

CCNA 200-301, Volume I



Chapter 12

Analyzing Classful IPv4 Networks

Objectives

- Classful Network Concepts

Classful Network Concepts

- This chapter examines how to begin with a single IP address and then determine the following facts:
 - Class (A, B, or C)
 - Default mask
 - Number of network octets/bits
 - Number of host octets/bits
 - Number of host addresses in the network
 - Network ID
 - Network broadcast address
 - First and last usable address in the network







IPv4 Address Classes Based on First Octet Values

Class	First Octet Values	Purpose
A	1–126	Unicast (large networks)
B	128–191	Unicast (medium-sized networks)
C	192–223	Unicast (small networks)
D	224–239	Multicast
E	240–255	Reserved (formerly experimental)

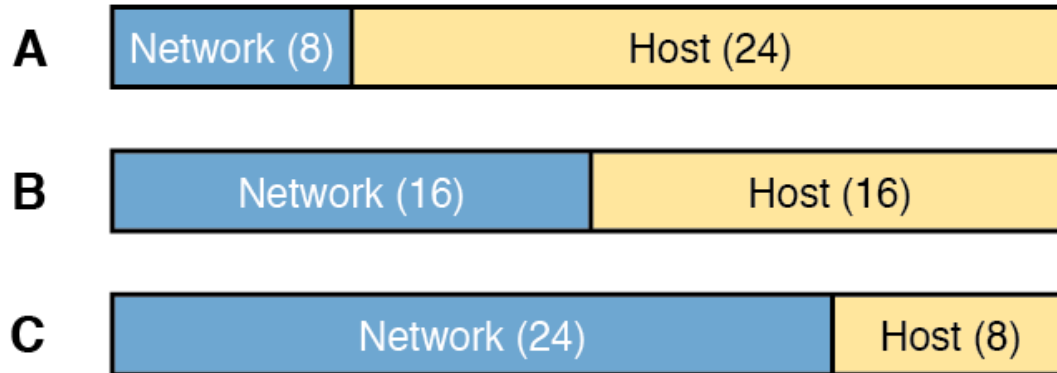
Key Facts for Classes A, B, and C

	Class A	Class B	Class C
First octet range	1 – 126	128 – 191	192 – 223
Valid network numbers	1.0.0.0 – 126.0.0.0	128.0.0.0 – 191.255.0.0	192.0.0.0 – 223.255.255.0
Total networks	$2^7 - 2 = 126$	$2^{14} = 16,384$	$2^{21} = 2,097,152$
Hosts per network	$2^{24} - 2$	$2^{16} - 2$	$2^8 - 2$
Octets (bits) in network part	1 (8)	2 (16)	3 (24)
Octets (bits) in host part	3 (24)	2 (16)	1 (8)
Default mask	255.0.0.0	255.255.0.0	255.255.255.0

Numbers and Sizes of Class A, B, and C Networks

Class	Networks	Hosts/Network
A	 126	 16,777,214
B	 16,384	 65,534
C	 2,097,152	 254

Sizes (Bits) of the Network and Host Parts of Unsubnetted Classful Networks



Default Masks for Classes A, B, and C

A

Decimal	255	.	0	.	0	.	0
Binary	11111111		00000000		00000000		00000000
Concept	Network (8)		Host (24)				

B

Decimal	255	.	255	.	0	.	0
Binary	11111111		11111111		00000000		00000000
Concept	Network (16)				Host (16)		

C

Decimal	255	.	255	.	255	.	0
Binary	11111111		11111111		11111111		00000000
Concept	Network (24)						Host (8)

Deriving the Network ID and Related Numbers

- Each classful network has four key numbers that describe the network.
 - Network number
 - First (numerically lowest) usable address
 - Last (numerically highest) usable address
 - Network broadcast address

Example of Deriving the Network ID and Other Values from 10.17.18.21

Class 1

Divide ②

B

C



Make Host=0 ③

Add 1 ④

Make Host=255 ⑤

Subtract 1 ⑥

Network	Host
10	17 . 18 . 21
10	0 . 0 . 0
10	0 . 0 . <u>+1</u>
10	255 . 255 . 255
10	255 . 255 . <u>-1</u>
	254

Example Deriving the Network ID and Other Values from 172.16.8.9

Class ①	A	B	C
Divide ②		↓	
	Network	Host	
	172 . 16	8 . 9	
Make Host=0 ③	172 . 16	0 . 0	
Add 1 ④	172 . 16	0 . <u>+1</u>	
		1	
Make Host=255 ⑤	172 . 16	255 . 255	
Subtract 1 ⑥	172 . 16	255 . <u>-1</u>	
		254	

Practice Deriving Key Facts Based on an IP Address

	IP Address	Class	Number Network Octets	Number Host Octets	Network ID	Network Broadcast Address
1	1.1.1.1					
2	128.1.6.5					
3	200.1.2.3					
4	192.192.1.1					
5	126.5.4.3					
6	200.1.9.8					
7	192.0.0.1					
8	191.255.1.47					
9	223.223.0.1					

Practice Remembering the Details of Address Classes

Class	First Octet Values	Purpose
A		
B		
C		
D		
E		

	Class A	Class B	Class C
First octet range			
Valid network numbers			
Total networks			
Hosts per network			
Octets (bits) in network part			
Octets (bits) in host part			
Default mask			