



Jaringan Komputer

Teknik Komputer

Susmini I. Lestaringati, M.T

Basic Components of Networks

Every Networks includes:

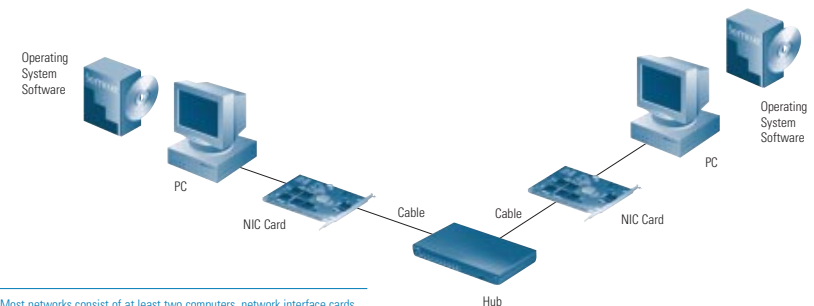
- At least two computers
- A network interface on each computer (the device that lets the computer talk to the network - usually called a Network Interface Card [NIC] or adapter)
- A connection medium - usually a wire or cable, but wireless communication between networked computers and peripherals is also possible.
- Network operating system software-such as Microsoft Windows 95 or Windows NT, Novell Netware, AppleShare, or Artisoft LANtastic
- Most networks-even those with just two computers-also have a **hub** or a **switch** to act as a connection point between the computers.

Computer Networks : Definition

- Computer Networks are collections of two or more connected computers.
- When their computers are joined in a network, people can share files and peripherals such as modems, printers, tape backup drives, and CD-ROM drives.
- When networks at multiple locations are connected using services available from phone companies, people can send e-mail, share links to the global Internet, or conduct videoconferences in real time with other remote users on the network.

Basic Networking Components

Basic Networking Components

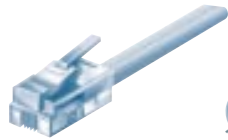


Most networks consist of at least two computers, network interface cards, cabling, network operating system software, and a hub.

Network Components : Wiring/ Cables

- Networks use three primary types of wiring:

- Twisted Pair
- Coaxial
- Fiber Optic



Twisted Pair



Coaxial



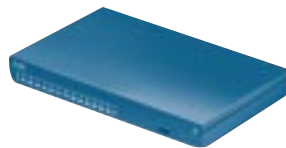
Fiber-Optic

Types of Wiring

- **Twisted-pair**—the industry standard in new installations. This wire comes in several “standards.” Unshielded twisted pair (UTP) Category 3 wire (also called 10BaseT) is often used for your phone lines, and UTP Category 5 (also called 10Base2) wire are the current networking standards.
- **Coaxial**—resembles round cable TV wiring.
- **Fiber-optic**—usually reserved for connections between “backbone” devices in larger networks, though in some very demanding environments, highly fault resistant fiber-optic cable is used to connect desktop workstations to the network and to link adjacent buildings. Fiber-optic cable is the most reliable wiring but also the most expensive.

Hub or Repeaters

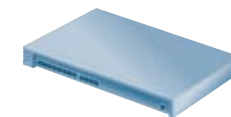
- Hubs, or repeaters, are simple devices that inter-connect groups of users. Hubs forward any data packets they receive over one port from one workstation—including e-mail, word processing documents, spreadsheets, graphics, or print requests—to all of their remaining ports. All users connected to a single hub or stack of connected hubs are in the same “segment,” sharing the hub’s bandwidth or data-carrying capacity. As more users are added to a segment, they compete for a finite amount of bandwidth devoted to that segment.



Hub

Network Components : Switch

- Switches are smarter than hubs and offer more bandwidth. A switch forwards data packets only to the appropriate port for the intended recipient, based on information in each packet’s header. To insulate the transmission from the other ports, the switch establishes a temporary connection between the source and destination, then terminates the connection when the conversation is done.
- As such, a switch can support multiple “conversations” and move much more traffic through the network than a hub. A single eight-port Ethernet hub provides a total of 10 megabits per second (Mbps) of data-carrying capacity shared among all users on the hub. A “full-duplex,” eight-port Ethernet switch can support eight 10-Mbps conversations at once, for a total data-carrying capacity of 160 Mbps. “Full-duplex” refers to simultaneous two-way communications, such as telephone communication. With half-duplex communications, data can move across the cable or transmission medium in just one direction at a time.



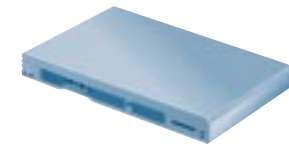
Switch

Network Components : Bridges

- A device that passes packets between multiple network segments using the same communications media. If a packet is destined for a user within the sender's own network segment, the bridge keeps the packet local. If the packet is bound for another segment, the bridge passes the packet onto the network backbone.

Network Components : Routers

- Compared to switches and bridges, routers are smarter still. Routers use a more complete packet "address" to determine which router



Router

or workstation should receive each packet. Based on a network roadmap called a "routing table," routers can help ensure that packets are traveling the most efficient paths to their destinations. If a link between two routers goes down, the sending router can determine an alternate route to keep traffic moving.

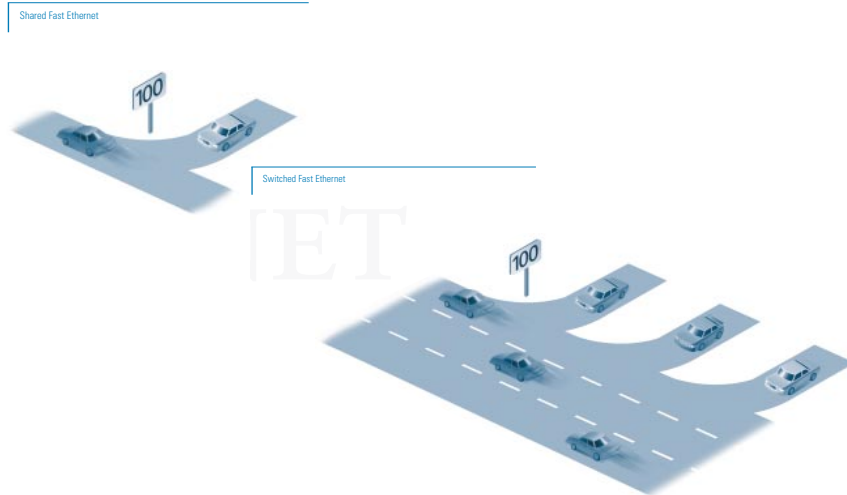
Local Area Networks: Ethernet and Fast Ethernet

- Ethernet has been around since the late 1970s and remains the leading network technology for local-area networks (LANs).
- A LAN is a network contained in a building or on a single campus.
- Ethernet is based on carrier sense multiple access with collision detection (CSMA/CD).
- An Ethernet workstation can send data packets only when no other packets are traveling on the network, that is, when the network is "quiet." Otherwise, it waits to transmit, just as a person might wait for another to speak during conversation.

Collisions

- If multiple stations sense an opening and start sending at the same time, a "collision" occurs. Then, each station waits a random amount of time and tries to send its packet again. After 16 consecutive failed attempts, the original application that sent the packet has to start again. As more people try to use the network, the number of collisions, errors, and subsequent retransmits grows quickly, causing a snowball effect.
- Collisions are normal occurrences, but too many can start to cause the network to slow down. When more than 50 percent of the network's total bandwidth is used, collision rates begin to cause congestion. Files take longer to print, applications take longer to open, and users are forced to wait. At 60 percent or higher bandwidth usage, the network can slow dramatically or even grind to a halt.

Shared Fast Ethernet vs Switched Fast Ethernet



Token Ring

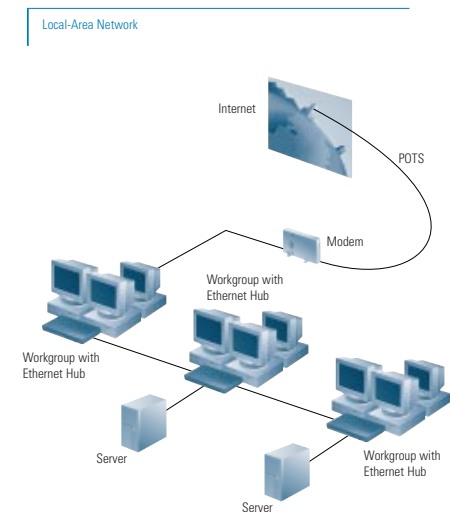
- Token Ring is a “token-passing” technology and an alternative to Ethernet’s collision-detection method. A token travels through the network, which must be set up in a closed ring, and stops at each workstation to ask whether it has anything to send. If not, the token continues to the next point on the network. If there is data to send, the sending station converts the token frame into a data frame and places it into the ring. The frame continues around the ring, sets repeated by all stations, but the destination station also copies the frame into memory. When the frame comes around to the sending station, it strips the data frame from the ring and releases a new token. Token Ring networks operate at either 4 or 16 Mbps, but with the low cost, ease of use, and easy migration to higher performance in Ethernet networks, Token Ring is rarely used for new network installations

FDDI (Fiber Distributed Data Interface)

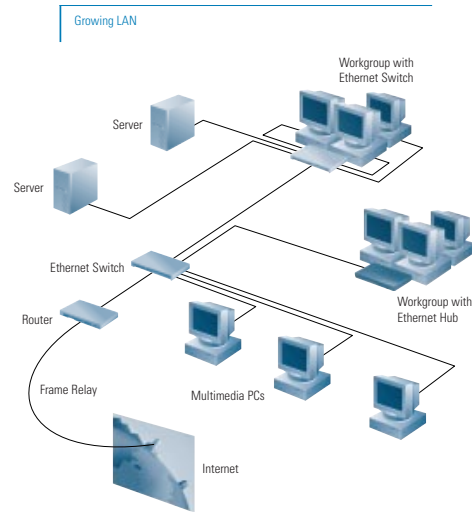
- Fiber Distributed Data Interface (FDDI) is another “token-passing” technology, operating at 100 Mbps. But because it requires different wiring (fiber) and different hubs and switches from Ethernet, FDDI is losing ground to Fast Ethernet and other high-speed technologies.
- Asynchronous Transfer Mode (ATM) operates at a range of speeds up to 622 Mbps. It is a popular choice for the backbones of extremely demanding or large networks, it has special features such as the ability to carry voice and video traffic along with data, and it can be used for wide-area networks connecting geographically separated sites. Gigabit Ethernet operates at 1000 Mbps and is fully compatible with Ethernet and Fast Ethernet wiring and applications.

Local Area Network at a Campus

- This LAN starts simply—shared Ethernet, with a pair of servers and a shared analog modem connecting students and faculty to the Internet one at a time.

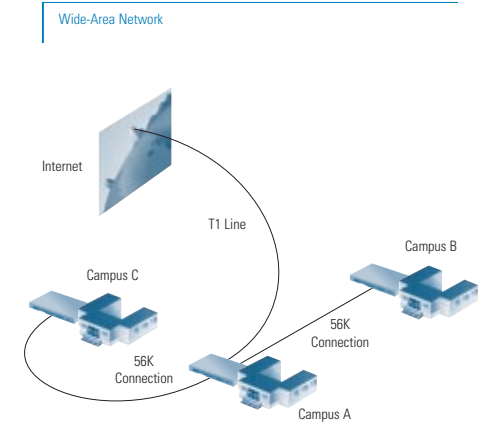


Growing LAN



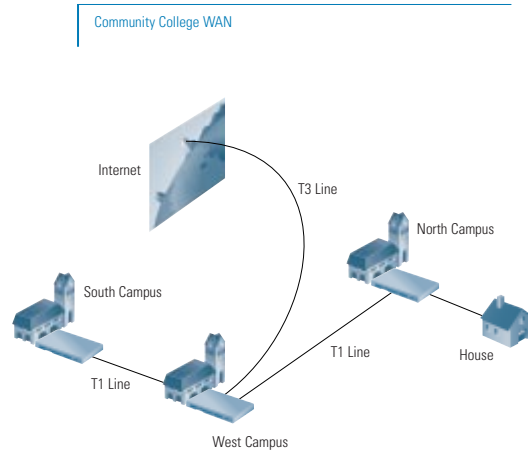
A Wide-Area Network for A Small District

- To improve communications between campuses and their central office, the campuses decide to install a wide-area network. The upgrade economizes on Internet connectivity by offering all campuses a connection through a central high-speed line.

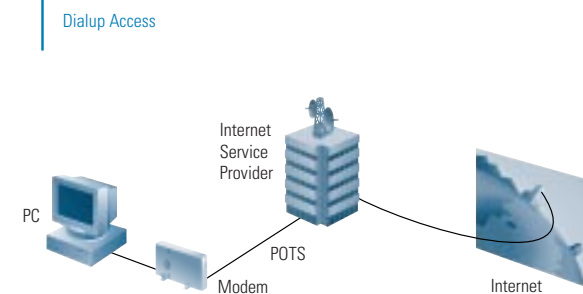


A Community College WAN

- A growing community college system sees rising network traffic at its three campuses. It wants to install future-ready local networks to support multimedia applications and to provide high-speed WAN links that will allow south and west campus students to take advantage of north campus courses via the network (distance learning).



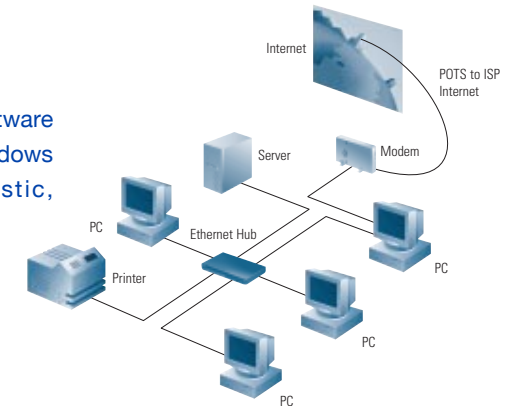
How to Connect to Connect the Internet



Networking Basics (1)

For Building a Small LAN

- Clients with NICs installed
- Server
- Hub
- Cabling
- Network operating system software (for example, Windows NT, Windows 95, Novell NetWare, LANtastic, AppleShare, and so on)
- Modem for Internet Access

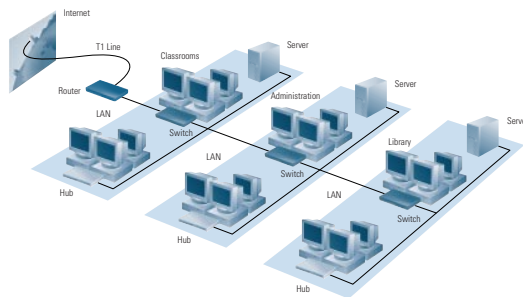


Networking Basics (2)

For Connecting Buildings on a Campus

- Clients with NICs installed
- Servers
- Hubs
- Switch
- Cabling

- Network operating system software (for example, Windows NT, Windows 95, Novell NetWare, LANtastic, AppleShare, and so on)
- Router for shared Internet access (optional)

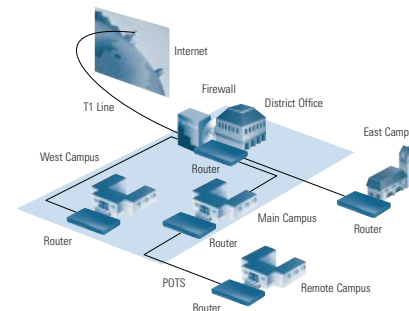


Networking Basics (3)

For Connecting to Another Campus or District

- Clients with NICs installed
- Servers
- Hubs
- Switches
- Routers at each location for WAN connections, shared Internet access

- Access server for dialup access for remote users
- Cabling
- WAN service (ISDN, Frame Relay, or leased-line service from phone company)
- Network operating system software (for example, Windows NT, Windows 95, Novell NetWare, LANtastic, and so on)



Glossaries (1)

- **ATM**
Asynchronous Transfer Mode. Under ATM, multiple traffic types (such as voice, video, or data) are conveyed in fixed-length cells (rather than the random-length “packets” moved by technologies such as Ethernet and FDDI). This feature enables very high speeds, making ATM popular for demanding network backbones. With networking equipment that has recently become available, ATM will also support WAN transmissions. This feature makes ATM valuable for large, dispersed organizations.
- **Bandwidth**
The “data-carrying” capacity of a network connection, used as an indication of speed. For example, an Ethernet link is capable of moving 10 million bits of data per second. A Fast Ethernet link can move 100 million bits of data per second – 10 times more bandwidth.
- **Collision Domain**
In Ethernet, the result of two nodes transmitting simultaneously. The frames from each device impact and are damaged when they meet on the physical media.
- **Backbone**
The part of a network that acts as the primary path for traffic moving between, rather than within, networks.

Glossaries (2)

- **Frame Relay**
A wide-area network service that provides switched (“on-and-off”) connections between distant locations.
- **ISDN**
Integrated Services Digital Network. Communication protocol offered by telephone companies that permits high-speed connections between computers and networks in dispersed locations.
- **Packet**
A block of data with a “header” attached that can indicate what the packet contains and where it is headed. Think of a packet as a “data envelope,” with the header acting as an address.
- **POTS, PSTN**
Plain Old Telephone Service (POTS) and Public Switched Telephone Network (PSTN). General terms referring to the variety of telephone networks and services in place currently worldwide.

Glossaries (3)

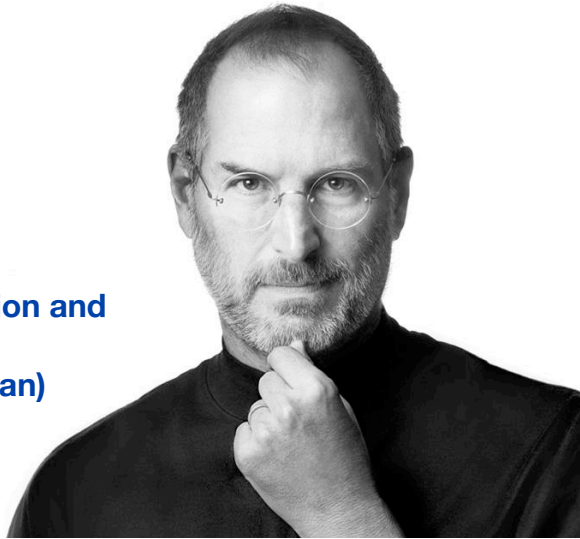
- **Hub**
A device that interconnects clients and servers, repeating (or amplifying) the signals between them. Hubs act as wiring “concentrators” in networks based on star topologies (rather than bus topologies, in which computers are daisy-chained together).
- **Switch**
A device that improves network performance by segmenting the network and reducing competition for bandwidth. When a switch port receives data packets, it forwards those packets only to the appropriate port for the intended recipient. This capability further reduces competition for bandwidth between the clients, servers, or workgroups connected to each switch port.
- **Bridge**
A device that passes packets between multiple network segments using the same communications media. If a packet is destined for a user within the sender’s own network segment, the bridge keeps the packet local. If the packet is bound for another segment, the bridge passes the packet onto the network backbone.

Glossaries (4)

- **Router**
A device that moves data between different network segments and can look into a packet header to determine the best path for the packet to travel. Routers can connect network segments that use different protocols. They also allow all users in a network to share a single connection to the Internet or a WAN.
- **Token Ring**
LAN technology in which packets are conveyed between network end stations by a token moving continuously around a closed ring between all the stations. Runs at 4 or 16 Mbps.
- **FDDI**
A Fiber Distributed Data Interface. A LAN technology based on a 100-Mbps token-passing network running over fiber-optic cable. Usually reserved for network backbones in large organizations.

**see you next
week....**

Chapter 13
Data Communication and
Networking
(Behrouz A Forouzan)
- Ethernet -



Stay Hungry
Stay Foolish

RIP Steve Jobs
1955 - 2011