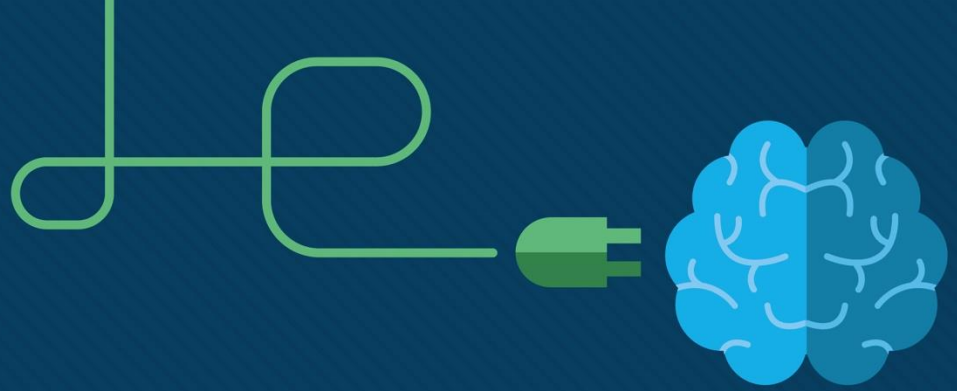

Module 11: IPv4 Adreslemesi 1.Kısım

CCNA1

Introduction to Networks v7.0 (ITN)

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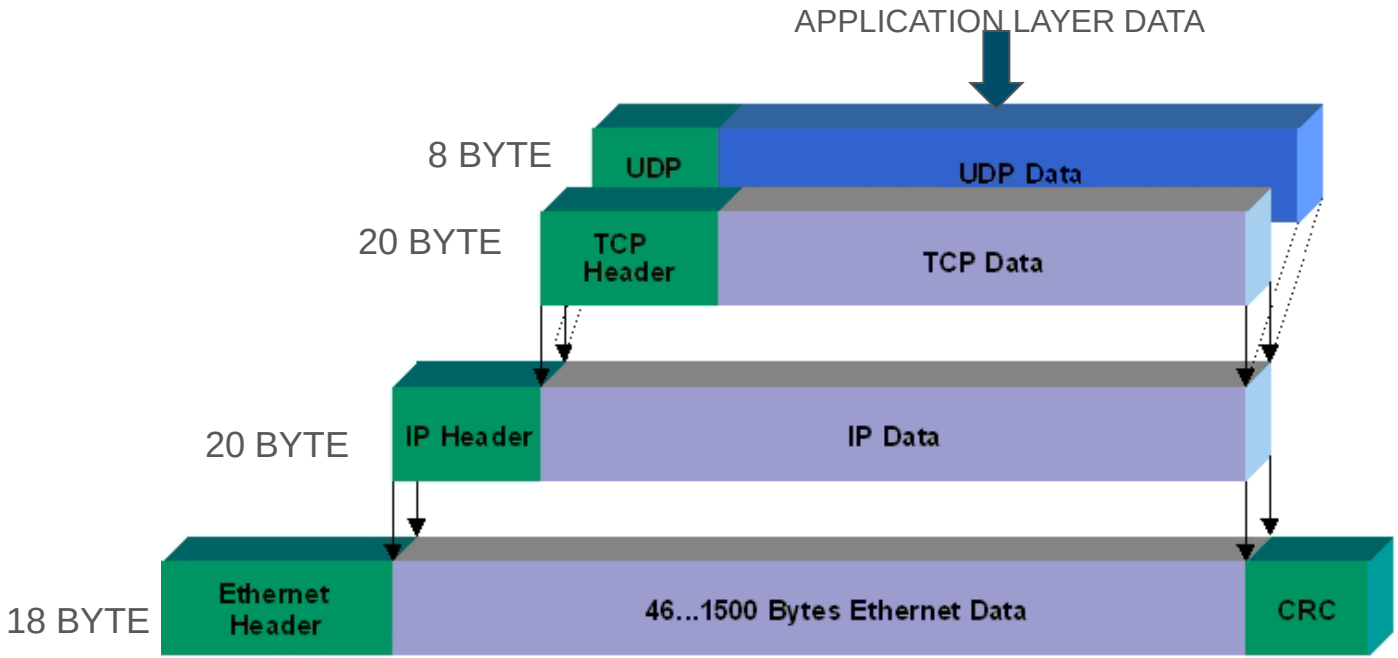
Module Objectives

Module Title: IPv4 Addressing

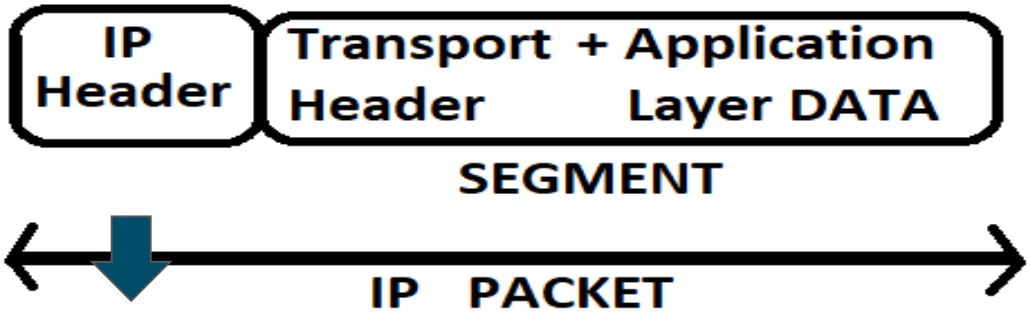
Module Objective: Calculate an IPv4 subnetting scheme to efficiently segment your network.

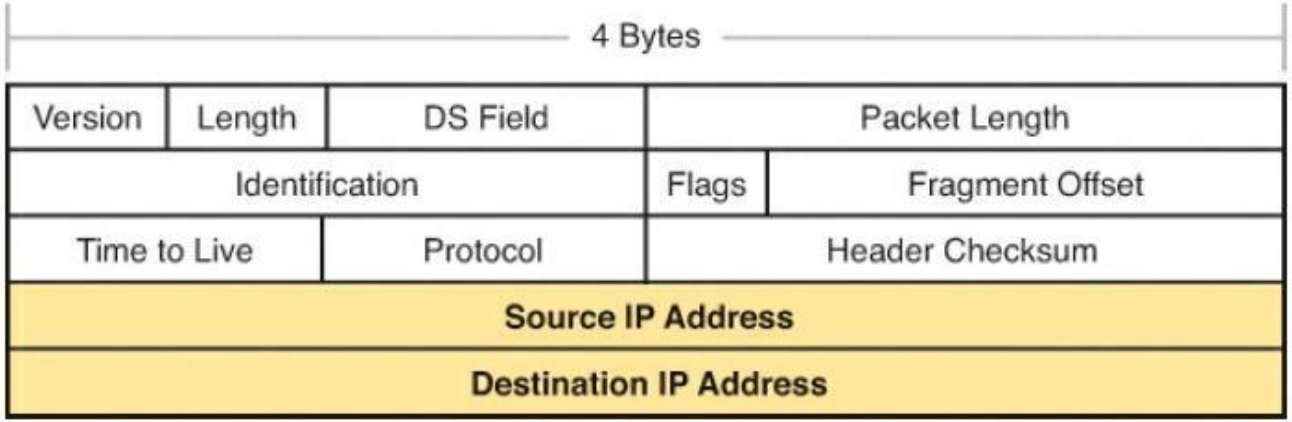
Topic Title	Topic Objective
IPv4 Address Structure	Describe the structure of an IPv4 address including the network portion, the host portion, and the subnet mask.
IPv4 Unicast, Broadcast, and Multicast	Compare the characteristics and uses of the unicast, broadcast and multicast IPv4 addresses.
Types of IPv4 Addresses	Explain public, private, and reserved IPv4 addresses.
Network Segmentation	Explain how subnetting segments a network to enable better communication.
Subnet an IPv4 Network	Calculate IPv4 subnets for a /24 prefix.

IP Başlığı

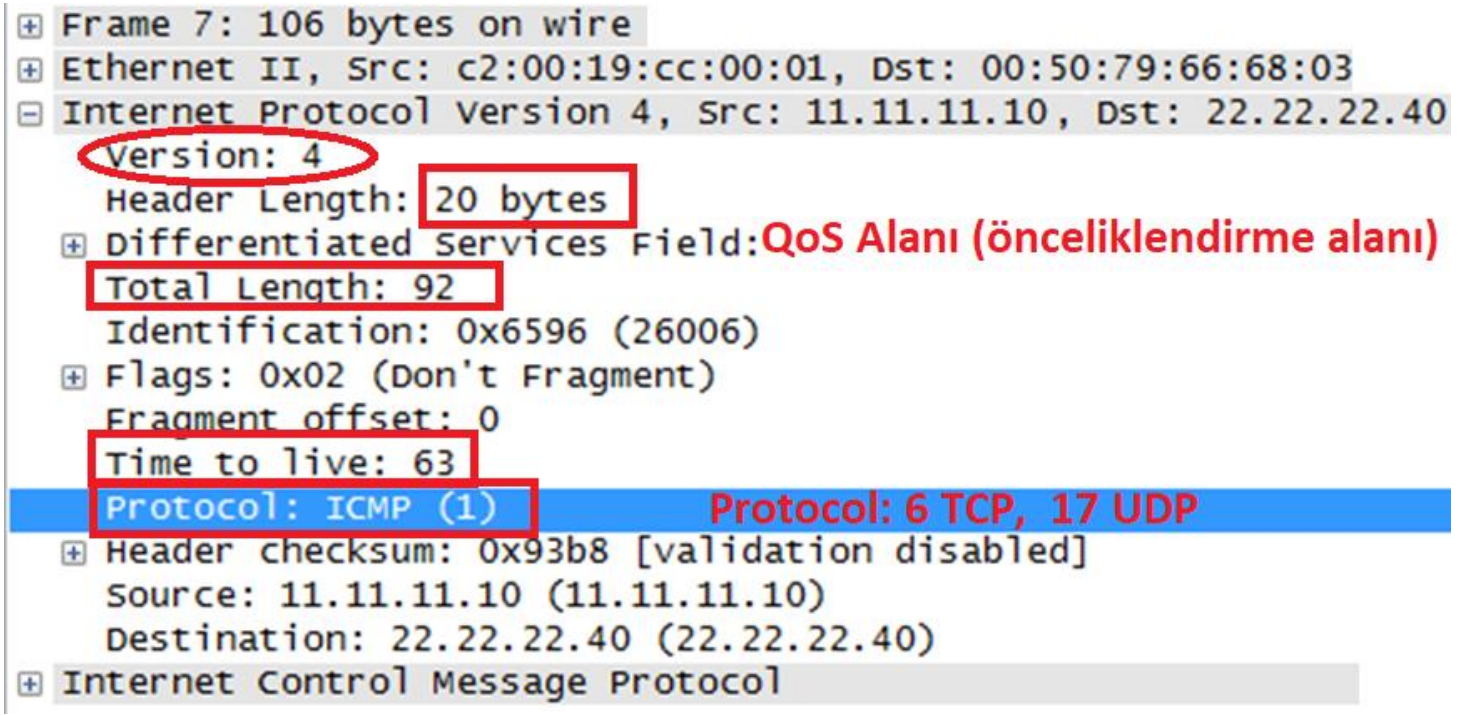


IPv4 Paket Başlığı (20 Byte)

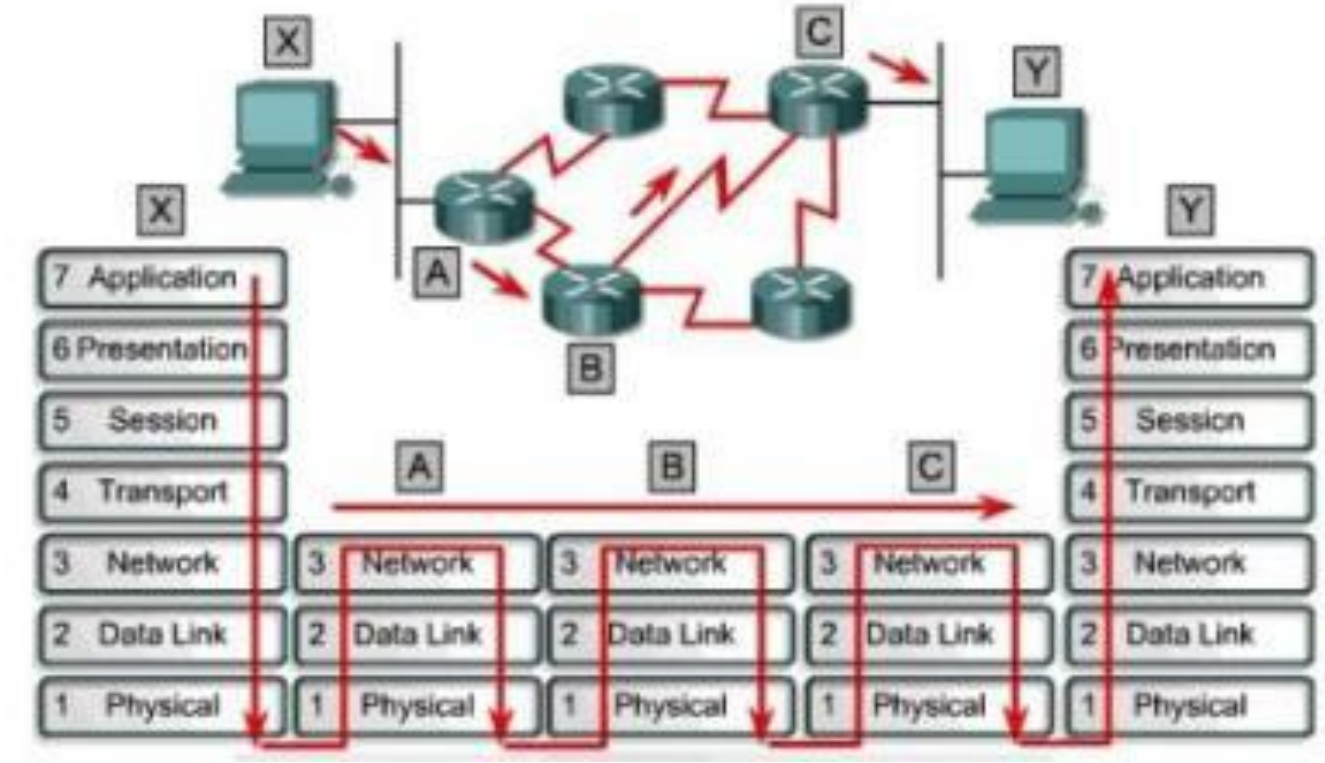




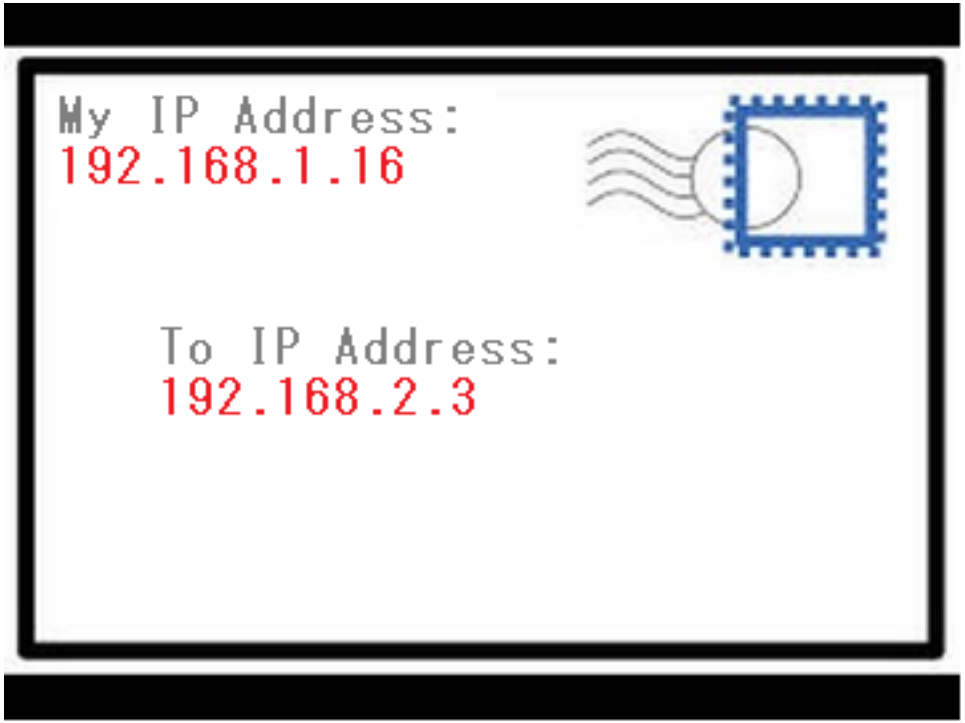
IPv4 Paket Başlığı (20 Byte)



IPv4 Paket Başlığı

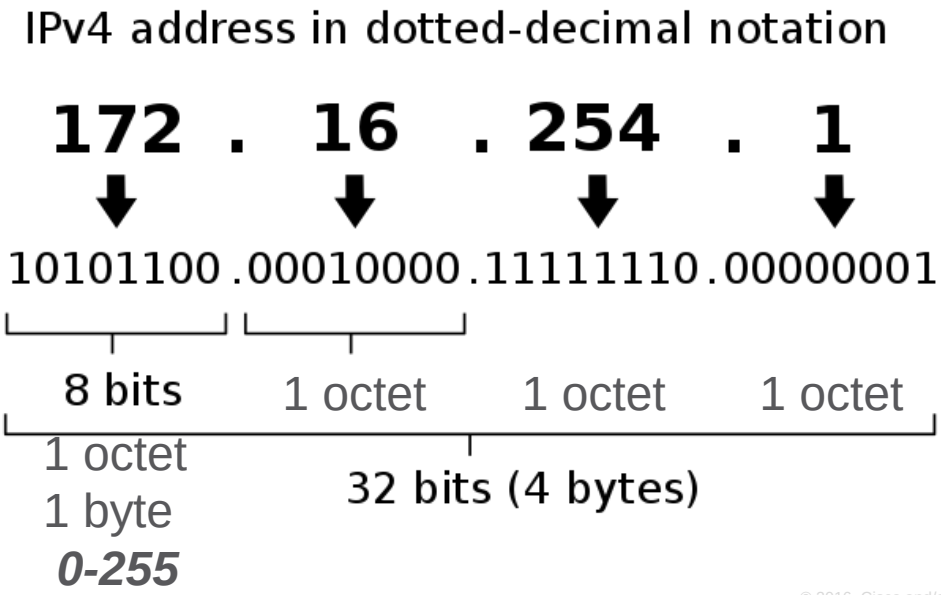


IPv4 Adresleri



IPv4 (Internet Protocol) Adresleri

noktalı onluk gösterim: (dotted decimal notation)



İkilikten Ondalığa Çevirme

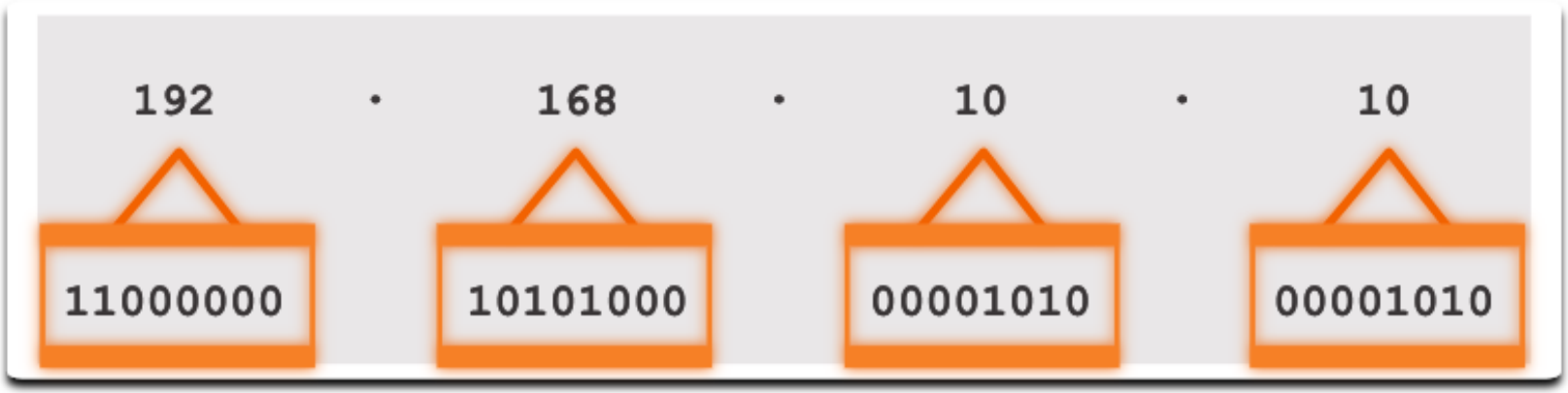
172 . 16 . 254 . 1

(0-255). (0-255).(0-255).(0-255)

____	____	____	____	____	____	____	____		
128	64	32	16	8	4	2	1		
0	0	0	0	0	0	0	0	=	0
0	0	0	0	0	0	1	1	=	?
0	1	0	1	1	0	0	1	=	89
1	1	1	0	0	0	0	0	=	?
0	0	0	1	1	1	1	1	=	?
1	1	1	1	1	1	1	1	=	255

IPv4 Addresses

- Routers and computers only understand binary, while humans work in decimal. It is important for you to gain a thorough understanding of these two numbering systems and how they are used in networking.

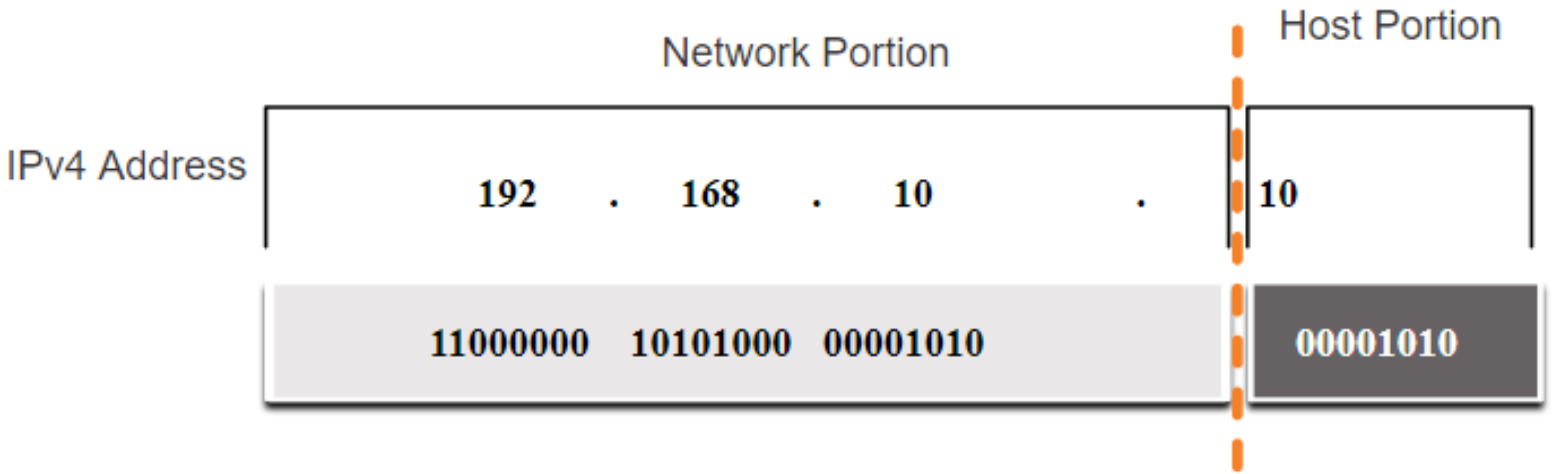


128	64	32	16	8	4	2	1

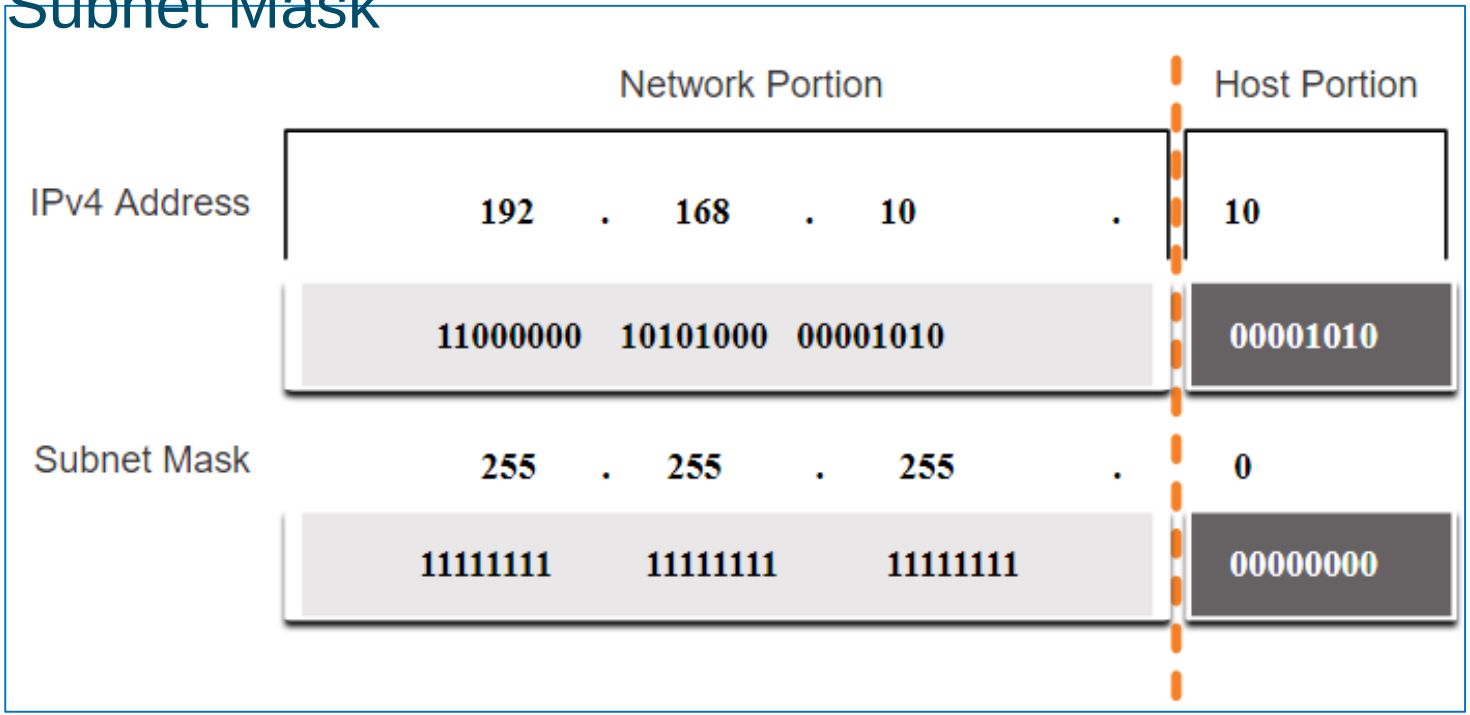
11.1 IPv4 Adres Yapısı

Network Kısmı ve Host Kısmı

- An IPv4 address is a 32-bit hierarchical address that is made up of a network portion and a host portion.
- When determining the network portion versus the host portion, you must look at the 32-bit stream.
- A **subnet mask** is used to determine the network and host portions.



The Subnet Mask



Subnet Mask (Alt Ağ Maskesi): (32 bit)

IP Adresinin Network Kısmı/ Host kısmı ayrımını belirler.

Network Kısmı bitleri: 1111 …1111

Host Kısmı bitleri: 0000 … 000

The Prefix Length (Ön Ek Uzunluğu)

Subnet Mask ≅ **Prefix Length (**Subnet Maskesindeki bit sayısı**)**
Alt Ağ Maskesi ≅ **Önek Uzunluğu** olarak da ifade edilir.

Subnet Mask	32-bit Address	Prefix Length
255.0.0.0	11111111.00000000.00000000.00000000	/8
255.255.0.0	11111111.11111111.00000000.00000000	/16
255.255.255.0	11111111.11111111.11111111.00000000	/24 (ilk 24 bit network kısmı)
255.255.255.128	11111111.11111111.11111111.10000000	/25
255.255.255.192	11111111.11111111.11111111.11000000	/26
255.255.255.224	11111111.11111111.11111111.11100000	/27
255.255.255.240	11111111.11111111.11111111.11110000	/28 (ilk 28 bit network kısmı)
255.255.255.248	11111111.11111111.11111111.11111000	/29
255.255.255.252	11111111.11111111.11111111.11111100	/30

The Prefix Length (Ön Ek Uzunluğu)

Binary Mask				Prefix Length	Subnet Mask
11111111	00000000	00000000	00000000	/8	255.0.0.0
11111111	10000000	00000000	00000000	/9	255.128.0.0
11111111	11000000	00000000	00000000	/10	255.192.0.0
11111111	11100000	00000000	00000000	/11	255.224.0.0
11111111	11110000	00000000	00000000	/12	255.240.0.0
11111111	11111000	00000000	00000000	/13	255.248.0.0
11111111	11111100	00000000	00000000	/14	255.252.0.0
11111111	11111110	00000000	00000000	/15	255.254.0.0
11111111	11111111	00000000	00000000	/16	255.255.0.0
11111111	11111111	10000000	00000000	/17	255.255.128.0
11111111	11111111	11000000	00000000	/18	255.255.192.0
11111111	11111111	11100000	00000000	/19	255.255.224.0
11111111	11111111	11110000	00000000	/20	255.255.240.0
11111111	11111111	11111000	00000000	/21	255.255.248.0
11111111	11111111	11111100	00000000	/22	255.255.252.0
11111111	11111111	11111110	00000000	/23	255.255.254.0
11111111	11111111	11111111	00000000	/24	255.255.255.0
11111111	11111111	11111111	10000000	/25	255.255.255.128
11111111	11111111	11111111	11000000	/26	255.255.255.192
11111111	11111111	11111111	11100000	/27	255.255.255.224
11111111	11111111	11111111	11110000	/28	255.255.255.240
11111111	11111111	11111111	11111000	/29	255.255.255.248
11111111	11111111	11111111	11111100	/30	255.255.255.252

Network, Host and Broadcast Addresses

Network Address:

(Network Adresi) Networkteki ilk adrestir. Host bitleri: «0» lardan oluşur

Yönlendirme tablolarında kullanılır

Örnek: 192.168.1.0/24

192.168.1. 0000 0000 192.168.1.0

Broadcast Address:

(Genel Yayın Adresi) Networkteki son adrestir. Host bitleri «1» lerden oluşur

Tüm ağ kullanıcılarına paket iletimi için kullanılır

192.168.1. 1111 1111 192.168.1.255

Host IP Aralığı: Network Adresi ile Broadcast adresi arasındaki adreslerdir.

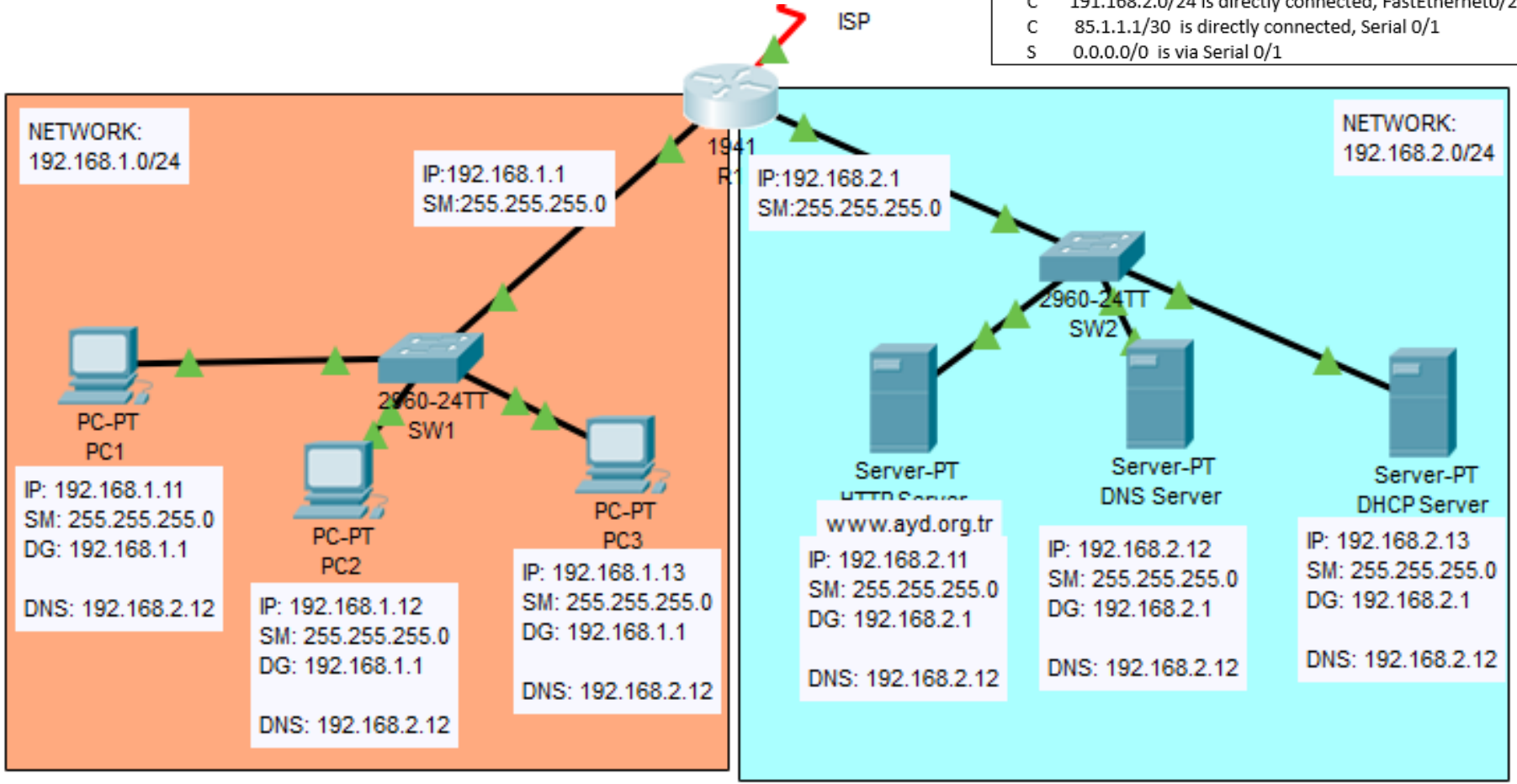
Son cihazlara IP adresi vermek için kullanılır.

192.168.1. 0000 0001 -192.168.1. 1111 1110 (192.168.1.1 - 254)

IPv4 Address Structure

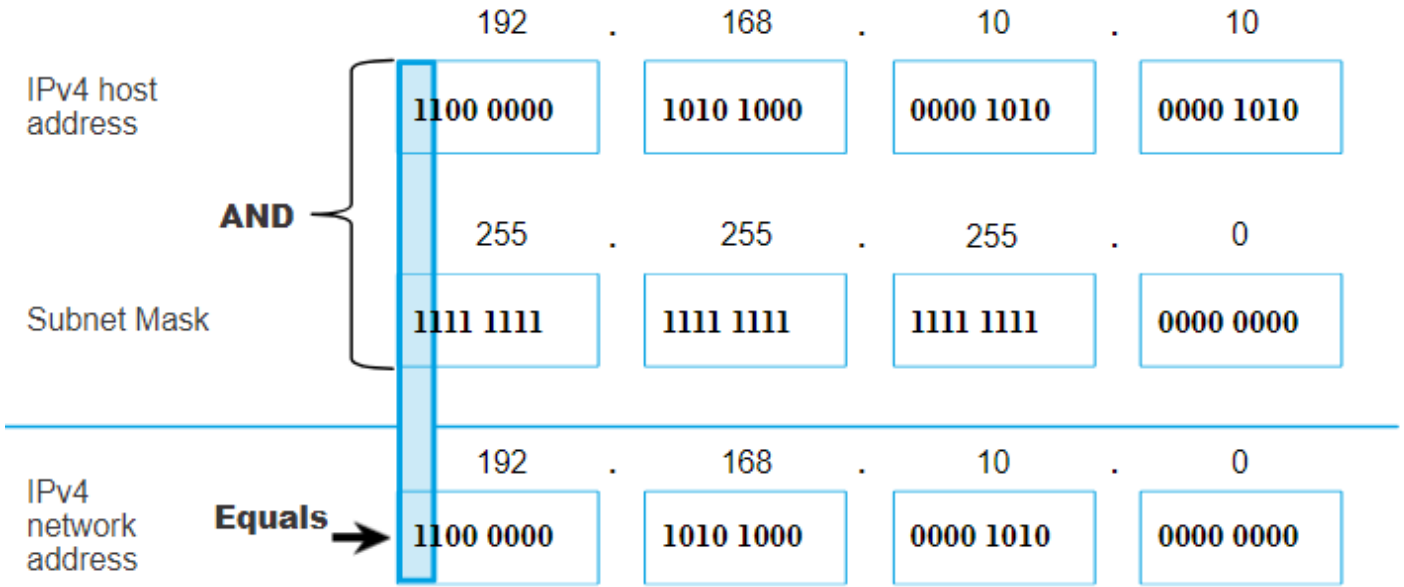
Network, Host and Broadcast Addresses

```
R1# show ip route
C    191.168.1.0/24 is directly connected, FastEthernet0/1
C    191.168.2.0/24 is directly connected, FastEthernet0/2
C    85.1.1.1/30  is directly connected, Serial 0/1
S    0.0.0.0/0  is via Serial 0/1
```



Determining the Network: Logical AND (Bit düzeyinde AND'leme)

AND	
X	Y
1	0
X	0

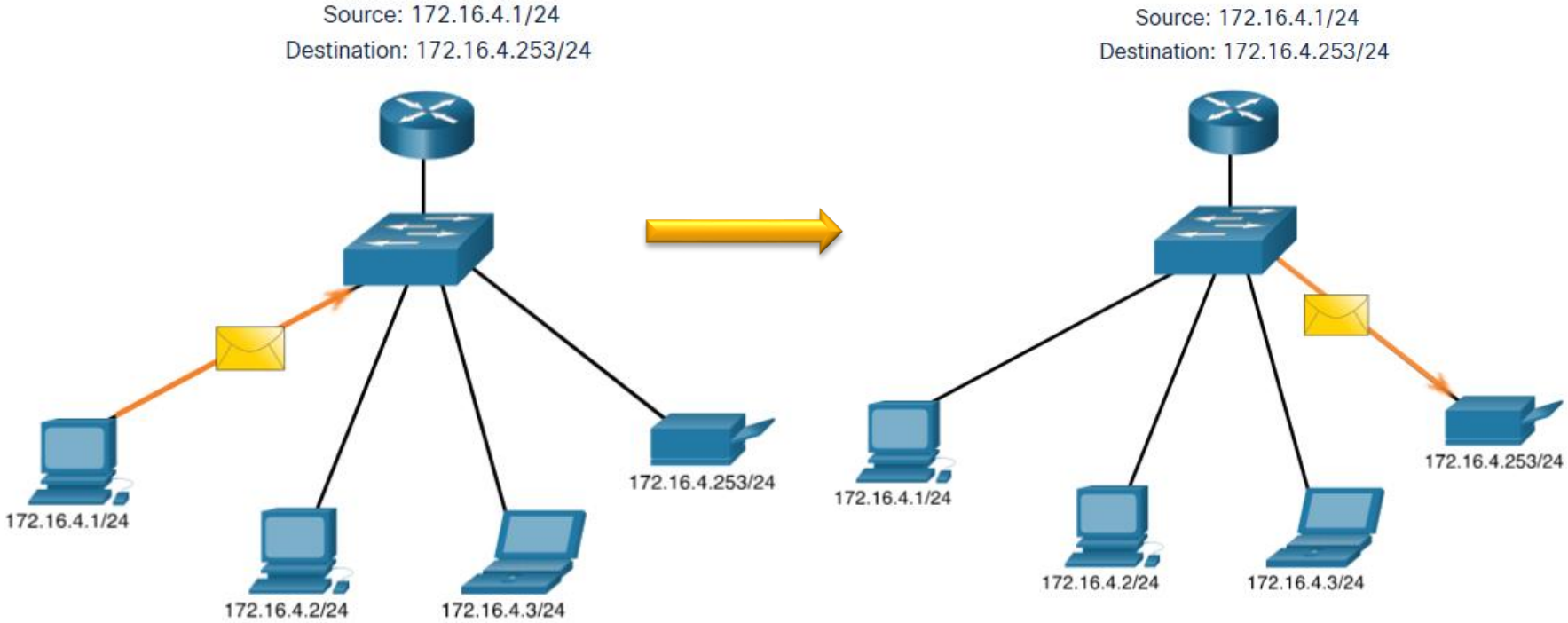


- A logical AND Boolean operation is used in determining the network address.
- To identify the network address, the host IPv4 address is logically ANDed, bit by bit, with the subnet mask to identify the network address.

11.2 IPv4 Unicast, Broadcast, and Multicast

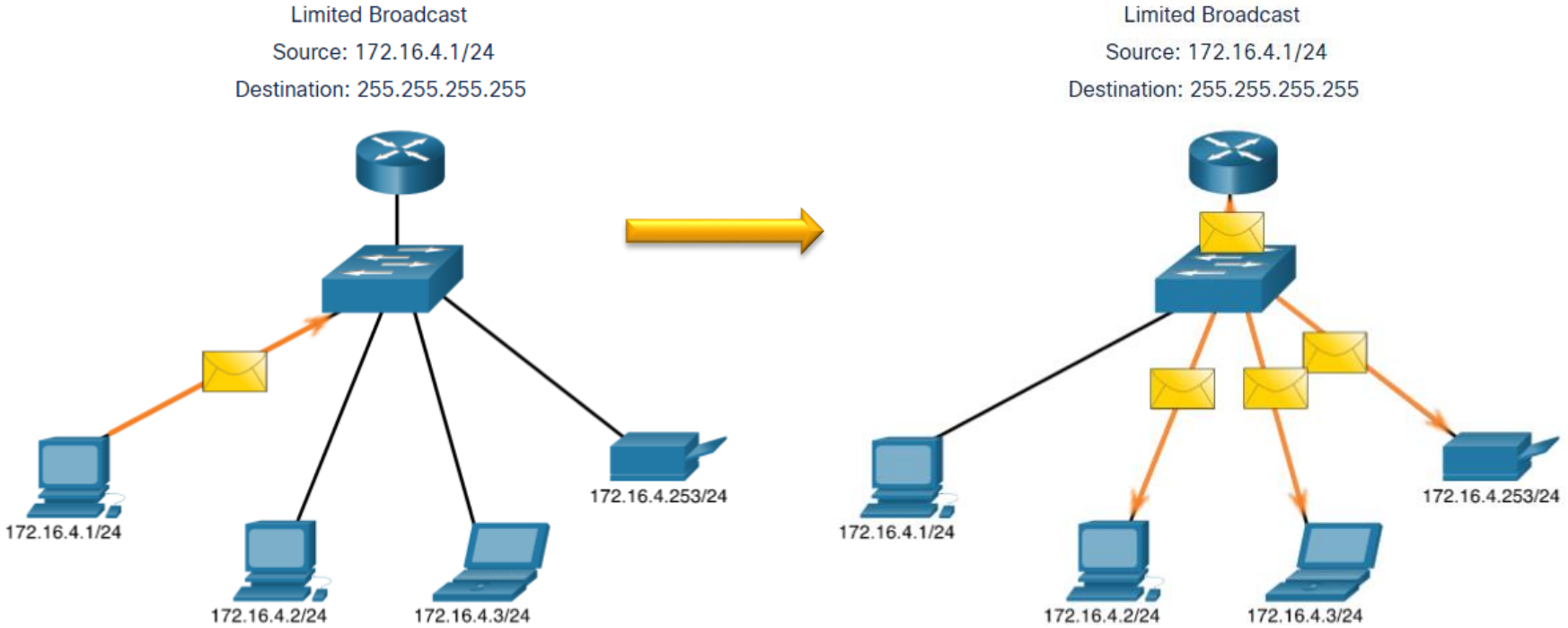
Unicast (Tekil Yayın)

- Tekil yayın iletimi, bir hedef IP adresine bir paket gönderiyor.
- Örneğin, 172.16.4.1 IP Adresli bilgisayar, 172.16.4.253 IP adresli yazıcıya tekil yayın paketi gönderir.



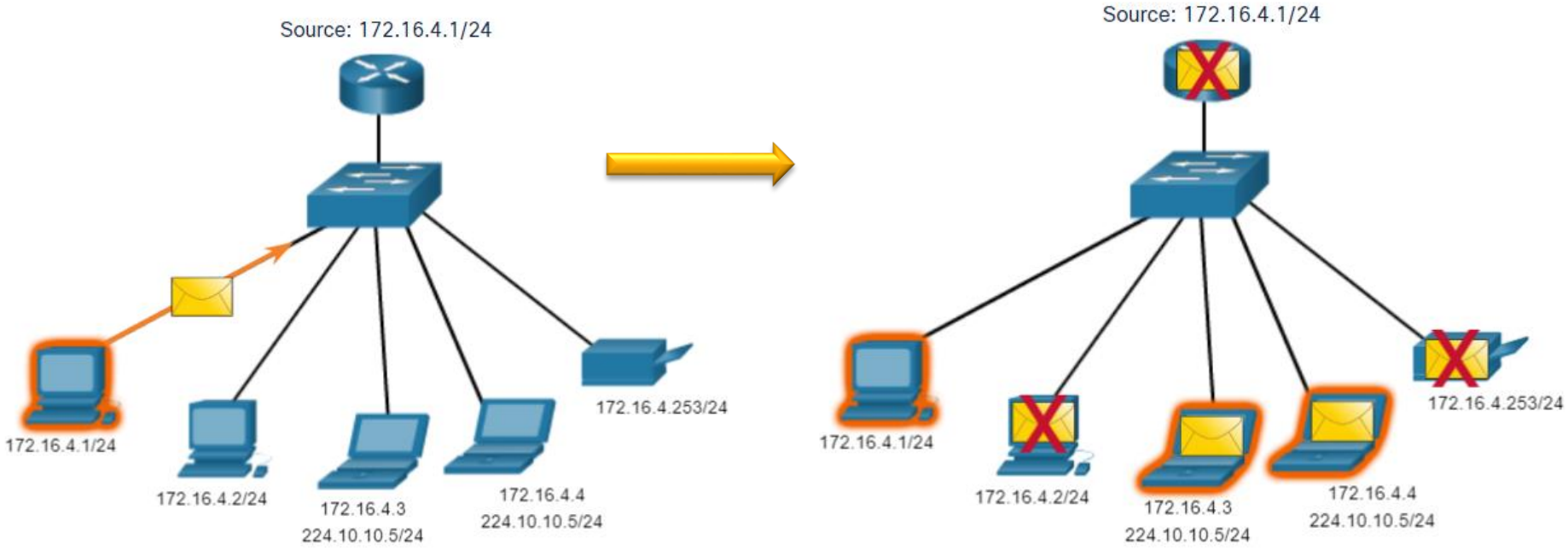
Broadcast (Genel Yayın)

- Genel Yayın iletimi diğer tüm hedef IP adreslerine bir paket gönderiyor.
- Örneğin, 172.16.4.1 IP'li bilgisayar tüm IPv4 cihazlarına bir genel yayın paketi gönderir.



Multicast (Çoklu Yayın)

- Çoklu yayın iletimi, çoklu yayın adres grubuna bir paket gönderiyor.
- Örneğin, 172.16.4.1 IP'li PC, çoklu yayın grubu adresine (224.10.10.5) çoklu yayın paketi gönderir.

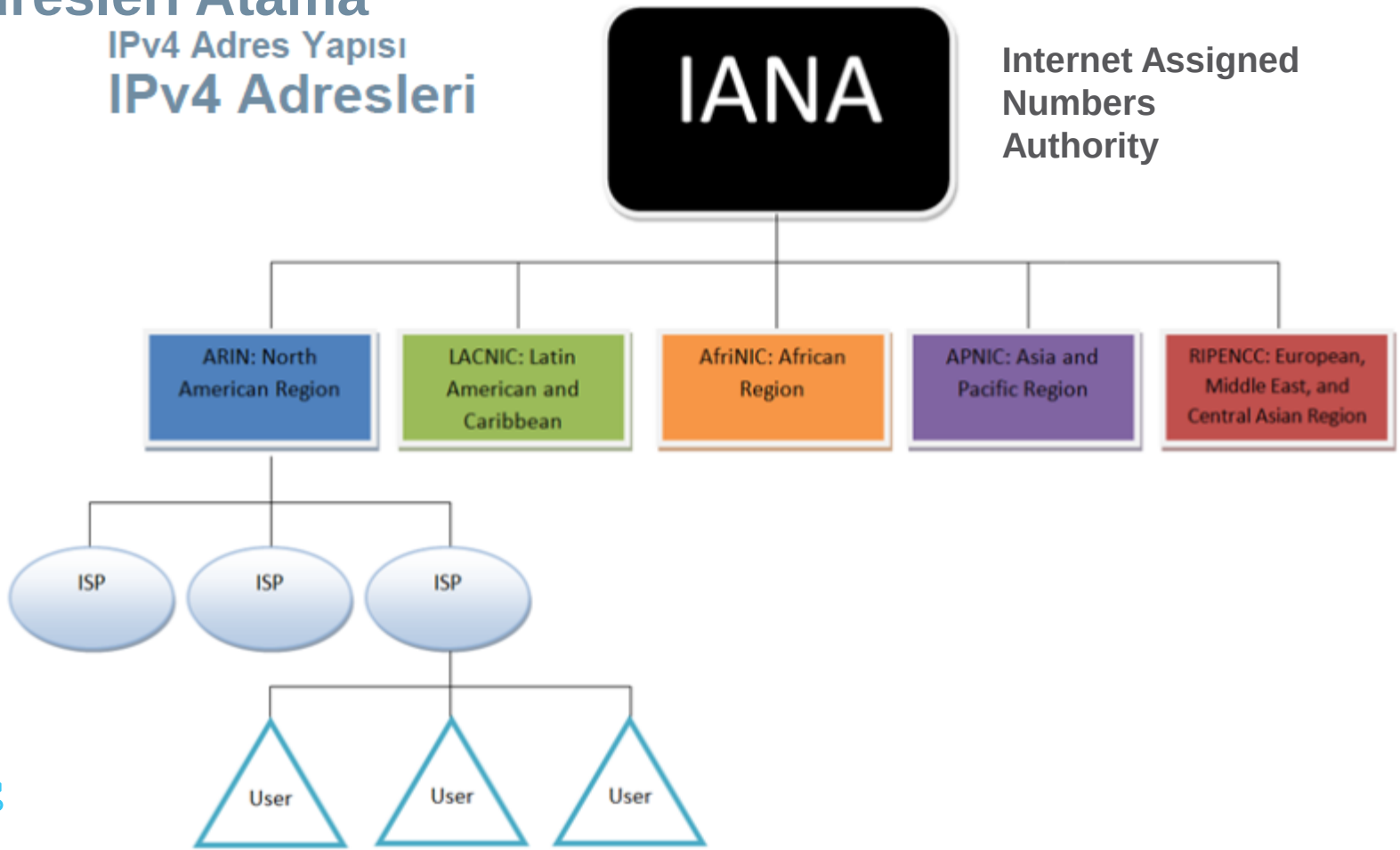


11.3 Types of IPv4 Addresses (IPv4 Adres Türleri)

IP Adresleri Atama

IPv4 Adres Yapısı

IPv4 Adresleri

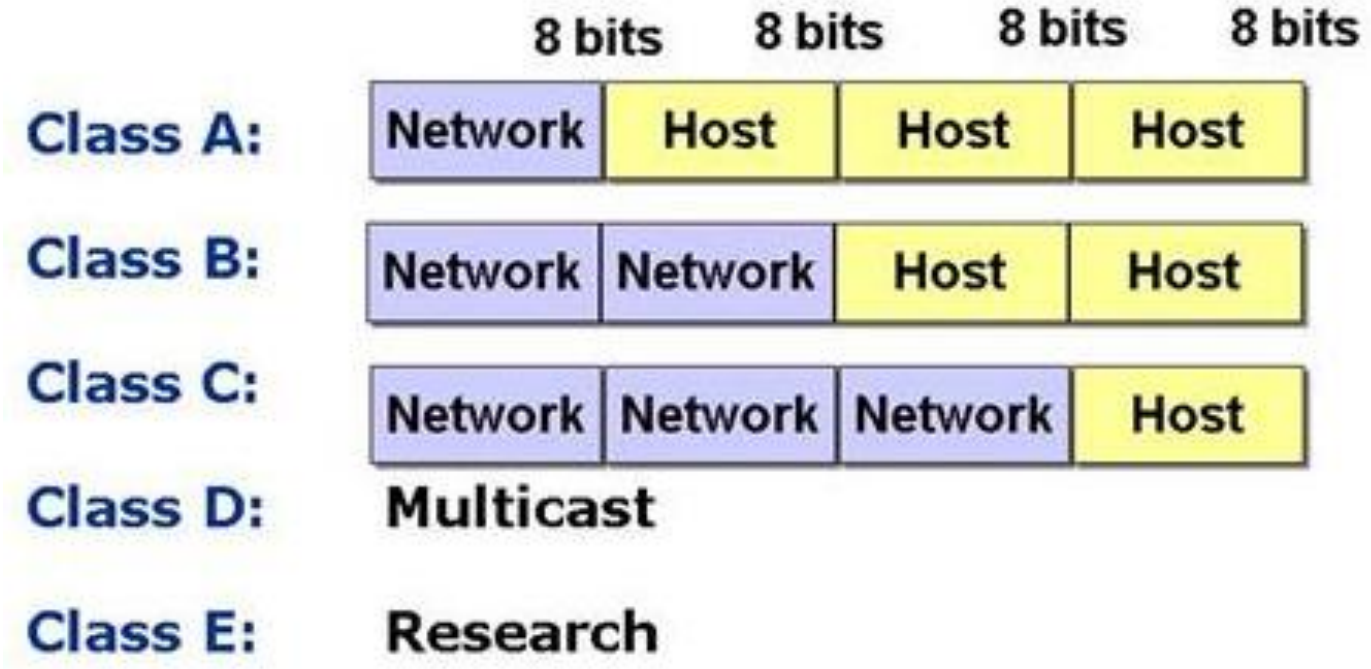


IP Adresleri Atama

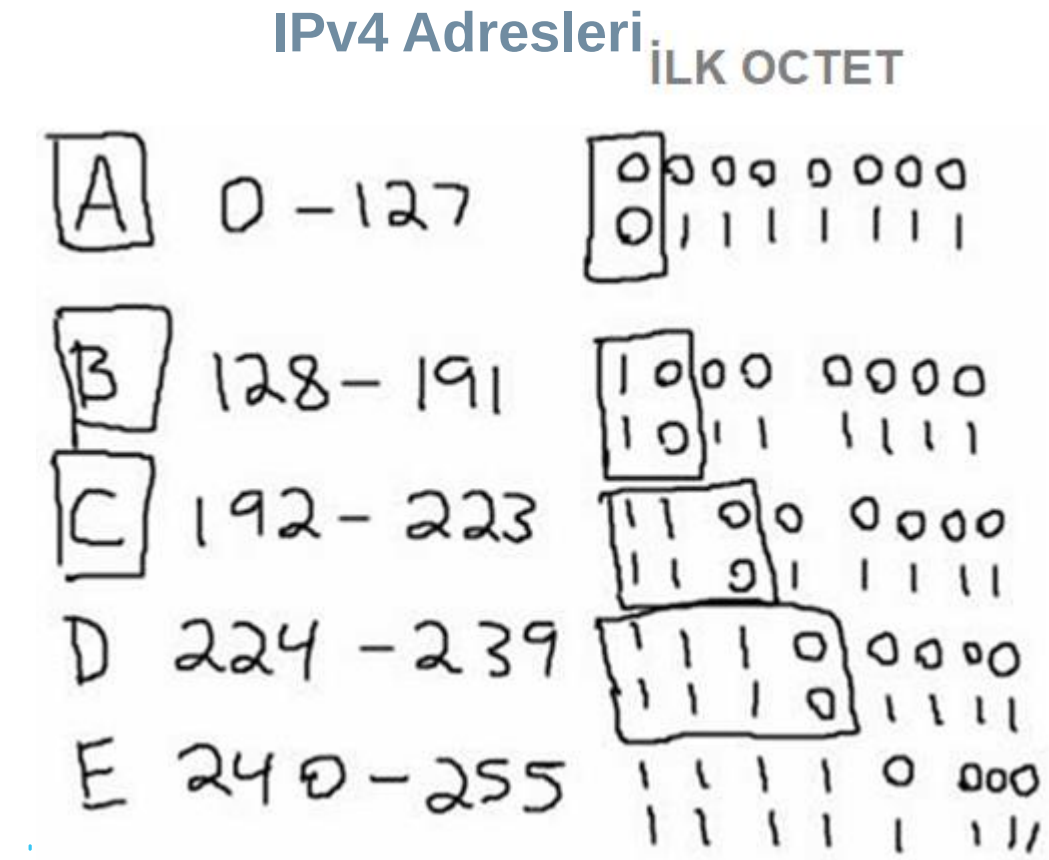
Bölgesel İnternet Kayıtları (RIR'ler)
Başlıca kayıt otoriteleri şunlardır:

Legacy Classful Addressing

IPv4 Adres Sınıfları (Sınıfsal Adresleme)



Legacy Classful Addressing



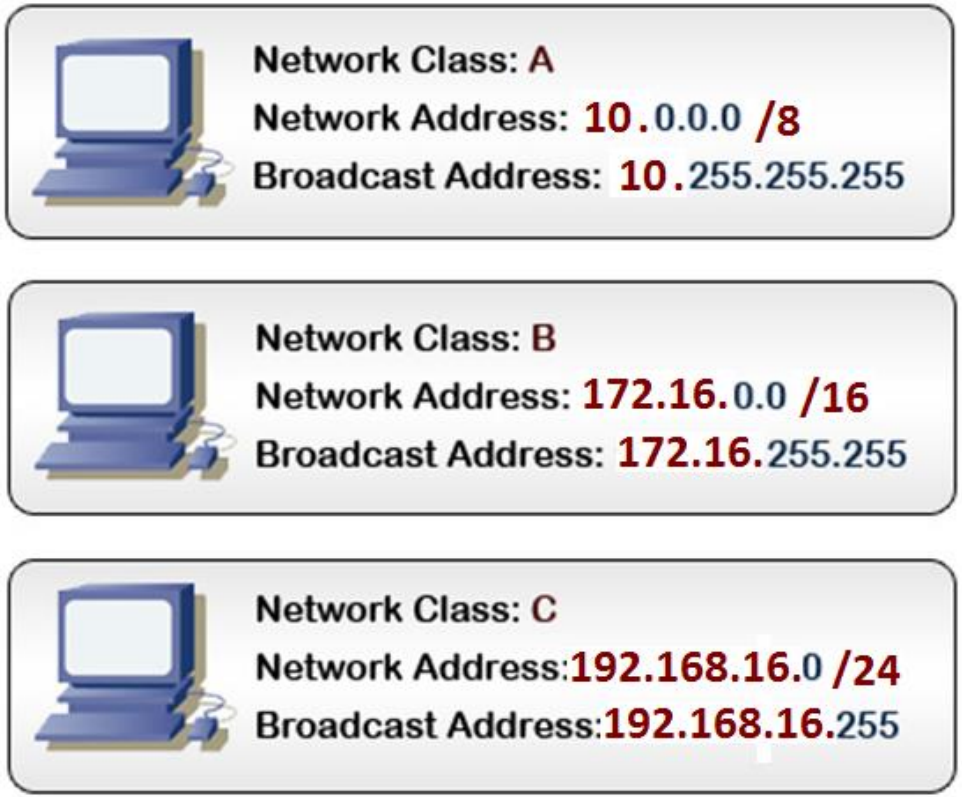
Legacy Classful Addressing

IPv4 Adres Sınıfları (Sınıfsal Adresleme)

Address Class	1st Octet (Decimal)	1st Octet bits (red bits don't change)	Network (N) and Host (H) Portion	Default Subnet Mask
A	1 – 127	00000000 - 01111111	N.H.H.H	255.0.0.0
B	128 - 191	10000000 - 10111111	N.N.H.H	255.255.0.0
C	192 - 223	11000000 - 11011111	N.N.N.H	255.255.255.0
D	224 - 239	11100000 - 11101111	N/A (multicast)	
E	240 - 255	11110000 - 11111111	N/A (experimental)	

Legacy Classful Addressing

IPv4 Adres Sınıfları (Sınıfsal Adresleme)



Legacy Classful Addressing

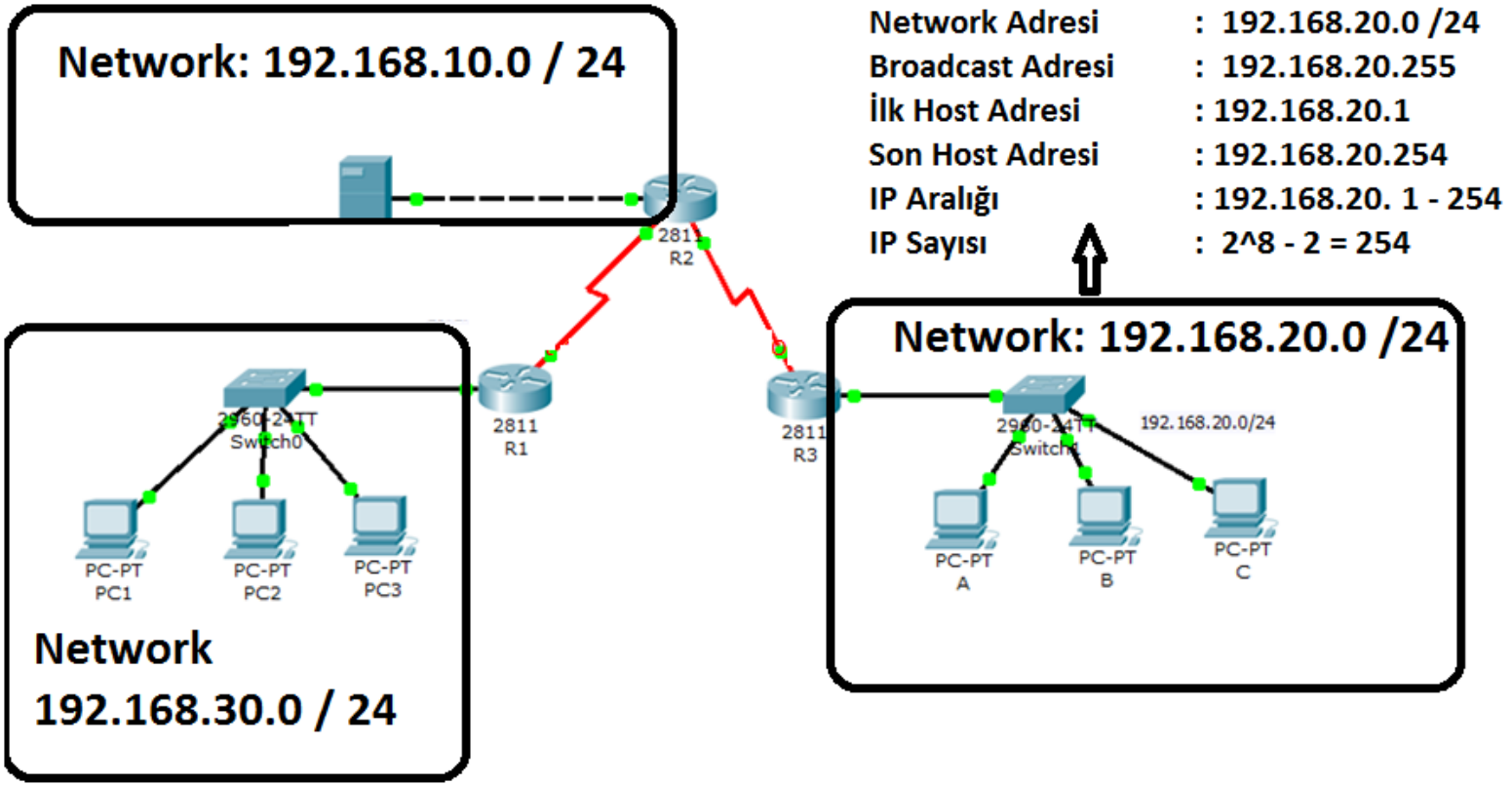
Classful Addressing (Örnekler)

İTÜ: (B Sınıfı) /16
Network Adresi **160. 75.** 0. 0
Subnet Maskesi 255.255. 0. 0
Broadcast Addresi **160. 75.**255.255
IP Aralığı 160.75.0.1-160.75.255.254

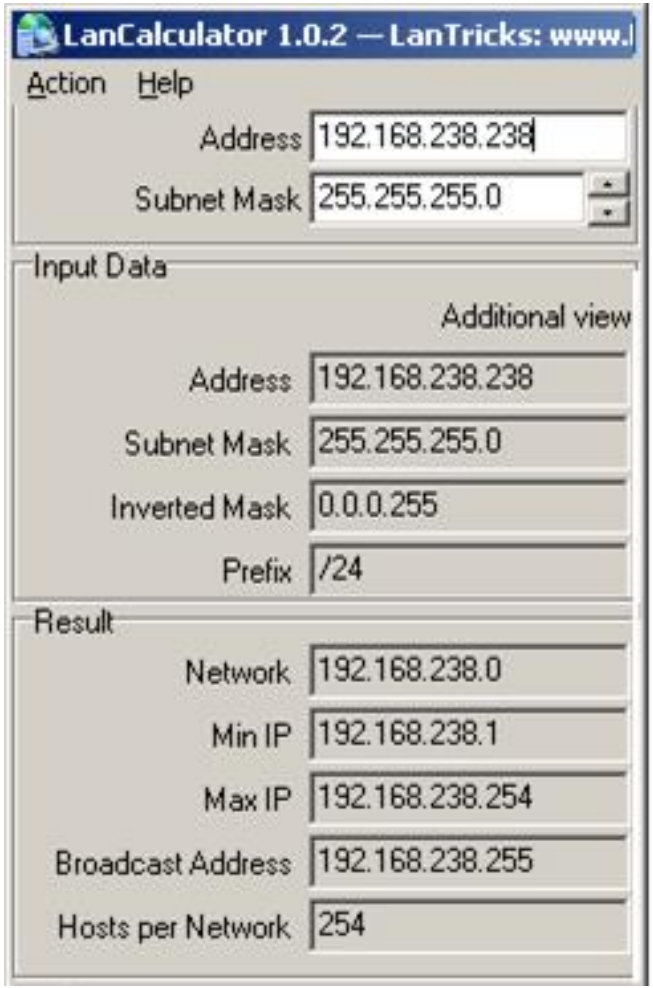
ODTÜ:(B Sınıfı) /16
Network Adresi **144.122.** 0. 0
Subnet Maskesi 255.255. 0. 0
Broadcast Addresi **144.122**.255.255
IP Aralığı 144.122.0.1 - 144.122.255.254

Marmara Üniv. (C Sınıfı) /24
Network Adresi **193.140.143**. 0
Subnet Maskesi 255.255.255. 0
Broadcast Addresi **193.140.143**.255
IP Aralığı 193.140.143.1 - 193.140.143.254

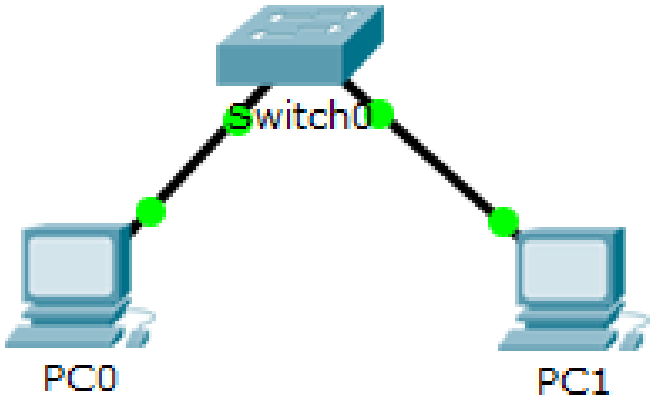
IP Ağını İnceleme



Ağ Adresi Hesaplayıcı



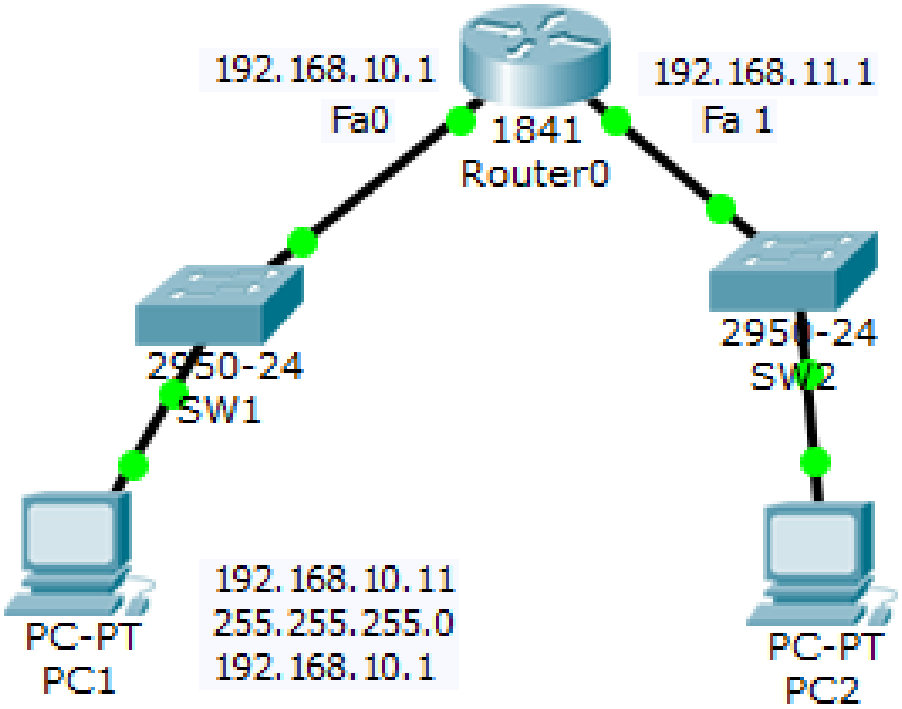
Network Adresi



PC0
192.168. 10 . 0000 1011
255.255.255. 0000 0000
[Network Kısmı]

PC1
192.168. 11 . 0101 0111
255.255.255. 0000 0000
[Network Kısmı]

Network Adresi



ROUTING TABLE

192.168.10.0 /24	FastEthernet0
192.168.11.0/24	FastEthernet1

ping 192.168.11.77

Classful Addressing (IPv4 Adres Sınıfları)

ADRES SINIFILARI	IP Bloğu	IP Bloğunu Alan Kurum
A Sınıfı: 16 milyon adres	3.0.0.0 /8	General Electric
B Sınıfı: 65,534 Adres	160.75.0.0/16	İTÜ
C Sınıfı: 254 Adres	194.27.32.0/24	Muğla Üniv.

İTÜ	
Network Adresi	160.75.0.0
Subnet Mask	255.255.0.0
İlk IP Adresi	160.75.0.1
Son IP Adresi	160.75.255.254
Broadcast Adresi	160.75.255.255
IP Sayısı	2^16-2 = 65,534 IP Adresi

Classless Addressing
(Sınıfsız Adresleme)

Sınıfsız Adresleme (Classless Addressing)

- Resmi adı Sınıfsız Etki Alanları Arası Yönlendirme'dir (CIDR, “cider” olarak telaffuz edilir)

- Servis sağlayıcılarının sadece A, B veya C sınıfı adresleri yerine herhangi bir adres bit sınırında (önek uzunluğu) IPv4 adresleri atamalarını sağlayan yeni standartlar oluşturulmuştur

Classless Addressing (Örnekler)

A Sınıfı, B Sınıfı, C Sınıfı yok.

Türk Telekom – ADSL (Classless)
Network Adresi **85.105.** 0. 0 /16
Subnet Maskesi 255.255. 0. 0
Broadcast Addresi **85.105.**255.255
IP Aralığı 85.105.0.1 - 85.105.255.254
IP Sayısı ?????

Turkcell - 3G (Classless)
Network Adresi **212. 252.** 168. 0 /21
Subnet Maskesi 255.255. 248. 0
Broadcast Addresi **212.252. ???.???**
IP Aralığı 212. 252. 168.1 – 212.252. ??? ???
IP Sayısı ?????

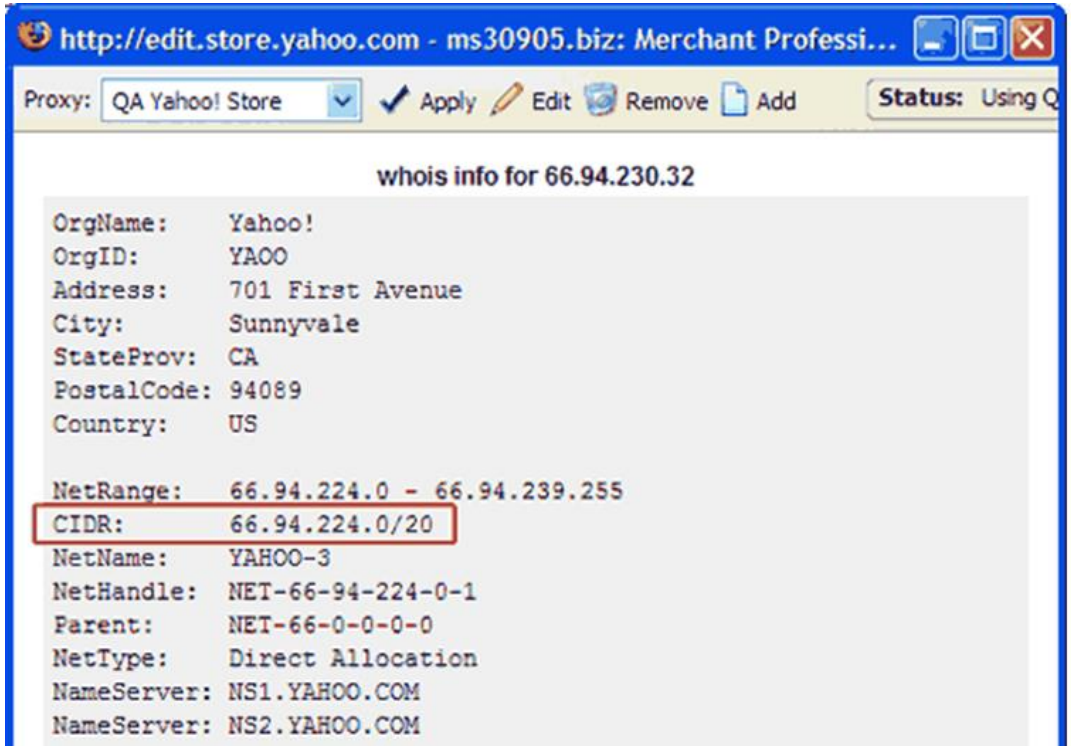
Dış dünyaya Turkcell kendini **212.252.168.0/21 olarak anons ediyor.**
Dilerse içeride IP bloğunu ALT AĞLARA bölebilir.

Classless Addressing
(Sınıfsız Adresleme)

Classless Addressing:	**A Sınıfı, B Sınıfı, C Sınıfı yok.**
CIDR: Classless Interdomain Routing	

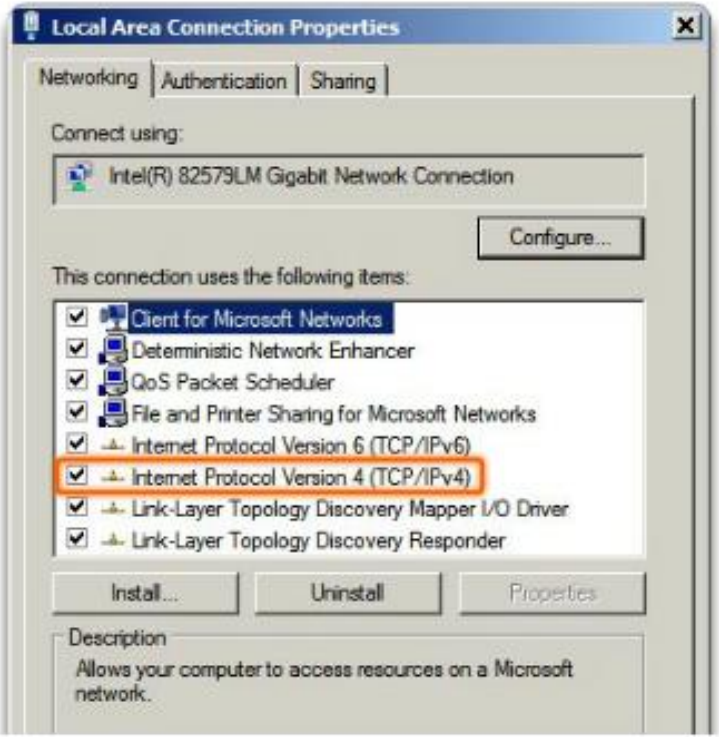
CIDR Block Prefix	# of Host Addresses
/30	4 hosts -2
/29	8 hosts -2
/28	16 hosts -2
....	.....
/20	4,096 hosts -2
/19	8,192 hosts -2
/18	16,384 hosts -2
/17	32,768 hosts -2
/16	65,536 hosts -2
/15	131,072 hosts -2

Classless Addressing
(Sınıfsız Adresleme)

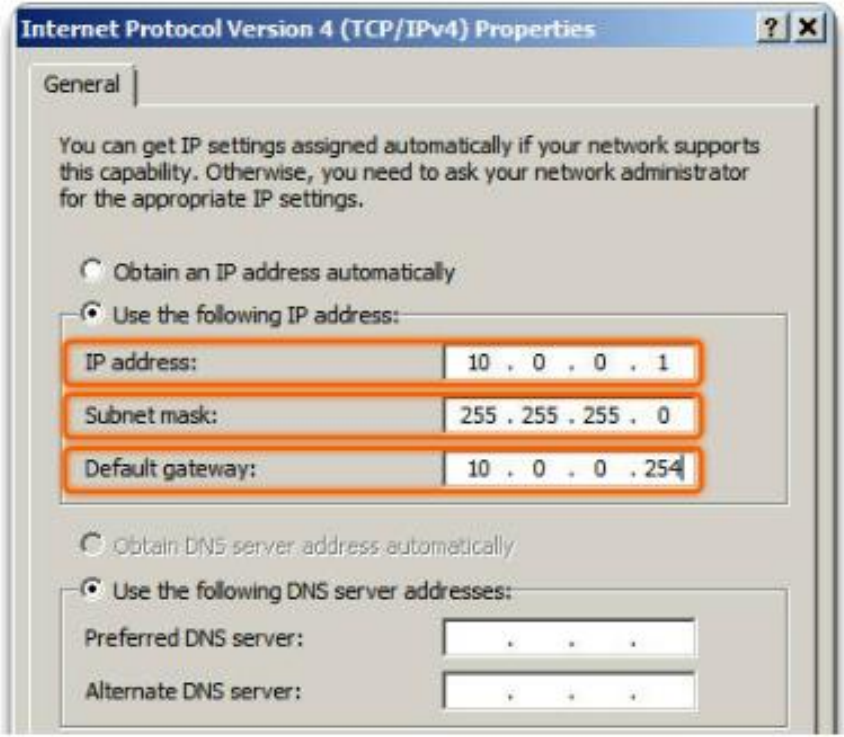


Hosta Statik IPv4 Adresi Atama

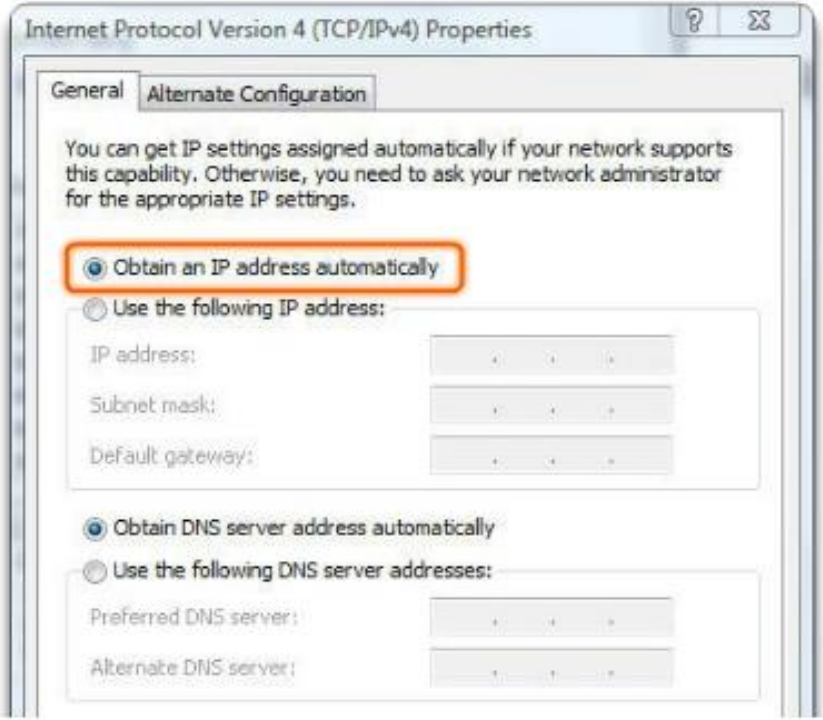
LAN Arayüzü Özellikleri

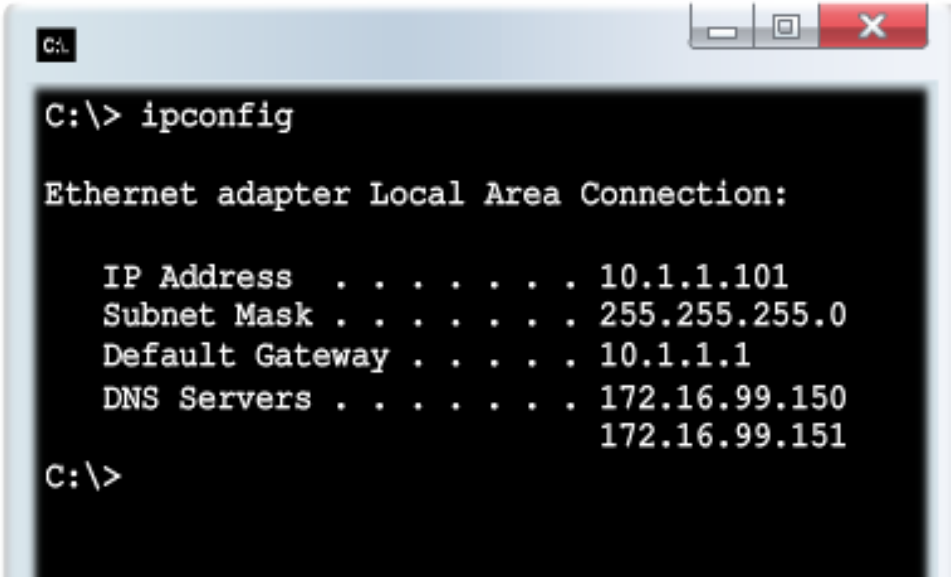


Statik IPv4 Adresini Yapılandırma



Hosta Dinamik IPv4 Adresi Atama





Doğrulama

DHCP - büyük ağlarda tercih edilen hostlara IPv4 adresleri 'kiralama' yöntemi, ağ destek personelinin üzerindeki yükü azaltır ve giriş hatalarını neredeyse tamamen ortadan kaldırır

Private IPv4 Addresses

- Genel (**Public**) IPv4 adresleri küresel olarak internet servis sağlayıcısı (ISP) yönlendiricileri arasında yönlendirilir.

- Özel (**Private**) IPv4 adresleri RFC1918'de tanımlanmıştır. Çoğu kuruluş tarafından iç networkteki bilgisayarlara IPv4 adresleri atamak için kullanılan yaygın adres bloklarıdır.
- Özel IPv4 adresleri benzersiz değildir ve herhangi bir iç ağda kullanılabilir.
- Ancak, özel adresler global olarak yönlendirilemezler.

Network Address and Prefix	RFC 1918 Private Address Range
10.0.0.0/8	10.0.0.0 - 10.255.255.255
172.16.0.0/12	172.16.0.0 - 172.31.255.255
192.168.0.0/16	192.168.0.0 - 192.168.255.255

Private IPv4 Adresleri

Özel adres blokları aşağıdakilerdir:

- 10.0.0.0 to 10.255.255.255 (**10.0.0.0/8**)
- 172.16.0.0 to 172.31.255.255 (172.16.0.0/12)

  172.16.0.0/16
  172.17.0.0/16
  ……
  172.31.0.0/16

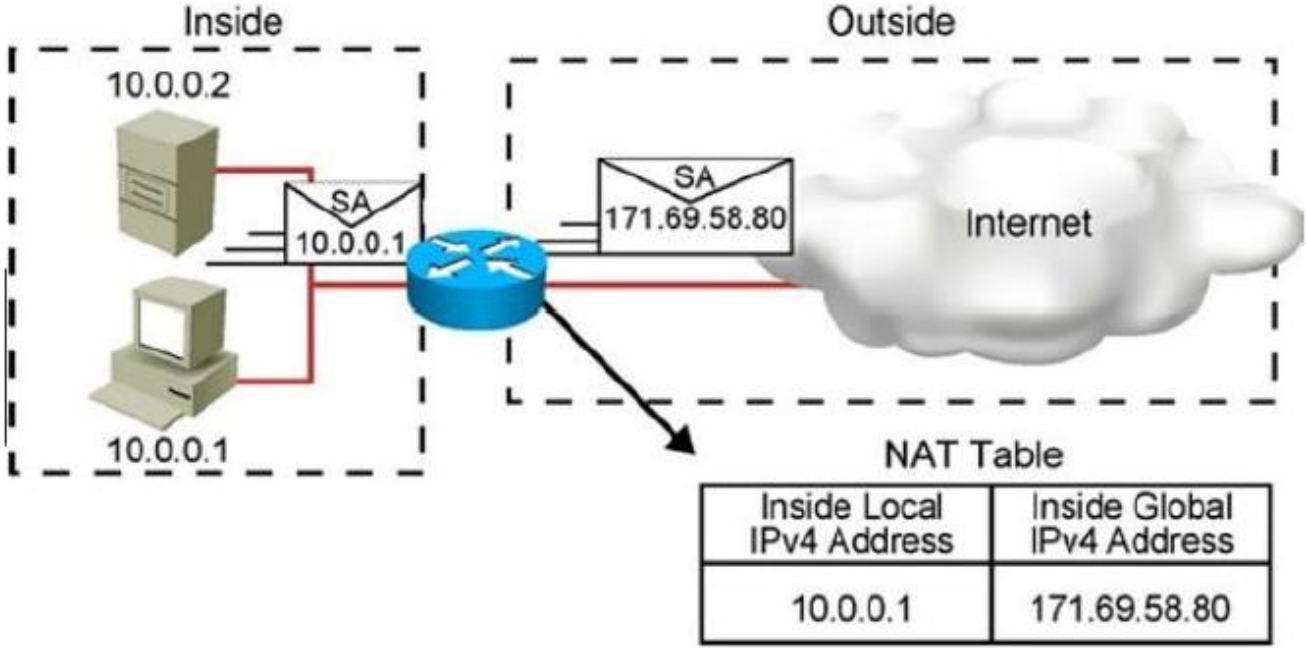
- 192.168.0.0 to 192.168.255.255 (192.168.0.0/16)

  192.168.0.0/24
  192.168.1.0/24
  …….

  192.168.255.0/24

Routing to the Internet

- Network Address Translation (NAT) translates private IPv4 addresses to public IPv4 addresses.
- NAT is typically enabled on the edge router connecting to the internet.
- It translates the internal **private** address to a **public** global IP address.



Special Use IPv4 Addresses

Loopback addresses

- **127.0.0.0 /8 (**127.0.0.1 to 127.255.255.254)
- Commonly identified as only 127.0.0.1
- Used on a host to test if TCP/IP is operational.

```
C:\Users\NetAcad> ping 127.0.0.1
Pinging 127.0.0.1 with 32 bytes of data:
Reply from 127.0.0.1: bytes=32 time<1ms TTL=128
Reply from 127.0.0.1: bytes=32 time<1ms TTL=128
```

Link-Local addresses

- **169.254.0.0 /16** (169.254.0.1 to 169.254.255.254)
- Genellikle **Automatic Private IP Addressing** (APIPA) adresleri veya kendinden atanan adresler olarak bilinir.
- Windows DHCP istemcileri tarafından, kullanılabilir DHCP sunucusu olmadığında kendi kendini yapılandırmak için kullanılır.

11.4 Network Segmentation (Subnetting İhtiyacı)

Broadcast Domains and Segmentation