BATCH : B107 **AWS DevOps**

LESSON : **Network**

DATE : 28.12.2022

SUBJECT : **IP Subnetting**

ZOOM GİRİŞLERİNİZİ LÜTFEN **LMS** SİSTEMİ ÜZERİNDEN YAPINIZ

Previous Session

- IP Address Blocks
- Network ID/Address
- Host ID/Address
- Subnet ID/Address
- Subnet Mask
- AND operation
- NAT

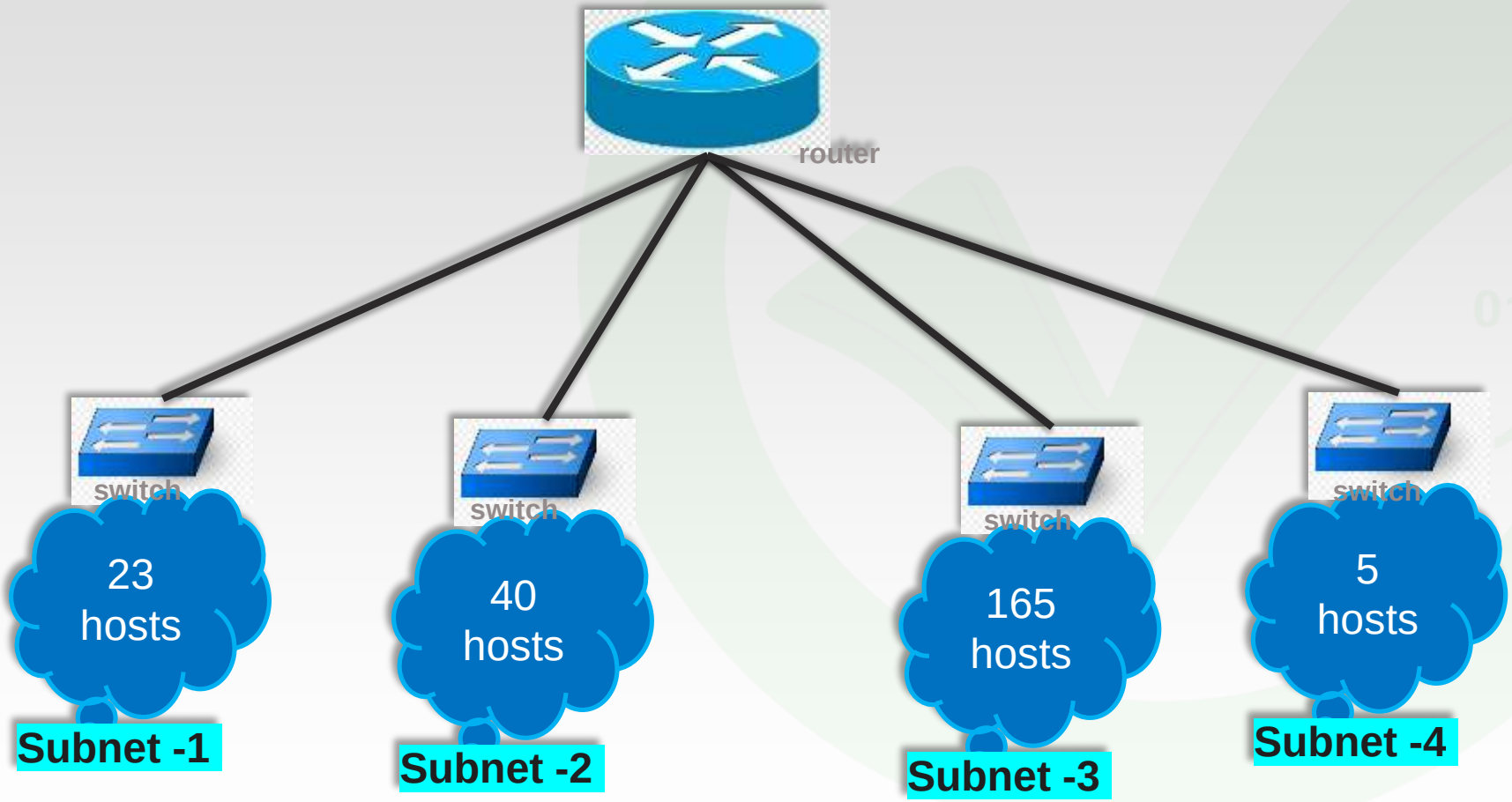
NETWORK Day 6

Contents

- IP Subnetting
- CIDR

What is IP Subnetting?

- A subnetwork or **subnet** is a logical subdivision of an **IP** network. The practice of dividing a network into two or more networks is called **subnetting**.



Why IP Subnetting?

- **Subnetting** helps to reduce the network traffic and conceals network complexity. This way, traffic doesn't have to flow through unnecessary routes, increasing network speeds.
- **Subnetting** is essential when a single network number has to be allocated over numerous segments of a local area network (LAN).
- **Subnets** were initially designed for solving the shortage of IP addresses over the Internet.
- **Routers** are used to communicate between subnets.
- **Routers** use **subnet IDs** to route traffic.

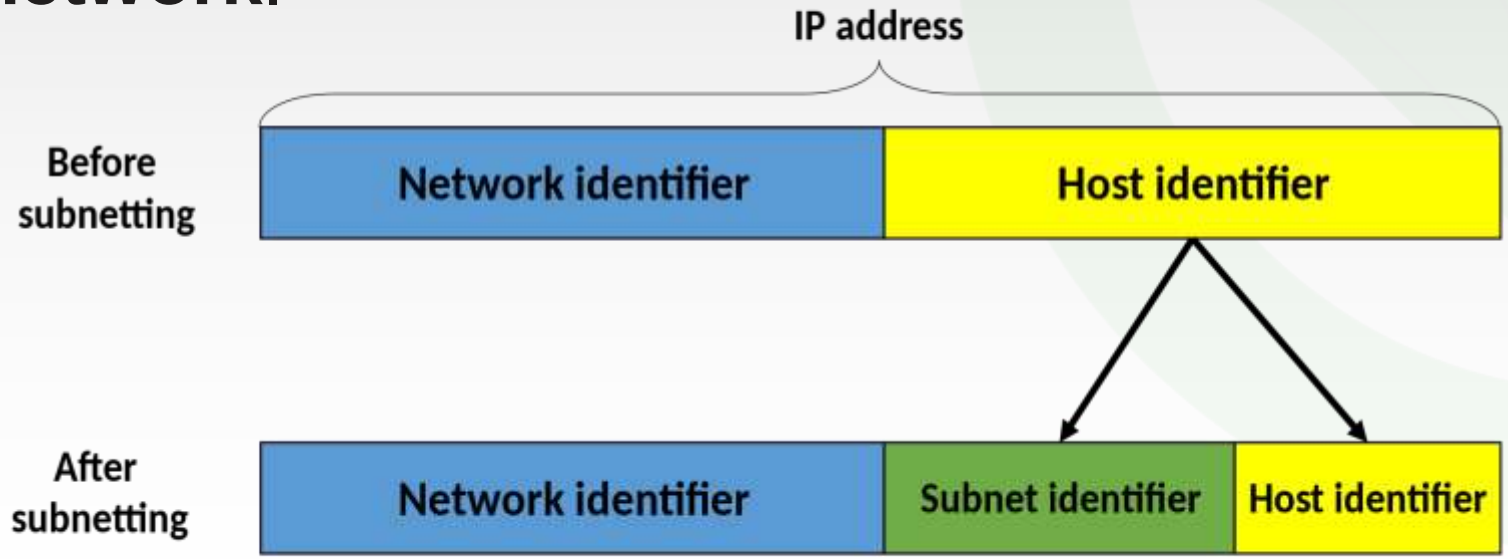
How does it work?

- A subnet mask is used to identify the part of the address that should be used as the Subnet ID. The subnet mask is applied to the full network address using a binary AND operation. AND operations operate, assuming and output is “TRUE” only when both inputs are “TRUE”. Otherwise, the output is “FALSE” only when two bits are both 1.

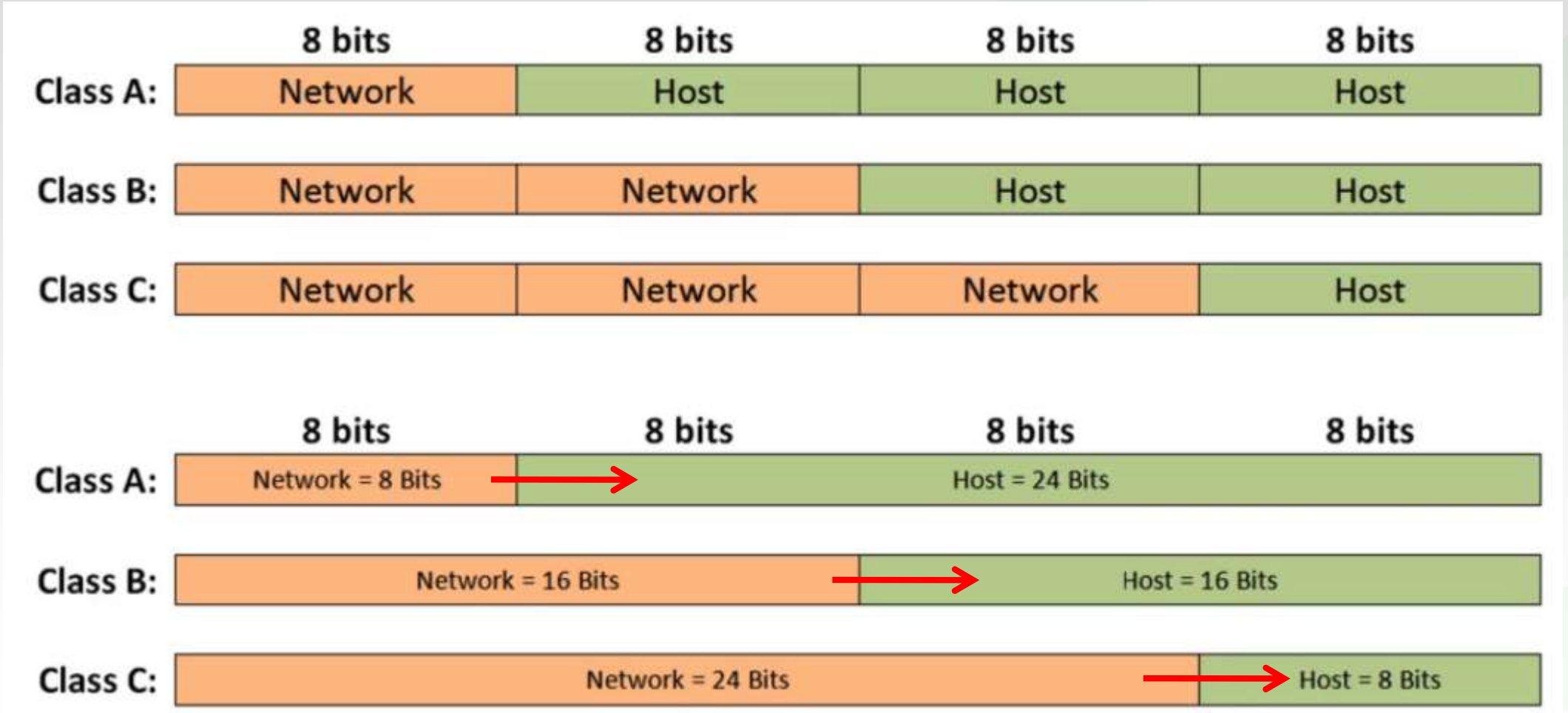
	128	64	32	16	8	4	2	1	128	64	32	16	8	4	2	1	128	64	32	16	8	4	2	1	128	64	32	16	8	4	2	1
IP Address	**172**								**16**								**2**								**15**							
IP Address	1	0	1	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	1	1
Subnet Mask	**255**								**255**								**255**								**0**							
	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Network Address	1	0	1	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0

How does it work?

- IP subnetting results in the logical division of an **IP** address into two fields: **the network number** or routing prefix and the rest field or **host identifier**.
- In subnetting we **borrow some bits from host-identifier** to use as **subnetwork**.

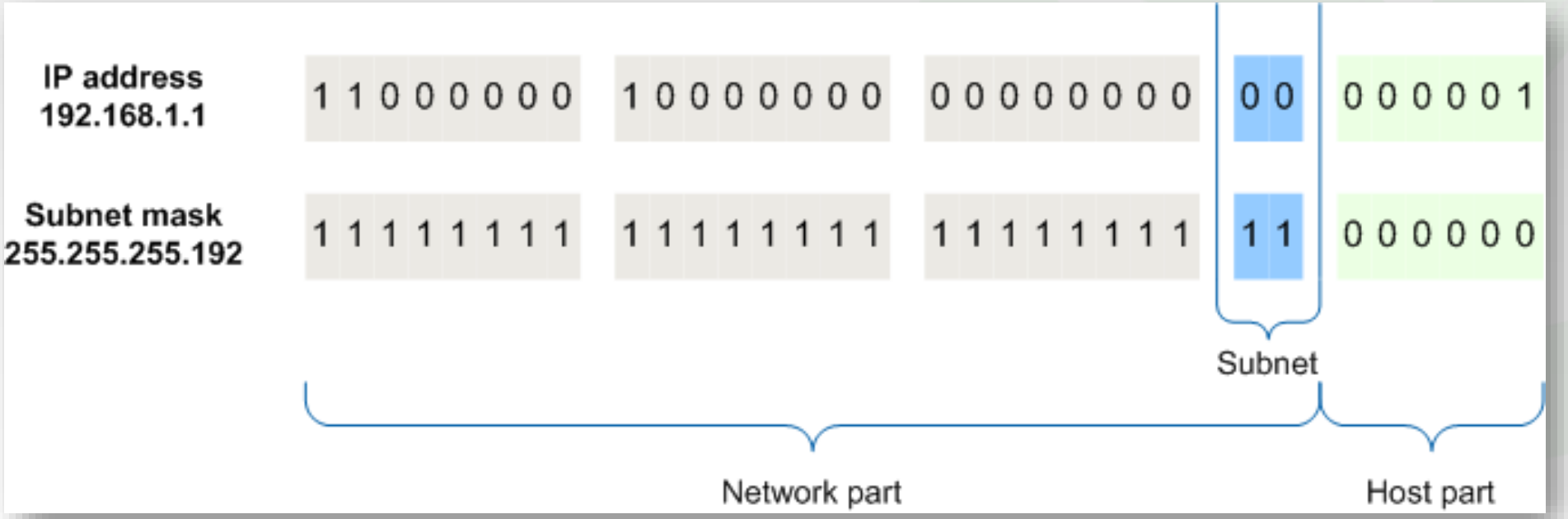


Subnetting IPv4 Adresses



Subnetting IPv4 Adresses

- A network created by Class A,B,C IP address can be divided into subnets by a system admin.
- It is done by borrowing bits from host part
- Borrowing 1 Host Bit makes $2^1=2$ subnets, borrowing 2 Host Bits makes $2^2=4$ subnets, etc.



Subnetting IPv4 Adresses

Binary (N.N.N.H)	Decimal	CIDR	# Subnets (2^x)	Block Size (2^y)	# Hosts (2^y - 2)
N.N.N.00000000	255.255.255.0	/24	$2^0 = 1$	$2^8 = 256$	$2^8 - 2 = 254$
N.N.N.10000000	255.255.255.128	/25	$2^1 = 2$	$2^7 = 128$	$2^7 - 2 = 126$
N.N.N.11000000	255.255.255.192	/26	$2^2 = 4$	$2^6 = 64$	$2^6 - 2 = 62$
N.N.N.11100000	255.255.255.224	/27	$2^3 = 8$	$2^5 = 32$	$2^5 - 2 = 30$
N.N.N.11110000	255.255.255.240	/28	$2^4 = 16$	$2^4 = 16$	$2^4 - 2 = 14$
N.N.N.11111000	255.255.255.248	/29	$2^5 = 32$	$2^3 = 8$	$2^3 - 2 = 6$
N.N.N.11111100	255.255.255.252	/30	$2^6 = 64$	$2^2 = 4$	$2^2 - 2 = 2$

Number of Subnets (2^x)

- X = number of host bits we borrow to create subnets

Block Size (2^y)

- Y = number of remaining host bits left that are used for the subnet IP addresses

Hosts per Subnet ($2^y - 2$)

- There are two addresses per network (or subnet) that we cannot use to assign to hosts on that network:
  - **Network Address**: This is the address used to uniquely identify the network (or subnet).
  - **Broadcast Address**: Address reserved for broadcast communication on the network.

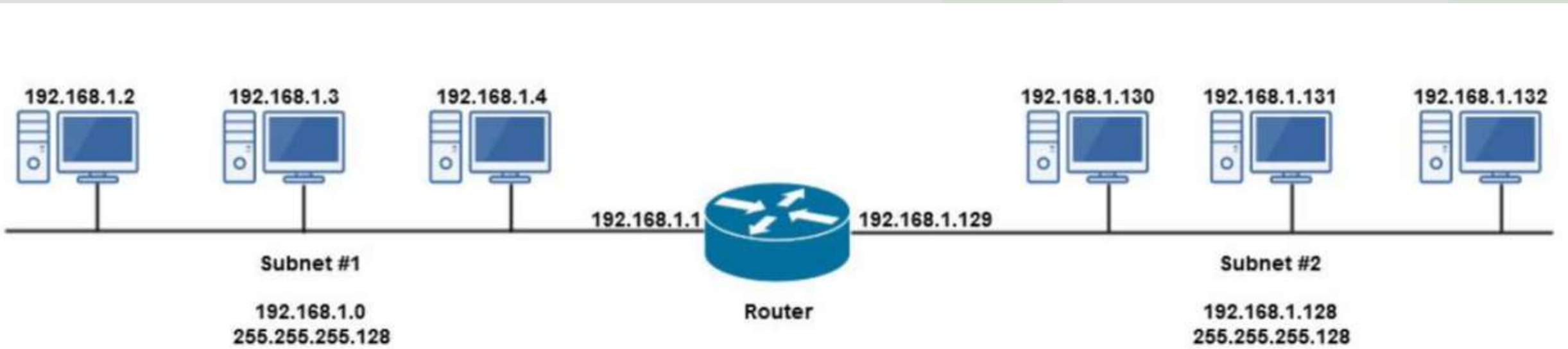
Subnetting IPv4 Adresses

- **Details & Requirements**
  - Network Address: 192.168.1.0
  - Default Subnet Mask: 255.255.255.0
  - Requires 2 Subnets
- **How many host bit do we need to borrow?**
  - 1 host bit, 2^1 = 2 Subnets
- **How many addresses hosts per subnet?**
  - 7 host bits left, 2^7 = 128 Addresses / Subnet
  - 2^7 - 2= 126 Addresses / Subnet
- **What are the valid subnets?**
  - 192.168.1.0 and 192.168.1.128
- **New Subnet Mask?**
  - 11111111.11111111.11111111.10000000
  - 255.255.255.128 or /25

Subnet	#1	#2
Network Address	192.168.1.	192.168.1.
First Host IP	192.168.1.	192.168.1.
Last Host IP	192.168.1.	192.168.1.
Broadcast Address	192.168.1.	192.168.1.

See Subnet Calculator

Subnetting IPv4 Adresses



Subnetting IPv4 Adresses

192.168.1.1 and Mask **255.255.255.192**

Broadcast address

➡ **192.168.1.63**

A Host/ip address

➡ **192.168.1.62**

Network address/id

➡ **192.168.1.0**

CIDR Classless Inter Domain Routing

IP address **192.168.1.0 and** Mask **255.255.255.0**

This IP address is in CIDR notation, which is a compact way of including the subnet mask along with the address. The /24 tells you that the first 24 bits of the IP address are used for network routing.

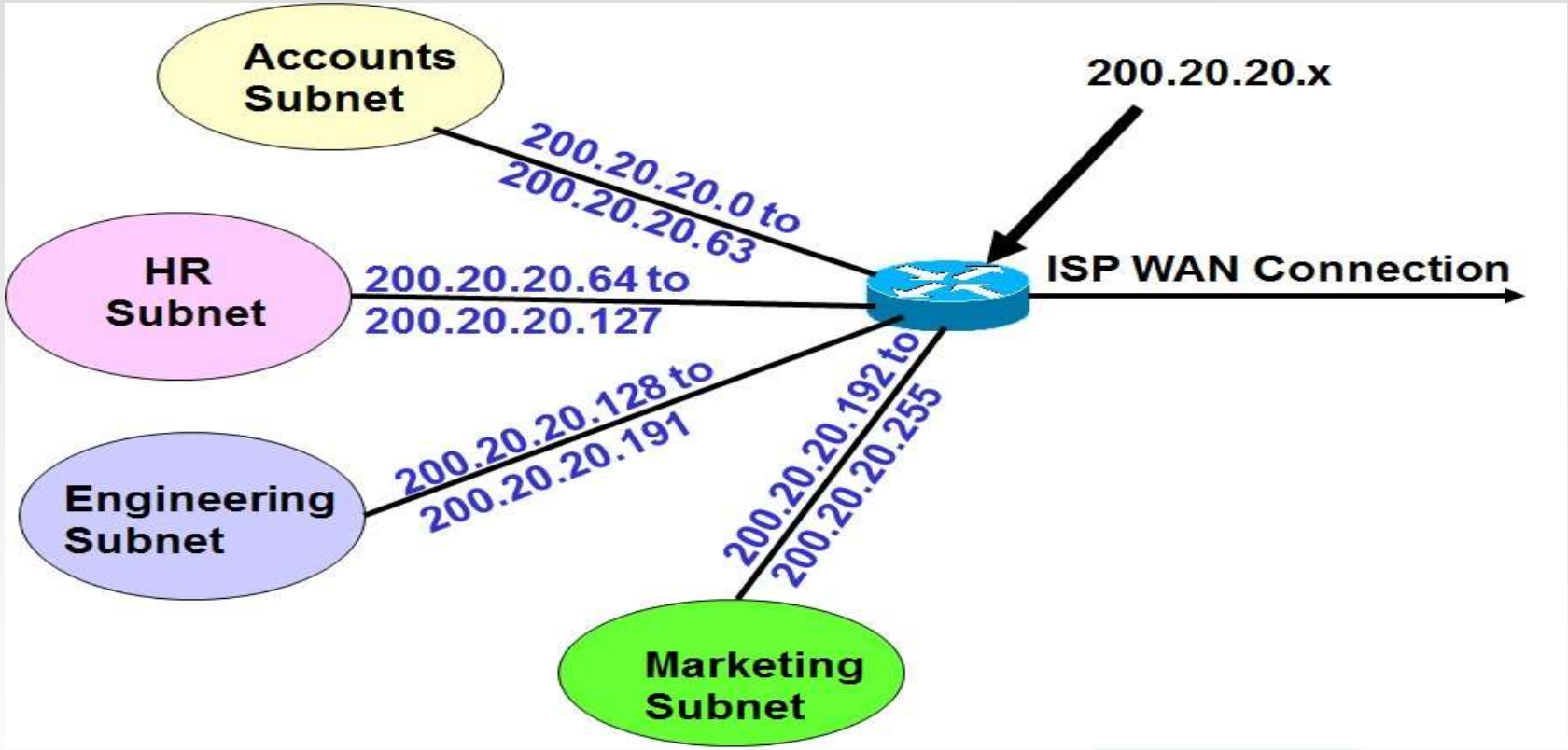
CIDR

Total number of Hosts: $2^{32-24}-2 = 254$

CIDR

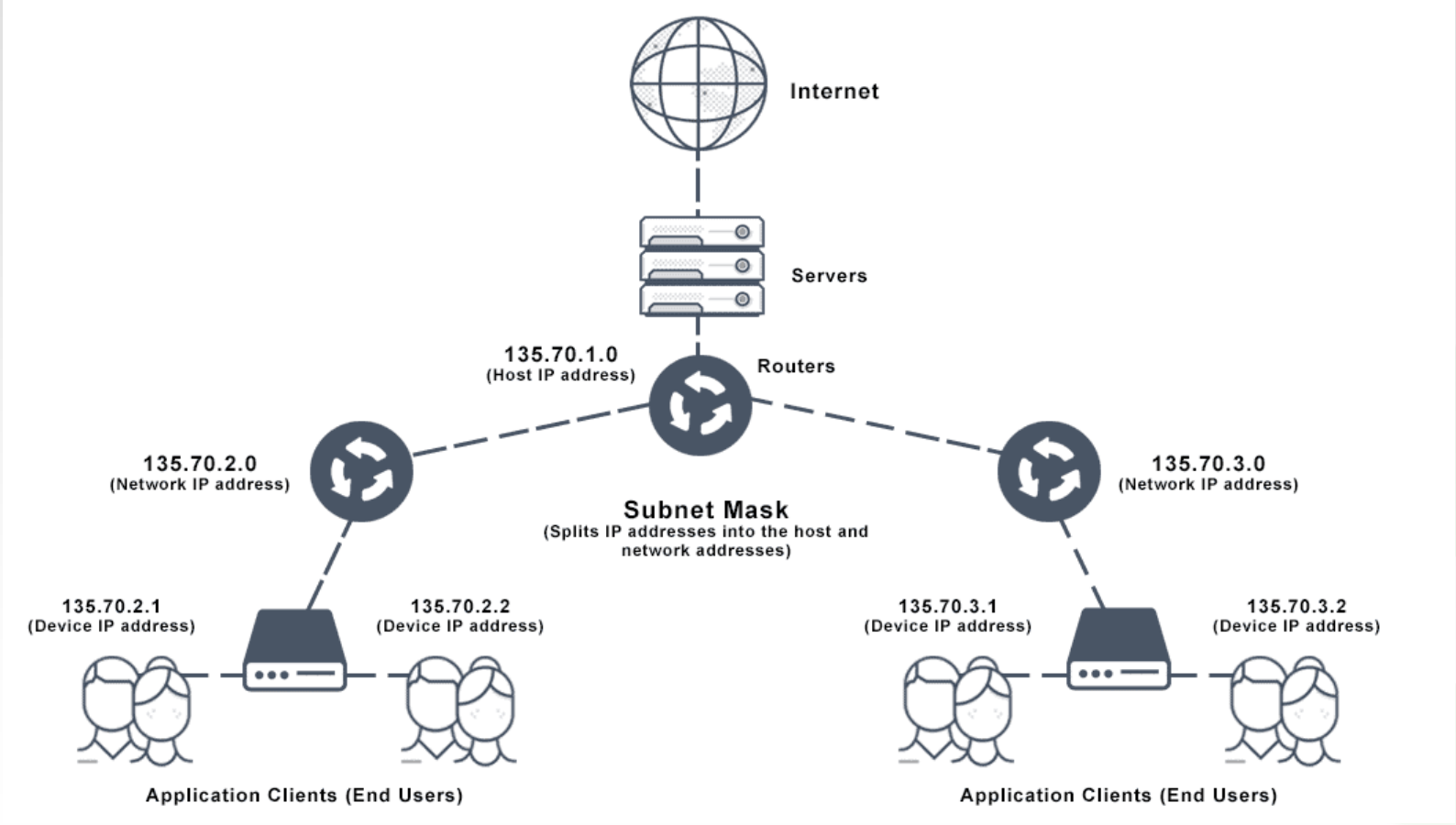
Total number of Hosts: $2^{32-23}-2 = 510$

Examples



- *A corporate network which has 4 subnets

Examples


Internet
Servers
135.70.1.0
(Host IP address)
Routers
135.70.2.0
(Network IP address)
135.70.3.0
(Network IP address)
Subnet Mask
(Splits IP addresses into the host and network addresses)
135.70.2.1
(Device IP address)
135.70.2.2
(Device IP address)
135.70.3.1
(Device IP address)
135.70.3.2
(Device IP address)
Application Clients (End Users)
Application Clients (End Users)

Examples

Private IP address space	
From	**To**
10.0.0.0	10.255.255.255
172.16.0.0	172.31.255.255
192.168.0.0	192.168.255.255

10.0.0.1
10.0.0.2

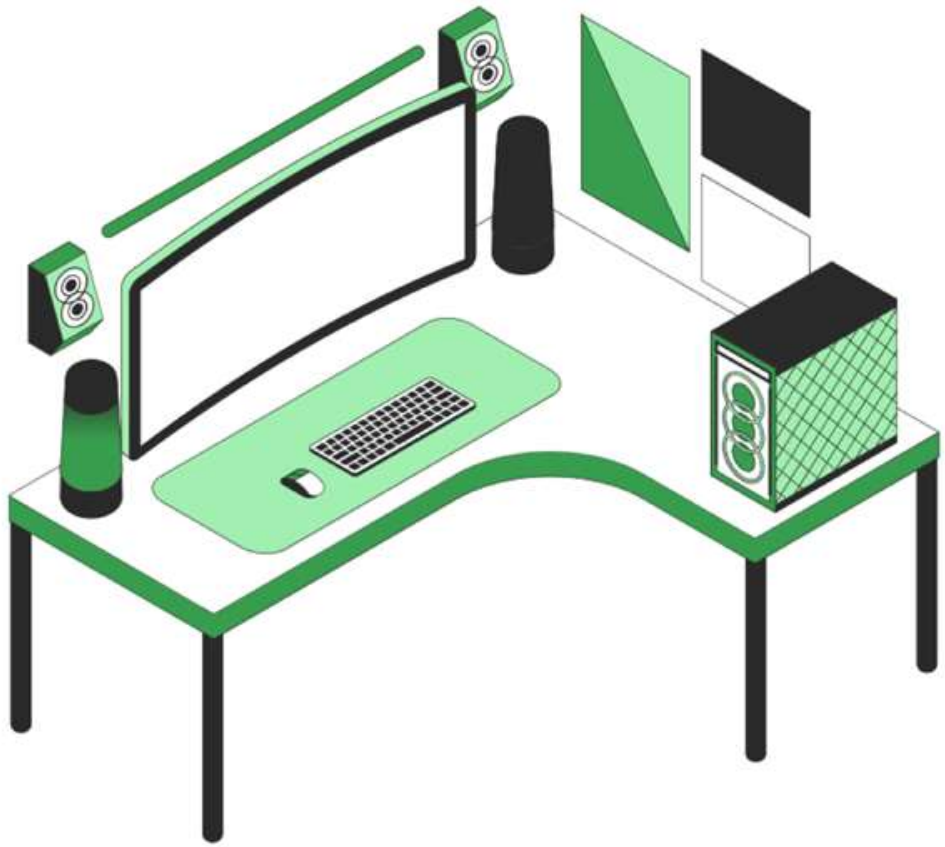
10.0.1.1
10.0.1.2

10.10.10.1
10.10.10.2

192.168.1.1
192.168.1.2

192.168.10.10
192.168.10.11

192.168.11.10
192.168.11.11



Do you have any questions?

Send it to us! We hope you learned something new.