Computer Networks

Spring 2025

CS6.201 – Introduction to Software Systems

184.19.243
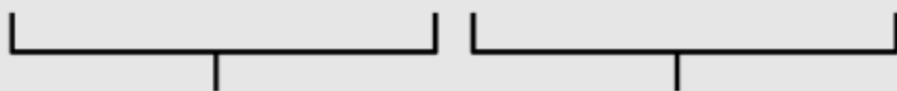
184.19.243.1   184.19.243.2   184.19.243.3   184.19.243.4
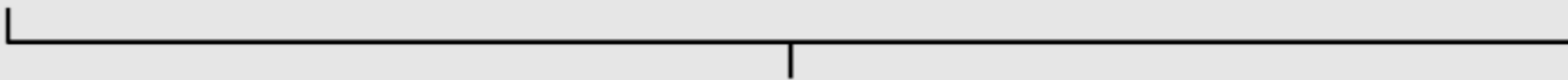
172 . 16 . 254 . 1
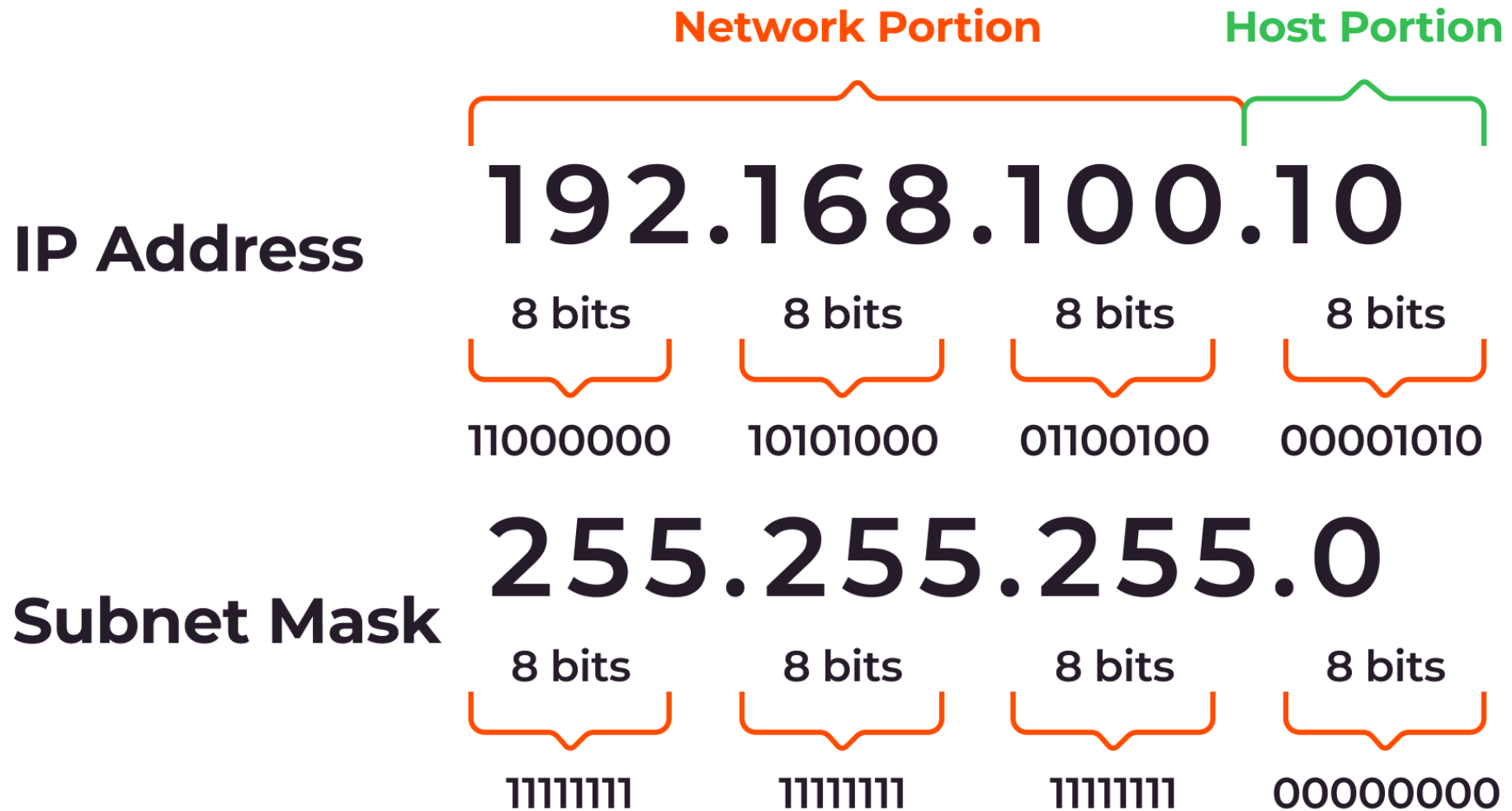
10101100.00010000.11111110.00000001
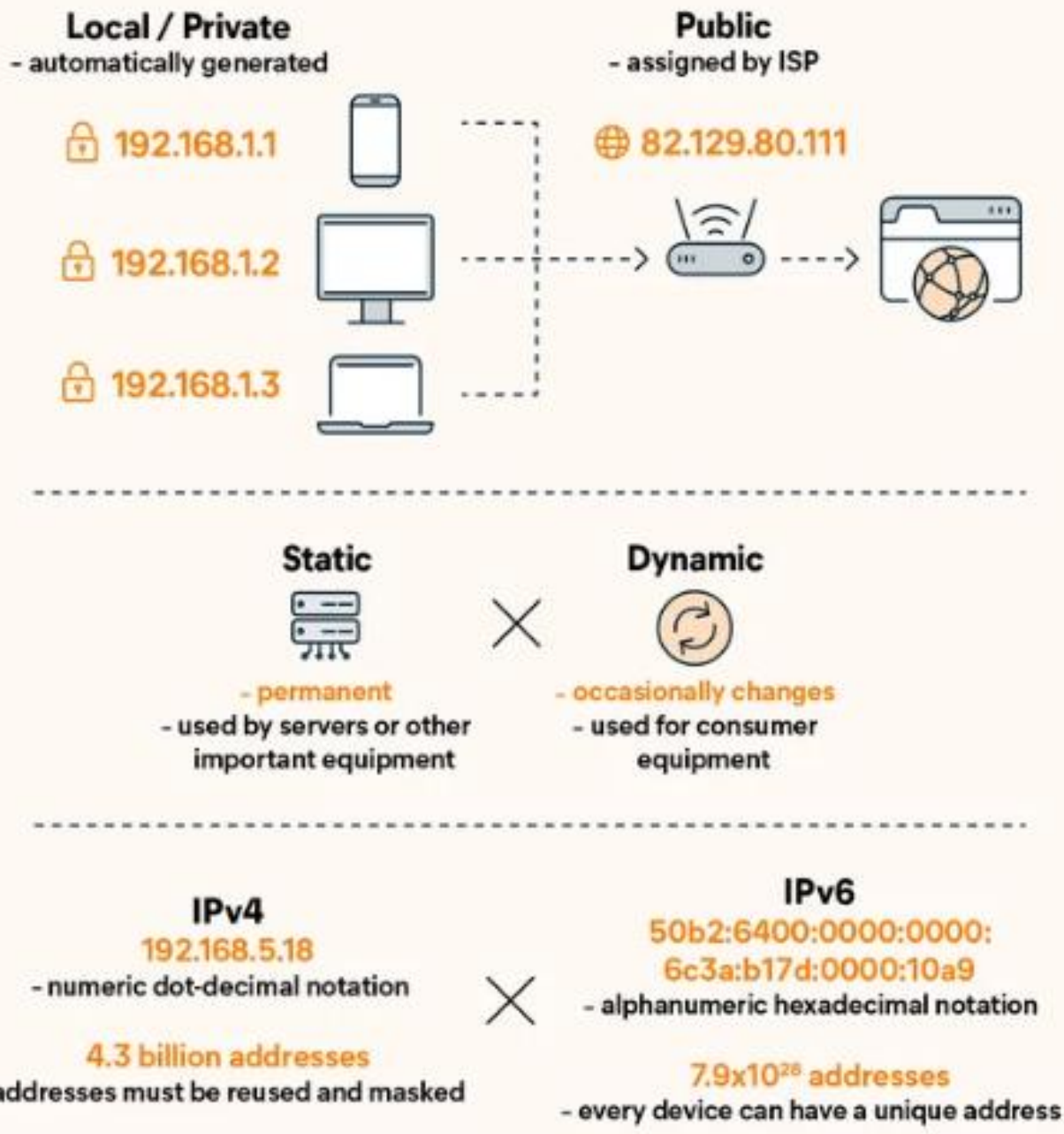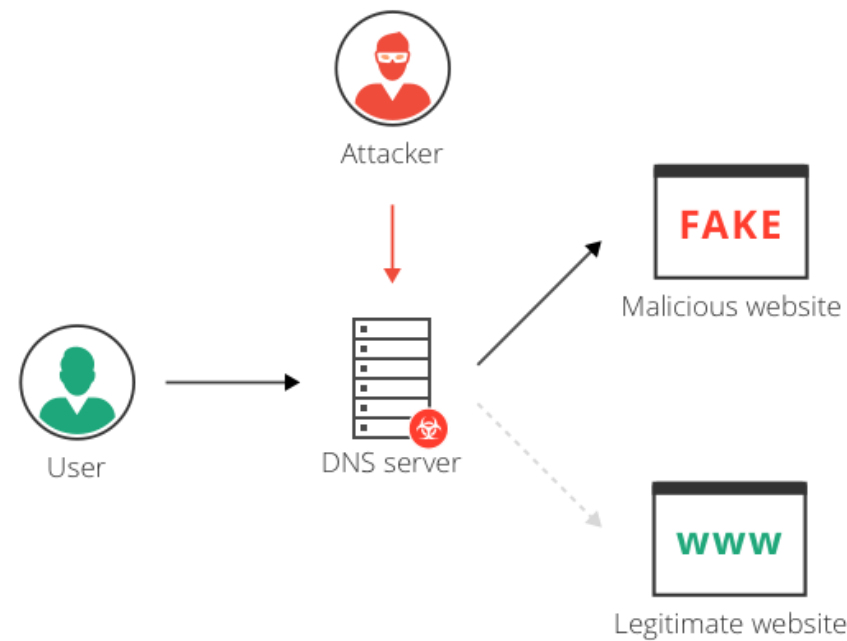
8 bits

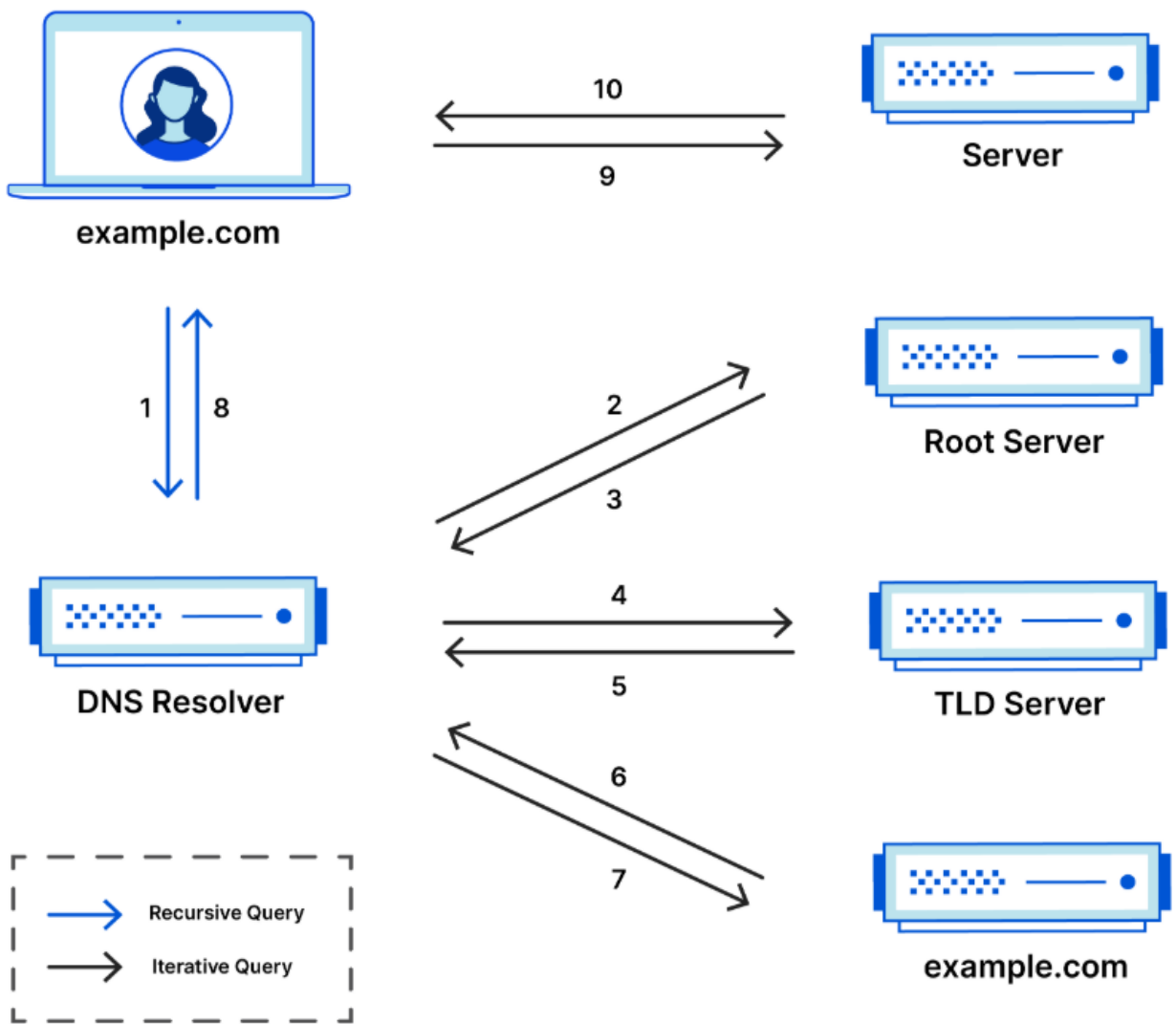32 bits (4 bytes)

Binary Notation of IP Address and Subnet

Network Portion **Host Portion**

IP Address 192.168.100.10

8 bits 8 bits 8 bits 8 bits

11000000 10101000 01100100 00001010

Subnet Mask 255.255.255.0

8 bits 8 bits 8 bits 8 bits

11111111 11111111 11111111 00000000

Local / Private
- automatically generated

🔒 192.168.1.1

🔒 192.168.1.2

🔒 192.168.1.3

Public
- assigned by ISP

🌐 82.129.80.111

Static

- permanent
- used by servers or other important equipment

×

Dynamic

- occasionally changes
- used for consumer equipment

IPv4

192.168.5.18

- numeric dot-decimal notation

4.3 billion addresses
- addresses must be reused and masked

×

IPv6

50b2:6400:0000:0000:
6c3a:b17d:0000:10a9

- alphanumeric hexadecimal notation

7.9x10²⁸ addresses
- every device can have a unique address
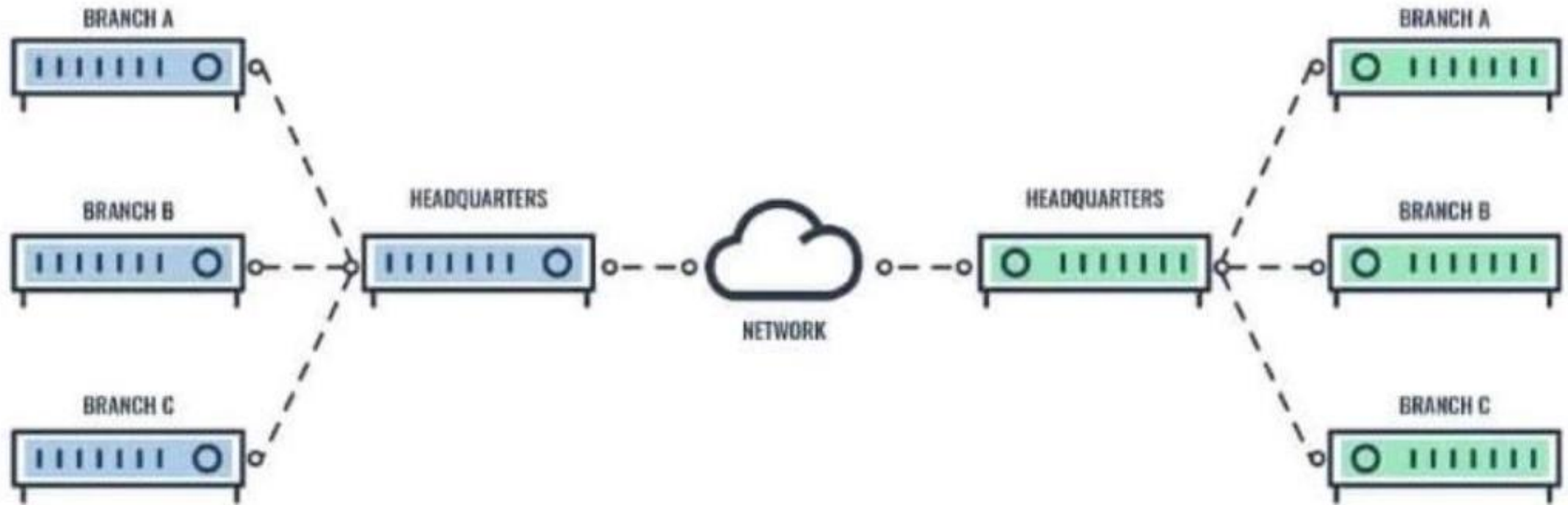
AD

1101010011001 **VPN** 1010010110100

Complete DNS Lookup and Webpage Query
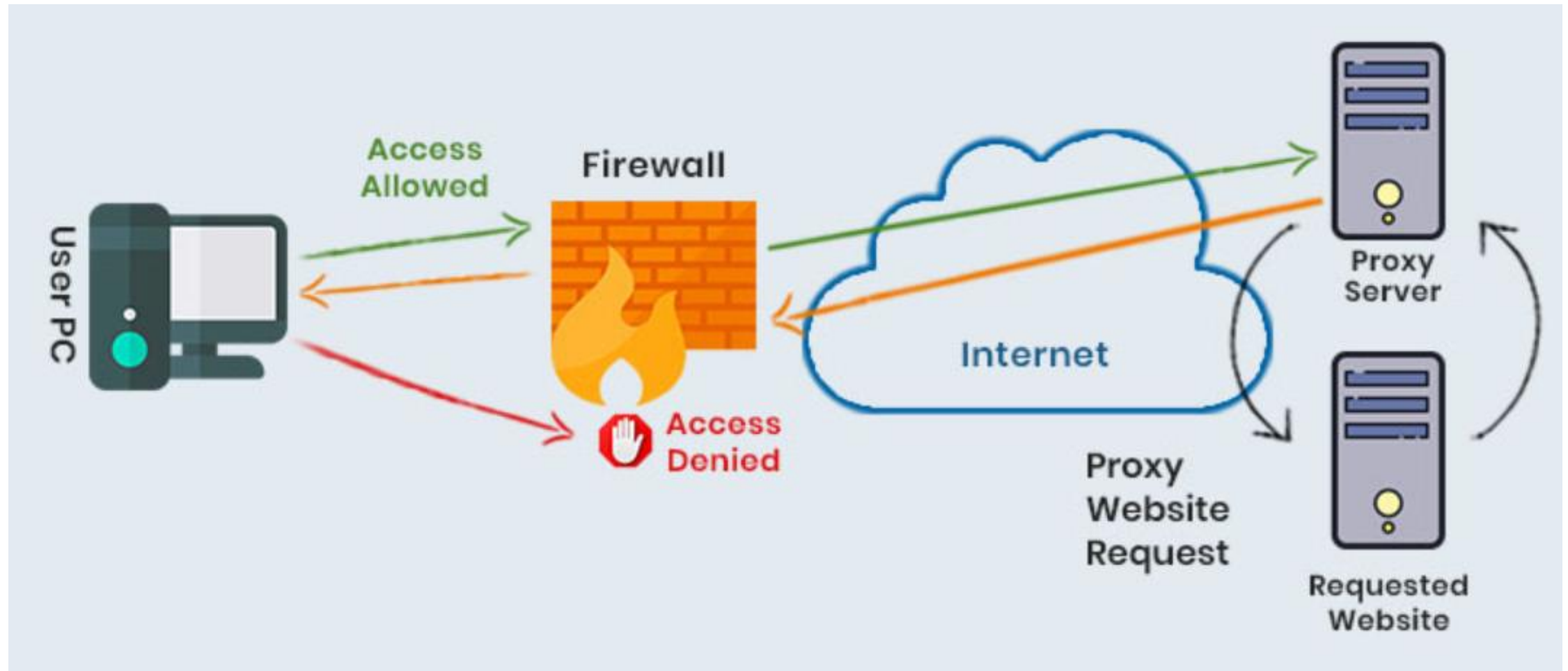
Five Different Classes of IPv4 Addresses

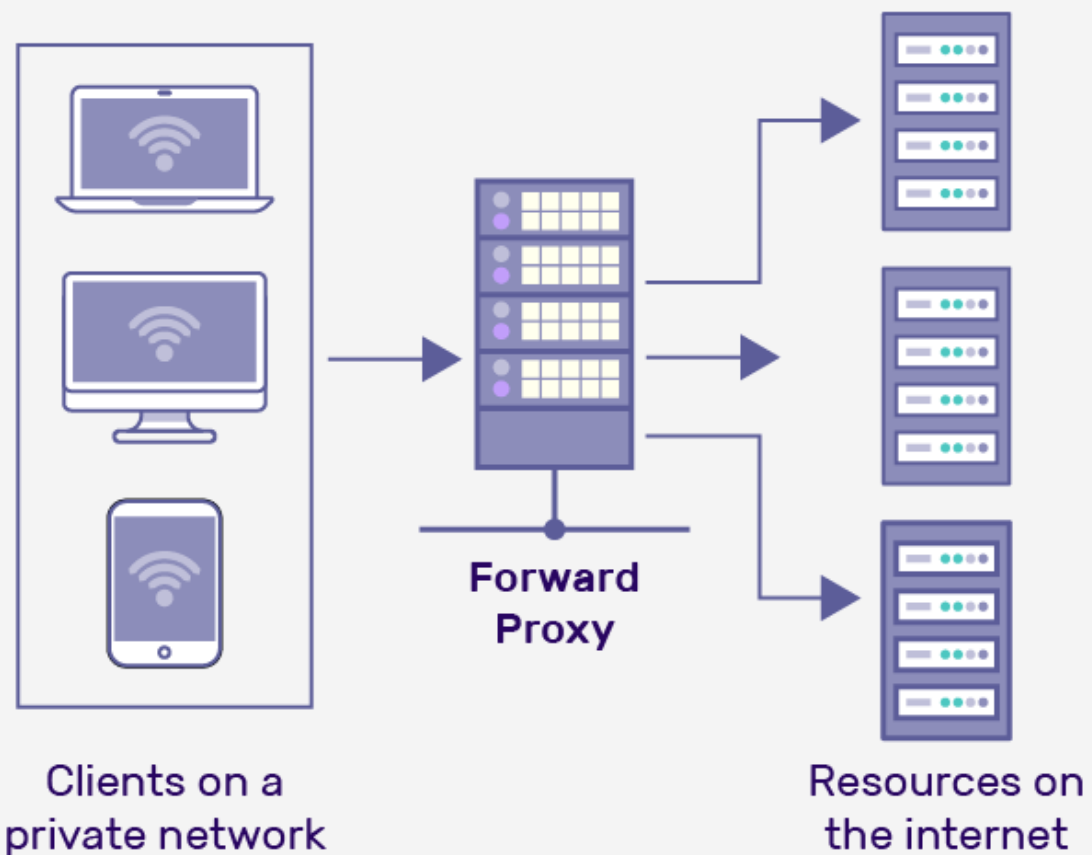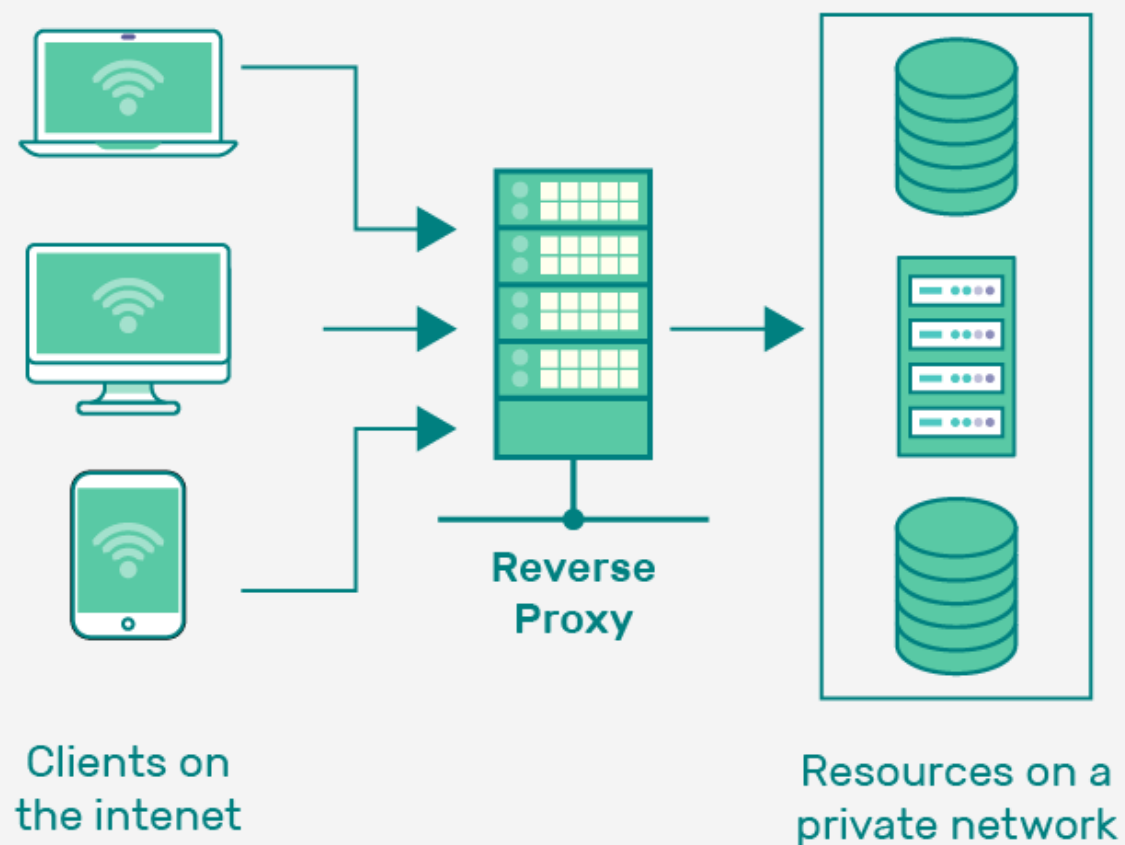| Class	First Octet decimal (range)	First Octet binary (range)	IP range	Subnet Mask	Hosts per Network ID	# of networks
Class A	0 — 127	**0**XXXXXXX	0.0.0.0-127.255.255.255	255.0.0.0	$2^{24}-2$	2^7
Class B	128 — 191	**10**XXXXXX	128.0.0.0-191.255.255.255	255.255.0.0	$2^{16}-2$	2^{14}
Class C	192 — 223	**110**XXXXX	192.0.0.0-223.255.255.255	255.255.255.0	2^8-2	2^{21}
Class D (Multicast)	224 — 239	**1110**XXXX	224.0.0.0-239.255.255.255			
Class E (Experimental)	240 — 255	**1111**XXXX	240.0.0.0-255.255.255.255			

Super-netting and Subnetting

Proxy Server – Forward and Reverse

Forward Proxy

Clients on a private network

Forward Proxy

Resources on the internet

Reverse Proxy

Clients on the intenet

Reverse Proxy

Resources on a private network

Network Protocol

HTTP vs HTTPS

User — Insecure Connection — Normal HTTP

User — Encrypted Connection — Secure HTTPS

SSL Certificate

Method   Path   Protocol version

```
GET    /    HTTP/1.1
Host: developer.mozilla.org
Accept-Language: fr
```

Headers

CLIENT   HTTP (insecure connection)   SERVER

SSL certificate

CLIENT   HTTPS (secure connection)   SERVER

YOU   FTP   SERVER

Download File
Upload Files
Delete Files
Rename File
...etc...