Introduction to IP Addressing

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Module Goals

What is an IPv4 address?

Classful vs. Classless addressing

Address types

Demonstration – IPv4 addresses

OSI Model

1.4

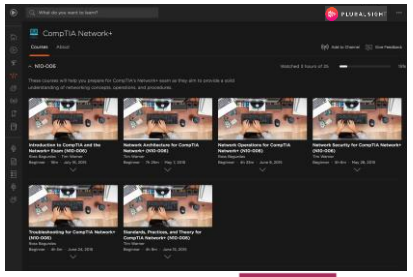
7	Application Layer
6	Presentation Layer
5	Session Layer
4	Transport Layer
3	Network Layer
2	Data Link Layer
1	Physical Layer

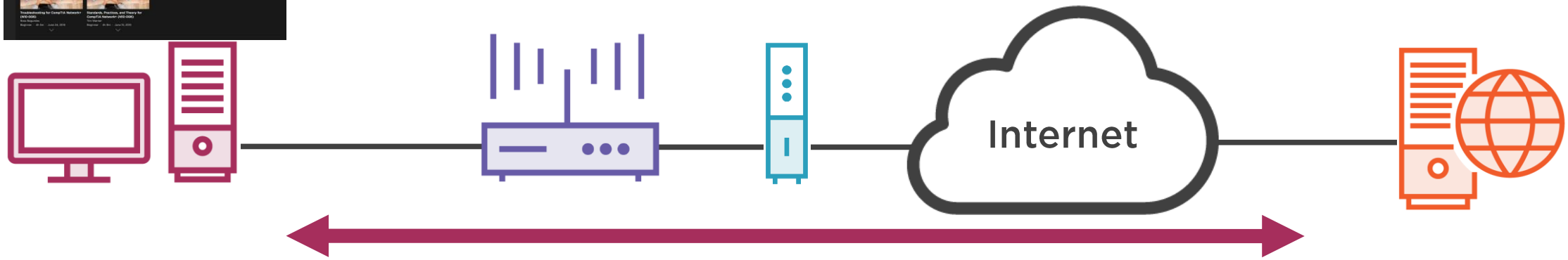
1.4

What is an IP Address?

1.4

https://www.pluralsight.com/





Network Layer

What is an IP Address?

Network Portion

Host Portion

203.0.113.10

123 Main Street
Cityville, IL 60787

IP Address Construction

Octet

203.0.113.10

11001011 00000000 01110001 00001010

8 Bits

IP Address Construction

Octet

203.0.113.10

11001011 00000000 01110001 00001010

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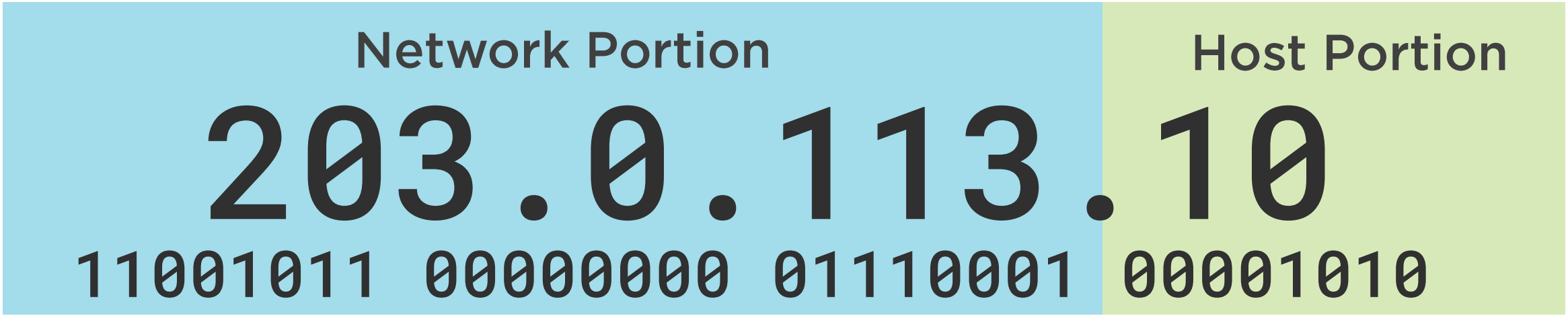
11001011 00000000 01110001 00001010

8 Bits

How Do We Identify the Network and Host Portions?



1. Classful Addressing (~1995 and prior)

2. Classless Addressing (~1995 to present)

1.4

Classless Addressing

The Subnet Mask

Network Portion | Host Portion

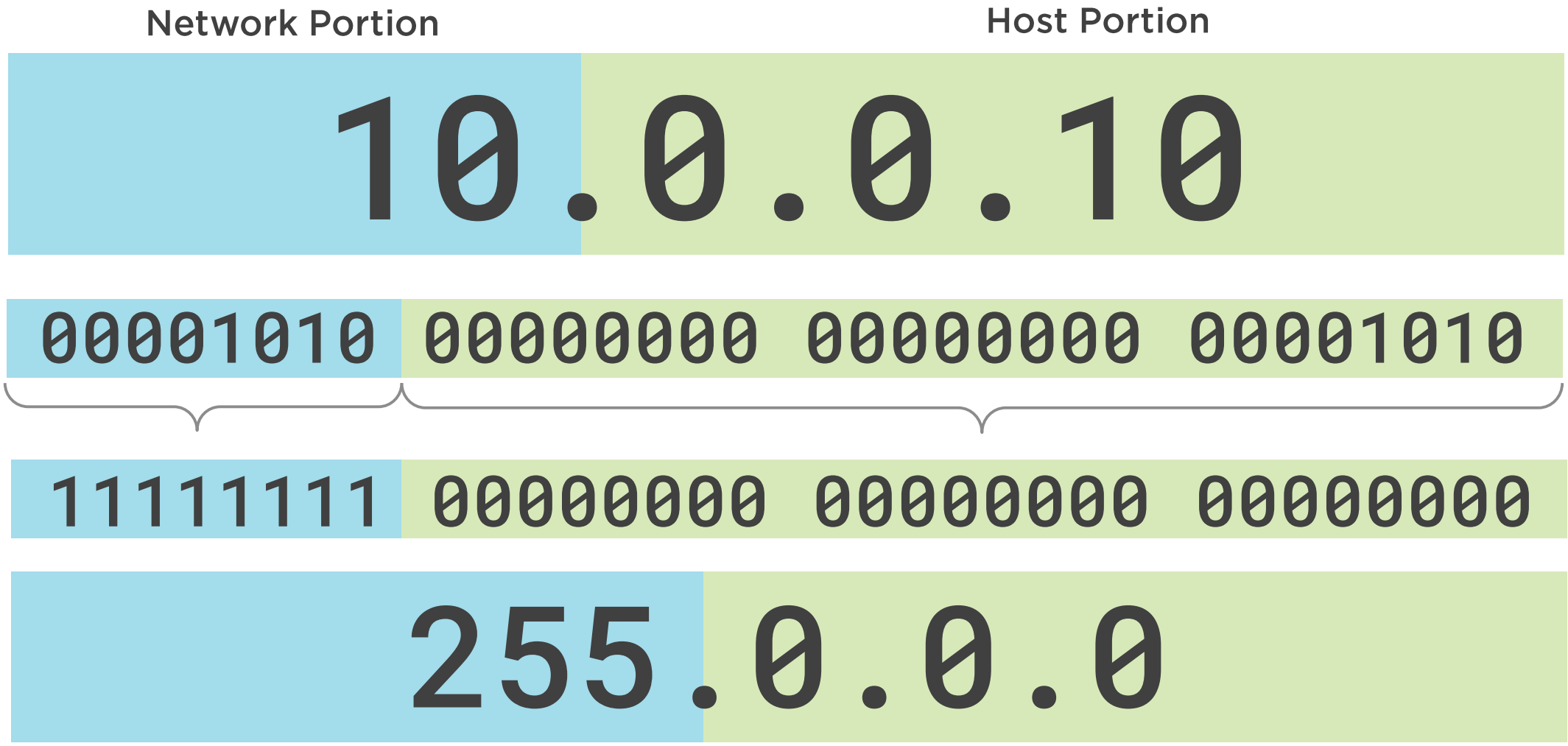
203.0.113.10

11001011 00000000 01110001 00001010

11111111 11111111 11111111 00000000

255.255.255.0

Classless Addressing



Classless Addressing

Network Portion | Host Portion

10.0.0.10

00001010 00000000 00000000 00001010

11111111 11111111 11110000 00000000

255.255.240.0

1.4

Classful Addressing

Classful Addressing

Class	IP Range	
A	0.0.0.0	127.255.255.255
B	128.0.0.0	191.255.255.255
C	192.0.0.0	223.255.255.255
D	224.0.0.0	239.255.255.255
E	240.0.0.0	255.255.255.255

Classful Addressing

Unicast

Class	IP Range	
A	0.0.0.0	127.255.255.255
B	128.0.0.0	191.255.255.255
C	192.0.0.0	223.255.255.255
D	224.0.0.0	239.255.255.255
E	240.0.0.0	255.255.255.255

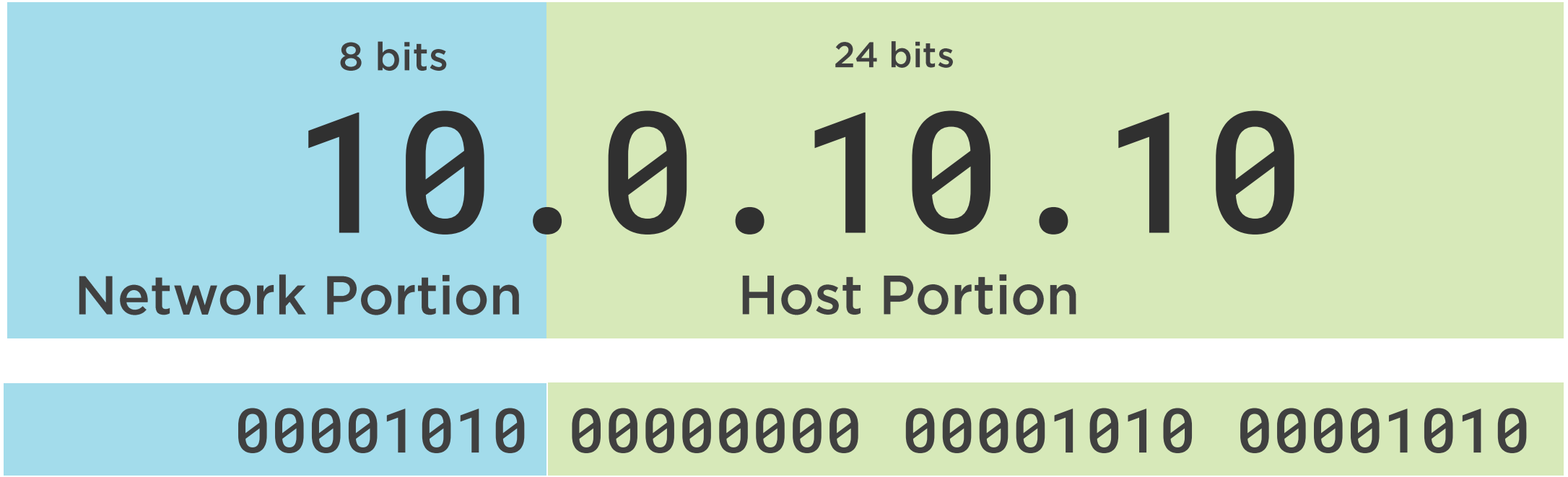
Classful Addressing

Class	IP Range	
A	0.0.0.0	127.255.255.255
B	128.0.0.0	191.255.255.255
C	192.0.0.0	223.255.255.255
D	224.0.0.0	239.255.255.255
E	240.0.0.0	255.255.255.255

Multicast

Classful Addressing

Class A: `0.0.0.0 – 127.255.255.255`



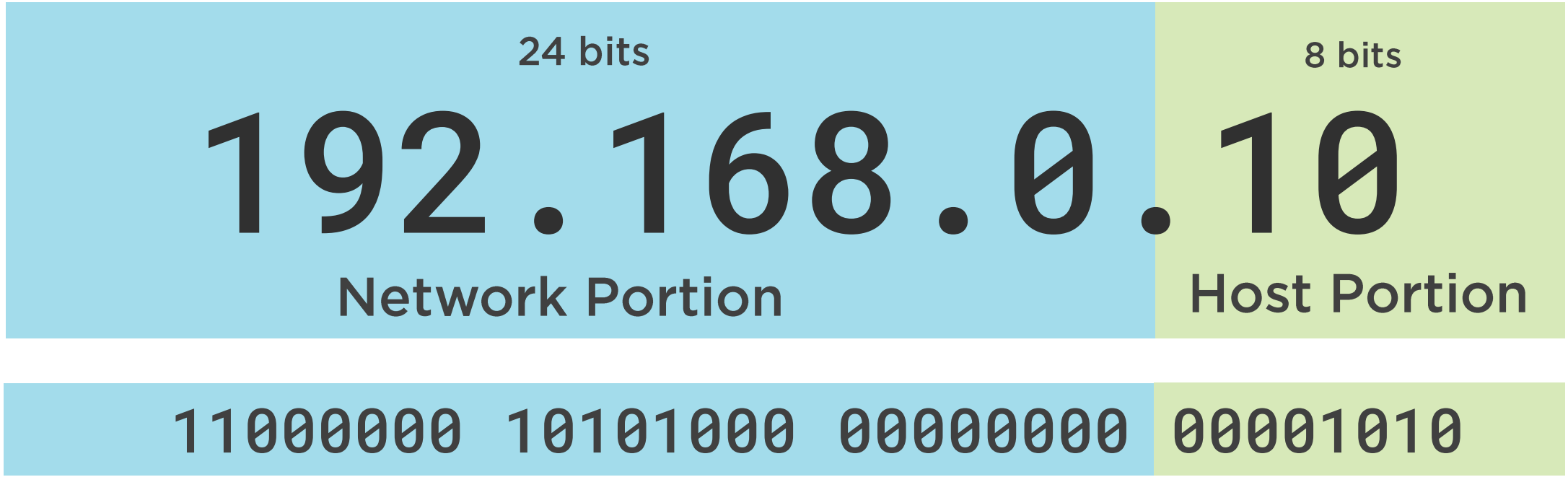
Classful Addressing

Class B: `128.0.0.0 – 191.255.255.255`

16 bits	16 bits
172.16.	10.10
Network Portion	Host Portion
10101100 00010000	00001010 00001010

Classful Addressing

Class C: `192.0.0.0 – 223.255.255.255`



Classful Addressing

Class D: `224.0.0.0 – 239.255.255.255`

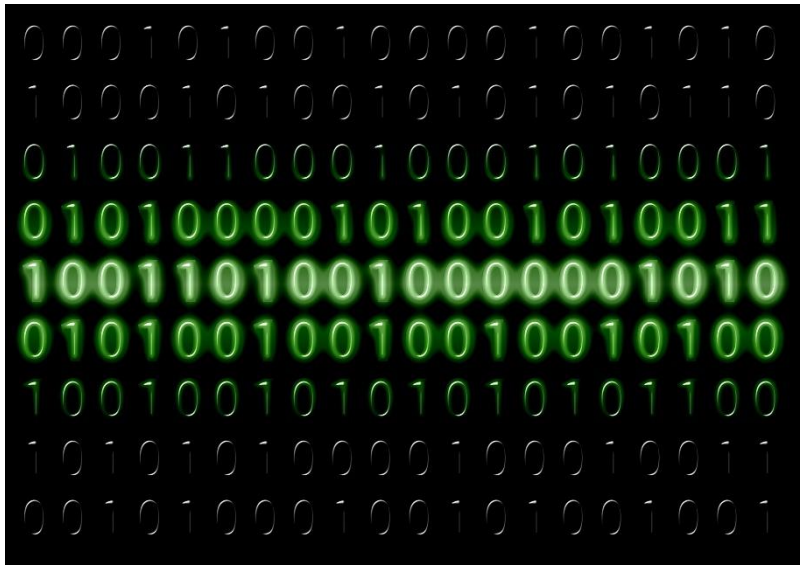
224.0.0.6

Network Portion

`11100000 00000000 00000000 00000110`

1.4

Address Types



IP Address Types

Network Address

- Identifier for a group of devices
- “Network Prefix”

Broadcast Address

- Identifier for all devices on a network

Host Address

- Identifies unique device on a network

1.4

Network Address

The Network Address

All Binary 0's in the HOST portion of the address

Host Portion

2(.0

11001011 00000000 01110001 00000000

11111111 11111111 11111111 00000000

255.255.255.0

1.4

Broadcast Address

The Broadcast Address

All Binary 1's in the HOST portion of the address

Host Portion

2(.255

11001011 00000000 01110001 11111111

11111111 11111111 11111111 00000000

255.255.255.0

1.4

Host Address

The Host Address

Anything EXCEPT all binary 0's or 1's.

Host Portion

2 .10

11001011 00000000 01110001 00001010

11111111 11111111 11111111 00000000

255.255.255.0

1.4

PRACTICE

Host Address

203.0.113.55

255.255.255.0

11001011	00000000	01110001	00110111
11111111	11111111	11111111	00000000

Host Address

192.168.10.25

255.255.255.0

11000000	10101000	00001010	00011001
11111111	11111111	11111111	00000000

Broadcast Address

192.168.10.255

255.255.255.0

11000000	10101000	00001010	11111111
11111111	11111111	11111111	00000000

Network Address

10.10.0.0

255.255.0.0

00001010 00001010	00000000 00000000
11111111 11111111	00000000 00000000

Network Address

10.128.224.64

255.255.255.224

00001010	10000000	11100000	01000000
11111111	11111111	11111111	11100000

Host Address

10.128.225.0

255.255.254.0

00001010	10000000	11100001	00000000
11111111	11111111	11111110	00000000

1.4

CIDR Notation

CIDR Notation

IP Address: 203.0.113.10

Subnet Mask: 255.255.255.0

```
11001011 00000000 01110001 00001010
11111111 11111111 11111111 00000000
```

Network Prefix

24 bits

CIDR Notation

Subnet Mask: 255.255.255.0

11111111 11111111 11111111 00000000

Network Prefix

24 bits

CIDR Notation

Subnet Mask: 255.255.255.0

11111111 11111111 11111111 00000000

Classless Inter-Domain Routing Notation or CIDR notation:

Framework for Discussing Subnetting

Subnet Mask: 255.255.255.0

11111111 11111111 11111111 00000000

Classless Inter-Domain Routing Notation or CIDR notation:

/24

CIDR Notation

Subnet Mask: 255.255.255.0

11111111 11111111 11111111 00000000

Classless Inter-Domain Routing Notation or CIDR notation:

Length of Network Prefix → /24

CIDR Notation

IP Address: 203.0.113.10

Subnet Mask: 255.255.255.0

/24

11111111 11111111 11111111 00000000

CIDR Notation

203.0.113.10/24

11001011 00000000 01110001 00001010

11111111 11111111 11111111 00000000

Private IP Address

Private IP Address Range	
10.0.0.0	10.255.255.255
172.16.0.0	172.31.255.255
192.168.0.0	192.168.255.255

Private IP Address

Private IP Address Range
10.0.0.0/8
172.16.0.0/12
192.168.0.0/16

Private IP Address

Private IP Address Range
10.0.0.0/8
172.16.0.0/12
192.168.0.0/16

APIPA
169.254.0.0/16

Private IP Address

Private IP Address Range
10.0.0.0/8
172.16.0.0/12
192.168.0.0/16

Avoid

APIPA
169.254.0.0/16


There's no place like
127.0.0.1
Loopback Address

1.4

Demo

Modify and test IP configuration

IP Address Configuration

IP Address Configuration

IP Address Configuration

1.4

Summary

What is an IPv4 address?

Classful vs Classless addressing

Address types

Demonstration – IPv4 addresses