

## **Unit: 6 Internet and Internet services**

### **Introduction to Internet**

The internet is a global network of interconnected computers and other electronic devices that communicate with each other using standardized protocols. It allows people to access and share information, communicate with each other, and conduct commerce online.

The internet has transformed the way we live, work, and interact with each other. It has revolutionized industries such as education, entertainment, communication, and commerce, making it possible to reach a global audience with minimal effort.

The World Wide Web, which is the primary interface used by most people to access the internet, was invented by British computer scientist Sir Tim Berners-Lee in 1989. It uses a system of hyperlinks to connect web pages together, making it easy to navigate and discover new information.

Today, the internet is an essential part of modern life, with billions of people around the world relying on it for work, education, entertainment, and communication. It has also become an important platform for activism, social movements, and political organizing.

### **Introduction to Internet Services**

The internet provides a wide range of services and applications that people use every day. Here are some of the most common internet services:

1. **World Wide Web (WWW):** The World Wide Web, or simply the web, is the most popular and widely used service on the internet. It provides access to billions of web pages that contain text, images, videos, and other types of content.
2. **Email:** Email is a widely used internet service that allows people to send and receive messages over the internet. It is a fast and convenient way to communicate with others, both personally and professionally.
3. **Instant messaging:** Instant messaging services like WhatsApp, Facebook Messenger, and Skype allow people to chat in real-time over the internet.
4. **File sharing:** File sharing services like Dropbox, Google Drive, and OneDrive allow people to store and share files over the internet.
5. **Social media:** Social media platforms like Facebook, Twitter, and Instagram allow people to connect with each other and share content like photos, videos, and status updates.
6. **Online shopping:** Online shopping services like Amazon and eBay allow people to buy and sell goods over the internet.

7. Online banking: Online banking services like PayPal, Venmo, and online banking apps allow people to manage their finances over the internet.
8. Online gaming: Online gaming services like Steam, Xbox Live, and PlayStation Network allow people to play games with others over the internet.
9. Video and audio streaming: Services like Netflix, Hulu, and Spotify allow people to stream video and audio content over the internet.

These are just a few examples of the many services that the internet provides. As technology continues to evolve, new internet services are likely to emerge in the future.

## History of Internet

The history of the internet can be traced back to the 1960s, when the United States Department of Defense initiated a research project called ARPANET (Advanced Research Projects Agency Network). The goal of the project was to create a decentralized, fault-tolerant communication network that could function even in the event of a nuclear attack.

In the late 1960s and early 1970s, the first nodes of ARPANET were connected, linking computers at universities and research institutions in the United States. The network used packet switching technology, which allowed data to be sent in small packets across different nodes of the network.

In 1972, the first email message was sent over ARPANET, and in 1973, the first international connection to the network was established, linking the University College of London with the University of California at Los Angeles.

In the 1980s, ARPANET was replaced by a new network called the Internet, which used the same packet switching technology but was open to the public. The first domain name, symbolics.com, was registered in 1985, and by the end of the decade, there were more than 300,000 hosts on the Internet.

In the 1990s, the World Wide Web was invented by British computer scientist Tim Berners-Lee. He created a system of hyperlinks that allowed people to navigate between web pages, making it easy to access and share information on the Internet. The first web browser, called WorldWideWeb, was released in 1991, and the first commercial website was launched in 1992.

Since then, the Internet has continued to evolve, with new technologies and applications emerging all the time. Today, the Internet is an essential part of modern life, and billions of people around the world rely on it for work, education, entertainment, and communication.

## **The Internet Architecture**

The internet architecture refers to the overall design and structure of the global computer network that connects devices and enables communication and data transfer between them. The internet is a complex system of interconnected networks that use standardized protocols and technologies to transmit and receive data.

At a high level, the internet architecture can be divided into two main components: the client-side and the server-side. The client-side includes all the devices that access the internet, such as computers, smartphones, and tablets. The server-side includes all the computers and other devices that host websites, applications, and other online services.

The internet architecture also includes a number of key protocols and technologies that enable communication and data transfer, including:

1. Transmission Control Protocol (TCP) and Internet Protocol (IP) – These are the foundational protocols that enable data transmission over the internet.
2. Domain Name System (DNS) – This is a protocol that maps human-readable domain names (like [www.example.com](http://www.example.com)) to IP addresses, which are used by computers to locate resources on the internet.
3. Hypertext Transfer Protocol (HTTP) – This is the protocol used by web browsers to request and receive web pages from servers.
4. Secure Sockets Layer (SSL) / Transport Layer Security (TLS) – These are protocols used to secure data transmissions over the internet, such as when transmitting sensitive information like credit card numbers.

Overall, the internet architecture is a complex and evolving system that continues to transform the way we communicate, access information, and conduct business.

## **Managing the Internet**

Managing the internet involves a range of activities and responsibilities that are carried out by various organizations and individuals. Here are some of the key aspects of managing the internet:

1. Infrastructure management: This involves maintaining and upgrading the physical infrastructure that enables the internet to function, including data centers, network

hardware, and undersea cables. Infrastructure management is typically carried out by internet service providers (ISPs), network operators, and other technology companies.

2. Domain name management: This involves managing the domain name system (DNS), which translates domain names into IP addresses that computers use to access websites and other online resources. The Internet Corporation for Assigned Names and Numbers (ICANN) is the primary organization responsible for managing the DNS and assigning domain names.
3. Standards development: The internet is based on a variety of standards and protocols that enable different devices and networks to communicate with each other. Developing and maintaining these standards is the responsibility of organizations like the Internet Engineering Task Force (IETF) and the World Wide Web Consortium (W3C).
4. Content moderation: With billions of users and a vast amount of content being created and shared every day, managing the internet also involves moderating content to ensure that it is legal, ethical, and does not violate community guidelines. This is typically done by social media platforms, search engines, and other online services.
5. Privacy and security: Managing the internet also involves protecting users' privacy and ensuring the security of their data. This includes implementing encryption technologies, enforcing data protection regulations, and responding to security threats such as hacking and cyber attacks.

Overall, managing the internet requires collaboration between various stakeholders, including governments, technology companies, non-profit organizations, and individual users, to ensure that it remains a safe and accessible resource for all.

## **IP Address and Domain Name System ( DNS )**

An IP address, or Internet Protocol address, is a unique numerical label assigned to each device connected to a computer network that uses the Internet Protocol for communication. It is used to identify and locate devices on the internet.

There are two versions of IP addresses in use today: IPv4 and IPv6. IPv4 addresses are made up of four sets of numbers, each ranging from 0 to 255, separated by periods. An example of an IPv4 address is 192.168.1.1. IPv6 addresses, on the other hand, are much longer and are made up of eight groups of four hexadecimal digits, separated by colons. An example of an IPv6 address is 2001:0db8:85a3:0000:0000:8a2e:0370:7334.

IP addresses can be assigned dynamically by a network's DHCP server, or they can be manually assigned to a device. They are necessary for devices to communicate with each other over the internet.

## **Domain Name System ( DNS )**

DNS stands for Domain Name System. It is a hierarchical decentralized naming system that translates domain names, such as [www.example.com](http://www.example.com), into IP addresses that can be used to locate and communicate with the corresponding website or server.

DNS allows users to access websites using human-readable domain names instead of having to remember the numerical IP addresses that correspond to each website or server. When a user types a domain name into their web browser or other internet-enabled application, the DNS resolver on their device sends a query to a DNS server, which returns the corresponding IP address for the domain name. The application can then use the IP address to communicate with the website or server.

DNS also supports other types of data, such as mail exchange (MX) records, which specify the mail server responsible for handling email for a particular domain, and service (SRV) records, which specify the location of services such as SIP or XMPP.

DNS is a critical component of the internet infrastructure, and its performance and reliability are essential for the proper functioning of the internet. There are numerous public DNS servers that can be used, including those operated by Google, Cloudflare, and OpenDNS.

## **Client - Server Architecture**

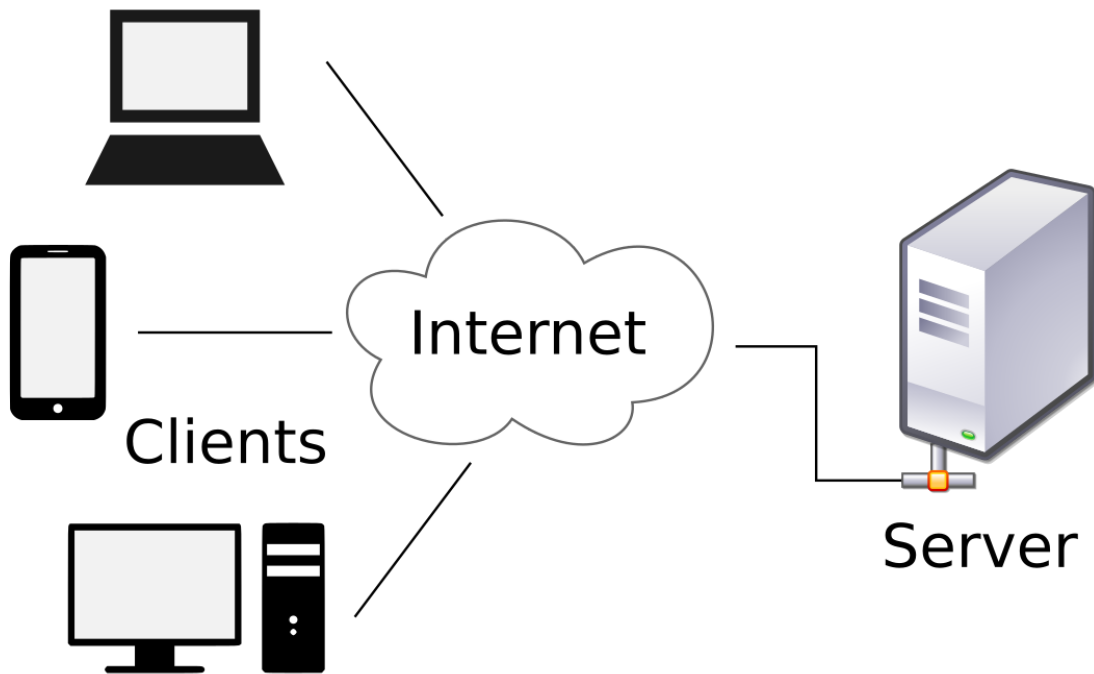
Client-server architecture is a common model of network computing in which a centralized server provides services to multiple clients. In this model, the server is responsible for processing requests and providing data or services, while the clients are responsible for making requests and receiving data or services from the server.

In a typical client-server architecture, clients send requests to the server using a network protocol such as TCP/IP, and the server responds with the requested data or services. The server may be a dedicated computer or a group of computers working together as a cluster. Clients can be any type of device or software application that can communicate with the server over the network.

The client-server model is used in many applications and services, including web servers, email servers, database servers, and file servers. One advantage of this architecture is that it allows for centralized control and management of data and resources, which can improve security, reliability, and scalability. Another advantage is that clients can be lightweight and simple, requiring only basic processing power and network connectivity.

However, the client-server architecture also has some limitations. One is that it can be more complex to set up and maintain than other models, such as peer-to-peer networking. Another is

that it can be more vulnerable to single points of failure, where the failure of the server can cause a widespread outage of services for all clients.



## HyperText Transfer Protocol (HTTP)

HTTP stands for Hypertext Transfer Protocol. It is an application-layer protocol that is used for transmitting data, such as web pages, over the internet. HTTP was developed to facilitate communication between web browsers and web servers.

HTTP operates using a client-server model, where the client, typically a web browser, sends a request to the server, which responds with the requested data. The client sends the request using a URL, or Uniform Resource Locator, which specifies the location of the resource on the server. The server responds with an HTTP response, which includes the requested data, such as a web page or image, and status information, such as whether the request was successful or not.

HTTP uses a request-response model, where each request from the client includes a method, such as GET, POST, PUT, or DELETE, which specifies the action to be taken on the resource. HTTP also supports headers, which are metadata associated with the request or response that provide additional information, such as the content type or language of the data.

HTTP is a stateless protocol, which means that each request from the client is treated as a new request, and the server does not maintain any information about previous requests. However, to support more advanced functionality, such as user authentication and session management, HTTP can use cookies, which are small pieces of data stored on the client's computer and sent back to the server with each request.

HTTP has evolved over time, with the latest version being HTTP/3, which uses a different underlying protocol, called QUIC, to improve performance and security.

## **Electronic Mail ( Email )**

Email, or electronic mail, is a method of exchanging digital messages between people using electronic devices connected to the internet or other computer networks. It is one of the most widely used forms of communication today and is often used for both personal and business purposes.

An email message typically consists of a message body, which is the actual content of the message, and one or more recipients' email addresses. It may also include attachments, such as documents, images, or other files.

Email can be accessed through various email clients or web-based email services, such as Gmail, Outlook, or Yahoo Mail. These services provide users with a way to compose, send, receive, and organize their email messages. Emails can also be sent and received from mobile devices such as smartphones and tablets.

## **File Transfer Protocol ( FTP )**

File Transfer Protocol (FTP) is a protocol used for transferring files over the internet or other computer networks. It is a standard protocol that is widely used for uploading and downloading files between servers and clients.

FTP works by establishing a connection between a client and a server, and then exchanging files and other data between them. Users can connect to an FTP server using an FTP client software, such as FileZilla, Cyberduck, or WinSCP, and authenticate themselves using a username and password.

Once the connection is established, users can browse the files and folders on the server, and transfer files between the server and the client. FTP supports both binary and ASCII file formats, and can transfer files of any size.

FTP is commonly used by web developers and designers to upload and download files to and from web servers. It can also be used for other purposes, such as sharing files between computers on a local network or transferring files between business partners.

## **World Wide Web ( WWW )**

WWW stands for World Wide Web, which is a system of interlinked hypertext documents, images, and other resources that are accessed through the internet using web browsers.

The World Wide Web was developed in 1989 by Sir Tim Berners-Lee, a British computer scientist, and has since revolutionized the way we access and share information.

The web is based on a set of standards and protocols, including HTML (Hypertext Markup Language), HTTP (Hypertext Transfer Protocol), and URL (Uniform Resource Locator). These standards allow web pages to be created, published, and accessed by anyone with an internet connection and a web browser.

Web pages are typically identified by their URL, which consists of the protocol, domain name, and path to the specific resource. For example, the URL "<https://www.google.com/search?q=world+wide+web>" identifies a web page on the Google search engine that displays search results for the query "world wide web".

The World Wide Web has transformed the way we communicate, access information, and do business. Today, billions of people around the world use the web every day to search for information, shop online, connect with others, and much more.

## **Remote Login ( TELNET )**

Telnet is a protocol used for remote login to a computer or network device over a network, such as the internet. It provides a text-based interface that allows a user to log in to a remote system and execute commands as if they were sitting in front of the computer.

To use Telnet, a user typically uses a Telnet client software, which establishes a connection to the Telnet server on the remote computer. The user then provides their login credentials, such as a username and password, to authenticate themselves with the remote system.

Once authenticated, the user can execute commands on the remote system as if they were sitting in front of it. This allows administrators and users to remotely manage and troubleshoot network devices and servers, and perform tasks such as configuration changes, software updates, and file transfers.



However, Telnet is considered a less secure protocol, as it transmits user credentials and commands in plain text, which can be intercepted and read by unauthorized users. For this reason, Telnet is gradually being replaced by more secure remote access protocols such as Secure Shell (SSH) and Virtual Private Network (VPN).

## **Static and Dynamic Web Pages**

Static and dynamic web pages are two types of web pages that are commonly used on the World Wide Web.

Static web pages are HTML pages that are pre-built and stored on a web server. They contain fixed content that does not change unless the web page is edited or updated manually. Examples of static web pages include company homepages, product descriptions, and contact pages. Static web pages are simple to create and are easy to host, but they can be limited in functionality.

Dynamic web pages, on the other hand, are web pages that are generated on-the-fly by a web server in response to a user's request. They are built using server-side scripting languages such as PHP, ASP, or Ruby, and are often connected to a database that contains the content and data for the web page. Dynamic web pages are capable of providing more interactive and personalized content than static web pages, and can also be used to create web applications such as e-commerce sites, social media platforms, and online booking systems.

Dynamic web pages can also be built using client-side scripting languages such as JavaScript, which allows for dynamic content to be added and modified on the client-side without requiring a page reload. This enables more interactive and responsive web applications and can improve the user experience.

In summary, static web pages are pre-built HTML pages that contain fixed content, while dynamic web pages are generated on-the-fly by a web server and can include more interactive and personalized content.

## **Search Engines**

A search engine is a software tool or service that enables users to search for information on the internet or other computer networks. Search engines use algorithms to analyze and index web pages and other online content, making it easier for users to find relevant information.

Search engines typically work by allowing users to enter search terms or queries into a search box, and then returning a list of web pages and other content that are related to the search terms.

The search results are ranked based on a number of factors, such as the relevance and quality of the content, the popularity of the web page, and the authority of the website.

The most popular search engines today include Google, Bing, Yahoo, and DuckDuckGo. These search engines use various techniques and algorithms to analyze and index the content on the web, including web crawling, indexing, and ranking.

Web crawling involves scanning the web and collecting information about web pages and other content, while indexing involves organizing the collected information and making it available for search. Ranking involves using algorithms to determine the relevance and quality of the content and ranking it accordingly in the search results.

Search engines are used by billions of people around the world to find information on the internet. They are an essential tool for businesses, researchers, students, and individuals who need to quickly and easily find information on a wide range of topics.

## **E- Commerce**

E-commerce, or electronic commerce, refers to the buying and selling of goods and services over the internet or other computer networks. E-commerce includes a wide range of activities, such as online shopping, electronic payments, and online auctions.

E-commerce has become increasingly popular over the last few decades, thanks to advances in technology, increased internet access, and the growth of mobile devices. E-commerce allows businesses to reach a wider audience and sell their products and services online, without the need for a physical storefront. It also enables consumers to shop online from the comfort of their own homes, and often provides a wider selection of products and better prices than traditional brick-and-mortar stores.

There are various types of e-commerce models, including business-to-consumer (B2C), business-to-business (B2B), consumer-to-consumer (C2C), and consumer-to-business (C2B). B2C e-commerce refers to the selling of goods and services directly to consumers, while B2B e-commerce refers to the selling of goods and services to other businesses. C2C e-commerce involves individuals selling products or services to other individuals, while C2B e-commerce involves individuals selling products or services to businesses.

E-commerce transactions typically involve the use of electronic payment systems, such as credit cards, electronic funds transfer, or mobile payment services. Online marketplaces, such as Amazon and eBay, provide a platform for businesses and individuals to sell their products and

services online, while social media platforms, such as Instagram and Facebook, are increasingly being used as e-commerce platforms.

Overall, e-commerce has transformed the way businesses and consumers interact and has become an essential part of modern commerce.

## **E-governance**

E-governance, or electronic governance, refers to the use of information and communication technology (ICT) to improve the delivery of government services, enhance transparency and accountability, and facilitate citizen participation in government decision-making processes. Nepal has implemented several e-governance initiatives to improve the delivery of government services, increase transparency and accountability, and promote citizen participation in government decision-making processes.

One of the key e-governance initiatives in Nepal is the National Identity Card (NID) project, which aims to provide all citizens with a unique digital identity card. The NID card will be linked to a citizen's biometric data, allowing them to access government services and information more easily and securely.

Another major e-governance initiative in Nepal is the Online Tax Payment System (OTPS), which allows taxpayers to pay their taxes online, reducing the time and cost involved in manual tax payments. The government has also introduced the Integrated Financial Management Information System (IFMIS) to improve financial management and reporting in the public sector.

Nepal has also launched several online portals to provide citizens with easier access to government services and information. For example, the Online Business Registration Portal allows businesses to register and obtain licenses online, while the Online Land Revenue Payment System enables citizens to pay land revenue online.

The government of Nepal has also introduced several initiatives to promote citizen participation in governance processes. The e-Petition system allows citizens to submit petitions online, while the Local Government Information System (LGIS) provides a platform for citizens to participate in local government decision-making processes.

Overall, e-governance initiatives in Nepal have the potential to improve the efficiency and transparency of government services and promote citizen participation in governance processes. However, there is still a need to address challenges such as the digital divide, lack of digital literacy, and the need for adequate infrastructure and resources to support e-governance initiatives.

## Smart City

A smart city is a city that uses advanced technologies and data analytics to improve the quality of life for its citizens and enhance the efficiency of its services. Smart cities use a range of technologies, such as the Internet of Things (IoT), big data, cloud computing, and artificial intelligence, to collect, process, and analyze data from various sources, including sensors, devices, and social media platforms.

The main goals of smart cities are to improve sustainability, reduce energy consumption and waste, increase mobility and transportation efficiency, enhance public safety, and improve the quality of life for citizens. Smart cities achieve these goals by implementing various initiatives, such as:

1. **Smart Transportation:** Implementing intelligent transportation systems, such as traffic management systems, smart parking, and public transit systems, to reduce congestion, improve safety, and enhance mobility.
2. **Smart Energy:** Implementing smart energy systems, such as smart grids, energy-efficient buildings, and renewable energy sources, to reduce energy consumption and carbon emissions.
3. **Smart Waste Management:** Implementing smart waste management systems, such as automated waste collection and recycling, to reduce waste and improve the efficiency of waste collection.
4. **Smart Public Safety:** Implementing smart public safety systems, such as surveillance cameras, emergency response systems, and crime mapping, to enhance public safety and reduce crime.
5. **Smart Healthcare:** Implementing smart healthcare systems, such as telemedicine and remote patient monitoring, to improve access to healthcare services and enhance the quality of care.

Smart cities also focus on citizen engagement and participation, by providing citizens with access to information and services through online platforms and mobile apps, and by involving citizens in decision-making processes.

## Censorship and Privacy Issues

Censorship and privacy issues are complex and intertwined topics that are relevant in various areas of society, including politics, media, and technology. Here's a brief overview of each topic:

**Censorship:** Censorship is the suppression or restriction of information, ideas, or artistic expression by an authority or organization. Censorship can be carried out by governments,

private organizations, or individuals, and can take various forms, including legal restrictions, content removal, and self-censorship. Censorship can be used to prevent the spread of harmful or offensive content, protect national security, or restrict the freedom of speech and press.

**Privacy:** Privacy refers to the right of individuals to control their personal information and how it is collected, used, and shared by others. Privacy is a fundamental human right, recognized by international human rights law and many national laws. Privacy issues can arise in various contexts, including online activities, government surveillance, and corporate data collection. In today's digital age, privacy is increasingly at risk due to the widespread collection and use of personal data by technology companies, governments, and other organizations.

Censorship and privacy issues are interconnected because censorship can be used as a means to control or limit access to information that is considered sensitive or private. For example, governments may censor websites or social media platforms that contain information that they deem harmful or sensitive, but this censorship may also infringe on the privacy rights of individuals who use those platforms. Similarly, censorship of online content may be justified by the need to protect privacy, such as in cases involving revenge porn or cyberbullying.

Overall, censorship and privacy issues are complex and require careful consideration and balancing of various interests, including the need for freedom of expression and the protection of sensitive or private information. It is important for individuals, organizations, and governments to be aware of these issues and work towards finding solutions that uphold human rights and promote transparency, accountability, and fairness.