

IP ADDRESS AND SUBNETTING

PERTEMUAN II

Teknologi Informasi, Universitas Udayana



Kampus
Merdeka
INDONESIA JAYA

Pengertian IP Address

- IP Address atau Alamat IP adalah alamat yang menjadi tanda pengenal untuk setiap host yang terhubung ke jaringan dengan TCP/IP (internet), berdasarkan aturan dari Internet Protocol (IP)
- Setiap host yang akan terhubung ke jaringan yang berbasis TCP/IP, harus memiliki IP address.
- IP Address bersifat unik, artinya dalam satu jaringan tidak ada dua host atau lebih yang menggunakan alamat IP yang sama

Format IP Address (V4)

- IP Address terdiri dari bilangan biner 32 bit yang

dibagi dalam 4 oktet, dan dituliskan dalam format 4 kelompok bilangan desimal

- Sebagian oktet (kelompok 8 bit) pertama dari IP Address menunjukkan Alamat Jaringan (Network Address) dan oktet yang lainnya menunjukkan Alamat Host (Host Address)

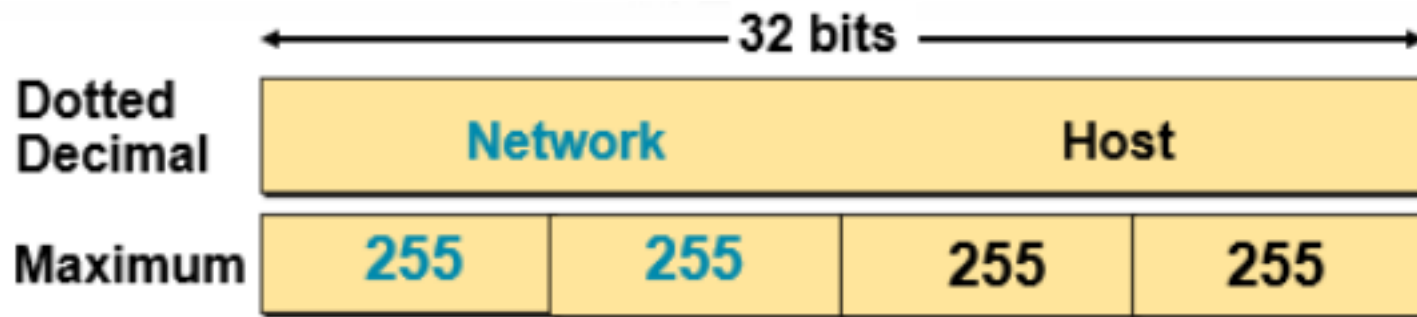
IP Addressing Structure

IPv4 Addresses

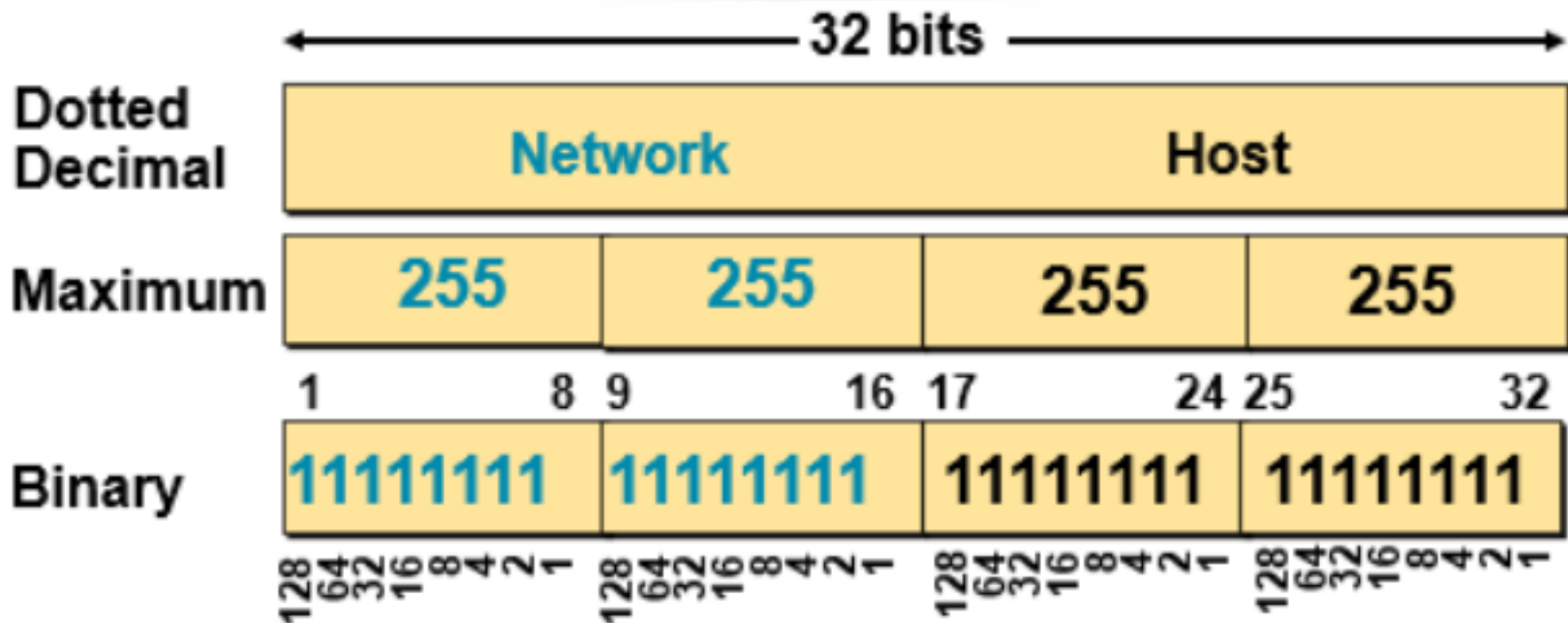
192	.	168	.	10	.	1
11000000		11000000		11000000		11000000

The computer using this IP address is on network
192.168.10.0.

IP Addressing



IP Addressing



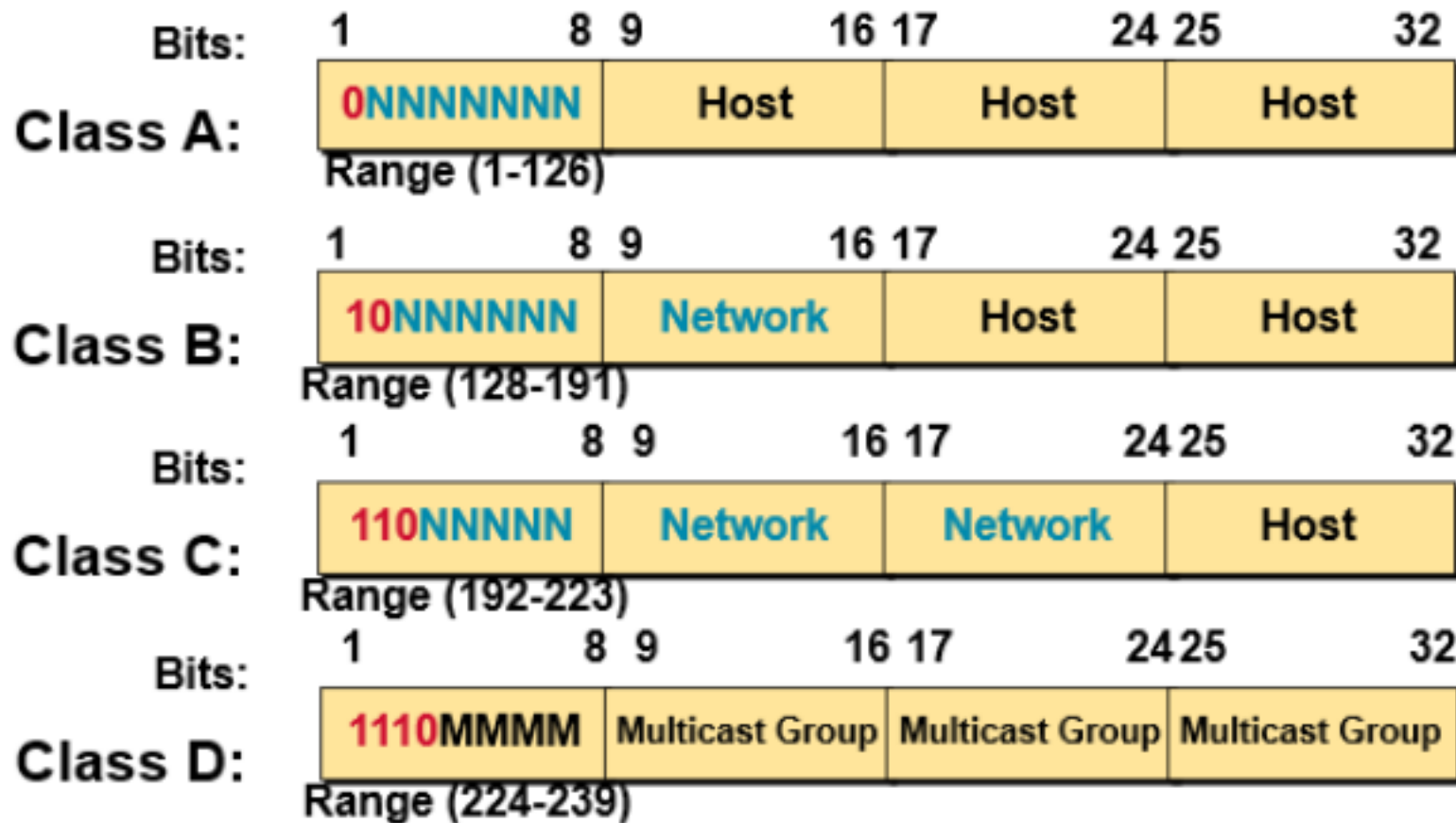
IP Addressing

	<div> <div>32 bits</div> <div></div> </div>			
Dotted Decimal	Network		Host	
Maximum	255	255	255	255
	1 8 9	16 17	24 25	32
Binary	11111111	11111111	11111111	11111111
	128 64 32 16 8 4 2 1	128 64 32 16 8 4 2 1	128 64 32 16 8 4 2 1	128 64 32 16 8 4 2 1
Example Decimal	172	16	122	204
Example Binary	10101100	00010000	01111010	11001100

IP Address Classes

	8 bits	8 bits	8 bits	8 bits
Class A:	Network	Host	Host	Host
Class B:	Network	Network	Host	Host
Class C:	Network	Network	Network	Host
Class D:	Multicast			
Class E:	Research			

IP Address Classes



Host Addresses

172.16.2.1

172.16.3.10

E0

172.16.2.1

172.16.12.12

10.250.8.11

10.180.30.118

10.1.1.1

10.6.24.2

E1

Routing Table

Network Interface

172.16 12 12

. .

172.16.0.0 10.0.0.0^{E0 E1}

Network Host

Determining Available Host Addresses

Network Host

172 16 0 0

6	5	4	8	3
1	1	1	1	2
			6	1
2	1		5	N
1	1	0	4	
		9		

$$\begin{matrix} & 2 \\ 1 & & 3 \end{matrix}$$

```
10101100 00010000 00000000 00000000
                                00000000 00000001
                                00000000 00000011
```

.. ..

..

11111111 11111101 65534

11111111 11111111

11111110 65535 65536

11111111

- 2

$$2^N - 2 = 2^{16} - 2 = 65534$$

65534

Addressing without Subnets

172.16.255.253

172.16.255.254.....

172.16.0.1 172.16.0.2 172.16.0.3

172.16.0.0

- Network 172.16.0.0

Addressing with Subnets

172.16.3.0

172.16.4.0

172.16.1.0 172.16.2.0

- Network 172.16.0.0

Subnet

Addressing

172.16.3.5

New Routing Table

172.16.2.2

172.16.3.100

172.16.2.200

172.16.2.160

172.16.3.150

E0

172.16.2.1

172.16.3.1 E1

2 160
Network Interface

172.16

Network

Host

172.16.0.0

172.16.0.0

E0 E1

Subnet

172.16.2.2

Addressing

172.16.3.1 E1

172.16.2.160

E0

172.16.2.1

172.16.2.200

172.16.3.5

172.16.3.100

172.16.3.150

New Routing Table

Network Interface

..

172.16 2 160

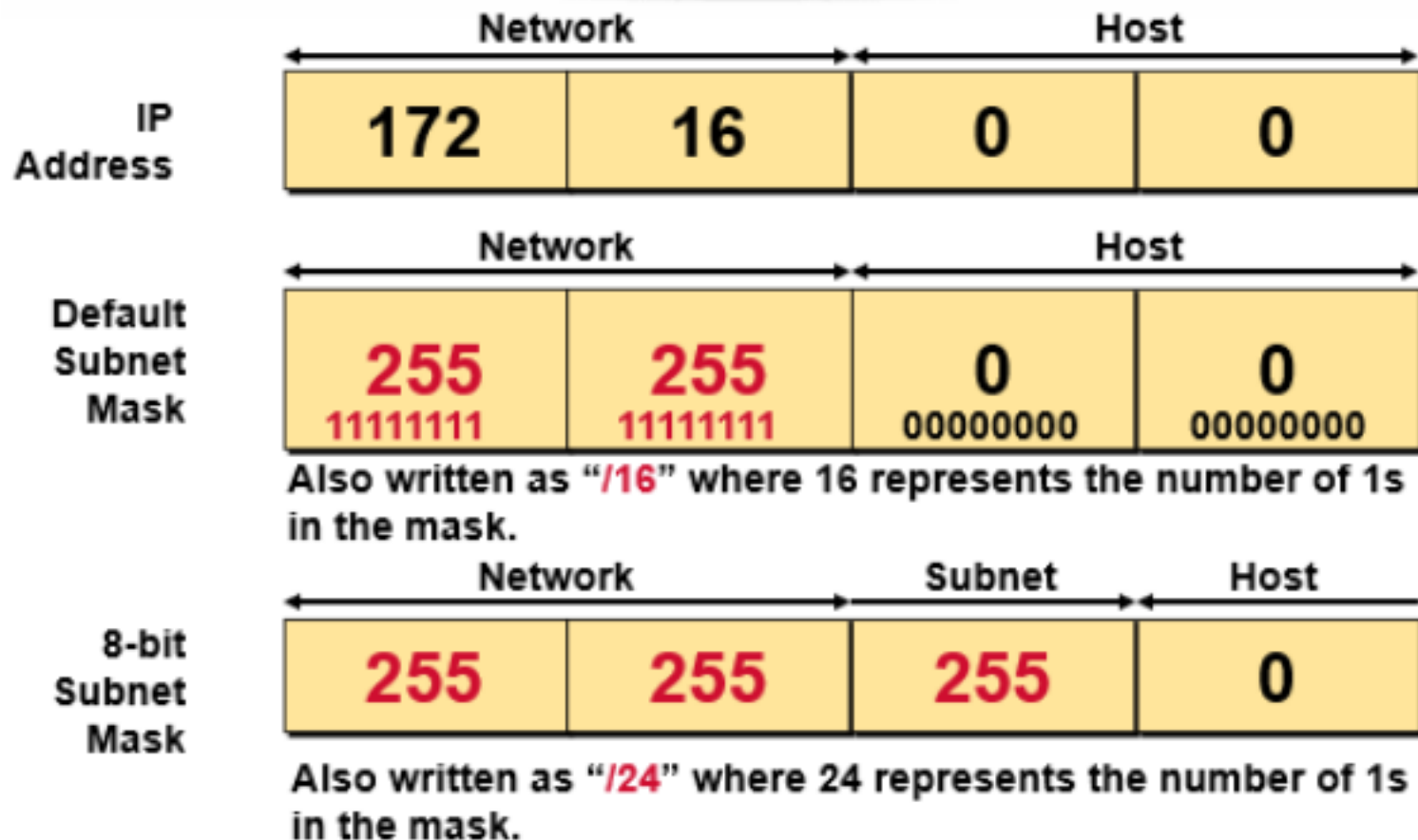
Network Host

Subnet
172.16.2.0

172.16.3.0

E0 E1

Subnet Mask



IP Addressing Structure

- Practice converting 8-bit binary to decimal

Binary To Decimal Conversion

Exponent	2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰							
Position	128	64	32	16	8	4	2	1							
Bits	1	1	1	1	0	1	0	1							
1 BYTE / 1 Octet															
Add these numbers together	128	+	64	+	32	+	16	+	0	+	4	+	0	+	1
Decimal	245														

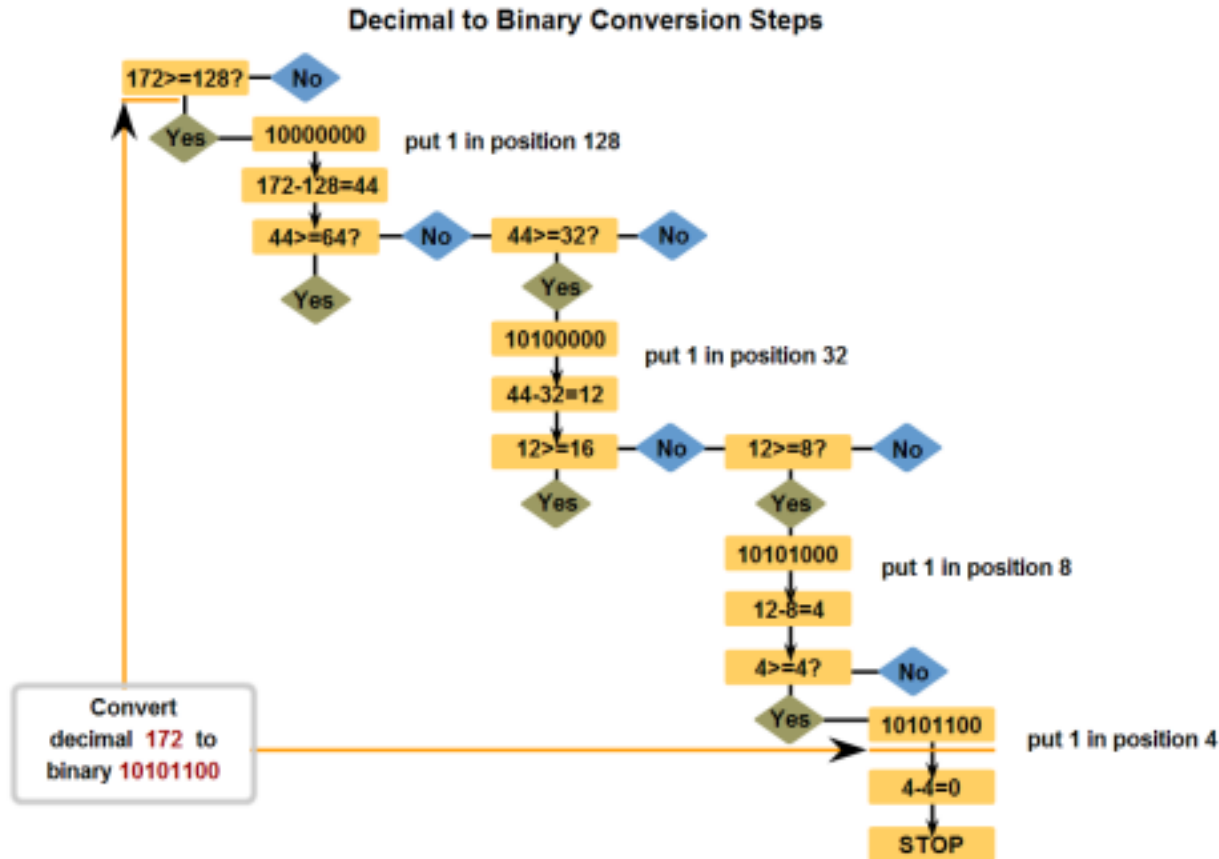
A 1 in this position means 64 is added to the total.

A 0 in any position means that 0 is added to the total.

11110101 in Binary = Decimal Number 245

IP Addressing Structure

- Convert decimal to 8-bit binary




IP Addressing Structure

- Practice converting decimal to 8-bit binary

Decimal to Binary Conversion Activity

Given a decimal value, enter the correct binary values for each position.

Decimal Value	209							
Exponent	2^7 th	2^6 th	2^5 th	2^4 th	2^3 rd	2^2 nd	2^1 st	2^0
Position	128	64	32	16	8	4	2	1
Bit	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>


Enter numbers for these 8 positions.

Ekivalen Desimal dari pola bit untuk subnet mask

[illegible]

Subnet Mask without Subnets

Network Host

172.16.2.16	0	0	0	0
0	1111111	1111111	0000000	10100000
255.255.0.0	1	1	0	00000000
1010110	10101100	00010000	00000000	00000000
	0001000	0000001		

Network Number

172 0 0 16

- Subnets not in use—the default

Subnet Mask with Subnets

		Subnet		Network Host	
	0	10101100	00000010	10100000	
172.16.2.160	10101100	00010000	11111111	00000000	
255.255.255.	11111111	11111111	00000010	00000000	
		00010000			
			128	24 ⁸	
			192	25 ²	
			224	25 ⁵	
			240		
Network Number					
25 ⁴					

172 2 0 16

- Network number extended by eight bits

Subnet Mask with Subnets (cont.)

		Subnet		
		Network Host		
		10101100	00010000	00000010 10100000
172.16.2.160	11111111	11111111	11111111	11000000
255.255.255.192	10101100	00010000	00000010	10000000
		2^{24}	2^4	2^5
		2^8	2^0	2^5
		2^8	2^8	2^5

Network

19²

24⁸

25⁴

22⁴

25²

12⁸

24⁰

25⁴

number extended by ten

Number

172 16 2 128 • Network

bits

Broadcast Addresses

172.16.4.0

172.16.1.0

172.16.3.255
(Directed broadcast)

X

(Local network
broadcast) X
255.255.255.255

172.16.2.0

172.16.255.255
(All subnets broadcast)

172.16.3.0

Addressing Summary Example

172 16 2 160

10101100 00010000 00000010 10100000 Host

172.16.2.160 255.255.255.192

Subnet

Mask

Broadcas

t First

Last

Addressing Summary Example

172 16 2 160

10101100

10100000

00010000

00000010 Host

172.16.2.160

92

11111111

11000000

255.255.255.1 11111111

11111111

Mask

Subnet

Broadcasts

t First

Last

Addressing Summary Example

172 16 2 160

172.16.2.160	00010000	10100000	
10101100	00000010 Host		
92	11111111	11000000	
255.255.255.1	11111111	11111111 Mask	Subnet

Broadcas

t First

Last⁷

Addressing Summary Example

172 16 2 160

172.16.2.160
10101100

00010000
00000010 Host

10100000

255.255.255.1
92

11111111
11111111
11111111

11000000

10000000

Subnet

Mask

Broadcas

t First

Last

Addressing Summary Example

172 16 2 160

172.16.2.16 10101100 00010000 00000010 10100000 Host
0

255.255.255.1 11111111 11000000 10000000
92 11111111 Mask

Subnet

10111111 First
Broadcast

Last

Addressing Summary Example

172 16 2 160

172.16.2.16 10101100 00010000 00000010 10100000 Host
0

255.255.255.1 11111111 11000000 10000000
92 11111111 Mask

Subnet

t

10111111

Broadcas

10000001

First

Last

Addressing Summary Example

172 16 2 160

0 00010000 00000010 10100000 Host

172.16.2.16 10101100

11111111 11000000 10000000

255.255.255.1 11111111

Subnet

92 11111111 Mask

t

10111111

Broadcas

1000010111 Last

001 110

First

Addressing Summary Example

172 16 2 160

172.16.2.16 10101100 00010000 00000010 10100000 Host

0 11111111 11111111 11111111 11000000 Mask

255.255.255
.192 10101100 00010000 00000010 10000000 Subnet

Broadcast

10101100 00010000

00000010 10111111

10101100

00000010

10101100

00010000

10000001

00010000

00000010

First Last

10111110

Addressing Summary Example

172 16 2 160

	8	00010000 00000010 10100000	
172.16.2.16	10101100		Mask
0		11111111 11111111 11000000	
	11111111		Subnet
255.255.255		00010000 00000010 10000000	
.192	10101100		
172.16.2.12			Host
		10101100 00010000	Broadcast
172.16.2.191		00000010 10111111	

172.16.2.129	00010000	10101100	10111110
172.16.2.190	00000010	00010000	First Last
10101100	10000001	00000010	

Class B Subnet Example

IP Host Address: 172.16.2.121

Subnet Mask: 255.255.255.0

	Network	Network Subnet Host
	255.255.255.11111111	00000010 00000000
172.16.2.121	0: 00010000	11111111
:	10101100 11111111	01111001
	Subnet: 10101100 00010000	00000000
		00000010
Broadcast:		10101100 00010000
		00000010 11111111

- Subnet Address = 172.16.2.0
- Host Addresses = 172.16.2.1–172.16.2.254
- Broadcast Address = 172.16.2.255 • Eight bits of subnetting

Subnet Planning

20 subnets

5 hosts per subnet

Class C address:

192.168.5.0

192.168.5.16

Other
subnets

192.168.5.32 192.168.5.48

Class C Subnet Planning Example

IP Host Address: 192.168.5.121

Subnet Mask: 255.255.255.248

Network Network

Network Subnet Host

	11000000	00000101	
192.168.5.121:	10101000	01111001	
255.255.255.248:	11111111	11111111	11111000
	11111111		
	10101000	00000101	
Subnet:	11000000		

01111000

Broadcast:

00000101 01111111

11000000 10101000

- Subnet Address = 192.168.5.120
- Host Addresses = 192.168.5.121–192.168.5.126
- Broadcast Address = 192.168.5.127 • Five Bits of Subnetting

Tugas IP Address Classes

Address Class Network Host 10.2.1.1

128.63.2.100

201.222.5.64

192.6.141.2

130.113.64.16

256.241.201.10

Tugas Subnet Mask

Address Subnet Mask Class Subnet

2

172.16.2.1

255.255.255.

0

0

10.6.24.20

255.255.240.

10.30.36.1

0

0

255.255.255.

Tugas Broadcast Addresses

Address Class Subnet Broadcast Subnet Mask

201.222.10.60 255.255.255.248

15.16.193.6 255.255.248.0

128.16.32.13 255.255.255.252

153.50.6.27 255.255.255.128