## CCNA 200-301, Volume I

Chapter 13 Analyzing Subnet Masks

## Objectives

- Subnet Mask Conversion
- Defining the Format of IPv4 Addresses

## **Three Mask Formats**

- 32-bit binary numbers
  - 11111111 0000000 0000000 0000000
  - 1111111111111111111111110000000
- Dotted Decimal Notation (DDN)
  - <sup>•</sup> 255.0.0.0
  - <sup>o</sup> 255.255.255.0
- Prefix (also called CIDR)
  - □ /8

#### • /24

### Converting Between Binary and Prefix Masks

Binary Mask	Logic	Prefix Mask
11111111 1111111 11000000 0000000	Count 8 + 8 + 2 = 18 binary 1s	/18
11111111 1111111 11111111 11110000	Count 8 + 8 + 8 + 4 = 28 binary 1s	/28
11111111 1111000 0000000 0000000	Count $8 + 5 = 13$ binary 1s	/13

Prefix Mask	Logic	Binary Mask
/18	Write 18 1s, then 14 0s, total 32	11111111 1111111 11000000 00000000
/ 28	Write 28 1s, then 4 0s, total 32	11111111 11111111 11111111 11110000
/ 13	Write 13 1s, then 19 0s, total 32	11111111 1111000 0000000 0000000

#### Converting Between Binary and DDN Masks

Binary Mask Octet	Decimal Equivalent	Number of Binary 1s
0000000	0	0
10000000	128	1
11000000	192	2
11100000	224	3
11110000	240	4
11111000	248	5
11111100	252	6
1111110	254	7
1111111	255	8

## **Example Conversions**

Binary Mask	Logic	Decimal Mask
11111111 1111111 11000000 00000000	11111111 maps to 255 11000000 maps to 192 00000000 maps to 0	255.255.192.0
11111111 1111111 11111111 11110000	11111111 maps to 255 11110000 maps to 240	255.255.255.240
11111111 1111000 0000000 0000000	11111111 maps to 255 11111000 maps to 248 00000000 maps to 0	255.248.0.0

Decimal Mask	Logic	Binary Mask
255.255.192.0	255 maps to 11111111 192 maps to 11000000 0 maps to 00000000	11111111 1111111 11000000 00000000
255.255.255.240	255 maps to 11111111 240 maps to 11110000	11111111 1111111 11111111 11110000
255.248.0.0	255 maps to 11111111 248 maps to 11111000 0 maps to 00000000	11111111 11111000 00000000 00000000

## Conversion from Prefix to Decimal: Full Binary Versus Shorthand



## Conversion from Decimal to Prefix: Full Binary Versus Shorthand



## Practice Converting Subnet Masks

Prefix	Binary Mask	Decimal
	11111111 11111111 11000000 00000000	
		255.255.255.252
/25		
/16		
		255.0.0.0
	11111111 11111111 11111100 00000000	
		255.254.0.0
/27		

#### Simple Subnet Design, with Mask /24



#### Prefix (Subnet) and Host Parts Defined by Mask 1s and 0s



## Mask 255.255.255.0: P=24, H=8



### Class Concepts Applied to Create Three Parts



# Subnet 10.1.1.0, Mask 255.255.255.0: N=8, S=16, H=8



Class

#### Relationship Between /P, N, S, and H



C: N = 24

# Visual Representation of Problem: 8.1.4.5, 255.255.0.0



#### Example - 200.1.1.1 255.255.255.252

- **Step 1** 255.255.255.252 = /30, so P=30.
- **Step 2** 200.1.1.1 is in the range 192–223 in the first octet, so it is Class C; so N=24.
- **Step 3** S = P N = 30 24 = 6.
- Step 4 H = 32 P = 32 30 = 2.
- **Step 5**  $2^2 2 = 2$  hosts/subnet
- **Step 6**  $2^6 = 64$  subnets.