

Information Systems

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IT372
Information Systems

Lecture 04



Module 2: Information Technology Infrastructure



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Chapter 6: Telecommunications, Internet and
Wireless Technology

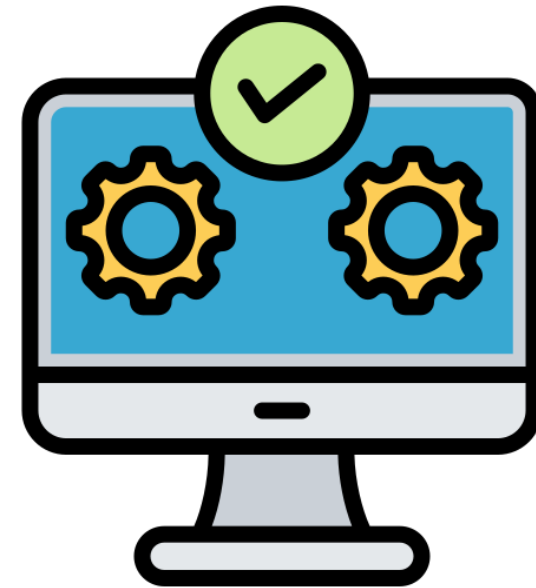


Information Systems (IT372)



An Information Technology Infrastructure :

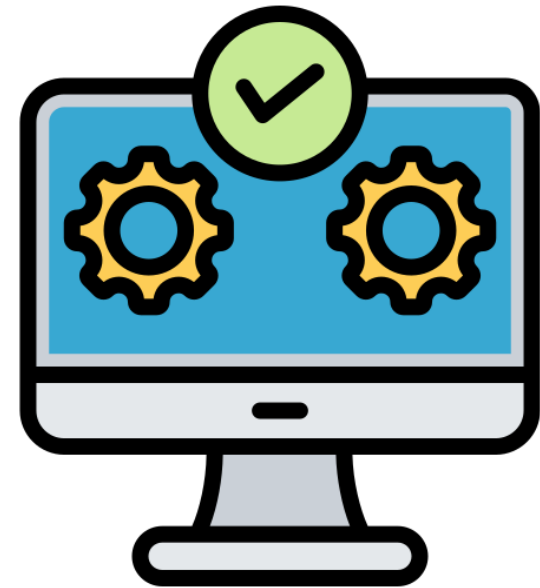
- Introduction to Telecommunications
- Computer Network
- Wireless Communication
- Cellular Network
- Telecommunication and Network Applications
- Case Study
- The Internet
- The World Wide Web
- Web 2.0
- Internet and Web Applications
- Summary





An Information Technology Infrastructure :

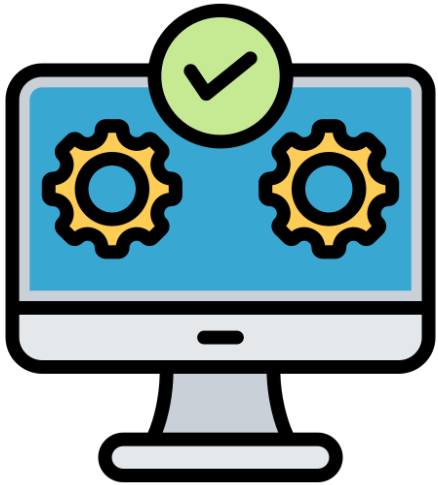
- Identify the telecommunication media and hardware required for transmission
- Identify the network types and key networking technologies (including protocols)
- Discuss the principal technologies and standards for wireless networking
- Describe several telecommunication applications that orgs benefit from today
- Discuss how Internet works and its support for communications and e-business

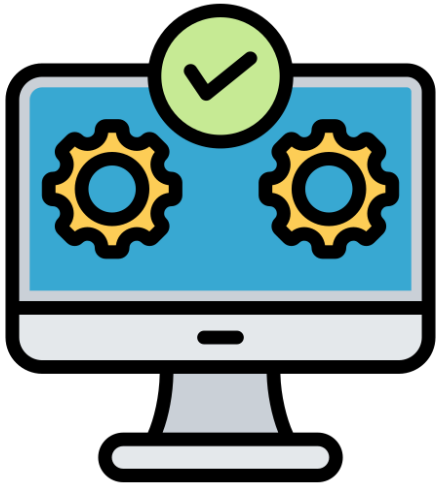




- **Telecommunication**

- Electronic transmission of signals for communication
- The general model of telecommunication consists of
 - The sending device
 - The medium
 - The communication device
 - The receiving unit



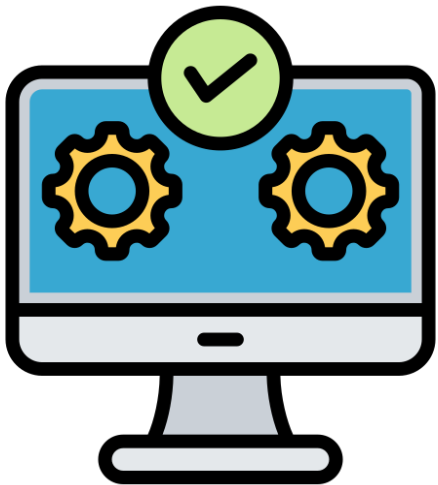


- **Transmission medium**

- Any material substance that carries an electronic signal to support communications between sending and receiving devices
- Divided into one or more communication channels
- Classified as simplex, half duplex, full duplex
- Characteristics:
 - **Bandwidth:** rate at which data is exchanged (bps)
 - Higher bandwidth, more channel transmits
 - Broadband
 - **Latency:** time it takes a signal to travel from one location to another
 - Best combo: high bandwidth, low latency



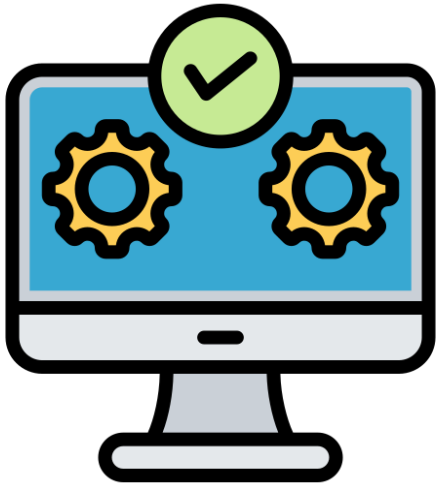
- Physical transmission medium

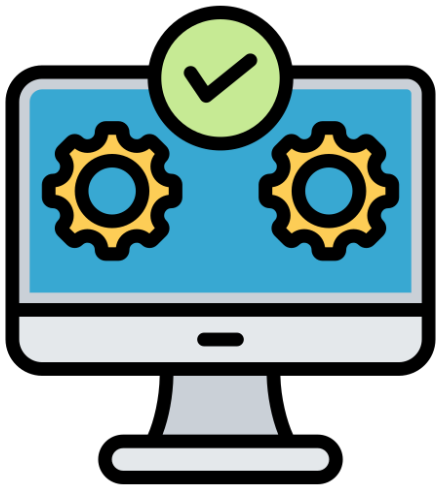


Media Type	Description	Advantages	Disadvantages
Twisted pair cable	Twisted pair of copper wires, insulated	Used for telephone services, widely available	Transmission speed and distance limitation
Coaxial Cable	Inner conductor wire surrounded by insulation	Cleaner and faster data transfer than twisted pair	More expensive than twisted pair
Fiber-Optic cable	Extremely thin glass strands bound together in a sheathing, uses light to transmit	Less diameter, less distortion and high transmission rate	Expensive to purchase and install



- **Wireless transmission medium**
 - Microwave
 - Radio
 - Infrared





- **Telecommunication Hardware**

- **Modem**

- Special device that converts digital signals to analog signals (modulation) and vice versa (demodulation)
 - PC modem, cable modem, DSL modem

- **Hub**

- Device that connect network components, sending a packet of data to all other connected devices

- **Switch**

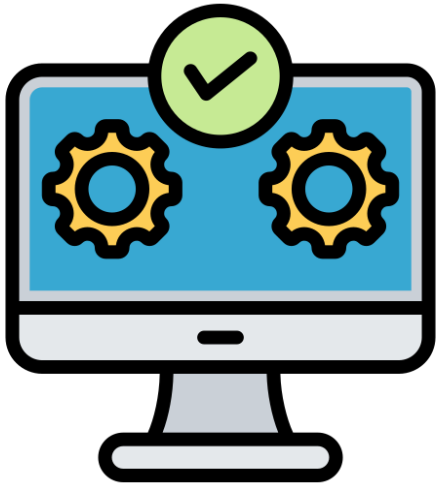
- Smarter than hub, forward data to specific destination

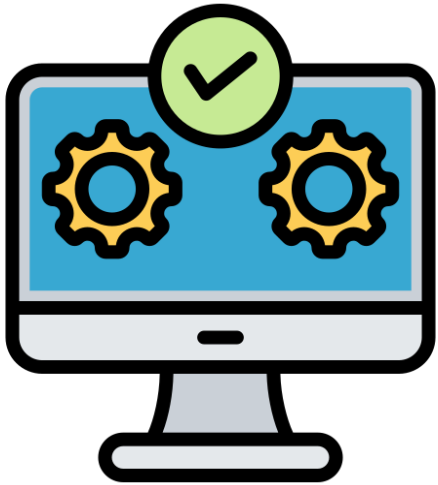
- **Network Interface Card**

- Network interface device, connection medium for linking network components

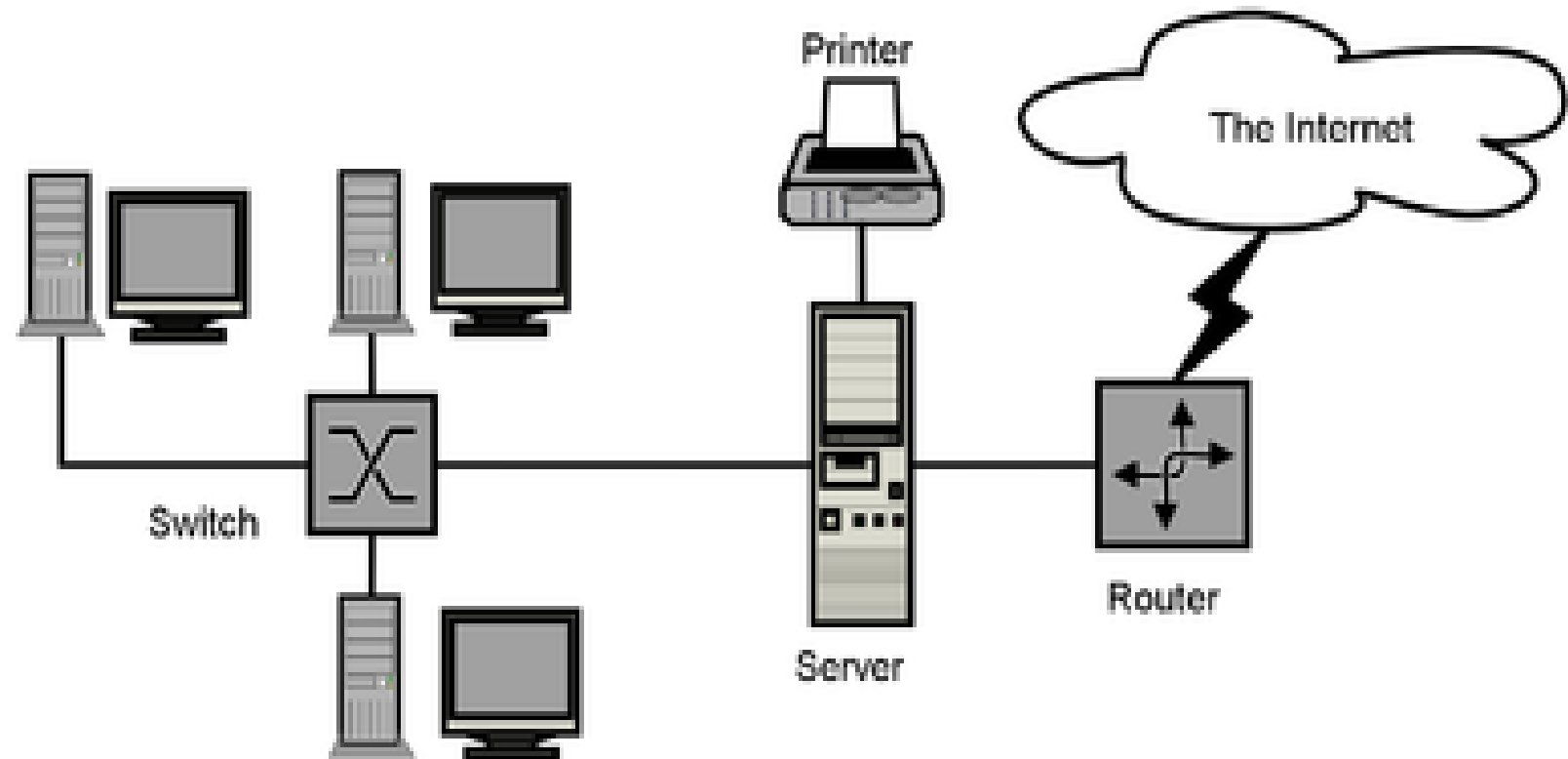
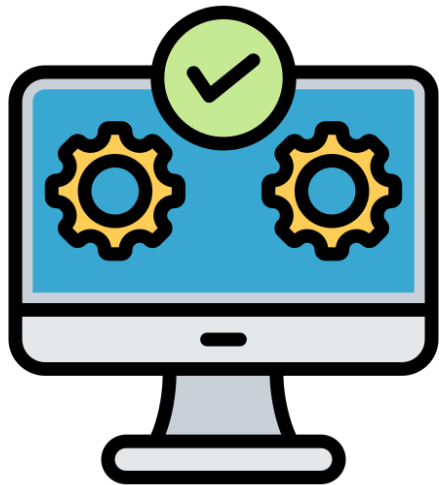


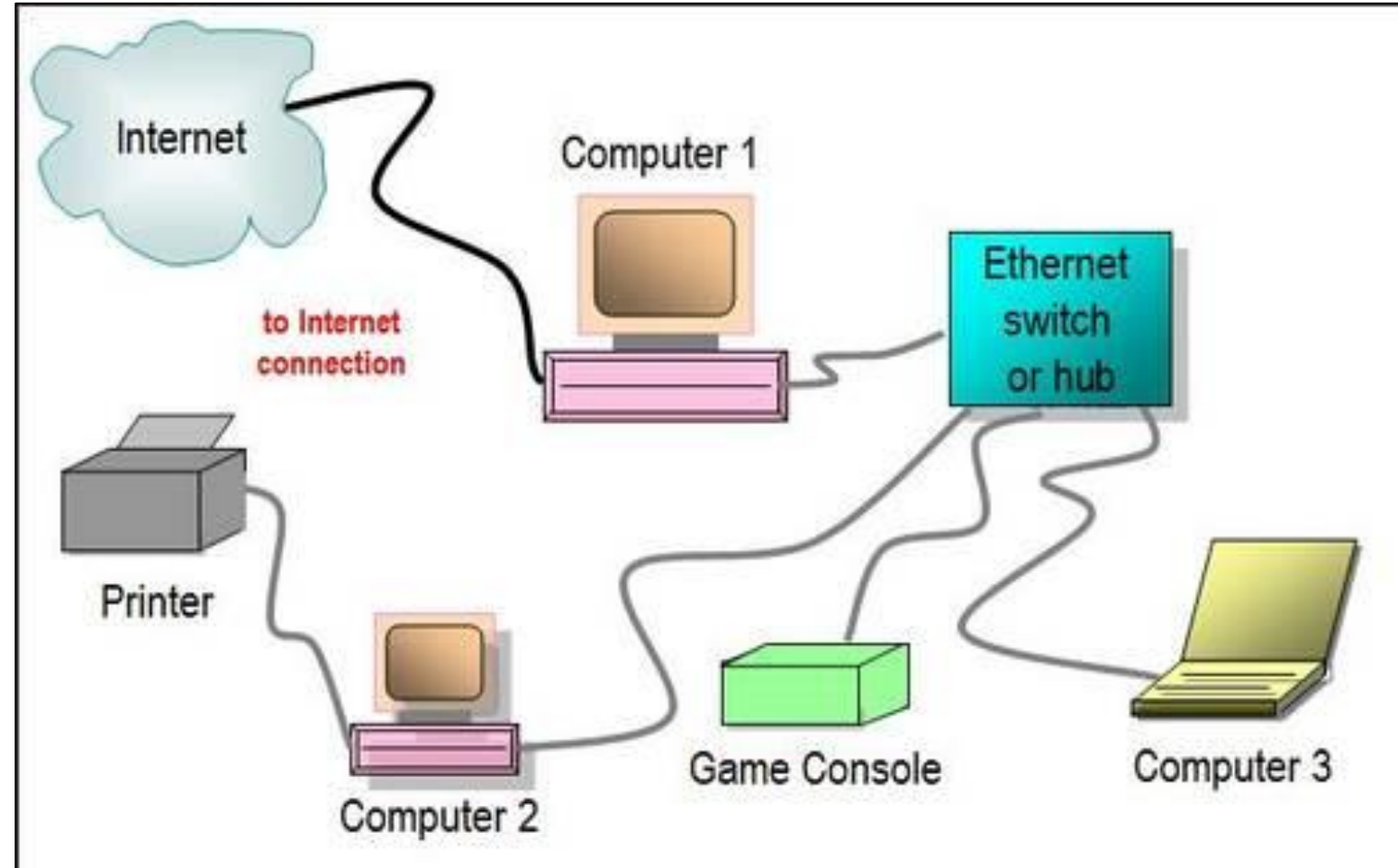
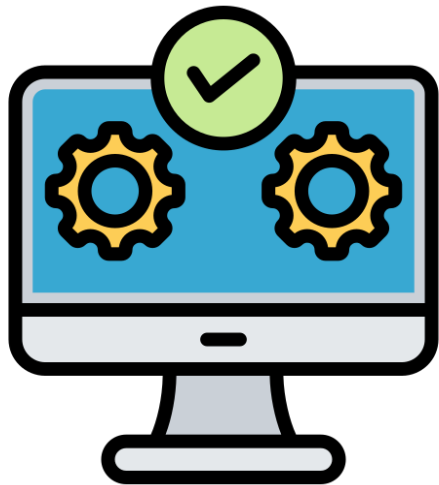
- **Telecommunication Hardware**
 - Router
 - WAP





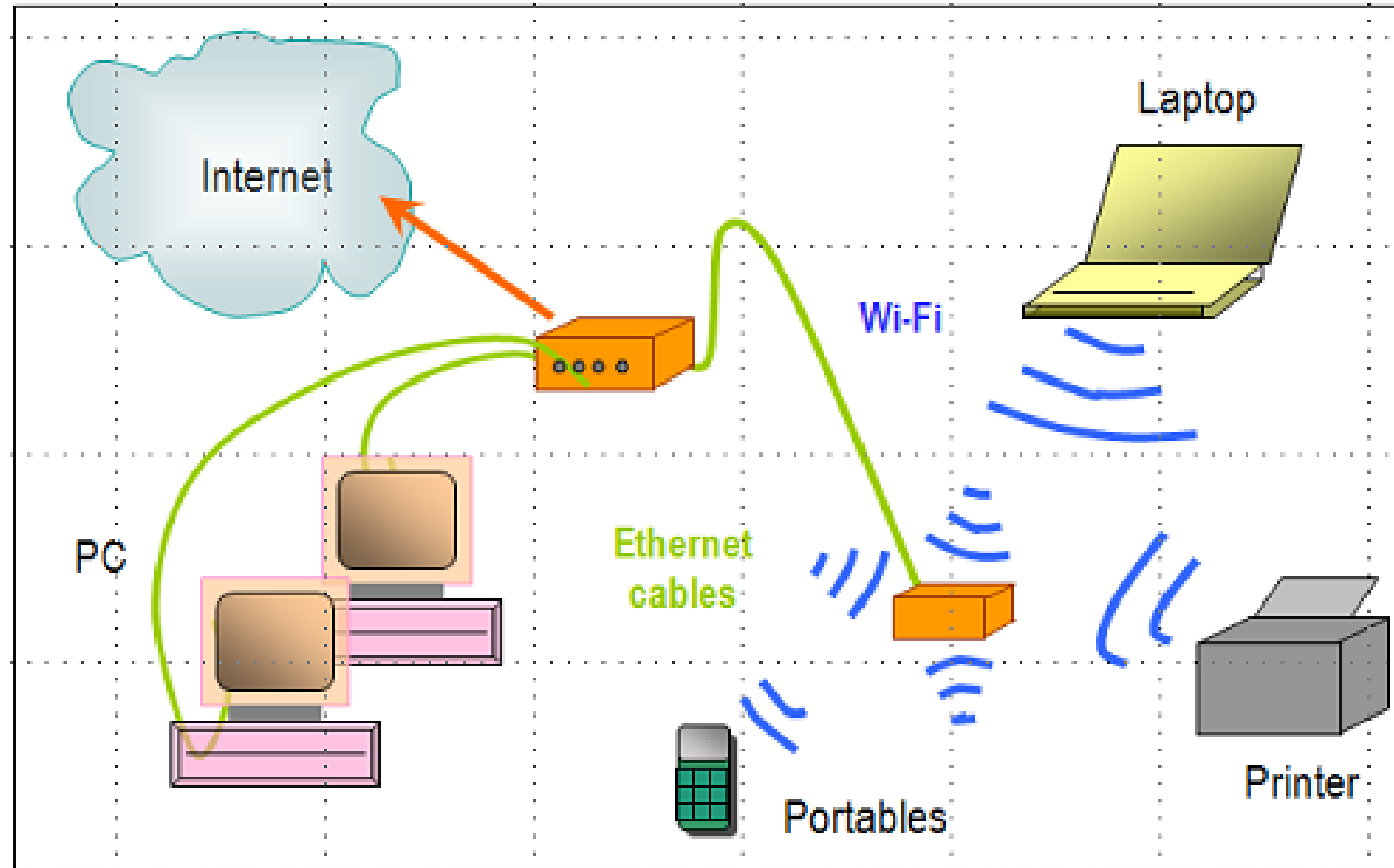
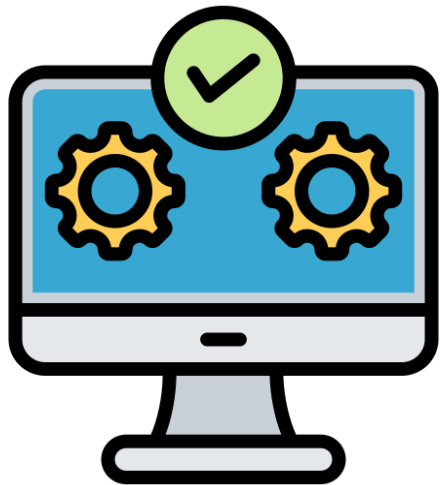
- **A network consists of two or more connected computers**
- **A simple network contains:**
 - Client computer
 - Dedicated server
 - Network interfaces
 - Connection medium
 - Network operating system
 - Hub/switch

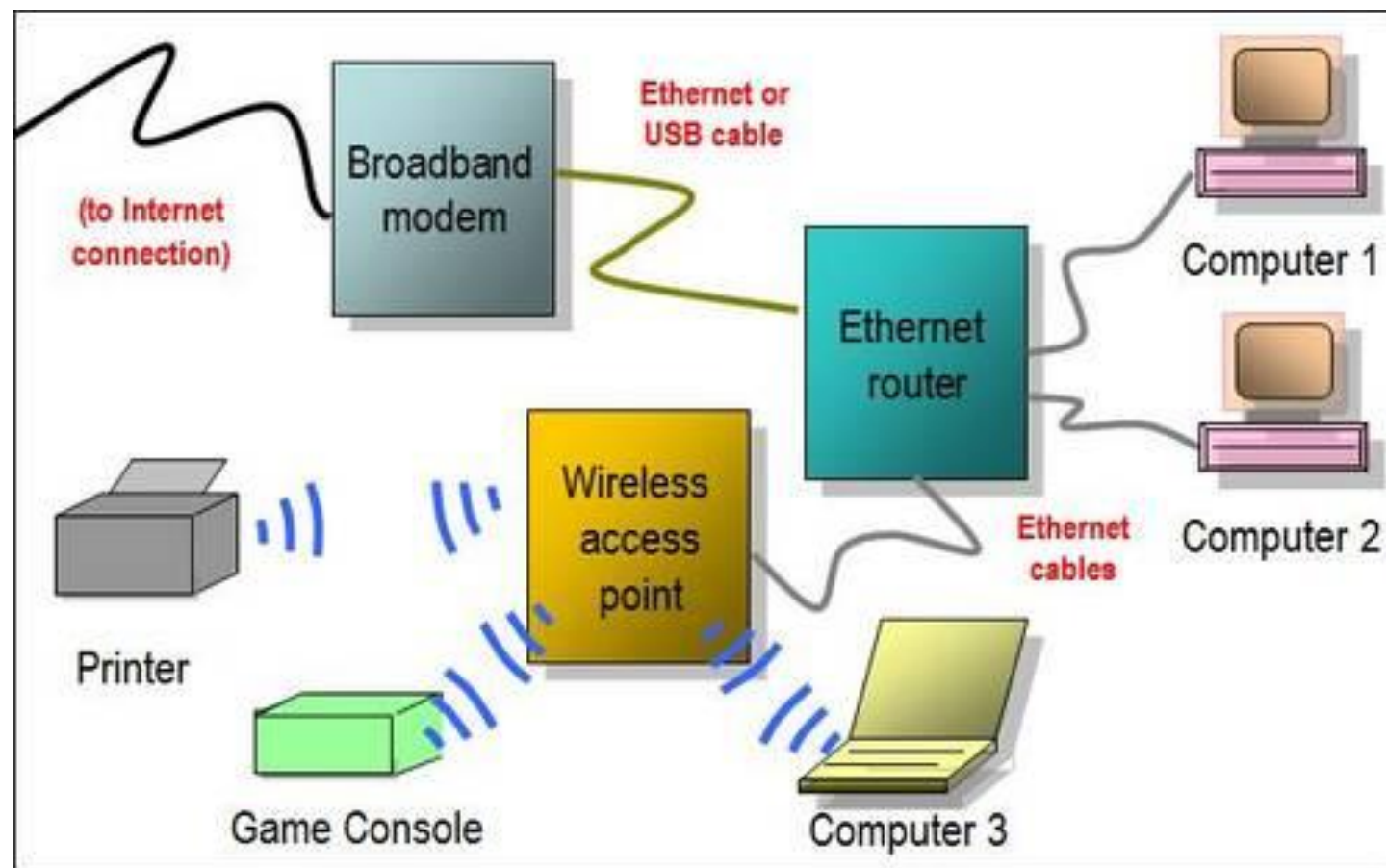
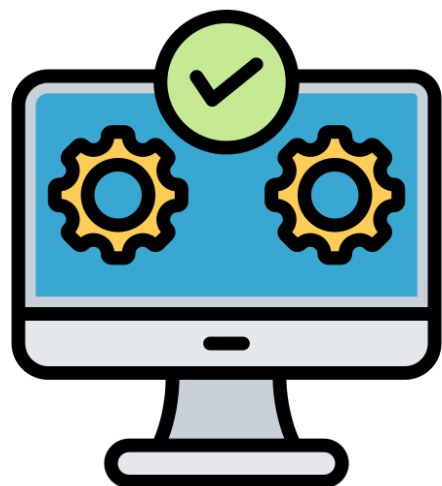


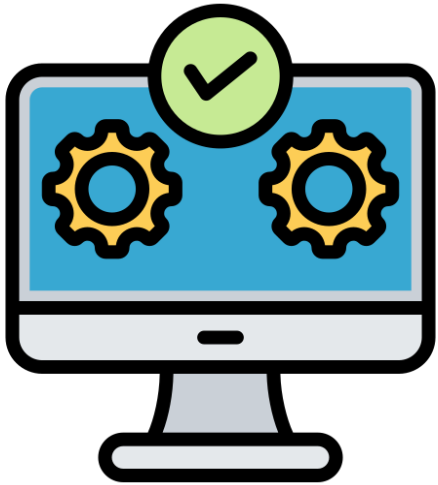




Two Router Network







- **Types of Networks**

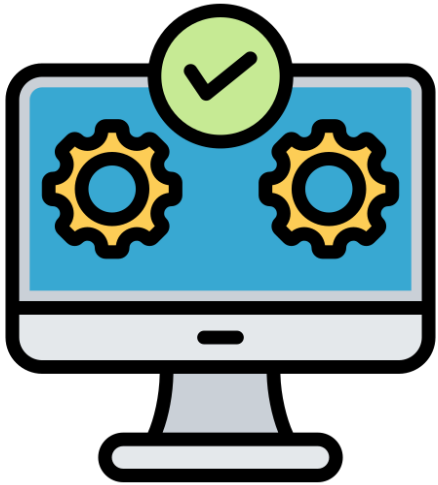
- **Local Area Networks (LAN):** connects computer systems and devices within a small area, typically they are wired into office buildings

- Computers must be equipped with the correct interface
- **Client/Server architecture:** One computer is dedicated network file server, providing access to resources
- Ethernet: LAN standard for physical medium (10 Mbps)
- Fast Ethernet (100Mbps), Gigabit Ethernet (1 Gbps)
- **Peer-to-peer architecture:** used in very small networks, different computers can exchange data by direct access and also peripheral devices. Useful for small businesses

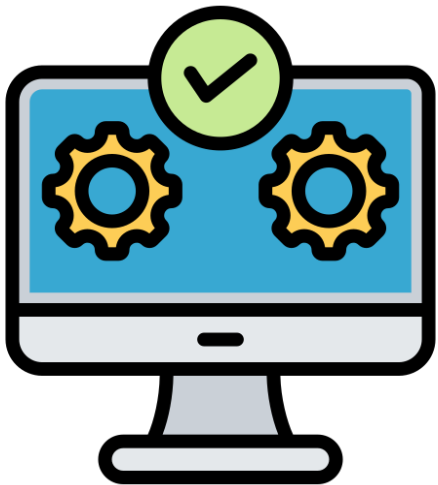
- **Metropolitan Area Networks (MAN):** connects computers systems within a campus or a city
 - Range of 30-90 miles



- **Types of Networks**



- **Wide Area Networks (WAN):** International Networks: connects large geographical regions
 - Internet – world's largest WAN
- **Mesh Networking:** way to route communications among network nodes by allowing for continuous connections and reconfiguration around blocked paths
 - Robust, if one node fails, others can still communicate
 - Can be used to provide Internet access, secure connections to corporate networks and VoIP calls

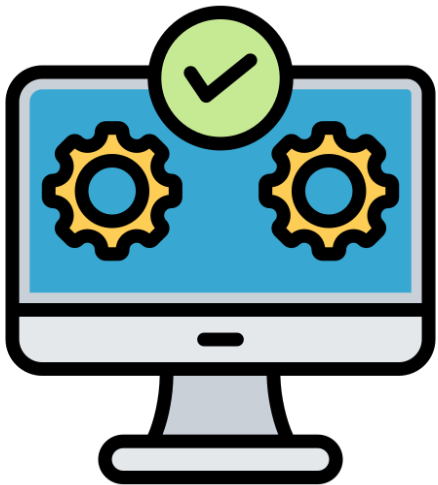


- **Client/Server computing**

- Distributed computing model, some processing power on client computers
- Linked to network to server computers, sets rules for communication, provides every client with an address

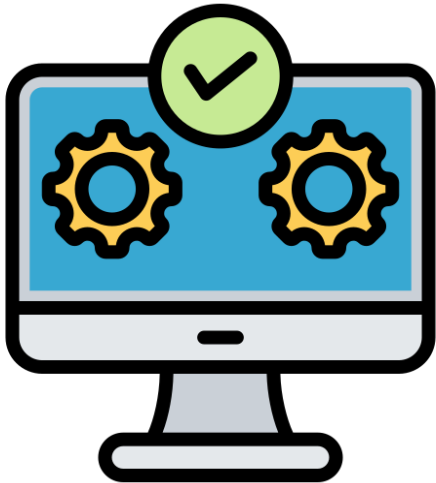
- **Packet Switching**

- Slicing digital messages into packets, sending them over communication paths, reassembling at destination
- Transmitted through routers

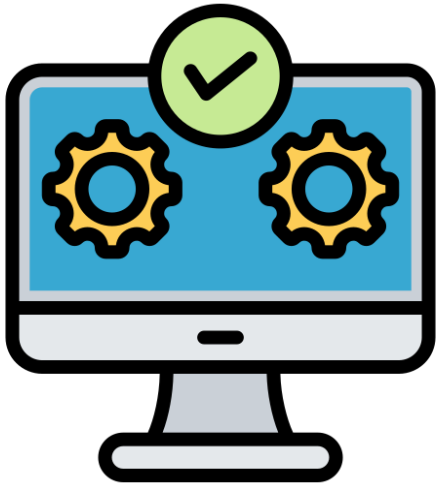


- **TCP/IP Connectivity**

- **Protocol:** set of rules and procedures concerning transmission of information between 2 points in a network
- Now only worldwide standard Transmission Control Protocol/Internet Protocol (TCP/IP) is used with any kind of hardware for networking
- **TCP:** handles movement of data between computers, sequencing packets and acknowledging sending
- **IP:** delivery of packets and reassembling during transmission



- **Advantages:**
- Helps businesses stay in touch with customers, suppliers, partners
- Provides flexible arrangements for organizing work
- Help create new products, services, sales channels
- Provide easier access to remote corporate areas

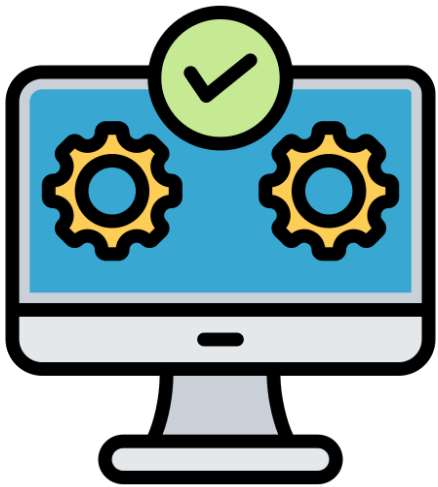


- **Bluetooth**

- Wireless N/W standard, creates PAN
- Range: 10m, 722Kbps (2.4Ghz)
- Useful for battery powered devices (printers, Keyboard)
- FedEx: signals transmitted from handheld devices through bluetooth

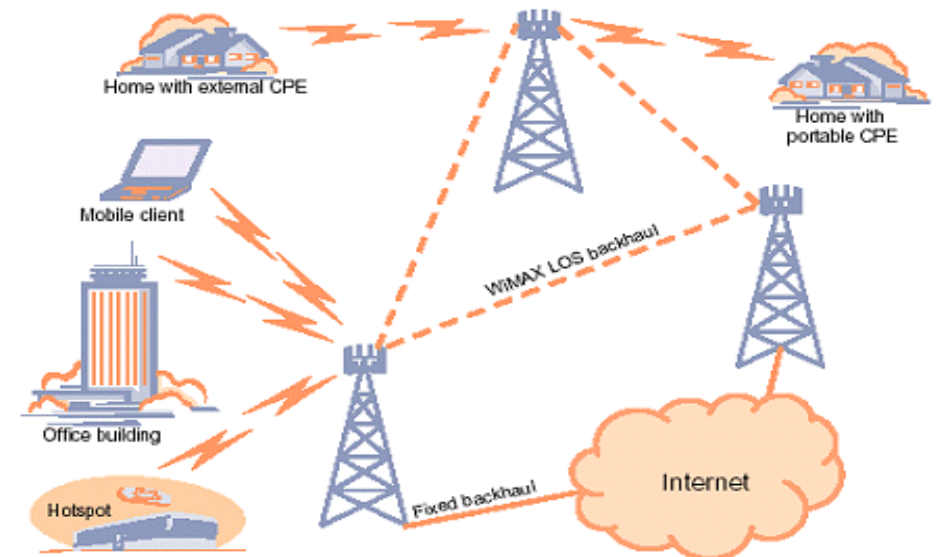
- **Wi-Fi (802.11)**

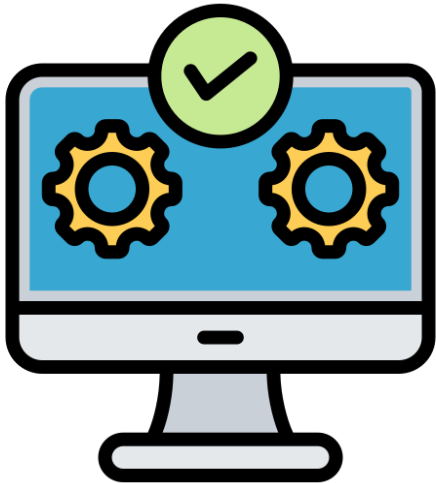
- Standard for wireless LAN and wireless Internet access
- Range: 30-5-m, 11Mbps-54Mbps (2.4Ghz)
- Use: creating 'hotspots'
- 802.11 n is the fastest (100Mbps) based on the MIMO(multiple input/multiple output)



- **WiMAX**

- Worldwide Interoperability for Microwave Access)
- Range: 31 miles, 75Mbps
- Use: areas where difficult to install broadband or Wi-Fi
- Connectivity provided by WiMAX towers

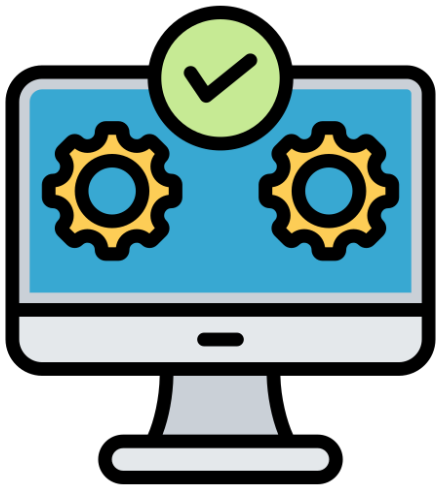




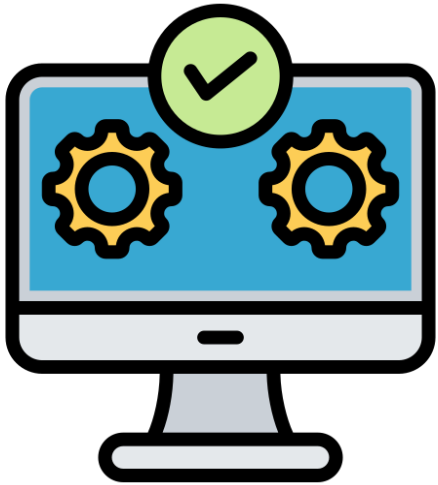
- **RFID**

- Standard for radio signals to communicate with a tag
- Use: tracking movement of goods through supply chain
- **RFID Tag**
 - embedded microchip and antenna
 - Active: battery powered, send data automatically, expensive
 - Passive: powered by the signals from reader, lighter, less expensive
- **RFID Reader**
 - Reads tag, capturing the data, decodes it and send it over the network to the computer
 - Reads data in its range
- Businesses need to update H/W and S/W to accommodate large data from RFID
- SAP, Oracle offer RFID-ready versions for SCM applications



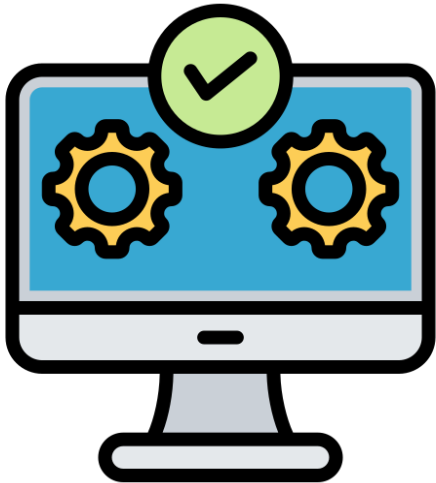


- **ITU developed standard for cellular networks**
 - To standardize and allow global roaming
- **Mobile Communication standard**
 - Global System for Mobile Communication (GSM) and CDMA
 - GPRS (General Packet Radio Service), EDGE, EVDO (Evolution Data Optimized)
 - Earlier for voice and small data
 - 3G 144 Kbps to 2.4 Mbps
 - Video, VoIP, graphics, rich media
 - Next: 4G 100Mbps

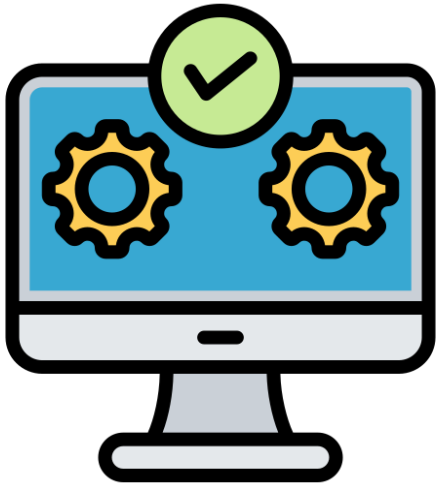


- **Important Business applications include:**
- **Linking Pcs to Mainframes/Servers**
- **Voice Mail**
 - Send/receive store verbal messages
- **Small Business Networks**
 - Create small networks with few devices easily
 - Either WAP with modem or a combo device (router, firewall, hub)
 - Filtering and encryption
- **Electronic Document Distribution**
 - Send/receive digital documents
 - Saves paper, access faster

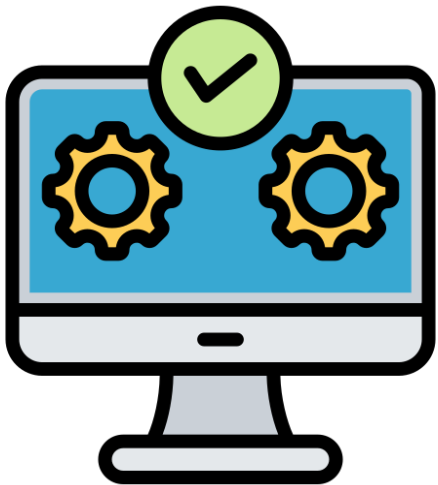




- **Call Centres**
- **Telecommuting/Virtual Networks**
- **Videoconferencing**
- **Electronic Data Exchange**
- **Electronic Funds Transfer**
- **Distance Learning**
- **Team Collaboration**



- **Delivering People More Efficiently Through Telecommunications**
- **Crew Transportation Industry**
 - Shuttling crew members to train locations where they are needed
- **Problem:**
 - Slow to adopt telecomm technologies
 - Van drivers could not communicate with dispatcher while in route
 - Railway company not happy
- **RailCrewXpress**
 - Serving railways through technology platform
 - Wireless telecommunication system that connects drivers with dispatchers and company IS
 - Tracks drivers, dynamic routing change, maintains history of routes and driver times
 - Data is analysed to optimize the efficiency of dispatches & routing

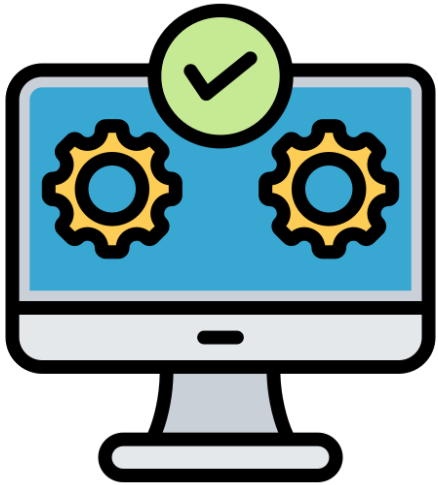


- **Challenges**

- Economical networking technologies
- Automatically switch between satellite and GPRS data transmission
- Intelligently decide how much info to send and when

- **Next milestone**

- RFID scanners to be installed in vans for tracking location

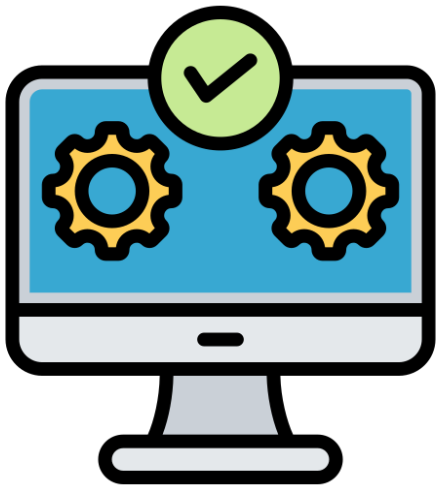


- **Advantages**

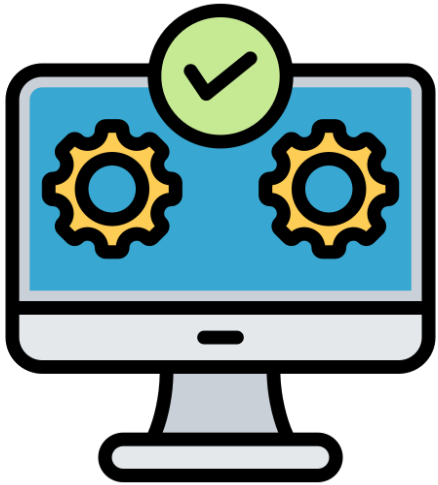
- Faster and efficient communication between drivers and dispatchers
- Happier railway companies, because they get accurate ETAs
- Flexibility to accept new trip orders and reroute quickly

- **Real Time Monitoring**

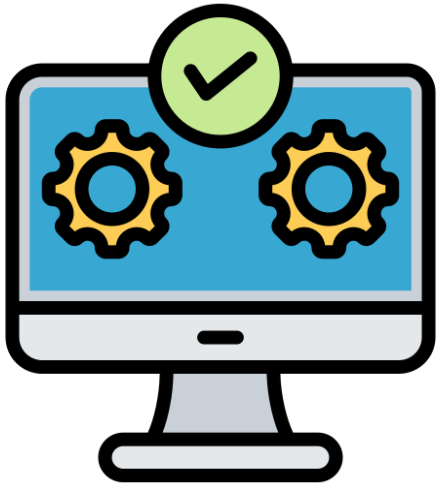
- Providing time-relevant info for quick decision-making
- View minute by minute info
- Respond quickly to changing conditions
- Analyse data for operational efficiency



- Extensive, public communication system
- worldwide collection of networks that links billions of diverse users
- World's largest implementation of Client/Server computing
- Started as ARPANET, project of DoD, U.S in 1970s
 - Initial Goal: Allow scientists at different physical locations to share information and work together on military and scientific projects
 - Originally 4 main computers (host)
 - Now: Grown into a public , cooperative, independent network, more than 1 billion host nodes
 - W3C researches and sets standards and guidelines

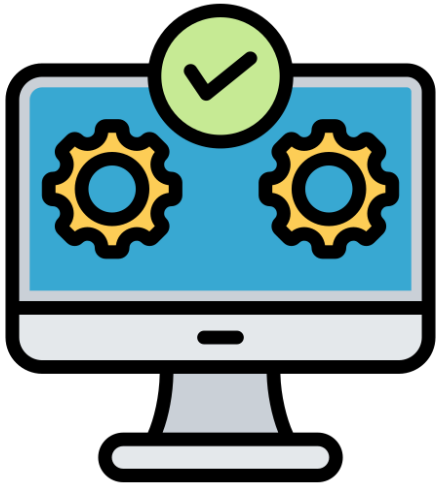


- Based on the TCP/IP networking protocol
- Every computer has an Internet Address
 - 32 bit number representing by four strings of numbers
 - E.g. 207.46.250.119
 - Domain Name: English name that corresponds to the 32.bit number
 - DNS server holds the list of IP addresses mapped to their domain names
 - International web sites outside USA, use a two letter country code, like 'pk' for Pakistan.

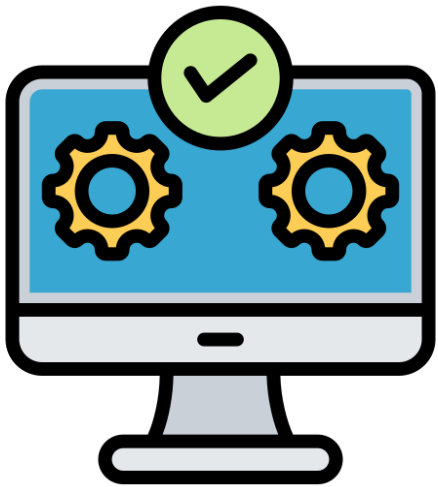


TOP-LEVEL DOMAINS

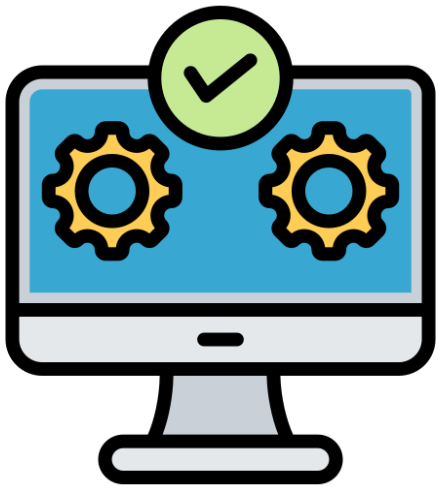
Original Top-Level Domains	Type of Domain
com	Commercial organizations, businesses, and companies
edu	Educational institutions
gov	Government agencies
mil	Military organizations
net	Network providers
org	Nonprofit organizations
Newer Top-Level Domains	Type of Domain
museum	Accredited museums
biz	Businesses of all sizes
info	Businesses, organizations, or individuals providing general information
name	Individuals or families
pro	Certified professionals such as doctors, lawyers, and accountants
aero	Aviation community members
coop	Business cooperatives such as credit unions and rural electric coops



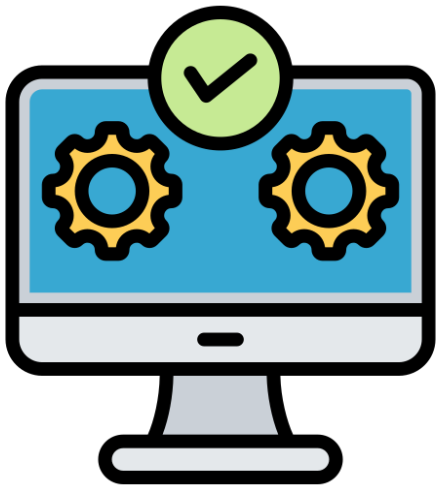
- **Internet Service Provider (ISP)** is any company that provides people and organizations access to the Internet
 - Mostly provide services over broadband internet access through DSLs, cable or satellite transmission
 - Some universities and businesses use the very fast T1 and T3 lines to connect to Internet
- **Wireless Internet Service Providers (WISP)**
 - Wireless Internet Service provider (WISP) is a company that provides wireless Internet access to computers and mobile devices



- On the internet, your computer is the client that can access data, information and services from a variety of servers
- Internet data traffic is carried over transcontinental high-speed **Internet backbone** (45Mbps to 2.5 Gbps)
 - Usually made of Fiber optics
- In addition to backbone, the internet encompasses an intricate collection of regional and local communication links (telephone lines, cable television lines etc)
 - These lease access to ISPs and companies



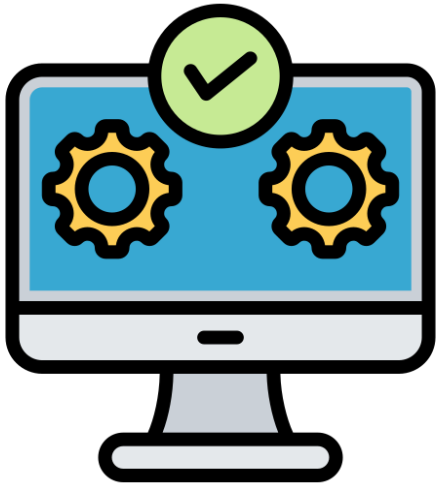
- Developed at CERN
- Most popular Internet Service
- Consists of a worldwide collection of electronic documents, each document called a **Web page**
- Collection of **web pages** and items associated with it constitute **Web site**
- **Web server** is a computer that delivers requested Web pages to your computer
- **Hypertext Transfer Language (HTML)**: language for formatting documents and web pages and incorporating dynamic link to other documents and pictures stored on same or remote computer



- **Web Address**

- a unique address of the Web page, also called a URL (Uniform Resource Locator)
- a **Web browser** retrieves a web page using its Web address
- Many addresses begin with HTTP – Hypertext Transfer Protocol
- **HTTP** is a set of rules that defines how pages transfer over the internet
- http://www.us-parks.com/grand_canyon/scenic_vistas.html

protocol Domain name path Web page name

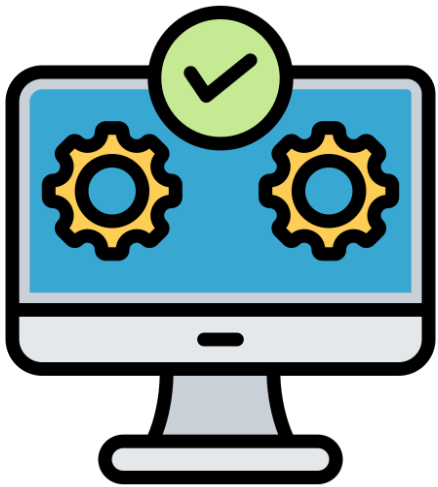


- **Search Engine**

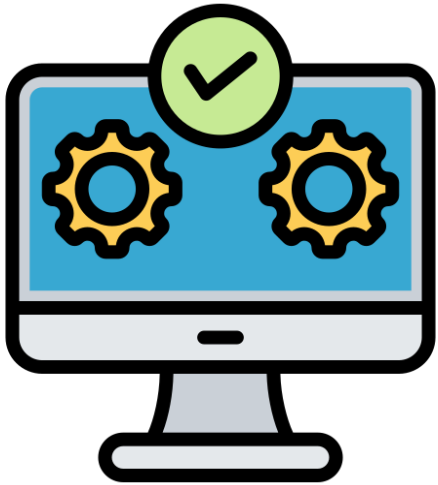
- It is a program that finds Web sites, Web pages, images, videos, news and other information
- The word or phrase entered for defining your search is called a **Search text** or Keyword
- The results of the search are known as **hits**.
- bring HTML files, Microsoft Office files, PDF files, videos, images

- **Search Engine Marketing**

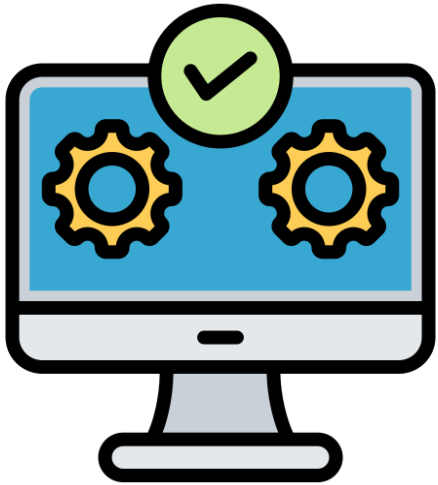
- Sponsored links for which advertisers have paid to be listed
- Fastest growing Internet advertising
- Companies optimize their sites for search engine recognition
- **Search Engine Optimization (SEO):** process of improving the quality & volume of web traffic to a website



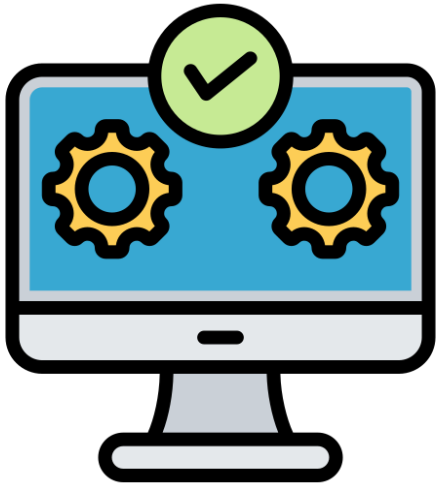
- Enables people to collaborate, share information, and create new services and content online
- *Four features:* interactivity, real-time user control, social participation and user generated content
- Mashups and Widgets
 - Software services that enable users and system developers to mix and match content or software components to create something new
- Blogs
 - Weblog is a personal Website that contains a series of chronological entries by the author
 - Popular publishing tools, also have business uses



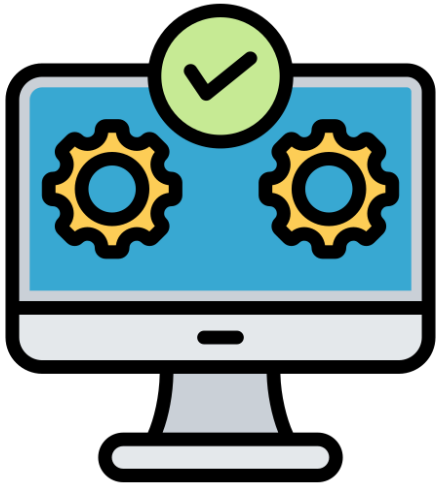
- RSS (Really Simple Syndication)
 - Syndicates web site content so that it can be used in another setting
 - Pulls specific content from Web sites and feeds it to user's computer for later viewing
 - News feeds, event listing, new stories, headlines, project updates, distributing corporate information etc.
- Wiki
 - Collaborative Web sites where visitors can add, delete or modify the site, including previous author's work
 - Motorola sales reps using Wiki for sharing sales info
- Social Networking
 - Build communities of friends and professional colleagues



- Internet Services
 - E-mail: Electronic mail is service that allows transfer of messages and files via a computer network
 - Chat
 - Instant Messaging
- VoIP
 - Voice transmission over the Internet, instead of telephone network
 - Voice travels in digital form using packet switching
 - Lower long distance call costs
- Newsgroups
 - worldwide discussion groups posted on Internet electronic bulletin boards on which people share views on a certain topic. Groups are either moderated or unmoderated, discussion through e-mail



- Telnet and FTP
 - Protocol that enables you to log on to other computers
 - Accessing public files
 - File Transfer Protocol, transferring files between host and remote computer
 - Also uploading, downloading content to/from a web site
- Content Streaming
 - Multimedia, radio broadcasts
 - Watching streamed videos
- Web shopping
- Web Auctions
 - Matching buyers and sellers, e.g. eBay



- Telecommunication technology lets more people send and receive all forms of data over greater distances
- EDD, EDI and EFT are useful telecomm applications that have changed the way orgs do businesses
- The internet provides a wide range of services, some practical for business use today
- However, management issues, speed and service affect all networks



Thank You