Chapter 7

APPLIED NETWORKING

Objective

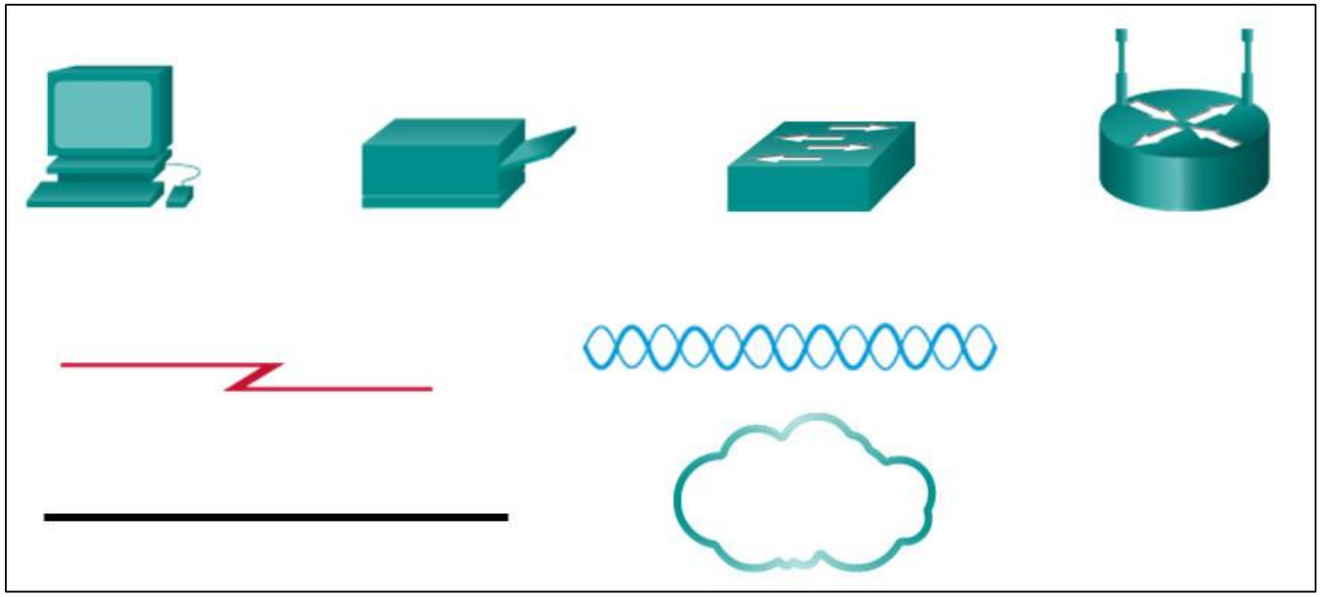
- *Principles of Networking*
- *Computer to Network Connection*
- *ISP Connection Technologies*
- *Internet Technologies*
- *Basic Troubleshooting Process for Networks*

7.1 Principles of Networking

Understand the using of components and types of computer networks

7.1.1 Computer Networks

Computer Network Devices and Components



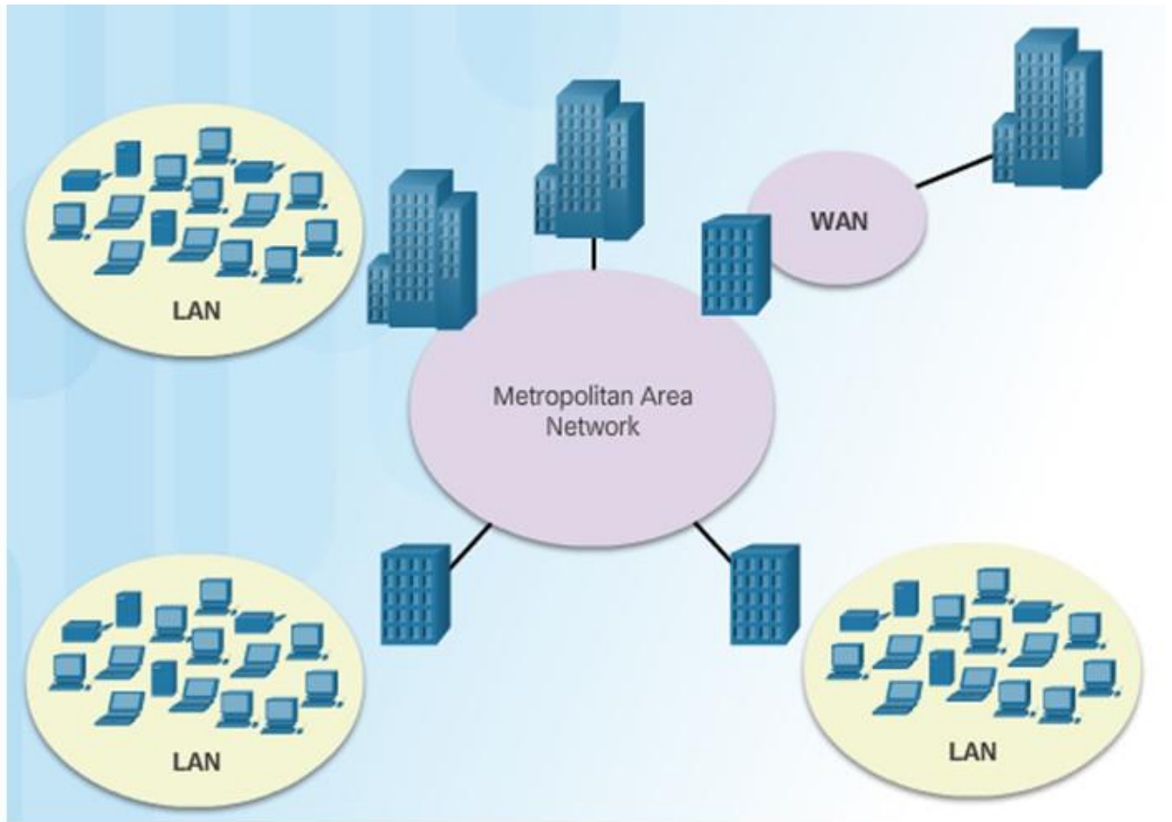
- Host Devices – any device that sends and receives information on the network (computer, printer, etc.)
- Intermediary Devices – exist in between host devices
- Media – component over which the message travels from source to destination

Can you name each device or component shown here?

7.1.2 Types of Networks

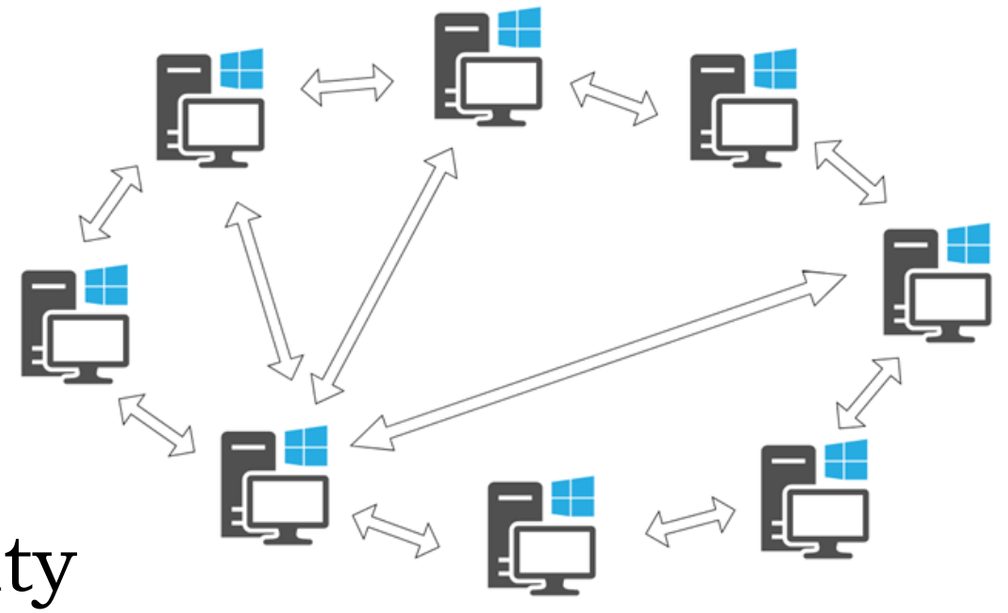
Major types of networks include:

- Local Area Networks (LANs)
- Wireless Local Area Networks (WLANs)
- Personal Area Networks (PANs)
- Metropolitan Area Networks (MANs)
- Wide Area Networks (WANs)



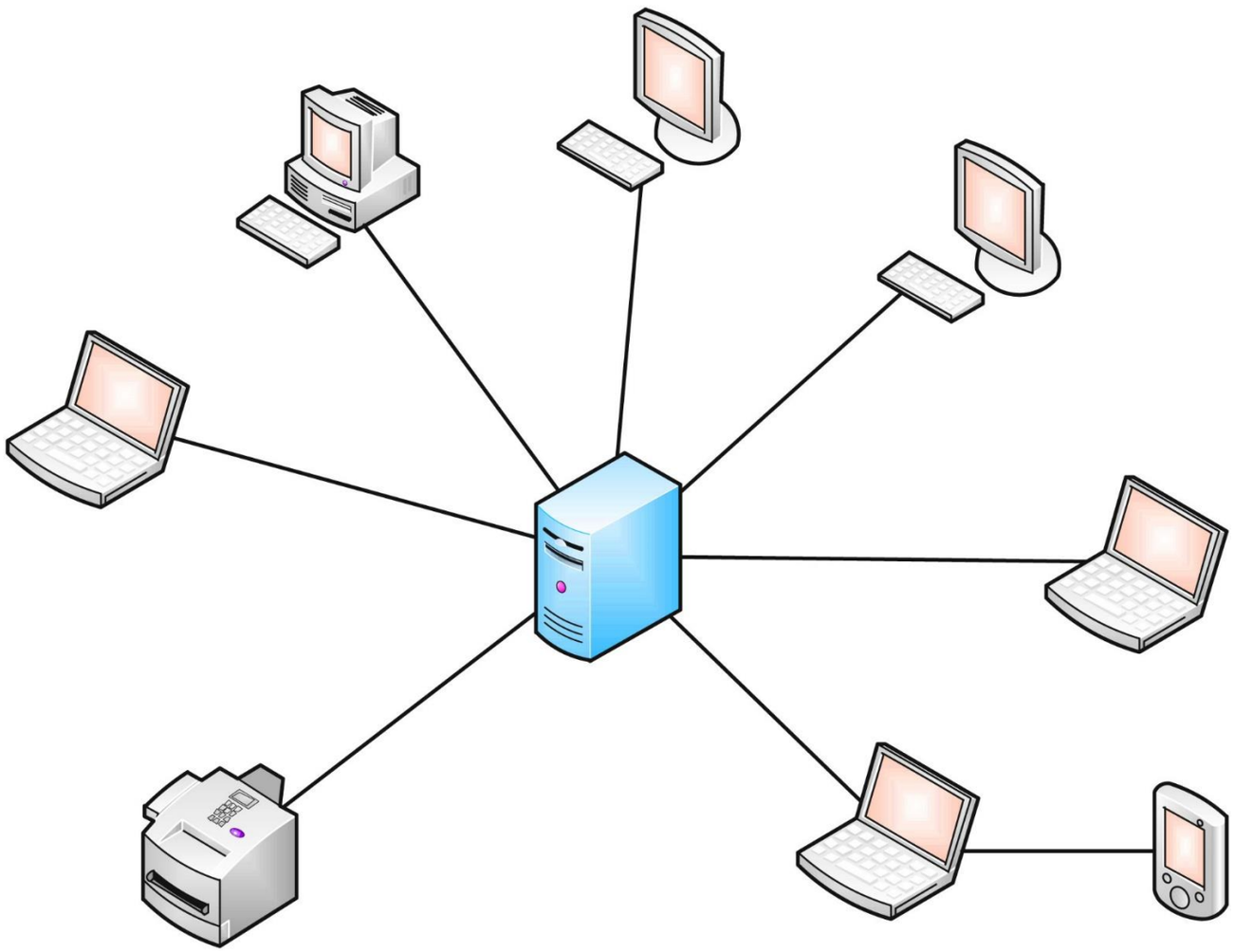
Peer-to-Peer Networks

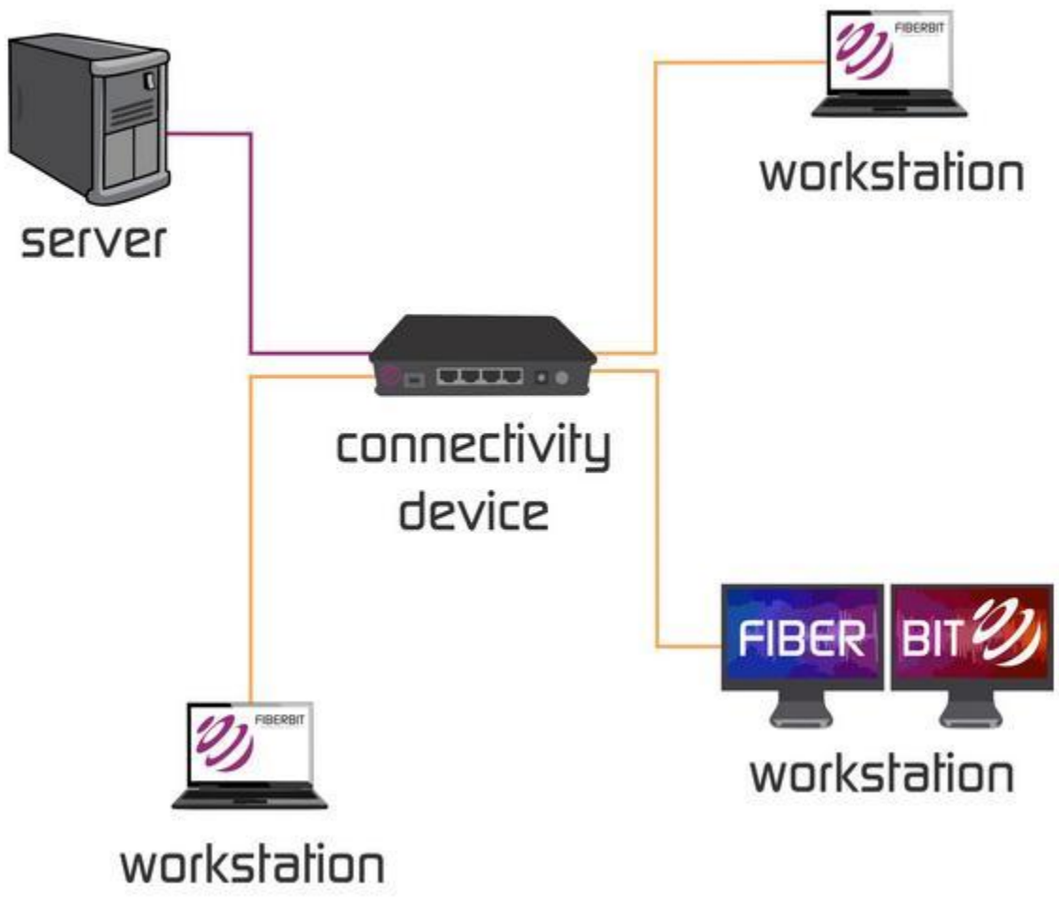
- No dedicated servers
- Each computer decides which resources to share
- No central administration or security



Client-Server Networks

- Server with software installed for client access
- Resources controlled by centralized administrator

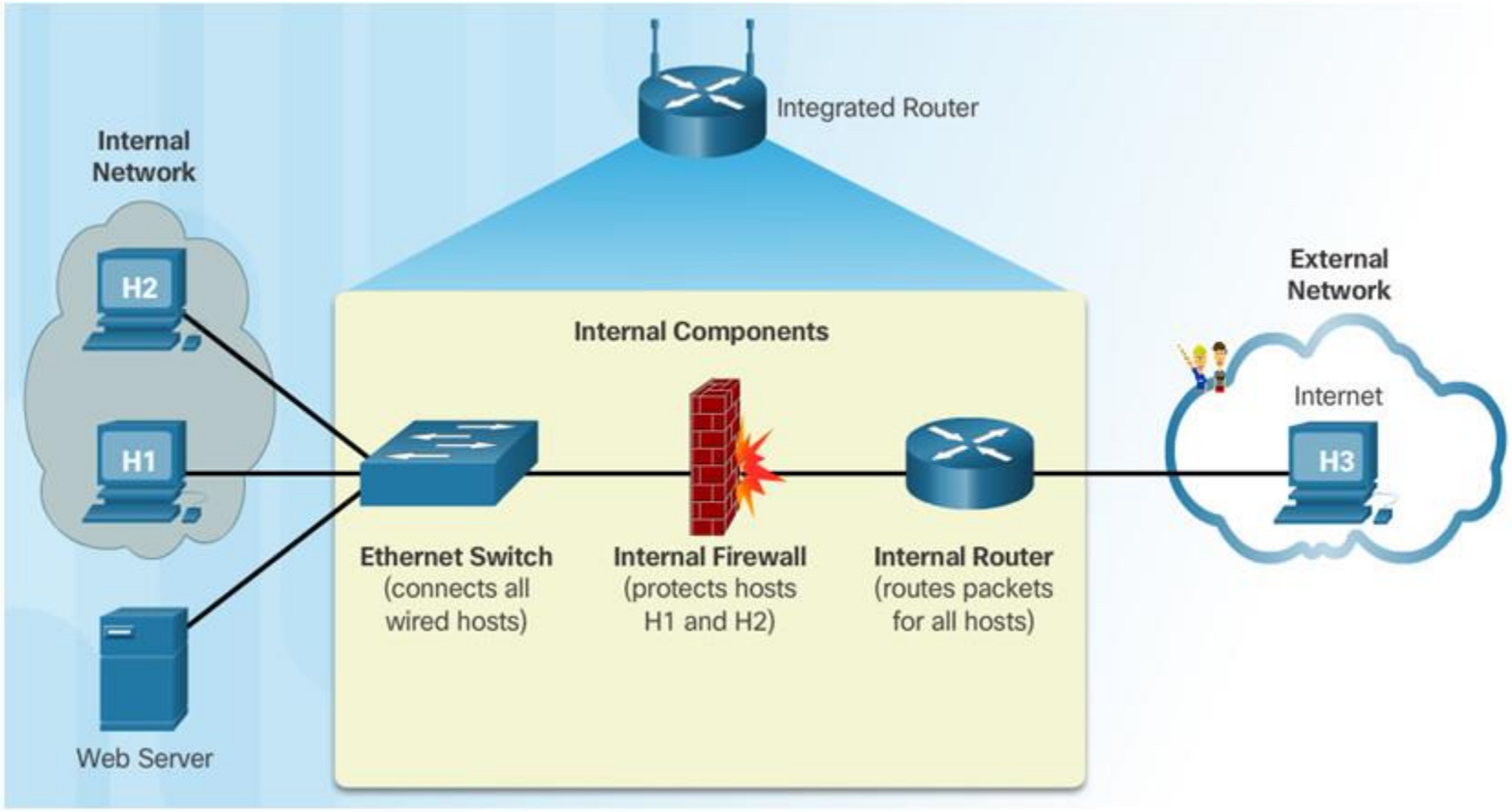


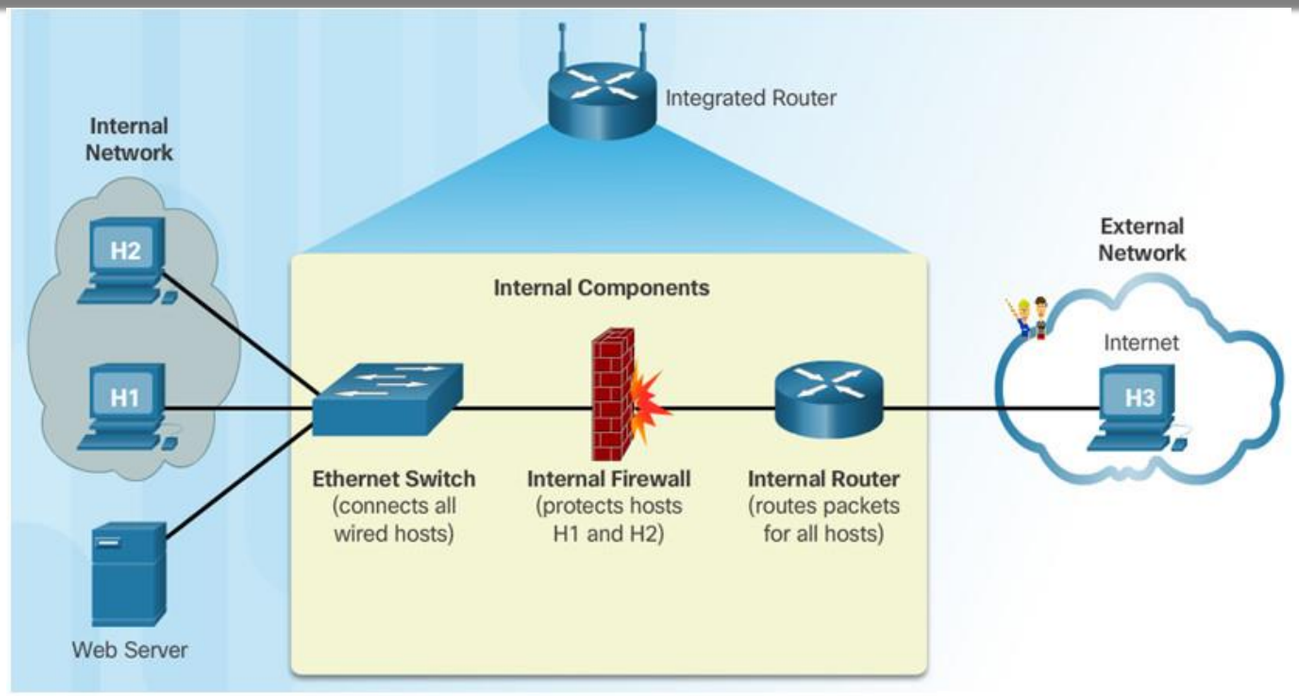


7.3 Physical Components of a Network

The hardware components are the server, client, peer, transmission medium, and connecting devices. The software components are operating system and protocols.

7.3.1 Network Devices

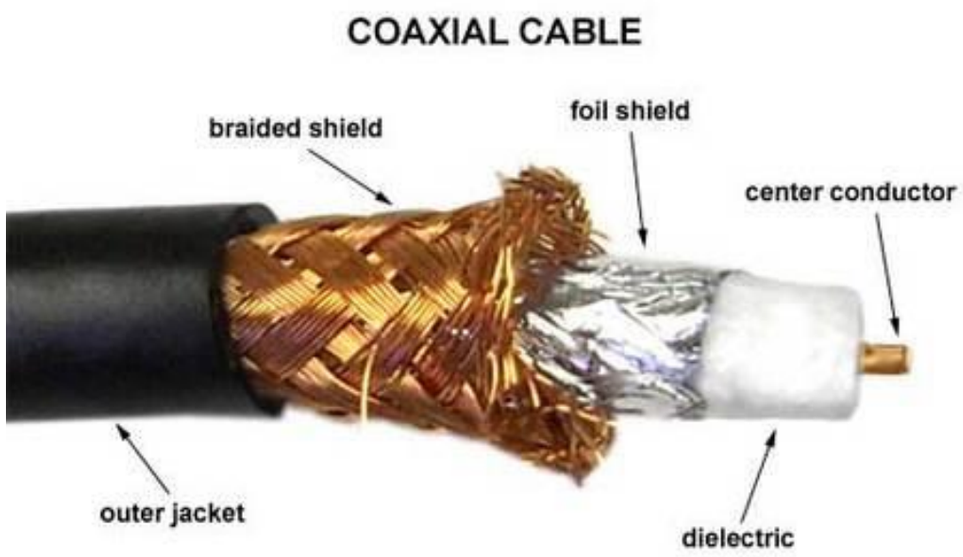


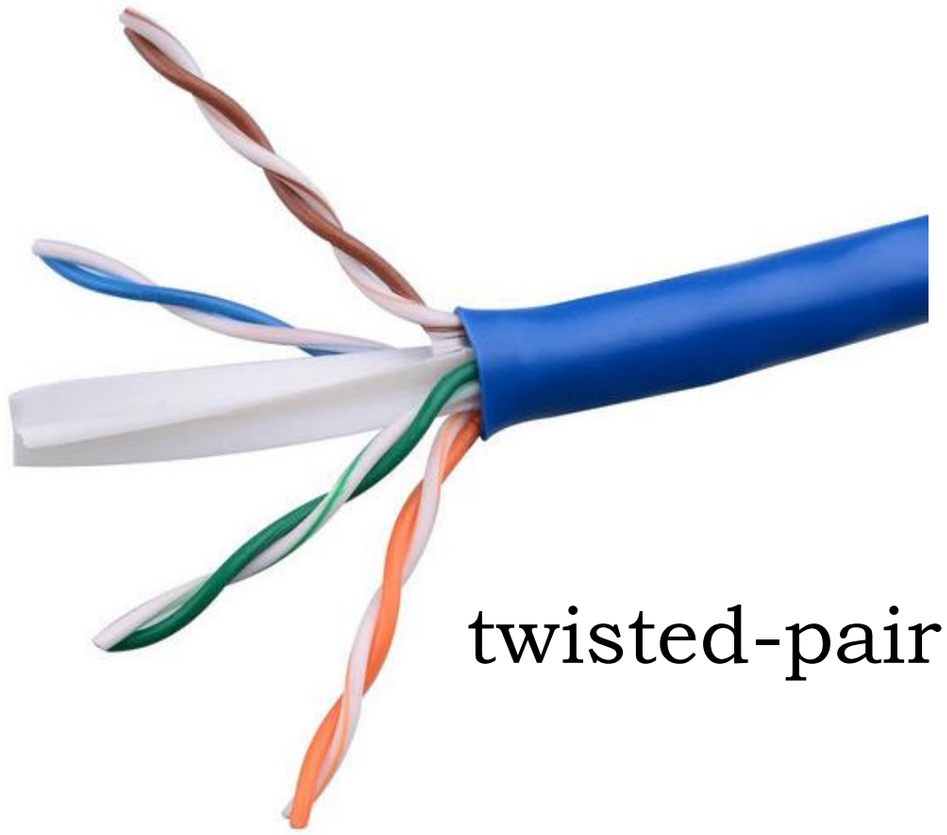


- **Modems** convert a computer's digital data into a format that can be transmitted on the ISP's network.
- **Switches** microsegment LANs by sending data only to the computer that needs it.
- **Wireless access points (APs)** connect wireless devices. Routers use IP addresses to forward traffic to other networks.
- In a home or small office, a route often includes a switch, a firewall, and an AP.

7.3.2 Cables and Connectors

- Coaxial and twisted-pair cables use electrical signals over copper to transmit data. Fiber-optic cables use light signals to transmit data. These cables differ in bandwidth, size, and cost.
- There are several types of coaxial cable: 10Base5 (thicknet), 10Base2 (thinnet), RG-59 (cable TV), RG-6 (better than RG-59)

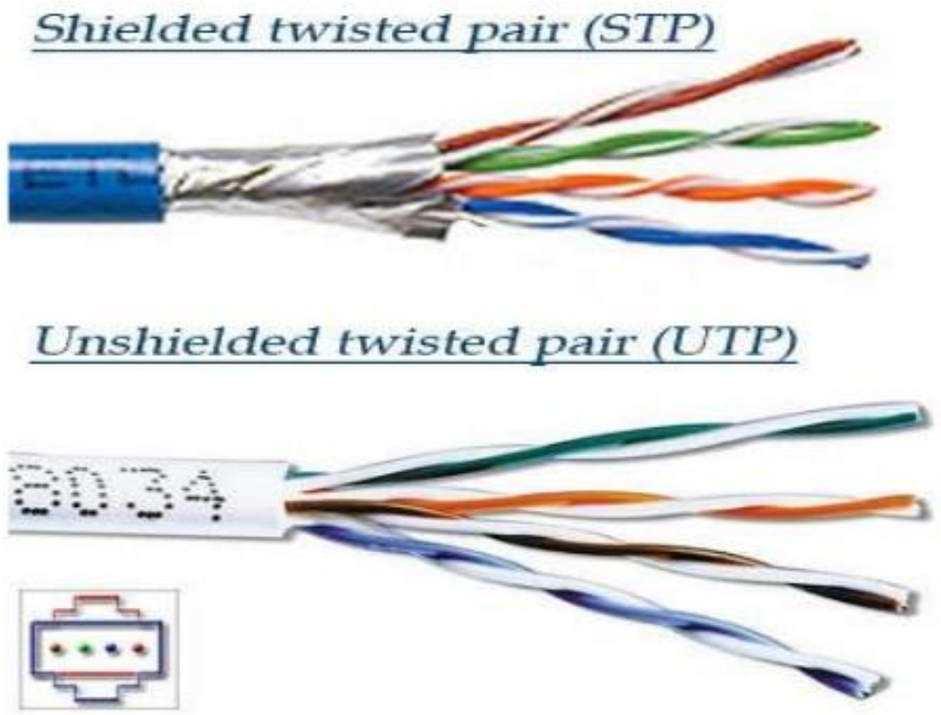




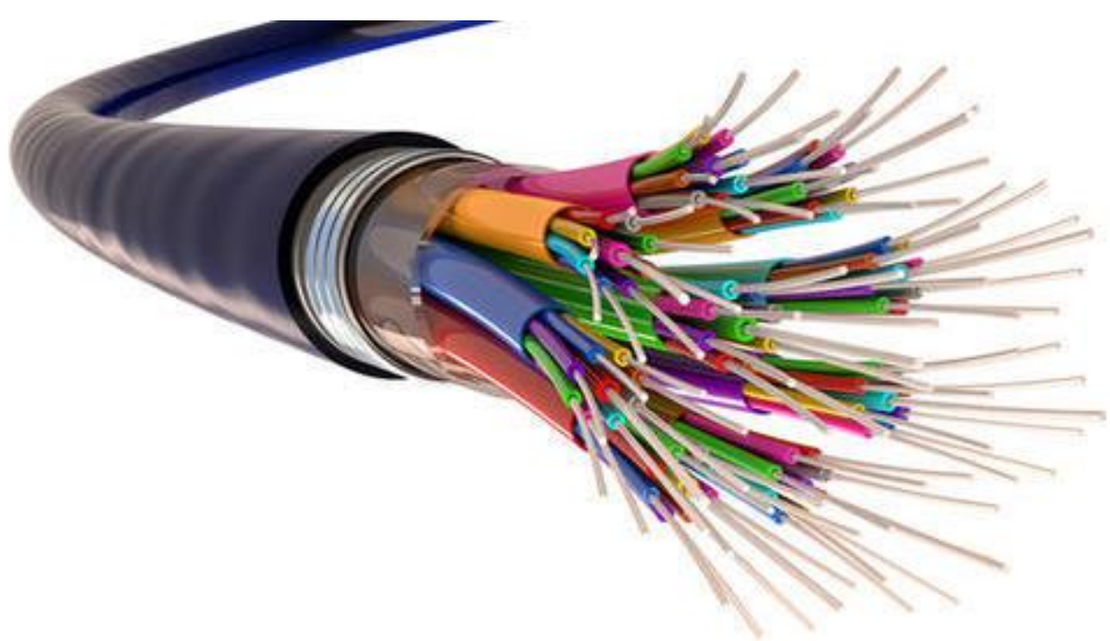
twisted-pair

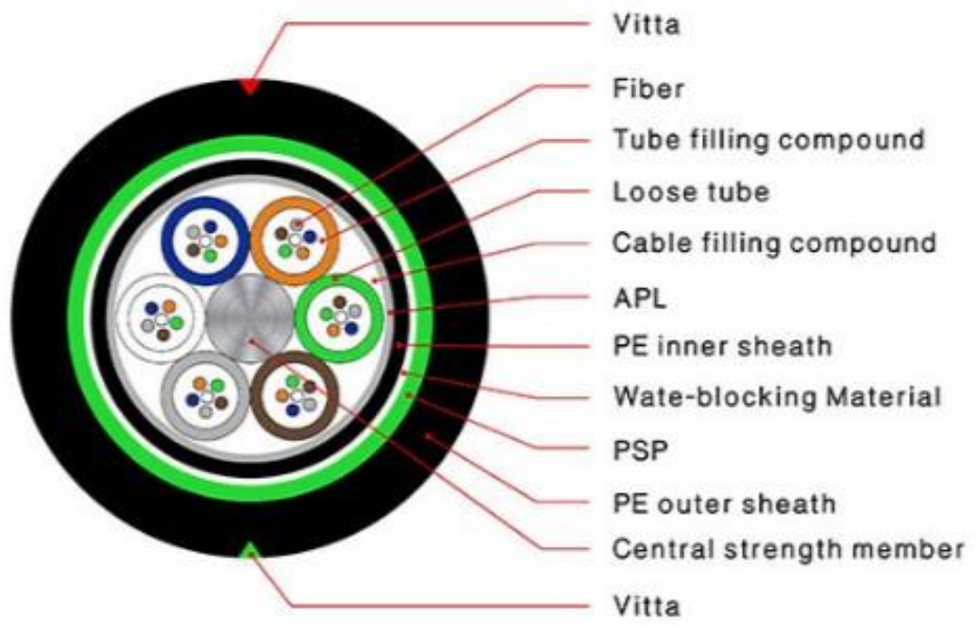
- Twisted-pair cables are terminated with an RJ-45 connector. Twisted-pair comes in two types:

- Unshielded Twisted-Pair (UTP)
- Shielded Twisted-Pair (STP)

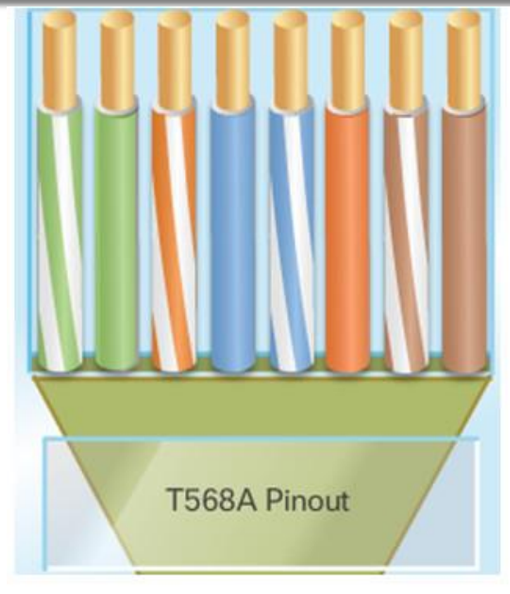


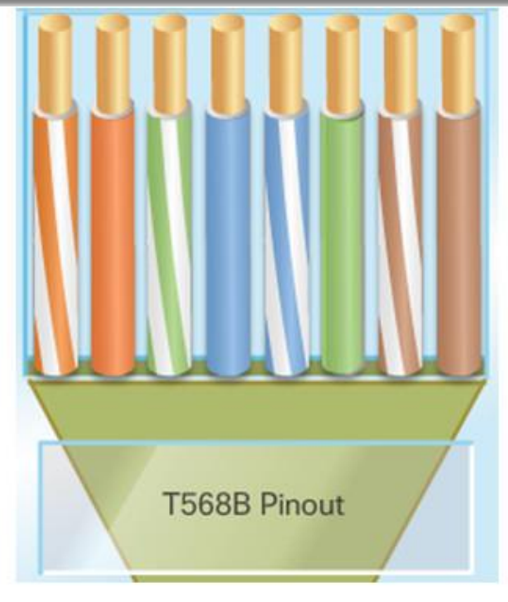
- Fiber-optic cables are broadly classified into two types:
- Single-mode fiber (SMF) – Uses lasers to send a single ray of light that can travel hundreds of kilometers.
- Multimode fiber (MMF) – Uses LEDs to send multiple light signals that can travel up to 550 meters.





- Twisted-pair is the most popular type of cabling used in LANs today.
- There are two different twisted-pair wiring schemes: called **T568A** and **T568B.**





- Two types of cables can be created:

-straight-through cable: common cable type, same on both sides *(devices different types)*.

-crossover cable: uses both T568A on one end of the cable and T568B on the other end of the same cable. *(devices same types)*

7.2 Computer to Network Connection

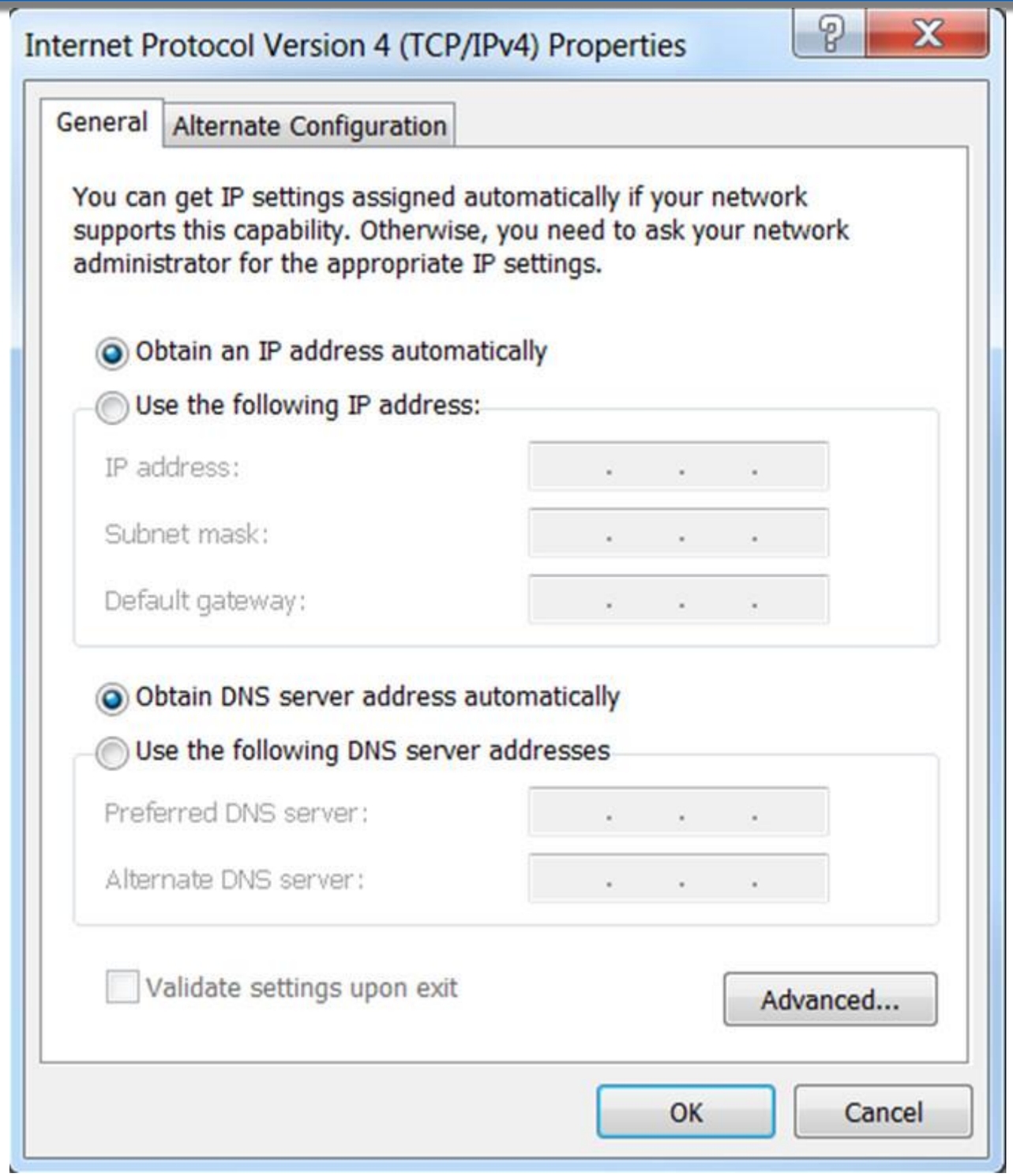
Understand how to connect computer to network and tools.

7.2.1 Networking Cards

A wired or wireless network interface card (NIC) is required to connect to the network. Modern network adapter cards are connect via USB.

After it is installed, IP settings must be configured either manually or dynamically.

You can also configure advanced settings, such as speed, duplex, Wake on LAN, and quality of service (QoS).



7.2.2 Wireless and Wired Router Configurations

To connect to a network, attach a straight-through Ethernet cable to the NIC port.

The other end connects to a router or to a telecommunications port that is wired so that data will reach the router.

For wireless connections, configure the router with the following:

- Network Mode (set the 802.11 standard)
- Network Name (SSID)
- Channel (important when there are multiple APs in the network)
- Wireless Security (should be WPA2)

7.2.3 Network Sharing

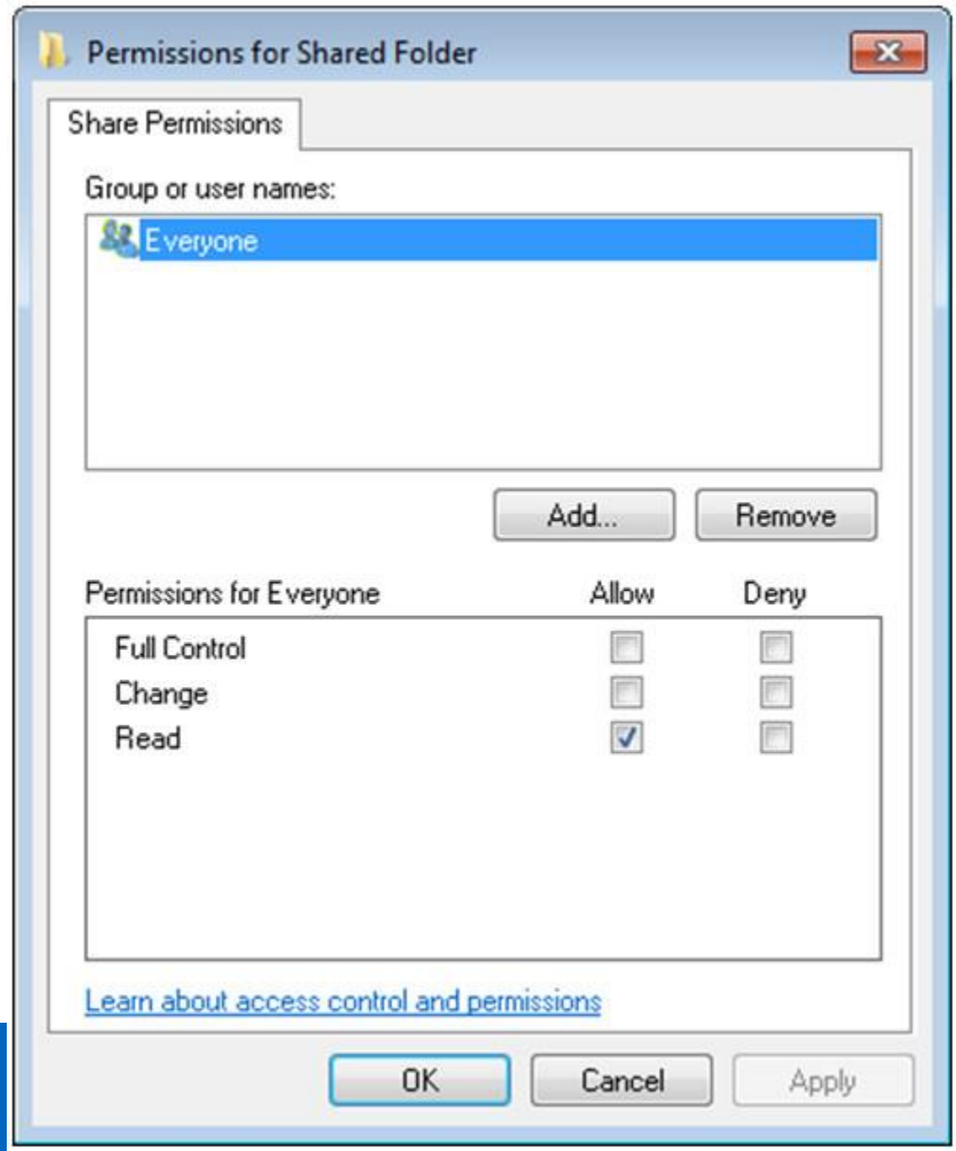
All Windows computers on a network must be part of either a domain or a workgroup.

Before computers can share resources, they must **share** the same domain name or workgroup name.

Mapping a local drive is a useful way to access a single file, specific folders, or an entire drive between different operating systems over a network.

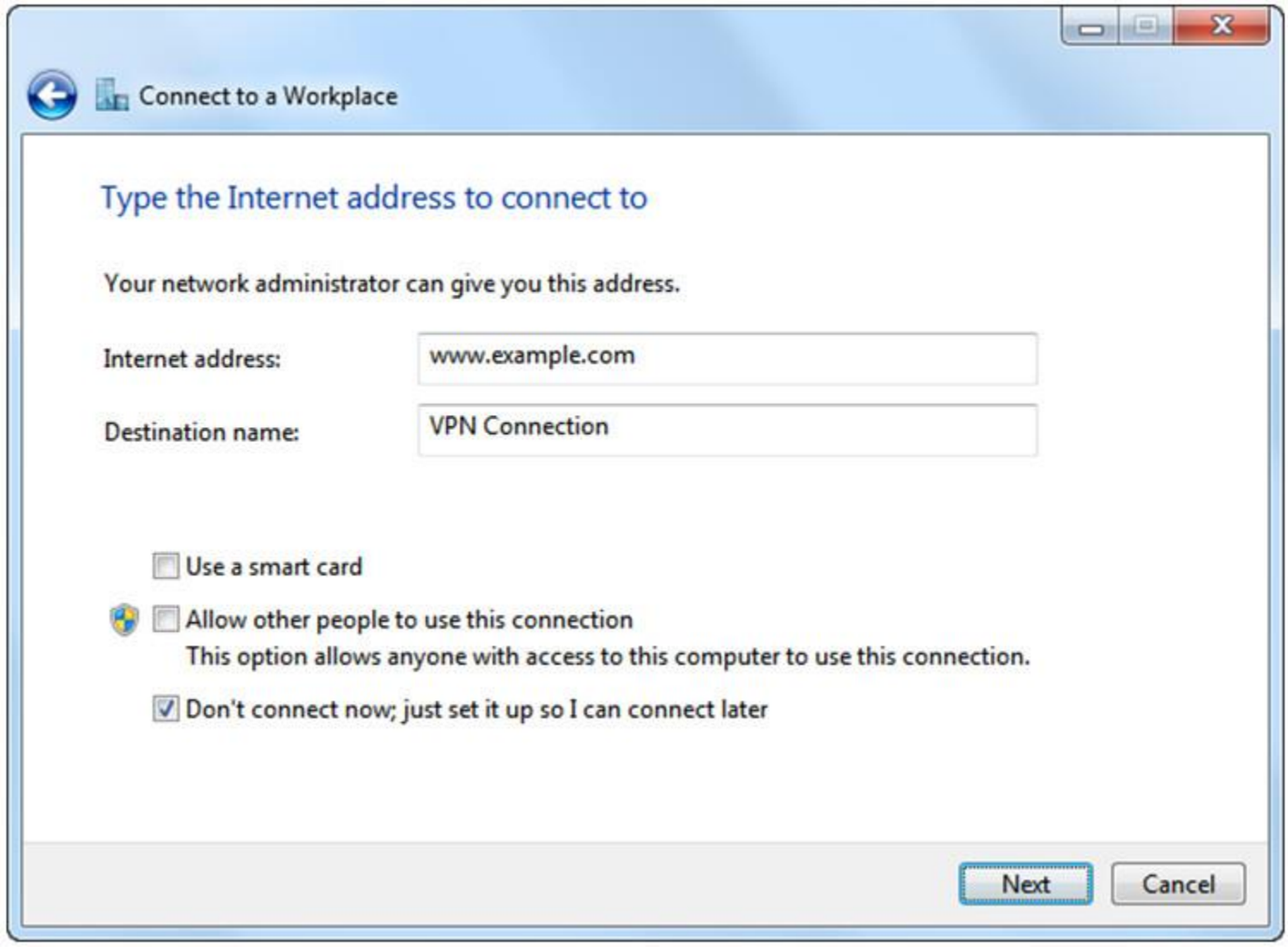
Determine which resources will be shared over the network and the type of permissions users will have to the resources.

- **Read** – user can view data in files and run programs
- **Change** – user can add files and subfolders, change the data in files, and delete subfolders and files
- **Full Control** – user can change permissions of files and folders



7.2.4 Remote Connections

A virtual private network (**VPN**) is a private network that connects remote sites or users together over a public network, like the Internet.

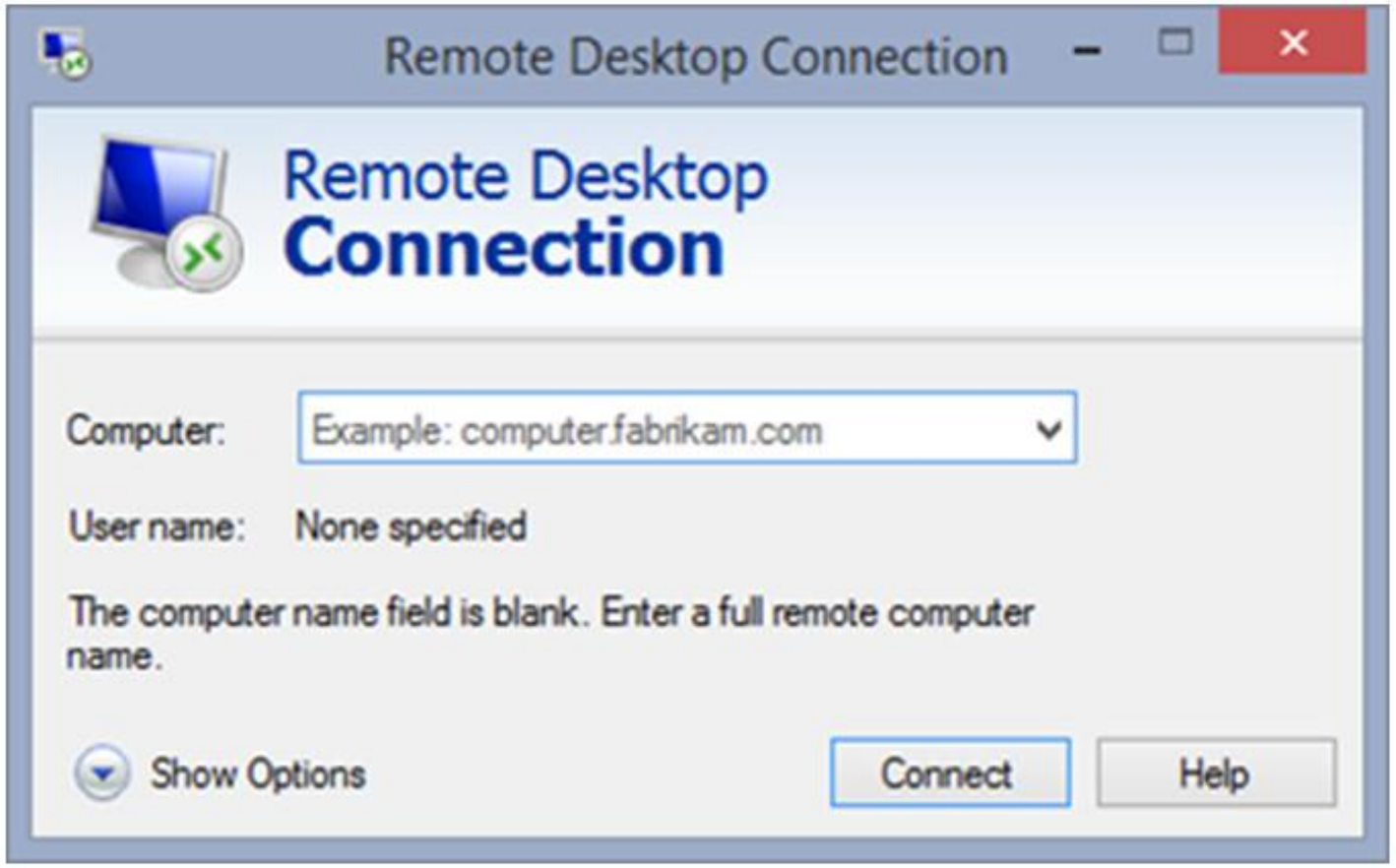


When connected to the corporate private network, users become part of that network and have access to all services and resources as if they were physically connected to the corporate LAN.

Remote-access users must install the VPN client on their computers to form a secure connection with the corporate private network.

Remote Desktop allows technicians to view and control a computer from a remote location.

Remote Assistance allows technicians to assist customers with problems from a remote location.



TeamViewer For Personal Use

TeamViewer is pretty much a household name in the remote desktop world and the company provides enterprise-grade remote services for a licence fee.

AnyDesk

AnyDesk is a proprietary remote desktop tool distributed by AnyDesk Software GmbH.

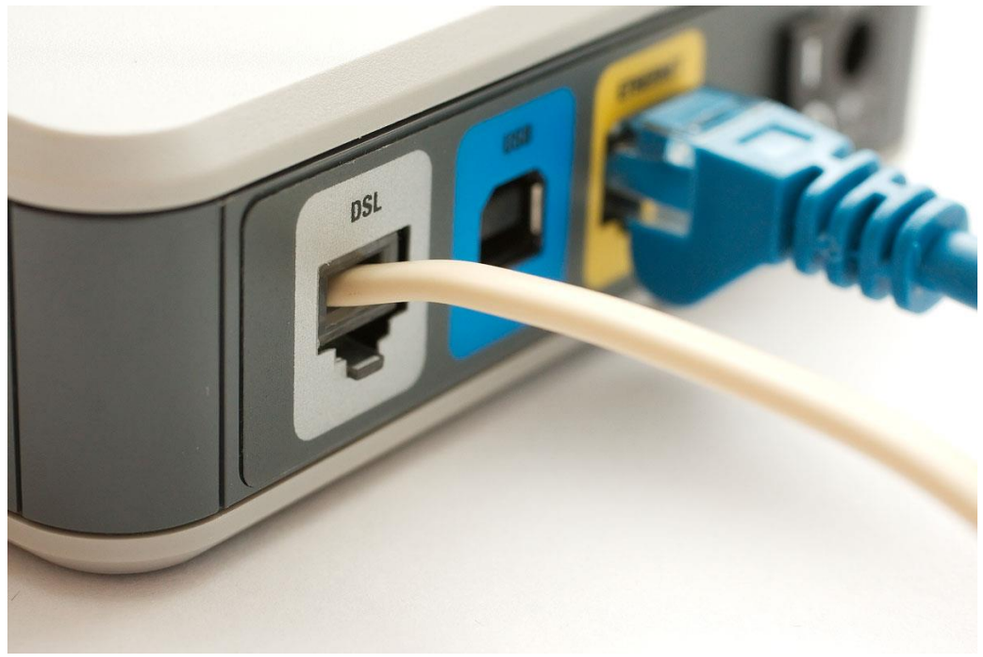
The software program provides free remote access to personal computers running the host application, which can be installed on Windows, macOS, Linux and FreeBSD

7.3 ISP Connection Technologies

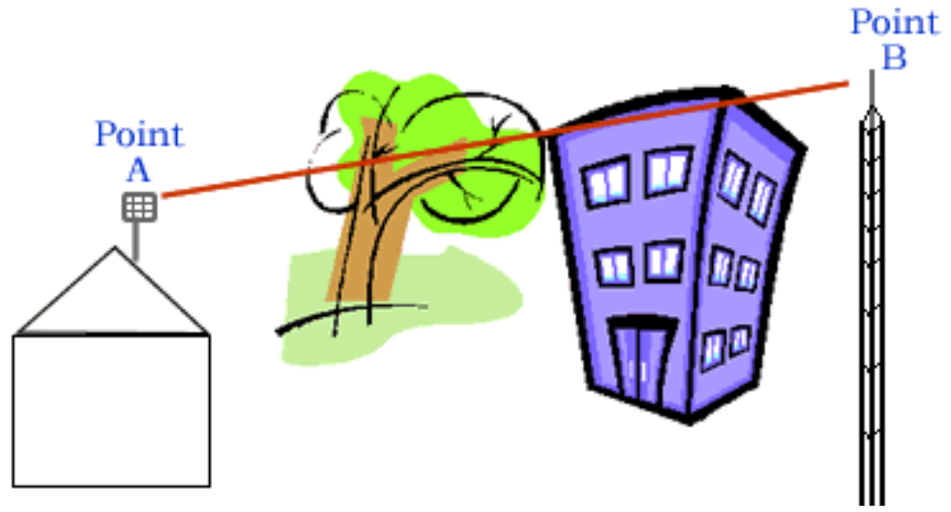
ISP = Internet Service Provider

7.3.1 Broadband Technologies

- **DSL** (Digital Subscriber Line) uses the existing copper telephone lines to provide high-speed digital data communication between end users and telephone companies.



- **Line of sight wireless** Internet is an always-on service that uses radio signals for transmitting Internet access

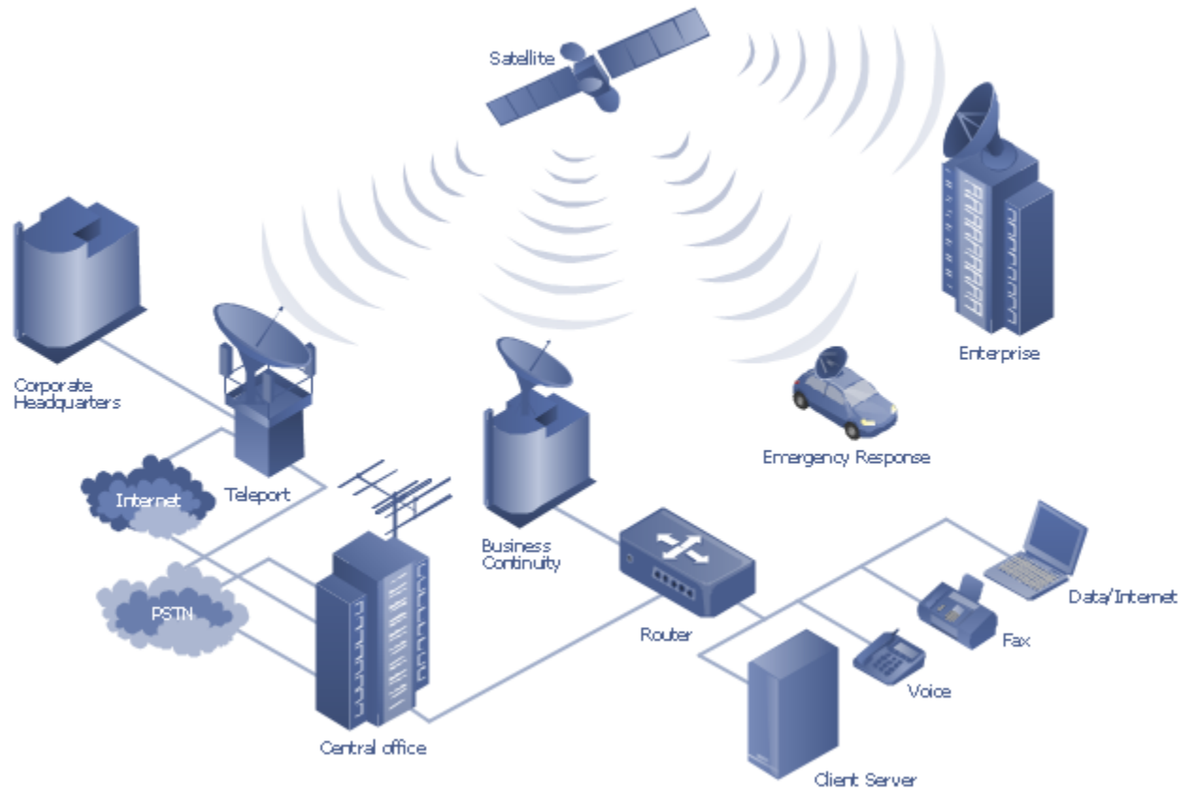


- **Cellular** technology enables the transfer of voice, video, and data.

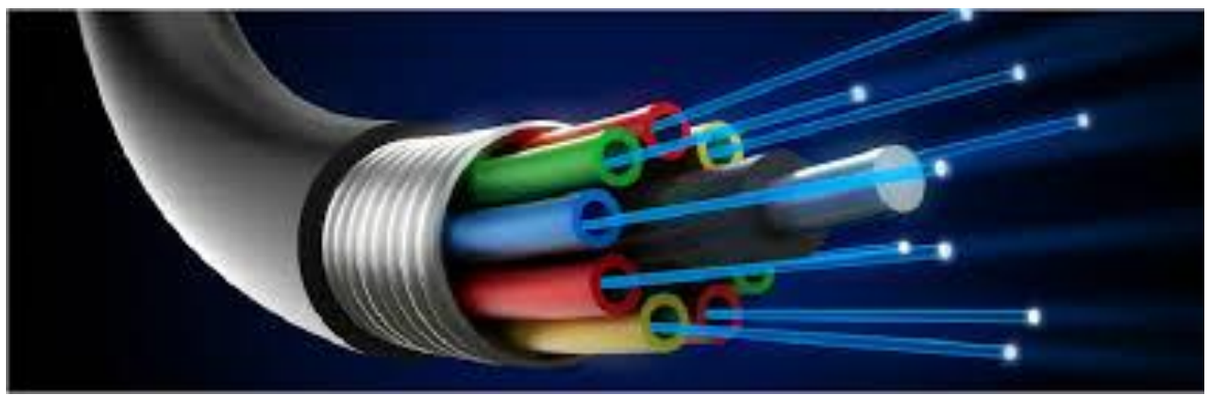
1G	2G	3G	4G	5G
1981	1992	2001	2010	2020(?)
2 Kbps	64 Kbps	2 Mbps	100 Mbps	10 Gbps
asic voice service sing analog rotocols	Designed primarily for voice using the digital standards (GSM/CDMA)	First mobile broadband utilizing IP protocols (WCDMA / CDMA2000)	True mobile broadband on a unified standard (LTE)	'Tactile Internet' with service-awar devices and fiber- like speeds

- **Cable** uses coaxial cable lines originally designed to carry cable television.

- **Satellite** is an alternative for customers who cannot get cable or DSL connections.



- **Fiber** broadband provides faster connection speeds and bandwidth than cable and DSL.



7.4 Internet Technologies

7.4.1 Data Centers and Cloud Computing

Data center is a data storage and processing facility run by an in-house IT department or leased offsite.

Cloud computing is an off-premise service that offers on-demand access to a shared pool of configurable computing resources.

Common Problems and Solutions for Networks

Network problems can be attributed to hardware, software, or configuration issues

Common networking problems include:

- Network cables are damaged or unplugged.
- Legitimate users are denied remote access.
- Device lacks sufficient addressing information.
- Users cannot access the Internet.
- User cannot map a drive or share a folder on the network

The three main **Cloud services** models are:

- Software as a Service (SaaS)
- Platform as a Service (PaaS)
- Infrastructure as a Service (IaaS)

The four Cloud deployment models are:

- Private
- Public
- Community
- Hybrid