Introduction to IP Addressing

Ross Bagurdes
Network Engineer

@bagurdes

Module Goals

What is an IPv4 address?

Classful vs. Classless addressing
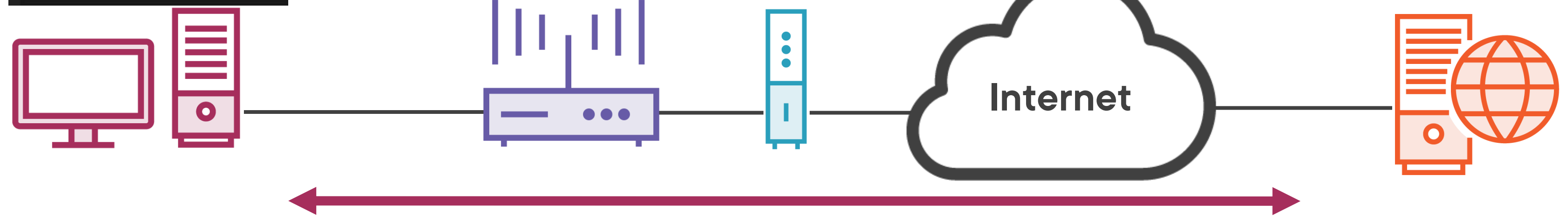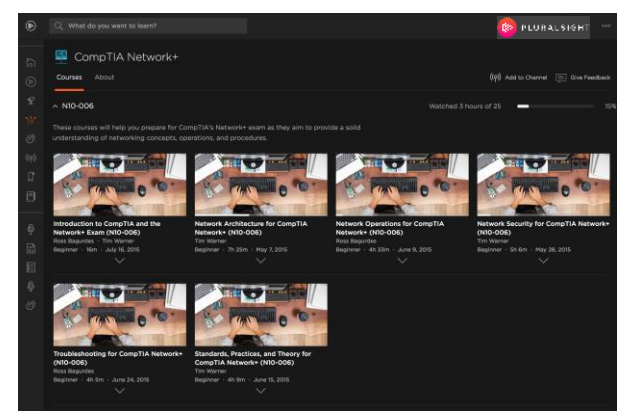
Address types

Demonstration – IPv4 addresses

OSI Model

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

What is an IP Address?

https://www.pluralsight.com/

Internet

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

8 Bits
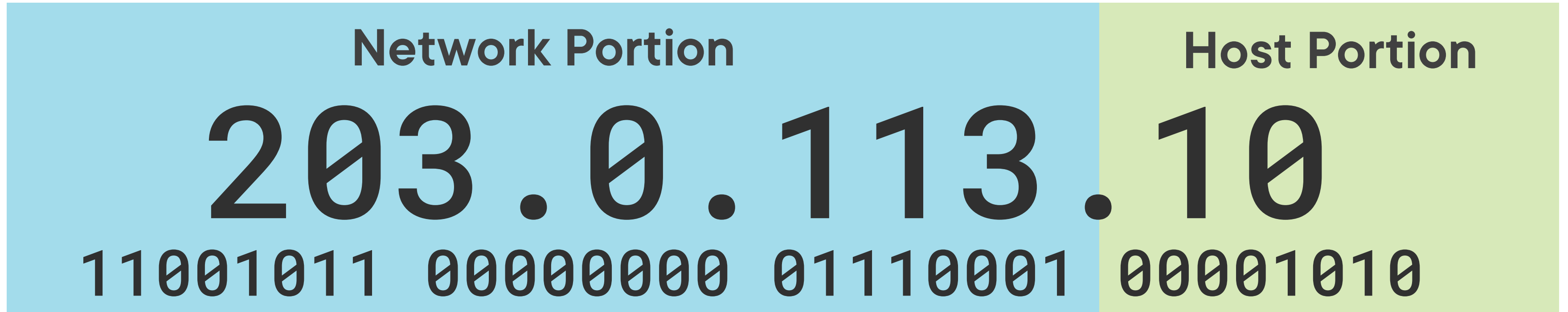
IP Address Construction

Octet

203 . 0 . 113 . 10

11001011 00000000 01110001 00001010

8 Bits

IP Address Construction

Octet

203 . **0** . **113** . **10**

11001011 **00000000** **01110001** **00001010**

8 Bits

How Do We Identify the Network and Host Portions?

Network Portion   **Host Portion**

203.0.113.10

11001011 00000000 01110001 00001010

1. Classful Addressing (~1995 and prior)

2. Classless Addressing (~1995 to present)

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

Network Portion **Host Portion**

10.0.0.10

00001010 00000000 00000000 00001010

11111111 00000000 00000000 00000000

255.0.0.0

Classless Addressing

Network Portion   **Host Portion**

10.0.0.10

00001010 00000000 00000000 00001010

11111111 11111111 11110000 00000000

255.255.240.0

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 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

24 bits	8 bits
192.168.0. Network Portion	**10** Host Portion

`11000000 10101000 00000000 00001010`

Classful Addressing

Class D: 224.0.0.0 − 239.255.255.255

224.0.0.6
Network Portion

11100000 00000000 00000000 00000110

Address Types

IP Address Types

Network Address
- Identifier for a group of devices
- "Network Prefix"

Broadcast Address
- Identifier for all devices on a network

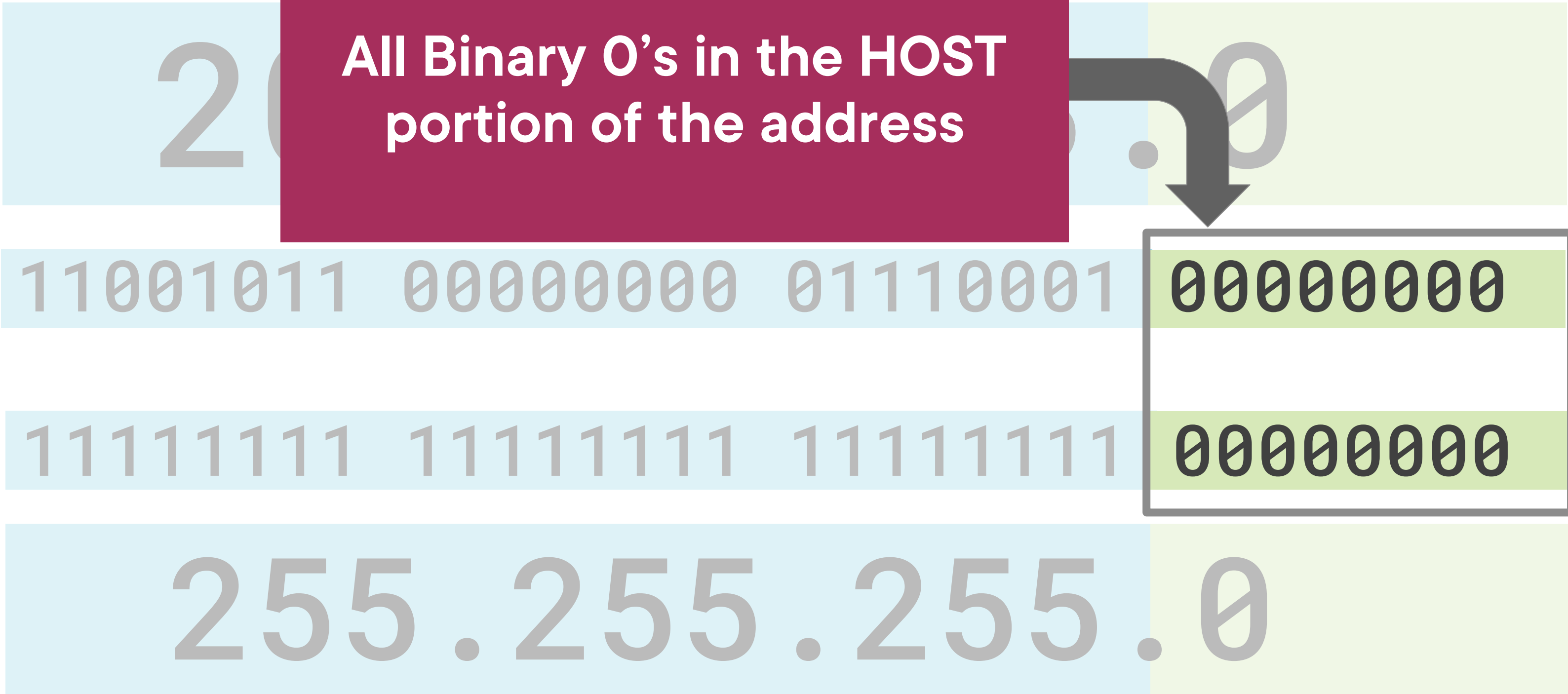**Host Address**
- Identifies unique device on a network

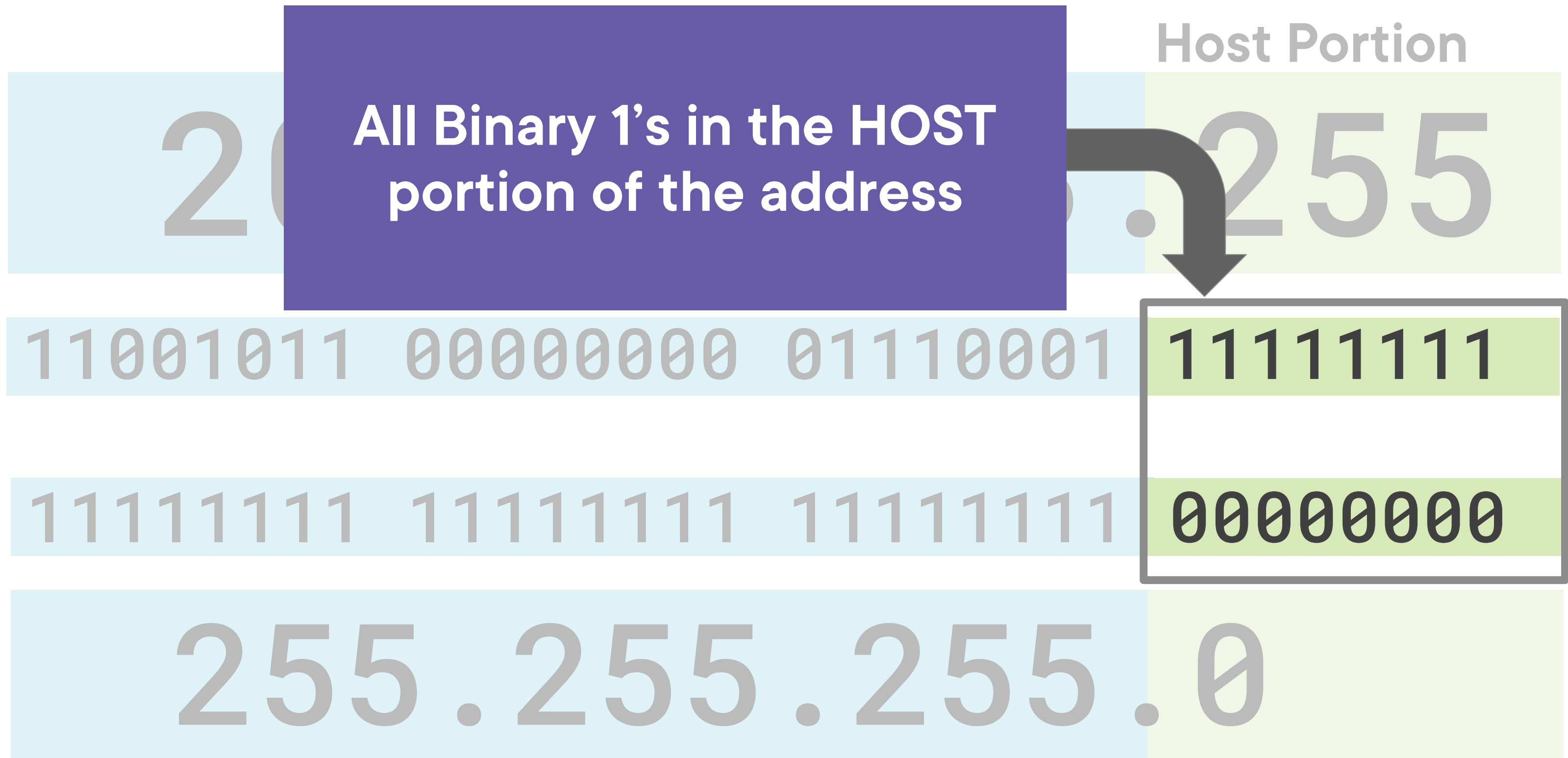# Network Address

The Network Address

Host Portion

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

11001011 00000000 01110001

11111111 11111111 11111111

00000000

00000000

255.255.255.0

Broadcast Address

The Broadcast Address

Host Portion

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

2 _ _ . 255

11001011 0000000 01110001

11111111

00000000

11111111 11111111 11111111

255.255.255.0

Host Address

The Host Address

Host Portion

2 . 10

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

11001011 0000000 01110001

00001010

11111111 11111111 11111111

00000000

255 . 255 . 255 . 0

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

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

RFC 1918

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

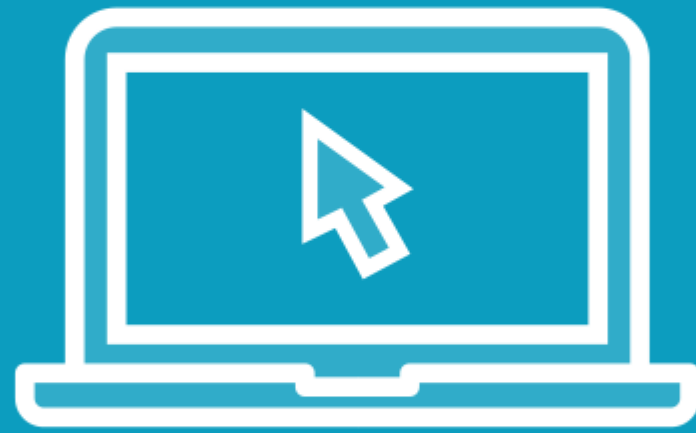**Avoid**

APIPA
169.254.0.0/16

There's no place like

127.0.0.1

Loopback Address

Demo

Modify and test IP configuration

IP Address Configuration

192.168.10.10
255.255.255.0

192.168.10.100
255.255.255.0

IP Address Configuration

192.168.11.10
255.255.255.0

192.168.10.100
255.255.255.0

IP Address Configuration

192.168.11.0
255.255.254.0

192.168.10.100
255.255.254.0

Summary

What is an IPv4 address?

Classful vs Classless addressing

Address types

Demonstration – IPv4 addresses