BATCH : BATCH 85

LESSON : Network -3

DATE : 21.06.2022

SUBJECT : Medium Types
Network Devices

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ZOOM GİRİŞLERİNİZİ LÜTFEN **LMS** SİSTEMİ ÜZERİNDEN YAPINIZ

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Network Türleri

OSI ve TCP/IP Modeli

Protokoller

Portlar

MAC

IP

TCP-UDP

Contents

- Transmission Media

- Network Devices

İçerik

- İletim Ortamları

- Network Cihazları

NETWORK Day 3

TRANSMISSION MEDIA

❖Wired (Kablolu)
- Coaxial
- Twisted pair(Burgulu Çift)
- Fiber

❖Wireless (Kablosuz)
- Laser (WLAN)
- Infrared (Bluetooth v.b)
- RF (WLAN, Uydu Haberleşmesi)

Coaxial Cable

- It is terminated with BNC connectors and the computer connection is made with T-shaped connectors.
- Its major drawback is the rather high signal attenuation, especially at very high frequencies.
- It must be transported underground to limit noise and interference.
- Its cost is higher than UTP cable.
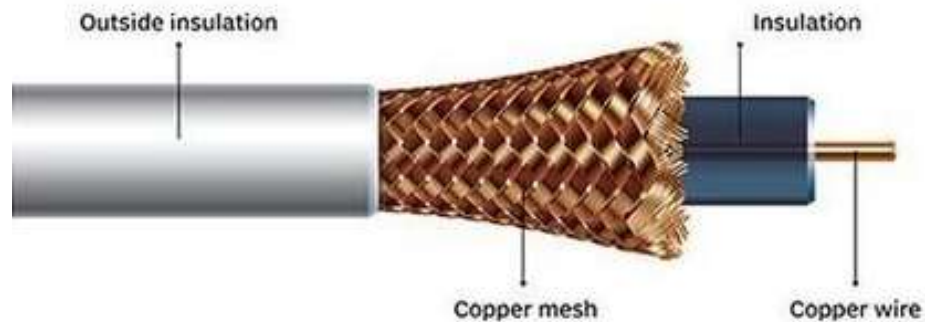
Wired Media

o It is obtained by helically rotating pairs of wires covered with the same insulating material.

o Winding the cables by twisting reduces the noise.

o Twisted-pair cables can consist of single, four, or eight pairs of cables.

o Such cables are terminated with connectors called 'RJ-45', which look like telephone plugs.

Shielded twisted pair (STP)
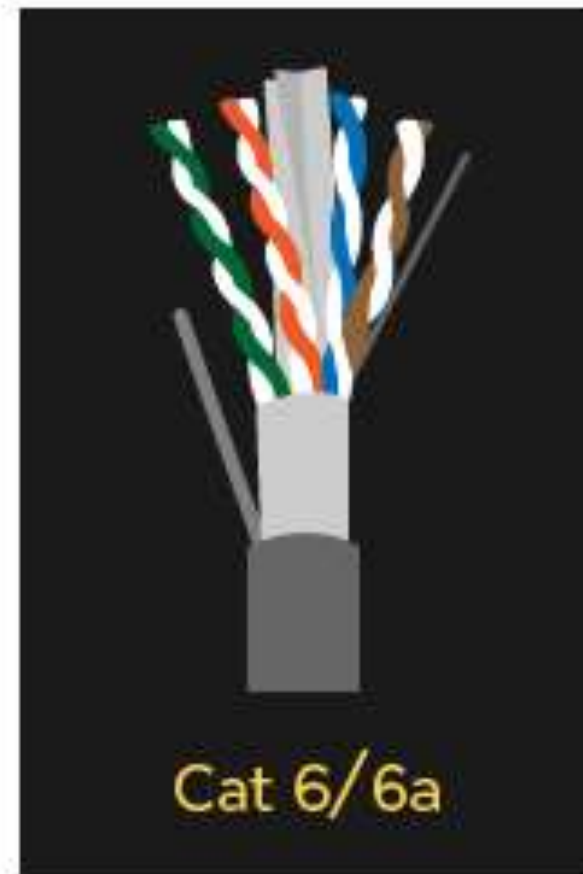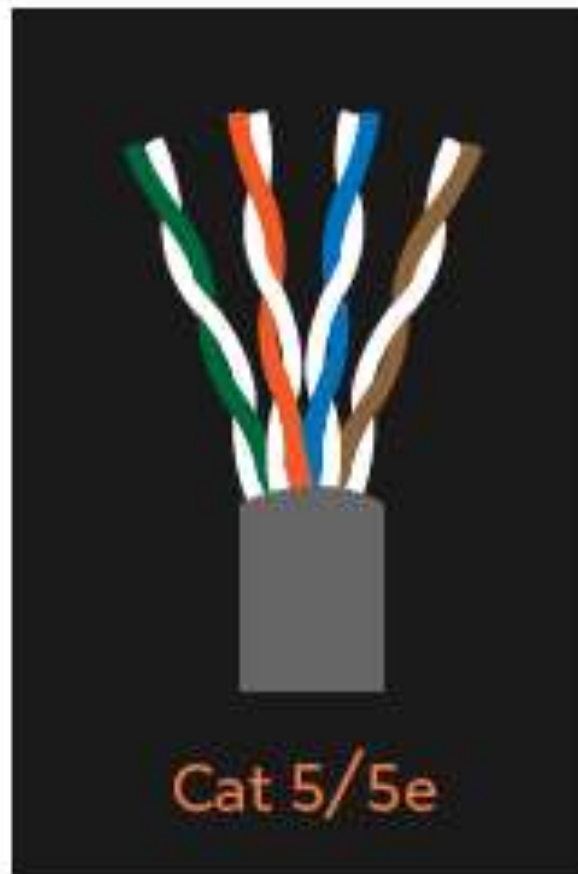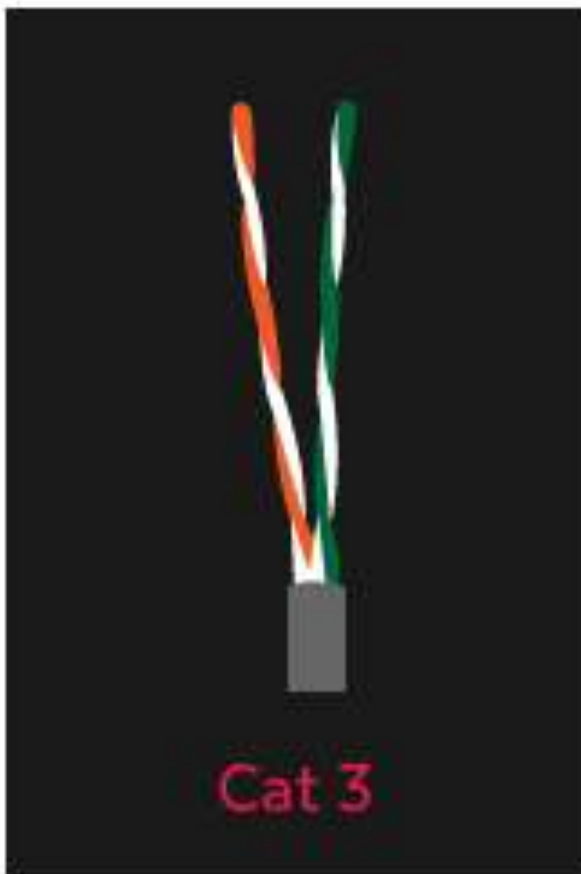
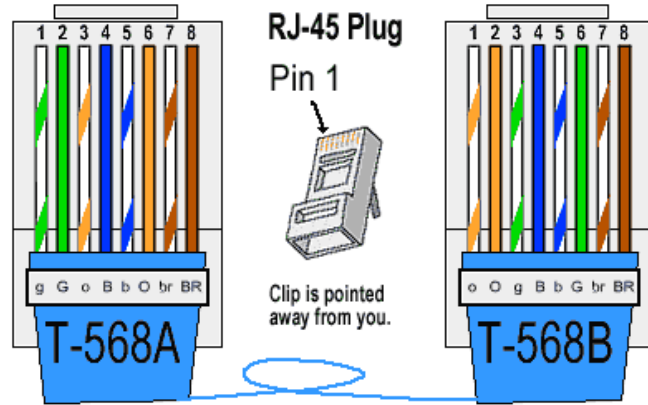Unshielded twisted pair (UTP)
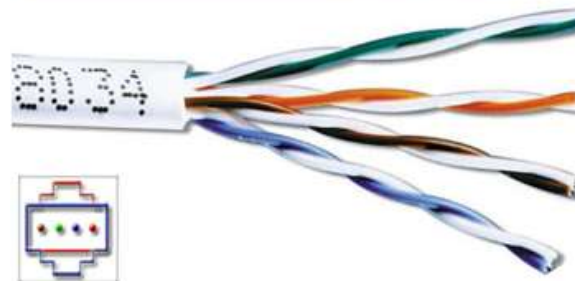
RJ-45

Cable Wiring Category

Cat 3

Cat 5/5e

Cat 6/6a

FEATURES OF CAT CABLES

FEATURES / SPECS	CAT 5E	CAT 6	CAT 6E	CAT 6A	CAT 7
Common Usage					
Phone Lines	✓	✓	✓	✗	✗
Home Network	✓	✓	✓	✗	✗
Office Network	✓	✓	✓	✓	✗
Data Center	✗	✗	✓	✓	✓
Potential Bandwidth (per sec)	1000 Megabits	1000 Megabits	1000 Megabits	10,000 Megabits	10,000 Megabits
Time to transfer 1 Terabyte	3 hours	3 hours	3 hours	20 minutes	20 minutes
Data Transmission	1000 BASE-T	1000 BASE-TX	Exceeds 1000BASE-TX	10GBASE-T	Exceeds 10GBASE-T
Connector Type	RJ45 8P8C	RJ45 (for Cat6)	RJ45 (for Cat6)	RJ45 (for Cat6A)	GG45
Frequency Range Minimum	0 - 100 MHz	0 - 250 MHz	0 - 250 MHz	0 - 500 MHz	0 - 600 MHz
Frequency Maximum	350 MHz	500 MHz	550 MHz	600 MHz	750 MHz
Performance Distance	328 Feet	328 Feet	328 Feet	328 Feet	328 Feet
Alt. Distance		10Gb @ 180ft	10Gb @ 180ft		

Crossover and Straight-through

Çapraz Bağlantı

Düz Bağlantı

| Düz (Straight)	Çapraz (Crossover)
PC <> Hub	Switch <> Switch
PC <> Switch	Hub <> Hub
Switch <> Router	Router <>Router
	Yönlendirici <>PC
	PC <> Sunucu
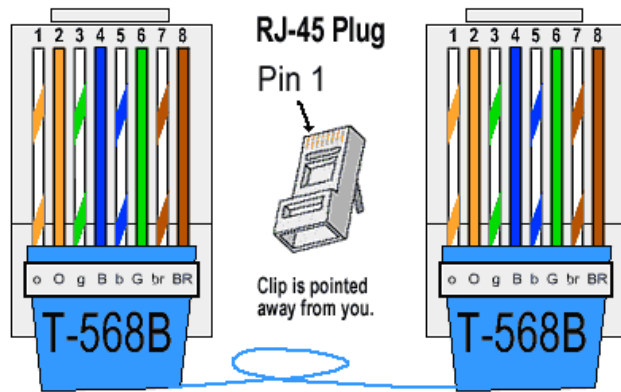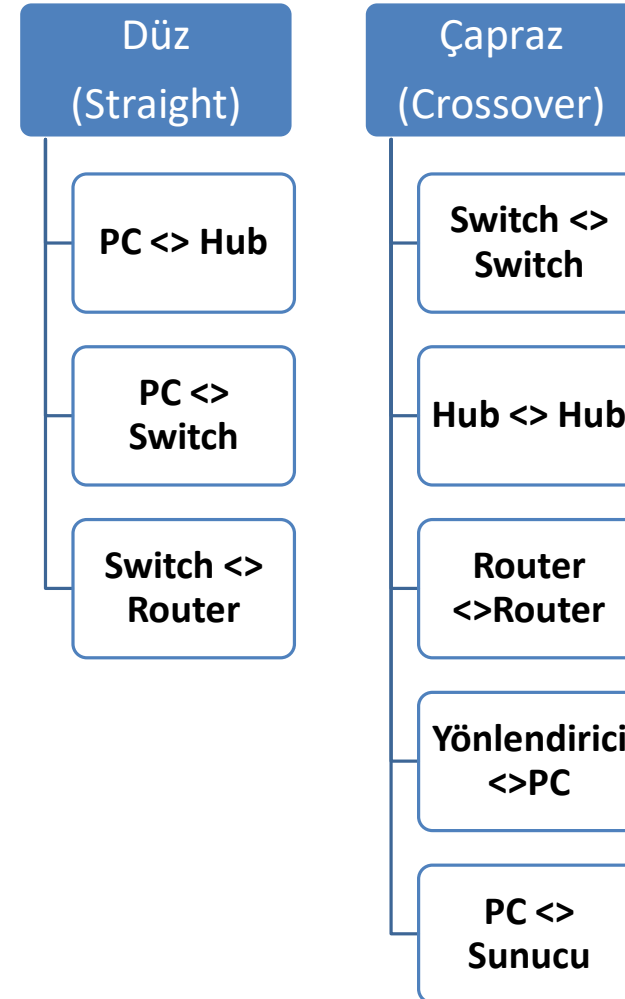
Optical Fiber Cables

- It is in the form of a very thin glass tube covered with a plastic insulator.
- There is a hard coating on the outside to protect against the brittleness of the glass.
- Information is carried on the cable by means of light.
- Compared to other cables, it can carry much more data per unit time.
- It is more resistant to electromagnetic interference.
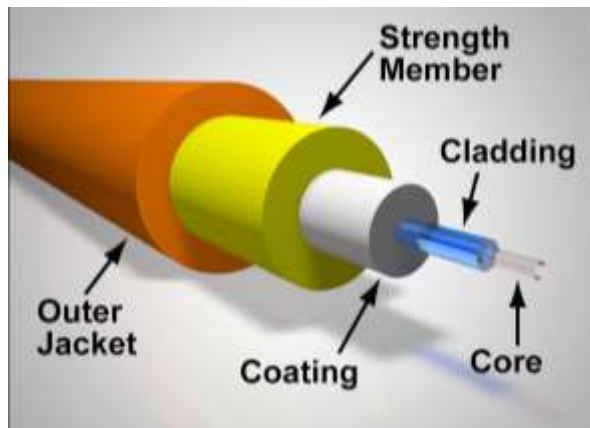
Optical Fiber Cables

- **According to the Sending Method**
  - **Single Mode (Single mode)**
  - **For long distance transmissions**
  - **Multi-Mode**
  - **In short distance transmissions**
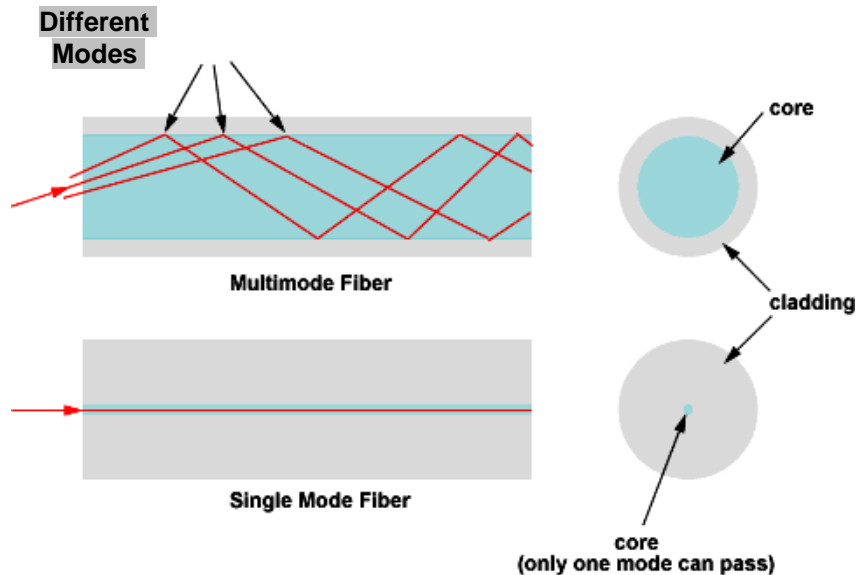
- **According to the light source**
  - **LED sourced**
    - **lower cost**
    - **shorter distance**
    - **High life (life time)**
    - **Used in multi-mode**
  - **Laser sourced**
    - **longer distance**
    - **More expensive**
    - **low lifespan**
    - **Can be used in multi and single mode**

Different Modes

core

cladding

Multimode Fiber

Single Mode Fiber

core
(only one mode can pass)

RF(WLAN)

Connect two or more buildings without cable installations

LaserLinks offer fast, secure and reliable connections in the same manner as fiber optic cable.
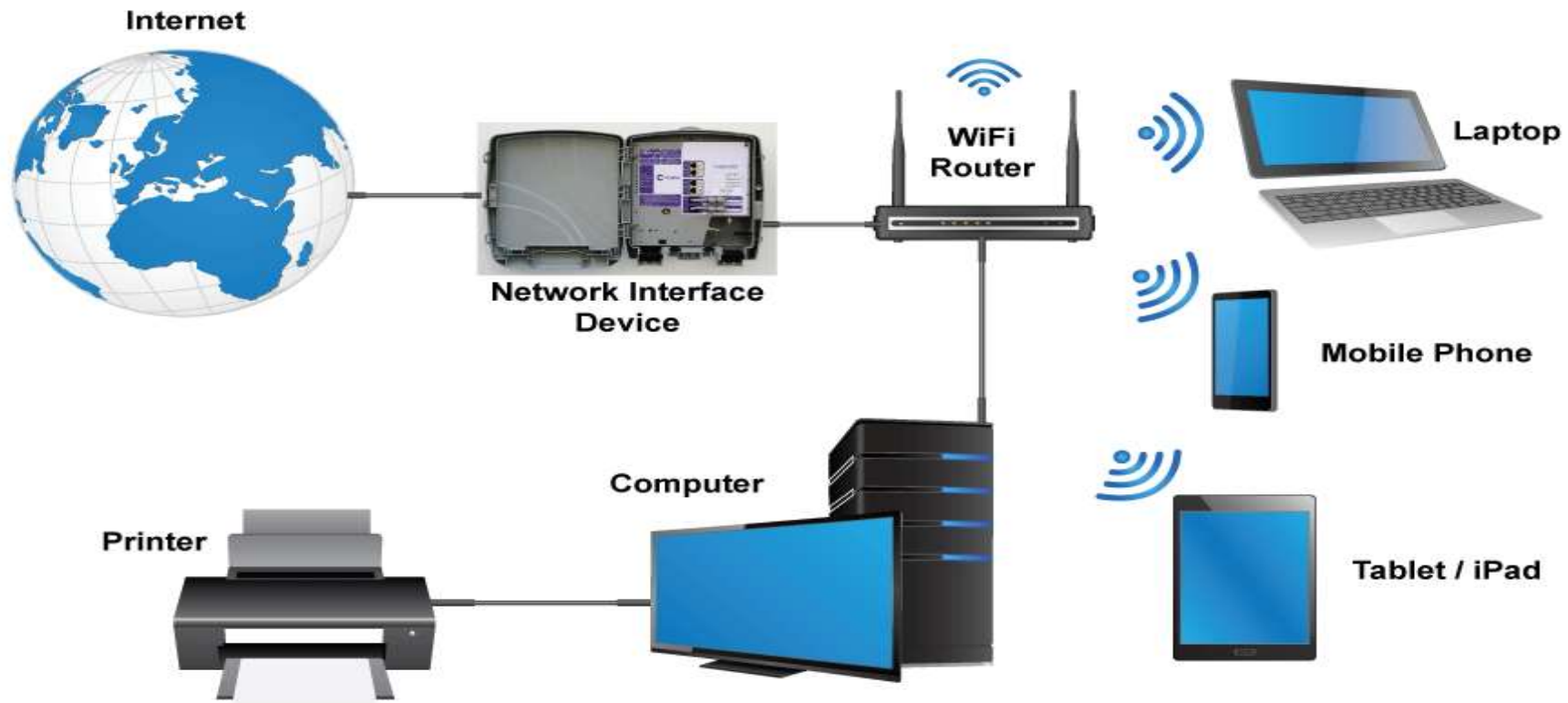
- Wireless high bandwidth LAN-to-LAN connections -

Wireless Network

LAN Network Diagram

Internet

Network Interface Device

WiFi Router

Laptop

Mobile Phone

Computer

Printer

Tablet / iPad

Wireless Network

Wireless Access Point

- Wireless networks have a component connecting all wireless devices together, the device is known as a *wireless access point (WAP),* or just AP.

- Wireless access points have at least one antenna (sometimes two for better reception—called *diversity*) and a port to connect them to a wired network.

- A Wireless Access Point (WAP) allows several devices to connect via WiFi to a single network. The wired equivalent is a switch. But unlike a switch, a WAP does not need to be wired to the router. Access Points connect via wired Ethernet to a switch, or a switch port on a router, then serve up WiFi.
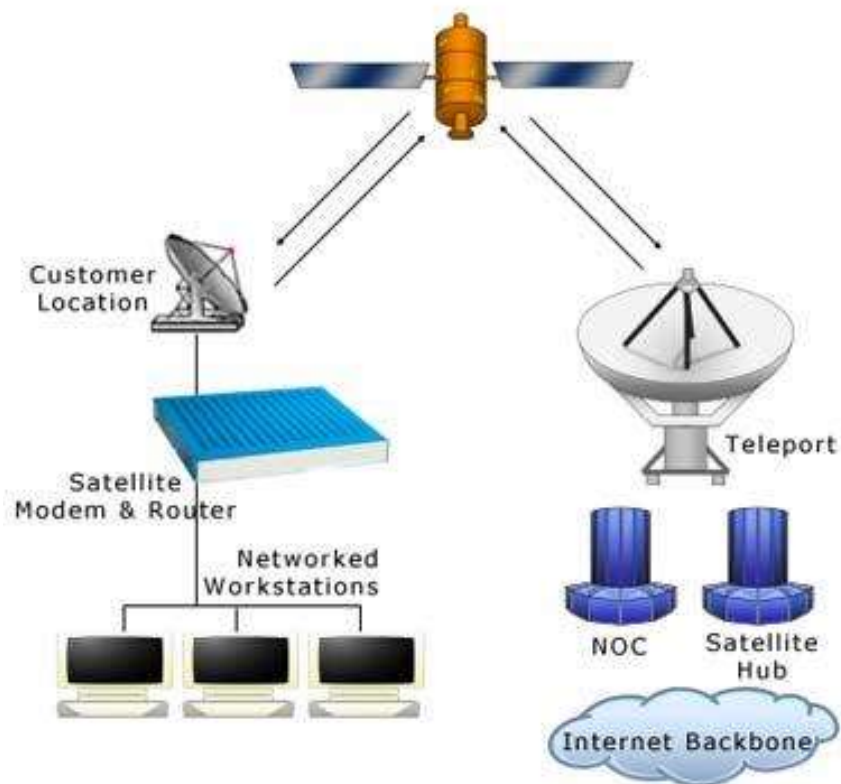
Wireless Network Card

- A wireless NIC does the same job as a traditional NIC; but instead of having a socket to plug some cable into, the wireless NIC has a radio antenna.

Wireless Network Interface Card (Wireless NIC)

Internet via Satellite

skyDSL2+ satellite router with WLAN

RM5111	Yes	Yes
Model	Router	wifi

1	4
GB/s Networking	LAN ports

further details

60	2.4 + 5 GHz	Yes	WEP/WPA/WPA2
MB/s Maximum bandwidth	802.11a/b/g/n WiFi Standard	WPS-Key Easy installation	Safety standards WiFi encryption

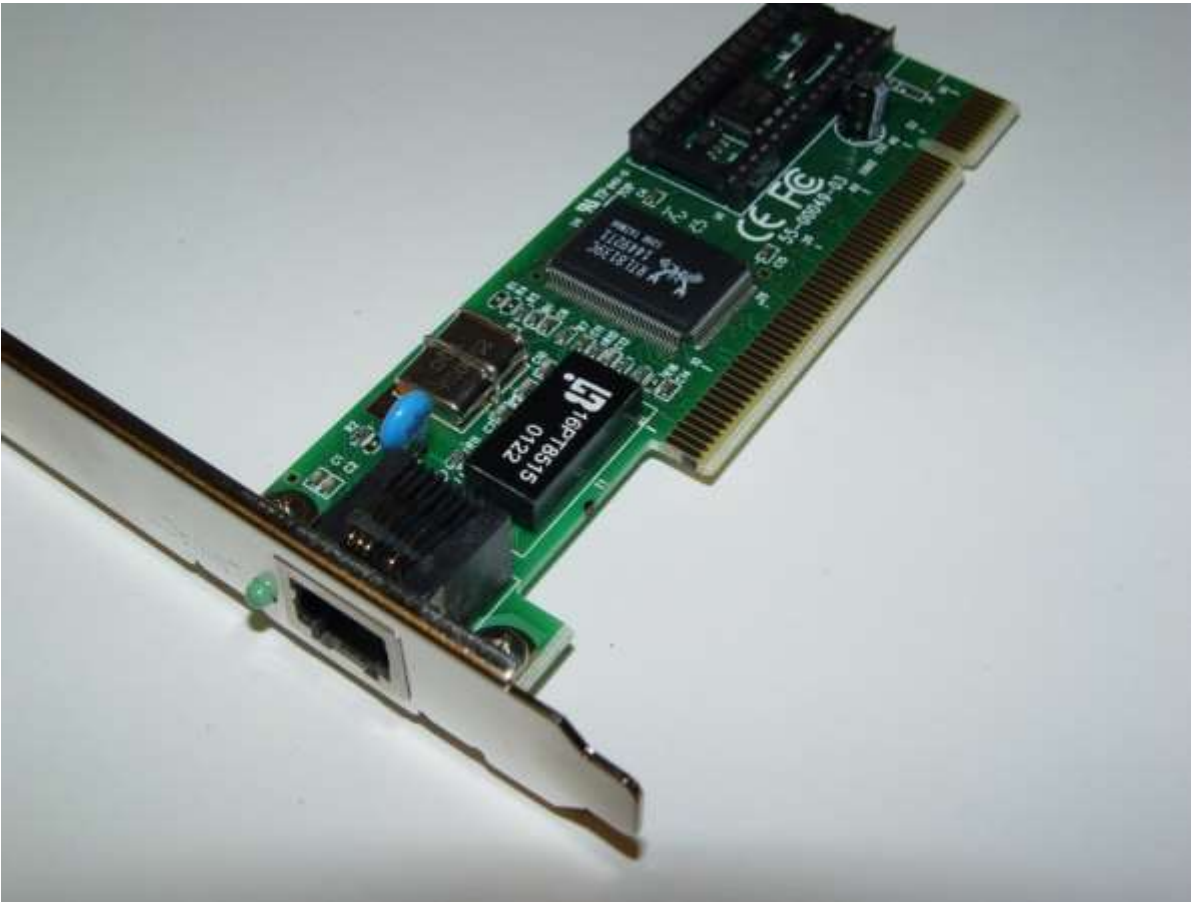| Black	100 - 240V
Color	Europlug Power adapter

Network Devices

- ❖ Network Interface Card (NIC)
- ❖ Hub
- ❖ Bridge
- ❖ Switch
- ❖ Router
- ❖ Firewall
- ❖ DNS
- ❖ DHCP
- ❖ Other specialized devices

NIC – Network Interface Card

- It is the interface that allows computers to physically connect to the internet.
- It can be found externally or internally on the motherboard.
- Every NIC on the Internet has its own unique id. This is called the MAC address.

HUB

- It is an old technology.
- It sends all incoming traffic to all computers connected to it.
- It creates a security gap.
- It cannot do routing.

SWITCH

- It allows computers and other network items to be connected to each other.

- It works in the 2nd layer of the OSI model and also in the 3rd layer as new distributors can do IP routing. (Layer 3 Switch)

SWITCH

- When a data packet (frame) reaches one of the ports, the distributor records the sender's MAC address and the sent port in the address table.

- It tries to determine the port to which the target MAC address is connected by examining the existing records in the MAC address table. If no record is found, the data packet is sent to all ports except the incoming port. If the MAC address is known, then the data packet is only sent to the destination port. If the sender and receiver MAC addresses are the same, the packet is deleted.

- It is also called a transparent bridge, multi-port bridge or smart hub, due to its similarity to the network bridge and the network hub in terms of the way it works.

SWITCH

- While there is no traffic on the switch devices, all ports are waiting in isolation from each other.

- If a node wants to communicate with one of the other nodes connected to the switch; The ports to which the two nodes are connected are connected to each other through the switch. This process is called 'switching'.

- In networks created using switches, more than one pair of computers can communicate at the same time, since the nodes that will communicate are connected to separate ports.

SWITCH

Port	MAC
1	22-FF-40-33-55-66
2	33-FF-28-44-55-65
3	22-FF-40-33-AB-32
4	56-FF-40-EF-55-21
5	43-67-78-90-55-61
6	22-FF-AC-33-55-66
7	22-FF-AE-33-55-DE
8	22-FF-BE-4F-23- 90
9	AB-1F-33-53-F0-34

ARP Table (MAC tablosu)

- Switch devices use the MAC addresses of the nodes for switching.

- For this reason, there is a table ARP (MAC table) where MAC addresses are kept on switch devices.

- After the switch learns the receiving MAC address in the frame, it establishes a connection between the two ports by looking at the MAC table.

- While two nodes connected send frames to each other, other ports in the switch can establish connections among themselves.
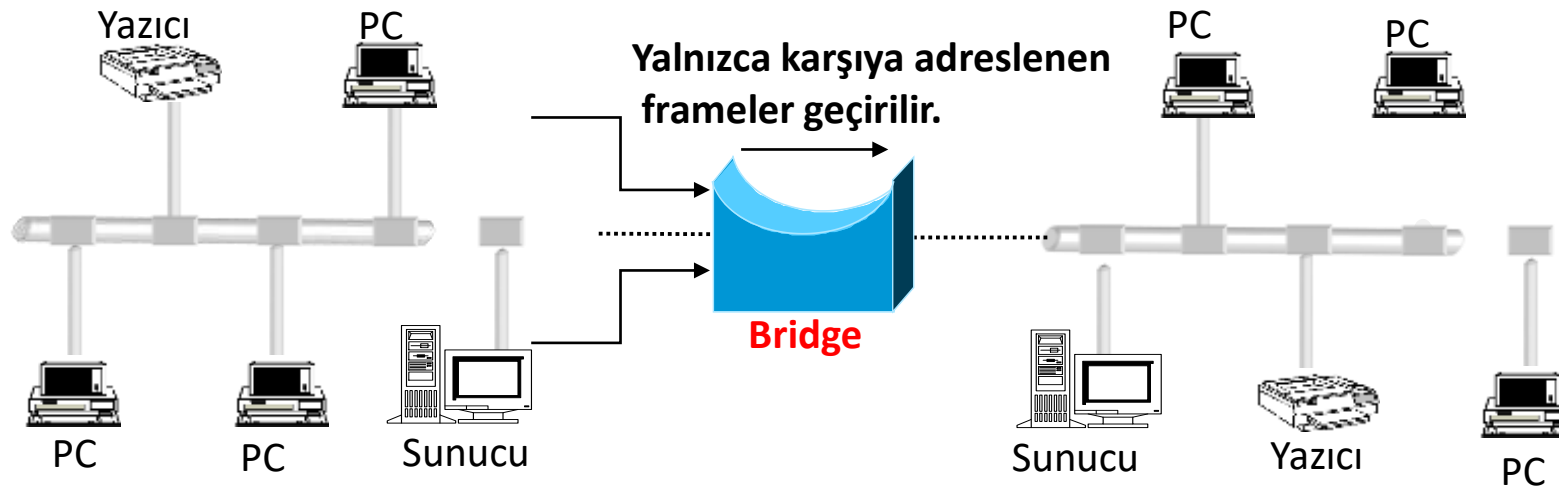
BRIDGE

- A simple bridge works transparently, connecting/separating two network segments by deciding at the frame level whether to forward from one network to another.

- Bridges reduce collisions by creating a separate collision domain on both sides of the bridge.

BRIDGE

Yalnızca karşıya adreslenen frameler geçirilir.

Yazıcı PC

Bridge

PC PC

PC PC Sunucu Sunucu Yazıcı PC

- Bridges are interconnection devices that can communicate with nodes connected to similar or dissimilar LANs as if they were on the same LAN.

- They can also be used to interconnect LANs that use different media such as twisted pairs, coaxial cable and fiber optics.

- They provide connectivity at the data link layer level and address according to MAC numbers.

BRIDGE

- A bridge connecting the LANs examines the transmitted frames, and if the destination MAC address of the packet indicates a node in the network from which the packet came, it does not send that packet to other networks, but only to the relevant node within the same network.

- Otherwise, if it knows which network the target is on, it transmits that frame only to the relevant network.

- Thus, it prevents the traffic of the parts of the network from affecting each other.

- There are many benefits to converting large networks with many nodes into small networks with the help of bridges.

  - The traffic density in the network is fragmented and the traffic belonging to one network does not affect other networks.

  - Network segments are isolated from each other in case of faults.

 - The span of LANs that come together through bridges is expanded.

ROUTER

- A router is an intersection between two or more networks.
- It carries an interface for every network it is a part of. Since it is part of both networks, it takes on the task of guiding data packets between networks.
- Although there is usually hardware specially produced for this job, computers with multiple interfaces can also work as routers with software support.
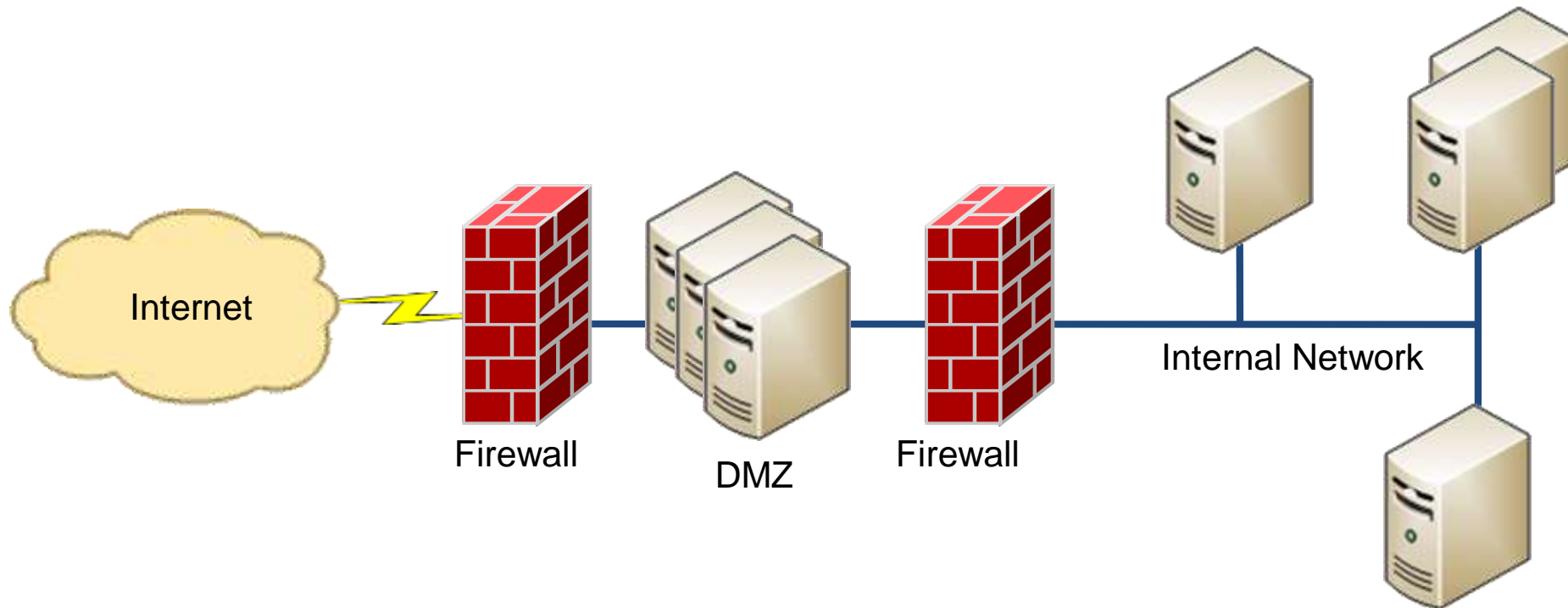
ROUTER
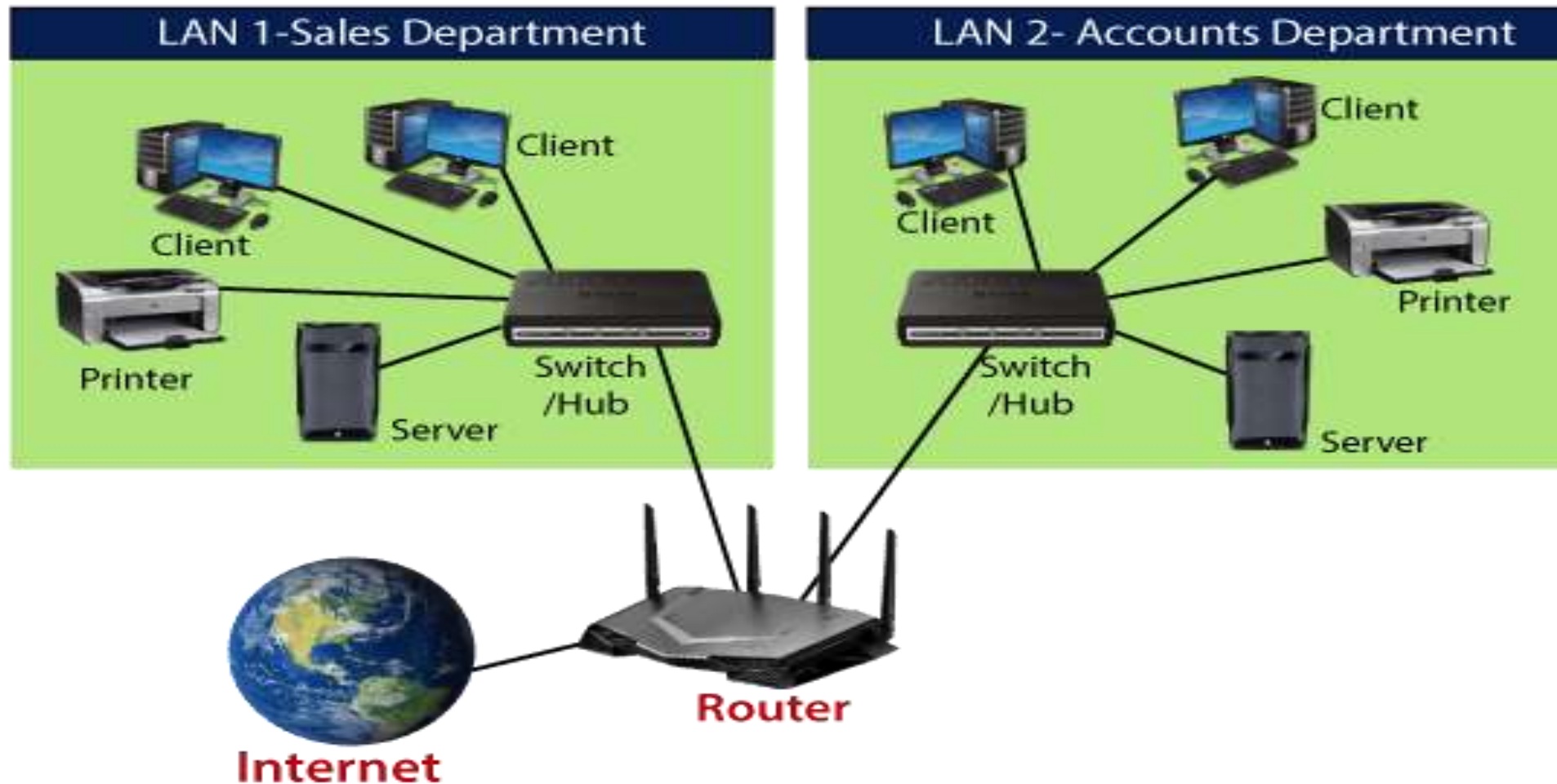
FIREWALL

- It keeps internet traffic under control, including incoming and outgoing packets of the computer and network, with different filtering features.

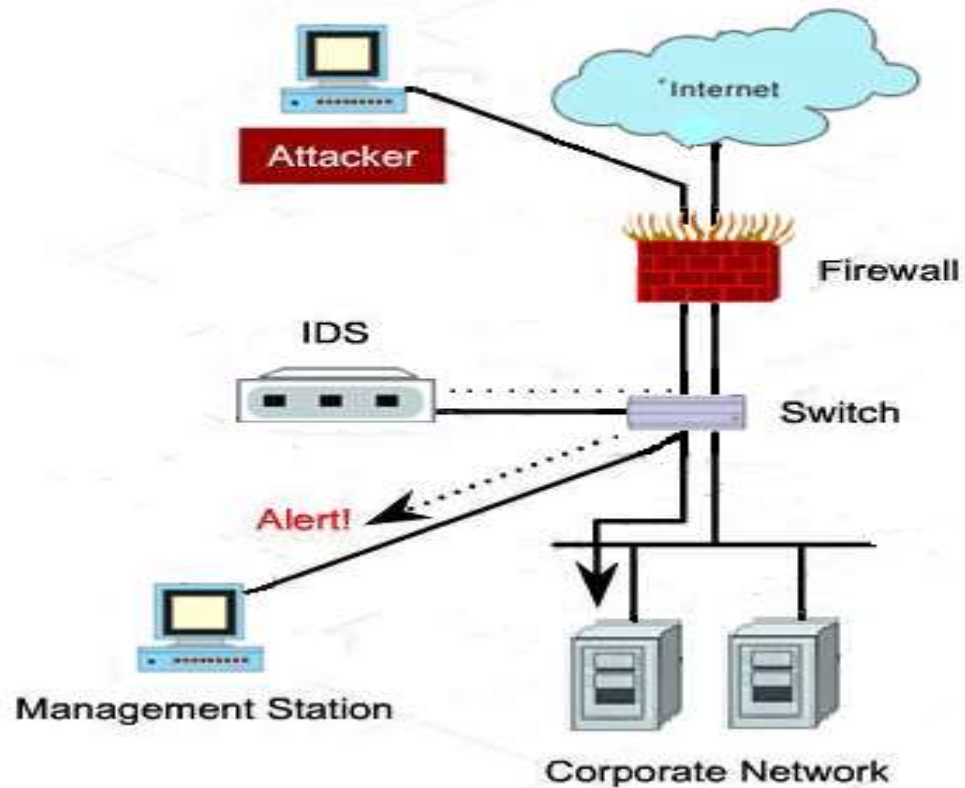- It filters based on IP, Port, Web, content.

FIREWALL

IDS & IPS

- Intrusion Detection Systems (IDS) - Intrusion Detection Systems are devices or software that are used to monitor malicious activities or policy violations against networks or systems.

- Intrusion Prevention Systems (IPS) also analyze packets, but may also stop the packet from being delivered, depending on what type of attacks it detects. In this way, it can help stop the attack.
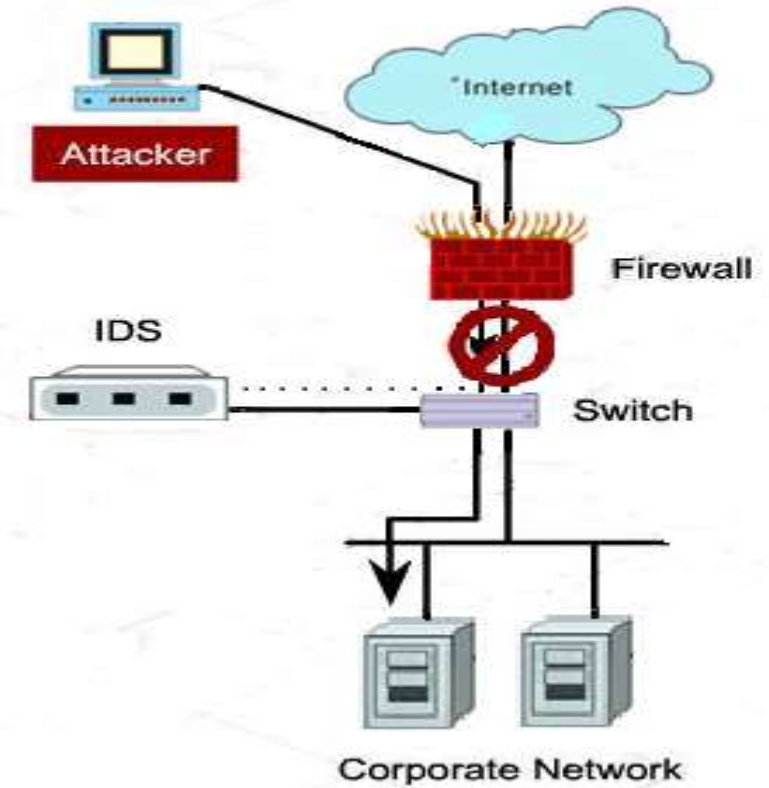
IDS & IPS
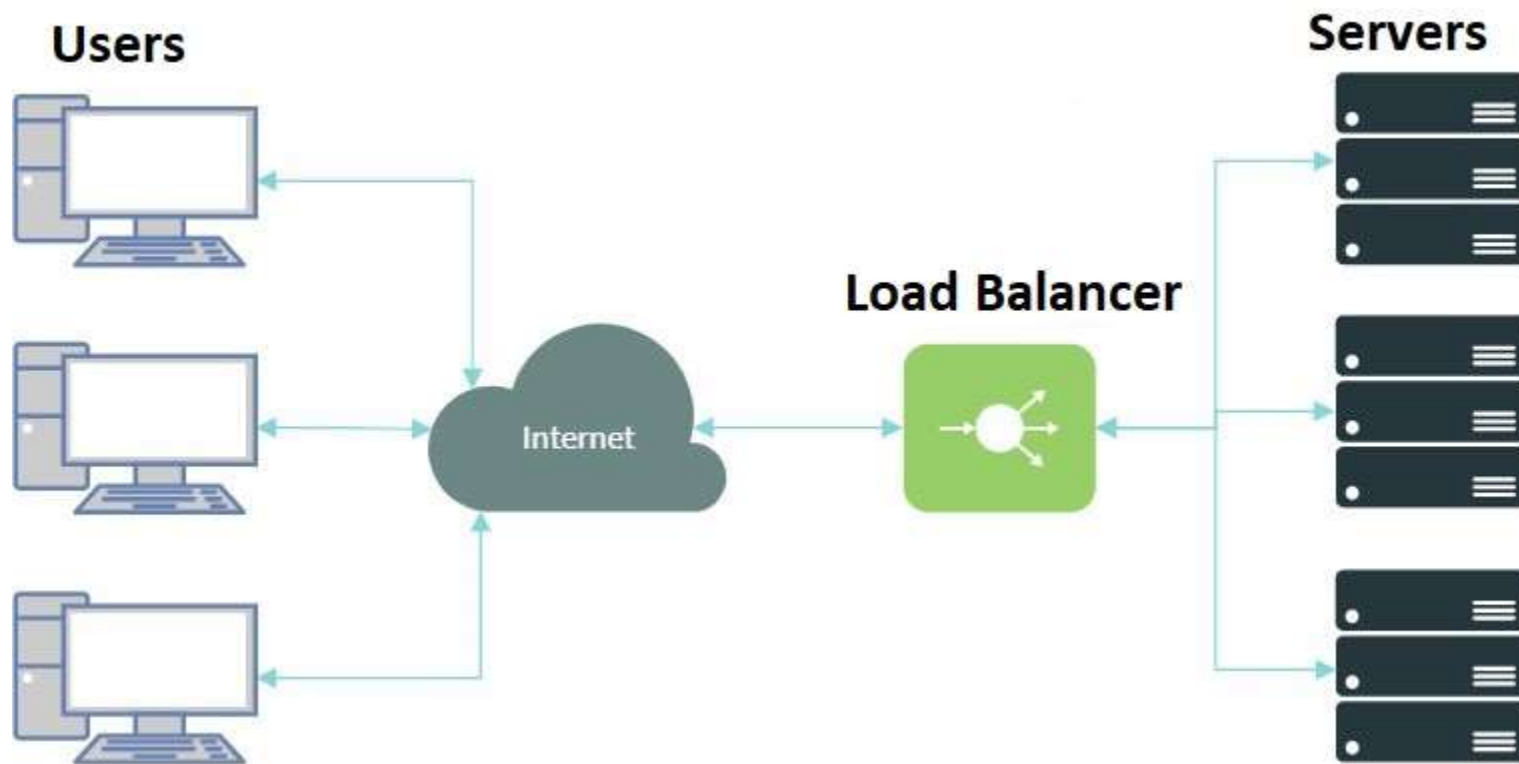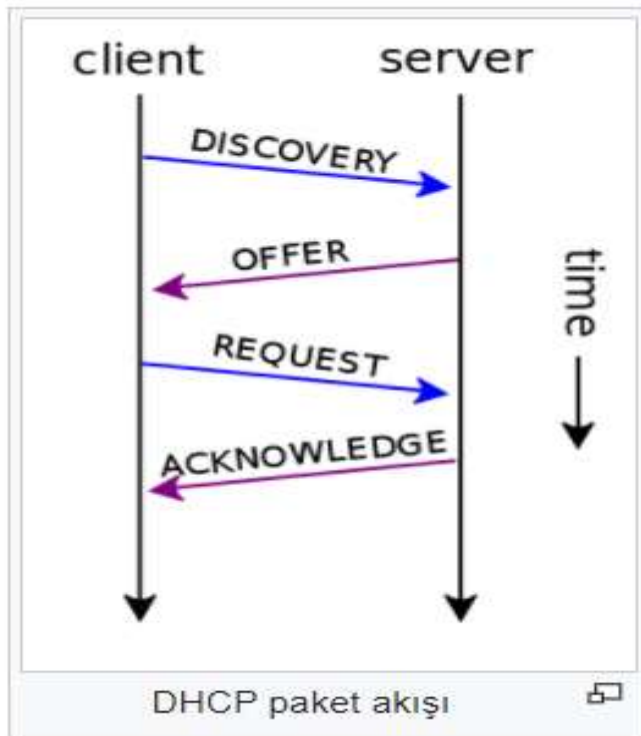
LOAD BALANCER

- Client requests are distributed among servers.

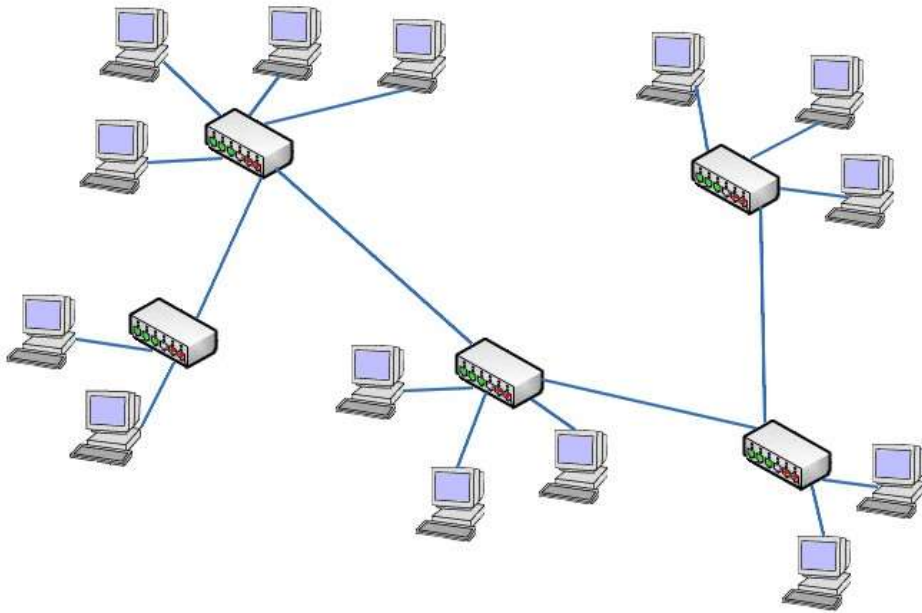- Increases high availability and stability.

DHCP Server Dynamic Host Configuration Protocol

DHCP paket akışı

- It is simply a service used to assign IP addresses and additional parameters to computers in the system.
- The main feature of DHCP is to prevent people who set up the system from visiting all machines one by one and entering the same or similar parameters repeatedly, thus saving time and facilitating the work of the system administrator.
- Facilitating DNS management: With DHCP, static identification of IP addresses and subnet masks is prevented. This process, which requires a lot of attention if a fixed IP is given, becomes unnecessary with the help of DHCP.
- Subnet mask is used to divide IP addresses into parts.

- Örnek Olay

- On bilgisayarlı bir yere sistem kurduğumuzu düşünelim. Kullanıcılar hem kendi aralarında haberleşecekler, hem de internette gezip, e-posta alıp verecekler. Bunun için belli bir IP bloğu tanımlayıp, DHCP üzerinden bilgisayarlara dağıtacağız. İsterseniz şimdi bilgisayarlar için tanımlayacağımız parametreleri bir gözden geçirelim.

1. Her makinenin birbirinden farklı IP adresi olması gereklidir. Hiçbir IP birbiriyle çakışmamalıdır.

2. Her Ethernet kartına ait belli bir ağ maskesi bulunmalı ve aynı alt ağ üzerinde bu ağ maskelerinin aynı olması gereklidir.

3. Eğer sistemin İnternete bağlantısı var ise İnternet'e bağlanacak olan bilgisayarların geçit (gateway) IP adresinin bulunması şarttır.

4. Son olarak en az bir, tercihen iki DNS IP adresinin de önceden belirlenmiş olması gereklidir.

- Yukarıdaki listeye bakarak geleneksel yöntemler ile (DHCP kullanılmadığı zaman) en az 4 değerin her bilgisayar için girilmesi gerektiğini de hemen söyleyebiliriz. Eğer 20 makinelik bir ağınız var ise, her bilgisayara teker teker girip toplam 80 numarayı yazmak zorundasınız. Eğer benzeri bir işlemi daha geniş bir ağda (250 bilgisayar) yapmak isterseniz, gerisini siz düşünün.

DNS Server Domain Name System Server

- It is a computer server that provides a network service that responds to incoming queries.
- Keeps records of hostname information corresponding to IP addresses

94.73.148.18 → **Easy to remember** → techproeducation.com

- **Internet Assigned Numbers Authority (IANA)**
- The **Internet Corporation for Assigned Names and Numbers** (**ICANN**) is an American multistakeholder group and nonprofit organization responsible for coordinating the maintenance and procedures of several databases related to the namespaces and numerical spaces of the Internet, ensuring the network's stable and secure operation.

TLD(Top Level Domain)

- **.gov** (government)
- **.edu** (educational institutions)
- **.info** (information) – Best use for information or database types of websites
- **.biz** (business) – Alternative to .com for businesses
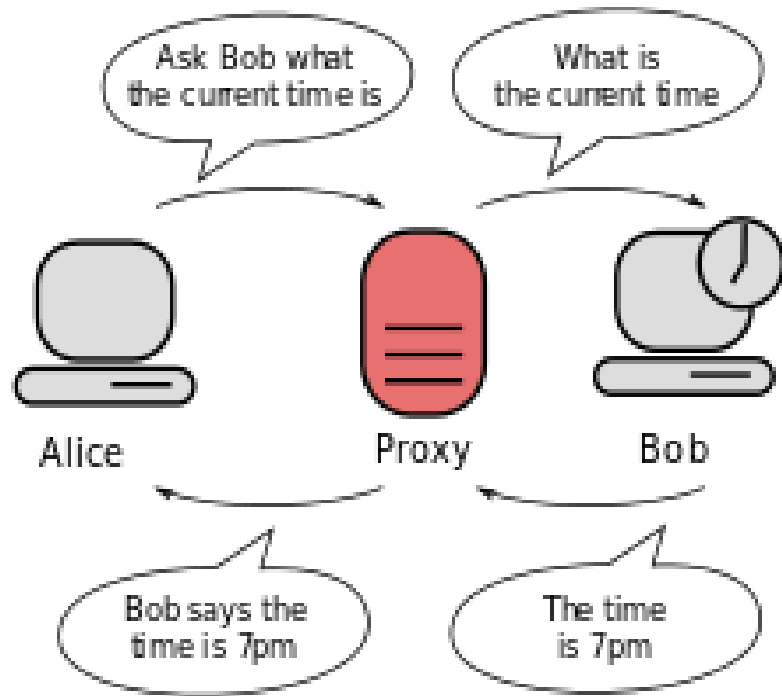- **.me** (personal)
- **.uk/.us/.tr** (Country Codes)

Sub Domain

- **mail.google.com**
- **lms.techproeducation.com**

PROXY Server Vekil Sunucu

- Acts as an intermediary between the user and the internet
- Extra speed-caching
- Extra control-firewall
- Extra privacy

Gateway

- A device that sits between different networks or applications. The gateway converts information, data or other communications from one protocol or format to another. A router may perform some of the functions of a gateway.

Terms of Today

- Proxy
- Domain- Sub domain
- TLD
- Bridge
- Router
- DHCP
- Subnet Mask
- Firewall
- Switch
- Hub
- WAP
- Routing Table
- Load Balancer
- Gateway