visibility in search results.

Github and Introductions :

➤ What is GitHub?

GitHub is a web-based platform that uses Git, a version control system, to facilitate collaborative software development. It allows developers to store, manage, and track changes to their code repositories. GitHub provides a user-friendly interface for Git, making it easier for individuals and teams to work together on projects, share code, and contribute to open-source software.

GIT Commands :

➤ First time use :

```
git config --global user.email "your-email@example.com"
```

```
git config --global user.name "Your Name"
```

➤ New Repository :

1) git init

2) git add .

3) git status

4) git commit -m "first commit"

5) git branch -M main

6) git remote add origin [https://github.com/Harshad0807 /xyz.git](https://github.com/Harshad0807/xyz.git)

7) git push -u origin main

➤ New File :

1) git add .

2) git status

3) git commit -m "file name"

4) git push -u origin main