How does it actually work?

- Information on the internet moves from one computer to another in the form of bits over various mediums, including ethernet cables, fibre optic cables, and wireless signals (i.e. radio waves through air, EMF, electromagnetic field)
- IP addresses and DNS

Steps of transmission

1. Data Segmentation -
- Files and messages split into smaller units called data packets.
- Each packet contains a piece of original data, along with addressing, sequence numbers, and error-checking codes which are particularly, techniques used to identify errors that may occur during the transmission or storage of digital data.
- Eg: 20 mb video into multiple packets, each with frames, audio & metadata.

2. Addressing and Routing:
- Each data packet is tagged with source and destination IP address
- Routers along the path examine the destination IP to determine where to forward the packet.
- Eg: each email sending, each packet has your device's IP as the source and the recipient's server IP as the destination.

3. Data Transmission:
- Data packets travel through mediums like fibre-optic cables or wireless signals.
- The data in the packets is converted into binary bits (0s and 1s) appropriate for the medium.
- Eg: your message converted into binary, is transmitted as light pulses in a fiber-optic cable or radio waves in a wifi signal.

4. Receiving and Reassembly:
- The receiving device collects the incoming data packets.
- Sequence numbers help reassemble the packets in the correct order to reconstruct the original data.
- Eg: a server receives packets containing parts of a webpage's HTML, CSS and images, which are assembled to display the page correctly.

5. Data decoding:
- data packets are decoded to retrieve the original content.
- This involves converting binary bits back into their original format, such as text, images or or audio.
- Eg: decoding a data packet containing an image involves converting the binary pixel data into an image format the device can display.

6. Error detection & correction:
- during transmission, data packets might get corrupted due to interference or noise.
- Error-detection mechanisms like checksums identify corrupted packets.
- they (or techniques like retransmission) or forward error correction help recover lost data.
- Eg: if a packet is corrupted, ED identifies and sender resends packet.

7. Data processing and interaction:
- The received data is processed by the recipient device or server.
- Interaction like displaying content, playing media or responding to user input occurs.
- eg.

8. Bidirectional Communication:
- Data transmission is not one-sided; devices can send data back.
- This enables interactions like submitting forms, sending responses or engaging in real-time communication.
- Eg: In a video call, both participants transmit audio and video data simultaneously.

9. Acknowledge & Handshake:
- Acknowledgement signals confirm successful reception of packets.
- Handshake protocols establish, maintain and terminate connections between devices.

10. Encryption and Security:
- data may be encrypted to ensure secure transmission.
- encryption algos protect data from unauthorized access during transmission.