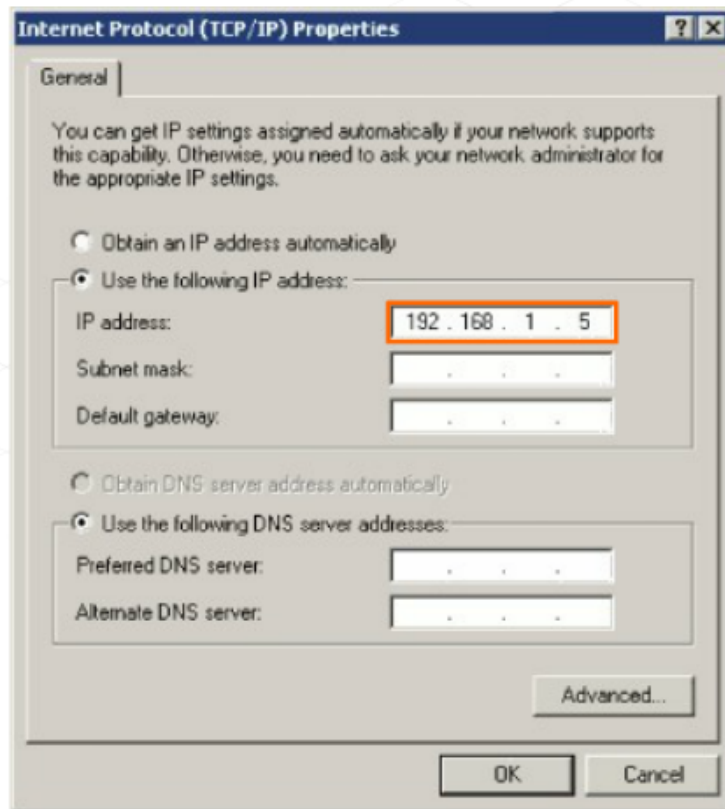


Addressing the Network-IPv4

Introduction



I see I have been assigned IP address 192.168.1.5. Now other hosts can find me.



IP version 4 (IPv4) is the current form of addressing used on the Internet.

IPv4

IPv4 Addresses

192	.	168	.	10	.	1
11000000		10101000		00001010		00000001

The computer using this IP address is on network 192.168.10.0.

Dotted Decimal Address

32-Bit Address

Octet

Network

Host

Binary to Decimal Conversion

Binary To Decimal Conversion

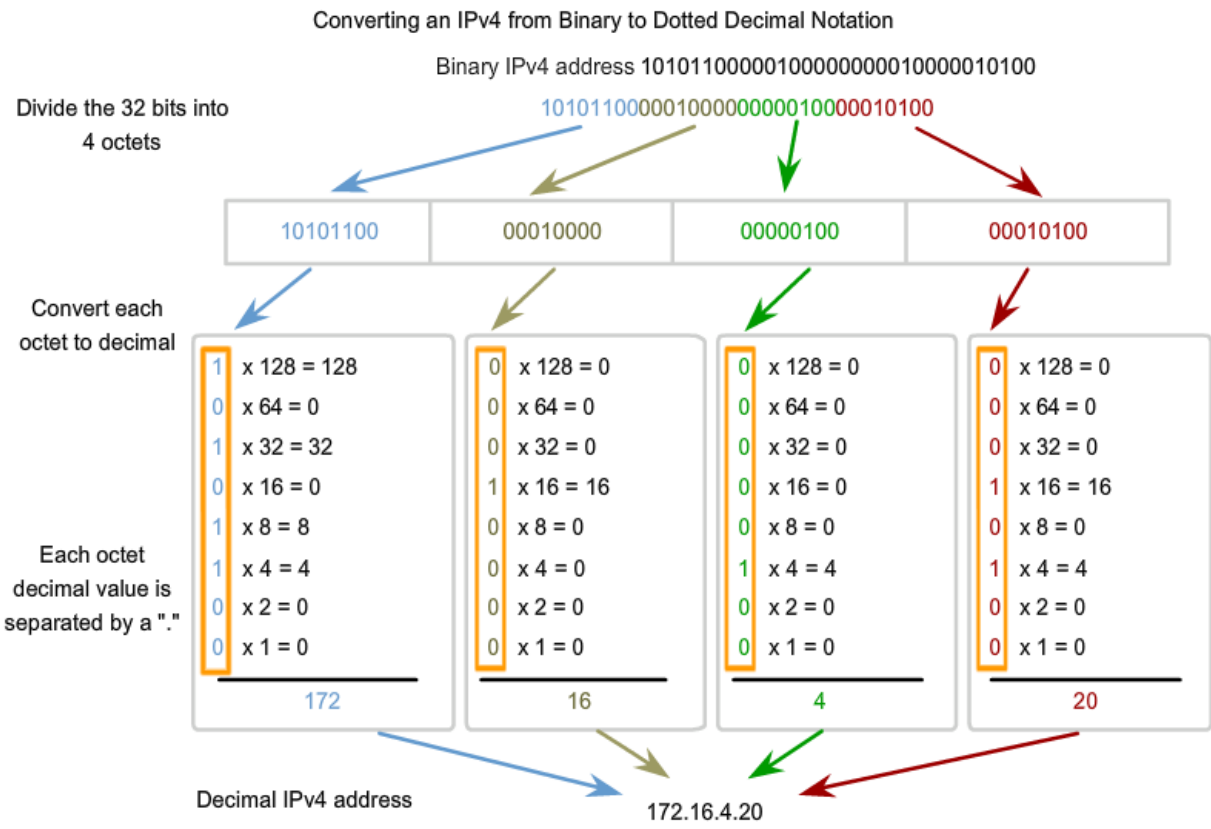
Exponent	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0							
Position	128	64	32	16	8	4	2	1							
Bits	1	1	1	1	0	1	0	1							
	1 BYTE / 1 Octet														
Add these numbers together	128	+	64	+	32	+	16	+	0	+	4	+	0	+	1
Decimal	245														

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.

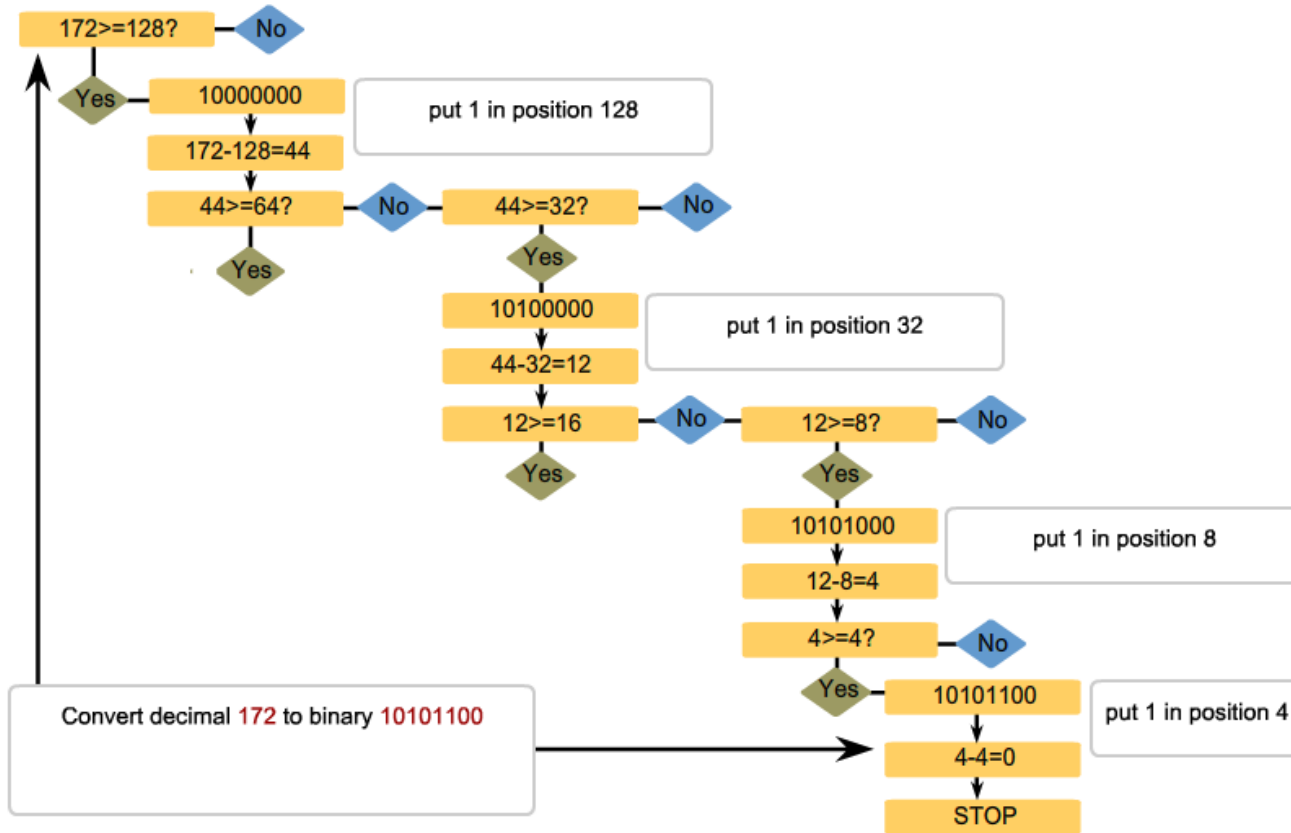
11110101 in Binary = Decimal Number 245

Binary to Decimal Conversion....

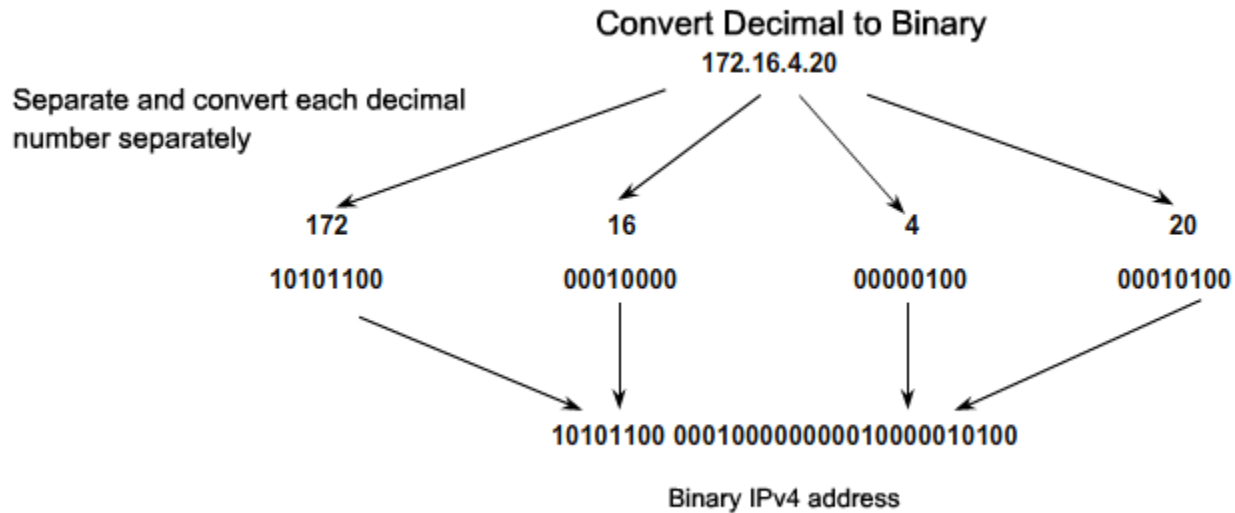


Decimal to Binary

Decimal to Binary Conversion Steps



Decimal to Binary...



Decimal to Binary...

Convert Decimal to Binary

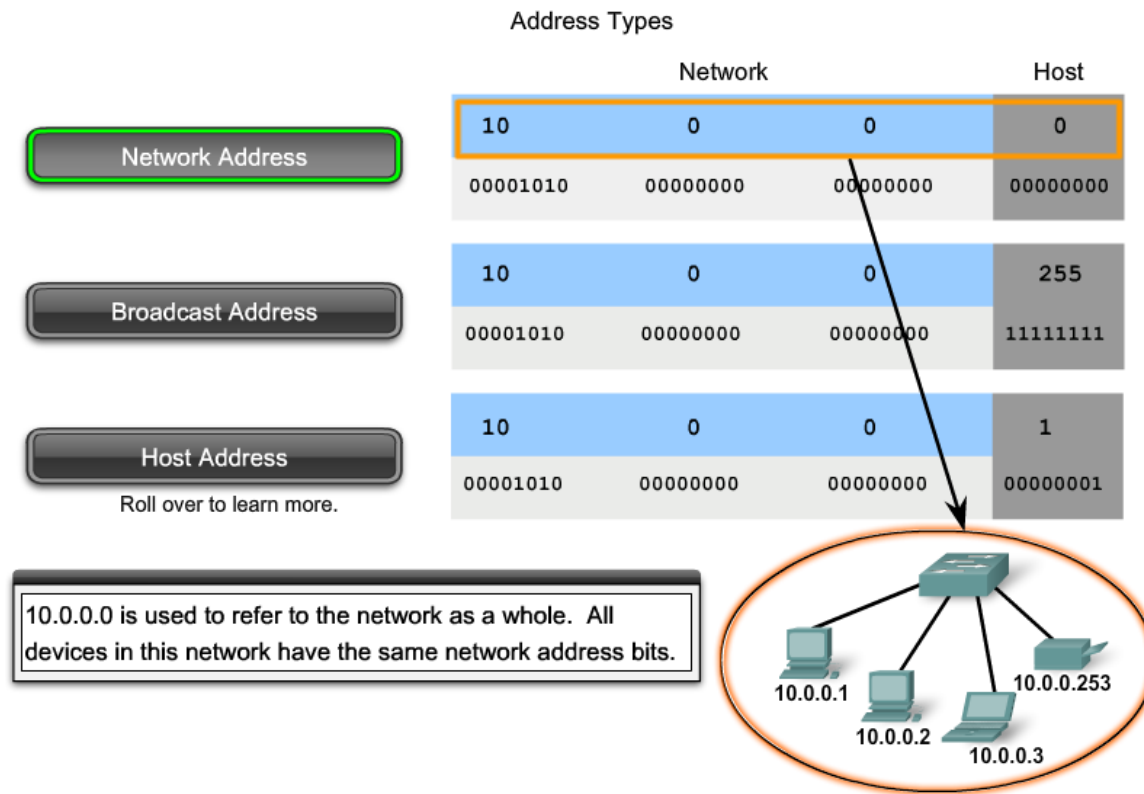
Decimal IPv4 address 172.16.4.20

Separate and convert each decimal number separately

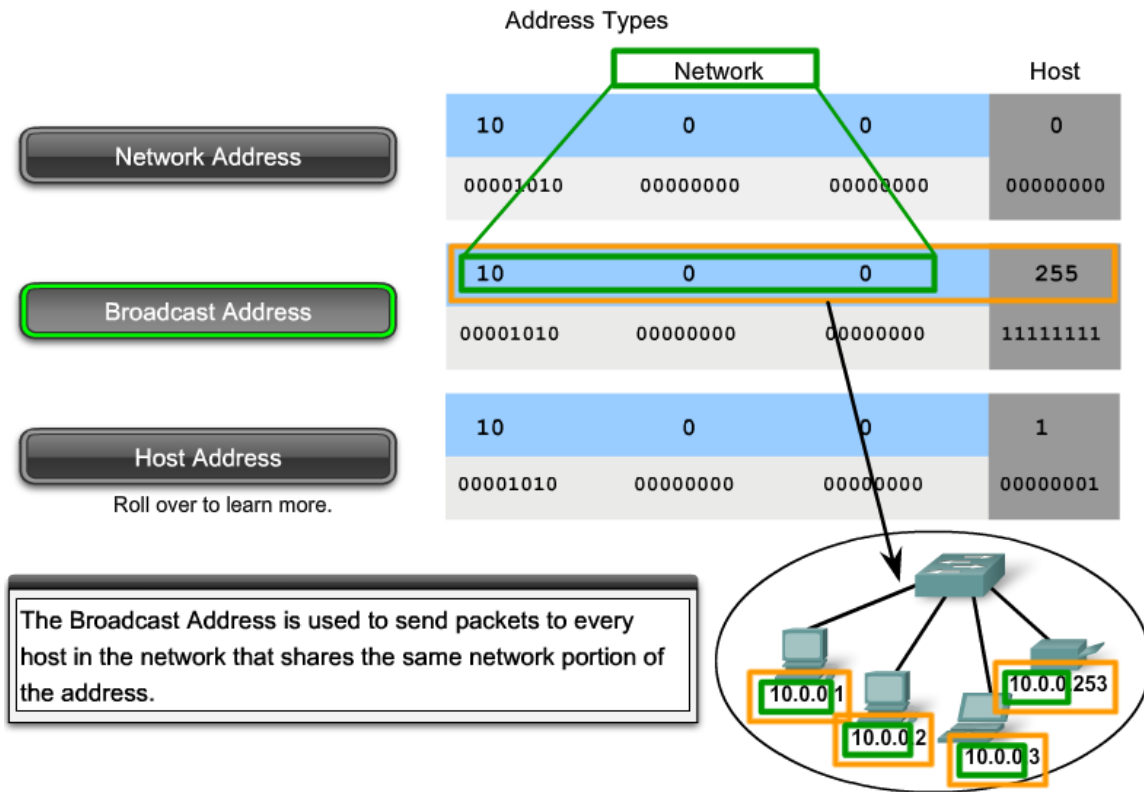
Convert 172	Convert 16	Convert 4	Convert 20
$172 - 128 = 44 \rightarrow 1 \times 128$	$16 < 128 \rightarrow 0 \times 128$	$4 < 128 \rightarrow 0 \times 128$	$20 < 128 \rightarrow 0 \times 128$
$44 < 64 = 0 \rightarrow 0 \times 64$	$16 < 64 \rightarrow 0 \times 64$	$4 < 64 \rightarrow 0 \times 64$	$20 < 64 \rightarrow 0 \times 64$
$44 - 32 = 12 \rightarrow 1 \times 32$	$16 < 32 \rightarrow 0 \times 32$	$4 < 32 \rightarrow 0 \times 32$	$20 < 32 \rightarrow 0 \times 32$
$12 < 16 = 0 \rightarrow 0 \times 16$	$16 - 16 = 0 \rightarrow 1 \times 16$	$4 < 16 \rightarrow 0 \times 16$	$20 - 16 = 4 \rightarrow 1 \times 16$
$12 - 8 = 4 \rightarrow 1 \times 8$	$0 < 8 \rightarrow 0 \times 8$	$4 < 8 \rightarrow 0 \times 8$	$4 < 8 \rightarrow 0 \times 8$
$4 - 4 = 0 \rightarrow 1 \times 4$	$0 < 4 \rightarrow 0 \times 4$	$4 - 4 = 0 \rightarrow 1 \times 4$	$4 - 4 = 0 \rightarrow 1 \times 4$
$0 < 2 = 0 \rightarrow 0 \times 2$	$0 < 2 \rightarrow 0 \times 2$	$0 < 2 \rightarrow 0 \times 2$	$0 < 2 \rightarrow 0 \times 2$
$0 < 1 = 0 \rightarrow 0 \times 1$	$0 < 1 \rightarrow 0 \times 1$	$0 < 1 \rightarrow 0 \times 1$	$0 < 1 \rightarrow 0 \times 1$
10101100	00010000	00000100	00010100

Binary IPv4 address 10101100 00010000000010000010100

Types of addresses in an IPv4 Network



Types of addresses in an IPv4 Network...



Types of addresses in an IPv4 Network...

Address Types

	Network			Host
Network Address	10	0	0	0
	00001010	00000000	00000000	00000000
Broadcast Address	10	0	0	255
	00001010	00000000	00000000	11111111
Host Address	10	0	0	1
	00001010	00000000	00000000	00000001

Roll over to learn more.

Each host in this network has a unique address.

The diagram illustrates a network topology where a central router is connected to three hosts. The hosts are labeled with their IP addresses: 10.0.0.1, 10.0.0.2, and 10.0.0.253. The IP address 10.0.0.1 is highlighted with an orange box, and an arrow points from the 'Host Address' row in the table above to it, indicating that this address is a unique host address within the network.

Types of addresses in an IPv4 Network...

Using Different Prefixes for the 172.16.4.0 Network

Network	Network Address	Host Range	Broadcast Address
172.16.4.0 /24	172.16.4.0	172.16.4.1 - 172.16.4.254	172.16.4.255
172.16.4.0 /25	172.16.4.0	172.16.4.1 - 172.16.4.126	172.16.4.127
172.16.4.0 /26	172.16.4.0	172.16.4.1 - 172.16.4.62	172.16.4.63
172.16.4.0 /27	172.16.4.0	172.16.4.1 - 172.16.4.30	172.16.4.31

SAME NETWORK ADDRESS
ALL PREFIXES

DIFFERENT BROADCAST
ADDRESS EACH PREFIX

Calculating Network, Hosts and broadcast addresses

Assigning Addresses

Network address

172 . 16. 20. 0/25
 10101100.00010000.00010100.00000000
 |-----Network -----|- host -|

$0+0+0+0+0+0+0+0=0$
 Network address = 172.16.20.0

Step 1

First host address

172 . 16. 20. 1
 10101100.00010000.00010100.00000001
 |-----Network -----|- host -|

$0+0+0+0+0+0+0+1=1$
 Lowest host address = 172.16.20.1

Step 2

Broadcast address

172 . 16. 20. 127
 10101100.00010000.00010100.01111111
 |-----Network -----|- host -|

$0+64+32+16+8+4+2+1=127$
 Broadcast address = 172.16.20.127

Step 3

Last host address

172 . 16. 20. 126
 10101100.00010000.00010100.01111110
 |-----Network -----|- host -|

$0+64+32+16+8+4+2+0=126$
 Highest host address = 172.16.20.126

Step 4

Examples

Given address/prefix of **148.6.123.128 /20**

For each row, enter the values for that type of address.

Type of Address	Enter LAST octet in binary	Enter LAST octet in decimal	Enter full address in decimal
Network	<input type="text" value="00000000"/>	<input type="text" value="0"/>	<input type="text" value="148.6.112.0"/>
Broadcast	<input type="text" value="11111111"/>	<input type="text" value="255"/>	<input type="text" value="148.6.127.255"/>
First Usable Host Address	<input type="text" value="00000001"/>	<input type="text" value="1"/>	<input type="text" value="148.6.112.1"/>
Last Usable Host Address	<input type="text" value="11111110"/>	<input type="text" value="254"/>	<input type="text" value="148.6.127.254"/>

Given address/prefix of **153.180.219.125 /22**

For each row, enter the values for that type of address.

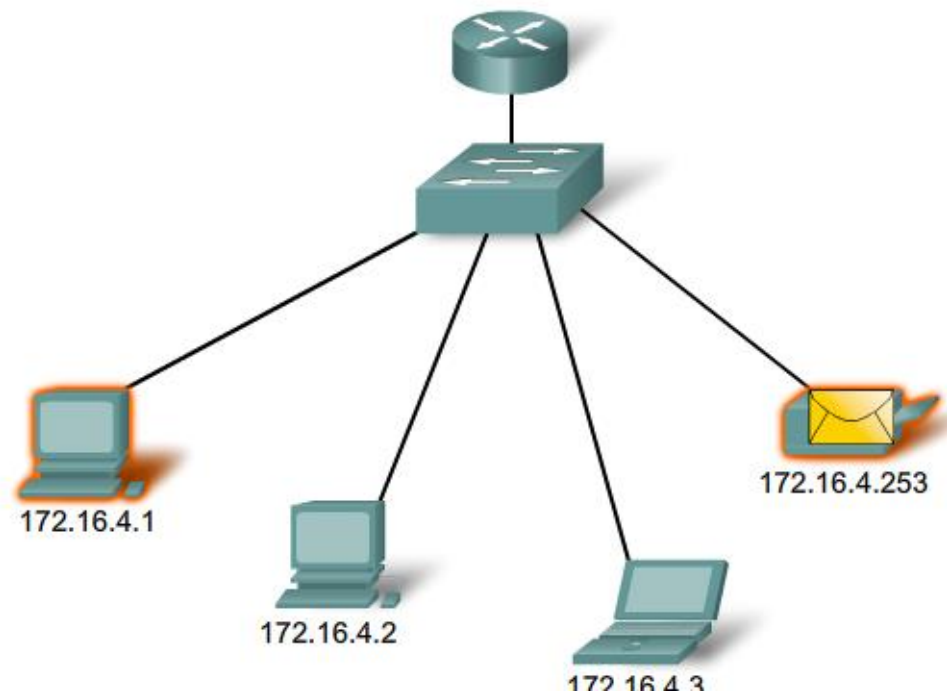
Type of Address	Enter LAST octet in binary	Enter LAST octet in decimal	Enter full address in decimal
Network	<input type="text" value="00000000"/>	<input type="text" value="0"/>	<input type="text" value="153.180.216.0"/>
Broadcast	<input type="text" value="11111111"/>	<input type="text" value="255"/>	<input type="text" value="153.180.219.255"/>
First Usable Host Address	<input type="text" value="00000001"/>	<input type="text" value="1"/>	<input type="text" value="153.180.216.1"/>
Last Usable Host Address	<input type="text" value="11111110"/>	<input type="text" value="254"/>	<input type="text" value="153.180.219.254"/>

Unicast Transmission

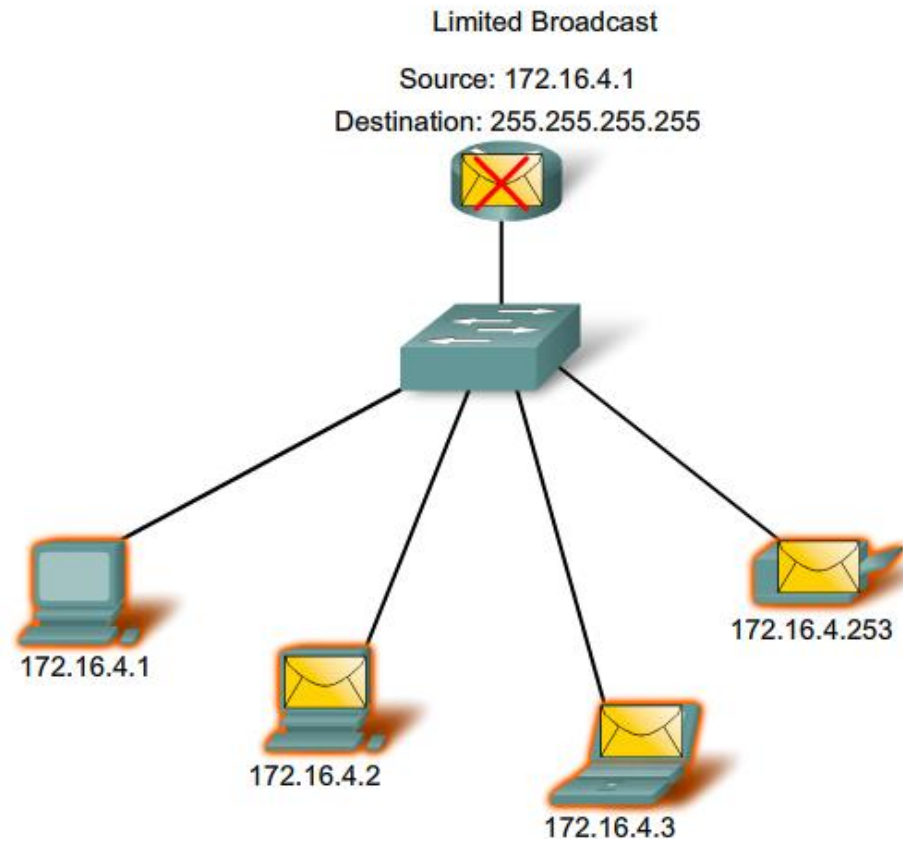
Unicast Transmission

Source: 172.16.4.1

Destination: 172.16.4.253



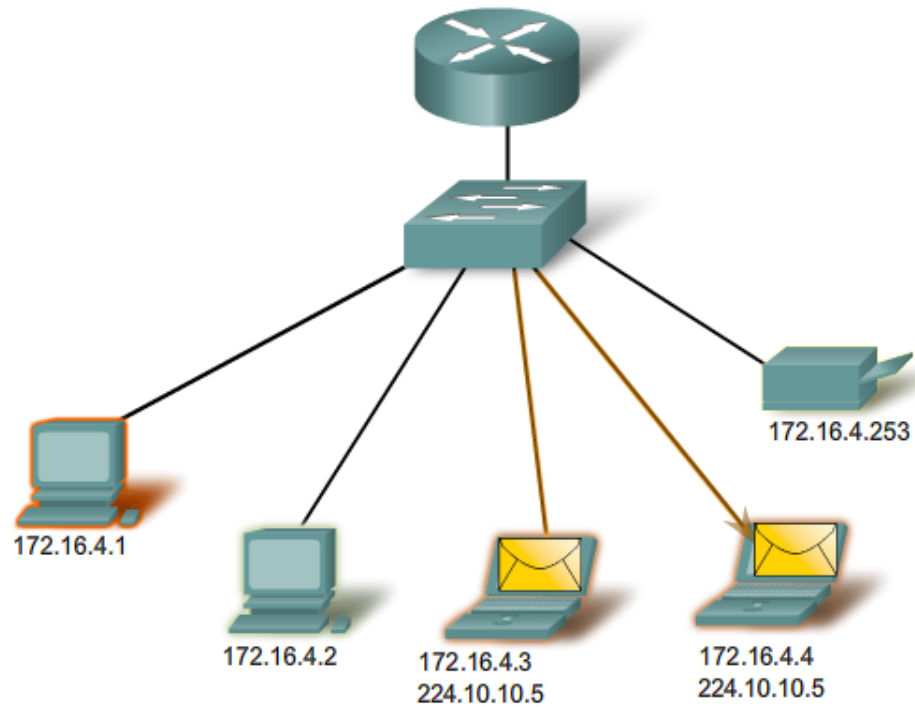
Broadcast Transmission



Multicast Transmission

Multicast Transmission

Source: 172.16.4.1



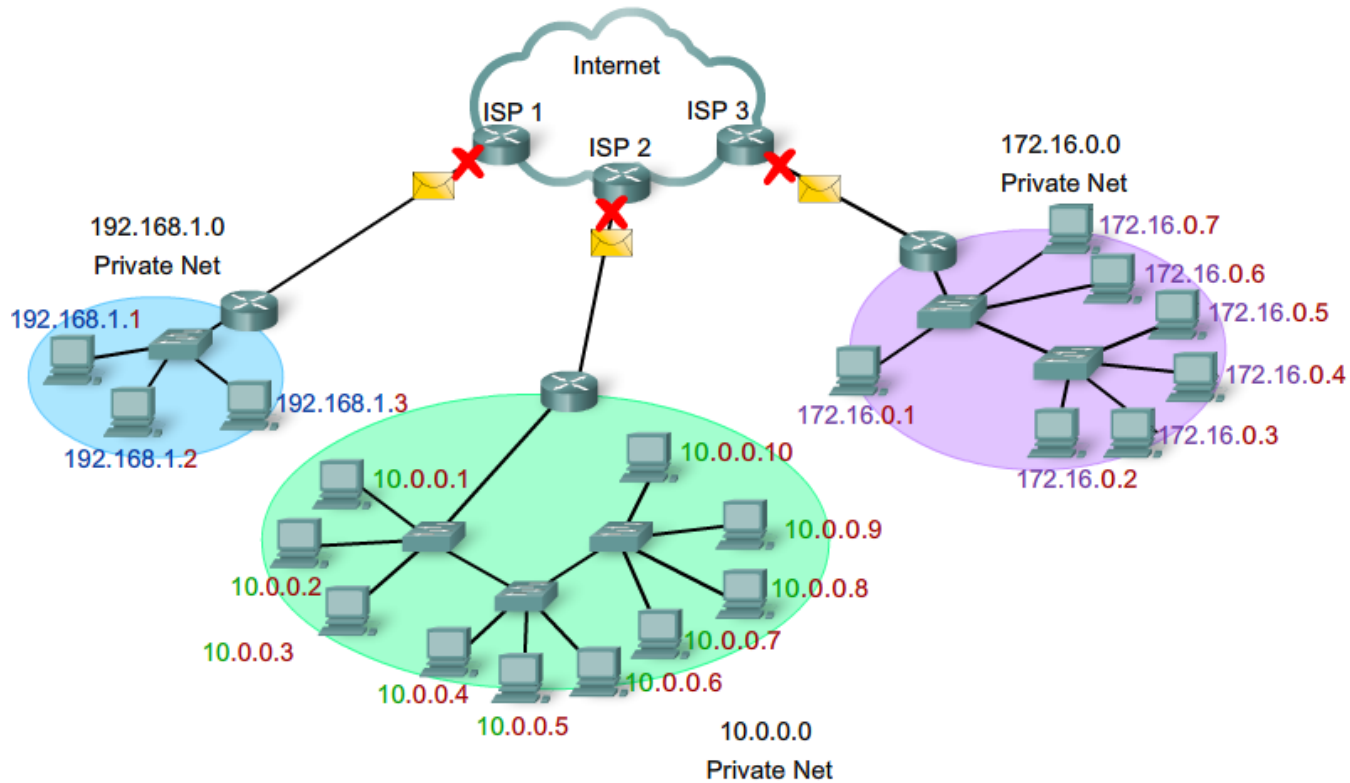
Reserved IPv4 Address Ranges

Reserved IPv4 Address Ranges

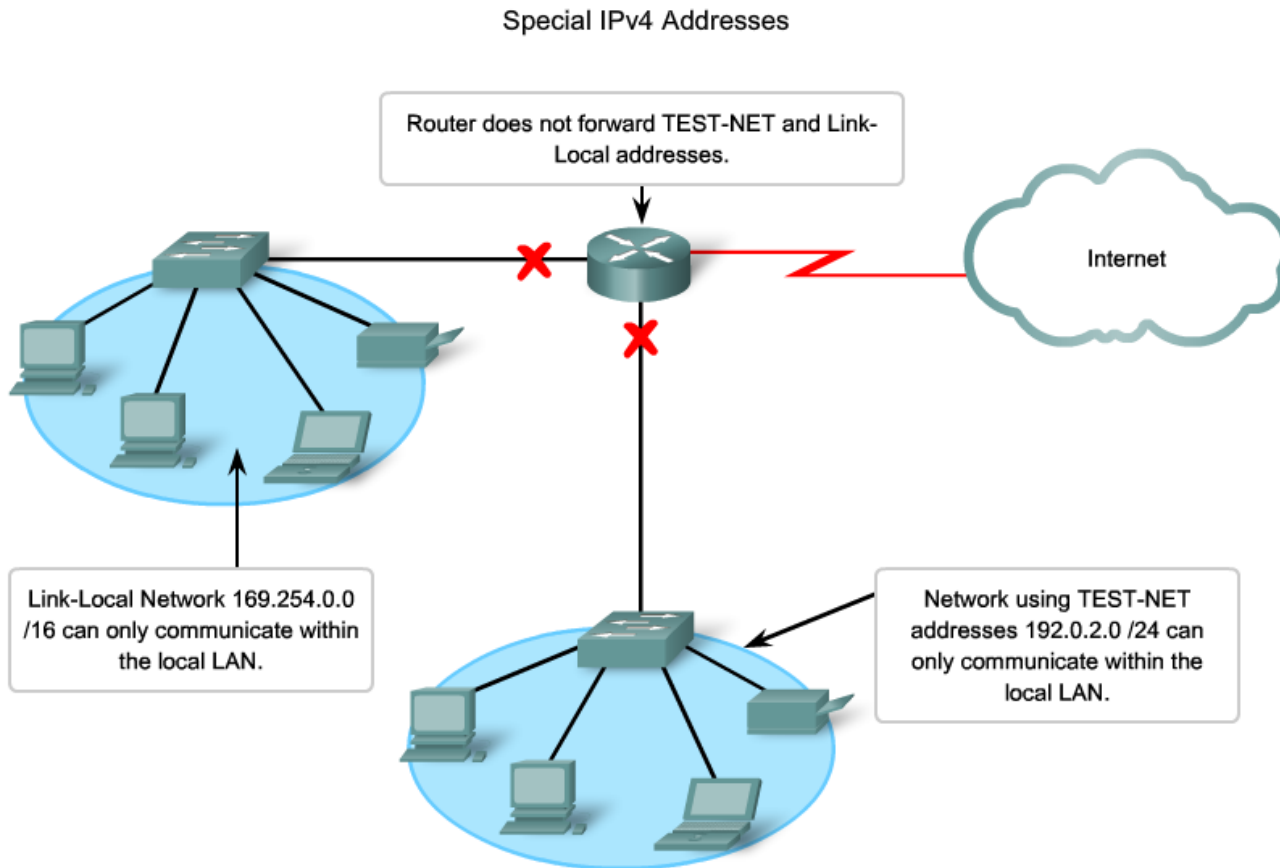
Type of Address	Usage	Reserved IPv4 Address Range	RFC
Host Address	used for IPv4 hosts	0.0.0.0 to 223.255.255.255	790
Multicast Addresses	used for multicast groups on a local network	224.0.0.0 to 239.255.255.255	1700
Experimental Addresses	<ul style="list-style-type: none">• used for research or experimentation• cannot currently be used for hosts in IPv4 networks	240.0.0.0 to 255.255.255.254	1700 3330

Public and Private Addresses

Private Addresses Used in Networks without NAT



Special IPv4 Addresses



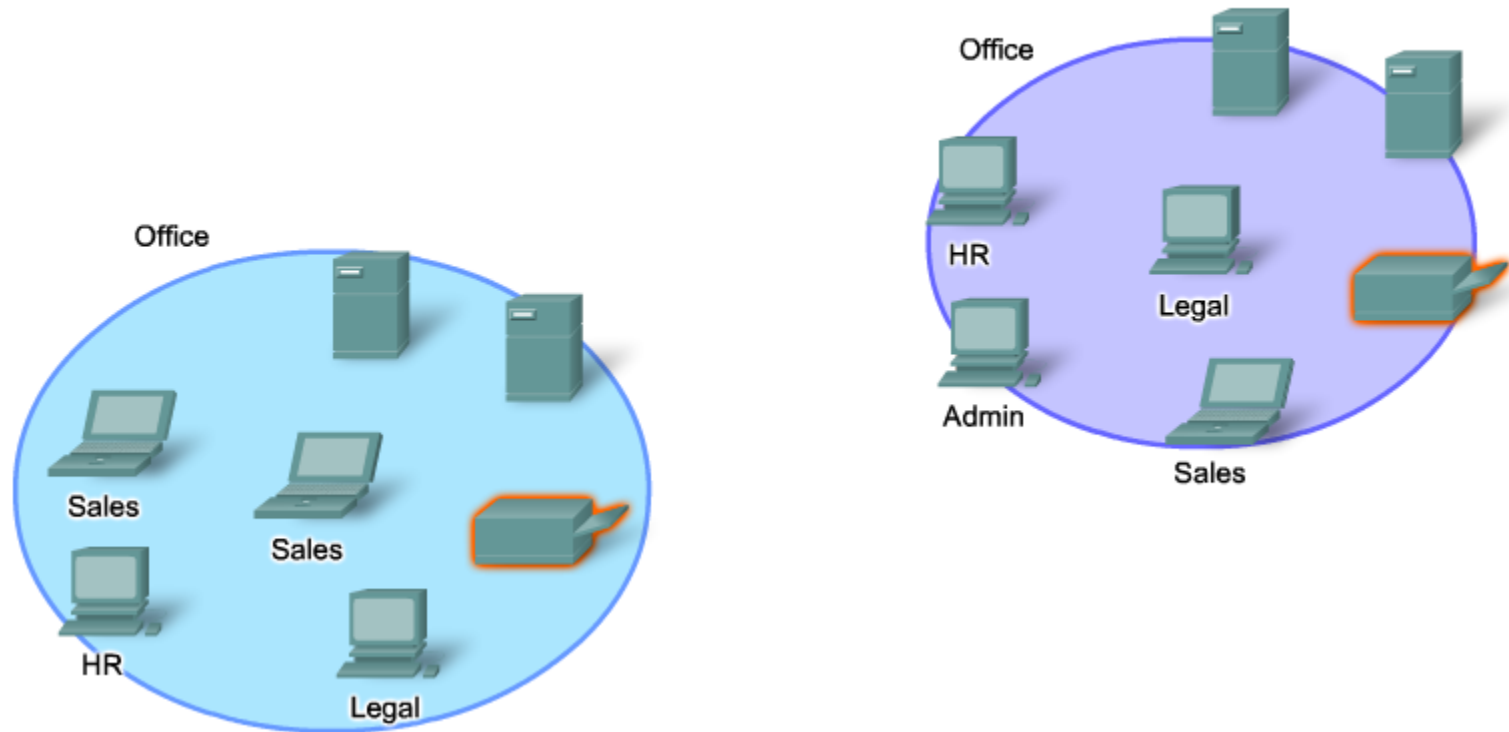
IP Addresses

IP Address Classes

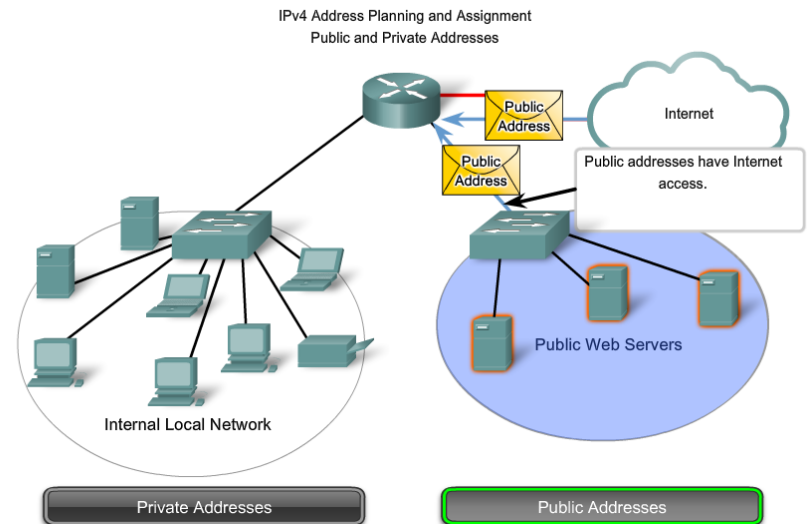
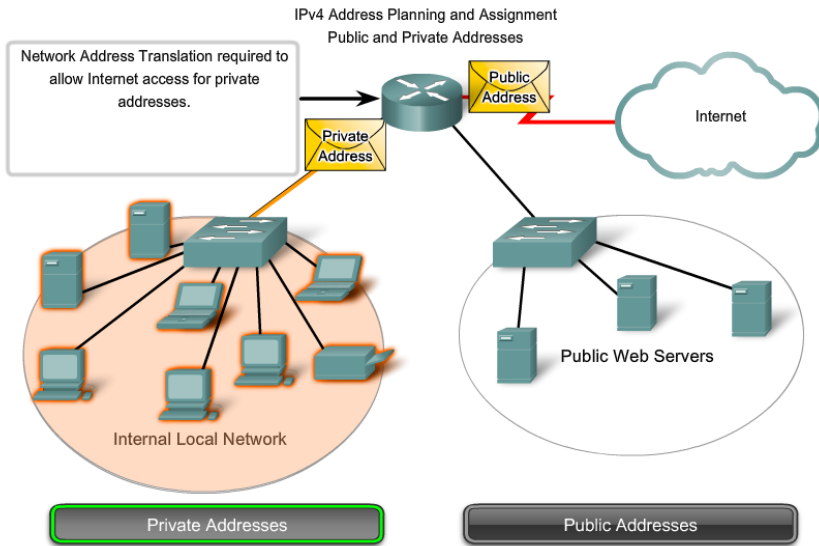
Address Class	1st octet range (decimal)	1st octet bits (green bits do not change)	Network(N) and Host(H) parts of address	Default subnet mask (decimal and binary)	Number of possible networks and hosts per network
A	1-127**	00000000-01111111	N.H.H.H	255.0.0.0	128 nets (2^7) 16,777,214 hosts per net (2^{24-2})
B	128-191	10000000-10111111	N.N.H.H	255.255.0.0	16,384 nets (2^{14}) 65,534 hosts per net (2^{16-2})
C	192-223	11000000-11011111	N.N.N.H	255.255.255.0	2,097,150 nets (2^{21}) 254 hosts per net (2^{8-2})
D	224-239	11100000-11101111	NA (multicast)		
E	240-255	11110000-11111111	NA (experimental)		

Planning to Address the Network

IPv4 Address Planning and Assignment

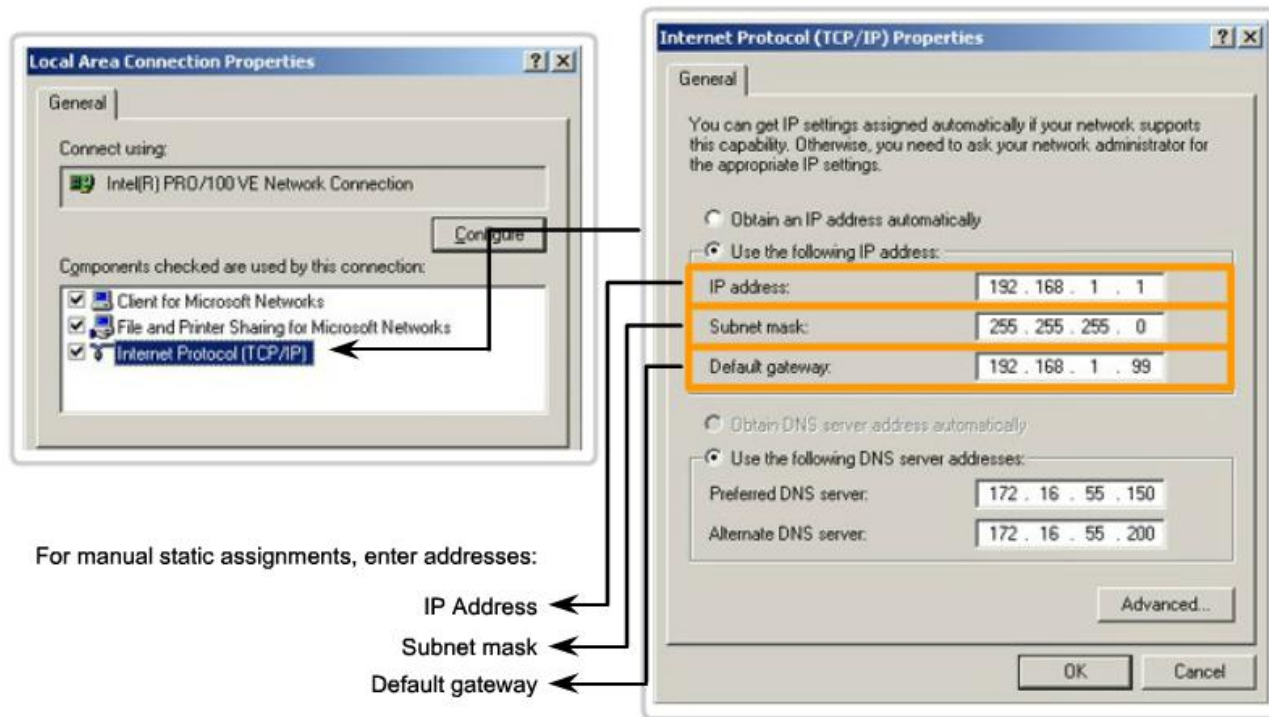


Planning to Address the Network....



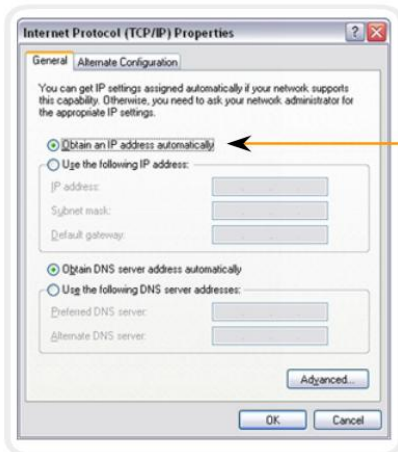
Static or Dynamic Addressing for End Devices

Addressing End Devices



Static or Dynamic Addressing for End Devices ...

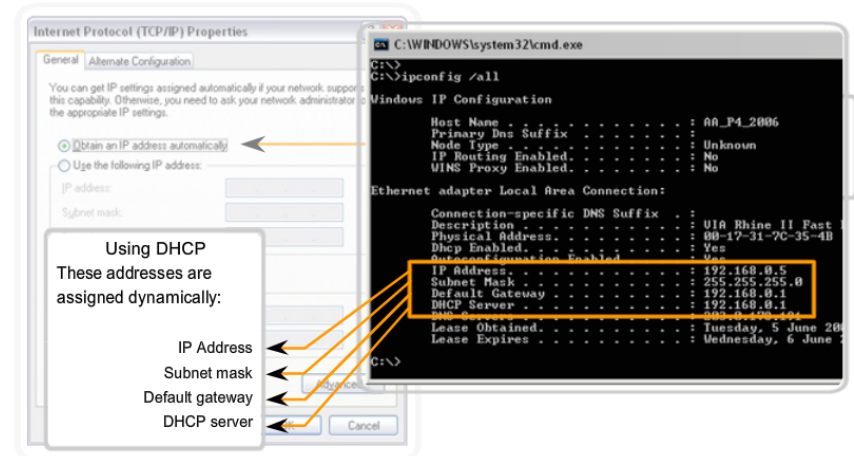
Assigning Dynamic Addresses



This property will set the device to obtain an IP address automatically.

Device Configuration

Assigning Dynamic Addresses



Using DHCP
These addresses are assigned dynamically:

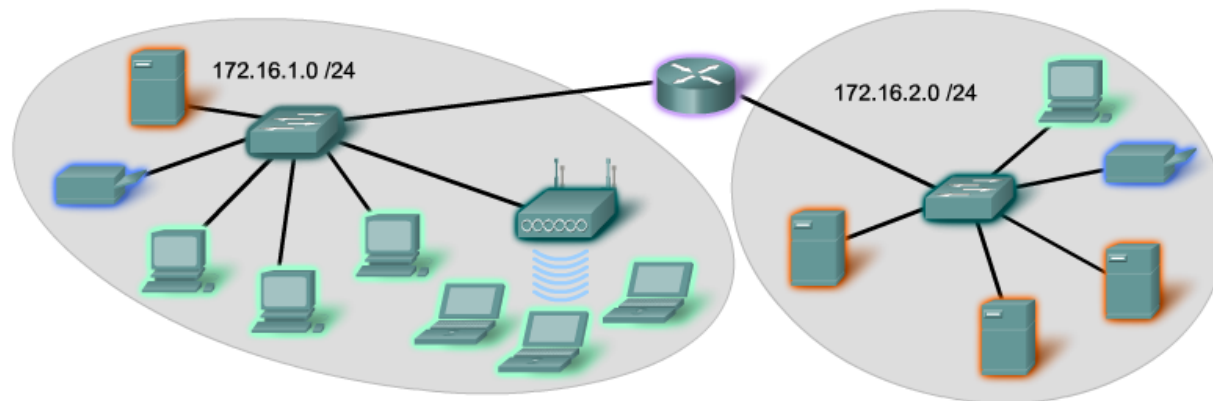
- IP Address
- Subnet mask
- Default gateway
- DHCP server

Device Configuration

Assigning Addresses to Other Devices

Devices IP Address Ranges

Use	First Address	Last Address	Summary Address
Network Address	172.16.x.0	172.16.x.0 /25
User hosts (DHCP pool)	172.16.x.1	172.16.x.127	
Servers	172.16.x.128	172.16.x.191	172.16.x.128 /26
Peripherals	172.16.x.192	172.16.x.223	172.16.x.128 /26
Networking devices	172.16.x.224	172.16.x.253	172.16.x.224 /27
Router (gateway)	172.16.x.254	
Broadcast	172.16.x.255	

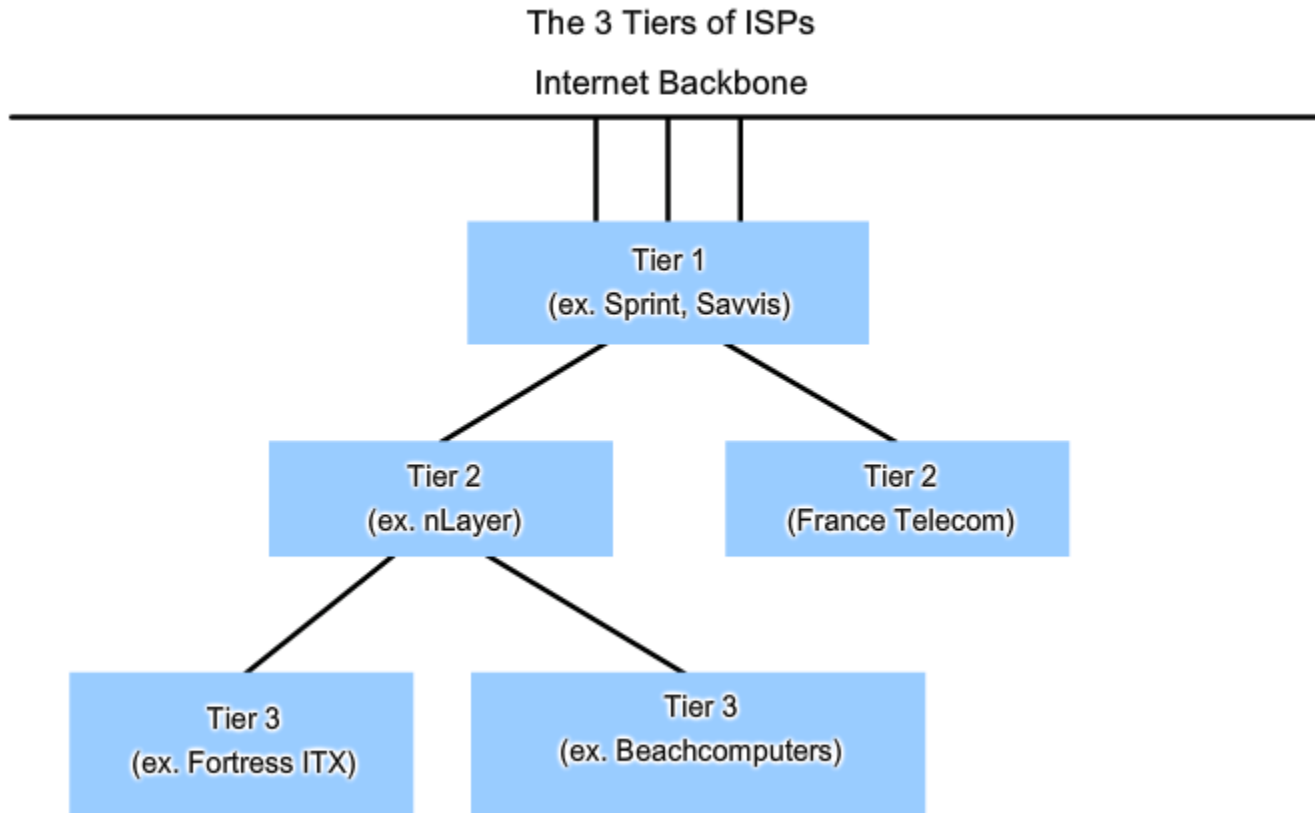


Who Assigns The Different Addresses?

Entities that Oversee IP Address Allocation

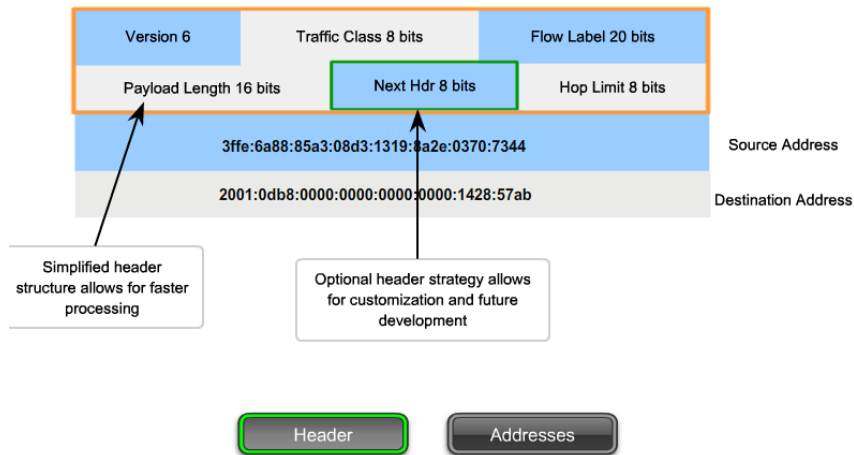
Global	IANA				
Regional Internet Registries	AfriNIC Africa Region	APNIC Asia/ Pacific Region	LACNIC Latin America And Caribbean Region	ARIN North America Region	RIPE NCC Europe, Middle East, Central Asia Region

ISPs

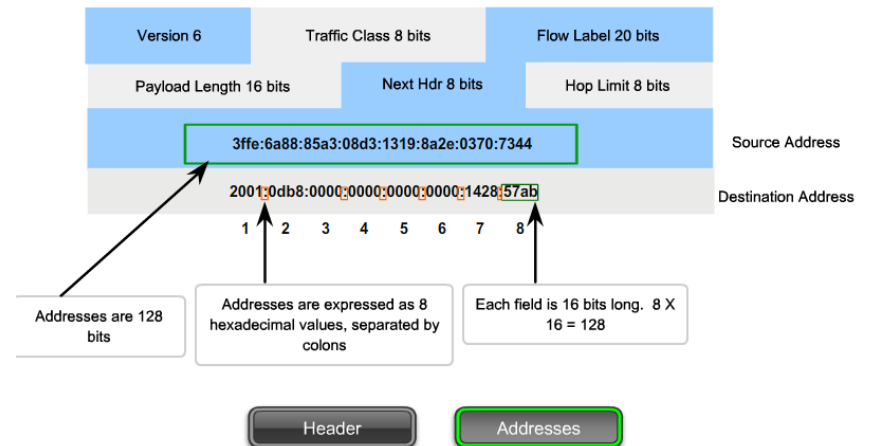


Overview of IPv6

IPv6 Header

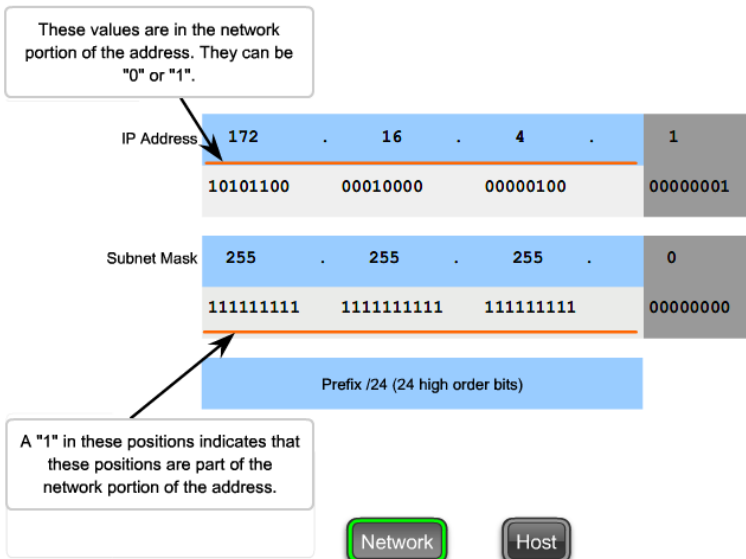


IPv6 Header

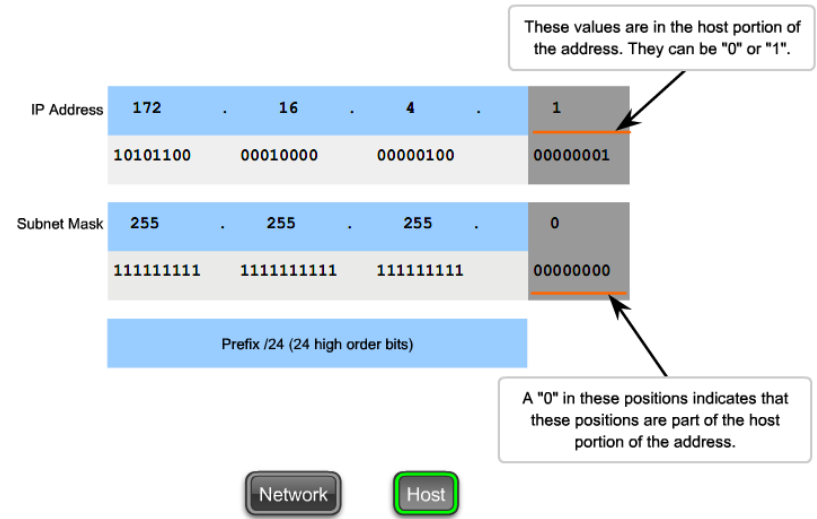


The subnet Mask- Defining the Network and Host Portions

Network and Host Portions of an IP Address



Network and Host Portions of an IP Address



ANDing- What Is in our Network?

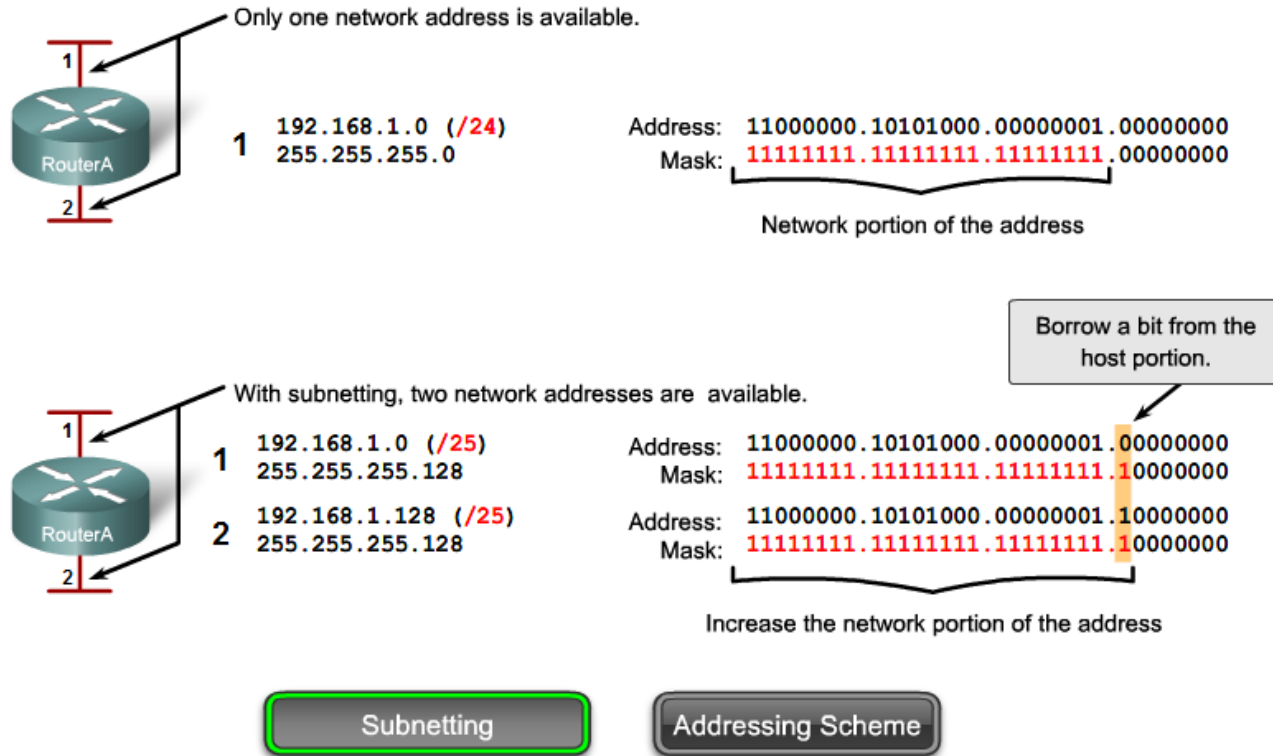
Applying the Subnet Mask

A device with address 192.0.0.1 belongs to network 192.0.0.0

	High order bits Prefix /16		Low order bits	
	192	0	0	1
Host Address	11000000	00000000	00000000	00000001
Subnet Mask	255	255	0	0
	11111111	11111111	00000000	00000000
Network Address	11000000	00000000	00000000	00000000
Network	192	0	0	0

Basic Subnetting

Borrowing Bits for Subnets



Basic Subnetting...

Borrowing Bits for Subnets

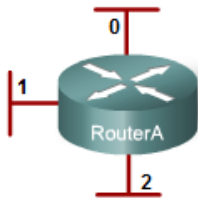
Addressing Scheme: Example of 2 networks

Subnet	Network address	Host range	Broadcast address
0	192.168.1.0/25	192.168.1.1 - 192.168.1.126	192.168.1.127
1	192.168.1.128/25	192.168.1.129 - 192.168.1.254	192.168.1.255

Subnetting

Addressing Scheme

Example with 3 subnets



Borrowing Bits for Subnets

-	192.168.1.0 (/24)	Address: 11000000.10101000.00000001.00000000
	255.255.255.0	Mask: 11111111.11111111.11111111.00000000
0	192.168.1.0 (/26)	Address: 11000000.10101000.00000001.00000000
	255.255.255.192	Mask: 11111111.11111111.11111111.11000000
1	192.168.1.64 (/26)	Address: 11000000.10101000.00000001.01000000
	255.255.255.192	Mask: 11111111.11111111.11111111.11000000
2	192.168.1.128 (/26)	Address: 11000000.10101000.00000001.10000000
	255.255.255.192	Mask: 11111111.11111111.11111111.11000000
3	192.168.1.192 (/26)	Address: 11000000.10101000.00000001.11000000
	255.255.255.192	Mask: 11111111.11111111.11111111.11000000

Two bits are borrowed to provide four subnets.

Unused address in this example.

A 1 in these positions in the mask means that these values are part of the network address.

More subnets are available, but fewer addresses are available per subnet.

Subnetting

Addressing Scheme

Example with 3 subnets...

Borrowing Bits for Subnets

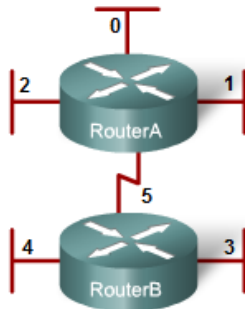
Addressing Scheme: Example of 4 networks

Subnet	Network address	Host range	Broadcast address
0	192.168.1.0/26	192.168.1.1 - 192.168.1.62	192.168.1.63
1	192.168.1.64/26	192.168.1.65 - 192.168.1.126	192.168.1.127
2	192.168.1.128/26	192.168.1.129 - 192.168.1.190	192.168.1.191
3	192.168.1.192/26	192.168.1.193 - 192.168.1.254	192.168.1.255

Example with 6 subnets

Borrowing Bits for Subnets

Start with this address	-	192.168.1.0 (/24)	Address: 11000000.10101000.00000001.00000000
		255.255.255.0	Mask: 11111111.11111111.11111111.00000000
Make 8 subnets	0	192.168.1.0 (/27)	Address: 11000000.10101000.00000001.00000000
		255.255.255.224	Mask: 11111111.11111111.11111111.11100000
	1	192.168.1.32 (/27)	Address: 11000000.10101000.00000001.00100000
		255.255.255.224	Mask: 11111111.11111111.11111111.11100000
	2	192.168.1.64 (/27)	Address: 11000000.10101000.00000001.01000000
		255.255.255.224	Mask: 11111111.11111111.11111111.11100000
	3	192.168.1.96 (/27)	Address: 11000000.10101000.00000001.01100000
		255.255.255.224	Mask: 11111111.11111111.11111111.11100000
	4	192.168.1.128 (/27)	Address: 11000000.10101000.00000001.10000000
		255.255.255.224	Mask: 11111111.11111111.11111111.11100000
	5	192.168.1.160 (/27)	Address: 11000000.10101000.00000001.10100000
		255.255.255.224	Mask: 11111111.11111111.11111111.11100000
	6	192.168.1.192 (/27)	Address: 11000000.10101000.00000001.11000000
		255.255.255.224	Mask: 11111111.11111111.11111111.11100000
	7	192.168.1.224 (/27)	Address: 11000000.10101000.00000001.11100000
		255.255.255.224	Mask: 11111111.11111111.11111111.11100000



Three bits are borrowed to provide eight subnets.

Subnetting

Addressing Scheme

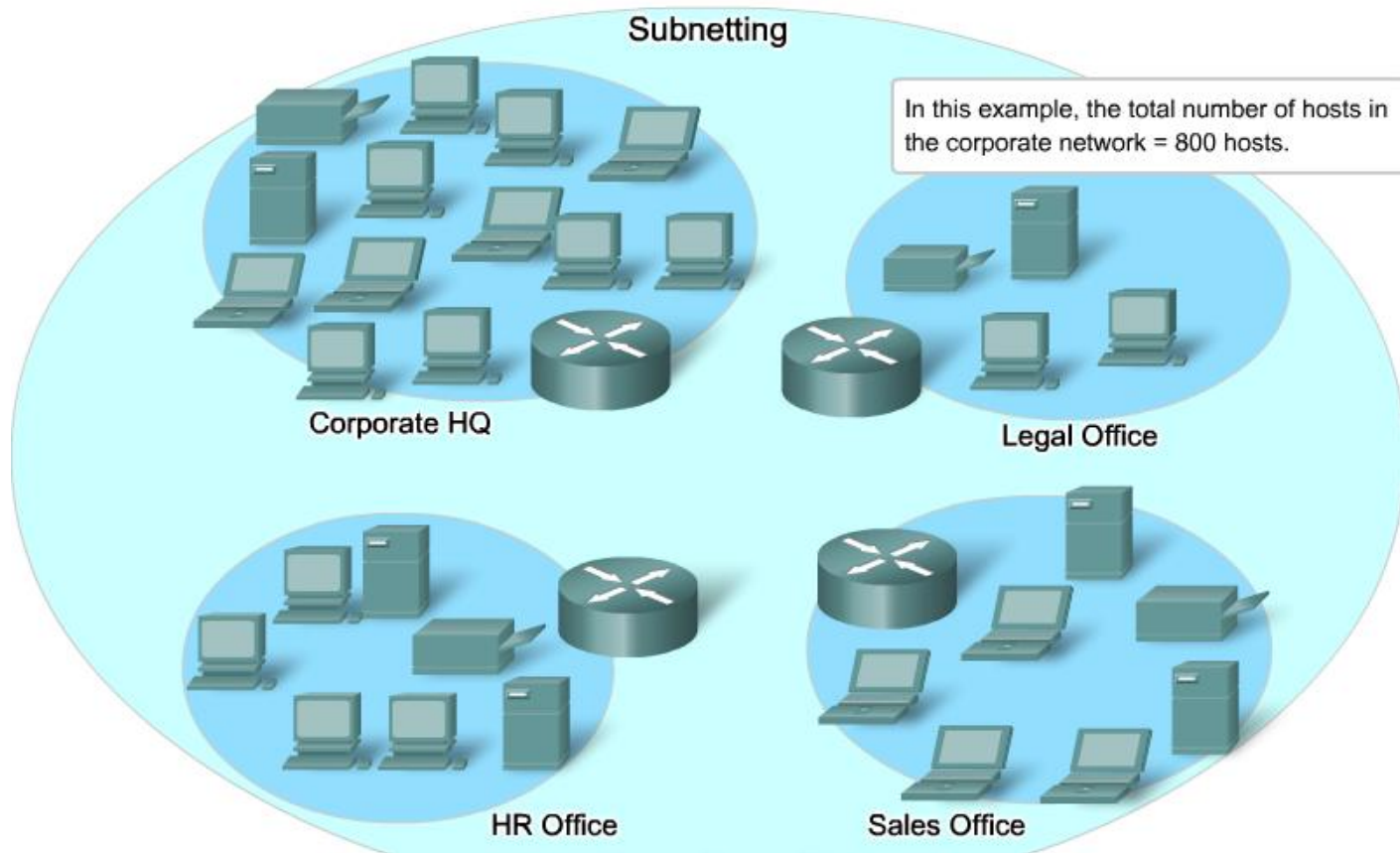
Example with 6 subnets...

Borrowing Bits for Subnets

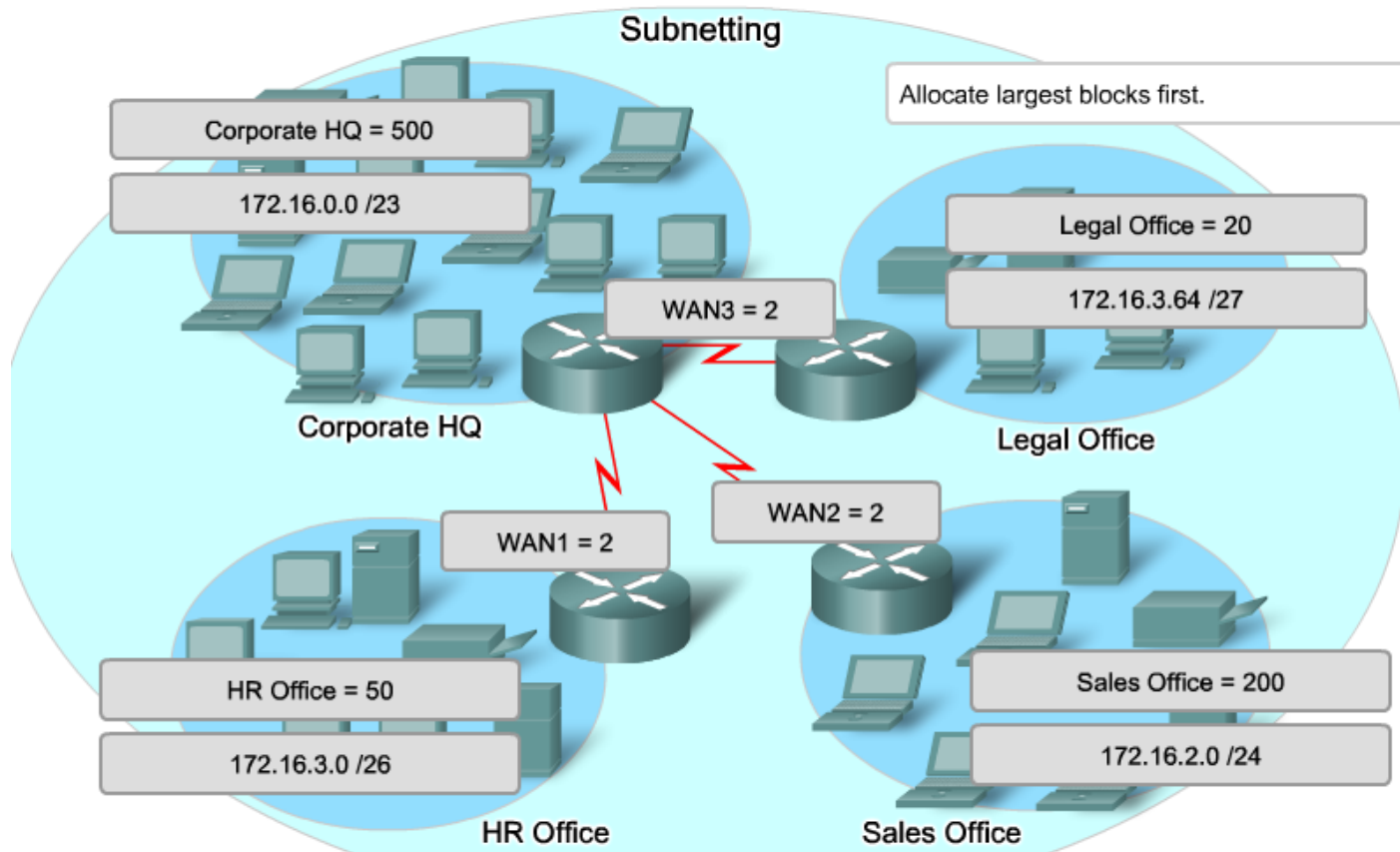
Addressing Scheme: Example of 6 networks

Subnet	Network address	Host range	Broadcast address
0	192.168.1.0/27	192.168.1.1 - 192.168.1.30	192.168.1.31
1	192.168.1.32/27	192.168.1.33 - 192.168.1.62	192.168.1.63
2	192.168.1.64/27	192.168.1.65 - 192.168.1.94	192.168.1.95
3	192.168.1.96/27	192.168.1.97 - 192.168.1.126	192.168.1.127
4	192.168.1.128/27	192.168.1.129 - 192.168.1.158	192.168.1.159
5	192.168.1.160/27	192.168.1.161 - 192.168.1.190	192.168.1.191
6	192.168.1.192/27	192.168.1.193 - 192.168.1.222	192.168.1.223
7	192.168.1.224/27	192.168.1.225 - 192.168.1.254	192.168.1.255

Subnetting- Dividing Networks Into Right Sizes



Subnetting- Dividing Networks Into Right Sizes...



Subnetting- Dividing Networks Into Right Sizes...

Corporate Net	HQ	Sales	HR	Legal
172.16.0.0/22	172.16.0.0/23	172.16.2.0/24	172.16.3.0/26	172.16.3.64/27
172.16.0.1	172.16.0.1			
	172.16.1.255			
		172.16.2.0		
		172.16.2.255		
			172.16.3.0	
			172.16.3.63	
				172.16.3.64
				172.16.3.95

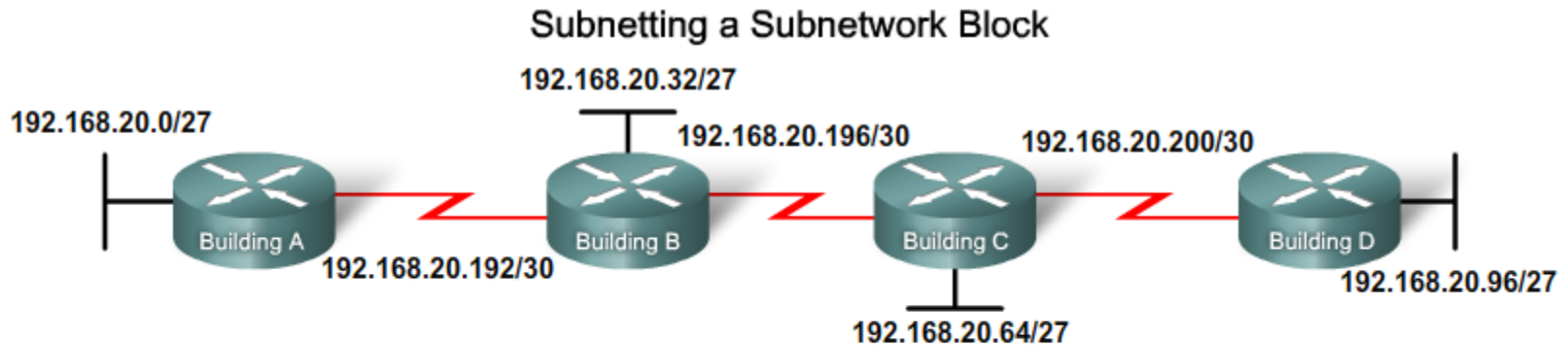
Subnetting- Dividing Networks Into Right Sizes...

HQ	HQ1	HQ2
172.16.0.0/23		
172.16.0.1	172.16.0.1	
	172.16.0.255	
		172.16.1.0
172.16.1.255		172.16.1.255

Step 1

Step 2

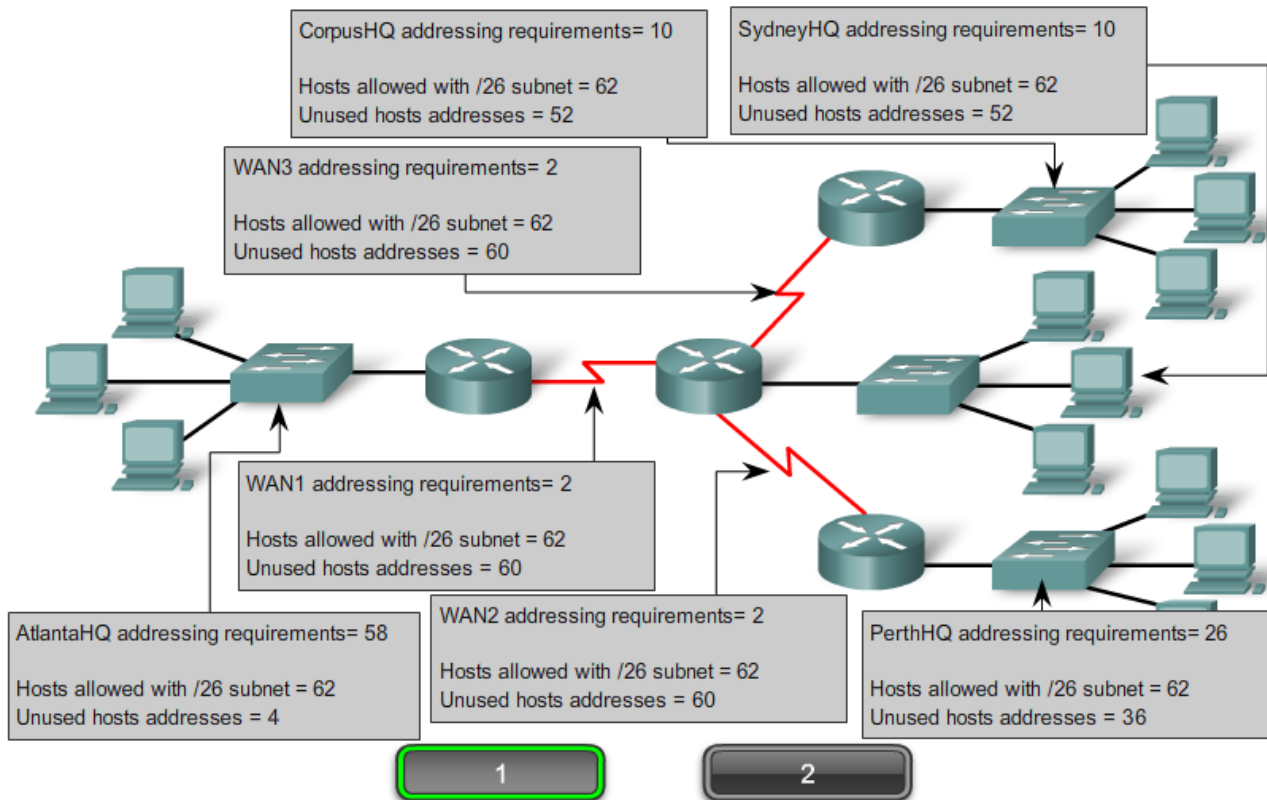
Subnetting a Subnet



Subnet Number	Subnet Address
Subnet 0	192.168.20.0/27
Subnet 1	192.168.20.32/27
Subnet 2	192.168.20.64/27
Subnet 3	192.168.20.96/27
Subnet 4	192.168.20.128/27
Subnet 5	192.168.20.160/27
Subnet 6	192.168.20.192/27
Subnet 7	192.168.20.224/27

Subnet Number	Subnet Address
Subnet 0	192.168.20.192/30
Subnet 1	192.168.20.196/30
Subnet 2	192.168.20.200/30
Subnet 3	192.168.20.204/30
Subnet 4	192.168.20.208/30
Subnet 5	192.168.20.212/30
Subnet 6	192.168.20.216/30
Subnet 7	192.168.20.220/30

Network Requirements: Using standard subnetting would be inefficient.



Network Requirements: Using standard subnetting would be inefficient.

	Actual Requirements	Total Wasted Addresses
AtlantaHQ	58 host addresses	4 addresses
PerthHQ	26 host addresses	36 addresses
SydneyHQ	10 host addresses	52 addresses
CorpusHQ	10 host addresses	52 addresses
WAN links	2 host addresses (each)	60 addresses

1

2

Example

Name - required addresses	Subnet address	Address range	Broadcast Address	Network/prefix
AtlantaHQ - 58				
PerthHQ - 26				
SydneyHQ - 10				
CorpusHQ - 10				
WAN1 - 2				
WAN2 - 2				
WAN3 - 2				

On your documentation, list your requirements in descending order.

Example...

Name - required addresses	Subnet address	Address range	Broadcast Address	Network/prefix
AtlantaHQ - 58	192.168.15.0	.1 - .62	.63	192.168.15.0 /26
PerthHQ - 26				
SydneyHQ - 10				
CorpusHQ - 10				
WAN1 - 2				
WAN2 - 2				
WAN3 - 2				

Calculate the subnet mask to meet largest requirement - AtlantaHQ.

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8

Example...

Name - required addresses	Subnet address	Address range	Broadcast Address	Network/prefix
AtlantaHQ - 58	192.168.15.0	.1 - .62	.63	192.168.15.0 /26
PerthHQ - 26	192.168.15.64	.65 - .94	.95	192.168.15.64 /27
SydneyHQ - 10				
CorpusHQ - 10				
WAN1 - 2				
WAN2 - 2				
WAN3 - 2				

Use the next available Address .64 to calculate a subnet mask for the next largest requirement - PerthHQ.

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8

Example...

Name - required addresses	Subnet address	Address range	Broadcast Address	Network/prefix
AtlantaHQ - 58	192.168.15.0	.1 - .62	.63	192.168.15.0 /26
PerthHQ - 26	192.168.15.64	.65 - .94	.95	192.168.15.64 /27
SydneyHQ - 10	192.168.15.96	.97 - .110	.111	192.168.15.96 /28
CorpusHQ - 10				
WAN1 - 2				
WAN2 - 2				
WAN3 - 2				

Use the next available .96 to calculate a subnet for SydneyHQ requirement of 10 hosts.

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8

Example...

Name - required addresses	Subnet address	Address range	Broadcast Address	Network/prefix
AtlantaHQ - 58	192.168.15.0	.1 - .62	.63	192.168.15.0 /26
PerthHQ - 26	192.168.15.64	.65 - .94	.95	192.168.15.64 /27
SydneyHQ - 10	192.168.15.96	.97 - .110	.111	192.168.15.96 /28
CorpusHQ - 10	192.168.15.112	.113 - .126	.127	192.168.15.112 /28
WAN1 - 2				
WAN2 - 2				
WAN3 - 2				

Use the next available address .112 to calculate a subnet for CorpusHQ which also requires 10 hosts.



Example...

Name - required addresses	Subnet address	Address range	Broadcast Address	Network/prefix
AtlantaHQ - 58	192.168.15.0	.1 - .62	.63	192.168.15.0 /26
PerthHQ - 26	192.168.15.64	.65 - .94	.95	192.168.15.64 /27
SydneyHQ - 10	192.168.15.96	.97 - .110	.111	192.168.15.96 /28
CorpusHQ - 10	192.168.15.112	.113 - .126	.127	192.168.15.112 /28
WAN1 - 2	192.168.15.128	.129 - .130	.131	192.168.15.128 /30
WAN2 - 2				
WAN3 - 2				

WAN links require 2 addresses each.



Example...

Name - required addresses	Subnet address	Address range	Broadcast Address	Network/prefix
AtlantaHQ - 58	192.168.15.0	.1 - .62	.63	192.168.15.0 /26
PerthHQ - 26	192.168.15.64	.65 - .94	.95	192.168.15.64 /27
SydneyHQ - 10	192.168.15.96	.97 - .110	.111	192.168.15.96 /28
CorpusHQ - 10	192.168.15.112	.113 - .126	.127	192.168.15.112 /28
WAN1 - 2	192.168.15.128	.129 - .130	.131	192.168.15.128 /30
WAN2 - 2	192.168.15.132	.133 - .134	.135	192.168.15.132 /30
WAN3 - 2	192.168.15.136	.137 - .138	.139	192.168.15.136 /30

The networking problem is solved.



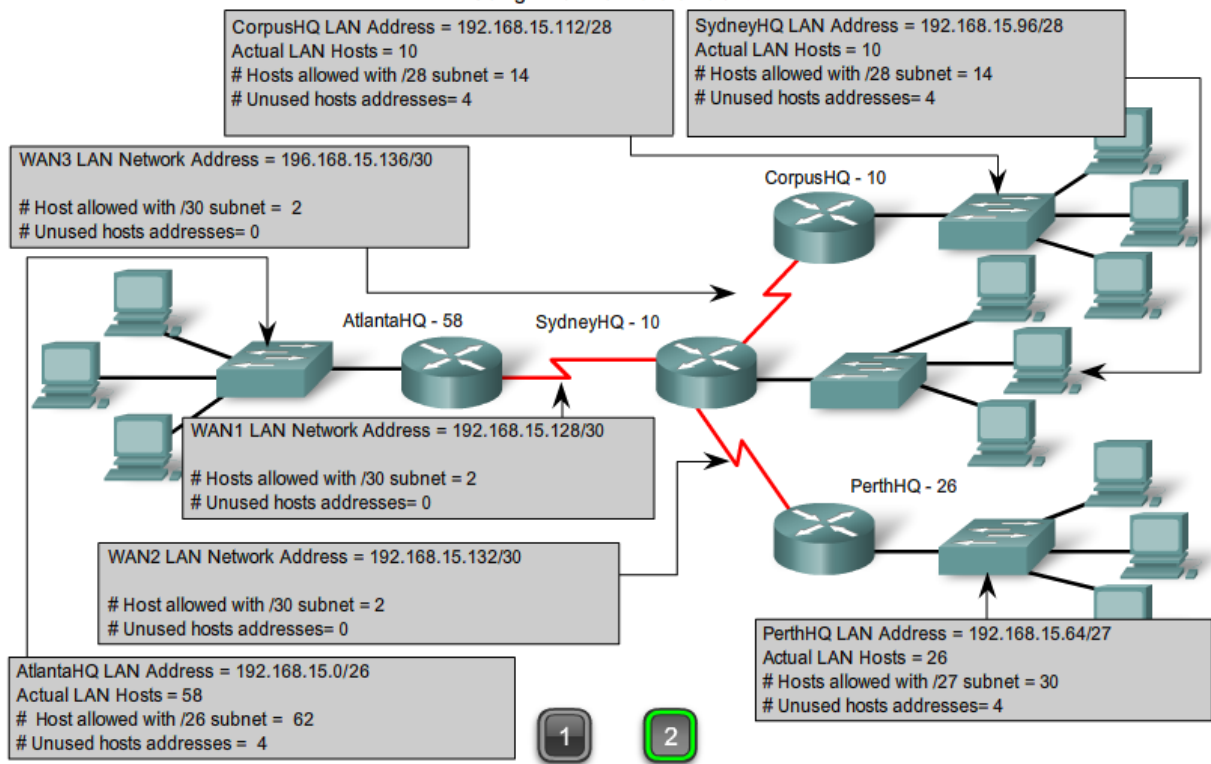
Network Requirements
Using VLSM is more efficient.

Name - required addresses	Subnet address	Address range	Broadcast Address	Network /prefix
AtlantaHQ - 58	192.168.15.0	.1-.62	.63	192.168.15.0/26
PerthHQ - 26	192.168.15.64	.65-.94	.95	192.168.15.64/27
SydneyHQ - 10	192.168.15.96	.97-.110	.111	192.168.15.96/28
CorpusHQ - 10	192.168.15.112	.113-.126	.127	192.168.15.112/28
WAN1 - 2	192.168.15.128	.129-.130	.131	192.168.15.128/30
WAN2 - 2	192.168.15.132	.133-.134	.135	192.168.15.132/30
WAN3 - 2	192.168.15.136	.137-.138	.139	192.168.15.136/30

1

2

Network Requirements
Using VLSM is more efficient.



VLSM Chart

	/25 (1 subnet bit) 2 subnets 126 hosts	/26 (2 subnet bits) 4 subnets 62 hosts	/27 (3 subnet bits) 8 subnets 30 hosts	/28 (4 subnet bits) 16 subnets 14 hosts	/29 (5 subnet bits) 32 subnets 6 hosts	/30 (6 subnet bits) 64 subnets 2 hosts	
.0	.0	.0 (.1-.62)	.0 (.1-.30)	.0 (.1-.14)	.0 (.1-6)	.0 (.1-2)	
.4					.4 (.5-6)		
.8					.8 (.9 - .10)		
.12					.12 (.13-.14)		
.16					.16 (.17-18)		
.20			.20 (.21-22)				
.24			.24 (.25-26)				
.28			.28 (.29-30)				
.32			.32 (.33-.62)	.32 (.33-46)	.32 (.33-38)	.32 (.33-34)	
.36					.36 (.37-38)		
.40		.40 (.41-42)					
.44		.44 (.45-46)					
.48		.48 (.49-50)					
.52		.48 (.49-.62)	.48 (.49-62)	.48 (.49-54)	.52 (.53-54)		
.56				.56 (.57-58)			
.60				.60 (.61-62)			
.64				.64 (.65-.126)	.64 (.65-.78)	.64 (.65-70)	.64 (.65-66)
.68						.68 (.69-70)	
.72		.72 (.73-74)					
.76		.76 (.77-78)					
.80	.80 (.81-.94)	.80 (.81-94)	.80 (.81-86)			.80 (.81-82)	
.84			.84 (.85-86)				
.88			.88 (.89-90)				
.92			.92 (.93-94)				
.96			.96 (.97-.126)	.96 (.97-110)	.96 (.97-102)	.96 (.97-98)	
.100	.100 (.101-102)						
.104	.104 (.105-106)						
.108	.108 (.109-110)						
.112	.112 (.113-.126)	.112 (.113-126)			.112 (.113-118)	.112 (.113-114)	
.116			.116 (.117-118)				
.120			.120 (.121-122)				
.124			.120 (.121-126)	.124 (.125-126)			

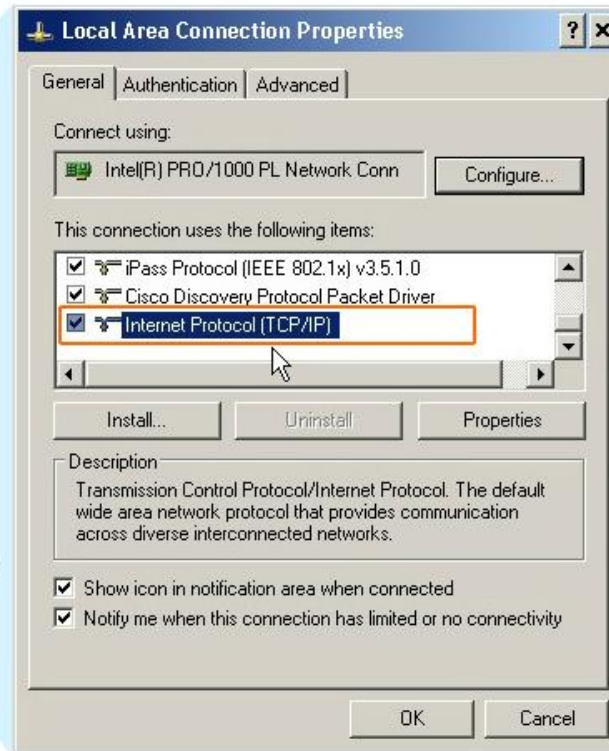
Testing the network Layer- testing the local stack ping 127.0.0.1

Testing Local TCP/IP Stack

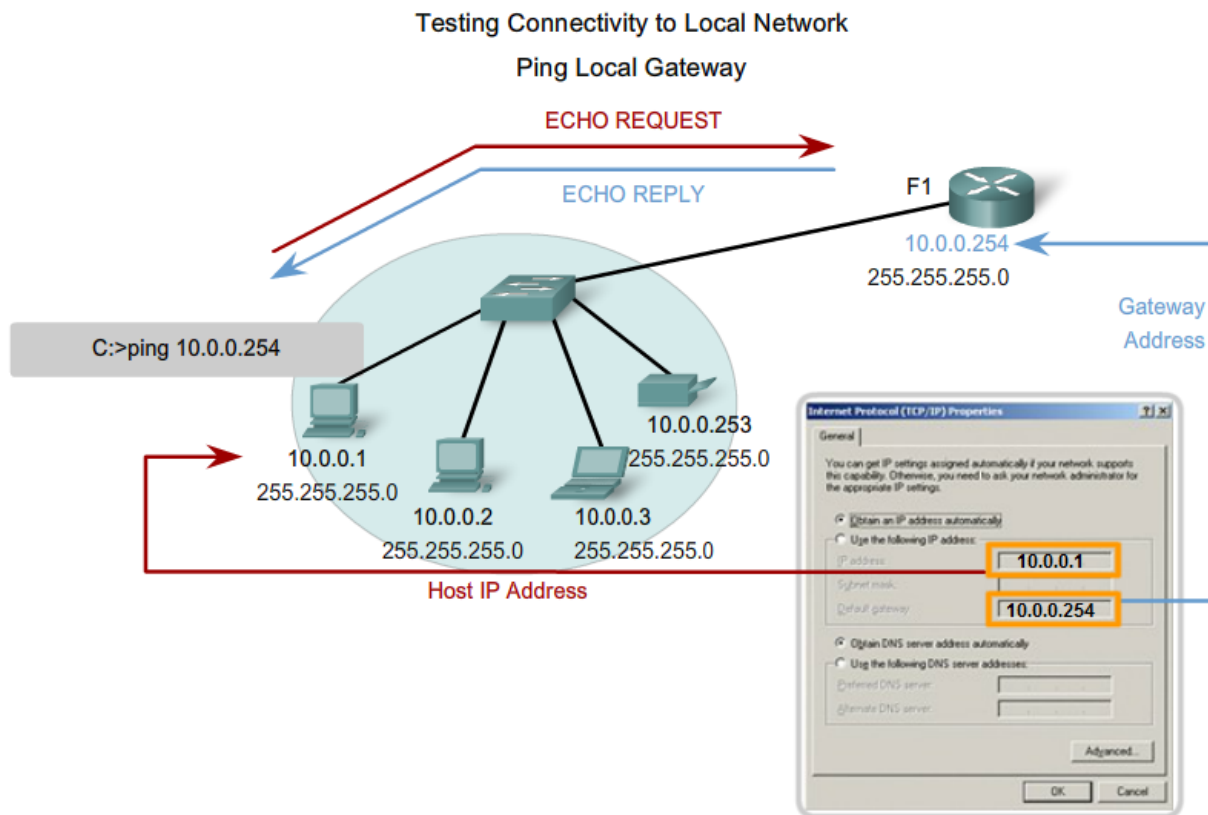
Pinging the local host confirms that TCP/IP is installed and working on the local host.



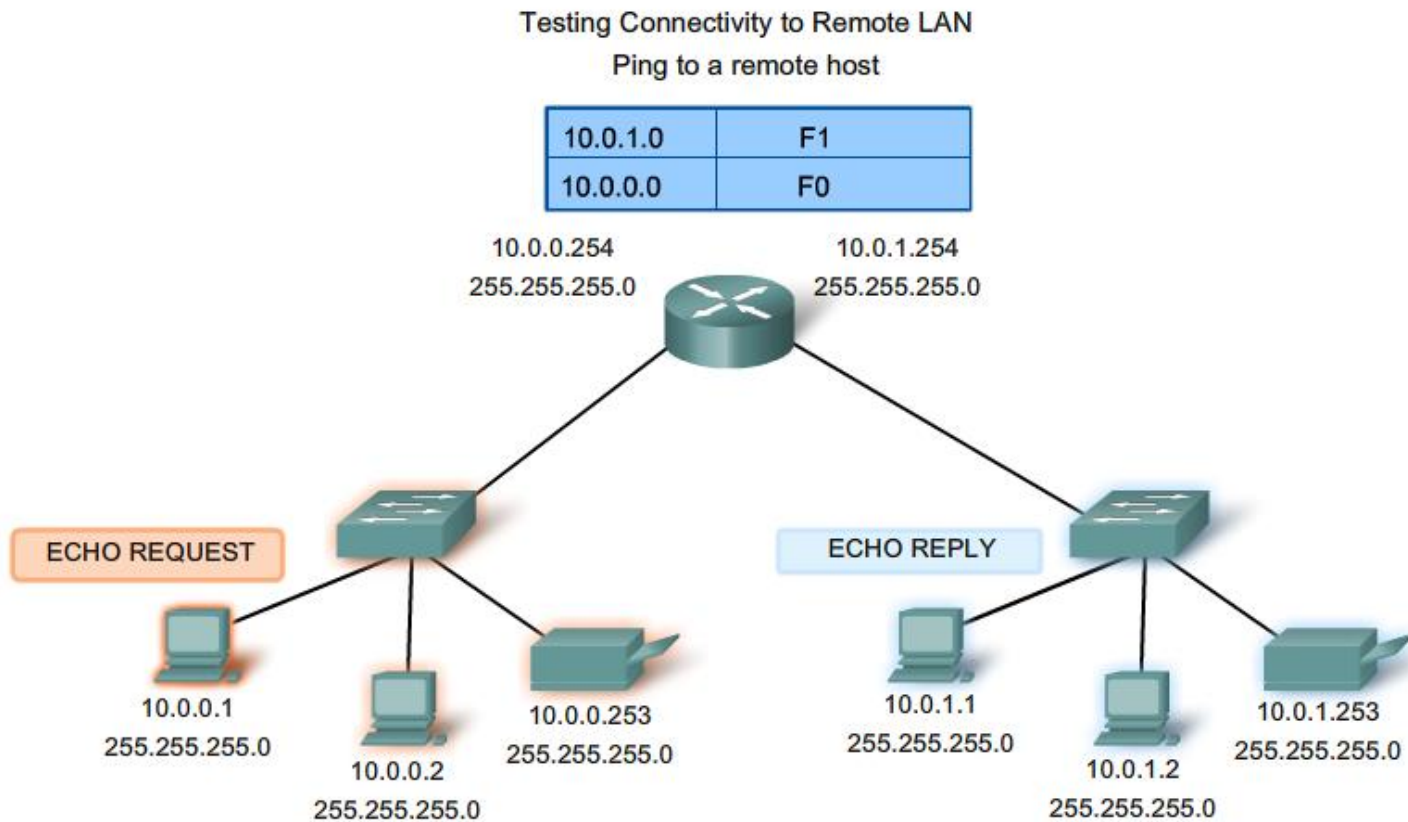
Pinging **127.0.0.1** causes a device to ping itself.



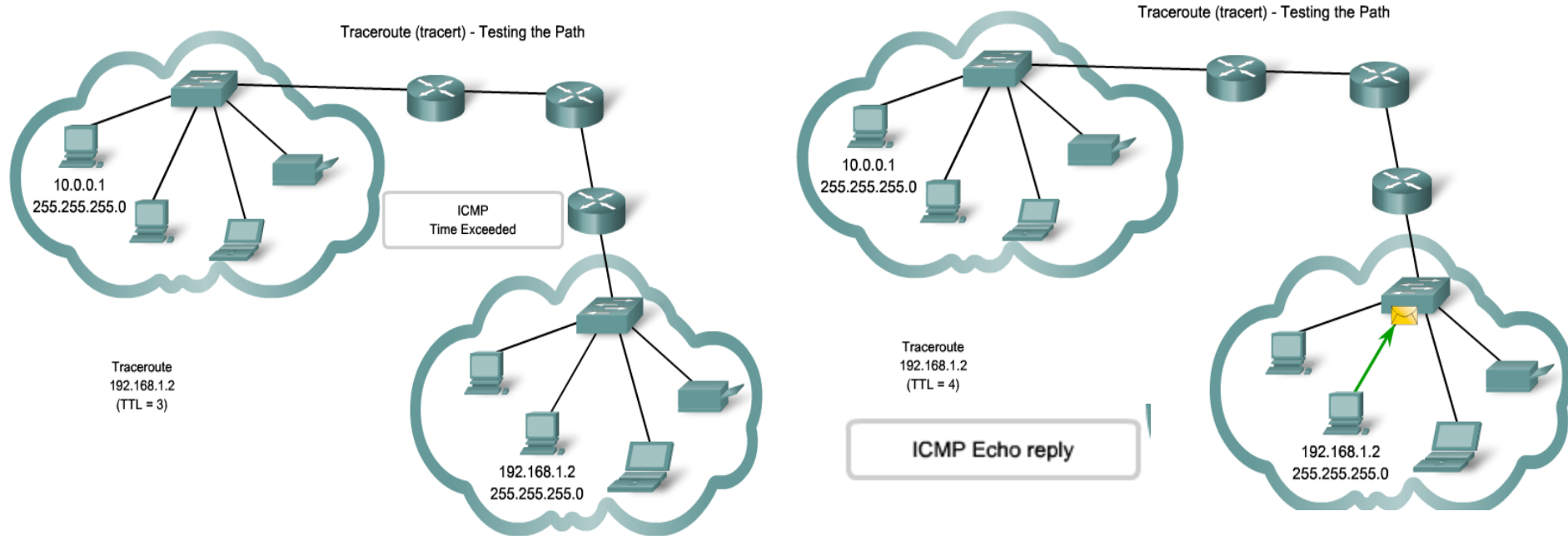
Ping Gateway-Testing the connectivity to the local LAN



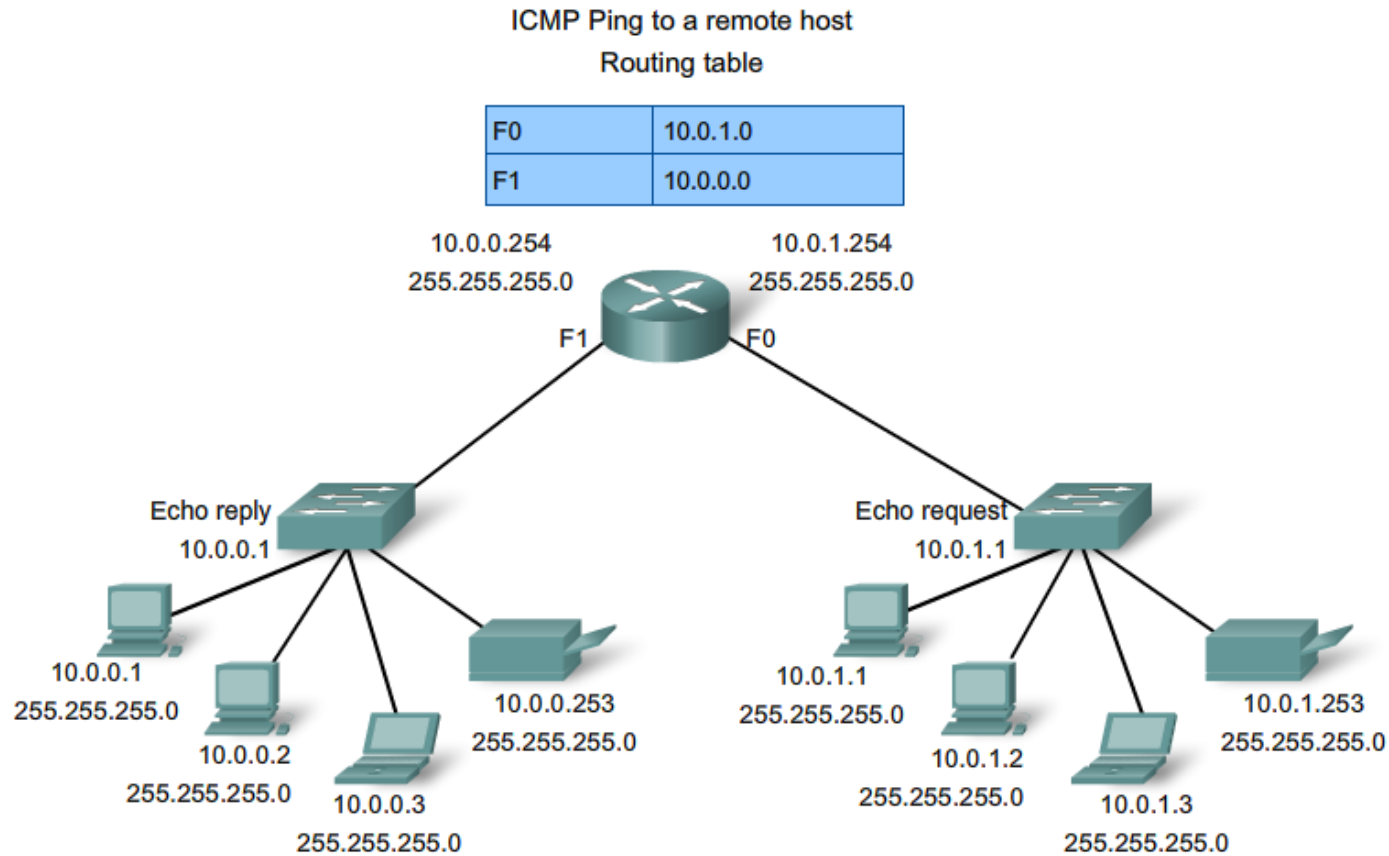
Ping Remote Host- testing connectivity to remote LAN



Traceroute (tracert)



The protocol supporting testing and Messaging-ICMPv4



Summary

- IPv4 addresses are hierarchical with network, subnetwork, and host portions. An IPv4 address can represent a complete network, a specific host, or the broadcast address of the network.
- Different addresses are used for unicast, multicast, and broadcast data communications.
- Addressing authorities and ISPs allocate address ranges to users, who in turn can assign these addresses to their network devices statically or dynamically. The allocated address range can be divided into subnetworks by calculating and applying subnet masks.
- Careful addressing planning is required to make best use of the available address space. Size, location, use, and access requirements are all considerations in the address planning process.
- Once implemented, an IP network needs to be tested to verify its connectivity and operational performance.

The End