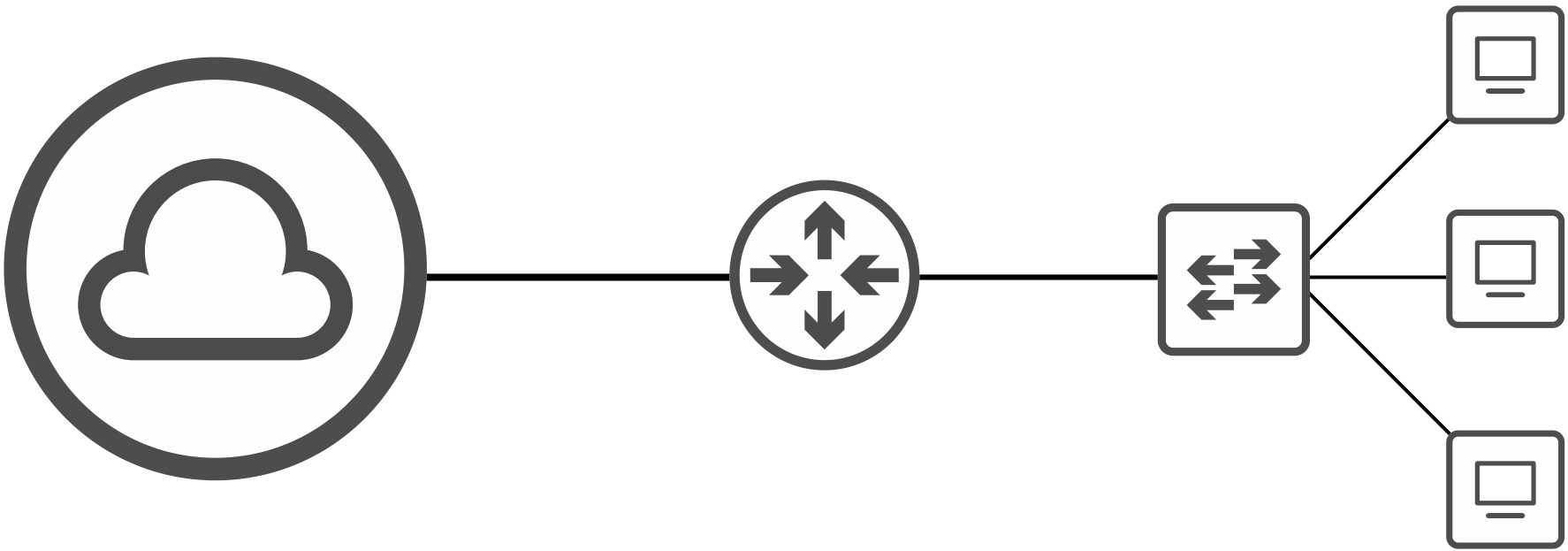
Jeremy's IT Lab

CCNA 200-301 Day 8

IPv4 Addressing (Part 2)



Things we'll cover

- IPv4 address classes (review, clarification)
- Finding the ...

  maximum number of hosts,

  network address,

  broadcast address,

  first usable address,

  last usable address of a particular network

- Configuring IP addresses on Cisco devices

IPv4 Address Classes

Class	First octet	First octet numeric range
A	0xxxxxxx	0-127
B	10xxxxxx	128-191
C	110xxxxx	192-223
D	1110xxxx	224-239
E	1111xxxx	240-255

IPv4 Address Classes

Class	Leading bits	Size of *network number* bit field	Size of *rest* bit field	Number of networks	Addresses per network
Class A	0	8	24	128 (2^7)	16,777,216 (2^{24})
Class B	10	16	16	16,384 (2^{14})	65,536 (2^{16})
Class C	110	24	8	2,097,152 (2^{21})	256 (2^8)

Maximum Hosts per Network

192.168.1.0/24 → 192.168.1.255/24

Host portion = 8 bits = $2^8 = 256$

Host portion all 0s = **network address** (network ID)

Host portion all 1s = **broadcast address**

Maximum hosts per network = $2^8 - 2 = 254$

Maximum Hosts per Network

172.16.0.0/16 → 172.16.255.255/16

Host portion = 16 bits = 2^{16} = 65,536

Host portion all 0s = **network address** (network ID)

Host portion all 1s = **broadcast address**

Maximum hosts per network = $2^{16}-2$ = 65,534

Maximum Hosts per Network

10.0.0.0/8 → 10.255.255.255/8

Host portion = 24 bits = 2^{24} = 16,777,216

Host portion all 0s = **network address** (network ID)

Host portion all 1s = **broadcast address**

Maximum hosts per network = $2^{24}-2$ = 16,777,214

Maximum hosts per network = $\mathbf{2^n-2}$
(n = number of host bits)

Jeremy's IT Lab

First/Last Usable Address

192.168.1.0/24 → 192.168.1.255/24

Host portion all 0s = **network address** (network ID)

00000000

00000001

192.168.1.1/24

= first usable address

Host portion all 1s = **broadcast address**

11111111

11111110

192.168.1.254/24

= last usable address

First/Last Usable Address

172.16.0.0/16

Host portion all 0s = **network address** (network ID)

00000000 00000000

00000000 00000001

172.16.0.1/16

= first usable address

172.16.255.255/16

Host portion all 1s = **broadcast address**

11111111 11111111

11111111 11111110

172.16.255.254/16

= last usable address

First/Last Usable Address

10.0.0.0/8

Host portion all 0s = **network address** (network ID)

00000000 00000000 00000000

00000000 00000000 00000001

10.0.0.1/8

= first usable address

10.255.255.255/8

Host portion all 1s = **broadcast address**

11111111 11111111 11111111

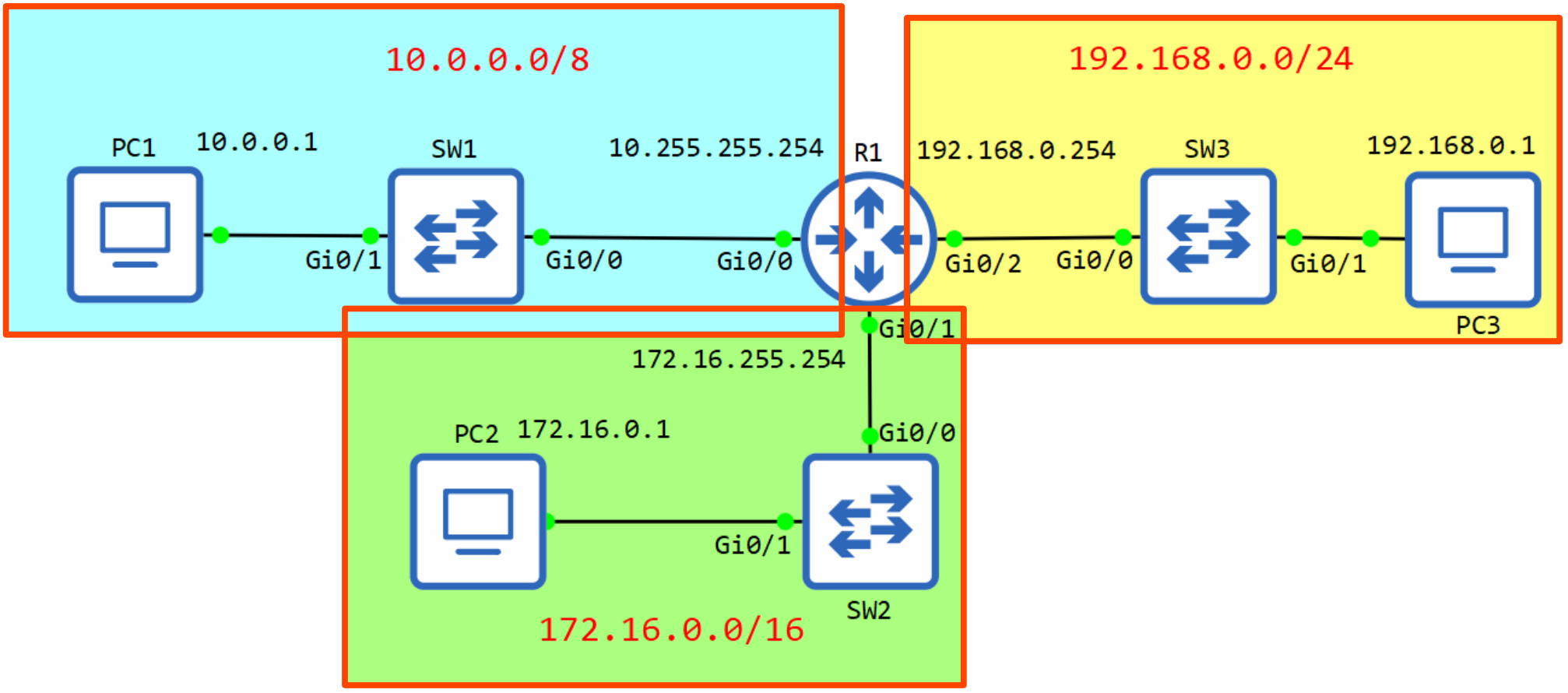
11111111 11111111 11111110

10.255.255.254/8

= last usable address

Jeremy's IT Lab

IPv4 Addressing



IPv4 Addressing

Layer 1 status

Layer 2 status

```
R1>en
R1#show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0     unassigned      YES unset  administratively down down
GigabitEthernet0/1     unassigned      YES unset  administratively down down
GigabitEthernet0/2     unassigned      YES unset  administratively down down
GigabitEthernet0/3     unassigned      YES unset  administratively down down
R1#
```

- `administratively down:` Interface has been disabled with the 'shutdown' command.
- This is the default `Status` of Cisco router interfaces.
- Cisco switch interfaces are NOT `administratively down` by default.

IPv4 Addressing

```
R1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#interface gigabitethernet 0/0
R1(config-if)#
```

```
R1(config)#interface gigabitethernet0/0
R1(config-if)#
```

```
R1(config)#i?
id-manager   ida-client   identity      interface
ip           ipc          iphc-profile  ipv6
isis         ixi
```

```
R1(config)#in?
interface
```

```
R1(config)#in g?
GMPLS  GigabitEthernet  Group-Async
```

```
R1(config)#in g0/0
R1(config-if)#
```

IPv4 Addressing

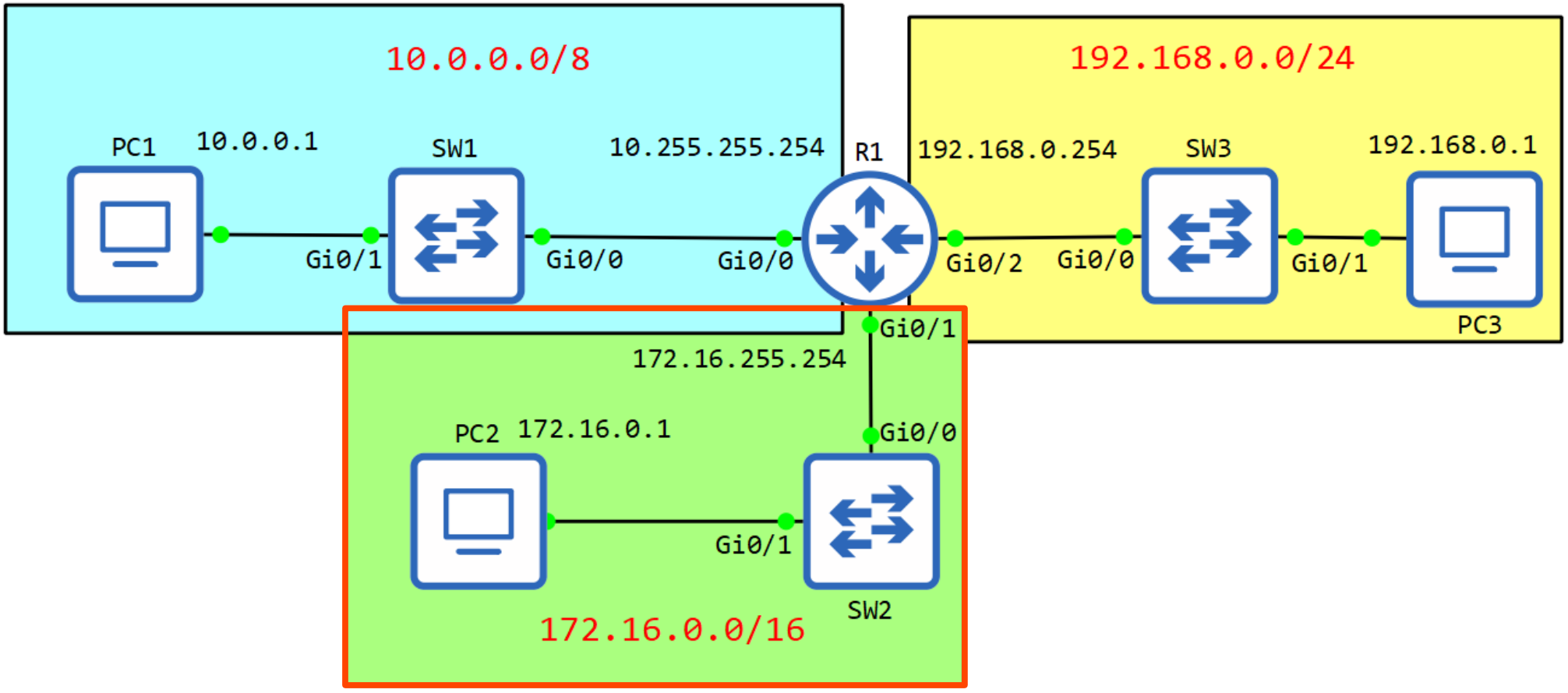
```
R1(config-if)#ip address 10.255.255.254 ?
  A.B.C.D  IP subnet mask

R1(config-if)#ip address 10.255.255.254 255.0.0.0
R1(config-if)#no shutdown
R1(config-if)#
*Dec  7 08:29:08.937: %LINK-3-UPDOWN: Interface GigabitEthernet0/0, changed state to up
*Dec  7 08:29:09.938: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/
0, changed state to up
R1(config-if)#
```

```
R1(config-if)#do sh ip int br
Interface              IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0     10.255.255.254  YES manual up                    up
GigabitEthernet0/1     unassigned      YES unset  administratively down down
GigabitEthernet0/2     unassigned      YES unset  administratively down down
GigabitEthernet0/3     unassigned      YES unset  administratively down down
R1(config-if)#
```

Jeremy's IT Lab

IPv4 Addressing

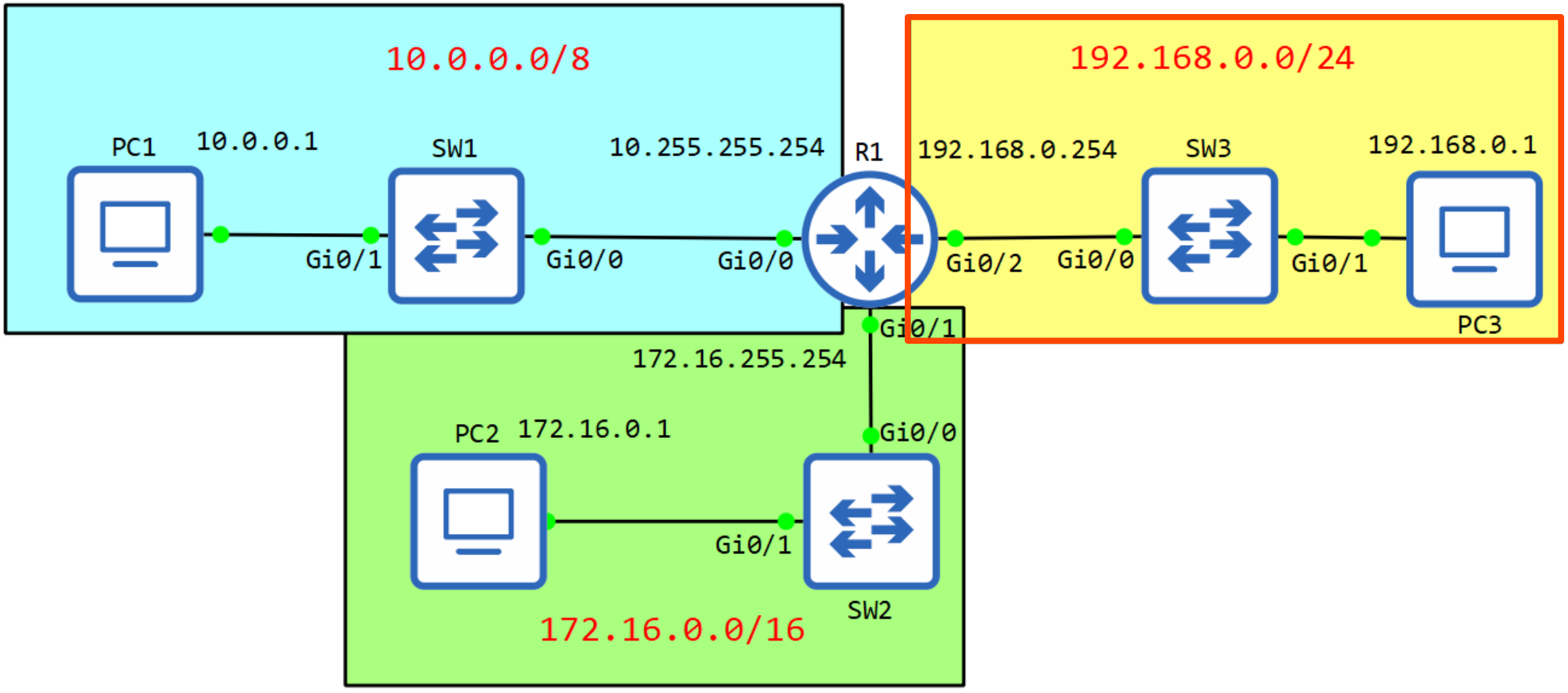


IPv4 Addressing

```
R1(config-if)#int g0/1
R1(config-if)#ip add 172.16.255.254 255.255.0.0
R1(config-if)#no shut
R1(config-if)#
*Dec  7 08:51:42.648: %LINK-3-UPDOWN: Interface GigabitEthernet0/1, changed state to up
*Dec  7 08:51:43.649: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/
1, changed state to up
R1(config-if)#do sh ip int br
Interface                  IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0         10.255.255.254  YES manual up                    up
GigabitEthernet0/1         172.16.255.254  YES manual up                    up
GigabitEthernet0/2         unassigned      YES unset  administratively down down
GigabitEthernet0/3         unassigned      YES unset  administratively down down
R1(config-if)#
```

Jeremy's IT Lab

IPv4 Addressing



IPv4 Addressing

```
R1(config-if)#int g0/2
R1(config-if)#ip add 192.168.0.254 255.255.255.0
R1(config-if)#no shut
R1(config-if)#
*Dec  7 09:05:41.505: %LINK-3-UPDOWN: Interface GigabitEthernet0/2, changed state to up
R1(config-if)#
*Dec  7 09:05:42.505: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/2, changed state to up
R1(config-if)#do sh ip int br
Interface                  IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0         10.255.255.254  YES manual up                    up
GigabitEthernet0/1         172.16.255.254  YES manual up                    up
GigabitEthernet0/2         192.168.0.254   YES manual up                    up
GigabitEthernet0/3         unassigned      YES unset  administratively down down
R1(config-if)#
```

Jeremy's IT Lab

show interfaces [*interface*]

```
R1#show interfaces g0/0
GigabitEthernet0/0 is up, line protocol is up
  Hardware is iGbE, address is 0c1b.8444.f000 (bia 0c1b.8444.f000)
  Internet address is 10.255.255.254/8
  MTU 1500 bytes, BW 1000000 Kbit/sec, DLY 10 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Auto Duplex, Auto Speed, link type is auto, media type is RJ45
  output flow-control is unsupported, input flow-control is unsupported
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:00:06, output 00:00:05, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     167 packets input, 30159 bytes, 0 no buffer
     Received 0 broadcasts (0 IP multicasts)
     0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
     0 watchdog, 0 multicast, 0 pause input
     350 packets output, 39097 bytes, 0 underruns
     0 output errors, 0 collisions, 2 interface resets
     105 unknown protocol drops
     0 babbles, 0 late collision, 0 deferred
     1 lost carrier, 0 no carrier, 0 pause output
     0 output buffer failures, 0 output buffers swapped out
```

show interfaces description

```
R1#show interfaces description
Interface                      Status         Protocol Description
Gi0/0                          up             up
Gi0/1                          up             up
Gi0/2                          up             up
Gi0/3                          admin down     down
```

Jeremy's IT Lab

show interfaces description

```
R1(config)#int g0/0
R1(config-if)#description ## to SW1 ##
R1(config-if)#int g0/1
R1(config-if)#desc ## to SW2 ##
R1(config-if)#int g0/2
R1(config-if)#desc ## to SW3 ##
R1(config-if)#do sh int desc
Interface                      Status         Protocol Description
Gi0/0                          up             up       ## to SW1 ##
Gi0/1                          up             up       ## to SW2 ##
Gi0/2                          up             up       ## to SW3 ##
Gi0/3                          admin down     down
```

Topics we covered

- IPv4 address classes (review, clarification)
- Finding the ...

  maximum number of hosts,

  network address,

  broadcast address,

  first usable address,

  last usable address of a particular network

- Configuring IP addresses on Cisco devices

QUIZ

Quiz Question 1

PC1 has an IP address of 43.109.23.12/8

Find the following:

Network address: 43.0.0.0

Maximum number of hosts in the network: 16,777,214

Network broadcast address: 43.255.255.255

First usable address of the network: 43.0.0.1

Last usable address of the network: 43.255.255.254

Quiz Question 2

PC4 has an IP address of 129.221.23.13/16

Find the following:

Network address: 129.221.0.0

Maximum number of hosts in the network: 65,534

Network broadcast address: 129.221.255.255

First usable address of the network: 129.221.0.1

Last usable address of the network: 129.221.255.254

Quiz Question 3

PC8 has an IP address of 209.211.3.22/24

Find the following:

Network address: 209.211.3.0

Maximum number of hosts in the network: 254

Network broadcast address: 209.211.3.255

First usable address of the network: 209.211.3.1

Last usable address of the network: 209.211.3.254

Quiz Question 4

PC5 has an IP address of 2.71.209.233/8

Find the following:

Network address: 2.0.0.0

Maximum number of hosts in the network: 16,777,214

Network broadcast address: 2.255.255.255

First usable address of the network: 2.0.0.1

Last usable address of the network: 2.255.255.254

Quiz Question 5

PC6 has an IP address of 155.200.201.141/16

Find the following:

Network address: 155.200.0.0

Maximum number of hosts in the network: 65,534

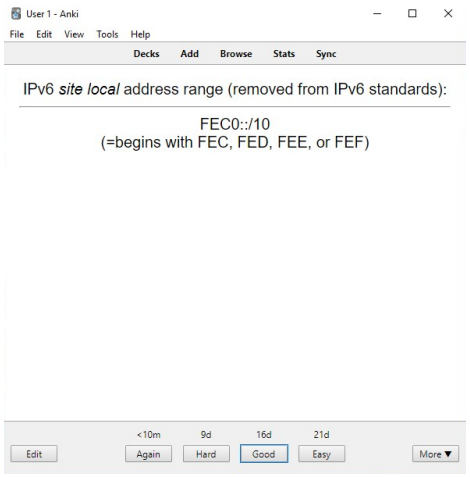
Network broadcast address: 155.200.255.255

First usable address of the network: 155.200.0.1

Last usable address of the network: 155.200.255.254

Supplementary Materials

- Review flash cards
  (link in the description)



- Packet Tracer lab