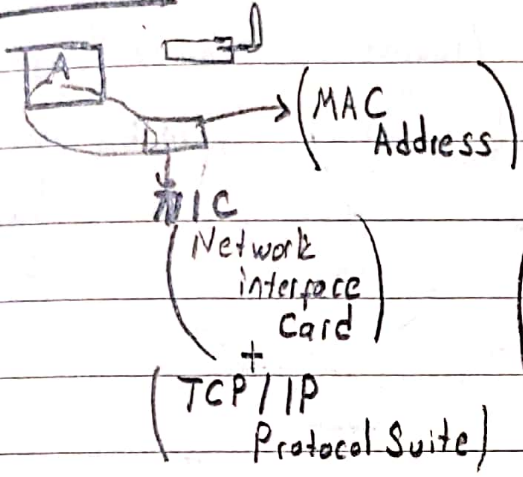
P2P istemci-istemci özel bir sunucunun olmadığı sistemler

Hizmetler (Servis / Sunucular)

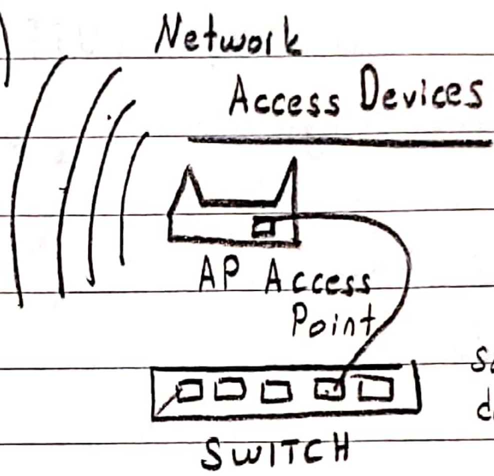
Ağ Cihazları (Ara cihazlar

Medya (iletim ortamı)

End Devices

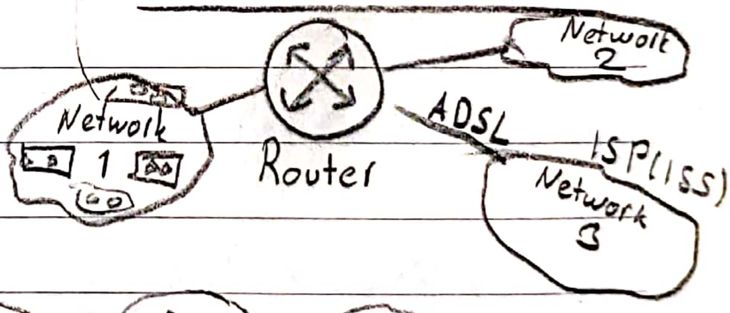


Network Access Devices

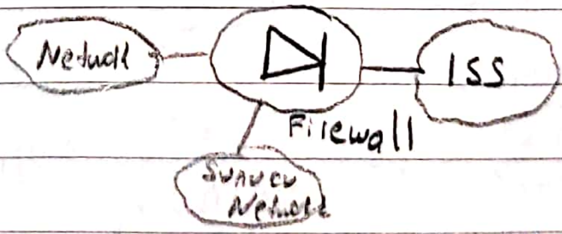


Son kullanıcıları dahil etmek için

Internetwork Devices



POE özellikli Swict AP e elektrik kablosu bağlamak istemese




LAN Switch


Router


Wireless Router


Firewall

19 inch kabinet

Media (iletim ortamı)

Networking Media

- Fiber Optik Kablolama (ışık) → Manyetik alandan etkilenmez
- Copper (elektriksel) (UTP) Coaxial → (Unshielded Twisted Pair max 100mt)
- Wireless (Electromagnetic waves)

Multimode Fiber

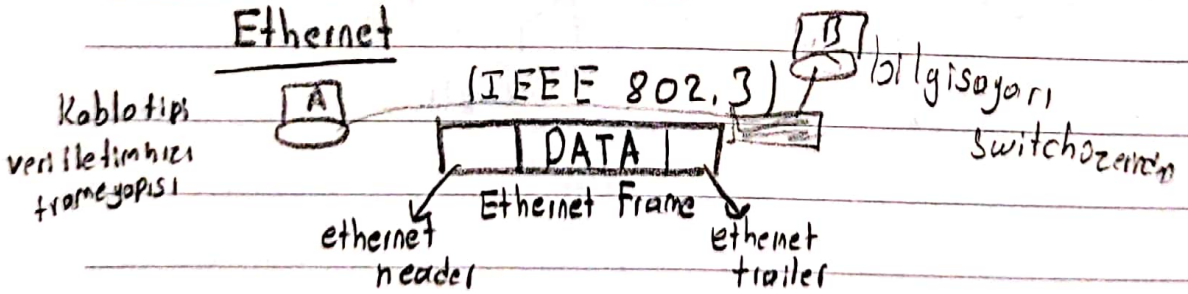
Singlemode Fiber

AP → 1500$ → kurumsal kalitede modem (AP demek) (200)

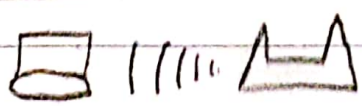
ADSL - Kablonet - Uydunet

LocalArea Network Technologies

Ethernet



Wireless LAN (IEEE 802.1)


Kablosuz cihazları

youtube

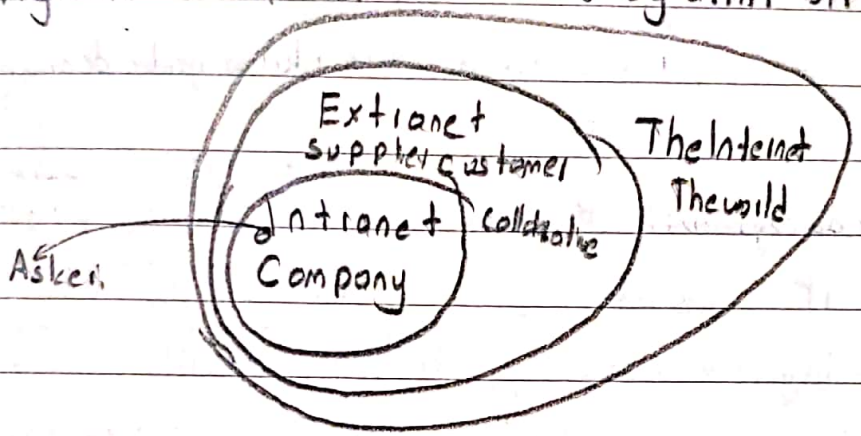
Wide Area Network Technologies

frekans ayrılığı

Download	Upload

VDSL
ADSL (8Mbps/1Mbps)
G.SHDSL (2Mbps/2Mbps
Fibernet (Metro Ethernet)

ISP Ağların Birleşmesi → İnternet ağlarını birleştirmek için ISP bağla



Kullanıcıları İnternet'e Bağlama

Kablonet → TV + İnternet
ADSL → Tel + İnternet
GSM → Tel + Baz isl internet
Stallite → İnternet uydu

İşletmeleri İnternete Bağlama

yedekli çalışan altyapı

OSI Reference Model

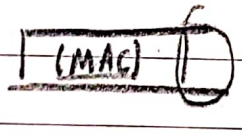
Application Layers
- L7 Application → provides interface for end device
- L6 Presentation → data iletim type'si (şifreleme, sıkıştırma, ...)
- L5 Session → istemci yazılımi ile sunucu yazılımı arasında oturum takibi (kalınan yerden devamedre)

Web tarayıcı

Data transfer Layers
- L4 Transport → datayı küçük parçalara bölüyor — T.H | DATA
- L3 Network → IP network başlığı — N.H | T.H | DATA
- L2 DATA LINK → kuyruk ve başlık bilgisi — F.H | N.H | T.H | DATA | F.T
- L1 PHYSICAL → datayı bitlere dönüştürüp iletimi — 1001010011010101001

Frame Header

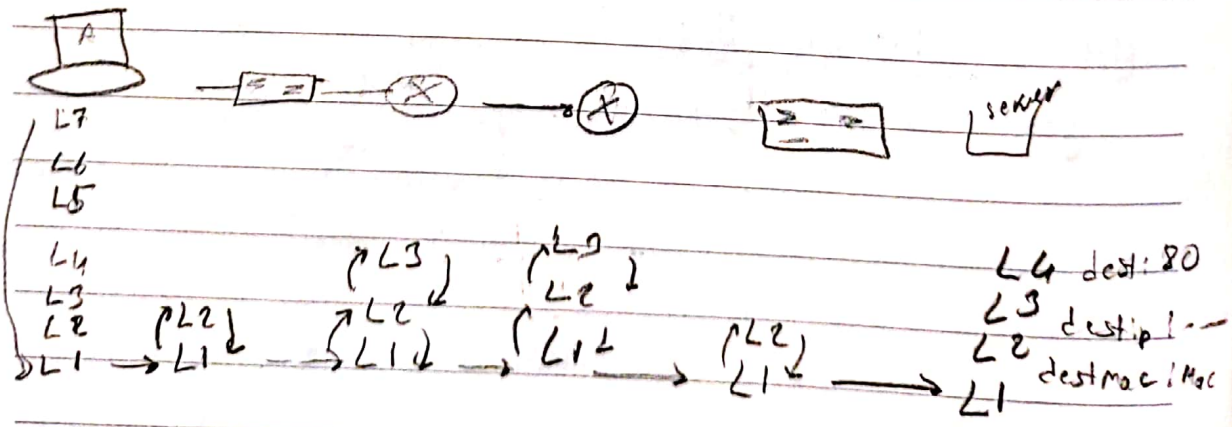
Source MAC
Dest. MAC



} mac adresleri sadece aynı network içerisinde iletişim için kullanılır.

Frame Trailer

Hata Kontrol bilgisi (Data iletiminde bozulmuş mu)



nedet port sunucu

koynak port dinamik

4 Transport Header ..../......./.......

Source Port : 9001 → web tarayıcı ile gelir → sunucu port 80

De Port : 80

seq. number : 1

ack number :

HTTP, FTP, DNS

HTTP, Get www.google.com index html

TCP, UDP

TCP, UDP

TCP/IP →

+

NIC

TCP max bant genişliği hızı da max

Web Tarayıcı — Firefox

L7 L6 L5 — APACHE web server — SMTP software

L4 → 80 TCP | 25 TCP

Port numarası: hangi uygulamaya gideceğini

web serverde her biri için source port farklı

60k ~ sayı ...

Network header

Source IP : 192.168.1.16 kullanıcı

Dest IP : 85.2.76.9

takibe Network kat IP

Protocol | Protocol Data Link (PDU)

HTTP, FTP, SMTP → DATA

4 Transport → TCP UDP → TH | DATA ; TH | DATA — UDP DATA, DATAGRAM

L3 Network → IP → NH | TH | DATA — PACKET

L2 Data link → Ethernet → FH NH TH DATA FT — Frame

L1 Physical → 1 0 1 — BIT

→ Kablo tipleri; voltaj seviyeleri

Katmanlı yapı da ihtiyaç duyulan

Kablo 1 IP 3 cihazlar

OSI

L7 Application
L6 Pres
L5 Sess
} APPLICATION

TCP/IP Protocol Suite

L4 Transport } TRANSPORT (TCP UDP)
L3 Network } INTERNET (IP)
L2 Data Link
L1 Physical
} NETWORK ACCESS

IP'de LAN'dan TEKNOLOJİ

Enerji hatlarından Ağ / Şebeke aynı faza ait olmalı.
Elektrik hatlarında internet taşınabilir.

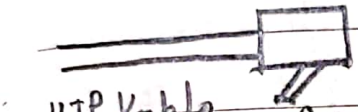
Ethernet UTP + Fiber kullanan mac adresini kullanan

Connector
Datahat

Physical (L1)

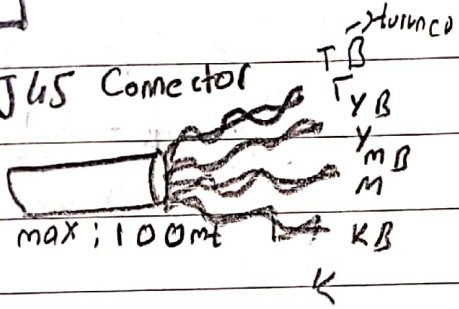
connector
data type
hız
switch / kablo / bilgisayar eşit hızlarda olmalı
kablolama daha maliyetli (en kaliteli döşenmeli)

ANSI - EIA/TIA - ITU-T - IEEE - ISO

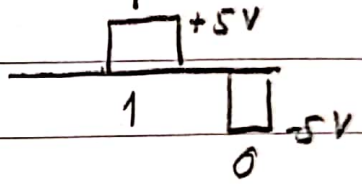


- UTP Kablo
- Voltaj Seviyeleri
- Kodlama (L1)
- Data hızları

RJ45 Conector



10 Mbps Ethernet



10Mbps
100Mbps
1Gbps
10Gbps
40Gbps
100Gbps

Fiziksel Katman

Bakır Kablo : UTP, Coaxial Cable
Fiber Kablo : Multi Mode Fiber
Single Mode Fiber
Wireless : Elektromanyetik Dalga

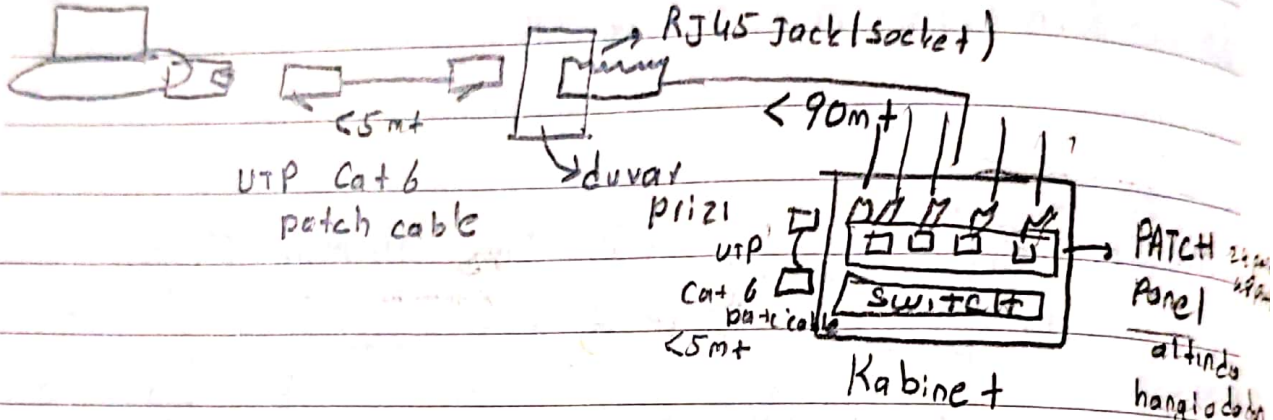
UTP Unshielded Twisted Pair

Cat 5 : 10/100 Mbps yalıtım + kablo lar üzelleştirme

Cat 5e : 10/100/1000 Mbps

engel → Cat 6 : 10/100/1000 Mbps 10 Gbps

+ Cat 6a Cat 7 : 10/100/1000 Mbps/10 Gbps 40 "



Throughput → verim

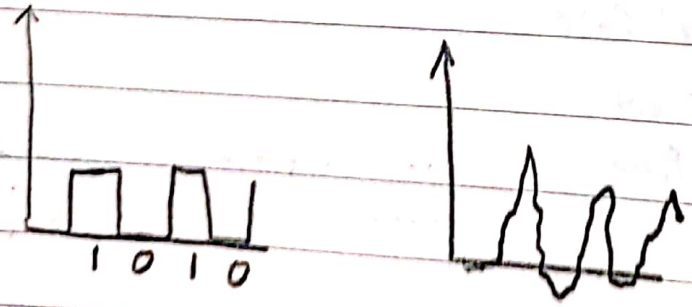
bandwidth

kontrol → başlangıç hata bitiş

Copper Media features

sonda ek bit control biti

sinyal bozulması



floresan ışıklar, elektrik kabloları

yüksek elektrik ~~atanda~~ hatlardan geçiyorsa dışına folyo sarıp topraklanabilir.

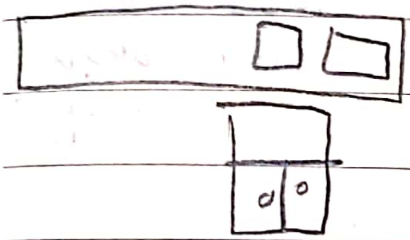
Colaxiel -> dışında izole kablo

5-6

RJ45 connector => [ ] socket jack

switchlerin yüksek hızlı portları switchleri bağlamak için kullanılabilir
takip cihazı etiketlemede kullanılabilir.
kabloları (8') birbirinden uzaklaştıkça manyetik alan artar.

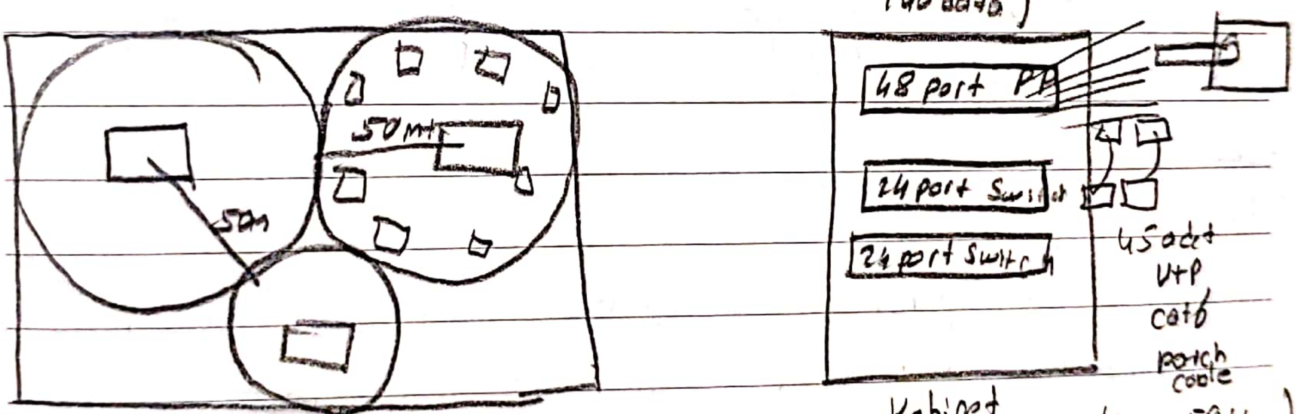
lazer -> single mod yoğun olduğu için



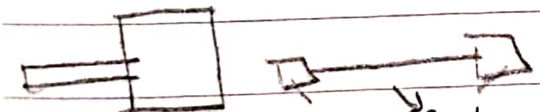
10km 500$ çık
80km 2000$
gönderme

mesafe uzak olunca single mode

yoğunlaştırıp yansıtan /pilli -> yüksek mesafelerde (140 data)

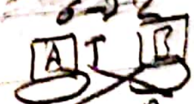


(140x50mt/...)
2000mt



Yeşil Receive
Turuncu Transmit

1 -> 3
2 -> 6
3 -> 1
6 -> 2



10/100mbps

T568B
1 TB
2 T
3 YB
4 M
5 MB
6 Y
KB

T568B
TB -> Tx+
T -> Tx-
YB -> Rx+
M
MB
Y -> Rx-
KB

T568B
1 TB
Y
M
MB
Y
KB
K

1 YB
2 Y
3 TB
M
M
T
KS
K

Straight Through Cable

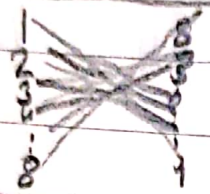
T568B → T568B

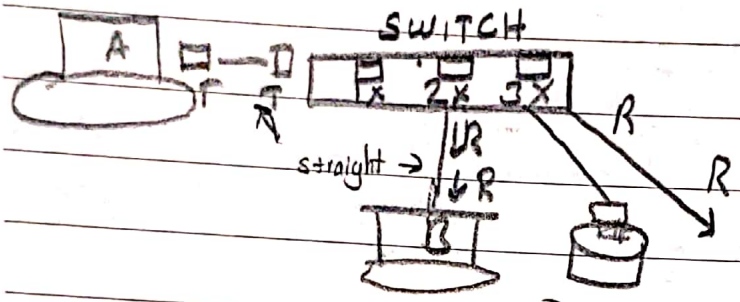
T568A → T568A

Crossover Cable

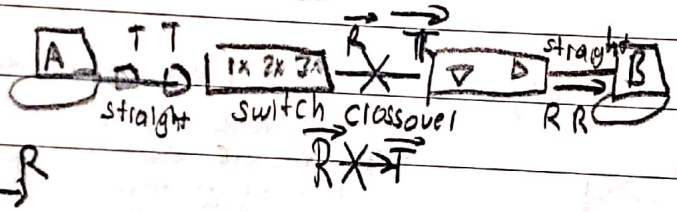
T568B → T568A

Console Cable / RoLLover Cable

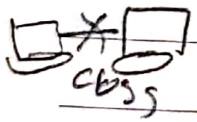




cross cable
alıcı kabloyu
vericiye
dönüştürür



T → switch → R

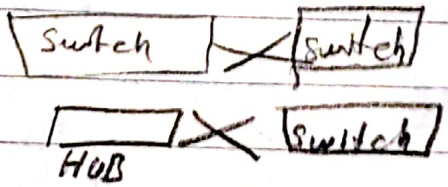


cs'ye

yeni nesil switchlerde düz ya da cross farketmez
ağ kartında hangisi olup olmadığına göre kendisini ayarlar

T568A - T568A

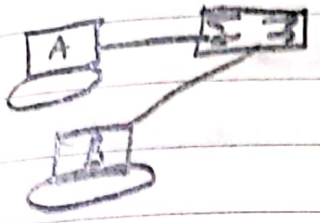
Aynı tip cihazlar cross cable ile bağlanır.
Router PC ile aynı tip bilgisayarda da network kartı var

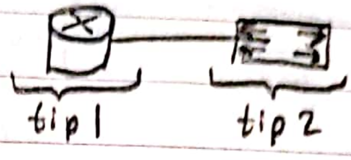


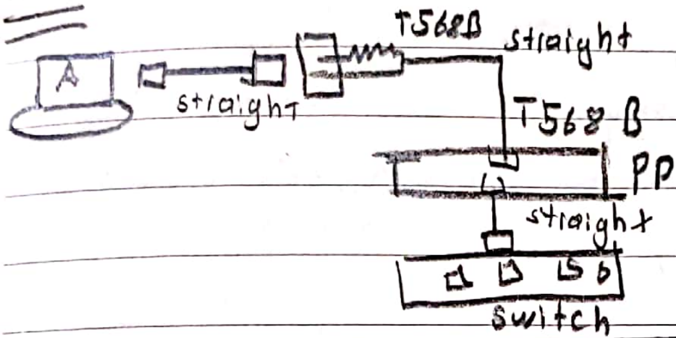
modem Türk Telekom'la nete bağlanmak için ..../......./.......

T568B - T568B

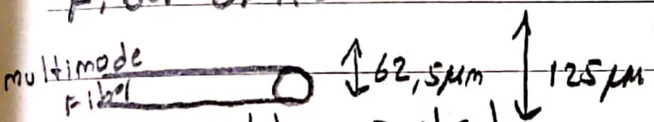
Farklı tip cihazlar düz kablo ile bağlanılır.







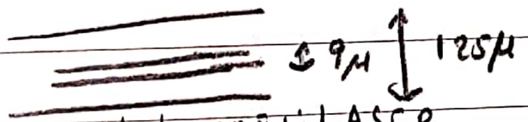
Fiber Optik



ışık kaynağı: Led

62/125µ multimode

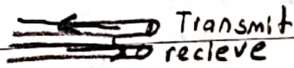
renk: turuncu

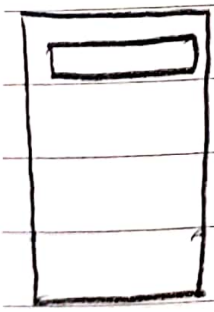


9/125µ singlemode fiber

ışık kaynağı: LASER

renk: sarı





fiber patch panel

8 tel 3$ /mt

16 tel 3,5$ /mt

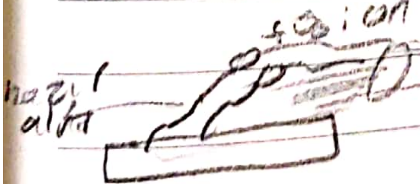
24 tel 4 $
core

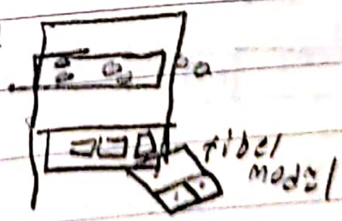
48

72 5$

20cm kaz

20 kaz
kum dök
aralara
tahta
üstüne taşlar
50mt bir levha
kanallar
kırılabilir

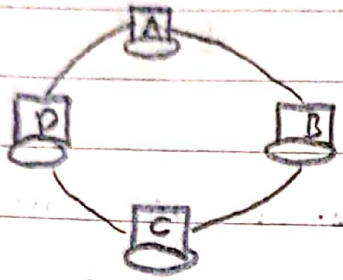




lazer ışıkla retinaya zararverir

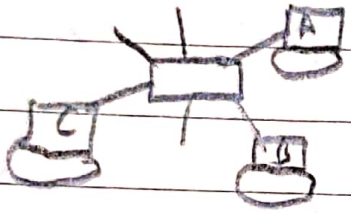
Fiziksel LAN Teknolojileri

Bus Topology

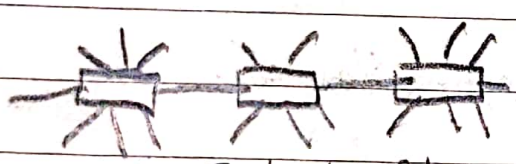


Ring Topology

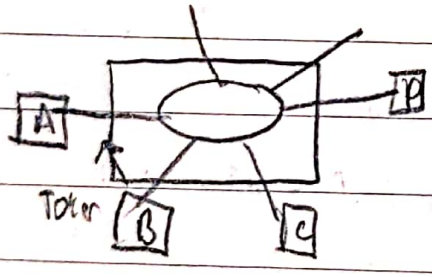
(FDDI



Star topology



Extended Star Topology



Token Ring

Fiziksel Top: star

Mantiksal Top: Ring

LAN Tekn: Ethernet
Token Ring (Eski)
FDDI (Eski)

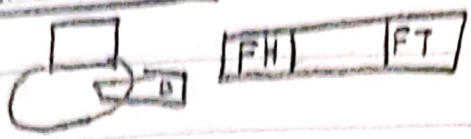
L2 → framing

L1 → fiziksel topoloji
↳ data hızları
↳ kablo yapısı

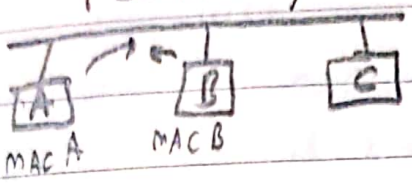
WAN Tech. : ADSL
MetroEthernet

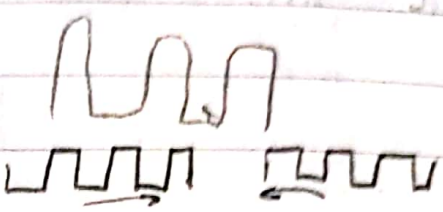
L2 Data Link LAYER

→ Framing



→ Media Access Control Method (Collision)

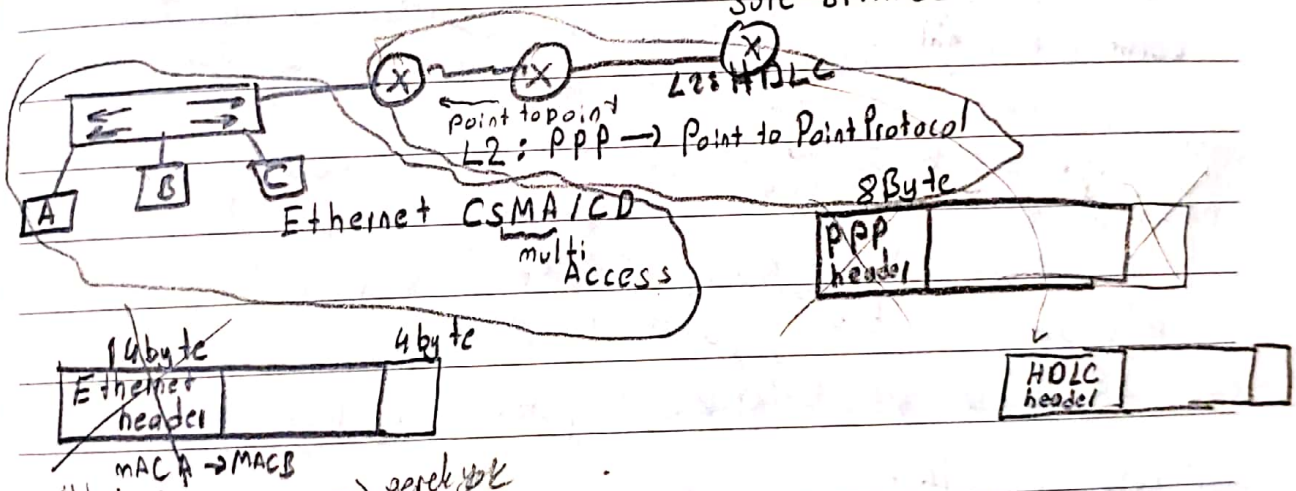




Ethernet : MAC Method → hat boşsa frame : ilet / hat doluysa bekle
CSMA/CD

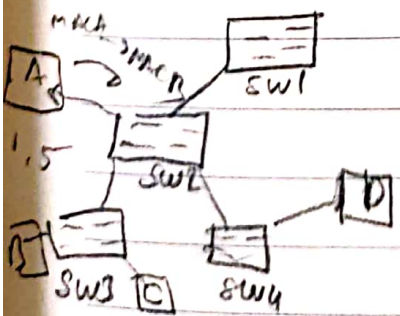
collision tespit edilirse
frame iletimini kes
bozucu bir sinyal yolla
sayaç başlat (random bir süre)
süre bitince

wireless LAN : CSMA/CA



ilk katmandan sonra → gerek yok

Switch sadece 2. katmana bakan → aynı IP bloğu içerisinde paketin bir noktadan diğerine gitmesini sağlar



İç networkte iletişim sadece mac adresi ile yapılır

macA → macR → router

IPA → IPgoogle

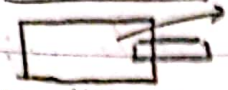
DHCP'den ağ ip alındığında
Default gateway
IP aldığında routere
sorgusu

sonrasında
mac adresi öğrenilir.

Ieee OUI OUI search ~~wireshark~~ wireshark

........./........./.........

MAC Adresi



→ burned-in address
physical adress ...

NIC network interface card

(Ethernet Card)

48 bit
0001,0001,1100,0011110001 1

↓
8
9
A
⋮
F

MAC Adr ipconfig -all ~~all ...~~

physical 00:01:AB:2E:55:11

24 bit — OUI (organizational unique identifier)

24 bit — vendor assigned serial number

kartın içinde gömülü gelir — network kartı satıcısından aldığı

~~aynı mac adress ethernet protokol~~ Aynı ağda sıkıntı olur

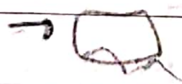
bilgisayarın bağlantısı — mac adress switch sistemi — hangi switchde

Unicast:

hedef: MAC_A

Multicast

hedef 01:00:5E

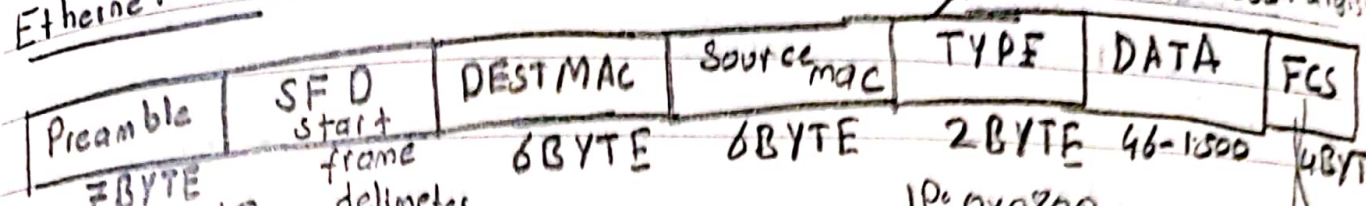


Broadcast

mac: FF-FF-FF-FF-FF-FF

hepsine yollar

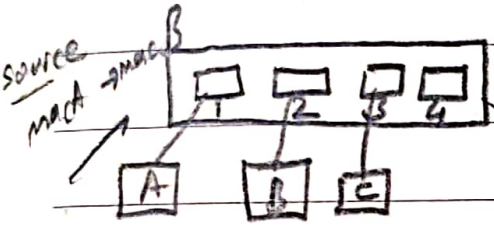
Ethernet Frame



minimum frame
64 BYTE

max frame
1518 BYTE

switch mac adreslerini tutar 5dk gelmezse veya bağlantı koparsa tablodan siler, routerlar paketyollar



show mac address-table

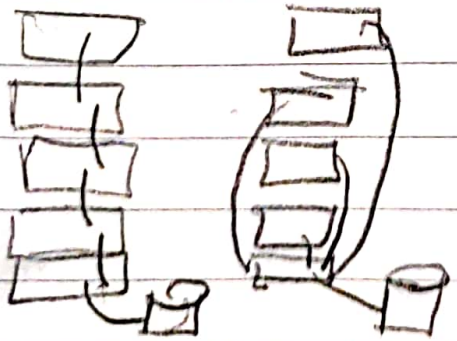
Port	mac Adı
1	mac A
2	mac B
3	mac C
4	mac D
4	mac E

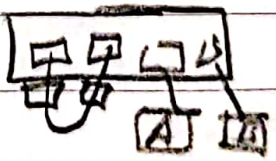
A → paketi hepsine yollar
↑ macB → macA
Source

switch kaynağa bakar ve onu tabloya ekler

switch paketi ilgili yere yollar / 1 portta 1den fazla mac Adı olabilir

switchler L2de mac adresine göre nereye yollayacağını ayarlayan aletlerdir.





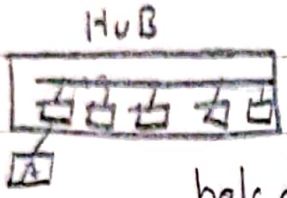
Aktif switchlerde döngüyü engeller ve o portu kapatırlar

Alıcı II

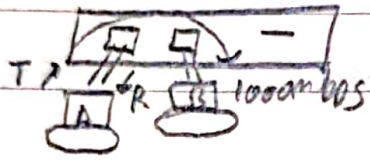
100 Base TX Ethernet

100 Mbps, T: Twisted Pair (UTP)

24x 100 Base TX port



half duplex: tek yönlü iletim



full duplex: çift yönlü iletişim

10Mbps Ethernet: Ethernet

100Mbps Ethernet: Fast Ethernet

1000Mbps Ethernet: Gigabit Ethernet

Fast Ethernet 0/1

speed ?

speed 10/auto

duplex full

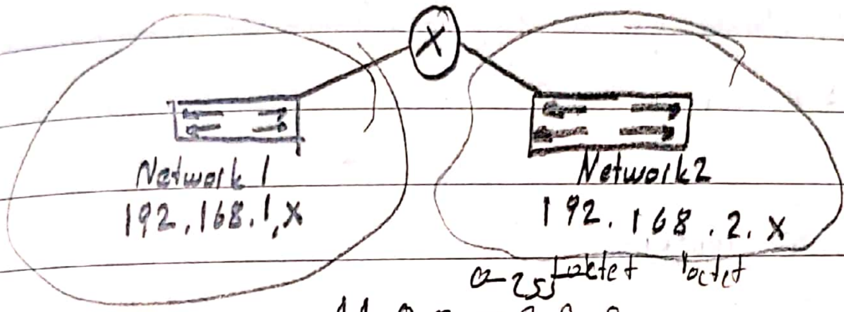
duplex half/auto

mdix auto → media dependent interface

L3 NETWORK LAYER

NH | TH | DATA
↳ Source IP: 32 bit
Dest IP: 32 bit

- Best path selection
  based on Dest. IP Address
- Routing (yol seçimi)
- Packet switching

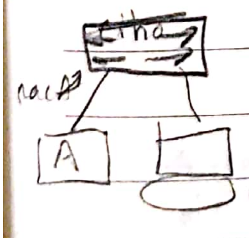


1 1 0 0 0 0 0 0
128 64 32 16 8 4 2 1

550k network

Routing Table → show ip route

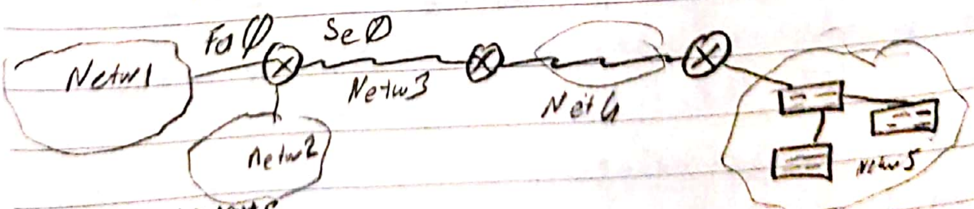
Dest. Network	exit interface	
C 192.168.1.0/24	Fa Ø	Tüteldeki bir router
C 192.168.2.0/24	Fa 1	dünyadaki tüm routerları bilme
0.0.0.0/0	Se Ø	zorunda



1 macA
2 macB
3 mac X1
4 X2 X3
macof

switch tablo doldurması
kalanı silmek zorunda kalıyor

switche koruma
1 portta en fazla 2 mac adresi
5 dk boyunca switch hub gibi kullanılabilir.



R1 # show ip route

	Dest. Netw	exit interface
Connected C	Netw1	Fa Ø
C	Netw2	Fa 1
C	Netw3	Se Ø
Static ← S	Netw4	Se Ø
S	Netw5	Se Ø

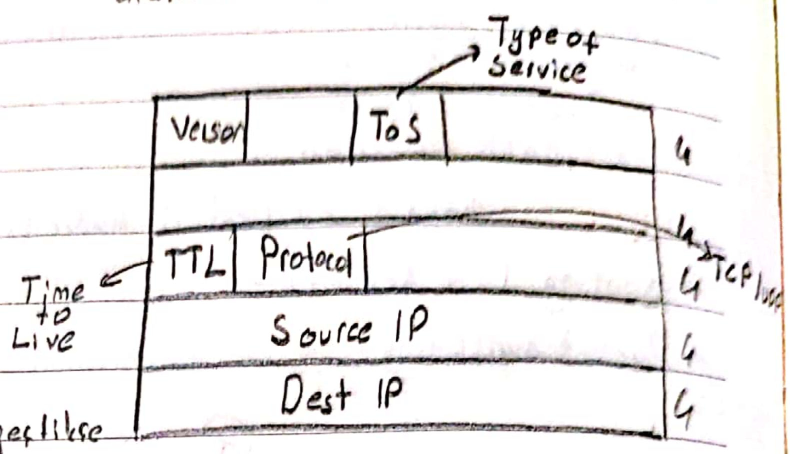
L3 Network Layer

→ best path selection — seçilen yol algılıp anahtarlama
→ Packet switching

IP → Internet Protocol

N.H	TH	Data

N.H → 20BYTE, TH → TCP/UDP



Time to live her cihazdan geçtikçe sayacı 1 azaltsın

tracert ·)) hepsi-router

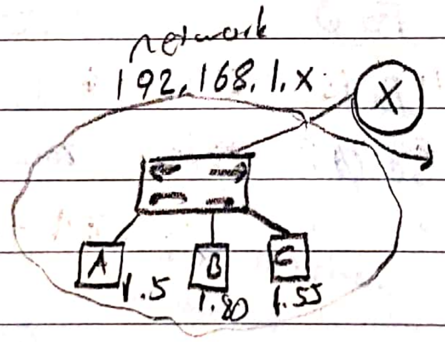
IP Adresleri

IP: 192.168.1.5 — 8bit 8bit 8bit 8bit (0-255)

network Portion — Host portion

1 octet

0	0	0	0	0	1	0	1
128	64	32	16	8	4	2	1



Subnet mask: network kısımları 1, host kısımları 0

255.255.255.0 — network: 255.255.255, host kısmı: 0

Default Gateway: sizinle aynı ip networkünde bulunan adres

192.168.1.1

1 mac A
2 mac B
3 mac C
4 mac R

her routerin her bacağının bir ip si vardır.

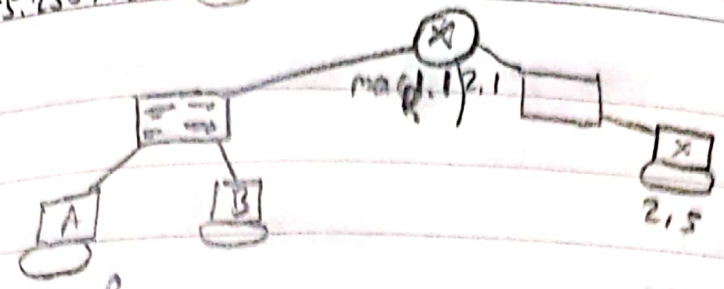
ipconf

SM 1 sayısı kadar /(number of 1)

Prefix length

255.255.255.128 /25

mac ig networkler ..... bağlanabilir.



Arp protocol

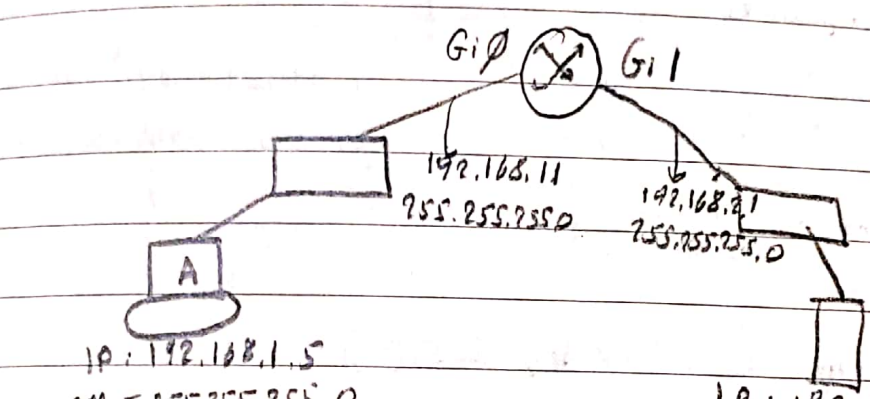
A → B

macB	macA	IPB	IPA	
d.mac	S.mac	dest Ip	S. Ip	

A → x

macR	macA	IPX	IPA	

yol boyunca 2. layer değişir (mac)



IP : 192.168.1.5
SM : 255.255.255.0
DG : 192.168.1.1

IP : 192.168.2.7
SM : 255.255.255.0
DG : 192.168.2.1

Routing Table

	Destin. netw	Exit Int.
C	192.168.1.0/24	Gi Ø
C	192.168.2.0/24	Gi 1

1 inetwork deki ilk ip adresi network adresidir.
Son ip adresi ise

192.168.1.x → 0 0 0 0 0 0 0 0

netw / Host

router network adreslerini tablolarına yazar

network adresi: Host bitlerinin "0" olduğu adres tir (network teki tüm kullanıcıları temsil eder

broadcast Adresi: Host bitleri "1" network teki tüm kullanıcılara paket gönderebilmek için kullanılır

Host Aralığı : Bilgisayarlara ip adresi atanabilecek aralıktır

192.168.1.(1-254)

192.168.1.(hhhh hhhh)

8 bit · 2^1

$2^8 - 2 = 254$ ip adresi

$2^h - 2$ = host sayısı

İlk + son adres.

ICANN
↳ IANA ⟹ ARIN American registery for internet numbers www.arin.net
⟹ RIPE → Reseau ip europeans www.ripe.net
⟹ APNIC
⟹ AfrinNic
⟹ Lap Nic

Internet assigned numbers authority

class A 0nnn.nnnn.H.H.H 255.0.0.0

class B 10nn nnnn.N.H.H 255.255.0.0

class C 110nnnnn.N.N.H 255.255.255.0

classfull Addressing

class A 0-127 N.H.H.H/8 $2^{24} \cong 16$ million

class B 128-191 N.N.H.H/16 $2^{16} = 65,534$

class C 192-223 N.N.N.H/24 $2^8 = 254$

class D 224-239 Multicast ip adres bloğu / class E 240-255 (Receive experimental addresses)

classless addressing → suanda ip dağıtım

PRIVATE ADDRESSES

çıkarken tek gerçek ip kadarda sahte ip adresi

10.0.0.0/8

172.16.0.0/16

172.17.0.0/16

⋮

172.31.0.0/16

192.168.0.0/24

192.168.1.0/24

192.168.2.0/24

⋮

192.168.255.0/24

VPN -> tünel içerisinden ağlar arası ip blokları kullanılabilir.

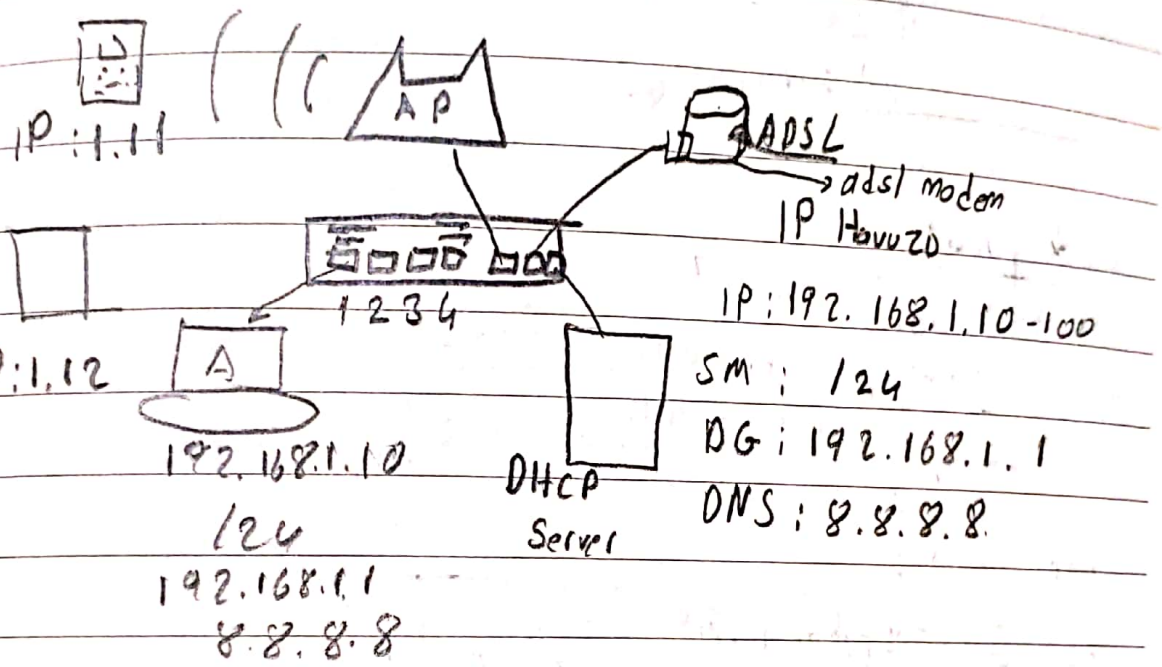
Loop Back Ip Address

127.0.0.0 / 8

TCP/IP bağlantı kontrolü

network kartı ile iletişim kontrolü

ping 127.0.0.1



DHCP yoksa APIPA 169.254.0.0/16

255.255.0.0

mac -> IP dağıtır

IP 169.254.7.7

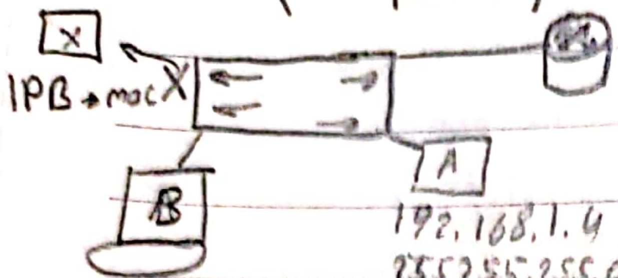
SM 255.255.0.0

IP: 169.254.8.16

SM 255.255.0.0

Aynı networkte çalışır
ip adresinden mac adresini sorgular

ARP (Address resolution protocol)



A → B
ping 192.168.1.5

Source Mac	Dest. Mac	Source Ip	Dest Ip	
macA	?	IpA	Ip B	Data: ping

BEKLE → önce B mac adresi öğrenilir
aynı networkte bi cihazlar birbirini ...

A: 192.168.1.4
255.255.255.0
192.168.1.1

B: 192.168.1.5
255.255.255.0
192.168.1.1

arp -a
IP C ⟷ mac C
IP B ⟷ mac B

Arp Request

IPB → mac adresin nedir?

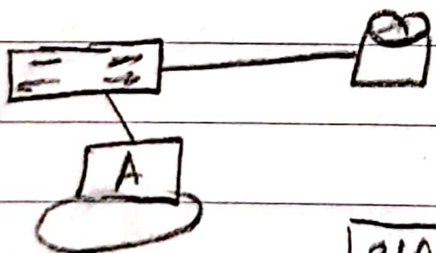
S. mac	D. mac	S. IP	D. IP	Data
mac A	FF... FF (Broadcast)	IPA	IPB	IP B mac adresi nedir?

Arp Reply

macB	macA	IPB	IPA	IP B mac adresi MacB

Arp sonradan geldikçe üstüne yazar, 3 5 dk tutulur

8.8.8.8
A → Ip google



mac A	?	IPA	IP google

IP
SN
DG

arp -a
IP B ⟷ mac B
IP C ⟷ mac C

ARP Request

IP DG → mac adresi nedir

Subnetting → host kısmından bit ödünç alarak parçalara ayırma

→ Network performansını arttırır
(Broadcast paketleri sınırlanır)
→ Networkler arası güvenlik

199.100.5.hhhh hhhh /24

Network Adresi : 199.100.5.0

Broad Adresi : 199.100.5.255

Subnetmask : 255.255.255.240

IP Aralık : 199.100.5.(1-254)

ip sayısı $2^8 - 2 = 254$

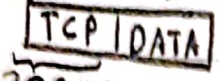
199.100.5.hhhh hhhh
8 8 8 ss hh hhhh

8+8+8+2 00	199.100.5.0	199.100.5.00hh hhhh
8+8+8+2 01	199.100.5.64	199.100.5.01hh hhhh
8+8+8+2 10	199.100.5.128	199.100.5.10hh hhhh
8+8+8+2 11	199.100.5.192	199.100.5.11hh hhhh

Show ip arp

L4 Transport Layer

TCP



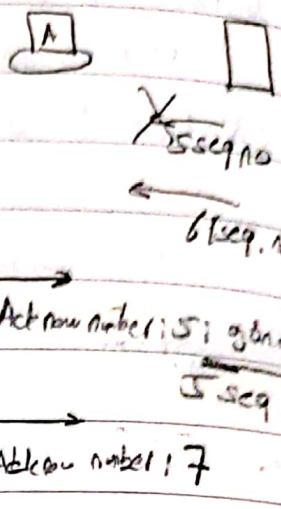
20 BYTE

Source Port	Dest Port: 80
Sequence Number	
Acknowl. Number	
Flag	Window size
DATA	

UDP

8 BYTE

Source Port	Dest Port
Length	Checksum (hata kontrol)
Data	



Flags

SYN (bit) : 0-1

Ack (bit) : 0-1

RST : 0-1

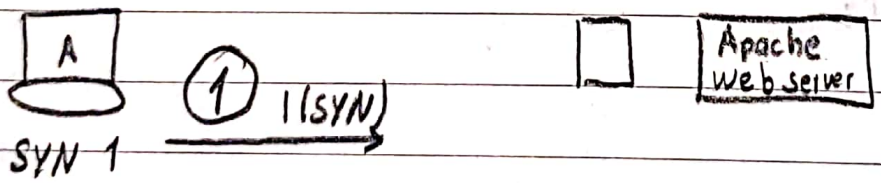
FIN : 0-1

TCP Haberleşmesi

① Connection Establishment Phase
(3 way hand shaking)

② Data transfer Phase

③ Connection termination Phase



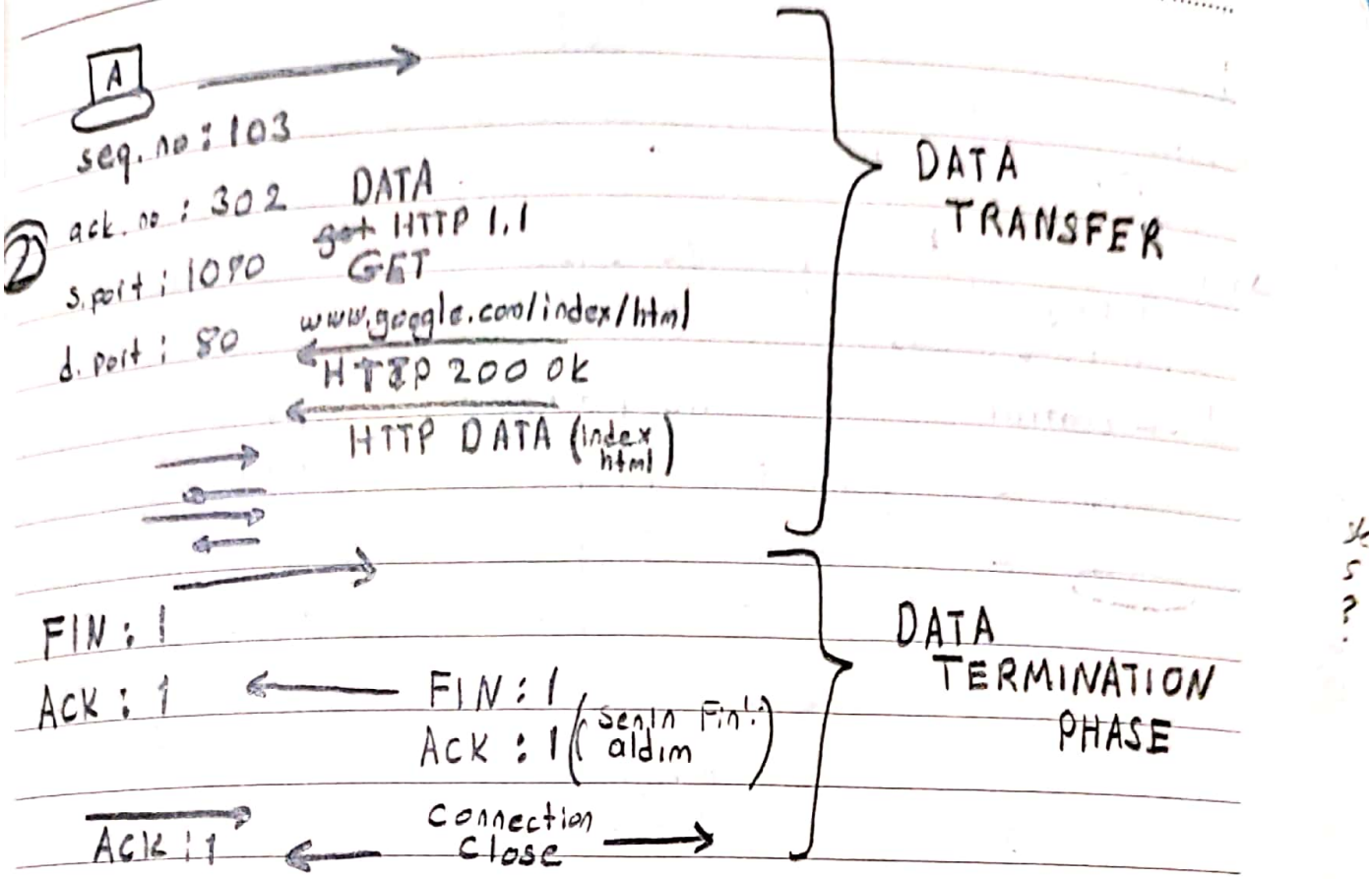
SYN 1
ACK: ∅
Initial Seq. number: 101
ack. number: -
S. port: 1090
D. Port: 80

2 (SYN, ACK)

SYN: 1
ACK: 1
Initiat seq. number: 301
ack. number: 102 (101 aldım 102 yolla)
S. Port: 80
D. Port: 1090

3 ACK

SYN: ∅
Ack: 1
~~Seq number 102~~
Ack number (302) 301 aldım 302 yolla
S. port: 1090
D. Port: 80



WIRESHARK

www.wireshark.org

PACKET TRACER

Cisco Net. Academy

netacad.com

Resources

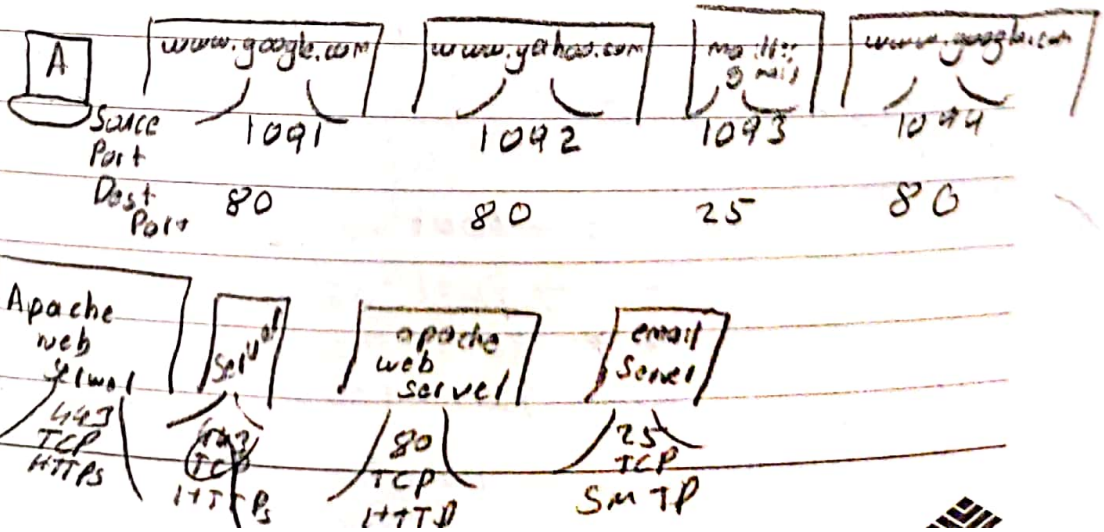
Port Numaraları

2 BYTE 2^{16} = 0-65535

Well Known port numbers : 0-1023

Registered port numbers : 1024-49151 (dynamic)

Dynamic Port Numbers : 49152-65535



TCP

→ connection-oriented
(3 way handshake)

→ reliable (güvenilir)
(eksik segmentleri yeniden iletir)
güvenilir ama yavaş

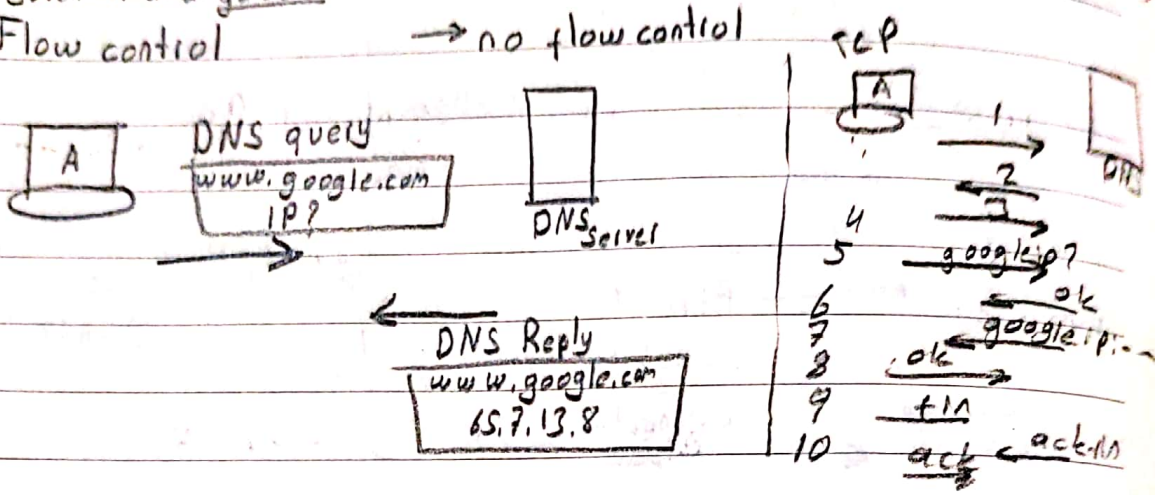
→ Flow control

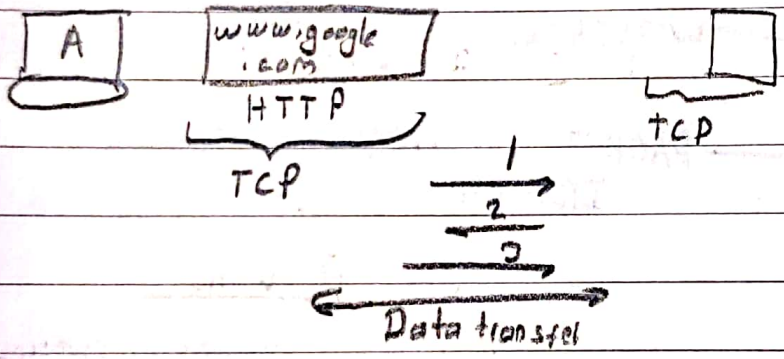
UDP

→ connectionless

→ unreliable
(hızlı)

→ no flow control





window size: 3000 BYTE

1000 0-1000
1000 1001-2000
1000 2001-3000

Acknum: 3001
window size: 3000 BYTE

3001-4000
4001-5000
5001-6000

Acknum 6001
wind. size: 5000 BYTE

6001-7000
7001-8000
~~8001-9000~~
9001-10000

Ack no: 8001
window size 1000

10.001-11.000

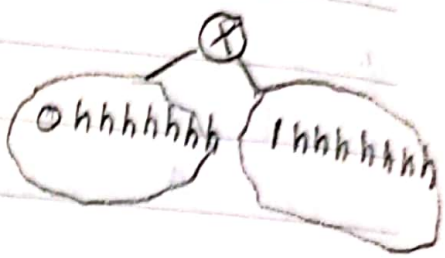
Ack no: 11,001
wind size 14000

Ripe ncc de

192.168.1.0/24
network host

1. Subnet . 0/n hhhhhhh /25

2. Subnet 1/n hhhhhhh /25



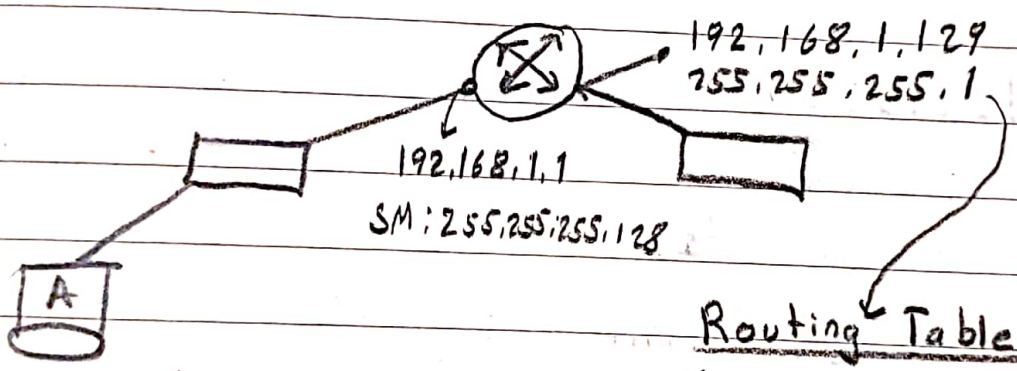
Network Adresi
1. subnet 192.168.1.0
2. subnet 192.168.1.128

Broadcast Adresi
192.168.1.127
192.168.1.255

Subnet Mask
255.255.255.128
255.255.255.128

Ip aralığı
1 → 192.168.1.(1-126)
2 → 192.168.1.(129-254)

0(1-126)127
128(129-254)255



IP: 192.168.1.80
SM: 255.255.255.128
DG: 192.168.1.1

Routing Table

Network Adresi	Interface
C 192.168.1.0/25	Fa0
C 192.168.1.128/25	Fa1

Network ADRESI
192.168.1.0/25

switch mac adresi port tıklama sonra port herzaman aynı ip dhcp aynı ipadresini verir.

IPV6 : 128 bit

0000 0
⋮
1001 9
1010 A
⋮
1111 F

2001 : 0DB8 : 0ABC : FBFB : BABA : BEBE : CC1E : 1B2C

16 bit hextit

2001 : 0DB8 : 0015 : 0000 : 0000 : 0000 : 00AB : 0012

2001 : DB8 : 15 : 0 : 0 : 0 : AB : 12

2001 : DB8 : 15 : : AB : 12

Application layer protocals

L7 APPLICATION
L6 Representation
L5 Session
} HTTP, HTTPS DNS SMTP POP3 IMAP DHCP, DNS, FTP

L4 Transport TCP UDP
L3 Network IP
L2 Data Link
L1 Physical Ethernet, PPP, HDLC, IEEE 802.11

rdp -> microsoft

APPLICATION LAYER

netstat -n

Nginx / Nginx

APPL → www.google.com son kullanıcı arayüzü sağlar

Presentation

Session

rfc dökümanlar http nin nasıl çalıştığı

post put -> form doldurduktan sonra

www.itu.edu.tr

ftp://ftp.itu.edu.tr ftp -> 21 port

dosya transferi başlarsa başka bir kanal açıyor.

http://160.75.3.25:8080

3389 -> uzaktan bağlantı protokolü

openSSL -> şifreleme

SMTP -> mail göndermek için

Imap -> Internet ~~Access Me~~ Media Access protocol - mail çekmek

POP -> Post Office Protocol

smtp -> outgoing mail server

imap -> incoming mail server

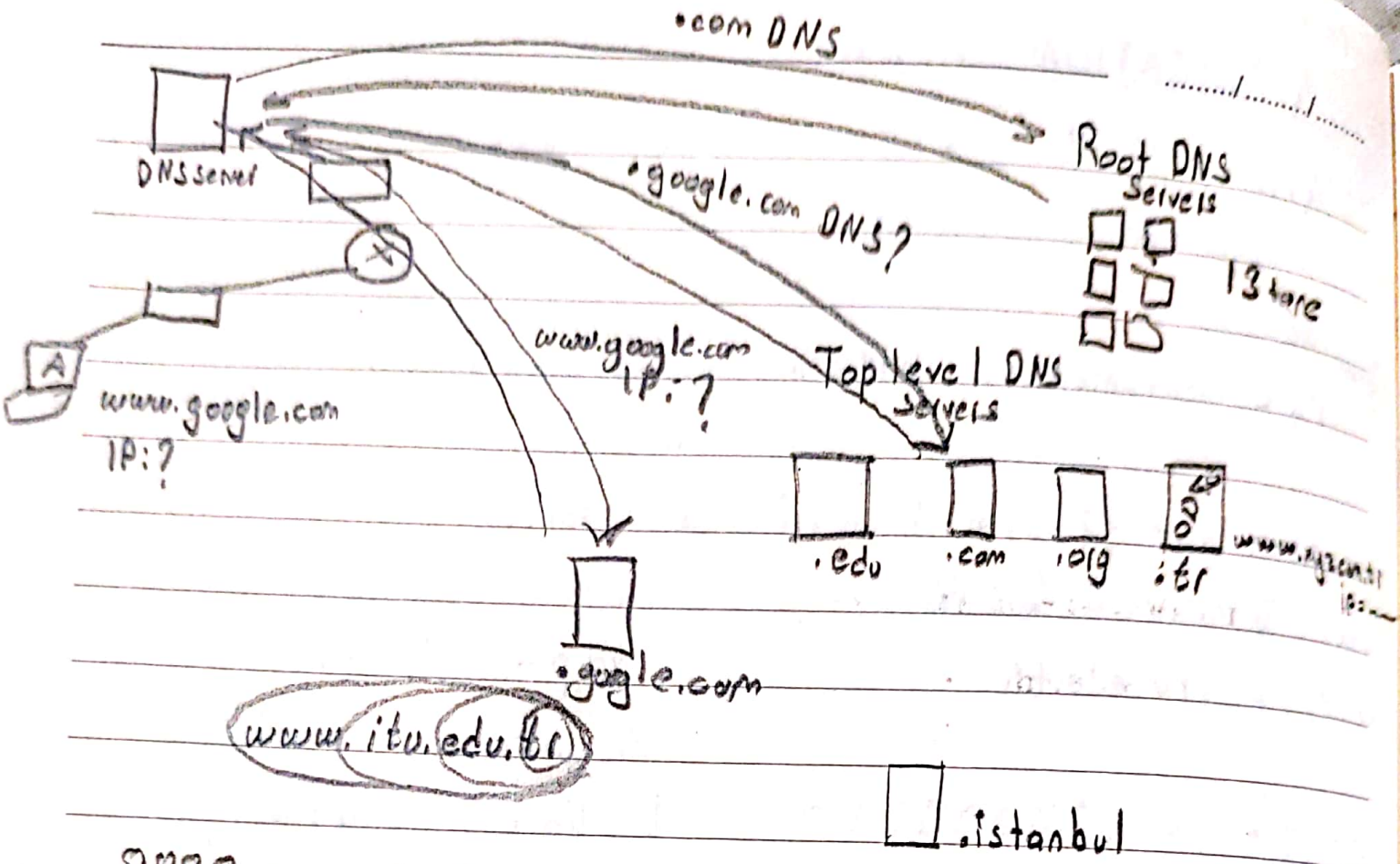
imap.gmail.com

smtp.gmail.com 25 -> spam gönderildiği için yasaklı durumunda

587 -> spam mailleri buradan gönderilmiyor

nslookup -> DNS sunucuları bilgisini gönderir.

> nslookup www.xyz.com -> site ipv4/v6 bilgisini verir.



8.8.8.8 → ayrı bir DNS sunucusuna sorar.

ADSL DNS i de öğreniyor modeme → DNS sunucusuna

DNS te başta sunucuları yasaklıyorlardı, sonrasında ip adreslerini yasaklamaya başladılar.

DHCP Discover

DHCP Offer

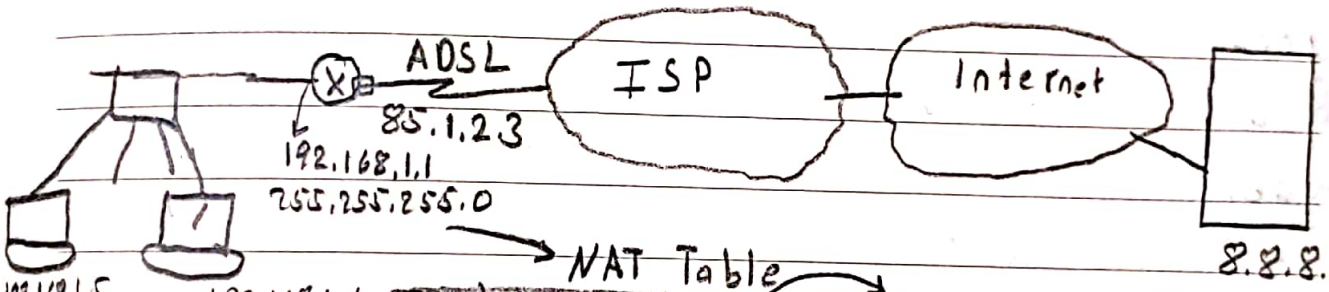
DHCP Request

DHCP Ack

ipconfig /all

ipconfig
ipconfig all

nslookup
netstat → açık portları görmek için
netstat -n
established → bağlantı kuruldu
close-wait → bağlantı kapamak üzere
Syn-sent → ilk bağlanma
time_wait → ?
127'lileri → kendi makinamızın portları loop back
ping ::1 → loop back



→ NAT Table

(source) inside local IP	Source IP	Dest ip
192.168.1.5:8001	85.1.2.3:8001	8.8.8.8:53 ←
192.168.1.5:3001	85.1.2.3:3001	26.2.8.12:80
192.168.1.6:5001	85.1.2.3:5001	26.2.8.12:80
192.168.1.7:5001	85.1.2.3:5001	26.2.8.12:80

natcihazları
85.1.2.3:5002 yapar

tek bir ip den 65k kişi bağlanabilir

hürriyet → 15 port harcıyor.

Network Address Translation

bu sebeple dışarıdan hiç kimse içerideki bir cihaza bir paket yollayamaz ipv6 ile bağlanabilir sonrasında güvenlik için firewall

router engelliyor broadcast paketleri

Log 1000 kişi 700 MB

Tekrar
PG cont 6. (www.gokhanakin.net)

emulator
simulator

DHCP Discover (Broadcast)

s. mac : mac A

d. mac : FF... FF

s. ip : 0.0.0.0

d. ip : 255.255.255.255

s. port : UDP 68

d. port : UDP 67

DHCP Request

DHCP Offer

s. mac : mac DHCP

d. mac : mac A

IP

SM

DG

DHCP Ack

DNS

lease 8 saat

Discover

Offer

Req.

Ack.

DHCP -> ip ~~dağıtmış~~

DHCP -> ip sürekli almak

DG -> bentin ip

DNS öğretme

> -> modlar

clock

2

93-35