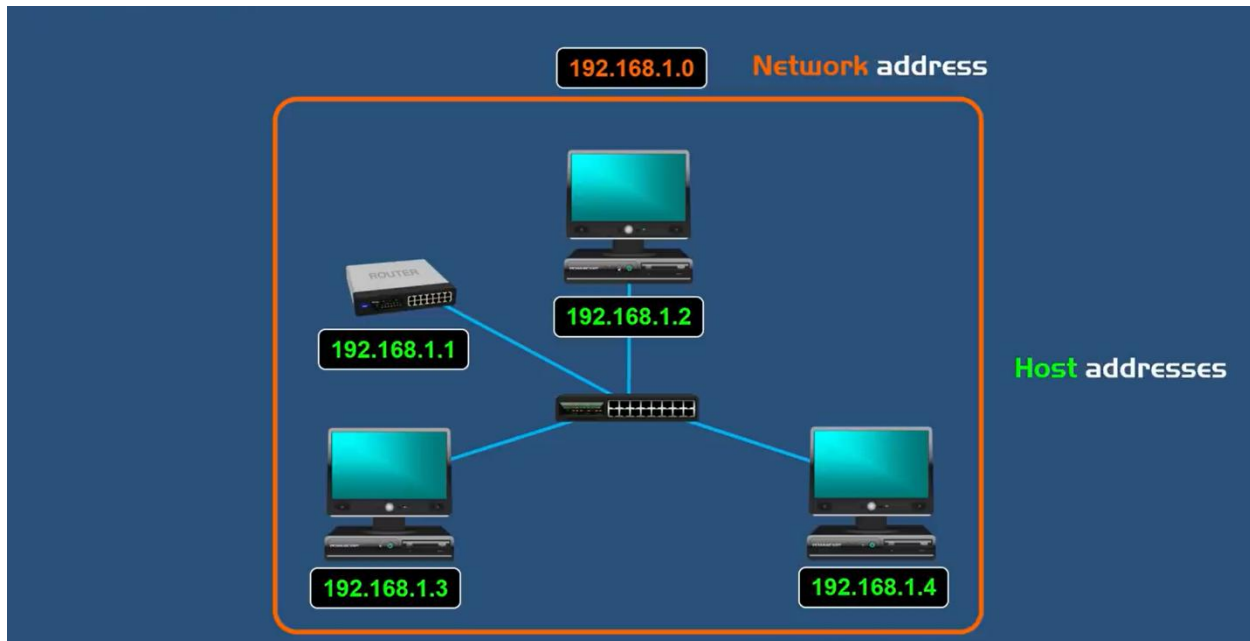


Subnet mask



192 . 168 . 1 . 0

An **IP address** consists of two parts.

Network address **Host address**

255 . 255 . 255 . 0

A **subnet mask** reveals how many bits in the IP address are used for the network by masking the **network** portion of the IP address.

IP address

192 . 168 . 1 . 0

11000000 . 10101000 . 00000001 . 00000000



Subnet mask

255 . 255 . 255 . 0

11111111 . 11111111 . 11111111 . 00000000



Binary numbers are made up of 1s and 0s.

8 Bit Octet Chart

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

If the number is a 1, then the number that it represents counts.

If the number is a 0, then the number that it represents does not count.

Binary numbers are made up of 1s and 0s.

8 Bit Octet Chart

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



$$128 + 64 = 192$$

192 . 168 . 1 . 0

Binary numbers are made up of 1s and 0s.

8 Bit Octet Chart

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

192 . 168 . 1 . 0

11000000 . 10101000

Binary numbers are made up of 1s and 0s.

8 Bit Octet Chart

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

0 0 0 0 0 0 0 1

$$1 = 1$$

192 . 168 . 1 . 0

11000000 . 10101000 . 00000001

8 Bit Octet Chart

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

0 0 0 0 0 0 0 0

$$0 = 0$$

192 . 168 . 1 . 0

→ 11000000 . 10101000 . 00000001 . 00000000

8 Bit Octet Chart

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

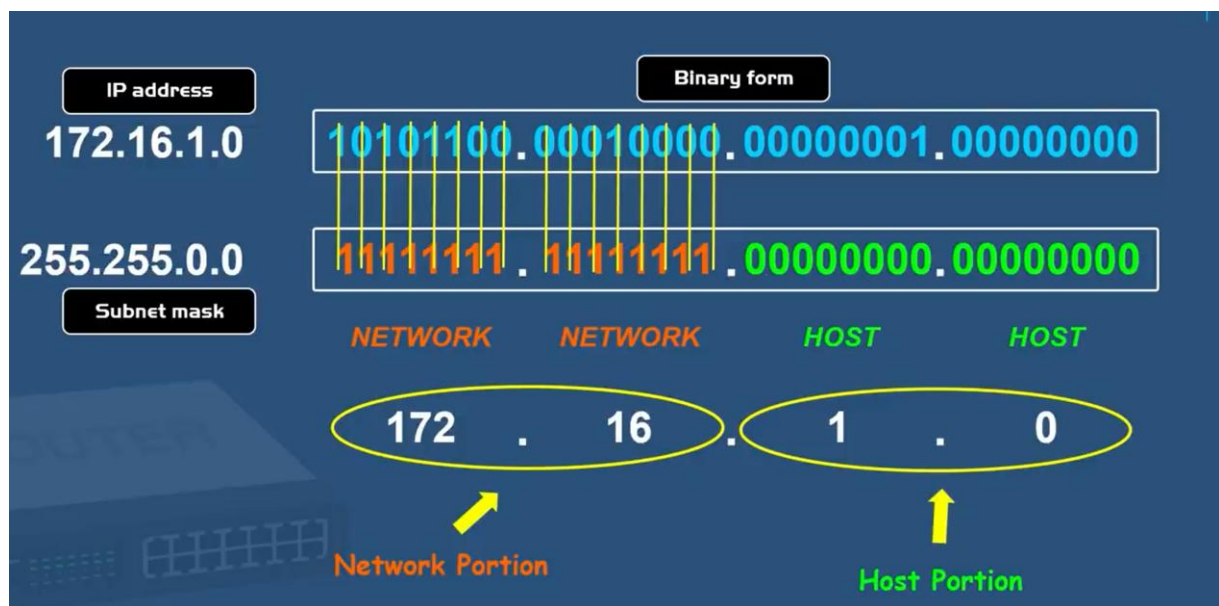
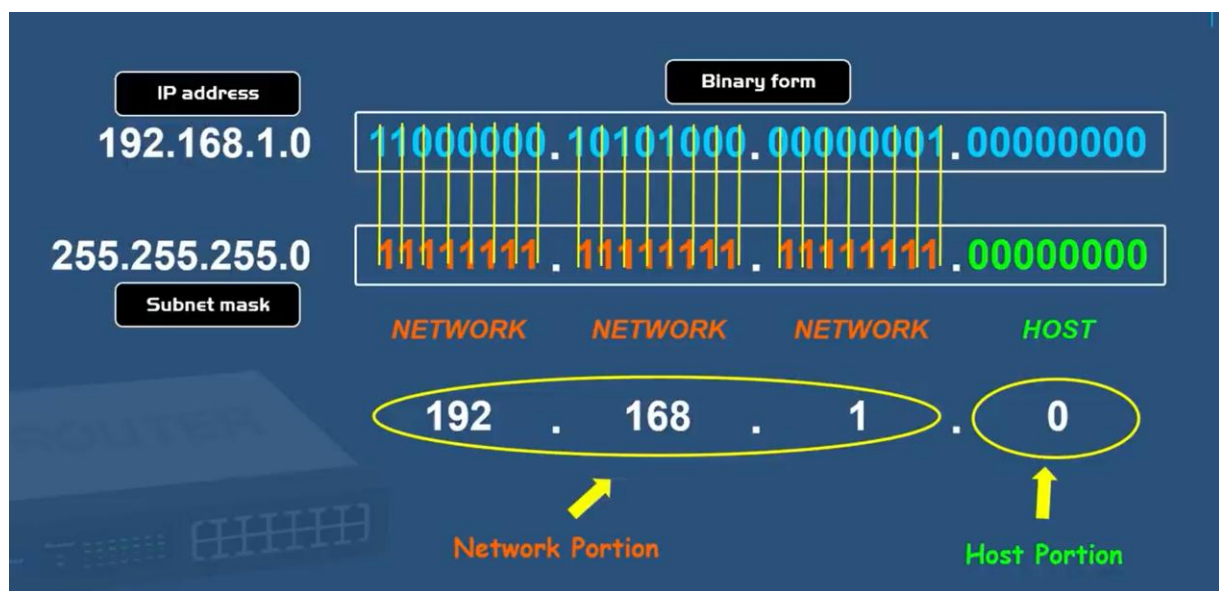
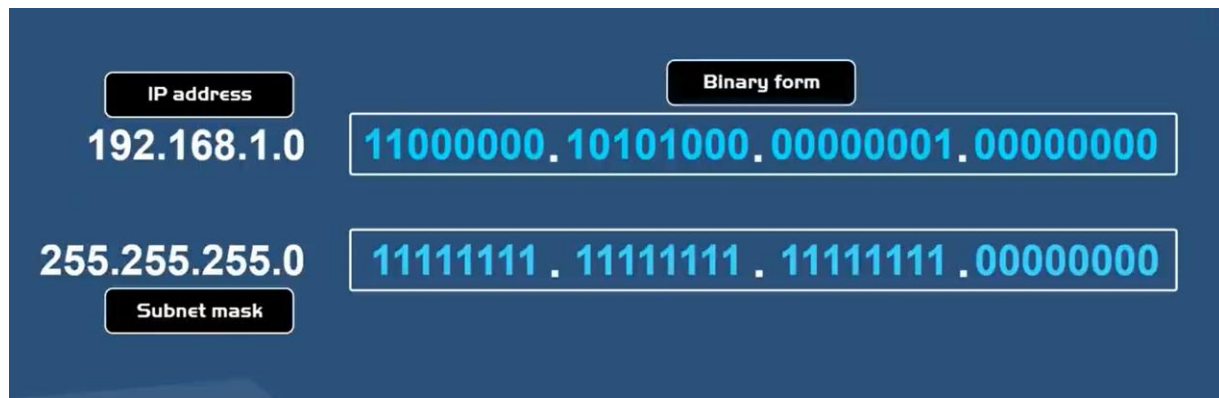
1 1 1 1 1 1 1 1

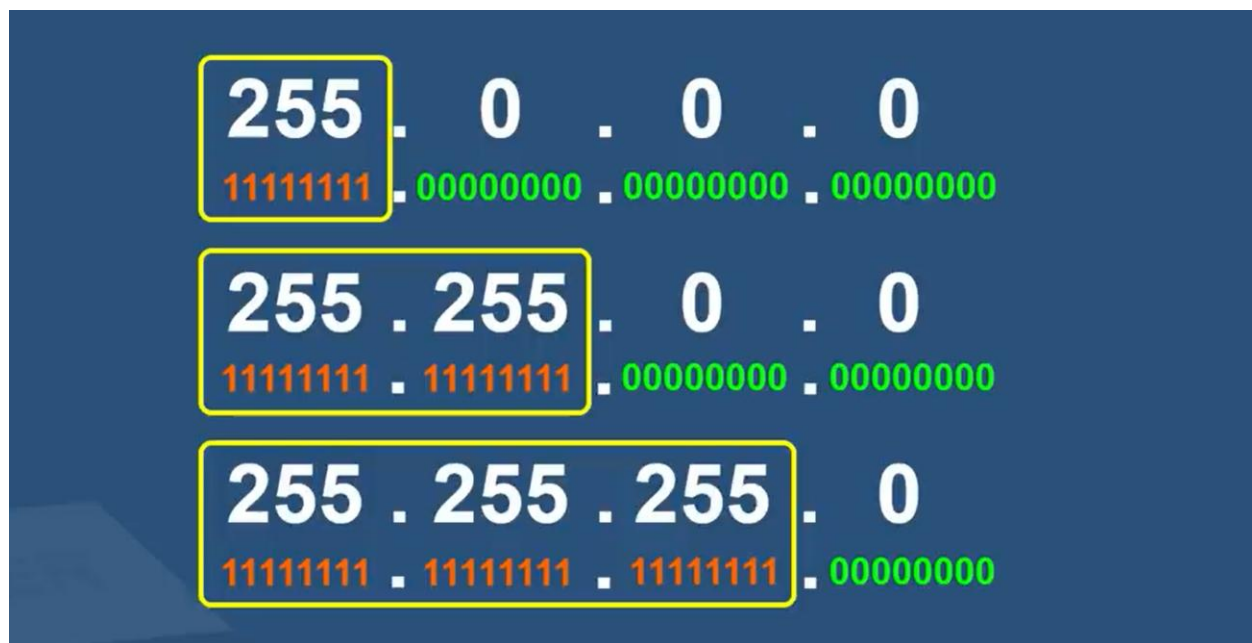
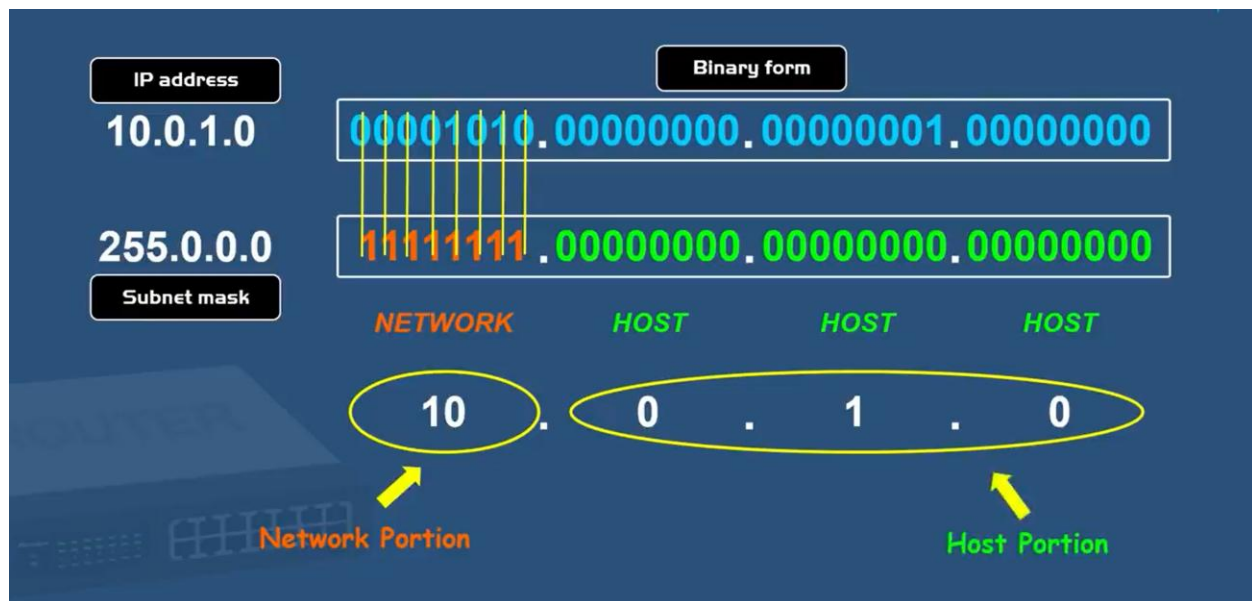
$$128 + 64 + 32 + 16 + 8 + 4 + 2 + 1 = 255$$

Subnet mask

255 . 255 . 255 . 0

11111111 . 11111111 . 11111111 . 00000000





255 . 0 . 0 . 0

11111111 . 00000000 . 00000000 . 00000000

255 . 255 . 0 . 0

11111111 . 11111111 . 00000000 . 00000000

255 . 255 . 255 . 0

11111111 . 11111111 . 11111111 . 00000000



255 . 255 . 224 . 0

11111111 . 11111111 . 11100000 . 00000000

8 Bit Octet Chart

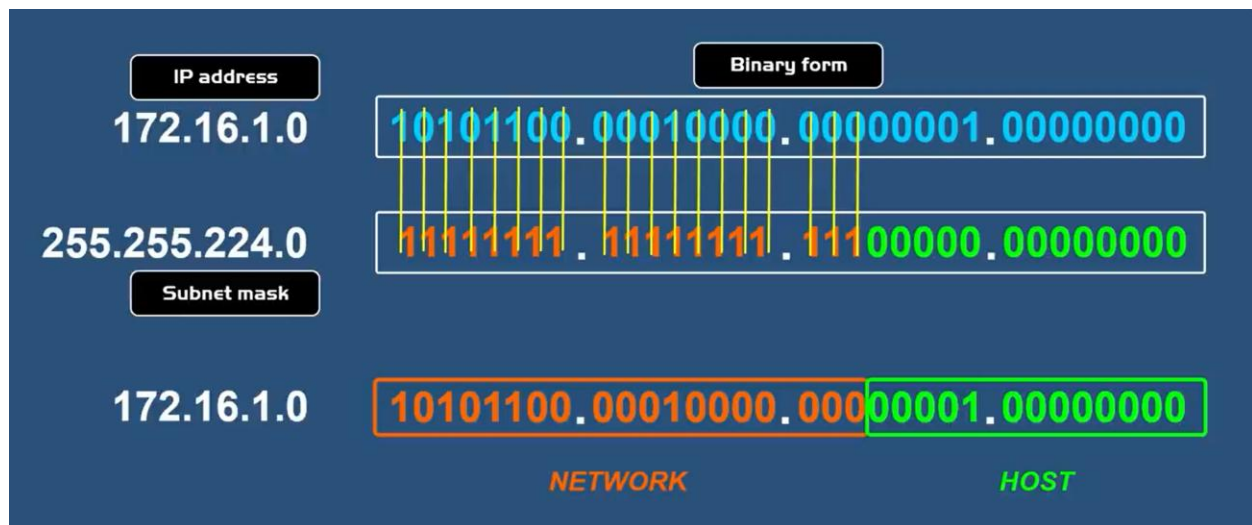
128	64	32	16	8	4	2	1
-----	----	----	----	---	---	---	---

1 1 1 0 0 0 0 0

$$128 + 64 + 32 = 224$$

255 . 255 . 224 . 0

11111111 . 11111111 . 11100000 . 00000000



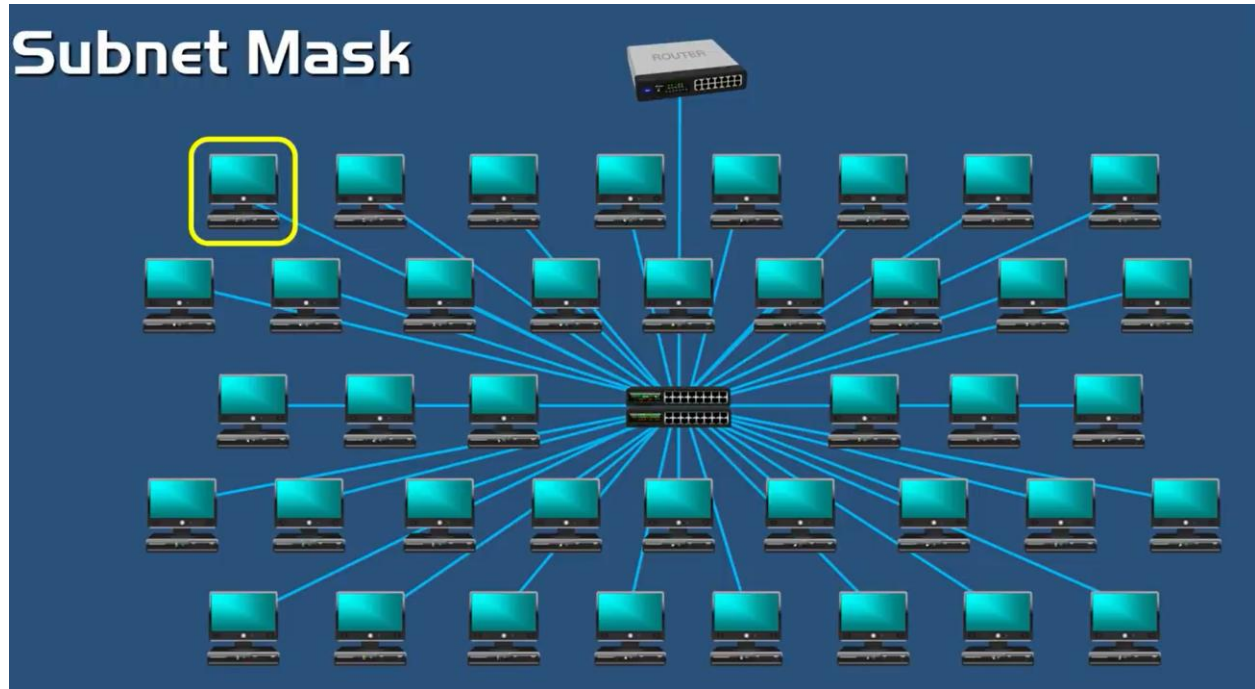
192 . 168 . 1 . 0

An **IP address** consists of two parts.

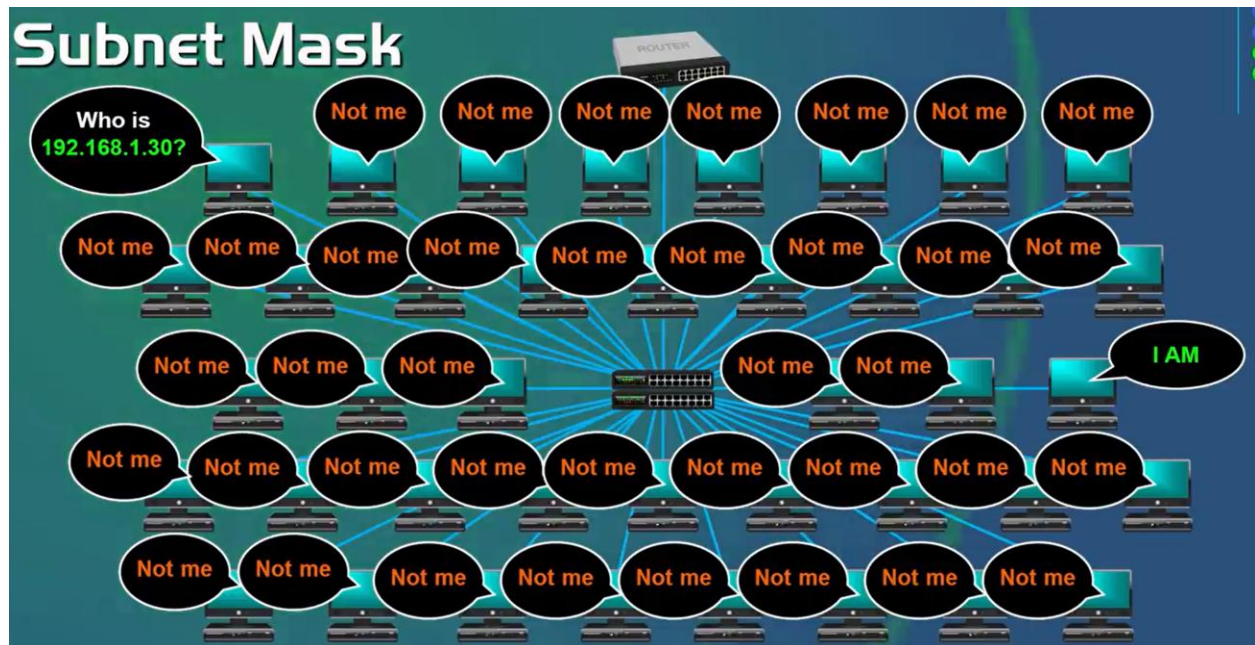
Network address **Host** address

Why does an IP address have a network and a host part?

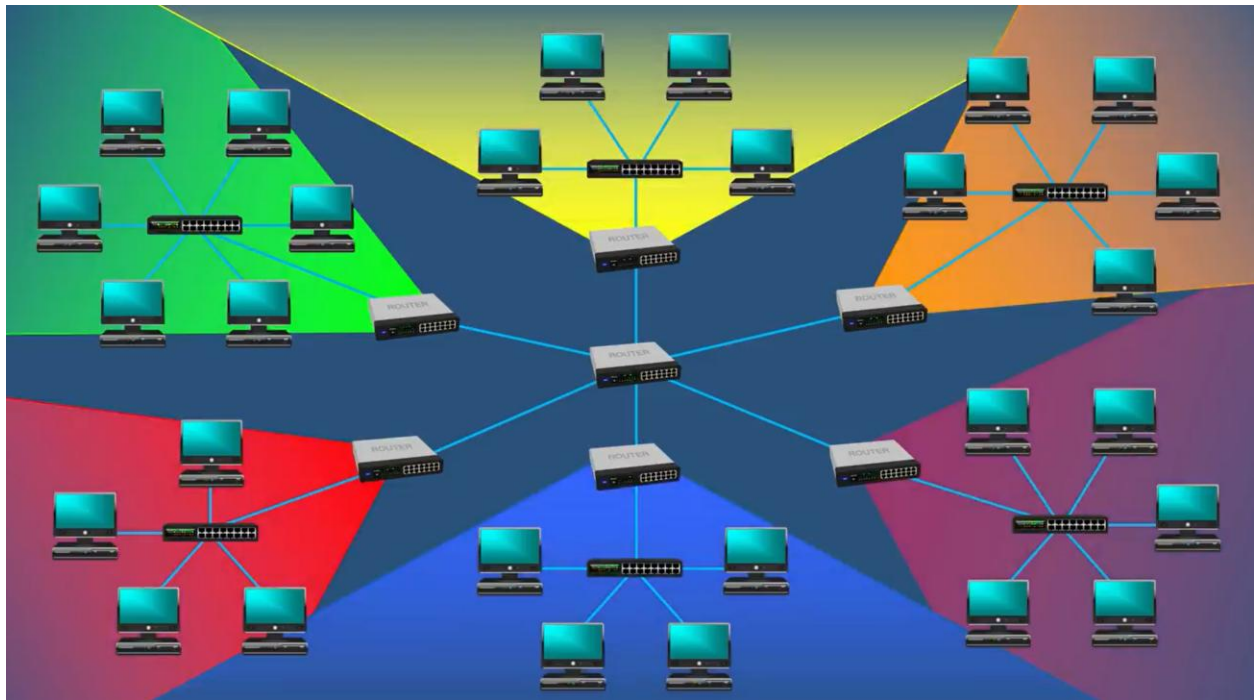
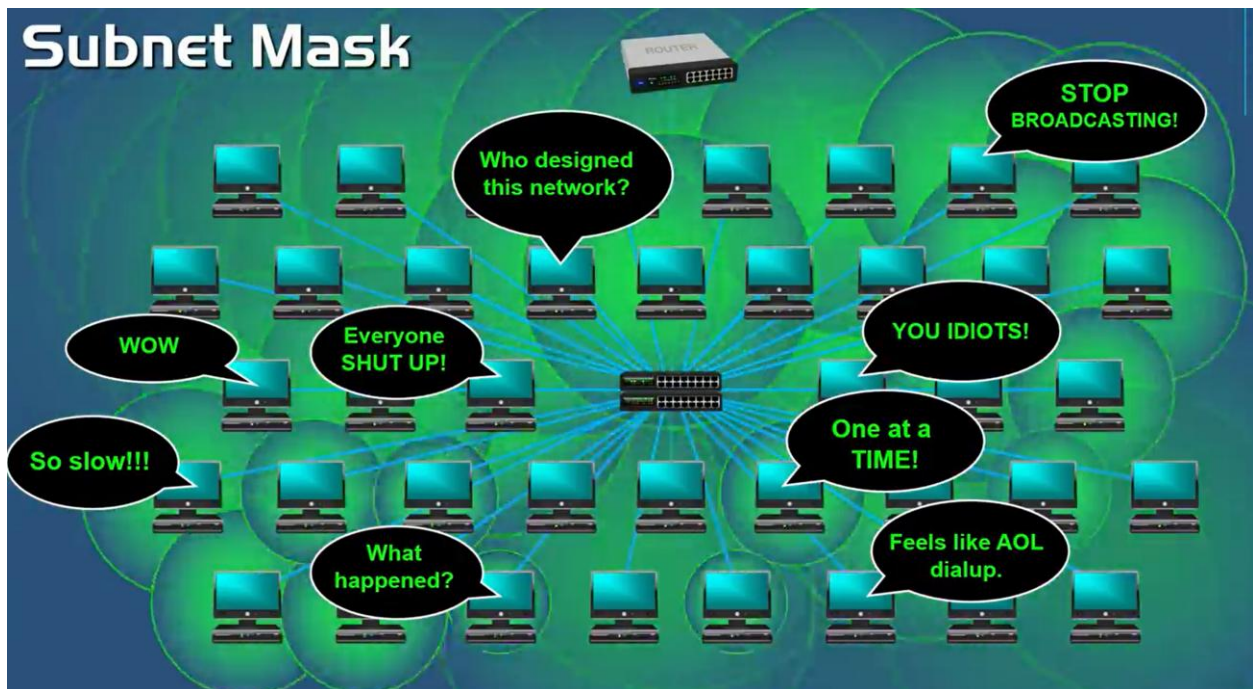
Subnet Mask



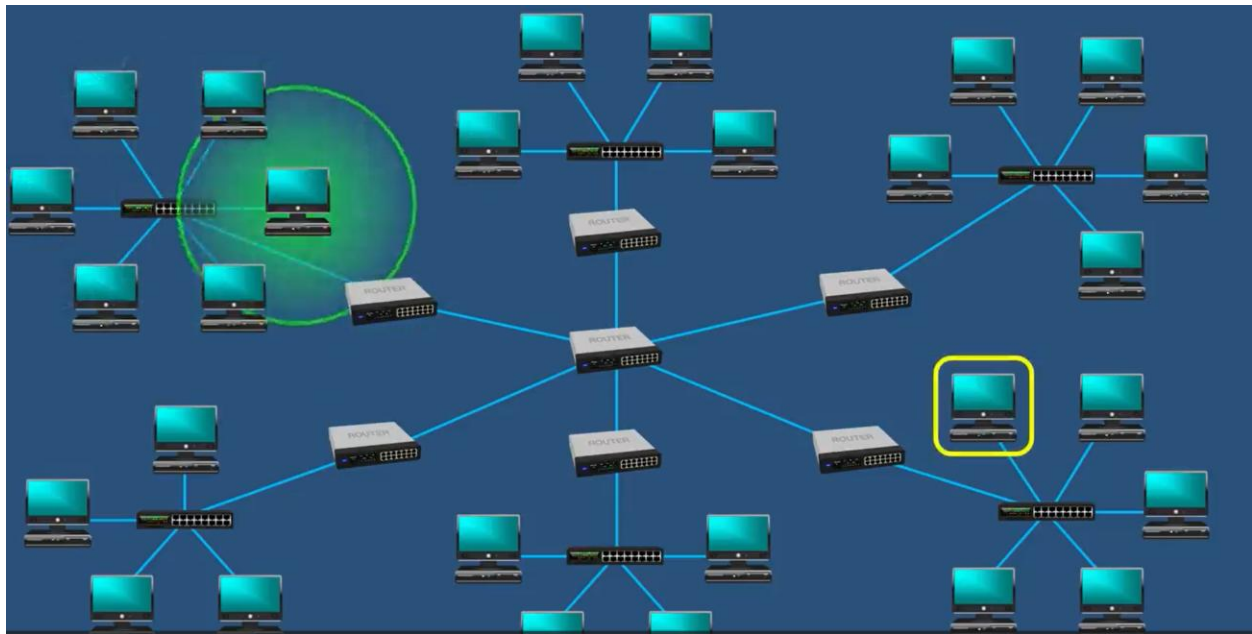
Subnet Mask



Subnet Mask



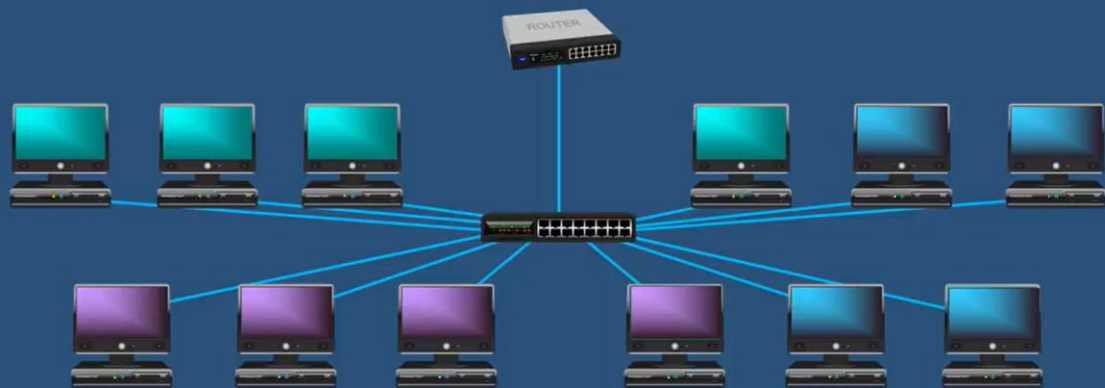
Broadcast only do it on the network it will not cross the router.



Subnet Mask

IP address 192.168.1.0

Subnet mask 255.255.255.0



Subnet mask

255.255.255.0 11111111 . 11111111 . 11111111 . 00000000

Subnetting is done by changing the default subnet mask by borrowing some of the bits from the host portion.

Subnet mask

255.255.255.0

11111111 . 11111111 . 11111111 . 00000000

1 network with 256 hosts

- Subnets

- $2^{\text{\# of subnet bits}}$

- Valid Hosts

- $2^{\text{\# of host bits}} - 2$

network
Broadcast

Subnet mask

255.255.255.0

11111111 . 11111111 . 11111111 . 00000000

1 network with 254 hosts

Subnet mask

255.255.255.128

11111111 . 11111111 . 11111111 . 10000000

2 networks with 126 hosts

Subnet mask

255.255.255.192

11111111 . 11111111 . 11111111 . 11000000

4 networks with 62 hosts

Subnet mask

255.255.255.224

11111111 . 11111111 . 11111111 . 11100000

8 networks with 30 hosts

Subnet mask

255.255.255.240

11111111 . 11111111 . 11111111 . 11110000

16 networks with 14 hosts

Subnet mask

255.255.255.248

11111111 . 11111111 . 11111111 . 11111000

32 networks with 6 hosts

Subnet mask

255.255.255.252

11111111 . 11111111 . 11111111 . 11111100

64 networks with 2 hosts

Subnet mask

255.255.255.254

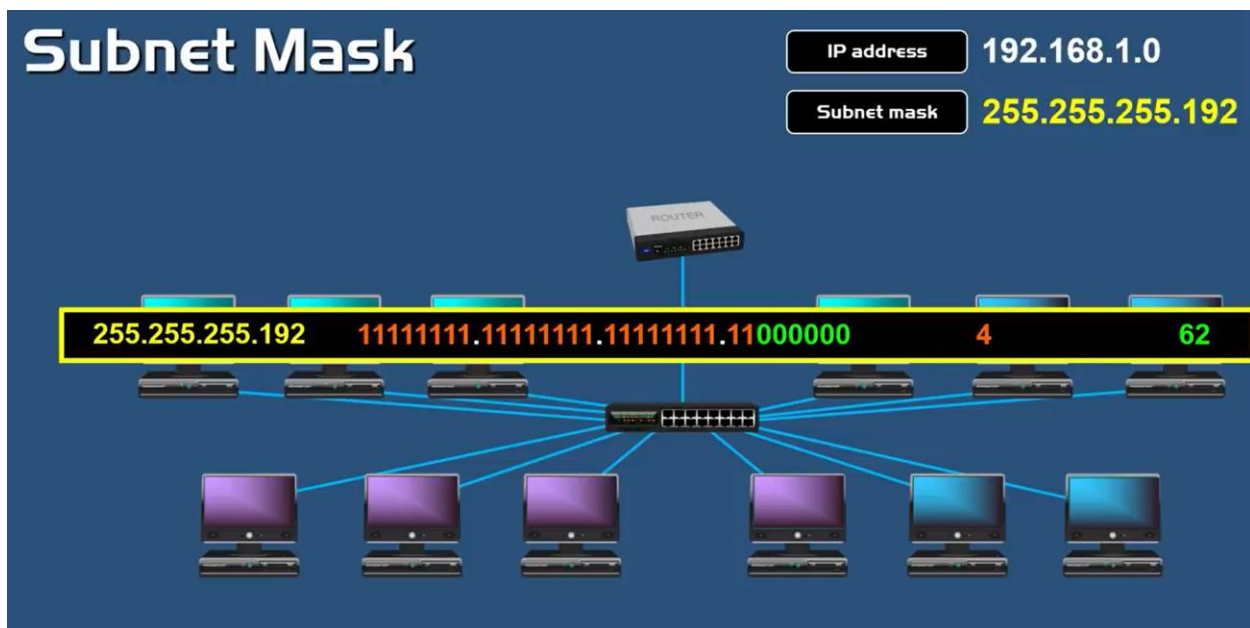
11111111 . 11111111 . 11111111 . 11111110

128 networks with 0 hosts

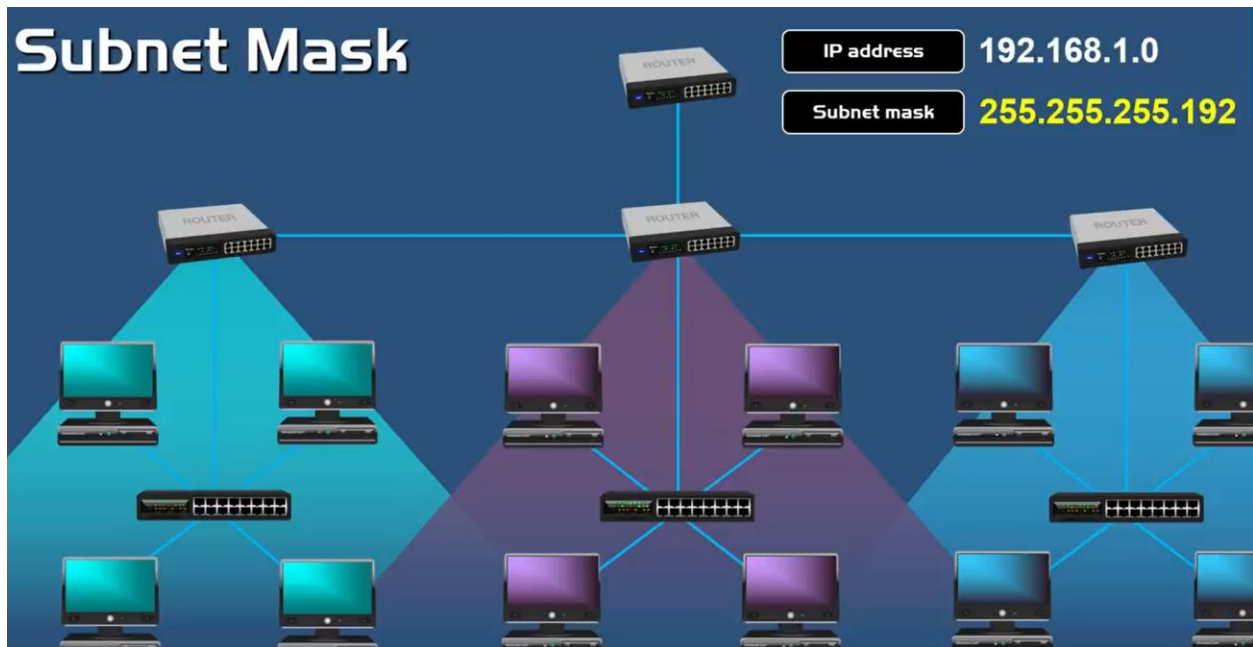


Subnet mask	Binary	Networks	Hosts
255.255.255.0	11111111.11111111.11111111.00000000	1	254
255.255.255.128	11111111.11111111.11111111.10000000	2	126
255.255.255.192	11111111.11111111.11111111.11000000	4	62
255.255.255.224	11111111.11111111.11111111.11100000	8	30
255.255.255.240	11111111.11111111.11111111.11110000	16	14
255.255.255.248	11111111.11111111.11111111.11111000	32	6
255.255.255.252	11111111.11111111.11111111.11111100	64	2
255.255.255.254	11111111.11111111.11111111.11111110	128	0

Subnet mask	Binary	Networks	Hosts
255.255.255.0	11111111.11111111.11111111.00000000	1	254
255.255.255.128	11111111.11111111.11111111.10000000	2	126
255.255.255.192	11111111.11111111.11111111.11000000	4	62
255.255.255.224	11111111.11111111.11111111.11100000	8	30
255.255.255.240	11111111.11111111.11111111.11110000	16	14
255.255.255.248	11111111.11111111.11111111.11111000	32	6
255.255.255.252	11111111.11111111.11111111.11111100	64	2
255.255.255.254	11111111.11111111.11111111.11111110	128	0



Subnet Mask



IP Class and range

Class	Starting Address	Ending Address	
<u>A</u>	0.0.0.0	127.255.255.255	} Host Addresses
<u>B</u>	128.0.0.0	191.255.255.255	
<u>C</u>	192.0.0.0	223.255.255.255	
<u>D</u>	224.0.0.0	239.255.255.255	} Multicast
<u>E</u>	240.0.0.0	255.255.255.255	} Experimental purposes

First octet determines the class

192.168.1.0 /24

255.255.255.0 **11111111 . 11111111 . 11111111 . 00000000**

Subnet mask

CIDR - Classless Inter-Domain Routing (slash notation)

192.168.1.0 /25

255.255.255.128 **11111111 . 11111111 . 11111111 . 10000000**

Subnet mask

/26

255.255.255.192 **11111111 . 11111111 . 11111111 . 11000000**

Subnet mask

/8

255.0.0.0 **11111111 . 00000000 . 00000000 . 00000000**

Subnet mask

IP class range

CLASS	FIRST OCTET ADDRESS	DEFAULT SUBNET MASK
A	1 – 126	255 . 0 . 0 . 0
B	128 – 191	255 . 255 . 0 . 0
C	192 – 223	255 . 255 . 255 . 0

192.168.1.0

255.255.255.240 (/28)

11111111.11111111.11111111.11110000

Network

- Is this a Class A, B, or C network?

• Subnets = $2^4 = (2 \times 2 \times 2 \times 2) = 16$

• Hosts = $2^4 = 16 - 2 = 14$

150.150.0.0

255.255.255.252 (/30)

11111111.11111111.11111111.11111100

Network

- Is this a Class A, B, or C network?

• Subnets = $2^{14} = 16,384$

• Hosts = $2^2 = 4 - 2 = 2$

Classless Inter-Domain Routing (CIDR) Website

<https://cidr.xyz/>

IP reserved in AWS VPC

The first four IP addresses and the last IP address in each subnet CIDR block are not available for your use, and they cannot be assigned to a resource, such as an EC2 instance. For example, in a subnet with CIDR block 10.0.0.0/24, the following five IP addresses are reserved:

- 10.0.0.0: Network address.
- 10.0.0.1: Reserved by AWS for the VPC router.
- 10.0.0.2: Reserved by AWS. The IP address of the DNS server is the base of the VPC network range plus two. For VPCs with multiple CIDR blocks, the IP address of the DNS server is located in the primary CIDR. We also reserve the base of each subnet range plus two for all CIDR blocks in the VPC. For more information, see [Amazon DNS server](#).
- 10.0.0.3: Reserved by AWS for future use.
- 10.0.0.255: Network broadcast address. We do not support broadcast in a VPC, therefore we reserve this address.