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Networks Simulation

IP addressing & IP Subnetting

Topic 5.1

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Exercise 3

Q2: Network manager assigned address of 192.168.15.0.
Need to build 10 networks, each network containing 10 PCs.

1. What class of IP address has been allocated?
2. How many host PCs can this address provides?
3. Need 10 networks – how many bits do we need to borrow?
4. How many hosts can we have in each subnet?

Exercise 3

What class of IP address has been allocated?
C

How many host (PCs) can this address provides? Which means this address (192.168.15.0) before the subnetting.
256 -2 = 254

Need to 'borrow' some bits from the first part of host portion to assign as sub-network identifiers.

Need 10 networks – how many bits do we need to have 10 networks ?
2^3 = 8 Networks = too few
2^4 = 16 Networks = too many, but close enough

So, how many bits do we need? >>> 4 bits

How many hosts can we have in each subnet?
2^4 = 16 hosts >> 16 – 2 = 14 hosts

So, how many bits do we need to have 10 PCs ? >>> 4 bits

Exercise 3

Class C

192 . 168 . 15 . 0

255 . 255 . 255 . 0

0 0 0 0 0 0 0 0

Borrowed for Subnet → 0 0 0 0 0 0 0 0

16 Subnets

16 Hosts

Exercise 3

Class C

192 . 168 . 15 . 0

255 . 255 . 255 . 0

0 0 0 0 0 0 0 0

128 64 32 16 8 4 2 1

Borrowed for Subnet → 0 0 0 0 0 0 0 0

Mask for Subnet → 1 1 1 1 0 0 0 0

255 . 255 . 255 . 240

Exercise 3

Class C

192 . 168 . 15 . 0

255 . 255 . 255 . 240

1st Usable Subnet Network address:

192 . 168 . 15 . 16

0 0 0 1 0 0 0 0

1st Usable Subnet Broadcast address:

192 . 168 . 15 . 31

0 0 0 1 1 1 1 1

Exercise 4

Network manager assigned address of 194.200.60.0.
Need to build 5 networks, each containing 25 PCs.

1. What class of IP address has been allocated?
2. How many host PCs can this address provide?
3. Need 5 networks – how many bits do we need?
4. How many hosts can we have in each subnet?

Exercise 4

What class of IP address has been allocated? C
How many host (PCs) can this address provides?
Which means this address (194.200.60.0) before the subnetting.
256 -2 = 254

How many bits do we need? Need 5 networks
$2^2 = 4$ = too few
$2^3 = 8$ = close enough

So, how many bits do we need? >>> 3 bits

How many hosts can we have in each subnet?
$2^5 = 32$ hosts. But 2 addresses will be required for subnet ID and subnet broadcast.
Therefore $2^5-2= 30$ hosts = 5 extra hosts per subnet

So, how many bits do we need to have 25 PCs ? >>> 5 bits

what is the subnet mask required to let them be successfully 'ANDed'? 1110000

What does this add up to in binary? 224

Subnet mask for all 10 subnets is 255.255.255.224

Exercise 4

Class C

194 . 200 . 60 . 0

255 . 255 . 255. 224

1st Usable Subnet Network address:

194 . 200 . 60 . 32

001 00000

1st Usable Subnet Broadcast address:

194 . 200 . 60 . 63

00111111

Subnet mask

Underline the network portion of each address:

Network Address	Subnet Mask
172.0.0.0	255.0.0.0
172.16.0.0	255.255.0.0
192.168.1.0	255.255.255.0=/24
192.168.0.0	255.255.0.0
192.168.0.0	255.255.255.0
10.1.1.0	/24
10.2.0.0	/16
10.0.0.0	/16

Q) What is the other portion of the address?
A) Host Addresses

Subnet mask

Q) What to read in a given address?

- 10.250.1.1
- 150.10.15.0
- 192.14.2.0
- 126.201.54.231
- 188.258.221.176

Valid?

Class?

Network Address?

Host Address?

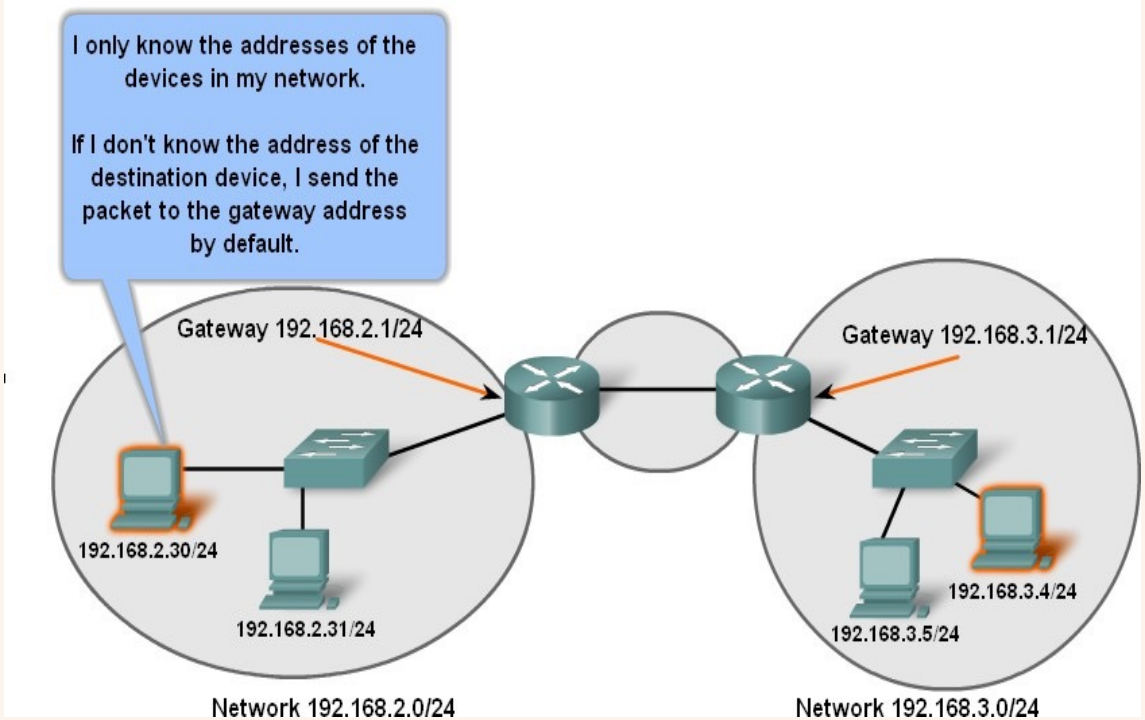
Broadcast

Q. *What's The Broadcast Address For Each Subnet and valid host*?

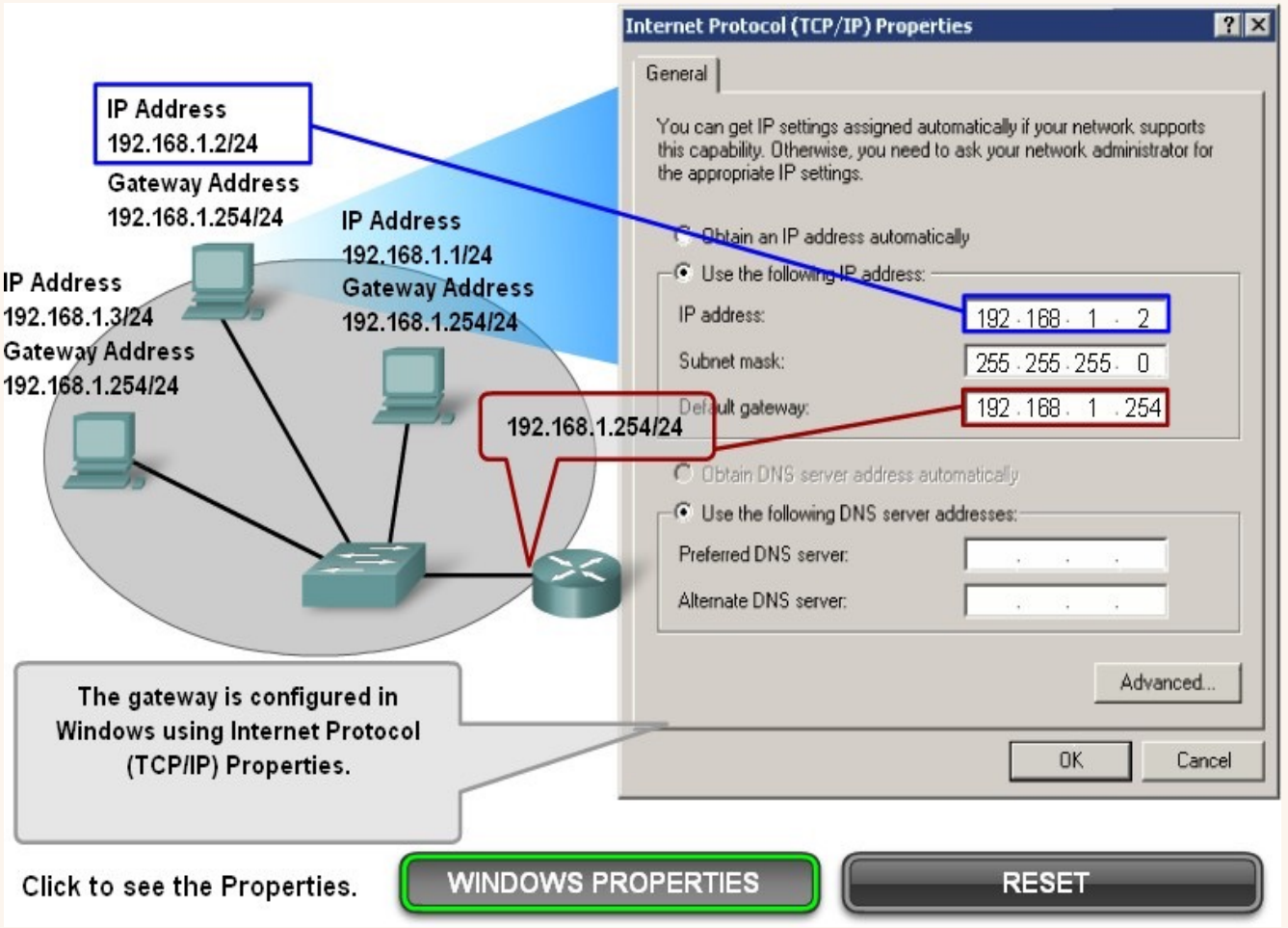
- The broadcast address is all host bits turned on, (1) which is the number immediately preceding the next subnet.
- Valid hosts are the number between the subnets, omitting all 0s and all 1s.

Gateway

The gateway, also known as the **default gateway**, is needed to send a packet out of the local network. If the network portion of the destination address of the packet is different from the network of the originating host, the packet has to be routed outside the original network



Gateway


IP Address
192.168.1.2/24
Gateway Address
192.168.1.254/24
IP Address
192.168.1.1/24
Gateway Address
192.168.1.254/24
IP Address
192.168.1.3/24
Gateway Address
192.168.1.254/24
192.168.1.254/24
Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address: 192 . 168 . 1 . 2
Subnet mask: 255 . 255 . 255 . 0
Default gateway: 192 . 168 . 1 . 254
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Advanced...
OK
Cancel
The gateway is configured in Windows using Internet Protocol (TCP/IP) Properties.
Click to see the Properties.
WINDOWS PROPERTIES
RESET

Gateway

Confirming the Gateway Settings

```
C:\>ipconfig

Windows IP Configuration

Ethernet adapter Local Area Connection:

        Connection-specific DNS Suffix  . :
     ① IP Address. . . . . . . . . . . . : 192.168.1.2
     ② Subnet Mask . . . . . . . . . . . : 255.255.255.0
     ③ Default Gateway . . . . . . . . . : 192.168.1.254
```

Default gateway address for this host computer

Sample ipconfig output showing default gateway address

Valid and Invalid Subnet mask

Valid masks are contiguous 1's from left to right.

Examples:

Valid
255.0.0.0
255.255.0.0
255.255.255.0

Invalid
255.1.0.0
255.0.255.0
255.255.64.0
200.255.0.0

Subnetting chart table

Mask	128	64	32	16	8	4	2	1
Sub net mask value	**128**	128+64 =**192**	128+64+ 32=**224**	**240**	**248**	**252**	**254**	**255**
Net Mask C.A/8	/9	/10	/11	/12	/13	/14	/15	/16
Net Mask C.B/16	/17	/18	/19	/20	/21	/22	/23	/24
Net Mask C.C/24	/25	/26	/27	/28	/29	/30	/31	/32

Subnet Questions

Answer Five Simple Questions:

- ✓ **How many subnets dose the chosen subnet mask produce?**
- ✓ **How many Valid hosts per subnet are available?**
- ✓ **What are the valid subnets?**
- ✓ **What's the broadcast address of each subnet?**
- ✓ **What are the valid hosts in each subnet?**

Subnet mask

Determines which part of an IP address is the network field and which part is the host field

Follow these steps to determine the subnet mask:

- ***1. Express the sub network IP address in binary form.***
- ***2. Replace the network and subnet portion of the address with all 1s.***
- ***3. Replace the host portion of the address with all 0s.***
- ***4. Convert the binary expression back to dotted-decimal notation.***
- 2^{n-2} is the subnet where n is no. of bit borrowed.
- 2^{m-2} m is the number of bit in the new host filed after borrowing.

Thank you!

Do you have any questions?

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