Chapter 04
Computer Network

- At the beginning age of computers and communi-cations technologies, these two technologies were dealt as totally different subjects. However, as those technologies developed, they began to merge. The innovation of new technology called a computer network emerged and changed the entire way of human life. In this chapter, we are going to learn the definition of computer networks, as well as the classification of networks and topologies.

Section 01 Computer Network(1)

The Definition of Computer Network 컴퓨터 네트워크 정의

- Computer networks are data communication systems combining computers and networks. Physically, computer networks are composed of many computers or terminals connected with communication lines. The computer networks enable users to share access to information through various networks. Some networks span the globe and others cover a relatively small area.
- Data communication system supports the process of transmitting information from one location to another. A data communication system consists of a group of terminals, computers, programs, and transmission equipment.

Section 01 Computer Network(2)

■ Type of Computer Network 컴퓨터 네트워크 종류

- Computer networks are a group of two or more computer systems linked together. There are many types of computer networks, including.
  - LAN(Local Area Network): The computers are geographically close together(that is, in the same building).
  - WAN(Wide Area Network): The computers are farther apart and are connected by telephone lines or radio waves.
  - CAN(Campus Area Networks): The computers are within a limited geographic area, such as a campus or military base.
  - MAN(Metropolitan Area Networks): A data network designed for a town or city.
  - HAN(Home Area Networks): A network contained within a user's home that connects person's digital devices.
  - PAN(Personal Area Networks): A network for interconnecting electronic devices centered on an individual person's workspace

Section 01 Computer Network(2)

Type of Computer Network 컴퓨터 네트워크 종류

- LAN(Local Area Network)
  - Contains printers, servers and computers
  - Systems are close to each other
  - Contained in one office or building
  - Organizations often have several LANS

- WAN(Wide Area Network)
  - Two or more LANs connected
  - Over a large geographic area
  - Typically use public or leased lines
    - Phone lines
    - Satellite
  - The Internet is a WAN

Section 01 Computer Network(2)

Type of Computer Network 컴퓨터 네트워크 종류

- CAN(Campus Area Networks)
  - A LAN in one large geographic area
  - Resources related to the same organization
  - Each department shares the LAN

- MAN(Metropolitan Area Networks)
  - Large network that connects different organizations
  - Shares regional resources

- HAN(Home Area Networks)
  - Small scale network
  - Connects computers and entertainment appliances
  - Found mainly in the home

- PAN(Personal Area Networks)
  - Very small scale network
  - Range is less than 2 meters
  - Cell phones, PDAs, MP3 players

How Networks Are Structured

Server based network

- Node is any network device
- Servers control what the node accesses
- Users gain access by logging in
- Server is the most important computer

How Networks Are Structured

Client/Server network

- Nodes and servers share data roles
- Nodes are called clients
- Servers are used to control access
- Database software
  - Access to data controlled by server
- Server is the most important computer

How Networks Are Structured

- Peer to peer networks (P2PN)
  - All nodes are equal
  - Nodes access resources on other nodes
  - Each node controls its own resources
  - Most modern OS allow P2PN
  - Distributing computing is a form
  - Torrent

Section 01 Computer Network(3)

Type of Network 네트워크 종류

- In addition to these types, the following characteristics are also used to categorize different types of networks:
  - topology: The geometric arrangement of a computer system. Common topologies include a bus, star, and ring.
  - protocol: The protocol defines a common set of rules and signals that computers on the network use to communicate. One of the most popular protocols for LANs is called Ethernet. Another popular LAN protocol for PCs is the IBM token-ring network.
  - architecture: Networks can be broadly classified as using either a peer-to-peer or client/server architecture.
- Computers on a network are sometimes called nodes. Computers and devices that allocate resources for a network are called servers.

Section 02 Network Topology (1)

Type of Network Topology 네트워크 토폴로지 종류

- Network Topology is the shape of a local-area network (LAN) or other communications system. Topologies are either physical or logical.
  - Bus topology
  - Ring topology
  - Star topology
  - Tree topology

- These topologies can also be mixed. For example, a bus-star network consists of a high-bandwidth bus, called the backbone, which connects collections of slower-bandwidth star segments.

Section 02 Network Topology (1)

■ Type of Network Topology 네트워크 토폴로지 종류

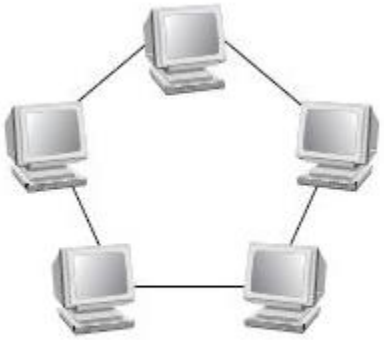
- Bus topology: All devices are connected to a central cable, called the bus or backbone. Bus networks are relatively inexpensive and easy to install for small networks. Ethernet systems use a bus topology.
  - Also called linear bus
  - One wire connects all nodes
  - Terminator ends the wires
  - Advantages
    - Easy to setup
    - Small amount of wire
  - Disadvantages
    - Slow
    - Easy to crash

버스 토폴로지

Section 02 Network Topology (1)

■ Type of Network Topology 네트워크 토폴로지 종류

- Ring topology: All devices are connected to one another in the shape of a closed loop, so that each device is connected directly to two other devices. Ring topologies are relatively expensive and difficult to install, but they offer high bandwidth and can span large distances.
  - Nodes connected in a circle
  - Tokens used to transmit data
    - Nodes must wait for token to send
  - Advantages
    - Time to send data is known
    - No data collisions
  - Disadvantages
    - Slow
    - Lots of cable



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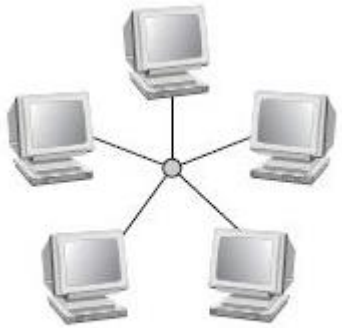
Section 02 Network Topology (1)

■ Type of Network Topology 네트워크 토폴로지 종류

- Star topology: All devices are connected to a central hub. Star networks are relatively easy to install and manage, but bottlenecks can occur because all data must pass through the hub.
  - All nodes connect to a hub
    - Packets sent to hub
    - Hub sends packet to destination
  - Advantages
    - Easy to setup
    - One cable can not crash network
  - Disadvantages
    - One hub crashing downs entire network
    - Uses lots of cable
  - Most common topology



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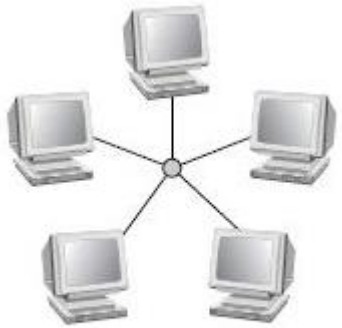

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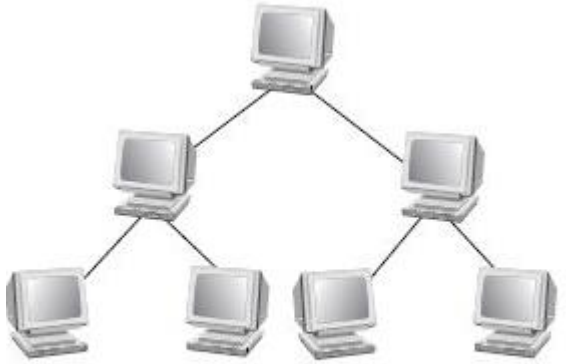
Section 02 Network Topology (1)

Type of Network Topology 네트워크 토폴로지 종류

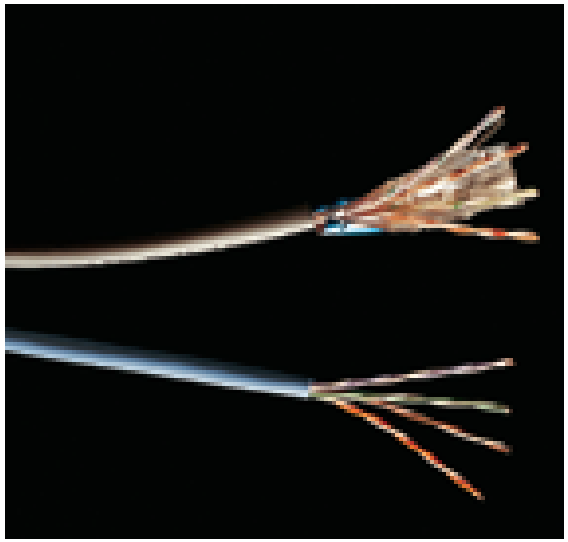
- Tree topology: A tree topology combines characteristics of linear bus and star topologies. It consists of groups of star-configured workstations connected to a linear bus backbone cable.
  - nodes in the hierarchical chain.
  - Advantages
    - Other hierarchical networks are not affected if one of them gets damaged
    - Easier maintenance and fault finding
  - Disadvantages
    - Uses lots of cable
    - A lot of maintenance is needed



계층 토폴로지

Network Media

- **Links that connect nodes**
- **Choice impacts**
  - Speed
  - Security
  - Size
- **Twisted-pair cabling**
  - Most common LAN cable
  - Called Cat5 or 100BaseT
  - Four pairs of copper cable twisted
  - May be shielded from interference
  - Speeds range from
    1 Mbps to 1,000 Mbps



Network Media

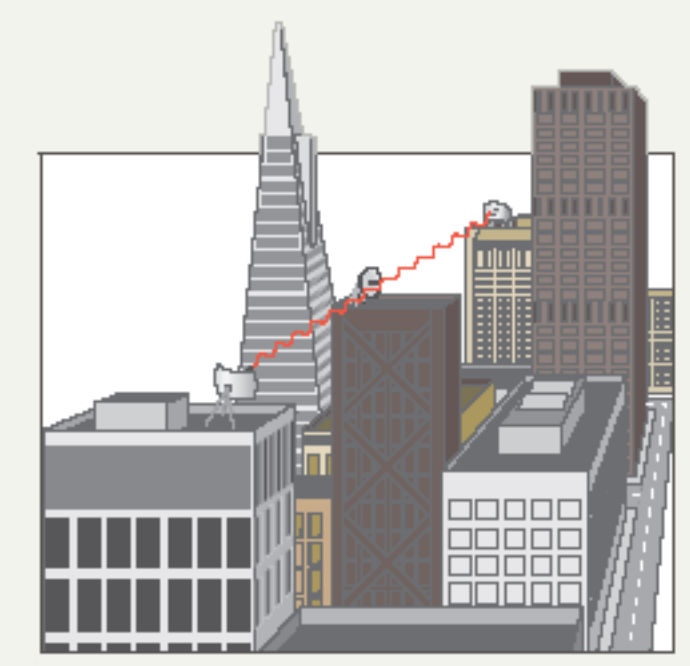
- **Coaxial cable**
  - Similar to cable TV wire
  - One wire runs through cable
  - Shielded from interference
  - Speeds up to 10 Mbps
  - Nearly obsolete

- **Fiber-optic cable**
  - Data is transmitted with light pulses
  - Glass strand instead of cable
  - Immune to interference
  - Very secure
  - Hard to work with
  - Speeds up to
    100 Gbps

Network Media

Wireless Media

- Data transmitted through the air
- LANs use radio waves
- WANs use microwave signals
- Easy to setup
- Difficult to secure



Section 03 Kevin Mitnick(1)

- kevin Mitnick (born August 6, 1963) is one of the most famous crackers to be jailed and convicted. Mitnick was arrested by the FBI on February 15, 1995 and charged with breaking into some of the United States' most "secure" computer systems.
- In December of 1988, he was arrested for stealing programs and tapping into Digital Equipment's computer network. Digital Equipment officials claimed that Mitnick had caused $4 million in damage to computer operations and stole over $1 million in computer software. In 1989, he was convicted and served one year in prison and six months in a resident treatment center. At the center he participated in a program to try to help him break his "hacking addiction".
- After his release in 1990, he seemed to be attempting to reform. He had trouble finding a computer related job, due to his past reputation, but he finally found work with a private investigation firm. Then in 1992 after Kevin's brother died of a heroin overdose, he fell into depression and began to revert to his old habits. In late 1992, when the FBI went to question Mitnick about some computer break-ins at Pacific Bell, they found that he had fled. From that time forward, Mitnick was "on the run" from the FBI, and in several instances, he escaped just narrowly. He moved from city to city, all the while continuing to hack into computer networks through a laptop and cellular phone.

Section 03 Kevin Mitnick(2)

- Then on December 25, 1994, Mitnick hacked into the home computer of Tsutomu Shimomura, a well-known security expert. Shimomura became determined to find the intruder. After about two months of work, Shimomura helped the FBI track the intruder's computer to Raleigh, North Carolina. Mitnick was soon arrested at his apartment at 1:30 a.m. on February 15, 1995.
- Some people say that hackers' destructive activities are harmful to the society, while others say that hackers contribute to the development of security technologies.

Section 04 Self Check

- Data communication is the transmitting of data and programs among computers, terminals and other equipment. For communication to be effective and efficient, the sending and receiving devices must work together. A protocol is a set of procedures used to regulate the transfer of data between communication devices.

- Protocols include many functions such as error detection and transmission, line and message control, and identification procedures. Major manufacturers of communication equipment provide their own protocols. The adaption of standard protocol makes communication systems easier to organize and modify and usually increases their efficiency.

"Sometimes you're a cell phone, sometimes you're a web browser, sometimes you're a contact manager. you have multiple personality disorder."

"I forgot to make a back-up copy of my brain,
so everything I learned last semester was lost."

Section 05 Practical English(3)

"I hacked into the school's computer and changed all my grades.
Then the school hacked into my computer and deleted all my games!"

Section 05 Practical English(4)

"Our web site got 150 hits today!"

Section 05 Practical English(5)

"I want my husband to pay more attention to me.

Got any perfume that smells like a computer?"

Section 05 Practical English(6)

"Some people are still afraid to use their credit card online,
so I set up our e-store with a web cam and a grandma."

응용문장

- Some students are still afraid to study the discrete math.
- The children still want to have candies after brushing their teeth.

Section 05 Practical English(7)

"To upgrade or not to upgrade, that is the question!"

응용문장

- To be or not to be, that is the question! .

Section 05 Practical English(8)

"After all our online chats, I'm happy to finally meet you in person!"

"Me too!"