Unit-3

Basics of Internet: Terminology, World Wide Web, Intranets, Extranets, Internet, Internet application and Internet ethics, Connectivity types: level one, level two and level three connectivity, Setting up a connection: hardware requirement, selection of a modem, software requirement, modem configuration, Internet accounts by ISP: Telephone line options, Protocol options, Service options, Telephone line options – Dialup connections through the telephone system, dedicated connections through the telephone system.

1. Basics of Internet: Terminology

For a specific purpose if things are connected together, are referred to as a **NETWORK**. A network can be of many types, like a telephone network, television network, computer network, or even a people network.

Similarly, a **COMPUTER NETWORK** is also a kind of setup, where it connects two or more devices to share a range of services and information in the form of **e-mails and messages**, **databases**, **documents**, **websites**, **audios and videos**, **telephone calls**, **and video conferences**, etc. among them.

A **PROTOCOL** is nothing but a set of defined **rules**, which has to be followed by every connected device across a network to communicate and share information among them. To facilitates **End to End** communication, a number of protocols worked together to form **Protocol Suites or Stacks**.

Networking terminology can be confusing, especially for those who are new to computer networking. Here are some basic terms and their definitions to help you understand the fundamentals of networking:

Network: A collection of interconnected devices, such as computers, printers, and servers, that can communicate with each other.

Node: Any device connected to a network, such as a computer, printer, or router.

Protocol: A set of rules and standards that define how devices on a network communicate with each other.

IP Address: A unique numerical identifier assigned to each device on a network, used to identify and communicate with other devices.

Router: A networking device that connects multiple networks together and forwards data packets between them.

Switch: A networking device that connects devices on a network and forwards data packets between them.

Firewall: A security device or software that monitors and controls incoming and outgoing network traffic, based on a set of predefined security rules.

DNS (Domain Name System): A system that translates domain names (such as www.example.com) into IP addresses, allowing devices to locate and connect to websites and other network resources.

LAN (Local Area Network): A network that connects devices within a limited geographical area, such as a home, office, or building.

WAN (Wide Area Network): A network that connects devices over a large geographical area, such as multiple offices in different cities or countries.

DHCP (Dynamic Host Configuration Protocol): A protocol that automatically assigns IP addresses and network configuration settings to devices on a network.

TCP/IP (Transmission Control Protocol/Internet Protocol): A set of protocols used to communicate over the internet and other networks.

These are just a few basic networking terms, but understanding them is essential to building a strong foundation in computer networking.

Some basic Protocols are:

- **IP** : Internet Protocol
- **FTP** : File Transfer Protocol
- **SMTP** : Simple Mail Transfer Protocol
- **HTTP** : Hyper Text Transfer Protocol

The **Network reference models** were developed to allow products from different manufacturers to interoperate on a network. A network reference model serves as a blueprint, detailing standards for how protocol communication should occur.

The most widely recognized reference models are the **Open Systems Interconnect** (**OSI**) Model and **Department of Defense** (DoD, also known as **TCP/IP**) model.

- **LANs (Local Area Networks)**
- **MANs (Metropolitan Area Networks)**
- **WANs (Wide Area Networks)**

An **Internetwork** is a general term describing multiple networks connected together. The Internet is the largest and most well-known internetwork.

- **SAN (Storage Area Network)**: A SAN provides systems with high-speed, lossless access to high-capacity storage devices.
- **VPN (Virtual Private Network)**: A VPN allows for information to be securely sent across a public or unsecured network, such as the Internet. Common uses of a VPN are to connect branch offices or remote users to the main office.

- A host can act as a ***Client*** when he is requesting information.
- A host can act as a ***Server*** when he provides information.

- A host can also request and provide information, which is called ***Peer***.

2. World Wide Web (WWW)

The World Wide Web (WWW), often called the Web, is a system of interconnected webpages and information that you can access using the Internet. It was created to help people share and find information easily, using links that connect different pages together. The Web allows us to browse websites, watch videos, shop online, and connect with others around the world through our computers and phones.

All public websites or web pages that people may access on their local computers and other devices through the internet are collectively known as the World Wide Web or W3. Users can get further information by navigating to links interconnecting these pages and documents. This data may be presented in text, picture, audio, or video formats on the internet.

What is WWW?

WWW stands for World Wide Web and is commonly known as the Web. The WWW was started by CERN in 1989. WWW is defined as the collection of different websites around the world, containing different information shared via local servers (or computers).

Web pages are linked together using hyperlinks which are HTML-formatted and, also referred to as hypertext, these are the fundamental units of the Internet and are accessed through Hypertext Transfer Protocol(HTTP). Such digital connections, or links, allow users to easily access desired information by connecting relevant pieces of information. The benefit of hypertext is it allows you to pick a word or phrase from the text and click on other sites that have more information about it.

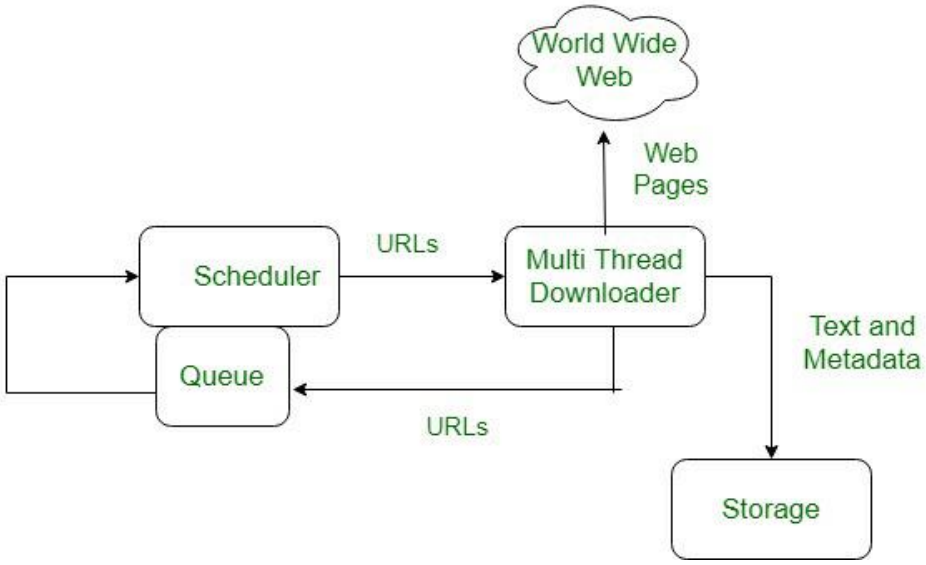
History of the WWW

It is a project created, by Tim Berner Lee in 1989, for researchers to work together effectively at CERN. It is an organization, named the World Wide Web Consortium (W3C), which was developed for further development of the web. This organization is directed by Tim Berner's Lee, the father of the web. CERN, where Tim Berners worked, is a community of more than 1700 researchers from more than 100 countries. These researchers spend a little time on CERN and the rest of the time they work at their colleges and national research facilities in their home country, so there was a requirement for solid communication so that they can exchange data.

System Architecture

From the user's point of view, the web consists of a vast, worldwide connection of documents or web pages. Each page may contain links to other pages anywhere in the world. The pages can be retrieved and viewed by using browsers of which internet explorer, Netscape Navigator, Google Chrome, etc are the popular ones. The browser fetches the page requested interprets the text and formatting commands on it, and displays the page, properly formatted, on the screen.

The basic model of how the web works are shown in the figure below. Here the browser is displaying a web page on the client machine. When the user clicks on a line of text that is linked to a page on the abd.com server, the browser follows the hyperlink by sending a message to the abd.com server asking it for the page.

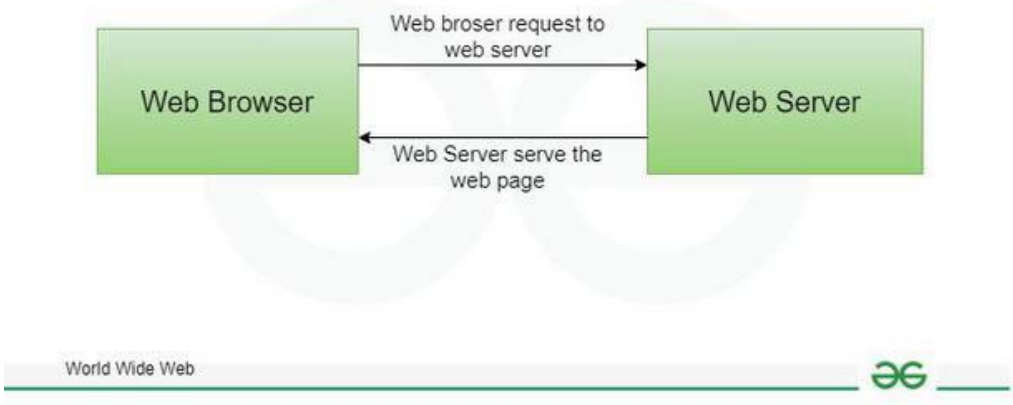


Here the browser displays a web page on the client machine when the user clicks on a line of text that is linked to a page on abd.com, the browser follows the hyperlink by sending a message to the abd.com server asking for the page.

Working of WWW

A Web browser is used to access web pages. Web browsers can be defined as programs which display text, data, pictures, animation and video on the Internet. Hyperlinked resources on the World Wide Web can be accessed using software interfaces provided by Web browsers. Initially, Web browsers were used only for surfing the Web but now they have become more universal.

The below diagram indicates how the Web operates just like client-server architecture of the internet. When users request web pages or other information, then the web browser of your system request to the server for the information and then the web server provide requested services to web browser back and finally the requested service is utilized by the user who made the request.



World Wide Web

Web browsers can be used for several tasks including conducting searches, mailing, transferring files, and much more. Some of the commonly used browsers are Internet Explorer, Opera Mini, and Google Chrome.

What is the Internet?

The Internet is a huge network of millions of computers and related devices from all corners of the globe through which users are able to communicate, exchange information, and partake in general resources. Its mechanism is more decentralized and does not have a specific owner; it works only as a common idea shared by various institutions, governments, and users. The Internet is the tool that links people, companies, and organizations, offering various opportunities for cooperation and development, as well as offering various possibilities to find the necessary information, using Internet resources, such as websites and services, research data, and social networks.

What is an Intranet?

An Intranet is a local area network that has been designed for use within an organization by its employees to share information as well as work together. An Intranet is also constructed from the technologies of the Internet from TCP/IP, HTTP, and web browsers but exist behind a security firewall and has only a limited number of authorized users. Its use is to enhance the cooperation internally, control the distribution of facilities and to work more effectively. These include company news that include the latest updates posted internally to and including personnel directories, project management applications and access to databases all of which assist the organization in enhancing its efficiency.

What is Extranet?

An Extranet is an extended form of an Intranet that enables secure communication and collaboration between an organization and external entities, such as suppliers, partners, or clients. While it uses Internet protocols to facilitate connectivity, an Extranet is controlled and accessible only to authorized users with login credentials. The primary purpose of an Extranet is to extend the reach of internal resources to trusted external users while maintaining security through firewalls, encryption, and access control measures.

What is Internet ethics?

Ethics are a set of moral principles that govern an individual or a group on what is acceptable behaviour while using a computer. Computer ethics is a set of moral principles that govern the usage of computers.

One of the common issues of computer ethics is violation of copyright issues. Duplicating copyrighted content without the author's approval, accessing personal information of others are some of the examples that violate ethical principles.

Internet Ethics means acceptable behaviour for using internet. We should be honest, respect the rights and property of others on the internet.

We have to know and accept that internet is not a value free-zone. World Wide Web is a place where values are considered in the broadest sense so we must be careful while shaping content and services and we should always recognize that internet is not apart from universal society, but a primary component of it.

Internet belongs to everyone and there is no barrier of national and local cultures. It cannot be subject to a single set of values, like the local TV channel or the local newspaper, but must adapt to the multiplicity of uses.

We should avoid chatting with strangers and forwarding e-mails from unknown people /strangers. We must **be aware of risks involved in chatting and forwarding e-mails to strangers**.

We must not use internet to fool others by **pretending to be someone else**. Hiding our own identity to fool others in the Internet world is a crime and may also be a risk to others.

We must not use **rude or bad language** while using e-Mail, chatting, blogging and using social networks. We need to **respect** their views and should not criticize anyone on the internet.

We should not give **personal details** like home address, phone numbers, interests, passwords. We should be careful about sending photos to strangers because it might be misused and shared with others without our knowledge.

3. Internet Connection

- ## Level of Connectivity

The internet is an interconnected global network that relies on various levels of connectivity to facilitate communication, data exchange, and online services. The structure of internet connectivity can be understood in terms of different levels, which vary based on the scale, speed, infrastructure, and geographical reach. These levels can be broadly categorized into global (Tier 1), regional (Tier 2), and local (Tier 3) levels of connectivity, each playing a crucial role in maintaining the internet as we know it.

Tier 1 Internet Providers (Global Backbone)

Overview: Tier 1 providers represent the top level of the internet hierarchy. These providers form the global backbone of the internet, operating vast networks of high-speed fiber-optic cables that span continents and oceans. They own and manage large portions of the internet's infrastructure, and they peer with other Tier 1 providers without having to pay for the exchange of data. Tier 1 ISPs (Internet Service Providers) do not purchase transit from any other network, allowing them to deliver data directly across international routes.

Characteristics:

- They provide global connectivity and rarely need to purchase bandwidth from other networks.
- They have vast infrastructure, including submarine cables and major data centers.
- Peering agreements allow them to exchange traffic freely with other Tier 1 providers.
- Operate at high speeds, often measured in terabits per second.

Example: Companies like AT&T, Verizon, NTT Communications, and Level 3 (now part of Lumen Technologies) are examples of Tier 1 providers. For instance, NTT Communications operates a global fiber-optic network that connects North America, Europe, and Asia. It provides essential services to other ISPs, content delivery networks (CDNs), and large enterprises.

Tier 2 Internet Providers (Regional ISPs)

Overview: Tier 2 ISPs operate on a regional level and provide internet services by purchasing transit from Tier 1 providers or peering with other networks. They act as intermediaries, connecting smaller local ISPs (Tier 3) to the broader internet. Tier 2 ISPs also engage in peering agreements with other Tier 2 providers, though they still need to pay for global transit from Tier 1 networks.

Characteristics:

- They connect regional or national networks to the global internet.
- Purchase bandwidth from Tier 1 providers.
- May peer with other Tier 2 networks for cost-saving purposes.
- They offer internet services to businesses, governments, and local ISPs.

Example: A Tier 2 provider like Telia Carrier offers regional connectivity in Europe, North America, and parts of Asia. They operate a large network of fiber-optic cables but rely on peering and transit agreements with Tier 1 providers to deliver global access. In this case, Telia might provide services to a local ISP in a European country, which in turn provides internet access to end-users.

Tier 3 Internet Providers (Local ISPs)

Overview: Tier 3 providers are local ISPs that deliver internet access directly to homes, small businesses, and individual customers. They rely entirely on Tier 1 and Tier 2 providers for global and regional internet connectivity, purchasing bandwidth from these higher-tier providers to route data to their customers. Tier 3 ISPs typically focus on the “last mile” of internet connectivity, delivering internet service from regional hubs to individual homes and offices.

Characteristics:

- Provide internet access to end-users (homes, schools, businesses).
- Purchase bandwidth from Tier 1 or Tier 2 providers.
- Focus on the last mile, which connects the internet to individual users.
- Often offer a variety of services, such as DSL, fiber, and cable internet.

Example: A local ISP like Comcast in the United States or BT in the United Kingdom is an example of a Tier 3 provider. These companies buy bandwidth from higher-tier providers like Level 3 or NTT and distribute it to millions of customers via cable, DSL, or fiber-optic infrastructure. A household might have a fiber connection from Comcast that delivers high-speed internet access purchased through peering agreements with regional and global providers.

- ## Connecting the Hardware:

1. **Install the Modem**:
    - Connect the modem to the wall outlet (cable, fiber, or DSL port depending on your service type).

- Power it on by plugging it into an electrical outlet.
- The modem will sync with your ISP; this may take a few minutes.

2. **Connect the Router**:
   - If using a separate router, connect it to the modem using an Ethernet cable (typically via the "WAN" or "Internet" port on the router).
   - Power the router on.
3. **Connect Devices**:
   - For a **wired connection**, connect your computer or other devices to the router using Ethernet cables.
   - For a **wireless connection**, your devices will need to connect to the router's Wi-Fi signal. The router should have a default SSID (network name) and password, typically found on a label on the router.

4. Configure Network Settings:

- **Access the Router's Settings**:
  - Open a web browser and type in the router's IP address (usually something like 192.168.0.1 or 192.168.1.1—this can be found in the router's manual).
  - Login using the default username and password (often "admin" and "password" unless changed).
- **Change SSID and Password**:
  - It's recommended to change the default SSID (network name) to something unique.
  - Set a strong password for your Wi-Fi network (use WPA2 or WPA3 security).
- **Set Up DHCP or Static IP**:
  - By default, your router will typically use DHCP (Dynamic Host Configuration Protocol) to assign IP addresses to devices.
  - If necessary, you can manually assign static IP addresses in the router's settings.

5. Test the Internet Connection:

- **Check Wired Connections**:
  - On your wired device (e.g., computer), test the connection by opening a browser and visiting any website.

- **Test Wireless Connections**:
    - On your wireless devices, find the new SSID, enter the password, and test the connection.
- **Speed Test**:
    - Run a speed test using a service like Speedtest.net to ensure you're getting the speeds you're paying for.

6. Troubleshoot if Necessary:

- **Modem/Router Lights**: Ensure that the modem's "Internet" or "WAN" light is solid (typically green), indicating a good connection.
- **Restart Equipment**: If the connection is not working, power cycle the modem and router by turning them off, waiting 30 seconds, and turning them back on.
- **Contact ISP**: If you're still having issues, contact your ISP's support line for troubleshooting help.

4. Internet Accounts by ISP

Setting up internet accounts with an ISP involves several choices related to the type of connection (telephone line options), protocols, and services they offer. Here's a breakdown of these options:

4.1 Telephone Line Options:

ISPs that provide internet through telephone lines use different technologies to deliver the connection, with several options available based on your location and infrastructure:

DSL (Digital Subscriber Line):

- **Description**: Uses traditional copper telephone lines to provide broadband internet.
- **Variants**:
    - **ADSL (Asymmetric DSL)**: Provides faster download speeds than upload speeds. Common for home internet use.
    - **SDSL (Symmetric DSL)**: Provides equal download and upload speeds. Suitable for business users who require consistent upload performance.
- **Speed Range**: 1 Mbps to 100 Mbps depending on distance from the telephone exchange.
- **Requirements**: Must have an active or inactive phone line.

VDSL (Very-high-bit-rate Digital Subscriber Line):

- **Description**: An advanced version of DSL that provides faster speeds over shorter distances. Often delivered over fiber-to-the-cabinet (FTTC) connections.
- **Speed Range**: 30 Mbps to 300 Mbps.
- **Requirements**: Requires a VDSL-compatible modem and is dependent on proximity to the distribution point.

ISDN (Integrated Services Digital Network):

- **Description**: A digital telephone service that can carry voice and data simultaneously over the same line.
- **Speed Range**: 64 kbps per channel (typically bundled into 128 kbps).
- **Use Case**: Rarely used today, except in specialized business settings, as broadband options have surpassed it.

4.2 Protocol Options:

When setting up an internet account, various protocols determine how data is transmitted over the connection. Common options include:

PPPoE (Point-to-Point Protocol over Ethernet):

PPPoE (Point-to-Point Protocol over Ethernet) is a network protocol used by Internet Service Providers (ISPs) to provide individual connections to multiple users on the same digital line. This protocol encapsulates PPP (Point-to-Point Protocol) within Ethernet frames, enabling features like authentication, encryption, and data compression for internet connections.

PPPoA (Point-to-Point Protocol over ATM):

PPPoA (Point-to-Point Protocol over ATM) is a network protocol that combines PPP (Point-to-Point Protocol) with ATM (Asynchronous Transfer Mode) technology. It is used primarily by DSL (Digital Subscriber Line) service providers to provide individual internet connections to users over an ATM network.

DHCP (Dynamic Host Configuration Protocol):

DHCP (Dynamic Host Configuration Protocol) is a network management protocol that automatically assigns IP addresses and other network configuration parameters to devices on a network. This allows devices to communicate over an IP network without the need for manual configuration.

IPv4 and IPv6:

IPv4 and IPv6 are versions of the Internet Protocol (IP) used to identify devices on a network and route data between them.

(i) IPv4 (Internet Protocol Version 4)

- **Address Format:** Uses a 32-bit address, written in a dotted-decimal format (e.g., 192.168.0.1).
- **Address Space:** Provides about 4.3 billion unique addresses (2^{32}), which is now limited due to the rapid growth of internet-connected devices.
- **Compatibility:** Widely supported, with the majority of internet devices still using IPv4.
- **Example:** 192.168.1.1

(ii) IPv6 (Internet Protocol Version 6)

- **Address Format:** Uses a 128-bit address, written in hexadecimal and separated by colons (e.g., 2001:0db8:85a3:0000:0000:8a2e:0370:7334).
- **Address Space:** Offers a vastly larger address space (2^{128} addresses), supporting approximately 340 undecillion unique addresses, solving the address exhaustion issue.
- **Enhanced Features:** Built-in security features, improved routing efficiency, and support for multicast.
- **Example:** 2001:0db8:85a3:0000:0000:8a2e:0370:7334

IPv6 is designed to eventually replace IPv4, but both are currently in use, often simultaneously, as the transition to IPv6 continues globally.

4.3 Service Options:

ISPs often offer different levels of service depending on the needs of the user, categorized into several tiers:

Residential Services:

Internet Residential Services refer to internet service plans specifically designed for home users, providing access to the internet at various speeds and price points. These services are tailored to meet the general needs of households, supporting activities such as web browsing, streaming, gaming, video calls, and smart home connectivity.

Business Services:

Business Internet Services are designed to meet the unique connectivity needs of businesses, providing more robust and reliable internet options compared to residential services. These plans cater to companies of all sizes, from small offices to large enterprises, ensuring high-speed and consistent connectivity for operations like cloud applications, file sharing, video conferencing, and secure data transfer.

Fiber Services:

Fiber Internet Services use fiber-optic cables to transmit data as light signals, offering extremely high-speed and reliable internet connections. Fiber services are known for their fast download and upload speeds, low latency, and capacity to handle heavy data usage, making them ideal for both residential and business applications.

Cable Services:

Cable Internet Services use the same coaxial cables as cable TV to provide high-speed internet connections to homes and businesses. Cable internet is popular for its speed, reliability, and wide availability, especially in urban and suburban areas.

5. Telephone Line Options

When it comes to internet connectivity through the telephone system, there are two primary options that have been used historically and to some extent in modern systems: Dial-up Connections and Dedicated Connections. Each option functions differently in terms of speed, technology, and how the telephone line is used. Here's a breakdown:

5.1 Dial-up Connections through the Telephone System:

Dial-up internet uses a standard telephone line (POTS - Plain Old Telephone Service) to connect to the internet. It requires dialing into an ISP's network using a modem.

- **Technology:**
    - The modem converts digital signals from the computer into analog signals that can travel over the telephone network and vice versa.
    - A dial-up connection is established by dialing a phone number associated with the ISP. This ties up the phone line during internet use, meaning you cannot use the phone for voice calls simultaneously unless you have multiple lines.
- **Speed:**
    - Dial-up is slow by modern standards, with maximum speeds around 56 kbps (kilobits per second).
- **Usage:**
    - Dial-up was the most common form of internet access in the 1990s and early 2000s. It’s now considered outdated but can still be found in rural or remote areas with no other internet options.
- **Disadvantages:**
    - Slow speeds: Limited to 56 kbps.
    - No simultaneous voice calls: The telephone line cannot be used for voice calls while connected to the internet.
    - Session-based: Users must dial in to connect and are disconnected when done, often paying by the minute or hour.
- **Advantages:**

- Wide availability: Works anywhere there is a telephone line.
- Low cost: Equipment is inexpensive, and basic dial-up services can be very cheap.

5.2. Dedicated Connections through the Telephone System:

A dedicated connection through the telephone system means the line is reserved for data communication rather than shared with voice calls. This type of connection provides always-on internet access, often using DSL (Digital Subscriber Line) technology.

Technology:

- DSL (Digital Subscriber Line): Uses existing copper telephone lines to transmit data at much higher speeds than dial-up, but without interrupting voice calls.
- Separation of Voice and Data: DSL splits the telephone line into different frequency bands—one for voice communication and one for internet data, allowing both to function simultaneously.

Speed:

- Speeds vary depending on the type of DSL but are typically much faster than dial-up. ADSL can provide download speeds from 1 Mbps to 100 Mbps, while VDSL (a faster version) can reach up to 300 Mbps.

Usage:

- DSL is common in areas where fiber-optic or cable connections are not available, particularly in suburban and rural locations. It provides constant connectivity as opposed to session-based access like dial-up.

Disadvantages:

- Distance Limitations: The farther you are from the telephone exchange (central office), the slower the connection may be.
- Speed limitations: Not as fast as cable or fiber-optic connections.

Advantages:

- Always-On Connection: Unlike dial-up, DSL provides continuous internet access without the need to dial in each time.
- Simultaneous Voice and Data: You can use the telephone for calls while connected to the internet.
- Higher Speeds: Offers much faster data rates than dial-up, suitable for streaming, browsing, and more.

Comparison:

Feature	**Dial-up**	**Dedicated Connection (DSL)**
Connection Type	Dial-up session (requires dialing in)	Always-on (no need to dial)
Speed	Max 56 kbps	1 Mbps - 100+ Mbps (ADSL, VDSL)
Telephone Line Usage	Cannot use phone for voice calls during internet usage	Simultaneous voice and data
Technology	Modem converts digital to analog and vice versa	DSL splits line for voice and data
Cost	Typically cheaper, pay per use or by minute/hour	Monthly subscription (varies by speed)
Availability	Anywhere with a phone line	Available in most areas with a telephone line
Distance Limitations	Not applicable (as long as phone line works)	Slower speeds the farther you are from the DSL

Unit- III

Basics of Internet

1. What is the Internet?

The internet is a global network of interconnected computers that communicate using standardized protocols. It allows users to share information and resources, access websites, send emails, and much more.

History of the Internet

The Internet came in the year 1960 with the creation of the first working model called ARPANET (Advanced Research Projects Agency). It allowed multiple computers to work on a single network which was their biggest achievement at that time. ARPANET uses packet switching to communicate multiple computer systems under a single network. In October 1969, using ARPANET first message was transferred from one computer to another.

Key Components

1. **Hardware**:
    - **Servers**: Powerful computers that store websites and data, serving content to users.
    - **Clients**: Devices like computers, smartphones, and tablets that access the internet.
    - **Routers**: Devices that direct data traffic between networks.
    - **Cables**: Physical connections (fiber optics, copper wires) that transmit data.
2. **Protocols**:
    - **TCP/IP (Transmission Control Protocol/Internet Protocol)**: The fundamental communication protocols that enable data exchange on the internet.
    - **HTTP/HTTPS (Hypertext Transfer Protocol/Secure)**: Protocols used for transferring web pages.
3. **Domain Names**:
    - **Domain Name System (DNS)**: A system that translates human-readable domain names (like www.example.com) into IP addresses that computers use to identify each other.
4. **Web Technologies**:
    - **HTML (Hypertext Markup Language)**: The standard language for creating web pages.
    - **CSS (Cascading Style Sheets)**: A stylesheet language used to describe the presentation of a document written in HTML.
    - **JavaScript**: A programming language that enables interactive web content.

How the Internet Works

1. **Connection**: Devices connect to the internet through Internet Service Providers (ISPs).
2. **Data Transmission**: Data is broken into packets, sent over the network, and reassembled at the destination.
3. **Request and Response**: When you enter a URL in a browser, a request is sent to the server, which responds with the requested content.

Common Uses

- **Web Browsing**: Accessing websites for information, entertainment, and shopping.
- **Email**: Sending and receiving messages electronically.
- **Social Media**: Connecting with others through platforms like Facebook, Twitter, and Instagram.
- **File Sharing**: Sharing documents, photos, and videos online.

Security

Understanding basic internet security is crucial. Key concepts include:

- **Encryption**: Protecting data by converting it into a secure format.
- **Firewalls**: Systems that protect networks from unauthorized access.
- **Antivirus Software**: Programs designed to detect and eliminate malware.

Conclusion

The internet is a vast and complex system that enables communication and information sharing on a global scale. Understanding its fundamentals can help you navigate and utilize it effectively.

Advantages of the Internet

- **Online Banking and Transaction:** The Internet allows us to transfer money online through the net banking system. Money can be credited or debited from one account to the other.
- **Education, Online Jobs, Freelancing:** Through the Internet, we are able to get more jobs via online platforms like Linkedin and to reach more job providers. Freelancing on the other hand has helped the youth to earn a side income and the best part is all this can be done via the INTERNET.
- **Entertainment:** There are numerous options for entertainment online we can listen to music, play games can watch movies, and web series, and listen to podcasts, youtube itself is a hub of knowledge as well as entertainment.
- **New Job Roles:** The Internet has given us access to social media, and digital products so we are having numerous new job opportunities like digital marketing and social media marketing online businesses are earning huge amounts of money just because the Internet is the medium to help us to do so.
- **Best Communication Medium:** The communication barrier has been removed from the Internet. You can send messages via email, Whatsapp, and Facebook. Voice chatting and video conferencing are also available to help you to do important meetings online.

- **Comfort to humans:** Without putting any physical effort you can do so many things like shopping online it can be anything from stationeries to clothes, books to personal items, etc. You can books train and plane tickets online.
- **GPS Tracking and google maps:** Yet another advantage of the internet is that you are able to find any road in any direction, and areas with less traffic with the help of GPS on your mobile.

Disadvantages of the Internet

- **Time Wastage:** Wasting too much time on the internet surfing social media apps and doing nothing decreases your productivity rather than wasting time on scrolling social media apps one should utilize that time in doing something skillful and even more productive.
- **Bad Impacts on Health**: Spending too much time on the internet causes bad impacts on your health physical body needs some outdoor games exercise and many more things. Looking at the screen for a longer duration causes serious impacts on the eyes.
- **Cyber Crimes:** Cyberbullying, spam, viruses, hacking, and stealing data are some of the crimes which are on the verge these days. Your system which contains all the confidential data can be easily hacked by cybercriminals.
- **Effects on Children:** Small children are heavily addicted to the Internet watching movies, and games all the time is not good for their overall personality as well as social development.
- **Bullying and Spreading Negativity:** The Internet has given a free tool in the form of social media apps to all those people who always try to spread negativity with very revolting and shameful messages and try to bully each other which is wrong.

Uses of the Internet

Some of the important usages of the internet are:

- **Online Businesses (E-commerce):** Online shopping websites have made our life easier, e-commerce sites like Amazon, Flipkart, and Myntra are providing very spectacular services with just one click and this is a great use of the Internet.
- **Cashless Transactions:** All the merchandising companies are offering services to their customers to pay the bills of the products online via various digital payment apps like Paytm, Google Pay, etc. UPI payment gateway is also increasing day by day. Digital payment industries are growing at a rate of 50% every year too because of the INTERNET.
- **Education:** It is the internet facility that provides a whole bunch of educational material to everyone through any server across the web. Those who are unable to attend physical classes can choose any course from the internet and can have point-to-point knowledge of it just by sitting at home. High-class faculties are teaching online on digital platforms and providing quality education to students with the help of the Internet.
- **Social Networking:** The purpose of social networking sites and apps is to connect people all over the world. With the help of social networking sites, we can talk, and share videos, and images with our loved ones when they are far away from us. Also, we can create groups for discussion or for meetings.

- **Entertainment:** The Internet is also used for entertainment. There are numerous entertainment options available on the internet like watching movies, playing games, listening to music, etc. You can also download movies, games, songs, TV Serial, etc., easily from the internet.

2. Basic Terminology

1. **IP Address**: A unique numerical label assigned to each device connected to a network, used for identifying and locating devices.
2. **Domain Name**: A human-readable address for a website (e.g., www.example.com) that corresponds to an IP address.
3. **URL (Uniform Resource Locator)**: The complete address used to access a resource on the internet, including the protocol (e.g., HTTP), domain name, and path to a specific page (e.g., https://www.example.com/page).
4. **HTTP/HTTPS**:
    - **HTTP (Hypertext Transfer Protocol)**: The protocol used for transmitting web pages.
    - **HTTPS (Hypertext Transfer Protocol Secure)**: A secure version of HTTP that encrypts data to protect it during transmission.
5. **Browser**: Software application used to access and view websites (e.g., Chrome, Firefox, Safari).
6. **Server**: A computer or system that provides data, resources, or services to other computers (clients) over the internet.
7. **Client**: Any device (computer, smartphone, etc.) that accesses services provided by a server.

Networking Terminology

8. **Router**: A device that directs data traffic between different networks, connecting local networks to the internet.
9. **Switch**: A device that connects multiple devices within a local network, allowing them to communicate.
10. **Bandwidth**: The maximum rate at which data can be transferred over a network, usually measured in bits per second (bps).
11. **Latency**: The time it takes for data to travel from the source to the destination, often measured in milliseconds.

Web Development Terminology

12. **HTML (Hypertext Markup Language)**: The standard markup language for creating web pages.
13. **CSS (Cascading Style Sheets)**: A style sheet language used for describing the presentation of a document written in HTML.
14. **JavaScript**: A programming language commonly used for creating interactive effects within web browsers.

15. **API (Application Programming Interface)**: A set of rules and protocols for building and interacting with software applications.

Security Terminology

16. **Firewall**: A security device that monitors and controls incoming and outgoing network traffic based on predetermined security rules.
17. **Malware**: Malicious software designed to harm, exploit, or otherwise compromise devices and networks.
18. **Phishing**: A fraudulent attempt to obtain sensitive information (like passwords) by disguising as a trustworthy entity in electronic communications.
19. **Encryption**: The process of converting data into a coded format to prevent unauthorized access.

Other Terms

20. **Cloud Computing**: The delivery of computing services (storage, processing, etc.) over the internet, allowing for flexible resource management.
21. **IoT (Internet of Things)**: A network of interconnected devices that communicate and share data with each other over the internet.
22. **VPN (Virtual Private Network)**: A service that encrypts your internet connection, providing privacy and security while accessing the internet.

3. World Wide Web

The **World Wide Web (WWW)** is a system of interlinked hypertext documents and resources that are accessed via the internet using web browsers.

The World Wide Web is a collection of all the web pages, and web documents that you can see on the Internet by searching their URLs (Uniform Resource Locator) on the Internet. For example, www.geeksforgeeks.org is the URL of the GFG website, and all the content of this site like webpages and all the web documents are stored on the World Wide Web. Or in other words, the World Wide Web is an information retrieval service of the web. It provides users with a huge array of documents that are connected to each other by means of hypertext or hypermedia links. Here, hyperlinks are known as electronic connections that link the related data so that users can easily access the related information hypertext allows the user to pick a word or phrase from text, and using this keyword or word or phrase can access other documents that contain additional information related to that word or keyword or phrase. World Wide Web is a project which is created by Timothy Berner's Lee in 1989, for researchers to work together effectively at **CERN**. It is an organization, named **World Wide Web Consortium (W3C)**, which was developed for further development in the web.

Here's a breakdown of its key components and concepts:

Key Concepts

1. **Web Pages**: The individual documents that make up the web, usually written in HTML and accessible through a web browser.
2. **Hyperlinks**: Clickable links that connect one web page to another, allowing users to navigate between different resources.
3. **Web Browsers**: Software applications (like Chrome, Firefox, Safari) used to access and display web pages.
4. **Web Servers**: Computers that host websites and deliver web pages to users when requested.
5. **HTTP/HTTPS**: Protocols that govern how data is transmitted over the web.
    - **HTTP**: The standard protocol for transferring web pages.
    - **HTTPS**: A secure version of HTTP that encrypts data for safety during transmission.

How It Works

- **Addressing**: Each web page is identified by a URL (Uniform Resource Locator), which specifies the location of the resource on the internet.
- **Request and Response**: When you enter a URL in a browser, the browser sends a request to the web server, which then responds by sending the requested web page back to the browser for display.

Evolution

- **Inception**: The WWW was invented by Tim Berners-Lee in 1989 while he was at CERN. It was initially designed to facilitate information sharing among researchers.
- **Growth**: Since its inception, the web has grown exponentially, leading to the development of e-commerce, social media, streaming services, and many other online applications.

Current Trends

- **Web 2.0**: Refers to the second generation of the web, emphasizing user-generated content, usability, and interoperability (e.g., social media platforms).
- **Web 3.0**: Often associated with the concept of a decentralized web, integrating technologies like blockchain and focusing on data privacy and user control.

Conclusion

The World Wide Web has fundamentally transformed how we access information and communicate. It serves as a vital component of modern life, enabling everything from education and entertainment to business and social interaction.

4. Internet, Intranet, Extranet

Internet

- **Definition**: The internet is a global network of interconnected computers and servers that use standardized protocols (like TCP/IP) to communicate.
- **Accessibility**: It is publicly accessible to anyone with a connection, allowing users to access a vast range of information and services.
- **Usage**: Used for web browsing, email, social media, streaming, online gaming, and much more.
- **Examples**: Websites, email services, social networks (e.g., Facebook, Twitter).

Intranet

- **Definition**: An intranet is a private network used within an organization. It utilizes internet technologies but is restricted to authorized users.
- **Accessibility**: Only accessible to employees or members of the organization, usually protected by passwords or firewalls.
- **Usage**: Used for internal communication, sharing resources, collaboration, and managing information within the organization.
- **Examples**: Company portals, internal websites, employee resources.

Extranet

- **Definition**: An extranet is a controlled private network that allows external users (like partners, suppliers, or customers) to access specific parts of an organization's intranet.
- **Accessibility**: Accessible to authorized external users, providing a way to collaborate and share information securely with selected parties.
- **Usage**: Used for facilitating collaboration with business partners, sharing information with clients, and managing supply chain interactions.
- **Examples**: Supplier portals, customer support platforms.

Summary of Differences

Feature	Internet	Intranet	Extranet
Definition	Global network of computers	Private network within an organization	Private network for external users
Accessibility	Publicly accessible	Restricted to internal users	Accessible to authorized external users
Usage	General communication and information sharing	Internal collaboration and communication	Collaboration with partners and clients
Examples	Websites, social media	Company intranet sites	Partner portals, customer support sites

5. Internet applications

Internet applications encompass a wide range of software and services that leverage internet connectivity to perform various tasks. Here are some of the most common types of internet applications:

1. Web Browsers

- **Examples**: Google Chrome, Mozilla Firefox, Safari.
- **Function**: Enable users to access and navigate the World Wide Web.

2. Email Services

- **Examples**: Gmail, Outlook, Yahoo Mail.
- **Function**: Allow users to send, receive, and manage email communications.

3. Social Media Platforms

- **Examples**: Facebook, Twitter, Instagram, LinkedIn.
- **Function**: Facilitate social networking and content sharing among users.

4. E-Commerce Platforms

- **Examples**: Amazon, eBay, Shopify.
- **Function**: Enable buying and selling of goods and services online.

5. Streaming Services

- **Examples**: Netflix, Spotify, YouTube.
- **Function**: Allow users to stream video and audio content over the internet.

6. Cloud Storage and File Sharing

- **Examples**: Google Drive, Dropbox, OneDrive.
- **Function**: Provide online storage solutions and enable sharing of files across devices.

7. Online Collaboration Tools

- **Examples**: Slack, Microsoft Teams, Zoom.
- **Function**: Facilitate communication and collaboration among teams, often including video conferencing and document sharing.

8. Content Management Systems (CMS)

- **Examples**: WordPress, Joomla, Drupal.
- **Function**: Allow users to create, manage, and publish content on websites.

9. Search Engines

- **Examples**: Google, Bing, DuckDuckGo.
- **Function**: Help users find information on the web by indexing and retrieving content based on queries.

10. Online Banking and Financial Services

- **Examples**: PayPal, Venmo, online banking portals.
- **Function**: Enable users to conduct financial transactions, manage accounts, and pay bills online.

11. Online Learning Platforms

- **Examples**: Coursera, Udemy, Khan Academy.
- **Function**: Provide access to educational courses and resources over the internet.

12. Forums and Discussion Boards

- **Examples**: Reddit, Stack Overflow, Quora.
- **Function**: Allow users to discuss topics, ask questions, and share knowledge within communities.

13. Gaming Platforms

- **Examples**: Steam, Epic Games Store, online multiplayer games.
- **Function**: Facilitate online gaming, including single-player and multiplayer experiences.

14. Virtual Private Networks (VPN)

- **Examples**: NordVPN, ExpressVPN.
- **Function**: Provide secure connections to the internet, often for privacy and security while browsing.

Web browser

A web browser is a software program software that searches for, retrieves, and presentations material which includes Web pages, photos, videos, and different files. The browser sends a request to the Webserver, which then transmits the statistics returned to the browser, which presentations the findings at the laptop. Example – Mozilla Firefox, Microsoft Edge, Google Chrome, Safari etc.

Webpage

An internet web page (additionally called a web page) is a report that may be regarded in an internet browser at the World Wide Web. HTML (HyperText Markup Language) and CSS (Cascading Style Sheet) are used to generate the primary shape of an internet web page. An internet web page is generally a segment of an

internet site that carries statistics in plenty of formats, which includes textual content inside the shape of paragraphs, lists, tables, and so on.
The home web page is the beginning or first web page of an internet site. It gives trendy statistics and connections to all the internet pages which are associated. Every internet web page has its personal deal with. This may be visible withinside the deal with the bar. As a result, if we need to get admission to a selected internet web page, the deal needs to be placed inside the browser's deal with bar.

Website

An internet site, in trendy, is a group of statistics approximately statistics prepared into many internet pages. An internet site is probably made for a sure motive, subject matter, or to provide a service. An internet site (abbreviated as "website" or "site") is a group of online pages connected collectively through links and saved on an internet server. By clicking on links, a tourist can pass from one web page to the next. An internet site's pages also are connected below one area call and proportion a not unusual place subject matter and template.

Search Engine

Search engines are websites that search on the internet on behalf of users and show a listing of results. More than actually written may be discovered on seek engines. You can be capable of looking for different online content material which includes photographs, video content material, books, and news, in addition to gadgets and offerings, relying on the seek engine you are the use of.
To make use of the Internet, you do not always want to recognize the deal with an internet site. It is crucial to recognize the way to do a look for statistics. Using a seek engine is one of the only methods to seek. A seek engine can help you in finding what you are looking for. You also can appearance up net maps and instructions to help you to plot your adventure from one factor to some other. Example: Google, Bing, DuckDuckGo, yahoo, etc.

Chapter - 5

Services on Internet (Definition and Functions

Email:

Short for **electronic mail**, **e-mail** or **email** is information stored on a computer that is exchanged between two users over telecommunications. More plainly, e-mail is a message that may contain text, files, images, or other attachments sent through a network to a specified individual or group of individuals.

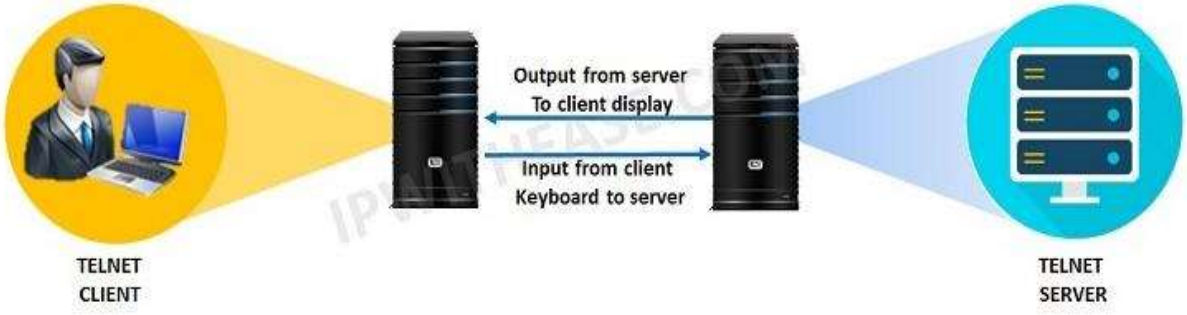
The first e-mail was sent by Ray Tomlinson in 1971. Tomlinson sent the e-mail to himself as a test e-mail message, containing the text "something like QWERTYUIOP." However, despite sending the e-mail to himself, the e-mail message was still transmitted through ARPANET.

WWW:

World Wide Web, which is also known as a Web, is a collection of websites or web pages stored in web servers and connected to local computers through the internet. These websites contain text pages, digital images, audios, videos, etc. Users can access the content of these sites from any part of the world over the internet using their devices such as computers, laptops, cell phones, etc. The WWW, along with internet, enables the retrieval and display of text and media to your device.

Telnet (Teletype Network Protocol):

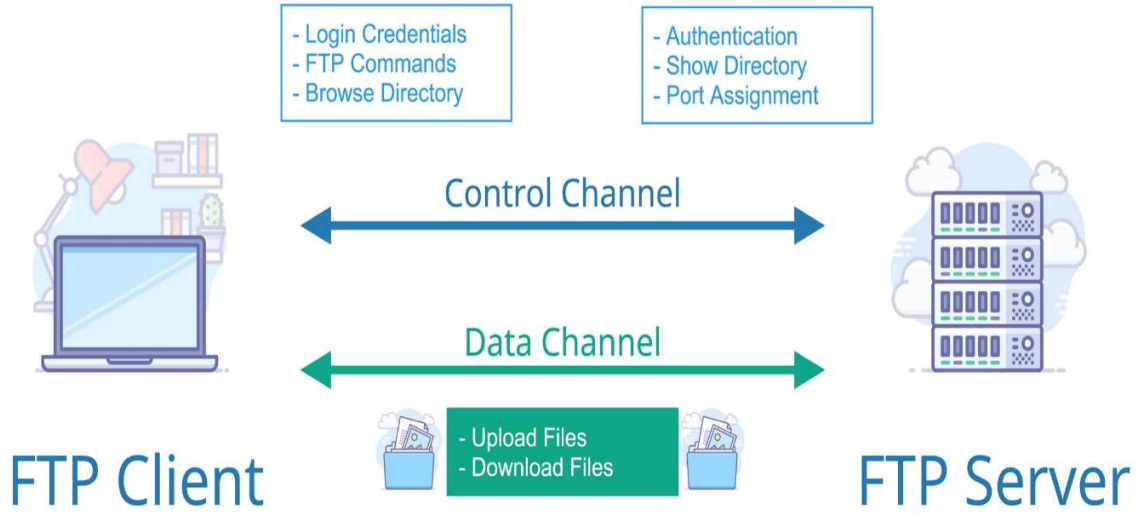
Telnet, developed in 1969, is a protocol that provides a command line interface for communication with a remote device or server, sometimes employed for remote management but also for initial device setup like network hardware. Telnet stands for Teletype Network, but it can also be used as a verb; 'to telnet' is to establish a connection using the Telnet protocol.



File Transfer Protocol (FTP):

FTP is short for File Transfer Protocol. A protocol is a set of rules that networked computers use to talk to one another. And FTP is the language that computers on a TCP/IP network (such as the internet) use to transfer files to and from each other.

You've probably encountered FTP out there on the net already. Ever downloaded a fresh nightly build of Firefox or grabbed MP3s from some kid's personal server in Sweden? Then you have probably used FTP without even knowing it. Today's web browsers allow you to download files via FTP from within the browser window.



Internet Relay Chat (IRC):

Stands for "Internet Relay Chat." IRC is a service that allows people to chat with each other online. It operates on a client/server model where individuals use a client program to connect to an IRC server. Popular IRC clients include mIRC for Windows and Textual for OS X. Several web-based clients are also available, including KiwiIRC and Mibbit.

In order to join an IRC conversation, you must choose a username and a channel. Your username, also called a handle, can be whatever you want. A channel is a specific chat group within an IRC network where users can talk to each other. Some networks publish lists of available channels, while others require you to manually enter channel names in order to join them. Channels always begin with a hashtag followed by a name that represents their intended chat topic, such as "#teenchat," "#politics," or "#sports". Some IRC channels require a password while others are open to the public.

Example of IRC

```
[18:51]  student2  Egypt
[18:51]     trivi  1 points to student2, who gave the
                   correct answer Egypt, Africa
[18:51]     trivi  From strtok: What is the symbol for
                   Unnilhexium?
[18:52]  student1  unhx
[18:52]  student2  uhx
[18:52]  student1  unnx
[18:52]  student2  unnhx
[18:52]     trivi  Aye, the answers too small for a hint
[18:52]  student1  unh
[18:52]     trivi  1 points to student1, who gave the
                   correct answer Unh
[18:52]     trivi  From strtok: What major chinese
                   revolutionist died on February 19, 1997?
[18:53]     trivi  Hint: X--o----
```

Search Engine:

A search engine is a web-based tool that enables users to locate information on the World Wide Web. Popular examples of search engines are Google, Yahoo!, and MSN Search. Search engines utilize automated software applications (referred to as robots, bots, or spiders) that travel along the Web, following links from page to page, site to site. The information gathered by the spiders is used to create a searchable index of the Web.

E-Content of
INTERNET TECHNOLOGY AND WEB DESIGN

Chapter: 3.3 Connectivity Types

Topic: 3.3.2 Level Two Connectivity

Level Two Connectivity

- Level Two connection is also known as **Dial-up connection**.
- This provides connection to Internet through a dial-up terminal connection.
- The computer, which provides Internet access, is known as 'Host' and the computer that receives the access, is 'Client' or 'Terminal'.
- The client computer uses modem to access a "host" and acts as if it is a terminal directly connected to that host. 56K modem access is now widely available and supported by most ISPs.
- It allows user to surf the Web at 56 Kbps with graphics.
- So this type of connection is also known as 'Remote Modem Access' connection.
- And the host to which the client gets connected is actually connected to the Internet by a full time connection.
- In dial-up connection to Internet, Host carries all the command that are typed on a client machine and forward them to Internet.
- It also receives the data or information from the Internet on behalf of the 'Client' and passes it to them.
- The client computer acts as a 'dumb' terminal connected to remote host.
- This type of connection can further be divided into three categories.
    - Shell Connection
    - TCP/IP Connection
    - ISDN

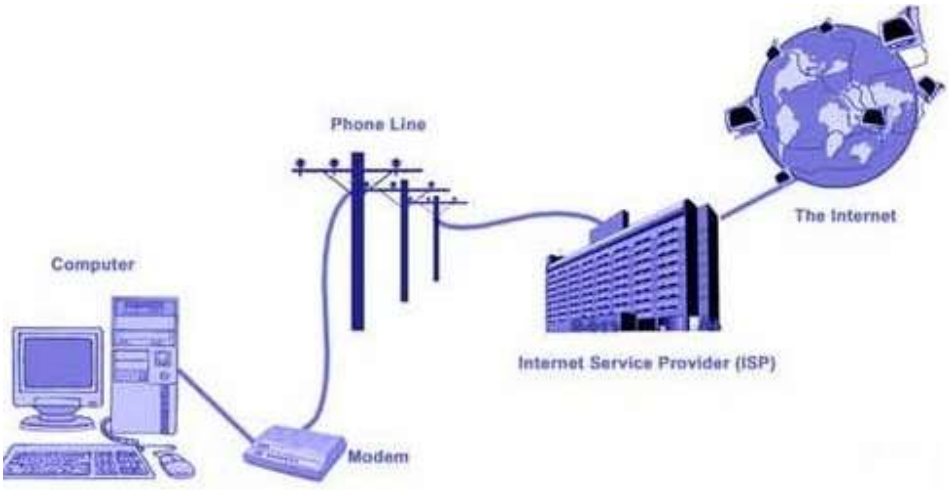


FIG 3.2: Dial-up Connection

- Shell Connection
  - In this type of Internet Connection, the user will get only textual matter of a Web Page.
  - This connection does not support Graphics display.
  - Shell Accounts were the only type of Internet access available for many years before the Internet entered in to the world of graphics and became more users friendly.
- TCP/IP Connection
  - Today's graphical World Wide Web browsers provide easier access with multimedia sound and pictures.
  - The major difference between Shell and TCP/IP account is that, Shell account can only display text and does not support graphics display, whereas TCP/IP can display both.

- ISDN

- ISDN (Integrated Services Digital Network) offers Internet connectivity at speeds of up to 128 Kbps through the use of digital phone lines. ISDN is a dial-up service that has been provided by telephone companies for many years.
- To access any of these dial-up accounts you need the followings:
  - Computer
  - Modem
  - Telephone Connection
  - Shell or TCP/IP/ISDN account from the ISP
  - Internet client software such as Internet browser

E-Content of
INTERNET TECHNOLOGY AND WEB DESIGN

Chapter: 3.3 Connectivity Types

Topic: 3.3.3 Level Three Connectivity

Level Three Connectivity

- Leased connection is also known as direct Internet access or Level Three connection.
- It is the secure, dedicated and most expensive, level of Internet connection.
- With leased connection, your computer is delicately and directly connected to the Internet using high speed transmission lines.
- It is on-line twenty-four hours a day, seven days a week.
- It provides secure and private dedicated connection.
- It can be laid for people requiring extra high bandwidth.
- Provides symmetrical, uncontended high speed connection.
- It is reliable and dependable but it is very expensive to install.
- It is not suitable for single or home workers.

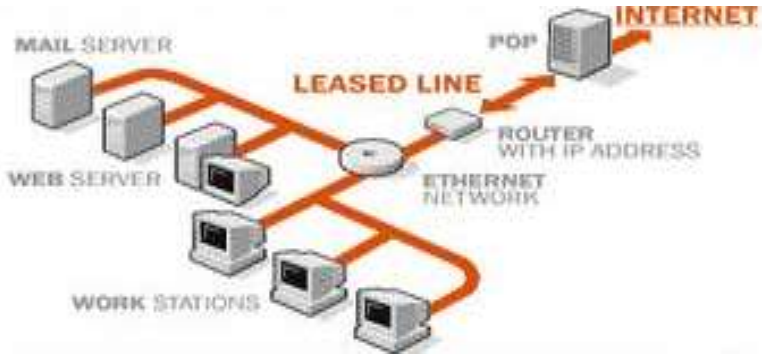


FIG 3.3: Leased Connection

Bandwidth

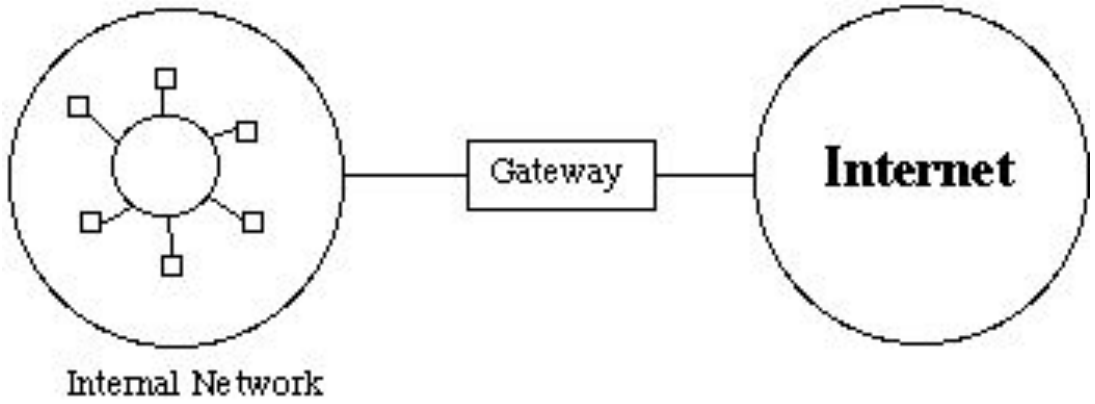
- The amount of data that can be transmitted in a fixed amount of time.
  - For digital devices, the bandwidth is usually expressed in bits per second(bps) or bytes per second(Bps). For analog devices, the bandwidth is expressed in cycles per second or Hertz(Hz).
- OR
- A range of frequencies within a given band, in particular that used for transmitting a signal.
- OR
- Bandwidth describes the maximum data transfer rate of a network or Internet connection. It measures how much data can

Levels of Internet Connectivity

- Level 1 - Access through a gateway
- Level 2 - Access via modem to host connected to network
- Level 3 - Direct Internet Access

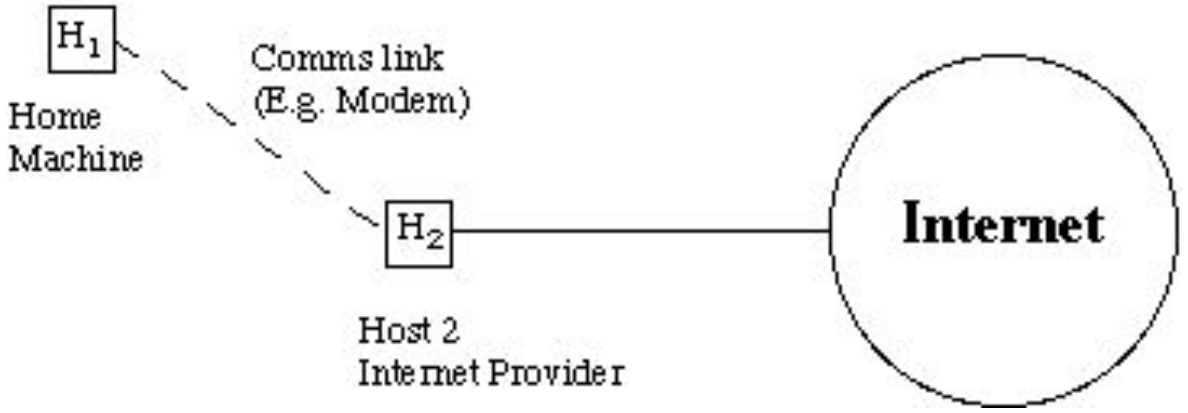
Level 1 Connectivity

- Services are limited to what gateway supports
- Examples
  - Department's / University's Computer Network.
  - America On-Line, Compuserve, Prodigy, etc.
  - Sub-network is not really on the Internet but has access to it in accordance with traffic allowed through gateway



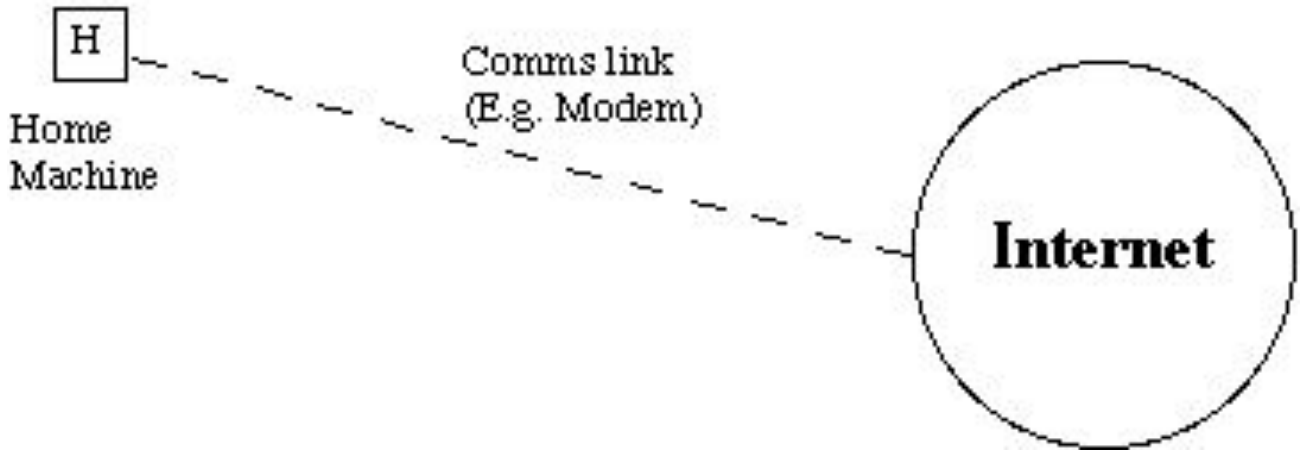
Level 2 Connectivity

- Services are limited to what the connected-to host (H_2) provides
- Everything is accomplished through the H_2
- File transfers from Internet to H_1 require two downloads: Internet to H_2 and H_2 to H_1
- Level 2 connectivity is the most prevalent of Internet access



Level 3 Connectivity for Consumer

- Some local companies provide ***Serial Line Interface Protocol (SLIP)*** or ***Point-to-Point Protocol (PPP)*** Internet access
-



Hardware and Software Requirements for Internet connection:

- The following are the methods of connecting a computer to the Internet using software and hardware peripherals.
  - Connecting a computer using Wireless Broadband
  - Connecting a computer using an Ethernet Cable
  - Connecting a Computer Using Dial-Up Community

Hardware Requirement :

- To connect the Internet, any one of the following is mandatory.
- Modem is used to connect Internet thorugh Telephoneconnection.
- NIC- Network Interface Card(wired/ wireless) facility is the most important hardware required to connect Internet. For example, the Laptop can be connected Internet through the wired/wireless.
- Dongle is used to connect the Internet using cellular network
- Wi-Fi router or Hotspot is used to connect the Internet using wireless network
- Electronic device which supports cellular network
- Internet Connectivity such as Dial-up connection, ISDN, DSL, Cable TV, wired and wireless (Cellular) Network.

Software Requirement

- The operating system should support TCP (Transfer Control Protocol) / IP (Internet Protocol), SMTP (Simple Mail Transfer Protocol), FTP (File Transfer Protocol), HTTP (Hyper Text Transfer Protocol) and HTTPS (Hyper Text Transfer Protocol Secured) protocols.
- Browsers and other Internet clients access to the web applications such as Outlook, Gmail, Whatsapp, Facebook, Twitter and etc.

Hardware and Software Requirements for Internet connection

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Three

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• Browsers and other Internet clients access to the web applications such as Outlook, Gmail, Whatsapp, Facebook, Twitter and etc.

Connection Types:

The following methods are able to connect internet.

Dial-up Connection :

A dial-up connection is established when two or more data communication devices use a **Public Switched Telephone Network** (PSTN) to connect to an Internet Service Provider (ISP) from computers. Many remote locations depend on Internet dial-up connections because broadband and cable are rare in remote areas with low population. Internet Service Providers often provide dial-up connections, a feasible alternative for budget-conscious subscribers.

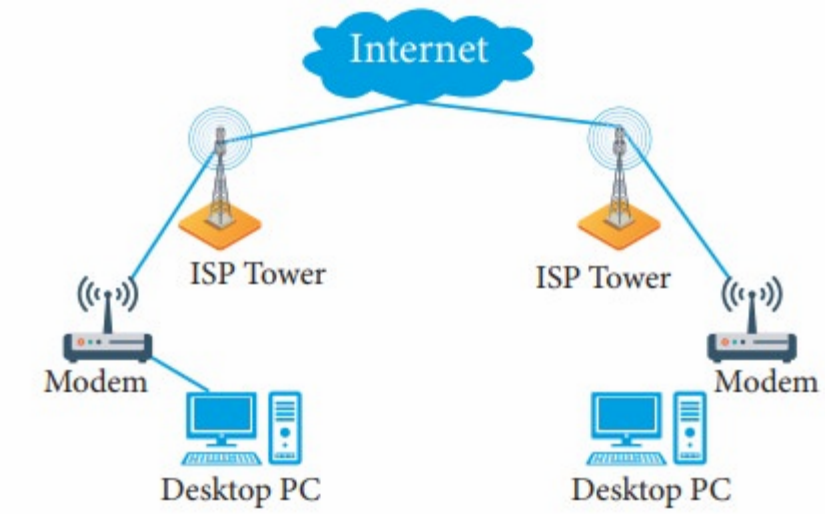


Figure 15.3 Dial-up Connection

ISDN

ISDN is the acronym of **Integrated Services Digital Network.** It establishes the connection using the phone lines (PSTN) which carry digital signals instead of analog signals. It is a set of communication standards for simultaneous digital transmission of data, voice, video, and other services over the traditional circuits of the public switched telephone network. There are two techniques to deliver ISDN services such as Basic Rate Interface (BRI) and Primary Rate Interface (PRI).

The following diagram shows accessing internet using ISDN connection:

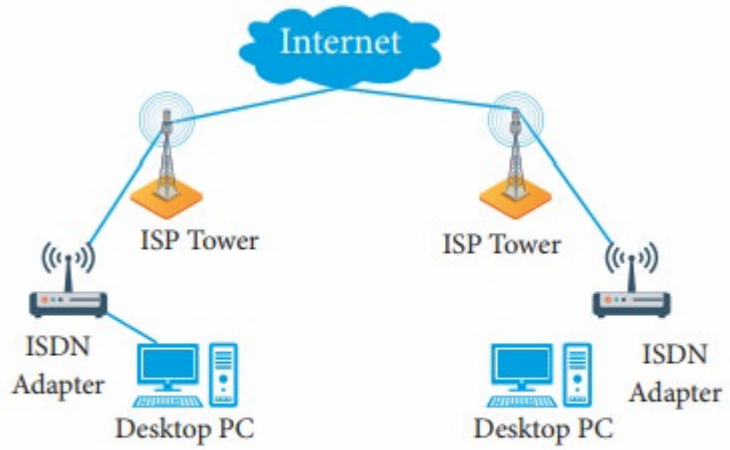


Figure 15.4a Integrated Services Digital Network

DSL:

Digital Subscriber Line (DSL) is a high-speed Internet service for homes and businesses that competes with cable and other forms of broadband Internet. DSL provides high-speed networking over ordinary Telephone lines using broadband modem technology. The technology behind DSL enables Internet and telephone service to work over the same phone line without requiring customers to disconnect either their Voice or Internet connections.

Cable TV Internet Connection (setup box):

The cable TV network can be used for connecting a computer or a local network to the Internet, competing directly with DSL (Digital Subscriber Line) technology.

This type of network is classified as HFC **(Hybrid Fiber-Coaxial),** as it uses both fiber optics and coaxial cables. The connection between the cable TV company to the distribution points (Optical nodes) is made using fiber optics, with distances up to 25 miles (40 km). Each optical node is typically serves between 500 and 2,000 clients (customers).

The following diagram shows that how internet is accessed using Cable TV connection:

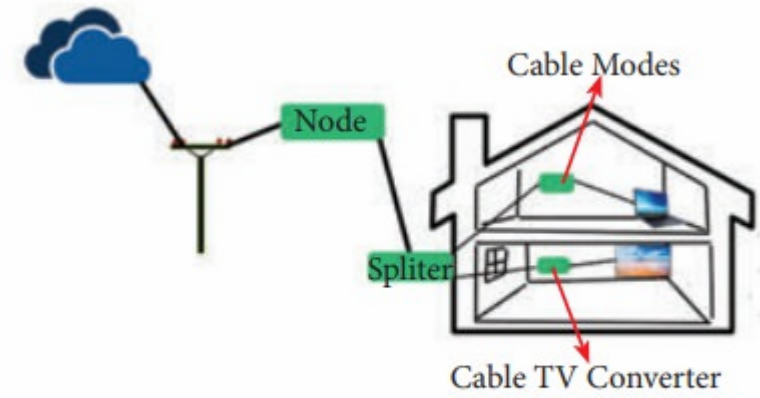


Figure 15.4b Cable TV Connection

Satellite Internet Connection:

Satellite Internet access is Internet access provided through satellite communication for domestic and enterprise usage. The facility of modern consumer grade satellite Internet service is typically provided to individual users through geostationary satellites . It provides fairly high data speeds, along with latest satellites using Ka-band to attain downstream data speeds up to 50 Mbps internet speed.

Wireless Internet Connection:

It is a technology for wireless local area networking with devices based on the IEEE 802.11 standards. Devices that can use Wi-Fi technology include personal computers, video-game consoles, phones and tablets, digital cameras, smart TVs, digital audio players and modern printers. Wi-Fi compatible devices can connect to the Internet via a WLAN and a wireless access point. Such an access point (or hotspot) has a range of about 20 meters (66 feet) indoors and a greater range of outdoors. Hotspot coverage can be as small as a single room with walls that block radio waves, or as large as many square kilometres achieved by using multiple overlapping access points.

What is Modem?

- A modem and router are two of the most frequent components in a home network configuration. A router establishes a local area network (LAN), whereas a modem connects to an internet service provider (ISP). For a home network to work, both devices are necessary.

What is a Modem?

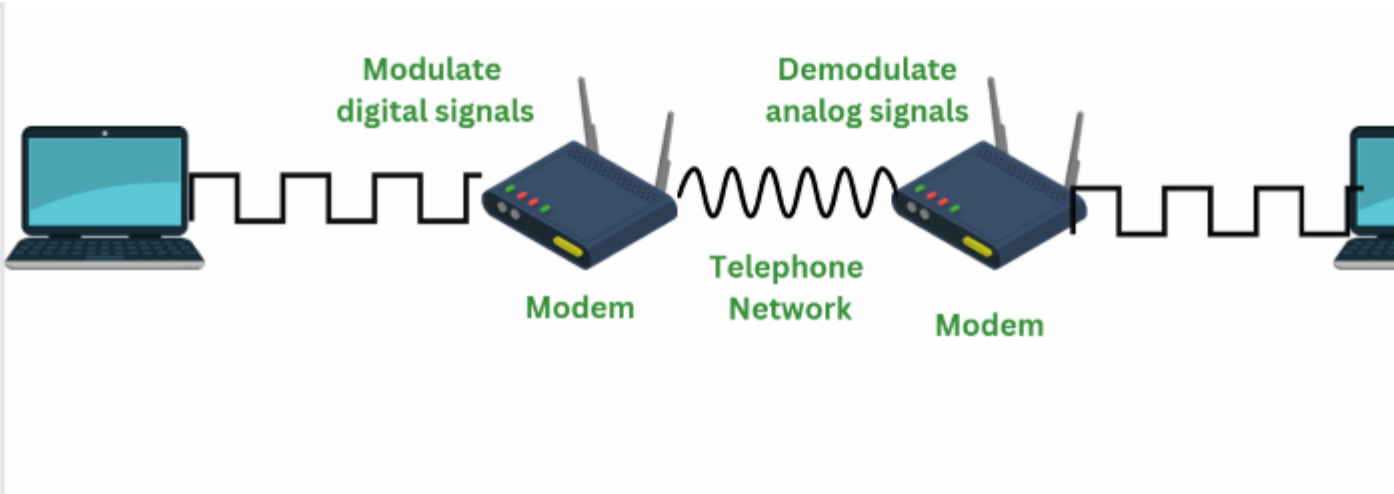
Modem stands for Modulator/Demodulator. The modem is defined as a networking device that is used to connect devices connected in the network to the internet. The main function of a modem is to convert the analog signals that come from telephone wire into a digital form. In digital form, these converted signals are stored in the form of 0s and 1s. The modem can perform both the task of modulation and demodulation simultaneously. Modems are majorly used to transfer digital data in personal systems. The modem is also known as a signal translator as it translates one signal into another signal by modulating the digital signal into an analog signal for transmission and then demodulates receiving analog signals into digital signals.

Features of Modem

- Modems can modulate as well as demodulate the signals simultaneously.
- Modem allows to connect only a specific number of devices to the internet.
- According to the features of modem, it's price ranges.
- Modems can be upgraded with the help of a specific software patch.
- To use the devices over the internet with a modem devices need to be configured with an Internet Service Provider(ISP).
- When the modem is connected to Hub it slows down its process.

Working of Modem

The two main components of a modem are modulation and demodulation. Where the modem can perform both tasks simultaneously. The step-by-step working of the modem is given below:



Step 1: Data Generation: When data needs to be transmitted it is first generated. Therefore computer system generated the data which is in digital form of 0s and 1s.
Step 2: Modulation: Modulation is defined as a process of converting digital data signals of the computer into analog data signals so that these signals can travel on the internet. The digital data is encoded onto a carrier wave.
Step 3: Transmission: The resultant of modulation that is modulated data is transmitted over the communication line to the modem that is receiving it.
Step 4: Demodulation: Demodulation is defined as a process in which analog data signals from the internet are converted into digital data signals so they can be understood by computer systems. In the process of demodulation the digital data from the carrier wave is decoded.
Step 5: Decoding: The resultant of demodulation that is demodulated data is being sent to the computer systems for their further use.

Types of Modem

There are different types of modems available. Each modem has different features and provides with different benefits. Below are the different types of modems:

1. Optical Modem

In modem, different type of media is used to transfer the signals. Optical Modem is the type of modem that makes use of optical cables instead of using another metallic type of media. The digital data is converted into the pulse of light that is transmitted on the optical fiber used in the optical Modem.

2. Digital Modem

Digital Modem is defined as a type of modem that is used to convert digital data into digital signals. Digital data is in form of 0s and 1s. For this, it performs the process of modulation. Digital Modem modulates the digital data on digital carrier signals for transmission.

3. Cable Modem

Cable modems are defined as a type of modem used to establish a communication between computer systems and the Internet Service Providers. A cable modem helps to access high-speed data through cable TV networks. Such modems are usually connected to desktops or systems and work like external devices.

4. Satellite Modem

Satellite Modems are defined as a type of modem that provides with the internet connection through satellite dishes. This type of modem works by sending the input bits into output radio signals and vice versa. The internet network that is provided by such types of modems is more reliable and efficient as compared to other types of modems.

5. Dial Modem

A Dial Modem is a type of modem that converts data used in telephone and data used on computers. In short dial modem converts between analog form and digital form. The networking devices connected to the computer are all at one end and the telephone line is at another end. This type of modem transmits the data at a speed of 56000 per/sec.

Advantages of Modem

- A modem converts digital signals into an analog signal.
- The cost of a modem increases according to the features it has.
- The modem helps to connect the LAN to the internet.
- Modem performs both modulation and demodulation processes simultaneously

Disadvantages of Modem

- The working of the modem slows down when connected to the hub.
- The modem cannot track the traffic between the LAN and the internet.
- When using a modem a limited number of network devices can be connected to the internet.
- Modems have a high rock of security-related attacks.
- The modem does not provide maintenance of traffic.

E-Content of
INTERNET TECHNOLOGY AND WEB DESIGN

Chapter: 3.5 Internet Accounts by ISP

Topic: 3.5.1 Telephone line Options

Telephone line Options

Dial-up Connections

- Dial-up Internet access is a type of Internet connectivity that operates through a standard telephone line.
- Dial-up access refers to connecting a device to a network via a modem and a public telephone network.
- Dial-up access is just like a phone connection the only difference is that; rather than people at the two ends computer devices are present.
- Dial-up access uses normal telephone lines thus the quality of the connection is not always good and data rates are limited.
- Dial-up internet access is offered through a number of Internet Service Provider (ISP).
- Most ISPs lease a set of telephone numbers, sometimes local, sometimes national, that dial into network pipeline that feed into the Internet.
- Open joining a dial-up service, the subscriber chooses a user name and password.
- Once the modem calls the phone number and makes a connection a “handshake” takes place in which information is exchanged between the computer modem and the remote server.
- The user name and password is supplied by the modem.
- This grants the user access through the dial-up gate way to the Internet.
- Dial-up service is least expensive but also the slowest type of Internet access.

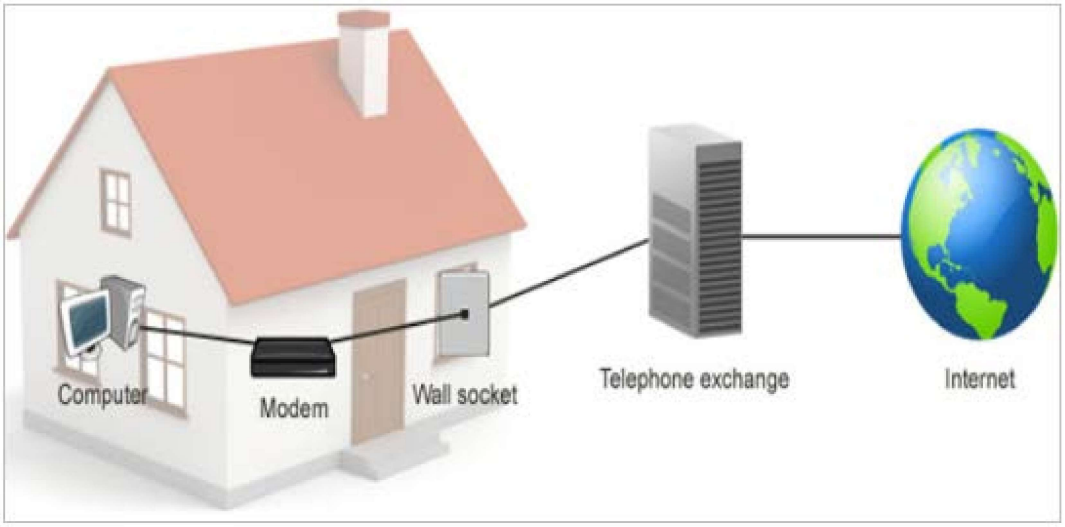


FIG 3.6: Dial-up Connection

Connecting to Dial-Up Internet Accounts

- Click on Start and point to Control Panel.
- Click on Network and Internet Connections.
- Click on Network Connections.
- Click on Create a new connection.
- Click on Next.
- Select Connect to the Internet and Click Next.
- Select Set up my connection manually and Click Next.
- Select Connect using a dial-up modem and Click Next.
- In the open field type in “Setarnet” and Click Next.
- Type in the phone number for ISDN dialup and Click Next.
- Type in the “Username” and “Password” and Click Next.
- Click Finish and the Internet setup are complete.

Dedicated Access

- Dedicated Internet Access is a reliable and scalable worldwide Internet access service.
- It is specifically designed to maximize today’s business-critical VPN connectivity needs.

- The ISPs managed Internet connectivity with a comprehensive suite of services features, all at the fair market price required by global businesses.
- The key benefit of dedicated access is that it is cost effective and it provides reliable internet access.

ISDN Connection

- ISDN is abbreviation of Integrated Services Digital Network.
- ISDN is an international communications standard for sending voice, video and data over digital telephone lines or normal telephones wires.
- ISDN supports data transfer rates of 64 Kbps (i.e., 64000 bits per seconds).
- It is mostly designed for leased lines.
- Configuration allows for multiple types of terminations. It uses a Terminal Adapter (TA) for termination and it is not a modem.
- There are two types of ISDN.
    - Basic Rate Interface (BRI)
    - Primary Rate Interface (PRI)
- Basic Rate Interface (BRI)
    - It consists of 64 Kbps B-Channels and one D-Channels for transmitting control information.
- Primary Rate Interface (PRI)
    - It consists of 23 B-Channels and one D-Channel (U.S.)
- The original version of ISDN employs base band transmission.
- Another version, called B-ISDN, uses broadband transmission and is able to support transmission rates of 1.5 Mbps. -ISDN requires fiber optic cables and is not widely

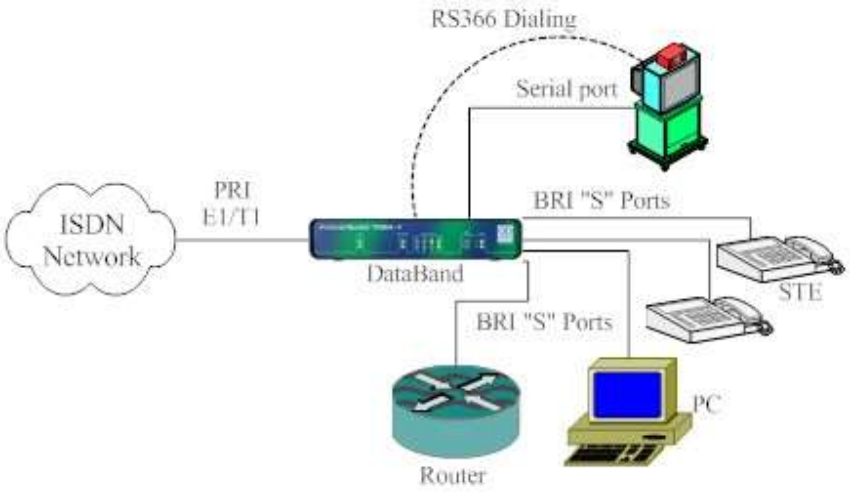


FIG 3.7: ISDN Connection

ISDN Services

- ISDN telephony
- ISDN telecopy
- ISDN and analog terminals
- Call forwarding
- Call waiting
- CLIP (Calling Line Identification Presentation)
- CLIR (Calling Line Identification Restriction)
- Three-party conference
- Advice of change
- Malicious call identification

Advantages of ISDN

- Digital services with less error.
- Direct fast connection with no dialing.
- Higher bandwidth (Takes less time in downloading material).
- Supports multiple users.
- Able to use ISDN for more than one task.

Disadvantages of ISDN

- ISDN is more expensive to install than a standard telephone.
- Not easy to set up.
- All exchanges do not provide ISDN service.

Types of Internet Connection

- An internet connection is a means by which individual devices or local networks are linked to the global internet, allowing them to communicate and exchange data. There are many connections that can be used for internet access. All the connections have their own speed range that can be used for different purposes like for home, or for personal use. In this article, we will discuss different types of internet connections.

What is the Internet?

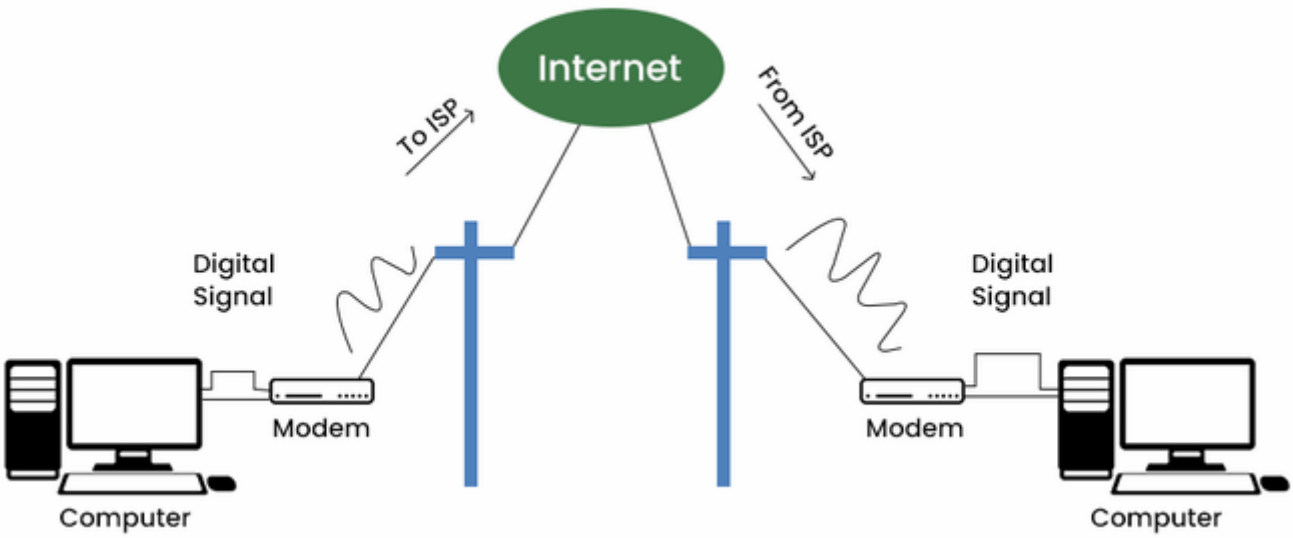
The Internet is a global network of computers connected. It allows people all over the world to communicate, share information, and access a huge amount of data. You can use the Internet to send emails, browse websites, watch videos, play games, and much more. It's like a huge library and playground that you can access from your computer, phone, or other devices anytime and anywhere.

Types of Internet Connection

1. Dial-Up Connection

A dial-up connection is established between your computer and the ISP server using a modem. A dial-up Connection is a cheap and traditional connection that is not preferred these days as this type of connection is very slow.

To access the internet connection in the dial-up connection we need to dial a phone number on the computer and that's why it requires a telephone connection. It requires a modem to set up a dial-up connection, which works as interference between your computer and the telephone line. In this connection, we can use either an internet connection or a telephone at a time.

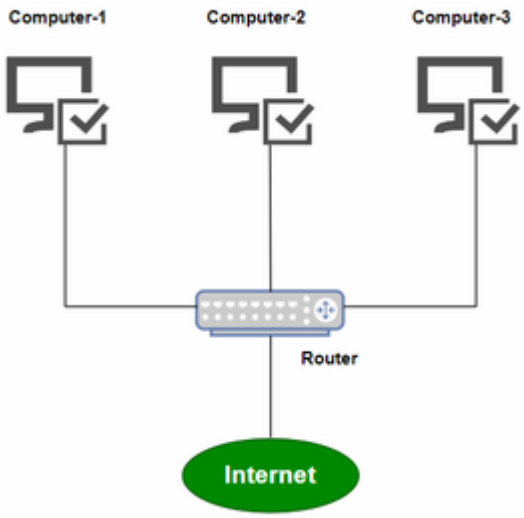


Dial Up Connection

2. Broadband Connection

Broadband refers to high-speed internet access that is faster than traditional dial-up access. It is provided through either cable or telephone composition. It does not require any telephone connection that's why here we can use telephone and internet connection simultaneously. In this connection, more than one person can access the internet connection simultaneously.

It is a wide bandwidth data transmission that transports several signals and traffic types. In this connection, the medium used is coaxial cable, optical fiber cable, radio, or twisted pair cable.

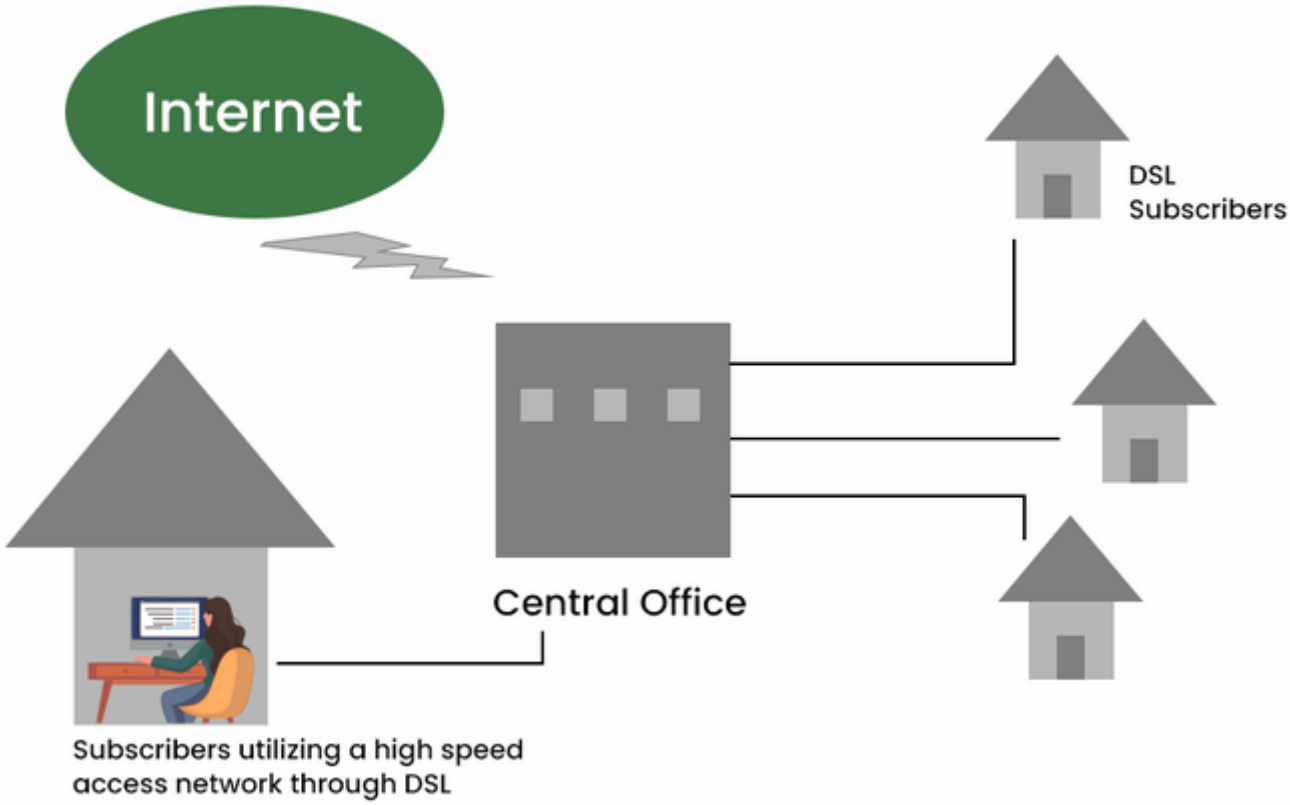


Broadband-Connection

3. DSL (Digital Subscriber Line)

DSL stands for Digital Subscriber Line. It provides an internet connection through the telephone line(network). DSL is a form of broadband communication that is always on, there is no need to dial a phone number to connect. DSL connection uses a router to transport data and the speed of this connection range between 128k to 8Mbps depending on the service offered. A DSL connection can translate data at 5 million bytes per second, or 5mbps.

DSL service can be delivered simultaneously with wired telephone service on the same telephone line due to high-frequency bands for data.

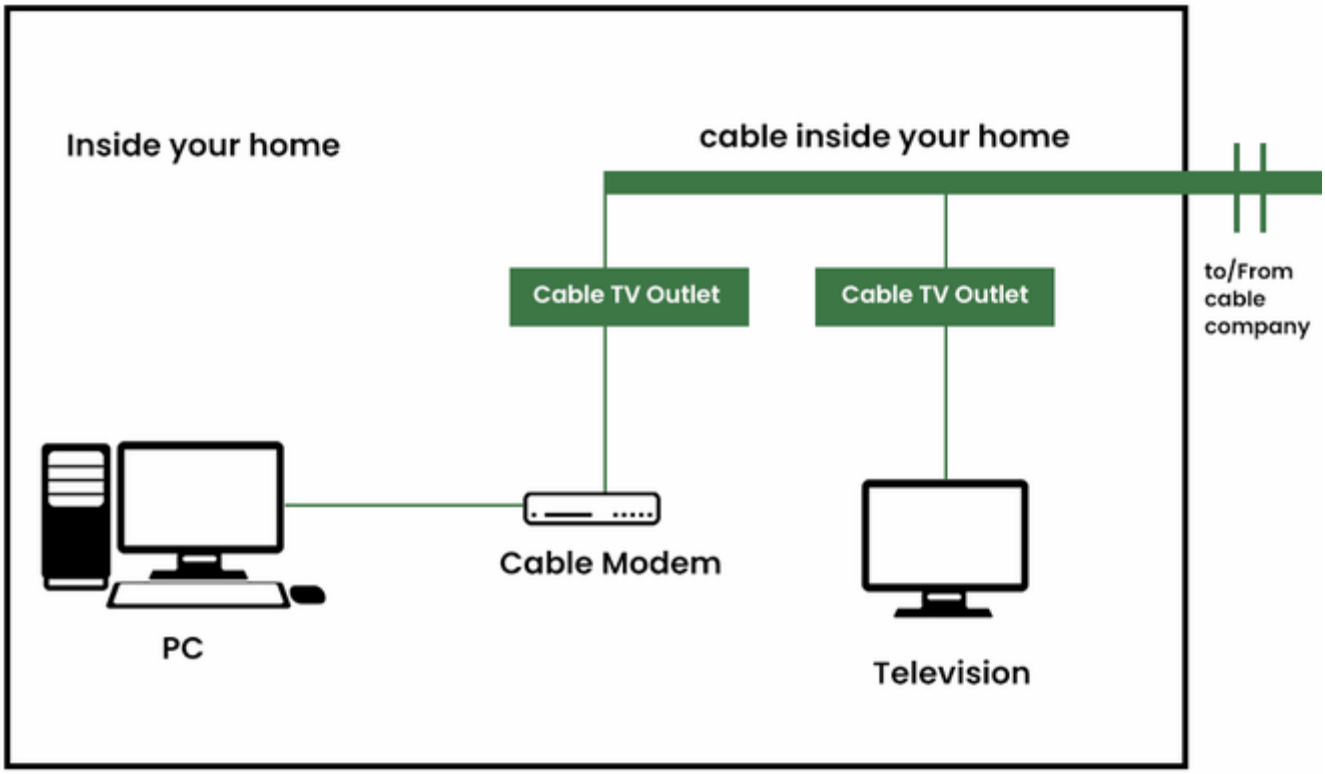


DSL

4. Cable

It is a form of broadband access cable modem that can provide extremely fast access to the internet. The speed of this connection varies which can be different for uploading data transmission or downloading.

It uses a cable modem to provide an internet connection and operates over cable TV lines. The speed of cable connection ranges from 512k to 20Mbps.h

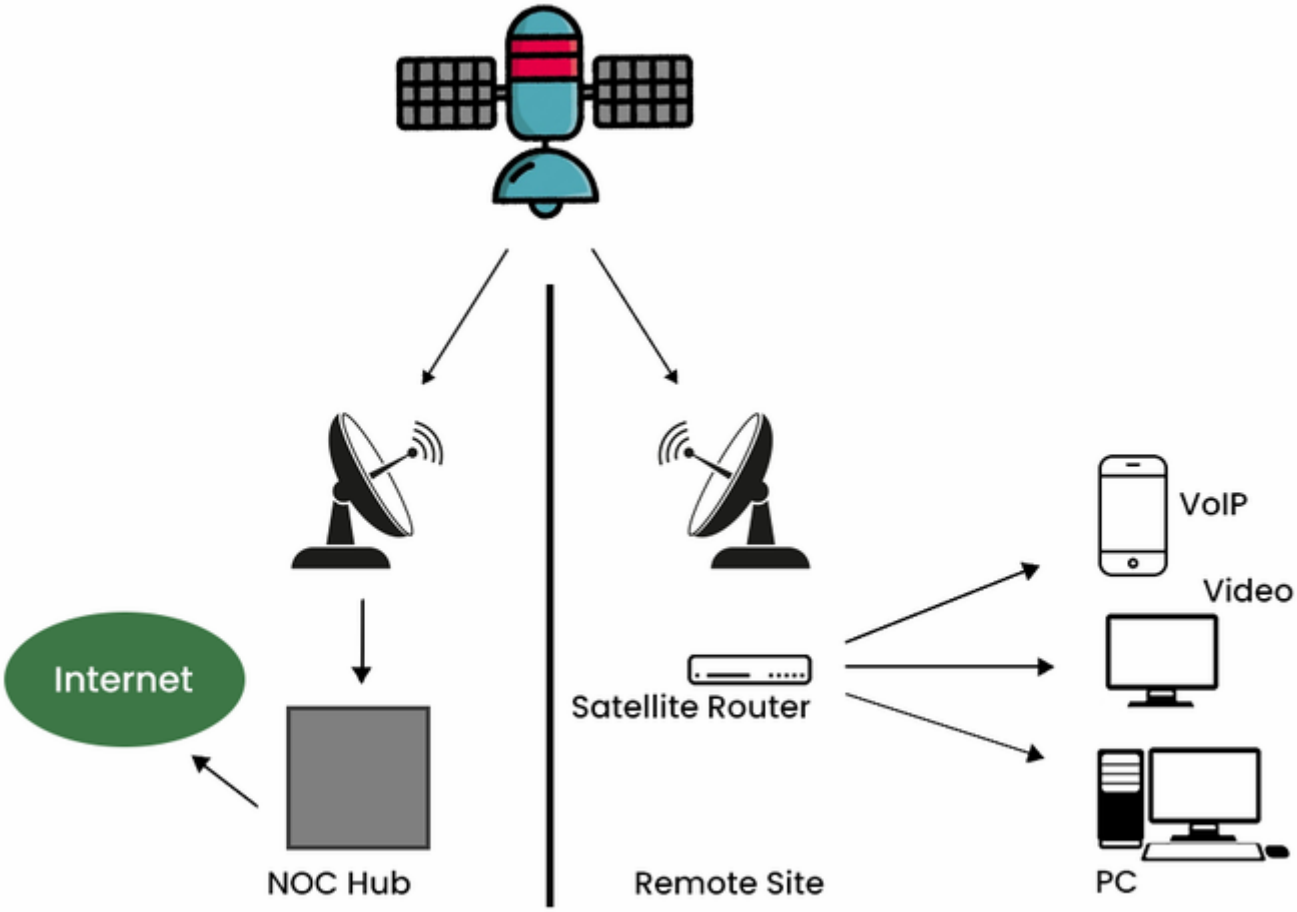


Cable

5. Satellite Connection

This type of connection is provided mainly in rural areas where a broadband connection is not yet offered. It accesses the internet via a satellite that is in Earth's orbit.

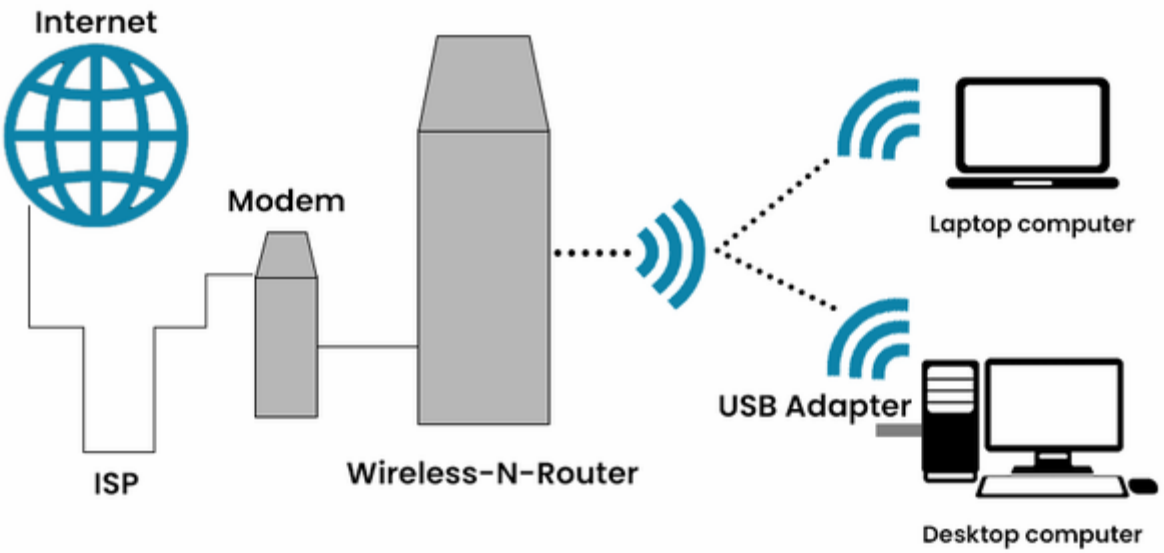
The signal travels from a long distance that is from earth to satellite and back again which provides a delayed connection. Satellite connection speeds range from 512k to 2.0Mbps.



Satellite Connection

6. Wireless Connection

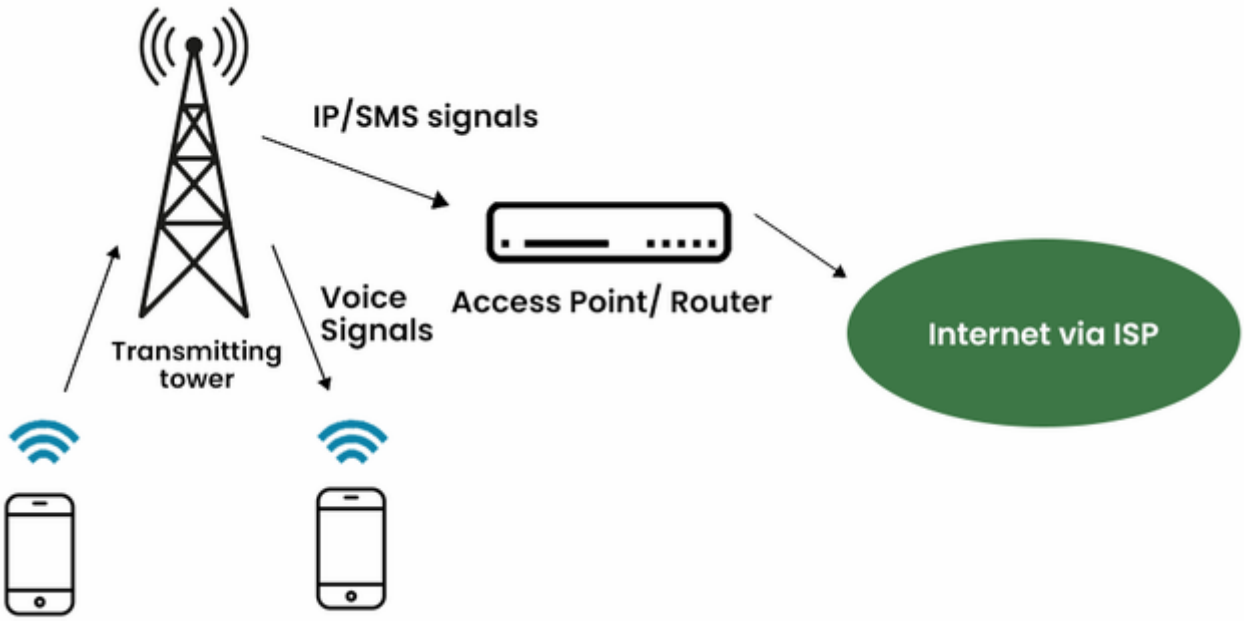
As the name suggests wireless connection does not use telephone lines or cables to connect to the internet. The wireless connection uses a radio frequency band to connect to the internet. It is also an always-on connection and this connection can be accessed from anywhere and speed may vary for different locations. It ranges from 5Mbps to 20Mbps.



Wireless Connection

7. Cellular

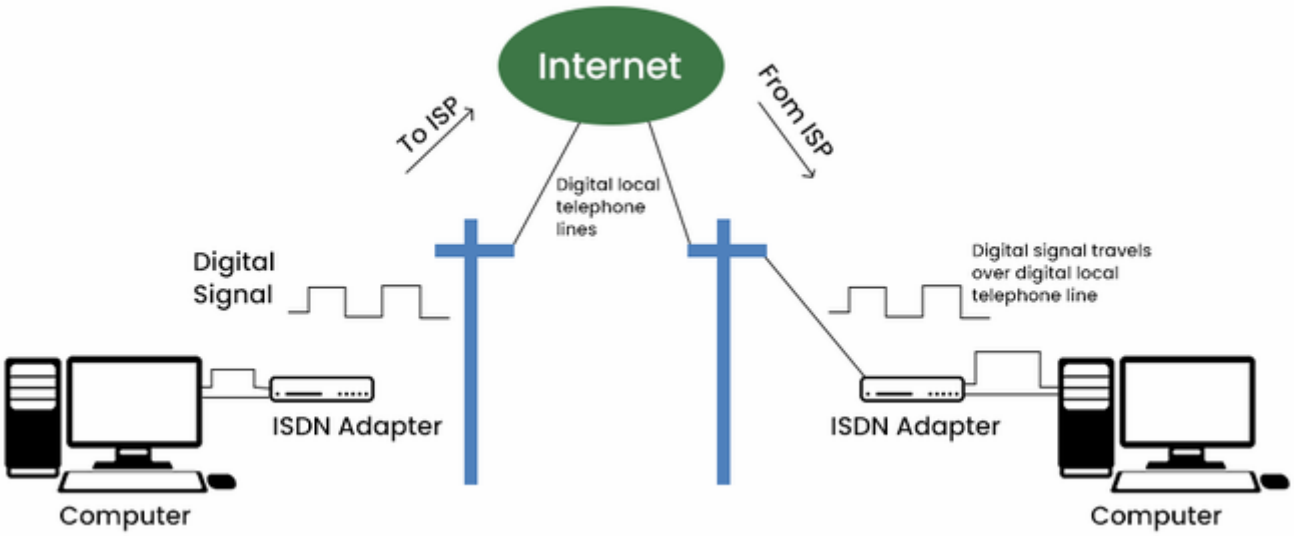
Cellular technology provides wireless Internet access through cell phones. Speed may vary depending on the service provider. The most common are 3G and 4G which means from 3rd generation and 4th generation respectively. The speed of the 3G cellular network is around 2.0Mbps and the 4G cellular network is around 21Mbps the goal of the 4G network is to achieve peak mobile speeds of 100Mbps but the current speed of the 4G network is about 21Mbps.



Cellular

8. ISDN (Integrated Service Digital Network)

ISDN stands for Integrated Service Digital Network and it is a circuit-switched telephone network system, but it also provides access to packet-switched networks that transmits both voice and data over a digital line. It provides a packet-switched connection for data in increments of 64 kilobit/s.
ISDN connection provides better speeds and higher quality than traditional connections. It provided a maximum of 128kbit/s bandwidth in both upstream and downstream directions.



ISDN

Components Required For Internet Connecton

- **Modem**: A device that modulates and demodulates signals for encoding and decoding digital data transmitted over a telephone line or cable system.
- **Router**: A device that routes data from a local network to the internet and vice versa, often includes Wi-Fi capabilities.
- **ISP (Internet Service Provider)**: The company that provides internet access to customers.

Conclusion

An internet connection is essential in today's digital age, serving as the backbone for communication, information sharing, and numerous applications across personal, educational, and professional domains.

Setting up a connection of internet in the form of hardware, modem software requirement modem configuration

Setting up an internet connection involves several steps, including hardware installation, software configuration, and modem setup. Here's a detailed guide:

1. Gather Required Hardware

- **Modem**: Device that connects to your ISP.
- **Router** (optional): For multiple devices and Wi-Fi.
- **Cables**:
  - Coaxial cable (for cable modems)
  - DSL line (for DSL modems)
  - Ethernet cables (to connect modem to router/computer)
- **Power Supply**: Ensure the modem and router are powered.

2. Connect the Modem

- **Cable Modem**:
  - Connect the coaxial cable from the wall outlet to the modem.
  - Plug the power adapter into the modem and an electrical outlet.
- **DSL Modem**:
  - Connect the DSL line to the modem.
  - Plug the power adapter into the modem and an electrical outlet.

3. Connect the Router (if using one)

- Connect an Ethernet cable from the modem's LAN port to the router's WAN/Internet port.
- Plug in the router's power supply and turn it on.

4. Configure the Modem

- **Access the Modem's Configuration Page**:
  - Connect a computer to the modem using an Ethernet cable (or connect to the router if using one).
  - Open a web browser and enter the modem's IP address (often `192.168.0.1` or `192.168.1.1`—check your modem's documentation).
- **Log in**:
  - Use default credentials (usually found on the modem or in the manual). Common defaults are `admin/admin` or `admin/password`.
- **Configure Settings**:
  - **Internet Connection Type**: Select the type (e.g., DHCP, PPPoE). Your ISP will provide this information.
  - **Username/Password**: If using PPPoE, enter the credentials provided by your ISP.
  - **Save and Reboot**: Save your settings and restart the modem if prompted.

5. Configure the Router (if using one)

- **Access the Router's Configuration Page**:
  - Open a web browser and enter the router's IP address (often `192.168.1.1` or `192.168.0.1`).
- **Log in**:
  - Use the default credentials (often `admin/admin`).
- **Set Up WAN Connection**:
  - Similar to the modem, configure the WAN settings as provided by your ISP.
- **Set Up Wi-Fi**:
  - Create a Wi-Fi network name (SSID) and password.
  - Save your settings and reboot the router.

6. Test the Connection

- Once everything is connected and configured, connect a device (computer, smartphone) to the network.
- Open a web browser and check if you can access the internet.

7. Troubleshooting

- If you encounter issues:
  - Ensure all cables are securely connected.
  - Restart the modem and router.
  - Check that your ISP is not experiencing outages.
  - Review the configuration settings for any errors.

Summary

1. **Gather hardware**: modem, router, cables.
2. **Connect the modem** to the internet source.
3. **Connect the router** (if using).
4. **Configure modem** settings via web interface.
5. **Configure router** settings (if applicable).
6. **Test the internet connection**.
7. **Troubleshoot** as necessary.

Scenario: Connecting your office LAN to the Internet with a modem - IBM Documentation

What is a network protocol?

A network protocol is a set of established rules that specify how to format, send and receive data so that computer network endpoints, including computers, servers, routers and virtual machines, can communicate despite differences in their underlying infrastructures, designs or standards.

To successfully send and receive information, devices on both sides of a communication exchange must accept and follow protocol conventions. In networking, support for protocols can be built into the software, hardware or both.

Email Protocols

- Email protocols are a collection of protocols that are used to send and receive emails properly. The email protocols provide the ability for the client to transmit the mail to or from the intended mail server. Email protocols are a set of commands for sharing mails between two computers. Email protocols establish communication between the sender and receiver for the transmission of email. Email forwarding includes components like two computers sending and receiving emails and the mail server. There are three basic types of email protocols.

Types of Email Protocols

1. SMTP (Simple Mail Transfer Protocol):

Simple Mail Transfer Protocol is used to send mails over the internet. SMTP is an application layer and connection-oriented protocol. SMTP is efficient and reliable for sending emails. SMTP uses TCP as the transport layer protocol. It handles the sending and receiving of messages between email servers over a TCP/IP network. This protocol along with sending emails also provides the feature of notification for incoming mails. When a sender sends an email then the sender’s mail client sends it to the sender’s mail server and then it is sent to the receiver mail server through SMTP. SMTP commands are used to identify the sender and receiver email addresses along with the message to be sent.

Some of the SMTP commands are HELLO, MAIL FROM, RCPT TO, DATA, QUIT, VERIFY, SIZE, etc. SMTP sends an error message if the mail is not delivered to the receiver hence, reliable protocol.

2. POP (Post Office Protocol):

Post Office Protocol is used to retrieve email for a single client. POP3 version is the current version of POP used. It is an application layer protocol. It allows to access mail offline and thus, needs less internet time. To access the message it has to be downloaded. POP allows only a single mailbox to be created on the mail server. POP does not allow search facilities

Some of the POP commands are LOG IN, STAT, LIST, RETR, DELE, RSET, and QUIT. For more details please refer to the POP Full-Form article.

3. IMAP (Internet Message Access Protocol):

Internet Message Access Protocol is used to retrieve mails for multiple clients. There are several IMAP versions: IMAP, IMAP2, IMAP3, IMAP4, etc. IMAP is an application layer protocol. IMAP allows to access email without downloading them and also supports email download. The emails are maintained by the remote server. It enables all email operations such as creating, manipulating, delete the email without reading it. IMAP allows you to search emails. It allows multiple mailboxes to be created on multiple mail servers and allows concurrent access. Some of the IMAP commands are: IMAP_LOGIN, CREATE, DELETE, RENAME, SELECT, EXAMINE, and LOGOUT.

4. MIME (Multipurpose Internet Mail Extension Protocol):

Multipurpose Internet Mail Extension Protocol is an additional email protocol that allows non-ASCII data to be sent through SMTP. It allows users to send and receive different types of data like audio, images, videos and other application programs on the Internet. It allows to send multiple attachments with single message. It allows to send message of unlimited length.

5. Telnet

Telnet or Teletype Network Protocol is a client/server application protocol. It allows users to connect with the email servers directly from the command line of their computer.
The primary purpose of Telnet is to establish a standardized connection between terminal-oriented devices and processes (RFC 854).It could also be used for sending emails and, in that process, testing the Simple Mail Transfer Protocol (SMTP) connection. However, there are specific limitations preventing you from actually sending emails on production, and we'll discuss them in detail.

6. FTP (File Transfer Protocol)

FTP is a standard communication protocol. There are various other protocols like HTTP which are used to transfer files between computers, but they lack clarity and focus as compared to FTP. Moreover, the systems involved in connection are heterogeneous, i.e. they differ in operating systems, directories, structures, character sets, etc the FTP shields the user from these differences and transfers data efficiently and reliably. FTP can transfer ASCII, EBCDIC, or image files. The ASCII is the default file share format, in this, each character is encoded by NVT ASCII. In ASCII or EBCDIC the destination must be ready to accept files in this mode. The image file format is the default format for transforming binary files.

7. IRC

Internet Relay Chat (IRC): Stands for "Internet Relay Chat." IRC is a service that allows people to chat with each other online. It operates on a client/server model where individuals use a client program to connect to an IRC server. Popular IRC clients include mIRC for Windows and Textual for OS X. Several web-based clients are also available, including KiwiIRC and Mibbit. In order to join an IRC conversation, you must choose a username and a channel. Your username, also called a handle, can be whatever you want. A channel is a specific chat group within an IRC network where users can talk to each other. Some networks publish lists of available channels, while others require you to manually enter channel names in order to join them. Channels always begin with a hashtag followed by a name that represents their intended chat topic, such as "#teenchat," "#politics," or "#sports". Some IRC channels require a password while others are open to the public

Search engine definition

A search engine is a type of software designed to help you find specific information online. It does this by methodically searching through web content based on the specific keywords a user enters into the search box. Search results typically appear on what are commonly known as search engine results pages (SERPs). These pages may display a variety of content including web pages, images, videos, and other file types.

A search engine is an **online answering machine**, which is used to search, understand, and organize content's result in its database based on the search query (keywords) inserted by the end-users (internet user). To display search results, all search engines first find the valuable result from their database, sort them to make an ordered list based on the search algorithm, and display in front of end-users. The process of organizing content in the form of a list is commonly known as a **Search Engine Results Page (SERP)**.

Google, **Yahoo!, Bing**, **YouTube**, and **DuckDuckGo** are some popular examples of search engines.

Advantages of Search Engine

Searching content on the Internet becomes one of the most popular activities all over the world. In the current era, the search engine is an essential part of everyone's life because the search engine offers various popular ways to find valuable, relevant, and informative content on the Internet.

A list of advantages of search engines is given below -

1. Time-Saving

Search engine helps us to save time by the following two ways -

- Eliminate the need to find information manually.
- Perform search operations at a very high speed.

2. Variety of information

The search engine offers various variety of resources to obtain relevant and valuable information from the Internet. By using a search engine, we can get information in various fields such as education, entertainment, games, etc. The information which we get from the search engine is in the form of blogs, pdf, ppt, text, images, videos, and audios.

3. Precision

All search engines have the ability to provide more precise results.

4. Free Access

Mostly search engines such as Google, Bing, and Yahoo allow end-users to search their content for free. In search engines, there is no restriction related to a number of searches, so all end users (Students, Job seekers, IT employees, and others) spend a lot of time to search valuable content to fulfill their requirements.

5. Advanced Search

Search engines allow us to use advanced search options to get relevant, valuable, and informative results. Advanced search results make our searches more flexible as well as sophisticated. For example, when you want to search for a specific site, type **"site:"** without quotes followed by the site's web address.

Suppose we want to search for java tutorial on javaTpoint then type **"java site:www.javatpoint.com"** to get the advanced result quickly.

To search about education institution sites (colleges and universities) for B.Tech in computer science engineering, then use **"computer science engineering site:.edu."** to get the advanced result.

6. Relevance

Search engines allow us to search for relevant content based on a particular keyword. For example, a site "javatpoint" scores a higher search for the term "java tutorial" this is because a search engine sorts its result pages by the relevance of the content; that's why we can see the highest-scoring results at the top of SERP.

Disadvantages of Search Engine

There are the following disadvantages of Search Engines -

- Sometimes the search engine takes too much time to display relevant, valuable, and informative content.
- Search engines, especially Google, frequently update their algorithm, and it is very difficult to find the algorithm in which Google runs.
- It makes end-users effortless as they all time use search engines to solve their small queries also.

Components of Search Engine

There are the following four basic components of Search Engine -

1. Web Crawler

Web Crawler is also known as a **search engine bot**, **web robot**, or **web spider**. It plays an essential role in search engine optimization (SEO) strategy. It is mainly a software component that traverses on the web, then downloads and collects all the information over the Internet.

2. Database

The search engine database is a type of **Non-relational database**. It is the place where all the web information is stored. It has a large number of web resources. Some most popular search engine databases are **Amazon Elastic Search Service** and **Splunk**.

There are the following two database variable features that can affect the search results:

- Size of the database
- The freshness of the database

3. Search Interfaces

Search Interface is one of the most important components of Search Engine. It is an interface between the user and the database. It basically helps users to search for queries using the database.

4. Ranking Algorithms

The ranking algorithm is used by Google to rank web pages according to the Google search algorithm.

How do search engines work

There are the following tasks done by every search engines -

1. Crawling

Crawling is the first stage in which a search engine uses web crawlers to find, visit, and download the web pages on the WWW (World Wide Web). Crawling is performed by software robots, known as "**spiders**" or "**crawlers**." These robots are used to review the website content.

2. Indexing

Indexing is an online library of websites, which is used to sort, store, and organize the content that we found during the crawling. Once a page is indexed, it appears as a result of the most valuable and most relevant query.

3. Ranking and Retrieval

The ranking is the last stage of the search engine. It is used to provide a piece of content that will be the best answer based on the user's query. It displays the best content at the top rank of the website.

Integrated Services Digital Network (ISDN)

The Integrated Services Digital Network (ISDN) is a set of communication protocols that enable the simultaneous digital transmission of voice, video, data, and other network services over traditional Public Switched Telephone Network(PSTN) connections. ISDN aims to enable end-to-end digital connectivity to serve a diverse set of services. In this article, we will discuss everything about Integrated Services Digital Network.

What is ISDN?

ISDN is a circuit-switched telephone network system, but it also provides access to packet-switched networks that allow digital transmission of voice and data. This results in potentially better voice or data quality than an analog phone can provide. It provides a packet-switched connection for data in increments of 64 kilobit/s. It provided a maximum of 128 kbit/s bandwidth in both upstream and downstream directions. A greater data rate was achieved through channel bonding. Generally, ISDN B-channels of three or four BRIs (six to eight 64 kbit/s channels) are bonded.

History of ISDN

Before the *Integrated Services Digital Network (ISDN)*, the telephone system was seen as a way to transmit voice, with some special services available for data. The main feature of ISDN is that it can integrate speech and data on the same lines, which were not available in the classic telephone system. In the context of the OSI model, ISDN is employed as the network in data-link and physical layers but commonly ISDN is often limited to usage to Q.931 and related protocols. These protocols introduced in 1986 are a set of signaling protocols establishing and breaking circuit-switched connections and for advanced calling features for the user. ISDN provides simultaneous voice, video, and text transmission between individual desktop videoconferencing systems and group video conferencing systems.

Types of ISDN Interfaces

- **Basic Rate Interface (BRI) :** There are two data-bearing channels (‘B’ channels) and one signaling channel (‘D’ channel) in BRI to initiate connections. The B channels operate at a maximum of 64 Kbps while the D channel operates at a maximum of 16 Kbps. The two channels are independent of each other. For example, one channel is used as a TCP/IP connection to a location while the other channel is used to send a fax to a remote location. In iSeries ISDN supports a basic rate interface (BRI). The basic rate interface (BRI) specifies a digital pipe consisting of two B channels of 64 Kbps each and one D channel of 16 Kbps. This equals a speed of 144 Kbps. In addition, the BRI service itself requires an operating overhead of 48 Kbps. Therefore a digital pipe of 192 Kbps is required.

- **Primary Rate Interface (PRI):** Primary Rate Interface service consists of a D channel and either 23 or 30 B channels depending on the country you are in. PRI is not supported on the iSeries. A digital pipe with 23 B channels and one 64 Kbps D

channel is present in the usual Primary Rate Interface (PRI). Twenty-three B channels of 64 Kbps each and one D channel of 64 Kbps equals 1.536 Mbps. The PRI service uses 8 Kbps of overhead also. Therefore PRI requires a digital pipe of 1.544 Mbps.

- **Broadband-ISDN (B-ISDN):** Narrowband ISDN has been designed to operate over the current communications infrastructure, which is heavily dependent on the copper cable however B-ISDN relies mainly on the evolution of fiber optics. According to CCITT B-ISDN is best described as 'a service requiring transmission channels capable of supporting rates greater than the primary rate.
-

ISDN Services

ISDN provides a fully integrated digital service to users. These services fall into 3 categories- bearer services, teleservices, and supplementary services.

- **Bearer Services:** Transfer of information (voice, data, and video) between users without the network manipulating the content of that information is provided by the bearer network. There is no need for the network to process the information and therefore does not change the content. Bearer services belong to the first three layers of the OSI model. They are well defined in the ISDN standard. They can be provided using circuit-switched, packet-switched, frame-switched, or cell-switched networks.

- **Teleservices:** In this, the network may change or process the contents of the data. These services correspond to layers 4-7 of the OSI model. Teleservices rely on the facilities of the bearer services and are designed to accommodate complex user needs. The user need not be aware of the details of the process. Teleservices include telephony, teletex, telefax, videotex, telex, and teleconferencing. Though the ISDN defines these services by name yet they have not yet become standards.

- **Supplementary Service:** Additional functionality to the bearer services and teleservices are provided by supplementary services. Reverse charging, call waiting, and message handling are examples of supplementary services which are all familiar with today's telephone company services.

Working of ISDN

The ISDN works based on the standards defined by ITU-T (formerly CCITT). The Telecommunication Standardization Sector (ITU-T) coordinates standards for telecommunications on behalf of the International Telecommunication Union (ITU) and is based in Geneva, Switzerland. The various principles of ISDN as per ITU-T recommendation are:

- To support switched and non-switched applications
- To support voice and non-voice applications
- Reliance on 64-kbps connections
- Intelligence in the network
- Layered protocol architecture
- Variety of configurations

Advantages of ISDN

- ISDN channels have a reliable connection.

- ISDN is used to facilitate the user with multiple digital channels.
- It has faster data transfer rate.
- Efficient use of bandwidth
- Improved call quality
- It provides Greater flexibility
- Integrated services

Disadvantages of ISDN

- ISDN lines costlier than the other telephone system.
- It requires specialized digital devices.
- It is less flexible.
- Limited coverage
- High installation and maintenance costs
- Limited features

Conclusion

The Integrated Services Digital Network (ISDN) improved telecommunications by allowing for simultaneous digital transmission of voice, video, and data via existing PSTN lines. ISDN offers significant advantages for a variety of applications by allowing for faster data transfer rates, better call quality, and additional digital channels. However, because to its high costs, the requirement for specialized equipment, and limited flexibility, its use has decreased as more modern broadband technologies have emerged.

E-Content of
INTERNET TECHNOLOGY AND WEB DESIGN

Chapter: 3.5 Internet Accounts by ISP

Topic: 3.5.1 Telephone line Options

Telephone line Options

Dial-up Connections

- Dial-up Internet access is a type of Internet connectivity that operates through a standard telephone line.
- Dial-up access refers to connecting a device to a network via a modem and a public telephone network.
- Dial-up access is just like a phone connection the only difference is that; rather than people at the two ends computer devices are present.
- Dial-up access uses normal telephone lines thus the quality of the connection is not always good and data rates are limited.
- Dial-up internet access is offered through a number of Internet Service Provider (ISP).
- Most ISPs lease a set of telephone numbers, sometimes local, sometimes national, that dial into network pipeline that feed into the Internet.
- Open joining a dial-up service, the subscriber chooses a user name and password.
- Once the modem calls the phone number and makes a connection a “handshake” takes place in which information is exchanged between the computer modem and the remote server.
- The user name and password is supplied by the modem.
- This grants the user access through the dial-up gate way to the Internet.
- Dial-up service is least expensive but also the slowest type of Internet access.

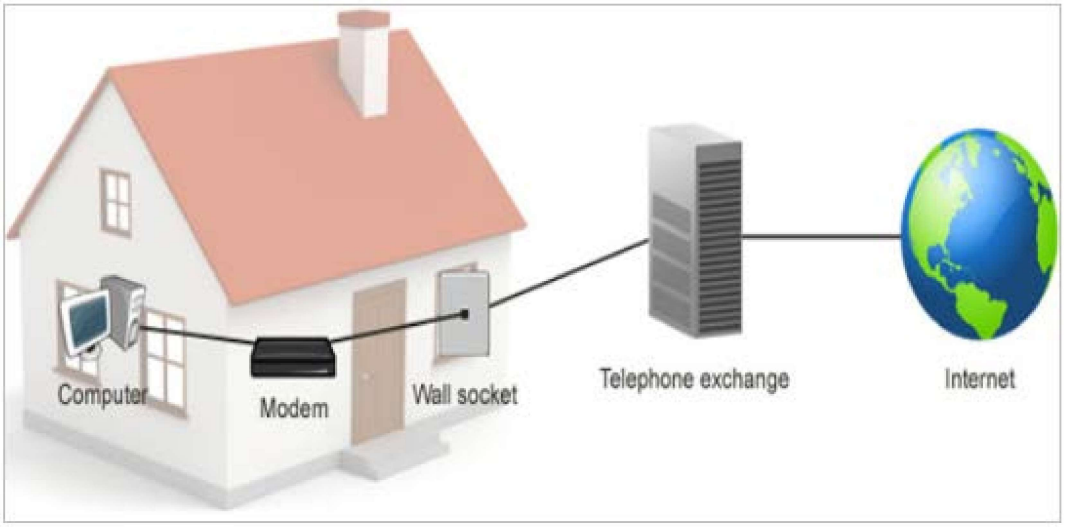


FIG 3.6: Dial-up Connection

Connecting to Dial-Up Internet Accounts

- Click on Start and point to Control Panel.
- Click on Network and Internet Connections.
- Click on Network Connections.
- Click on Create a new connection.
- Click on Next.
- Select Connect to the Internet and Click Next.
- Select Set up my connection manually and Click Next.
- Select Connect using a dial-up modem and Click Next.
- In the open field type in “Setarnet” and Click Next.
- Type in the phone number for ISDN dialup and Click Next.
- Type in the “Username” and “Password” and Click Next.
- Click Finish and the Internet setup are complete.

Dedicated Access

- Dedicated Internet Access is a reliable and scalable worldwide Internet access service.
- It is specifically designed to maximize today’s business-critical VPN connectivity needs.

- The ISPs managed Internet connectivity with a comprehensive suite of services features, all at the fair market price required by global businesses.
- The key benefit of dedicated access is that it is cost effective and it provides reliable internet access.

ISDN Connection

- ISDN is abbreviation of Integrated Services Digital Network.
- ISDN is an international communications standard for sending voice, video and data over digital telephone lines or normal telephones wires.
- ISDN supports data transfer rates of 64 Kbps (i.e., 64000 bits per seconds).
- It is mostly designed for leased lines.
- Configuration allows for multiple types of terminations. It uses a Terminal Adapter (TA) for termination and it is not a modem.
- There are two types of ISDN.
    - Basic Rate Interface (BRI)
    - Primary Rate Interface (PRI)
- Basic Rate Interface (BRI)
    - It consists of 64 Kbps B-Channels and one D-Channels for transmitting control information.
- Primary Rate Interface (PRI)
    - It consists of 23 B-Channels and one D-Channel (U.S.)
- The original version of ISDN employs base band transmission.
- Another version, called B-ISDN, uses broadband transmission and is able to support transmission rates of 1.5 Mbps. -ISDN requires fiber optic cables and is not widely

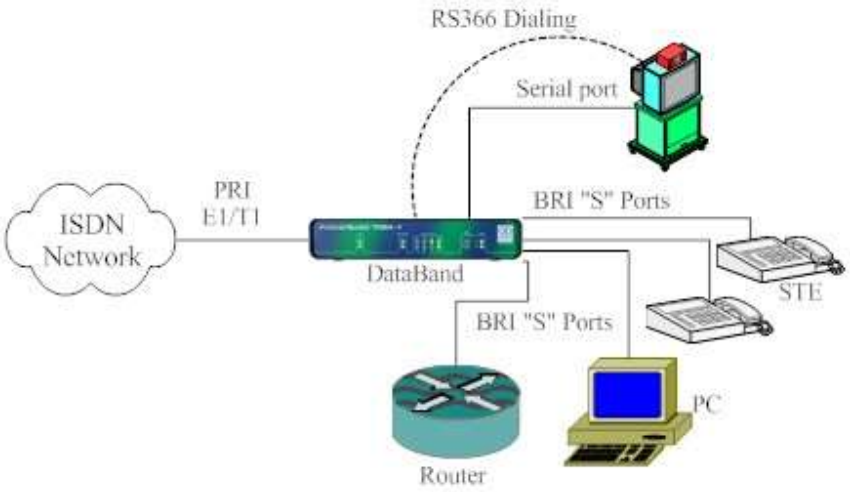


FIG 3.7: ISDN Connection

ISDN Services

- ISDN telephony
- ISDN telecopy
- ISDN and analog terminals
- Call forwarding
- Call waiting
- CLIP (Calling Line Identification Presentation)
- CLIR (Calling Line Identification Restriction)
- Three-party conference
- Advice of change
- Malicious call identification

Advantages of ISDN

- Digital services with less error.
- Direct fast connection with no dialing.
- Higher bandwidth (Takes less time in downloading material).
- Supports multiple users.
- Able to use ISDN for more than one task.

Disadvantages of ISDN

- ISDN is more expensive to install than a standard telephone.
- Not easy to set up.
- All exchanges do not provide ISDN service.