CCNA Foundations – Day 2

with

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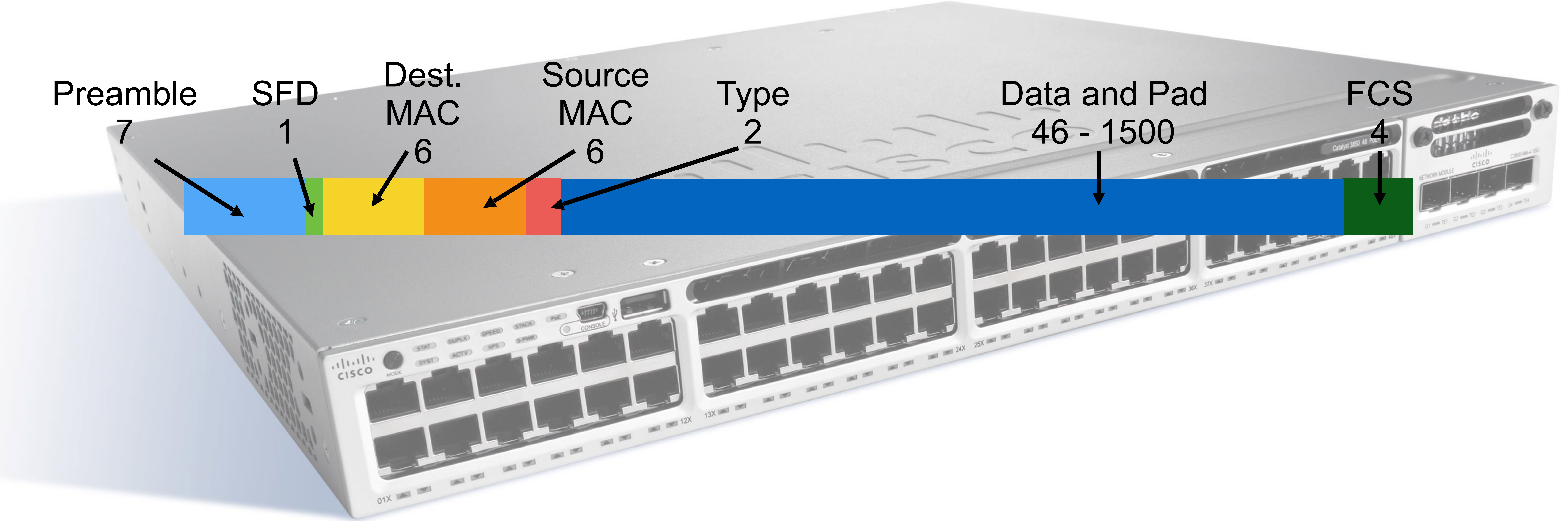
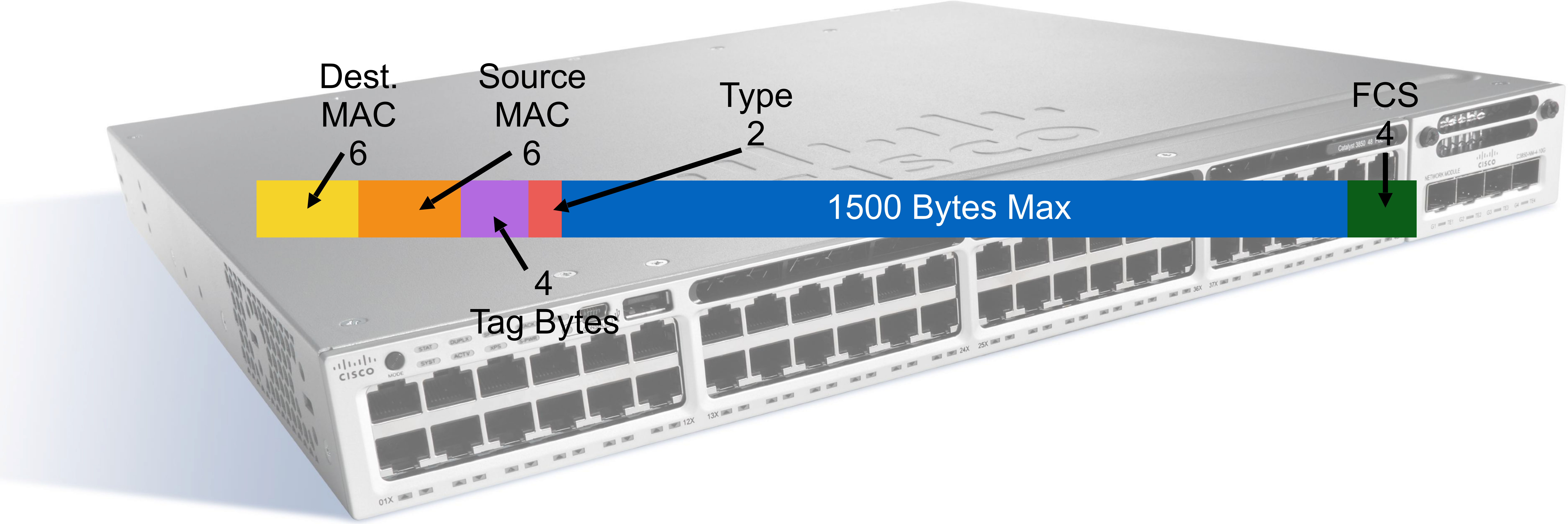
(R/S & Collaboration) #7945

Module 7
Ethernet Switches

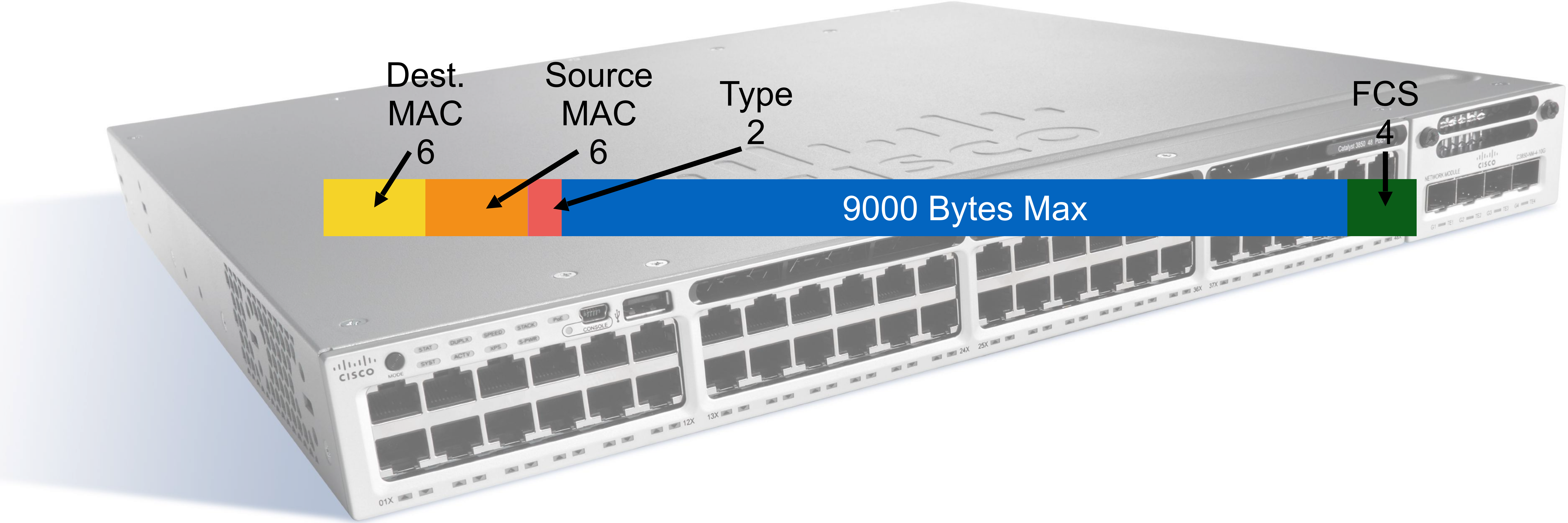
Ethernet Frame Format



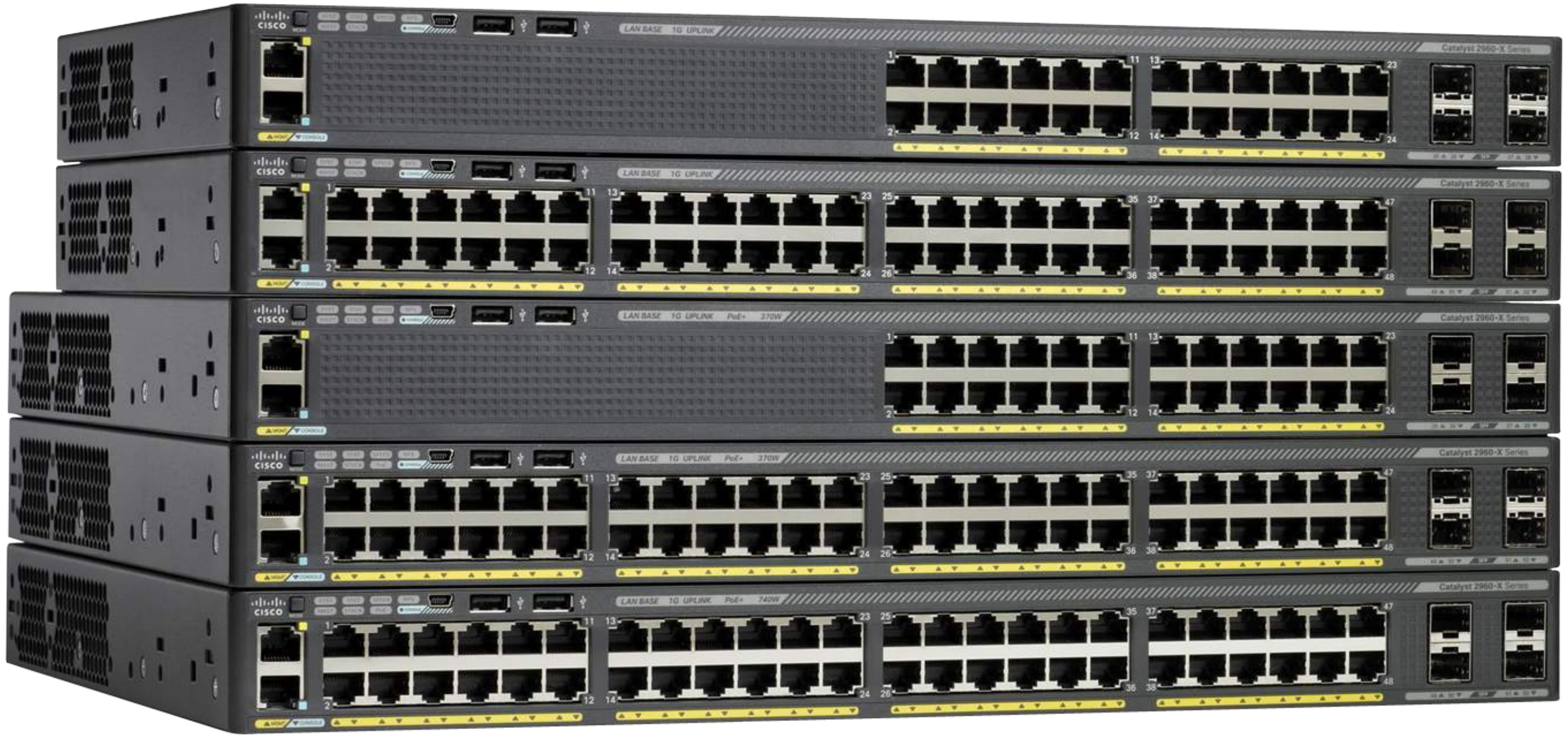
IEEE 802.1Q Frame



Jumbo Frame



Layer 2 vs. Multilayer Switches



Cisco Catalyst 2960-X Series Switches

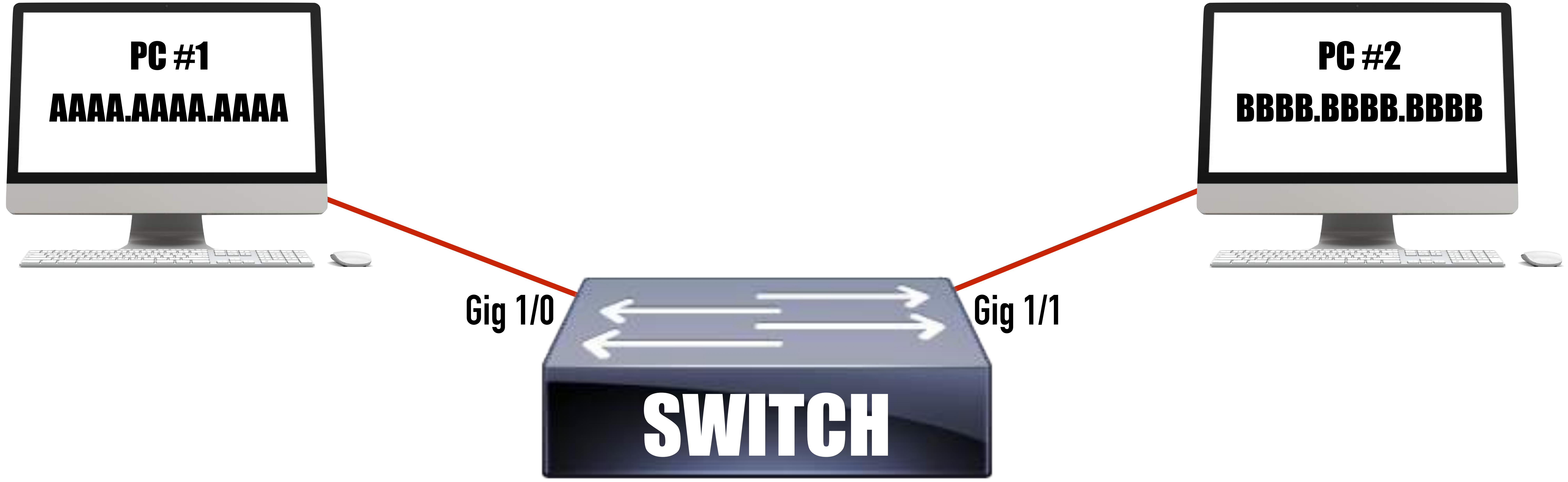
Cisco Catalyst 3650 Series Switch

MAC Address Structure

Organizationally Unique Identifier (OUI)	Assigned by Vendor

48-Bit MAC Address

Populating the MAC Address Table



PORT	MAC ADDRESS
Gig 1/0	AAAA.AAAA.AAAA
Gig 1/1	BBBB.BBBB.BBBB

MAC Address Table

CAM vs. TCAM

Layer 2 Forwarding
CAM

Security ACLs
Quality of Service ACLs
TCAM

Where should the frame be forwarded?
Should the frame be forwarded?
With what QoS treatment should the frame be forwarded?

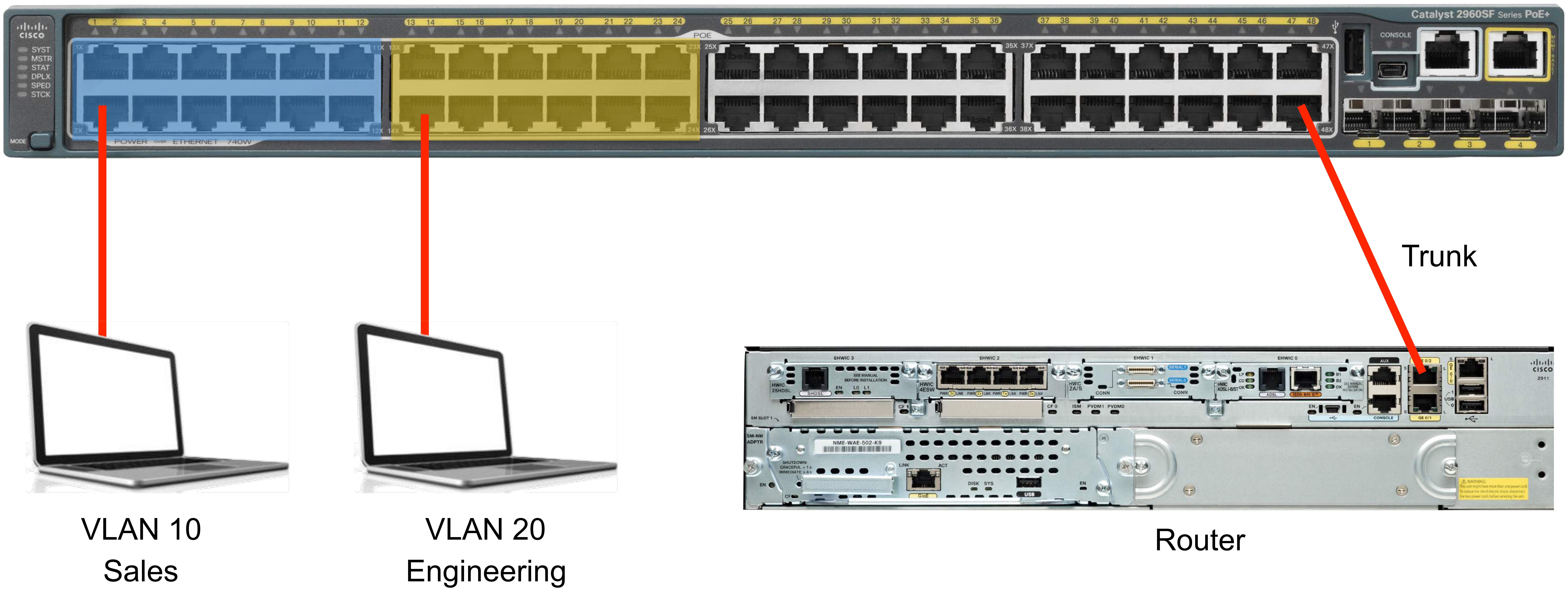
Forwarding Information Base (FIB)

Layer 3 Forwarding
FIB

Layer 2 Forwarding
CAM

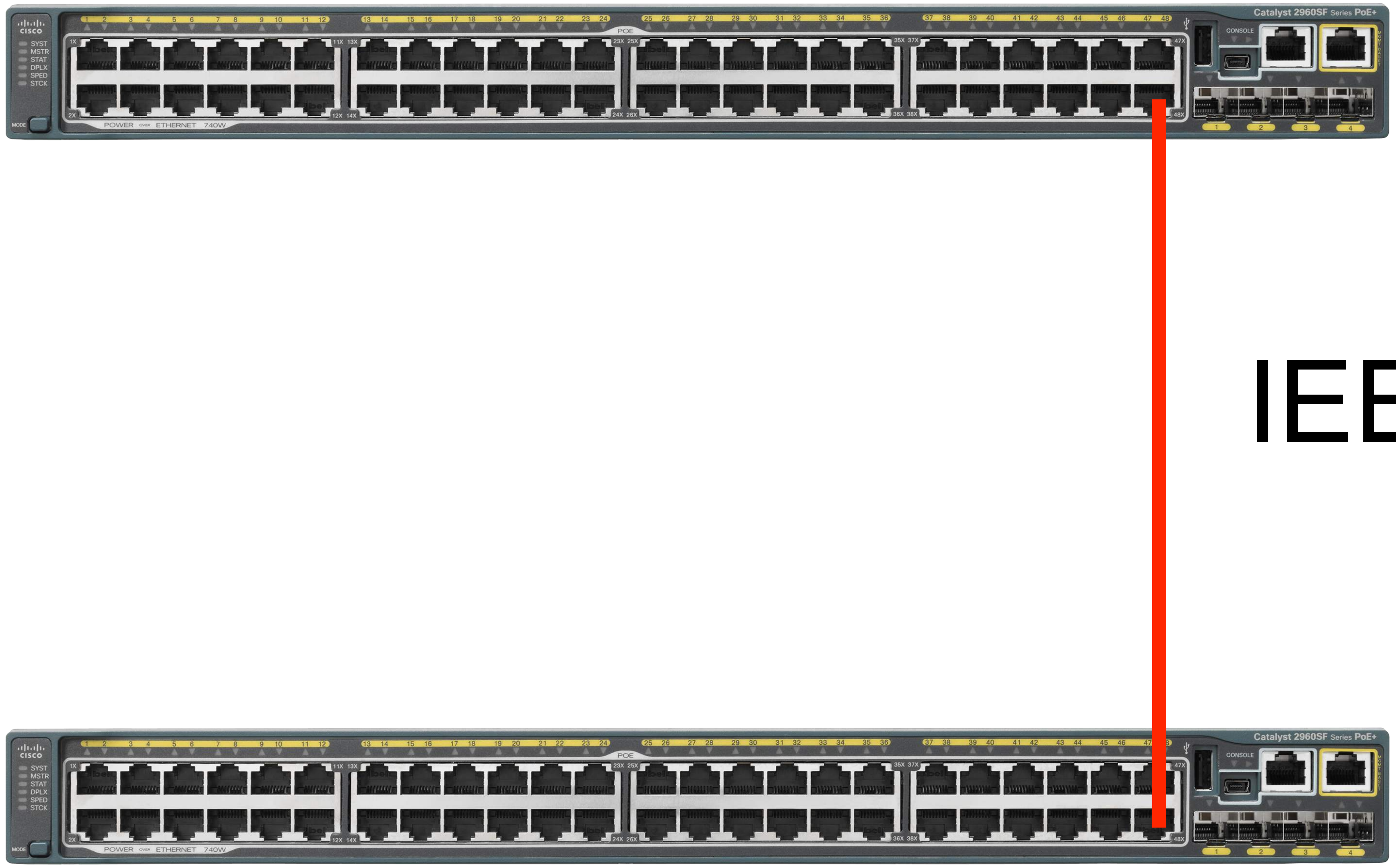
Security ACLs
Quality of Service ACLs
TCAM

VLANs



Catalyst 2960SF Series PoE+
Trunk
VLAN 10
Sales
VLAN 20
Engineering
Router

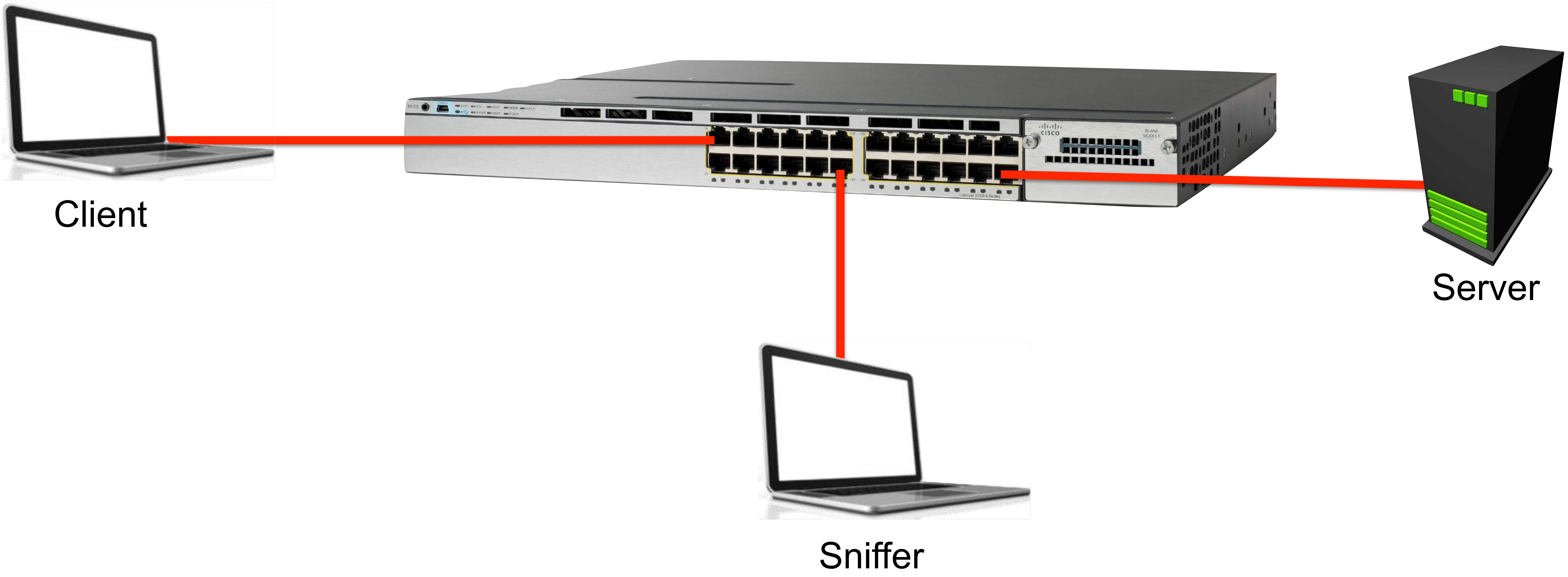
Trunks



IEEE 802.1Q Trunk

- Adds four tag Bytes to each frame (except the Native VLAN)
- **Native VLAN**: The one VLAN on a Dot1Q trunk that is untagged.

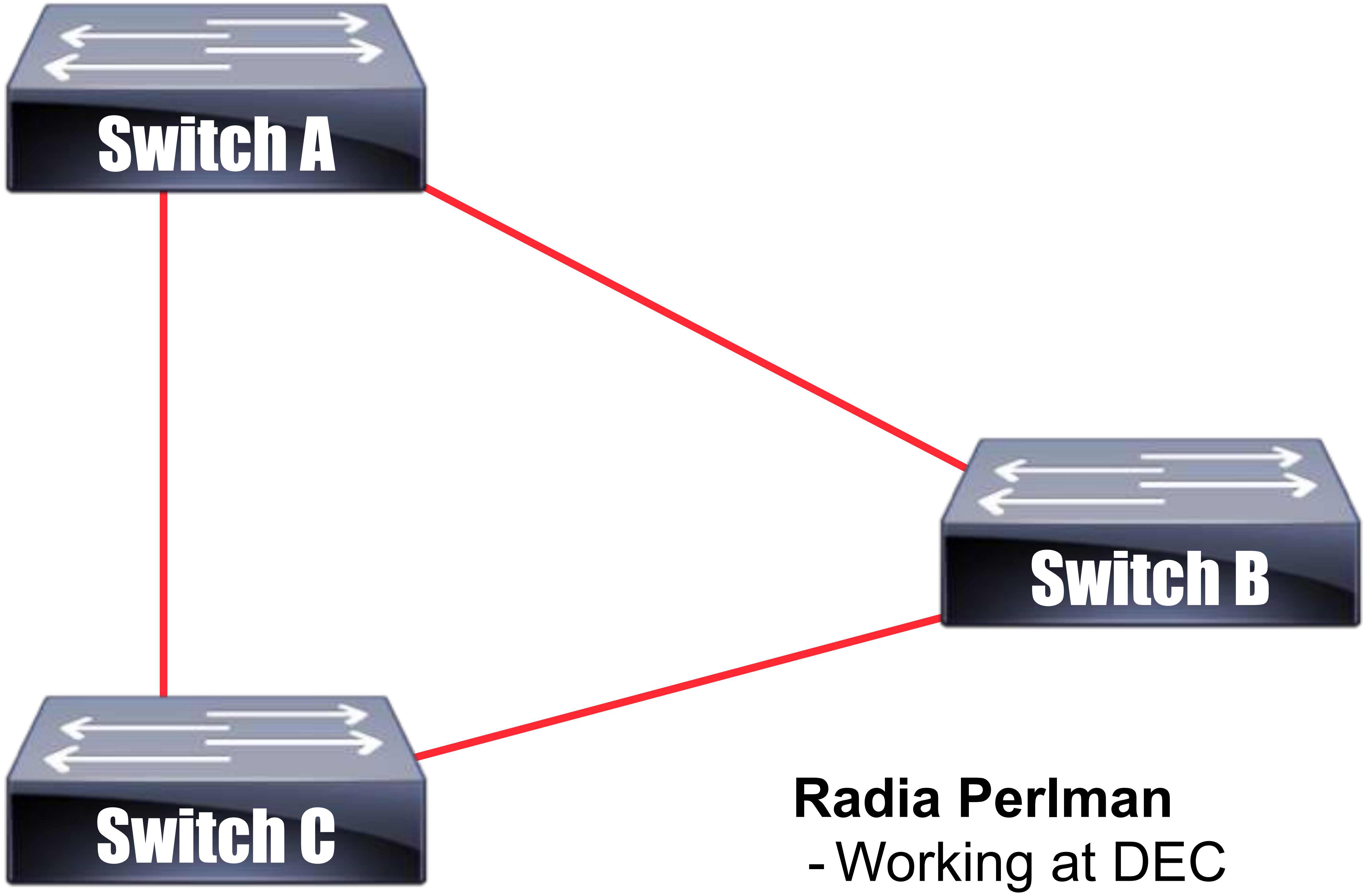
Port Mirroring



Introduction to Spanning Tree Protocol (STP)

- The time is the mid 80s.

Introduction to STP



Radia Perlman
- Working at DEC
- Develops Spanning Tree Protocol (STP)

Institute of Electrical and Electronics Engineers
- 1990
- IEEE 802.1D

Issues Without STP

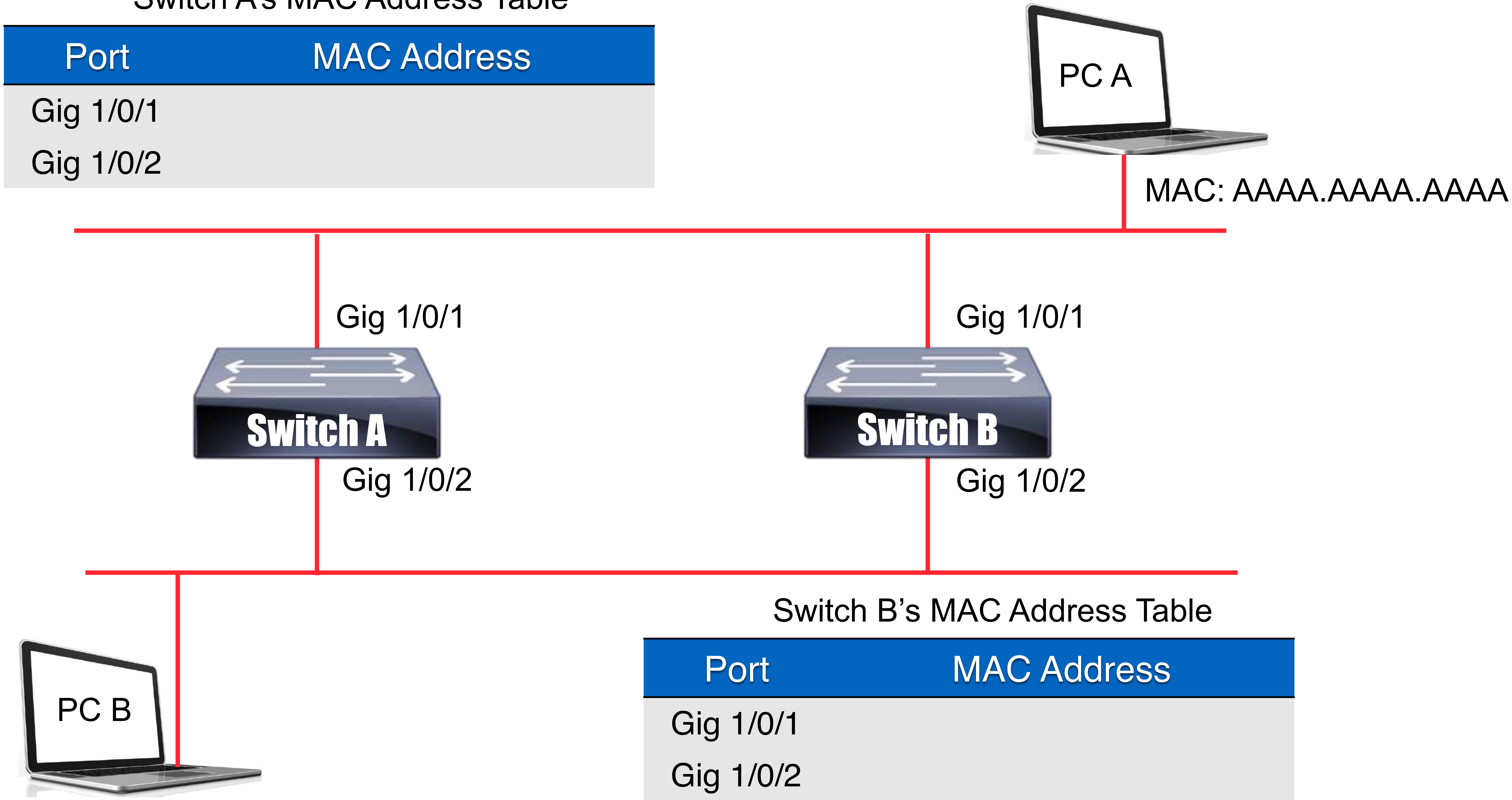
Issues Without STP

No TTL

MAC Address Table Corruption

Switch A's MAC Address Table

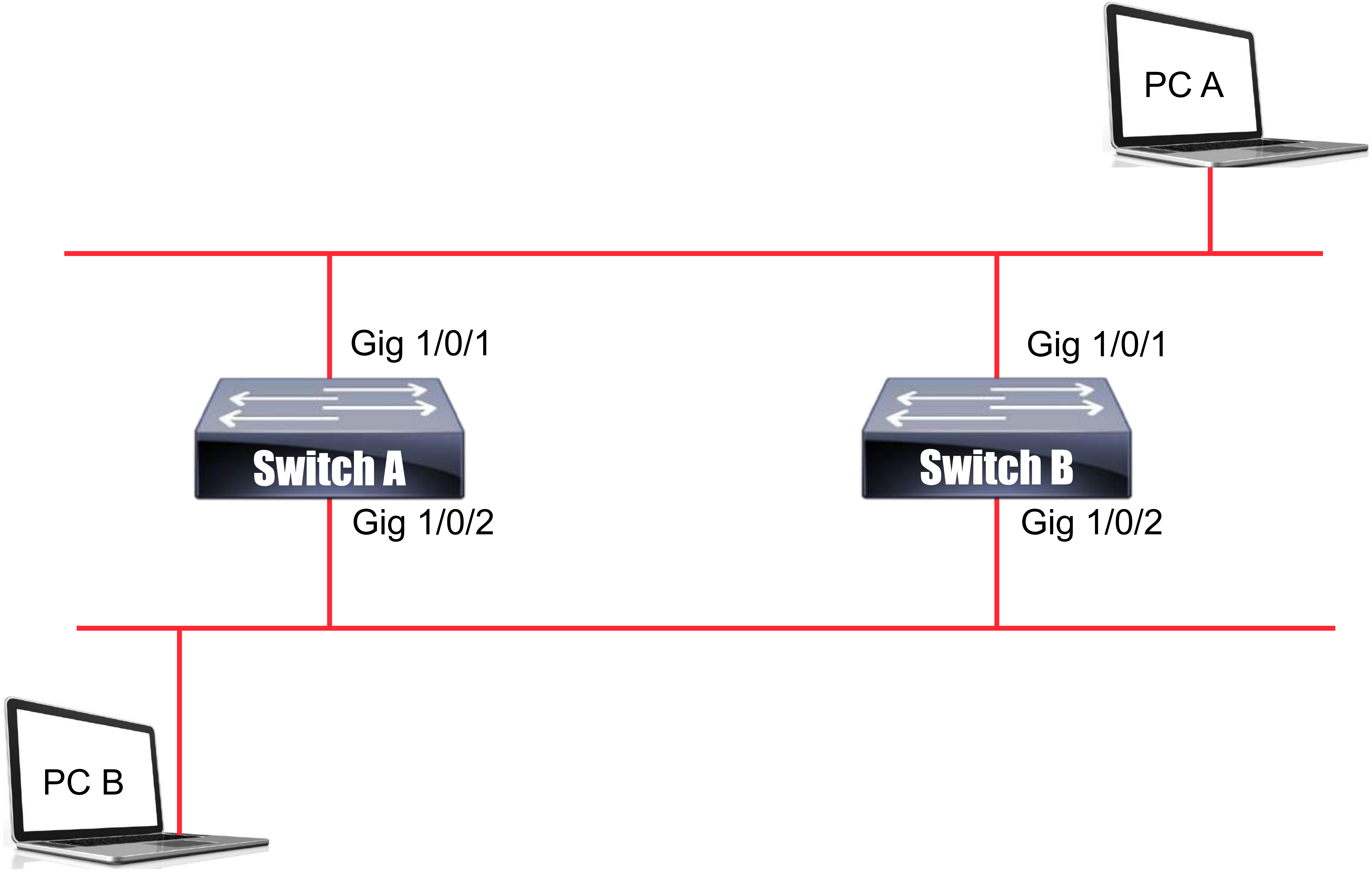
Port	MAC Address
Gig 1/0/1	
Gig 1/0/2	



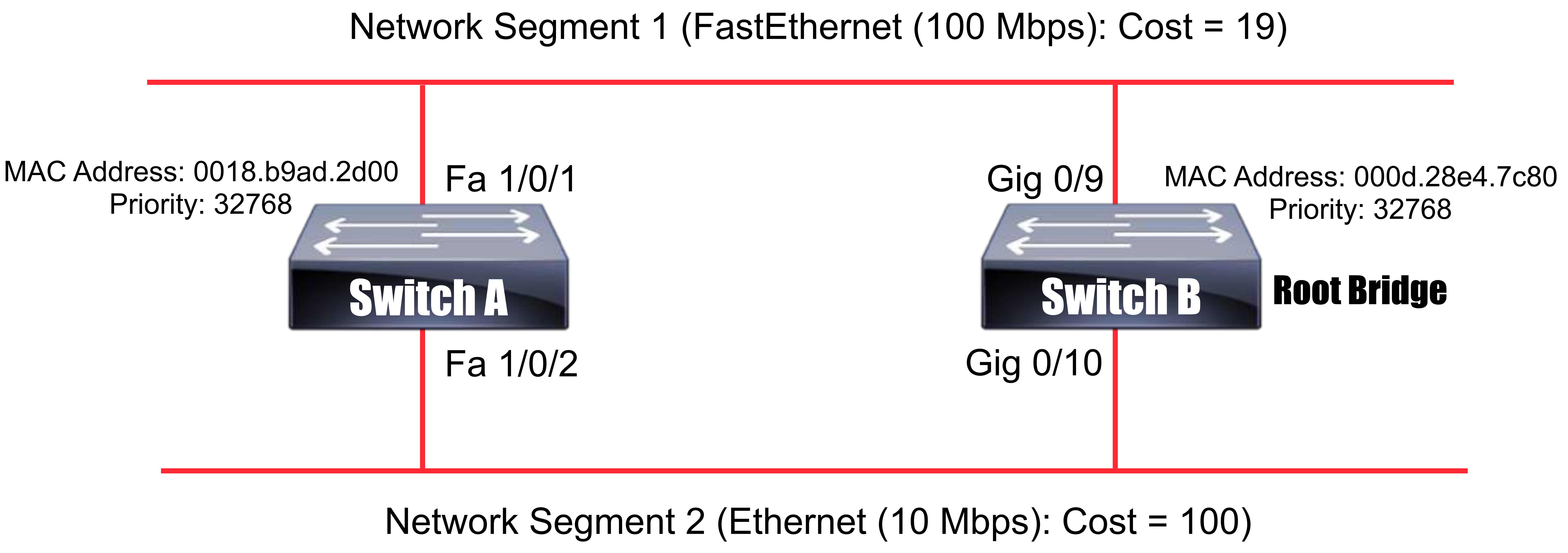
Switch B's MAC Address Table

Port	MAC Address
Gig 1/0/1	
Gig 1/0/2	

Broadcast Storm



Identifying STP Port States



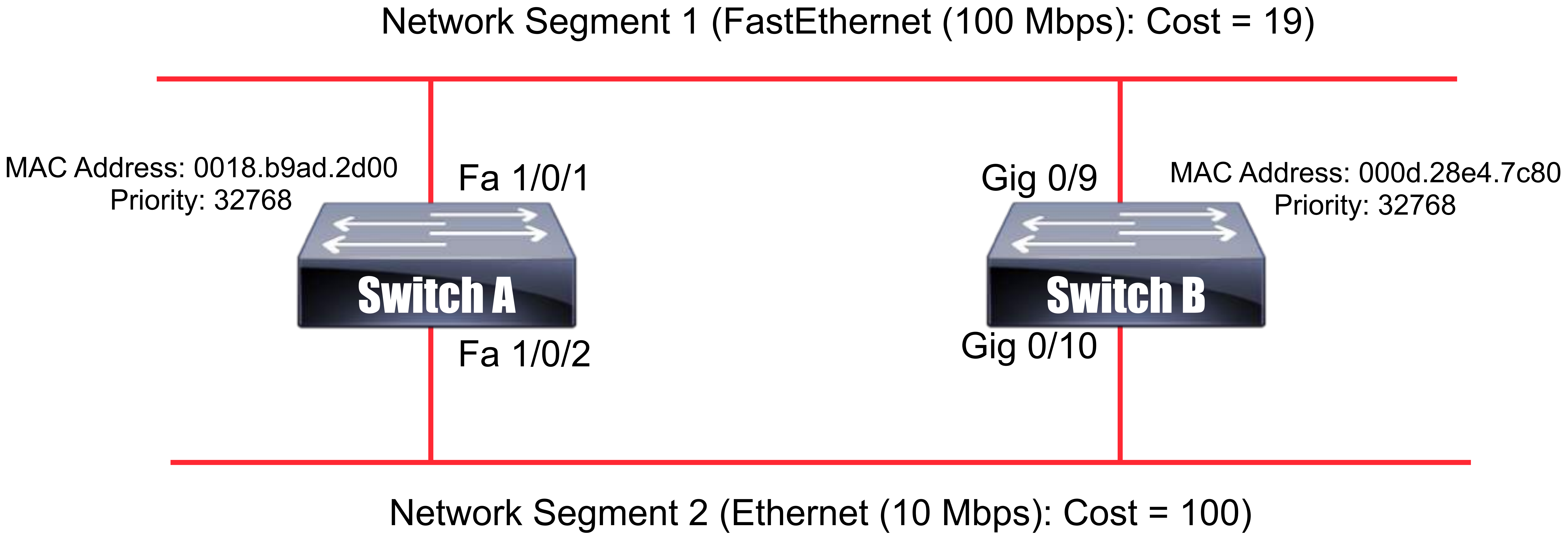
Root Bridge: An STP topology has a single *root bridge*. The bridge (or switch) with the lowest *bridge ID* (BID) is elected as the root bridge.

Bridge Priority (0 - 61440) Default: 32768	MAC Address

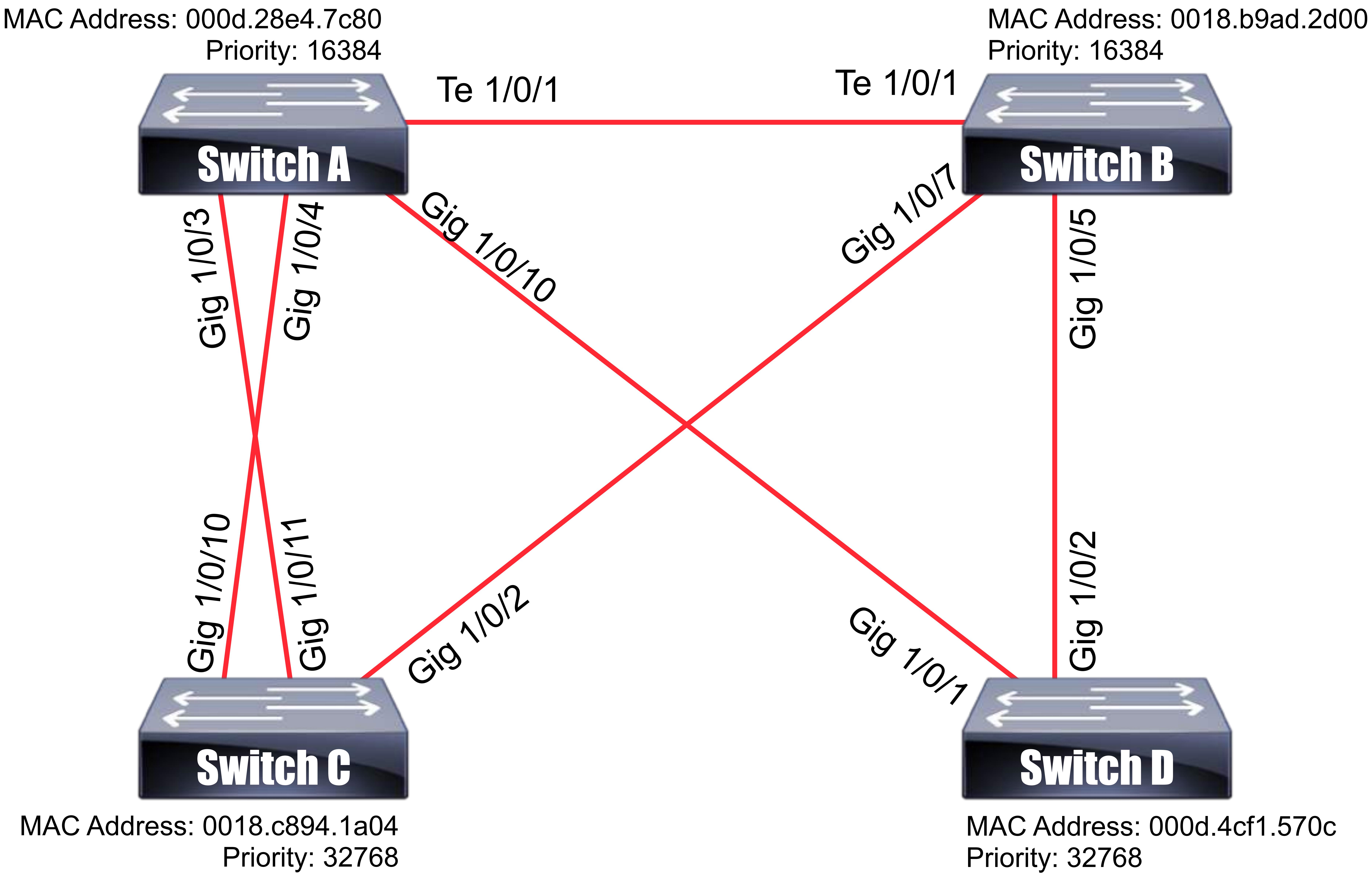
Identifying STP Port States

Port State	Description
Root Port	The port on a non-root bridge that is closest to the root bridge, in terms of cost
Designated Port	The port on a network segment that is closest to the root bridge, in terms of cost
Non-Designated Port	Ports that block traffic, in order to preserve a loop-free Layer 2 topology
Disabled Port	A port that is administratively shut down

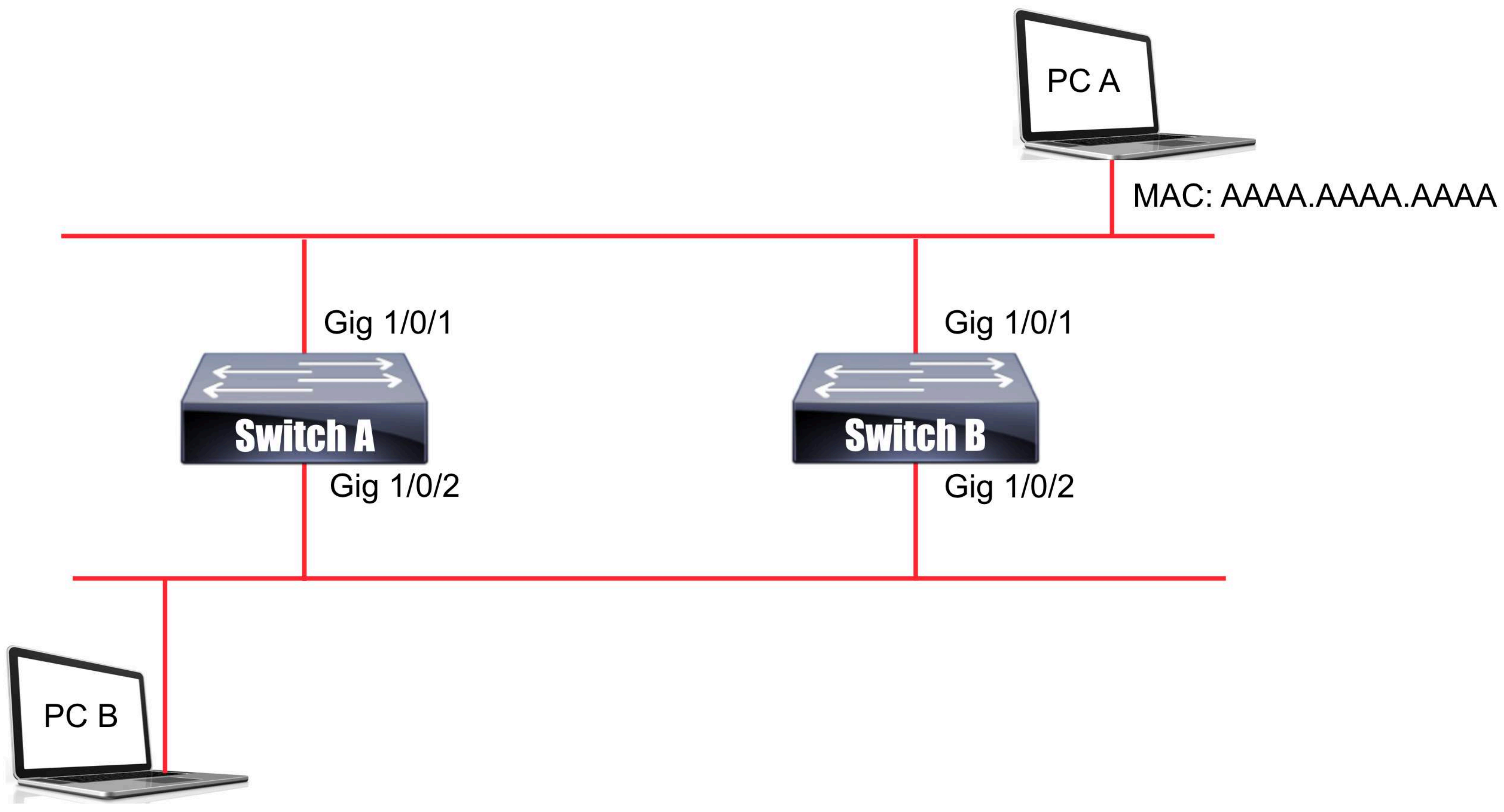
Port Speed	STP Port Cost
10 Mbps	100
100 Mbps	19
1 Gbps	4
10 Gbps	2



STP Practice Exercise



STP Convergence Times



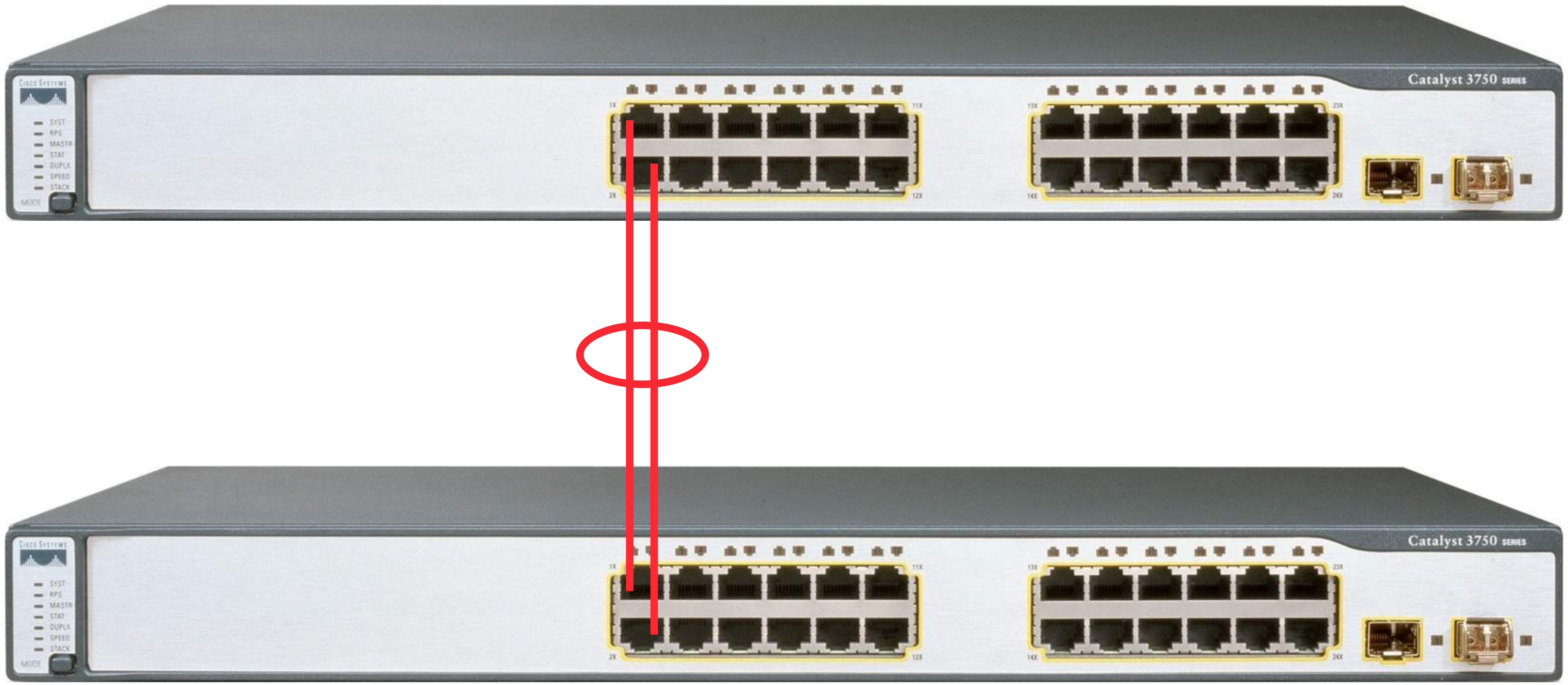
Forwarding

Learning (15 sec)

Listening (15 sec)

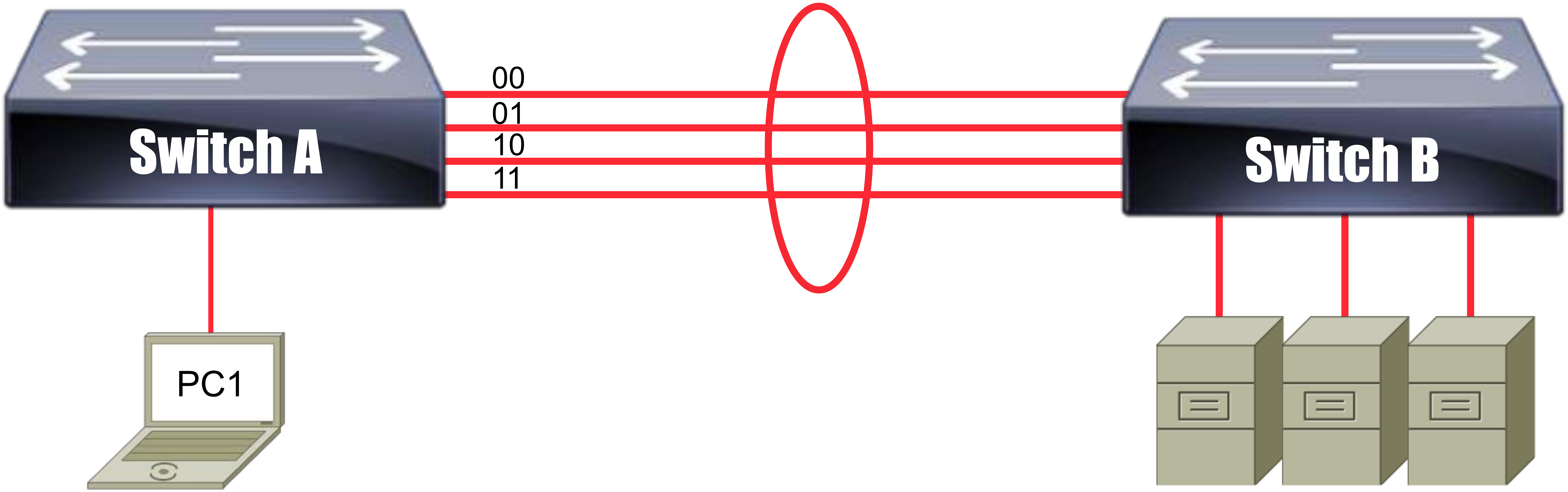
Blocking (20 sec)

EtherChannel Basics



- Allows higher bandwidth between switches
- Provides load-balancing
- Creates redundant links

EtherChannel Load-Balancing

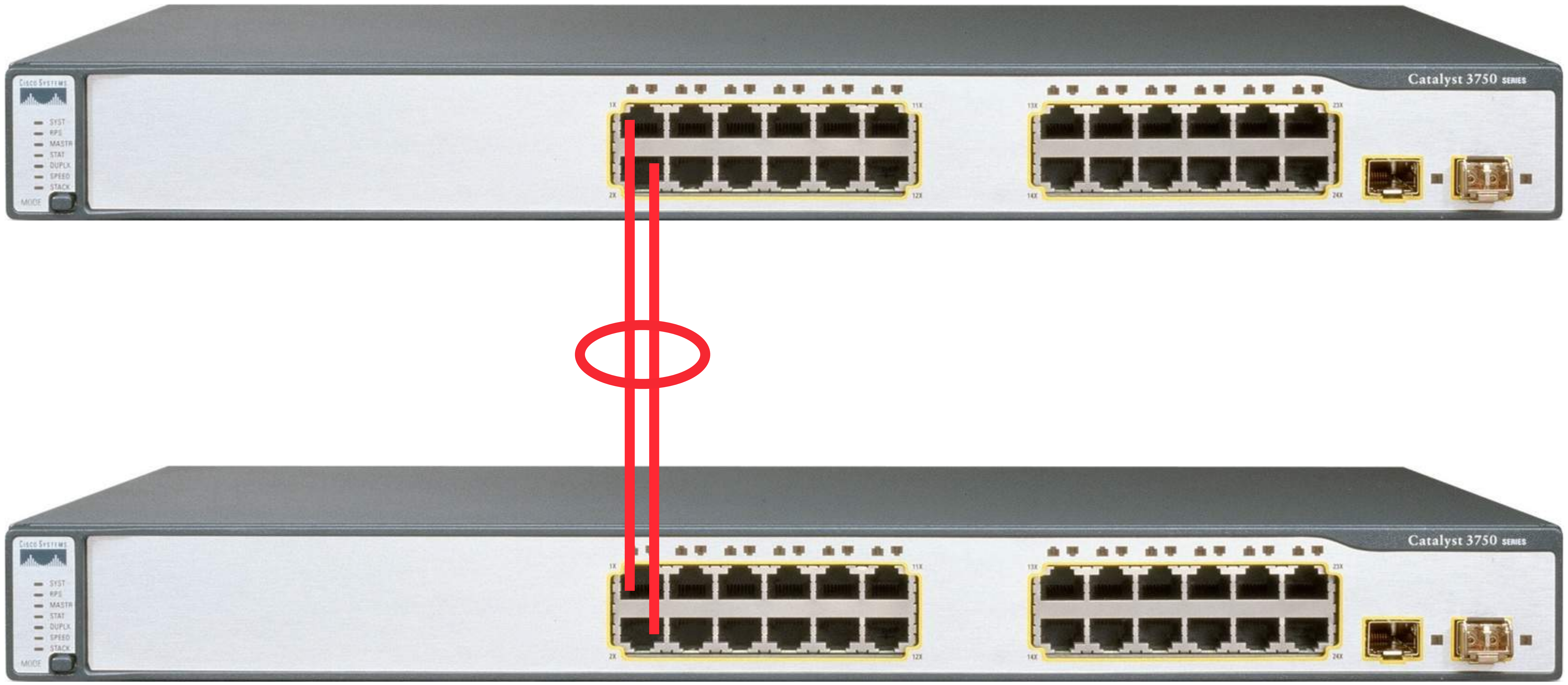


Last Hex Digit in MAC Address: 1 5 D

Load-Balancing Algorithms
- dst-ip
- dst-mac
- src-dst-ip
- src-dst-mac
- src-ip
- src-mac

Hex	Binary
1	0001
5	0101
D	1101

Link Aggregation Protocols



- **PAgP**: Port Aggregation Protocol
- **LACP**: Link Aggregation Control Protocol

Module 7
Ethernet Switches

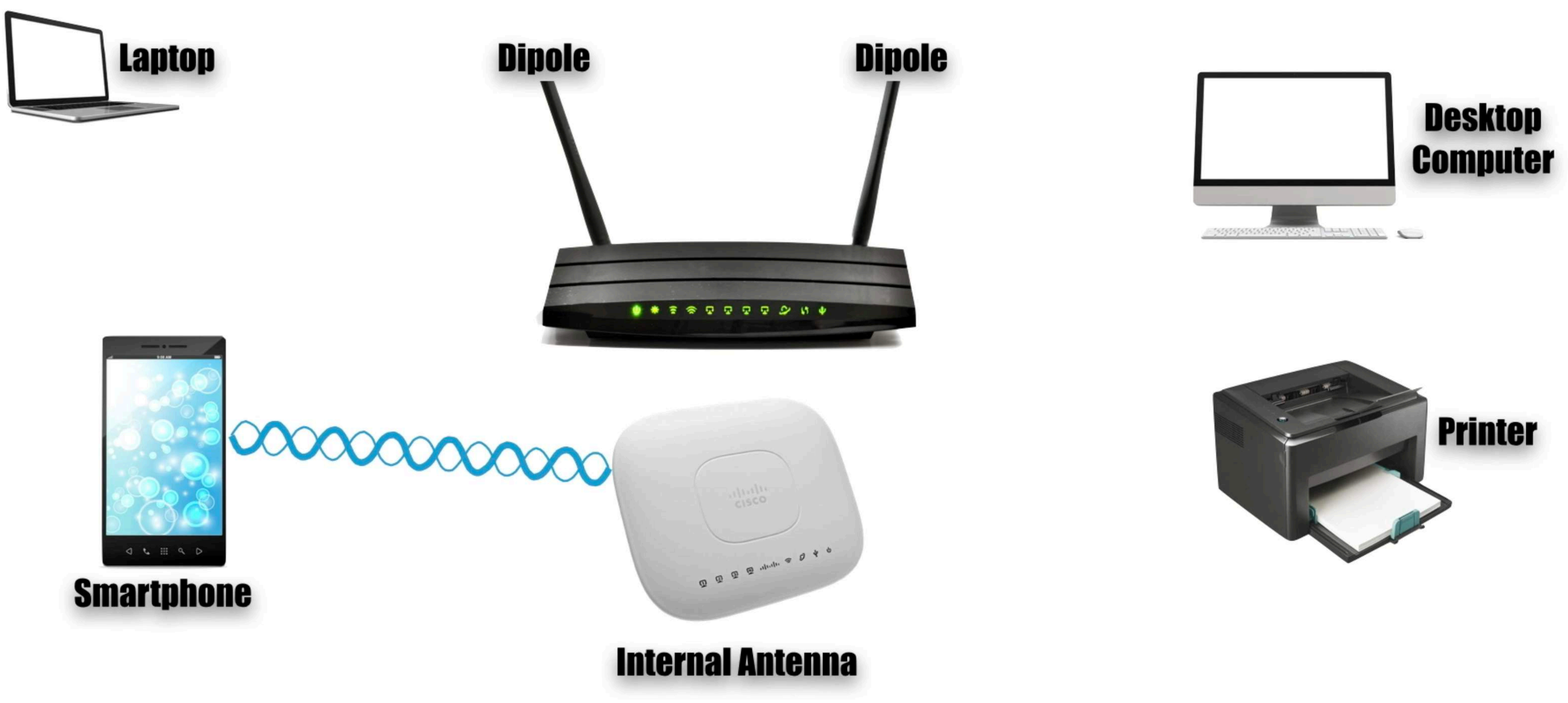
Module 8
Wireless Networks

Infrastructure Wireless LAN

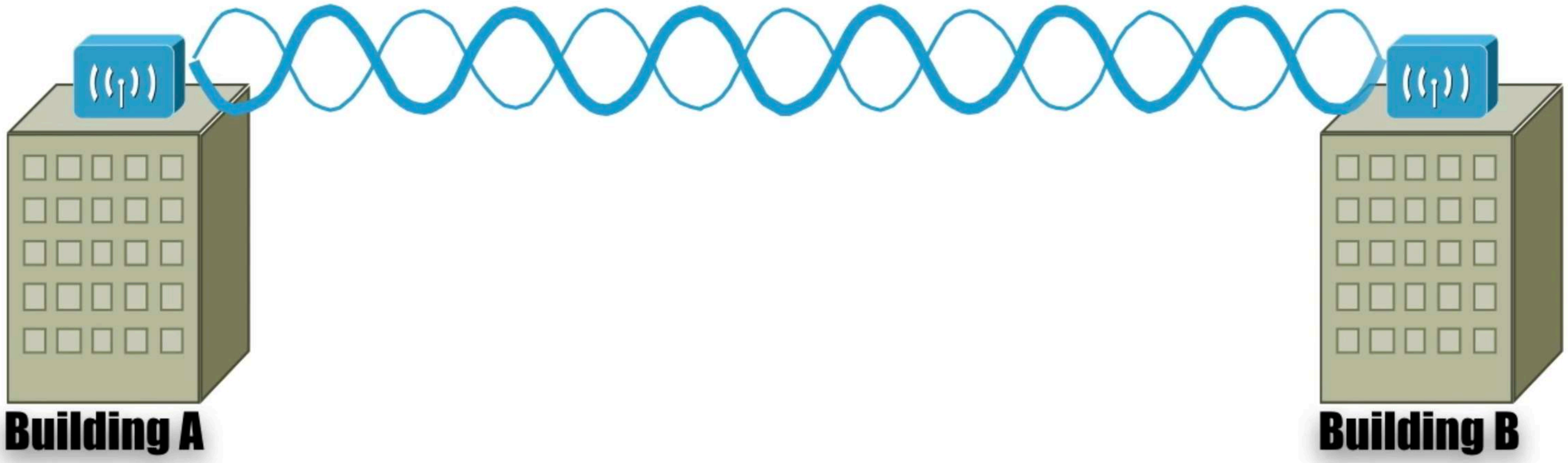
Ad Hoc Wireless LAN

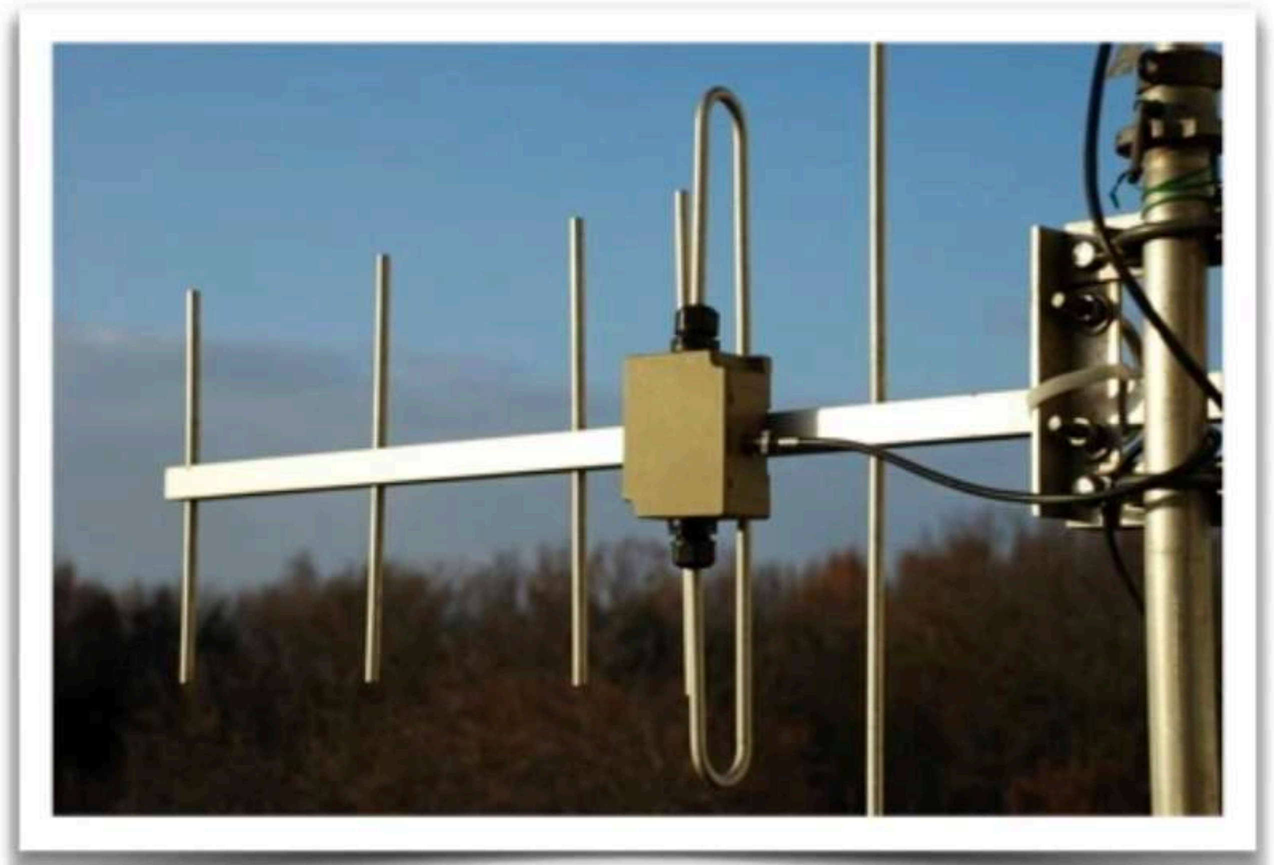
Mesh Wireless LAN

Omnidirectional Antenna



Point-to-Point Antenna





Yagi
Short Range

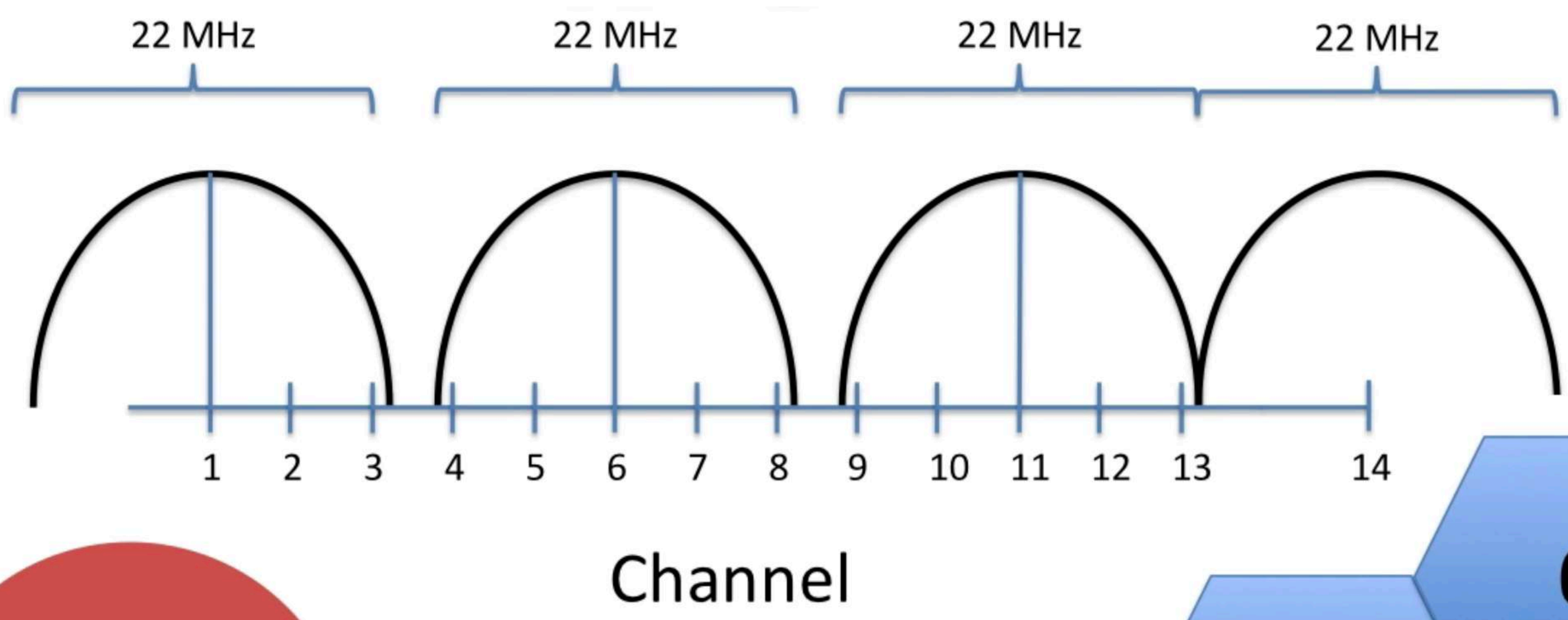
Parabolic
Long Range

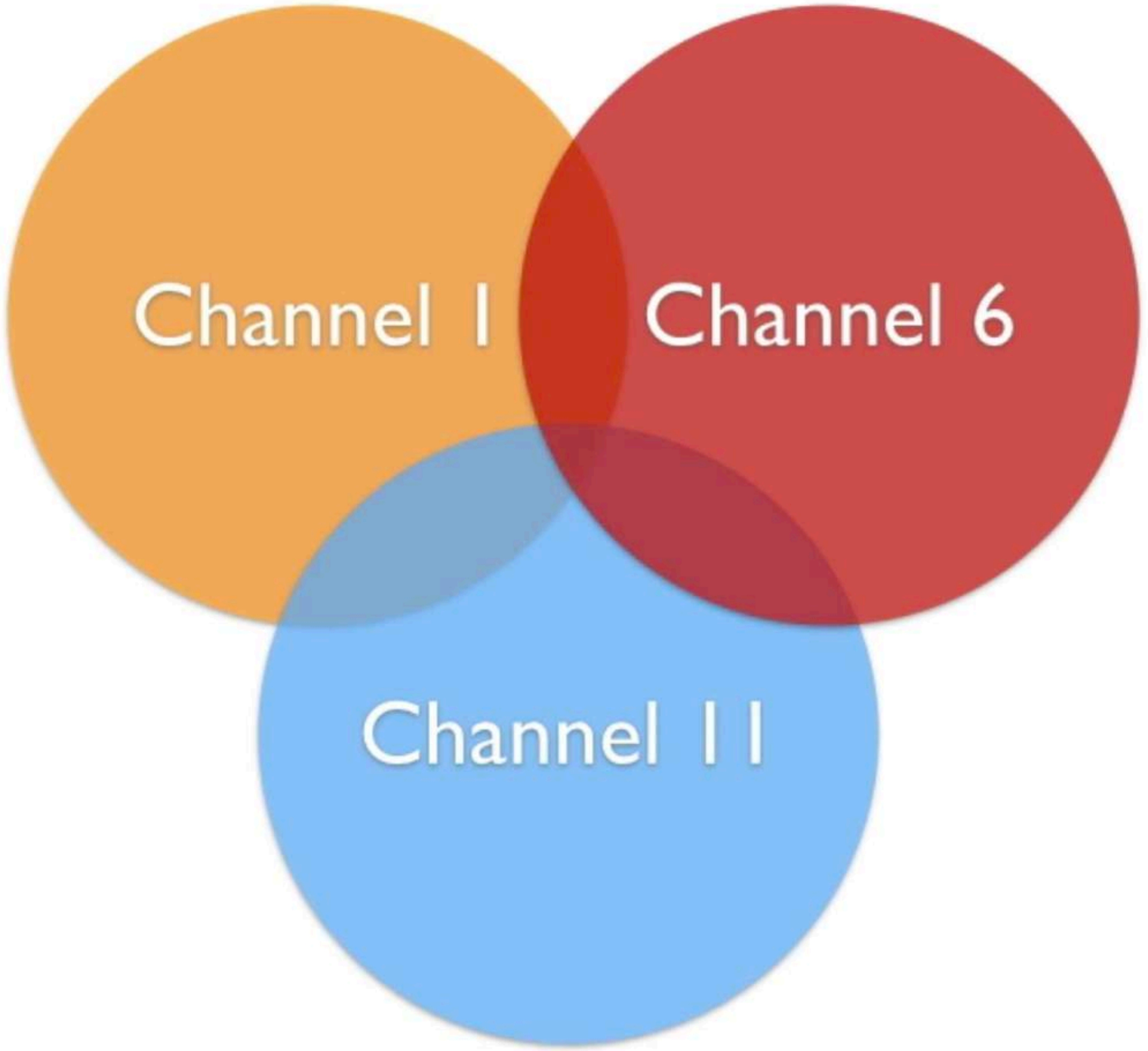
Wireless Frequencies

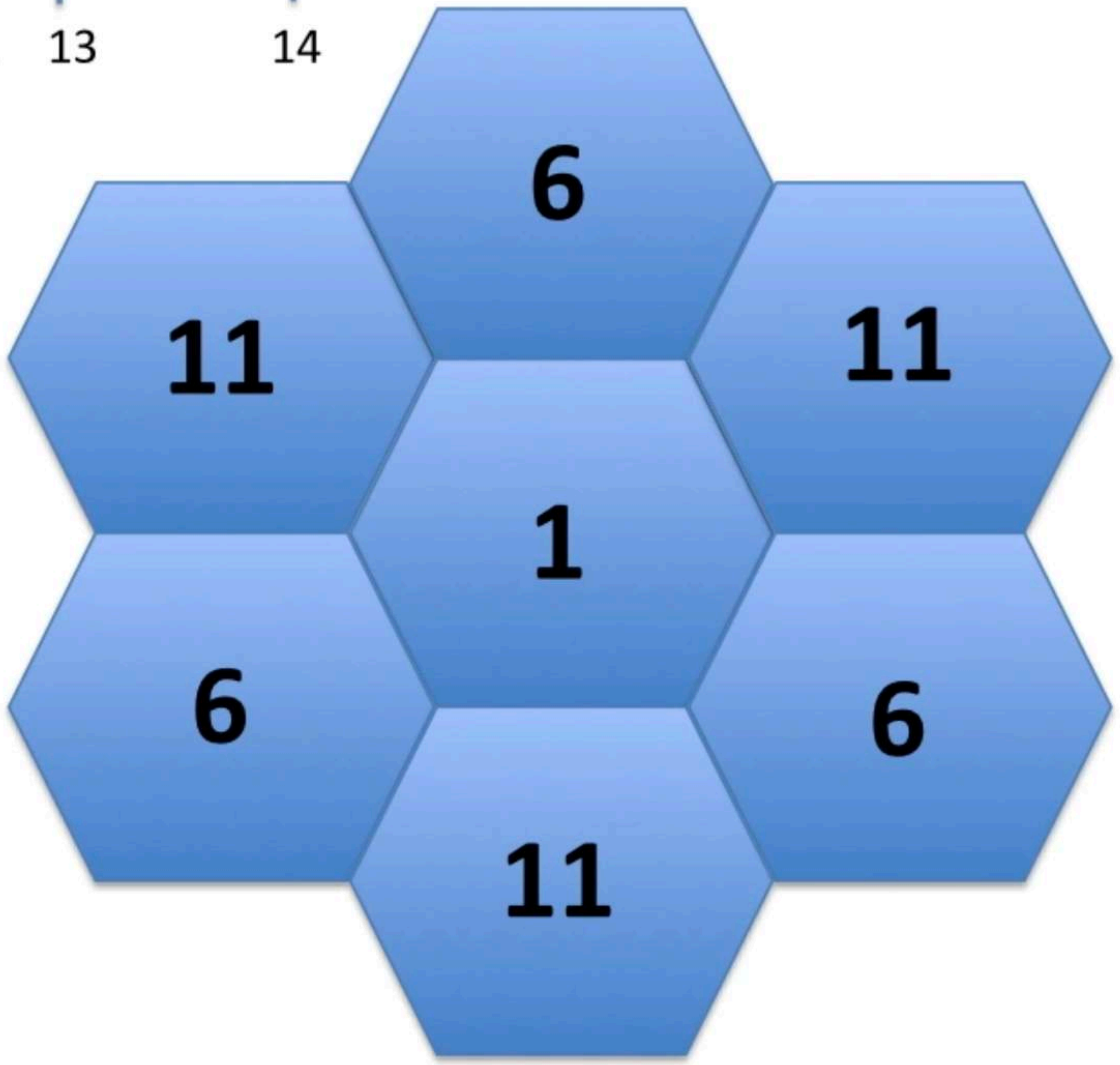
2.4 GHz - 2.5 GHz Range

5.725 - 5.875 GHz Range

Non-Overlapping 2.4 GHz Channels







Wireless Standards

Standard	Frequency Band	Maximum Bandwidth	Transmission Method	Maximum Range
802.11	2.4 GHz	1 or 2 Mbps	DSSS or FHSS	20 m indoors / 100 m outdoors
802.11a	5 GHz	54 Mbps	OFDM	35 m indoors / 120 m outdoors
802.11b	2.4 GHz	11 Mbps	DSSS	32 m indoors / 140 m outdoors
802.11g	2.4 GHz	54 Mbps	OFDM or DSSS	32 m indoors / 140 m outdoors
802.11n	2.4 GHz or 5 GHz (or both)	> 300 Mbps (with channel bonding)	OFDM	70 m indoors / 250 m outdoors
802.11ac	5 GHz	> 6 Gbps (with MU-MIMO and multiple antennas)	OFDM	Similar to 802.11n operating at 5 GHz

Module 8
Wireless Networks

Module 9
Network Addressing

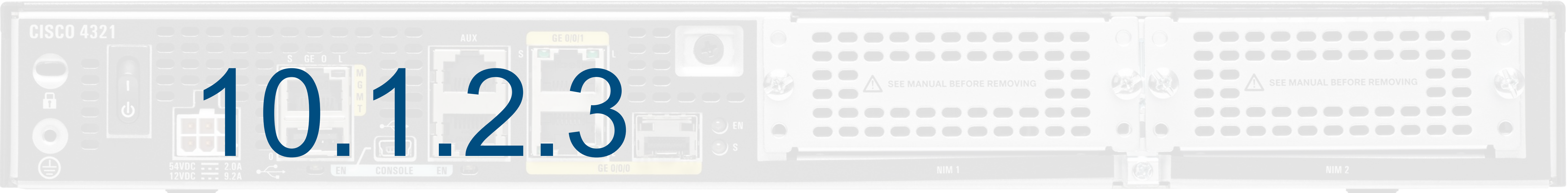
IPv4 Address Formatting

27837th Street

278 37th Street

2783 7th Street

IPv4 Address Formatting

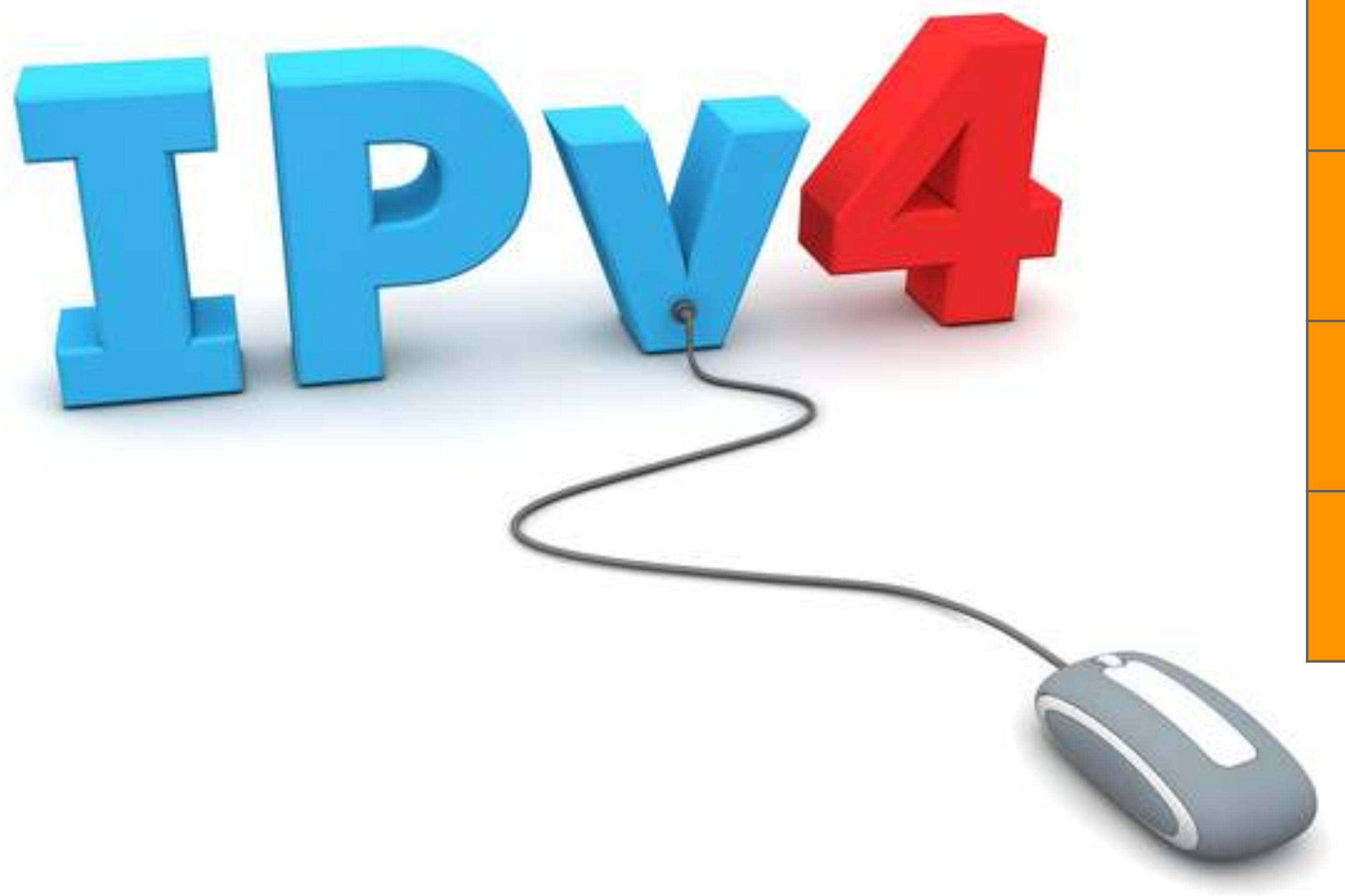


10.1.2.3

Dotted Decimal Notation	10	1	2	3
IP Address (in binary)	00001010	00000001	00000010	00000011
Subnet Mask	11111111	00000000	00000000	00000000
	Network Bits	Host Bits		

- 10.1.2.3: IP Address With No Subnet Information
- 10.1.2.3 /8: IP Address With Prefix Notation
- 10.1.2.3 255.0.0.0: IP Address With Dotted Decimal Notation

IPv4 Address Classes

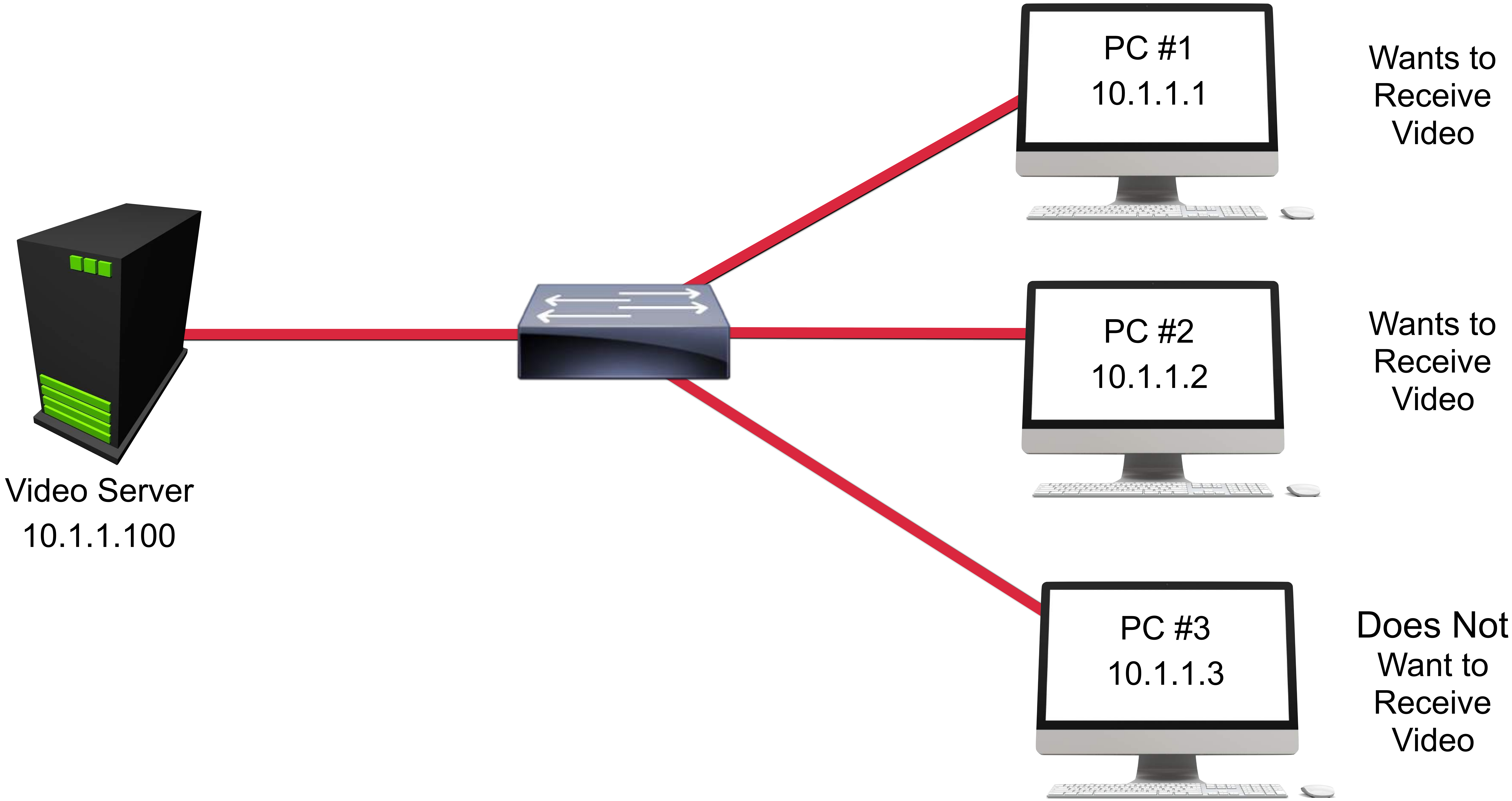


Address Class	Value in First Octet	Classful Mask (Dotted Decimal)	Classful Mask (Prefix Notation)
A	1 - 126	255.0.0.0	/8
B	128 - 191	255.255.0.0	/16
C	192 - 223	255.255.255.0	/24
D	224 - 239	N/A	N/A
E	240 - 255	N/A	N/A

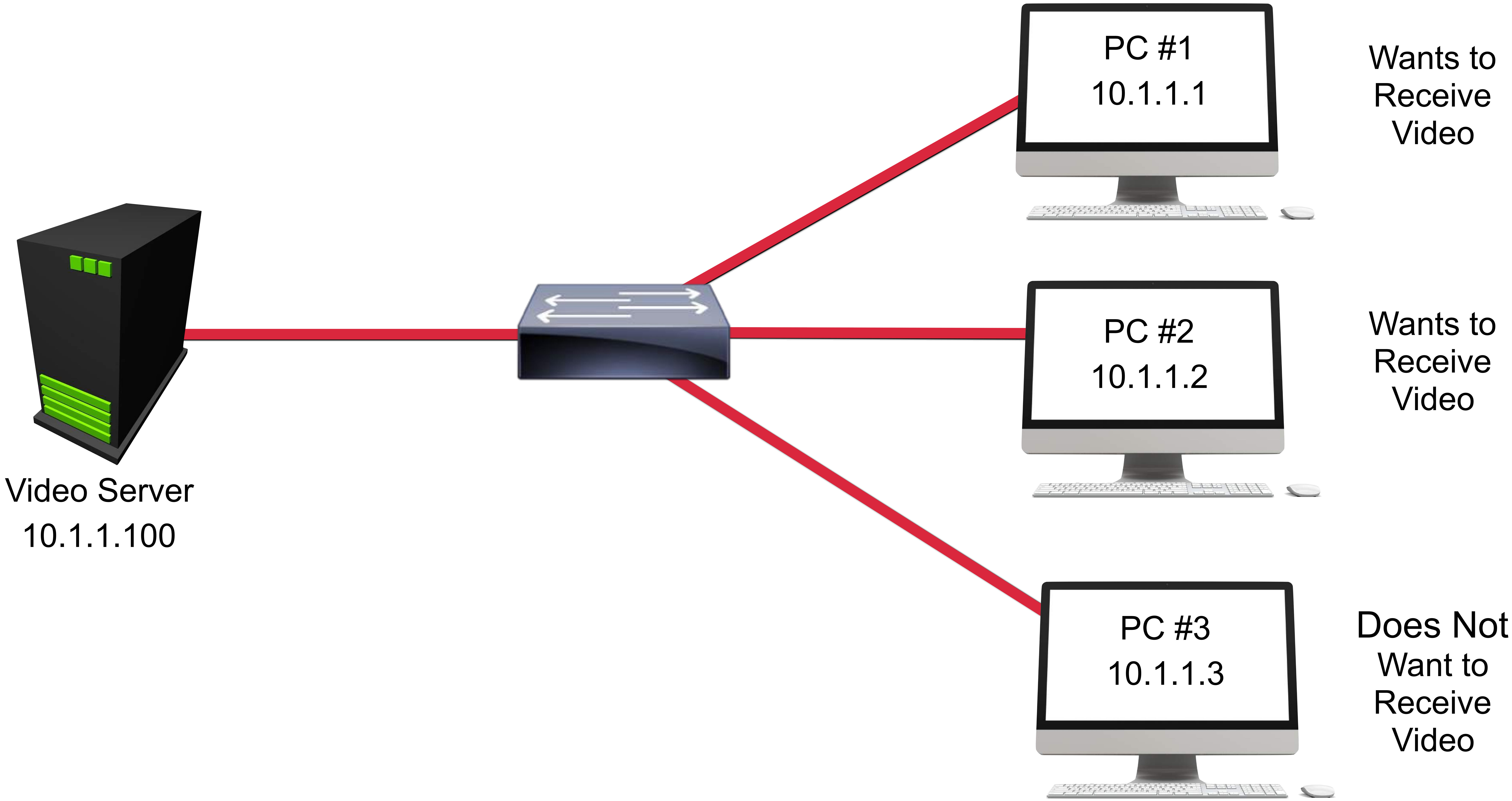
Public vs. Private IPv4 Addresses

Address Class	Address Range	Default Subnet Mask
A	10.0.0.0 - 10.255.255.255	255.0.0.0
B	172.16.0.0 - 172.31.255.255	255.255.0.0
B	169.254.0.0 - 169.254.255.255	255.255.0.0
C	192.168.0.0 - 192.168.255.255	255.255.255.0

Unicast

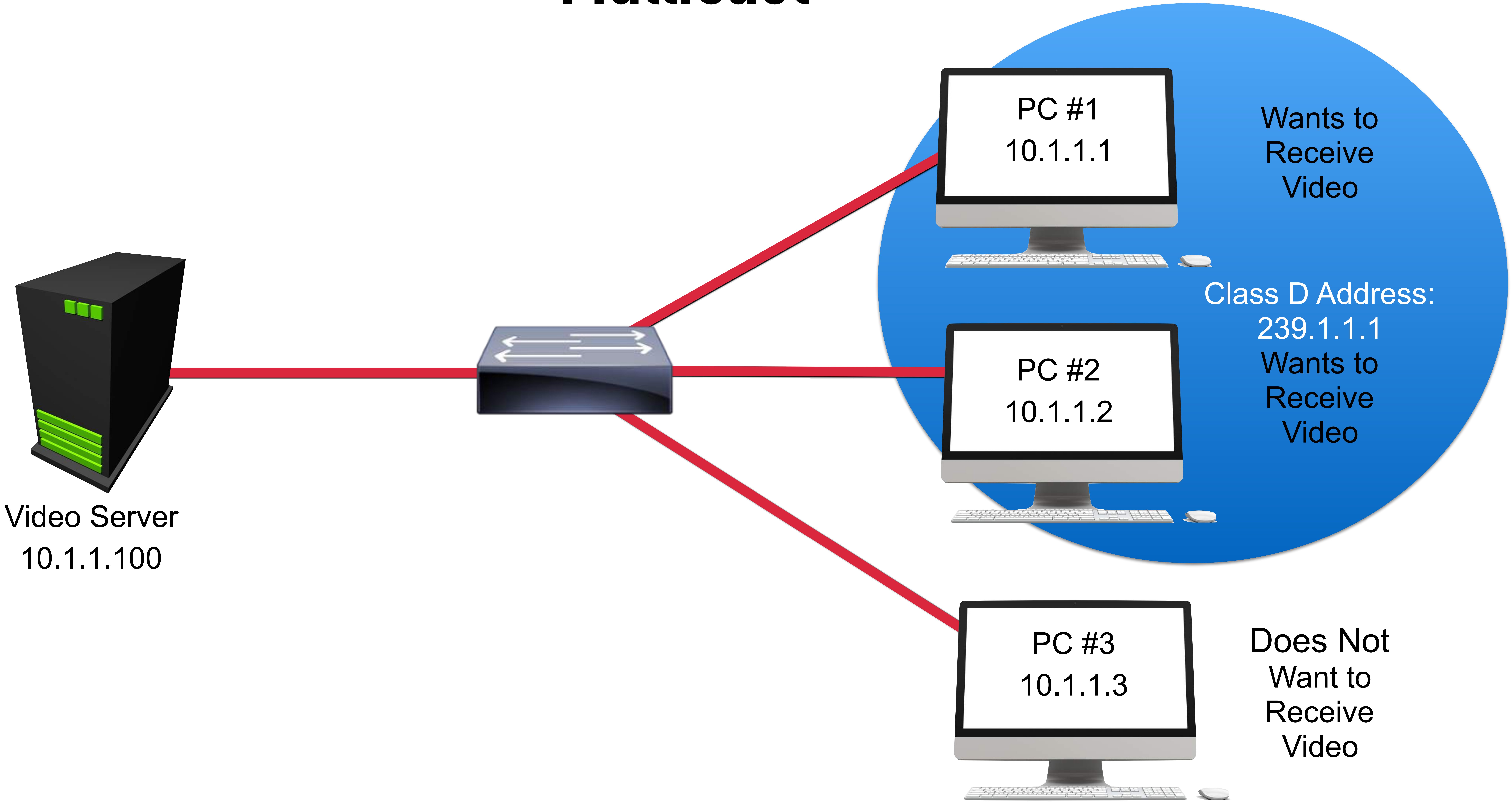

PC #1
10.1.1.1
Wants to Receive Video
PC #2
10.1.1.2
Wants to Receive Video
PC #3
10.1.1.3
Does Not Want to Receive Video
Video Server
10.1.1.100

Broadcast



PC #1
10.1.1.1
Wants to Receive Video
PC #2
10.1.1.2
Wants to Receive Video
PC #3
10.1.1.3
Does Not Want to Receive Video
Video Server
10.1.1.100

Multicast



PC #1
10.1.1.1
Wants to
Receive
Video
Class D Address:
239.1.1.1
Wants to
Receive
Video
PC #2
10.1.1.2
Video Server
10.1.1.100
PC #3
10.1.1.3
Does Not
Want to
Receive
Video

Converting Binary Numbers to Decimal

10.1.2.3

Dotted Decimal Notation	10	1	2	3
IP Address (in binary)	00001010	00000001	00000010	00000011
	Octet 1	Octet 2	Octet 3	Octet 4

Converting Binary Numbers to Decimal

128	64	32	16	8	4	2	1
1	0	0	1	0	1	1	0

128 + 16 + 4 + 2 = 150

Converting Decimal Numbers to Binary

Given a decimal number of 167, calculate the corresponding binary number.

128	64	32	16	8	4	2	1
1							

- Is 167 equal to or greater than 128?
- Yes
- Place a 1 in the 128 column
- Subtract 128 from 167 = 39

Converting Decimal Numbers to Binary

Given a decimal number of 167, calculate the corresponding binary number.

128	64	32	16	8	4	2	1
1	0						

- Is 39 equal to or greater than 64?
- No
- Place a 0 in the 64 column

Converting Decimal Numbers to Binary

Given a decimal number of 167, calculate the corresponding binary number.

128	64	32	16	8	4	2	1
1	0	1					

- Is 39 equal to or greater than 32?
- Yes
- Place a 1 in the 32 column
- Subtract 32 from 39 = 7

Converting Decimal Numbers to Binary

Given a decimal number of 167, calculate the corresponding binary number.

128	64	32	16	8	4	2	1
1	0	1	0				

- Is 7 equal to or greater than 16?
- No
- Place a 0 in the 16 column

Converting Decimal Numbers to Binary

Given a decimal number of 167, calculate the corresponding binary number.

128	64	32	16	8	4	2	1
1	0	1	0	0			

- Is 7 equal to or greater than 8?
- No
- Place a 0 in the 8 column

Converting Decimal Numbers to Binary

Given a decimal number of 167, calculate the corresponding binary number.

128	64	32	16	8	4	2	1
1	0	1	0	0	1		

- Is 7 equal to or greater than 4?
- Yes
- Place a 1 in the 4 column
- Subtract 4 from 7 = 3

Converting Decimal Numbers to Binary

Given a decimal number of 167, calculate the corresponding binary number.

128	64	32	16	8	4	2	1
1	0	1	0	0	1	1	

- Is 3 equal to or greater than 2?
- Yes
- Place a 1 in the 2 column
- Subtract 2 from 3 = 1

Converting Decimal Numbers to Binary

Given a decimal number of 167, calculate the corresponding binary number.

128	64	32	16	8	4	2	1
1	0	1	0	0	1	1	1

- Is 1 equal to or greater than 1?
- Yes
- Place a 1 in the 1 column
- Subtract 1 from 1 = 0

Practice Exercise #1

Given the a binary number of 01101011,
calculate the corresponding decimal number.

128	64	32	16	8	4	2	1

Practice Exercise #1

Given the a binary number of 01101011, calculate the corresponding decimal number.

128	64	32	16	8	4	2	1
0	1	1	0	1	0	1	1

$$64 + 32 + 8 + 2 + 1 = 107$$

Practice Exercise #2

Given the a decimal number of 49, calculate the corresponding binary number.

128	64	32	16	8	4	2	1

Practice Exercise #2

Given the a decimal number of 49, calculate the corresponding binary number.

128	64	32	16	8	4	2	1
0	0	1	1	0	0	0	1

- Is 49 greater than or equal to 128? => No => Put a 0 in the 128 column.
- Is 49 greater than or equal to 64? => No => Put a 0 in the 64 column.
- Is 49 greater than or equal to 32? => Yes => Put a 1 in the 32 column, and subtract 32 from 49 => 49 - 32 = 17
- Is 17 greater than or equal to 16? => Yes => Put a 1 in the 16 column, and subtract 16 from 17 => 17 - 16 = 1
- Is 1 greater than or equal to 8? => No => Put a 0 in the 8 column.
- Is 1 greater than or equal to 4? => No => Put a 0 in the 4 column.
- Is 1 greater than or equal to 2? => No => Put a 0 in the 2 column.
- Is 1 greater than or equal to 1? => Yes => Put a 1 in the 1 column.

Network Address

10.1.2.3 /8

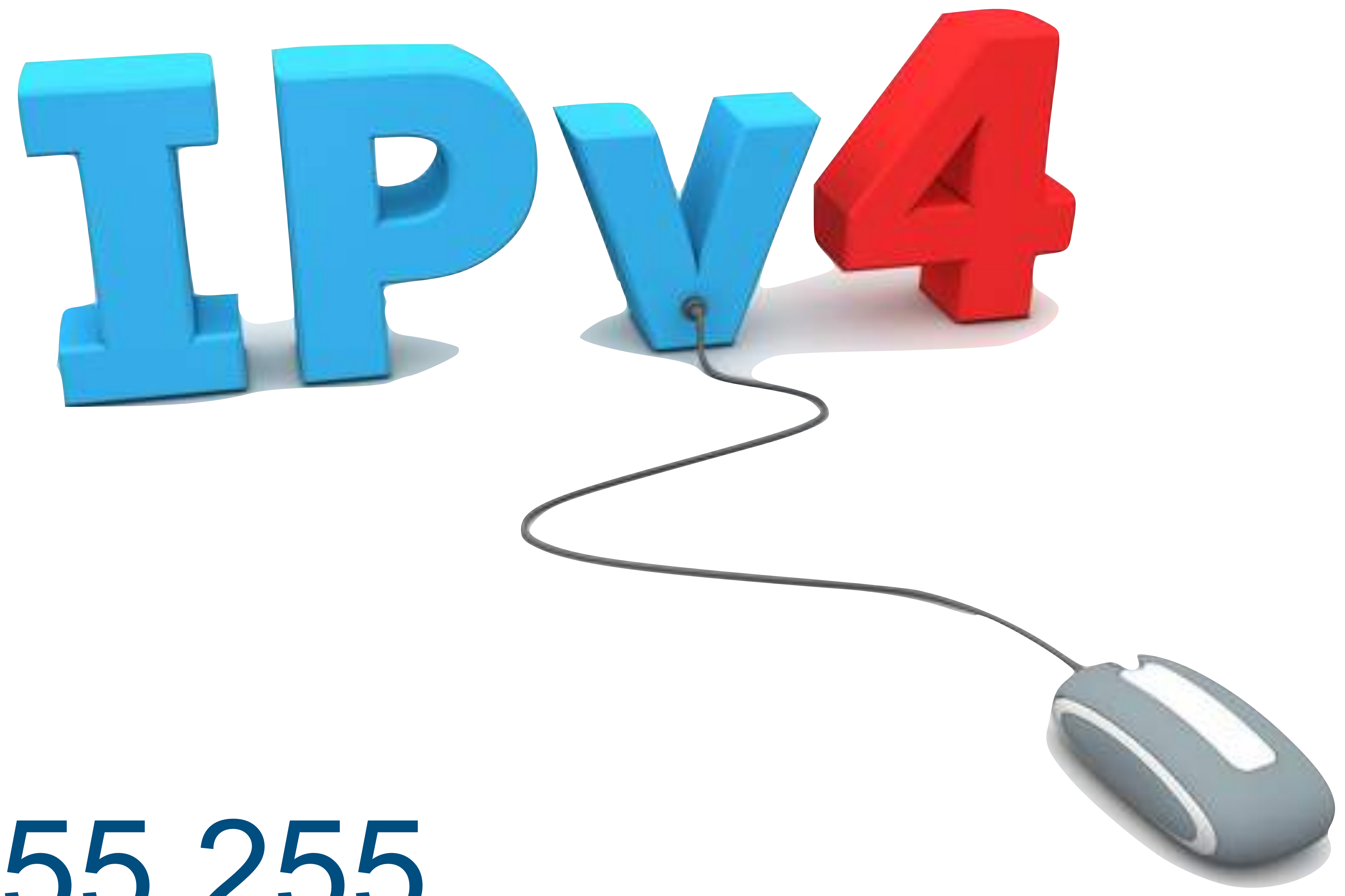
IP Address (Decimal)	10	1	2	3
IP Address (Binary)	00001010	00000001	00000010	00000011
Subnet Mask (Binary)	11111111	00000000	00000000	00000000
Subnet Mask (Decimal)	255	0	0	0
Network Address (Binary)	00001010	00000000	00000000	00000000
Network Address (Decimal)	10	0	0	0

Directed Broadcast Address

10.1.2.3 /8

IP Address (Decimal)	10	1	2	3
IP Address (Binary)	00001010	00000001	00000010	00000011
Subnet Mask (Binary)	11111111	00000000	00000000	00000000
Subnet Mask (Decimal)	255	0	0	0
Directed Broadcast Address (Binary)	00001010	11111111	11111111	11111111
Directed Broadcast Address (Decimal)	10	255	255	255

Review



- IP Address: 10.1.2.3
- Subnet Mask: 255.0.0.0
- Network Address: 10.0.0.0 /8
- Directed Broadcast: 10.255.255.255
- Usable IP Addresses: 10.0.0.1 - 10.255.255.254

The Need for Subnetting

Address Class	Assignable IP Addresses
A	16,777,214 (i.e. 2^{24} - 2)
B	65,534 (i.e. 2^{16} - 2)
C	254 (i.e. 2^{8} - 2)

Network: 192.0.2.0 /24

Wasted IP Addresses: 192.168.1.3 - 192.168.1.254

The Need for Subnetting

Network Address	Octet 1	Octet 2	Octet 3	Octet 4
192.168.1.0 /24	11000000	10101000	00000001	00000000
192.168.14.0 /24	11000000	10101000	00001110	00000000
192.168.25.0 /24	11000000	10101000	00011001	00000000
192.168.30.0 /24	11000000	10101000	00011110	00000000

All Networks Have Their First 19 Bits In Common

Subnet Mask (Binary)	11111111	11111111	11100000	00000000
Subnet Mask (Decimal)	255	255	224	0
Network Address (Binary)	11000000	10101000	00000000	00000000
Network Address (Decimal)	192	168	0	0
Directed Broadcast Address (Binary)	11000000	10101000	00011111	11111111
Directed Broadcast Address (Decimal)	192	168	31	255

Dotted Decimal Notation	Prefix Notation
255.0.0.0	/8 (Classful Subnet Mask for Class A Networks)
255.128.0.0	/9
255.192.0.0	/10
255.224.0.0	/11
255.240.0.0	/12
255.248.0.0	/13
255.252.0.0	/14
255.254.0.0	/15
255.255.0.0	/16 (Classful Subnet Mask for Class B Networks)
255.255.128.0	/17
255.255.192.0	/18
255.255.224.0	/19
255.255.240.0	/20
255.255.248.0	/21
255.255.252.0	/22
255.255.254.0	/23
255.255.255.0	/24 (Classful Subnet Mask for Class C Networks)
255.255.255.128	/25
255.255.255.192	/26
255.255.255.224	/27
255.255.255.240	/28
255.255.255.248	/29
255.255.255.252	/30

Subnet Octet Value	Number of Left-Justified 1s
0	0
128	1
192	2
224	3
240	4
248	5
252	6
254	7
255	8

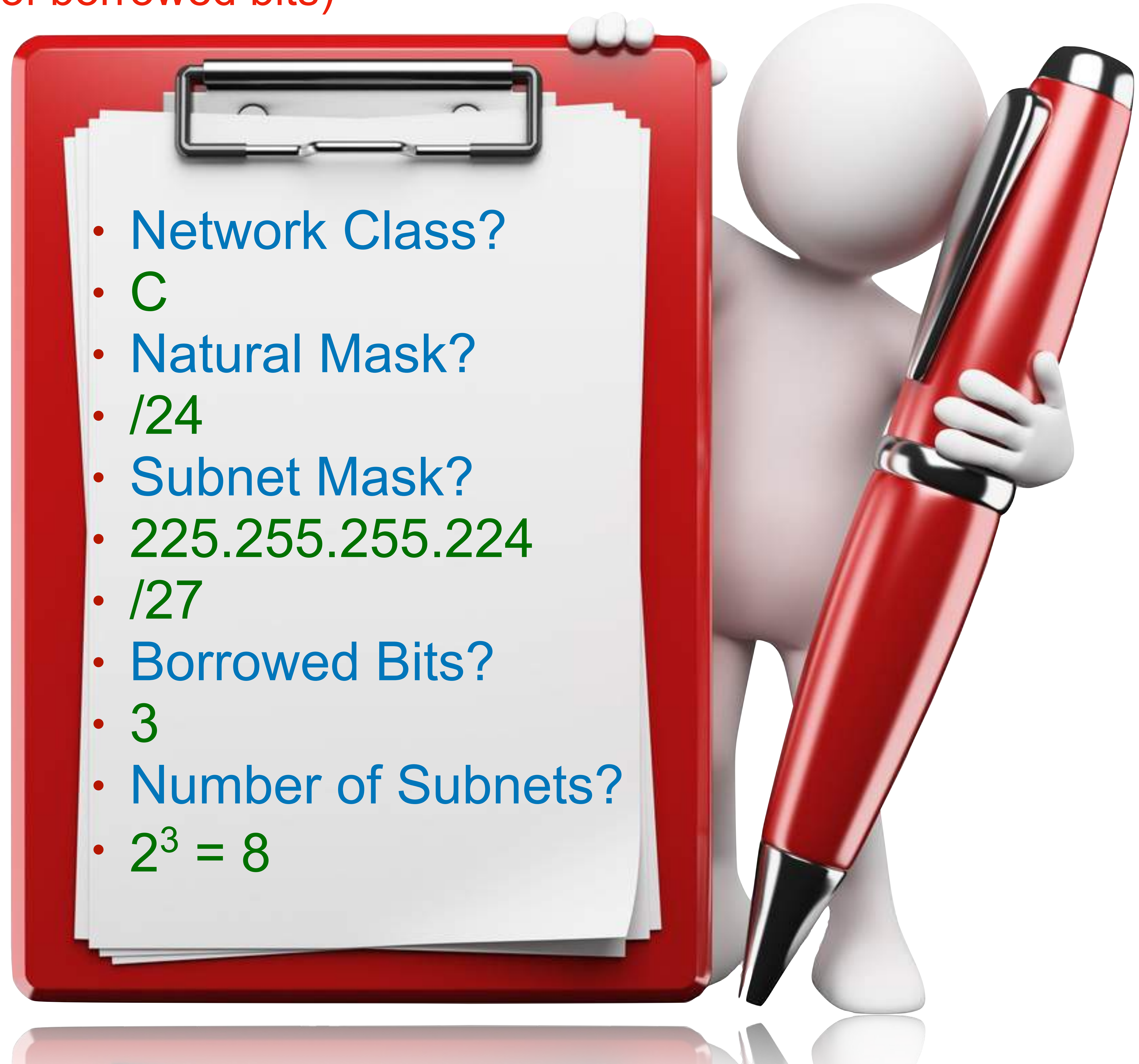
Calculating Available Subnets

Number of Created Subnets = 2^s

(where s is the number of borrowed bits)

Example

- A subnet mask of 255.255.255.224 is applied to a Class C network of 192.168.1.0 /24.
- How many subnets are created?



Calculating Available Subnets

Subnet	Mask	Host Range
192.168.1.0	255.255.255.224	192.168.1.1 - 192.168.1.30
192.168.1.32	255.255.255.224	192.168.1.33 - 192.168.1.62
192.168.1.64	255.255.255.224	192.168.1.65 - 192.168.1.94
192.168.1.96	255.255.255.224	192.168.1.97 - 192.168.1.126
192.168.1.128	255.255.255.224	192.168.1.129 - 192.168.1.158
192.168.1.160	255.255.255.224	192.168.1.161 - 192.168.1.190
192.168.1.192	255.255.255.224	192.168.1.193 - 192.168.1.222
192.168.1.224	255.255.255.224	192.168.1.225 - 192.168.1.254

Calculating Available Hosts

Number of Assignable IP Addresses in a Subnet = $2^h - 2$

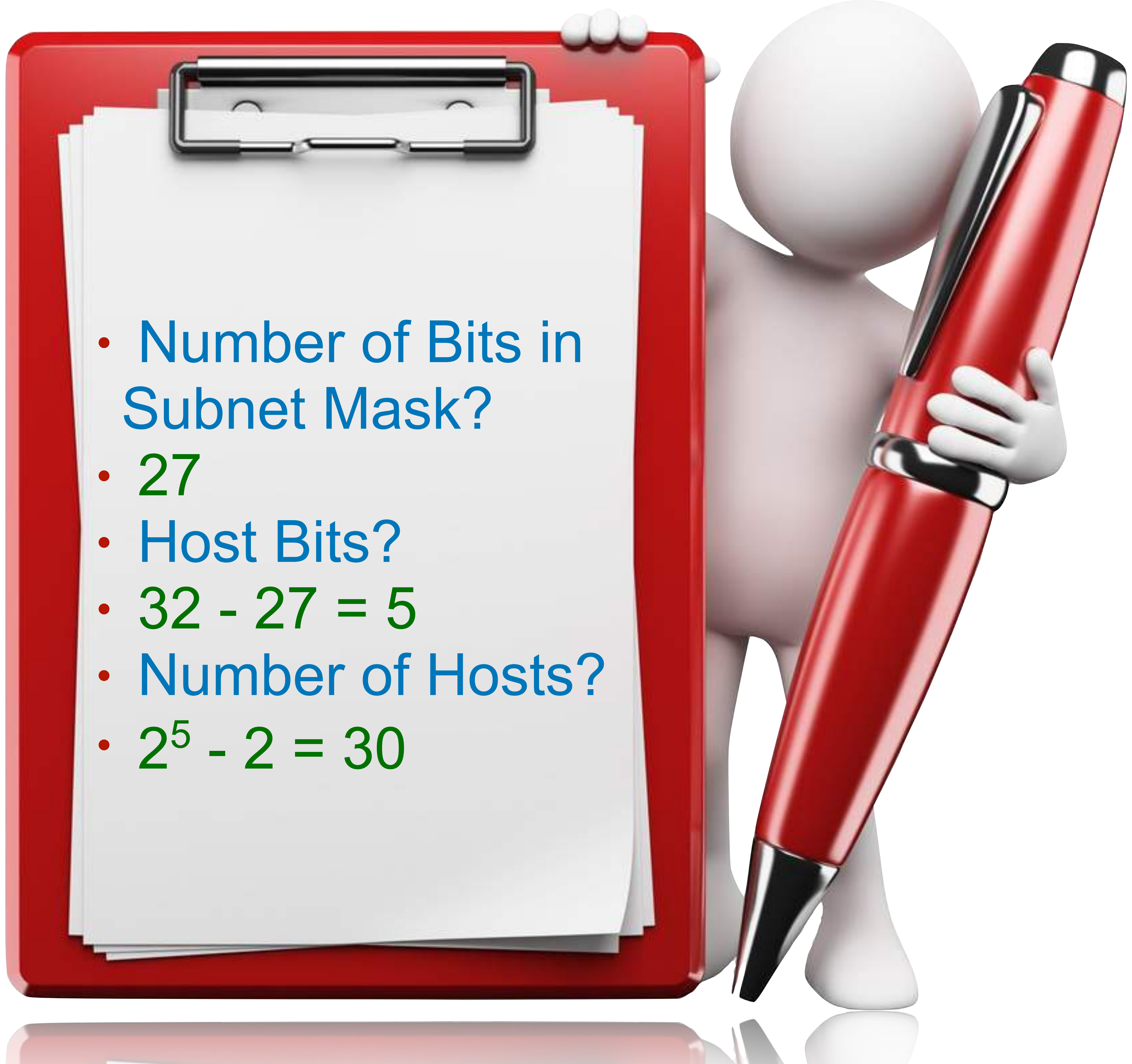
(where h is the number of host bits)

Why Subtract 2?

- You cannot assign the network address, where all host bits are set to 0
- You cannot assign the directed broadcast address, where all the host bits are set to 1

Example

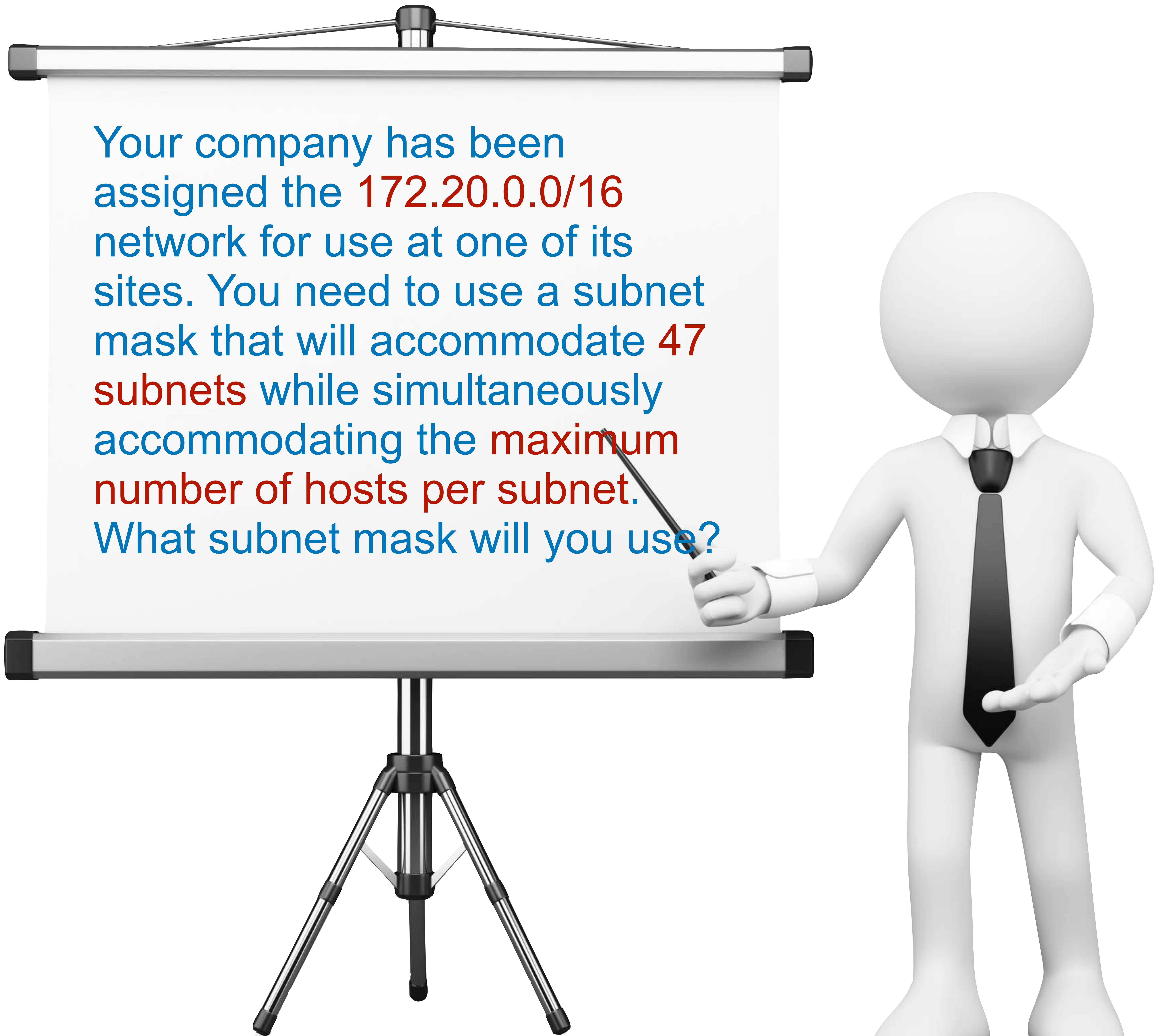
- A subnet mask of 255.255.255.224 is applied to a Class C network of 192.168.1.0 /24
- How many hosts can be assigned in each subnet?



Calculating Available Hosts

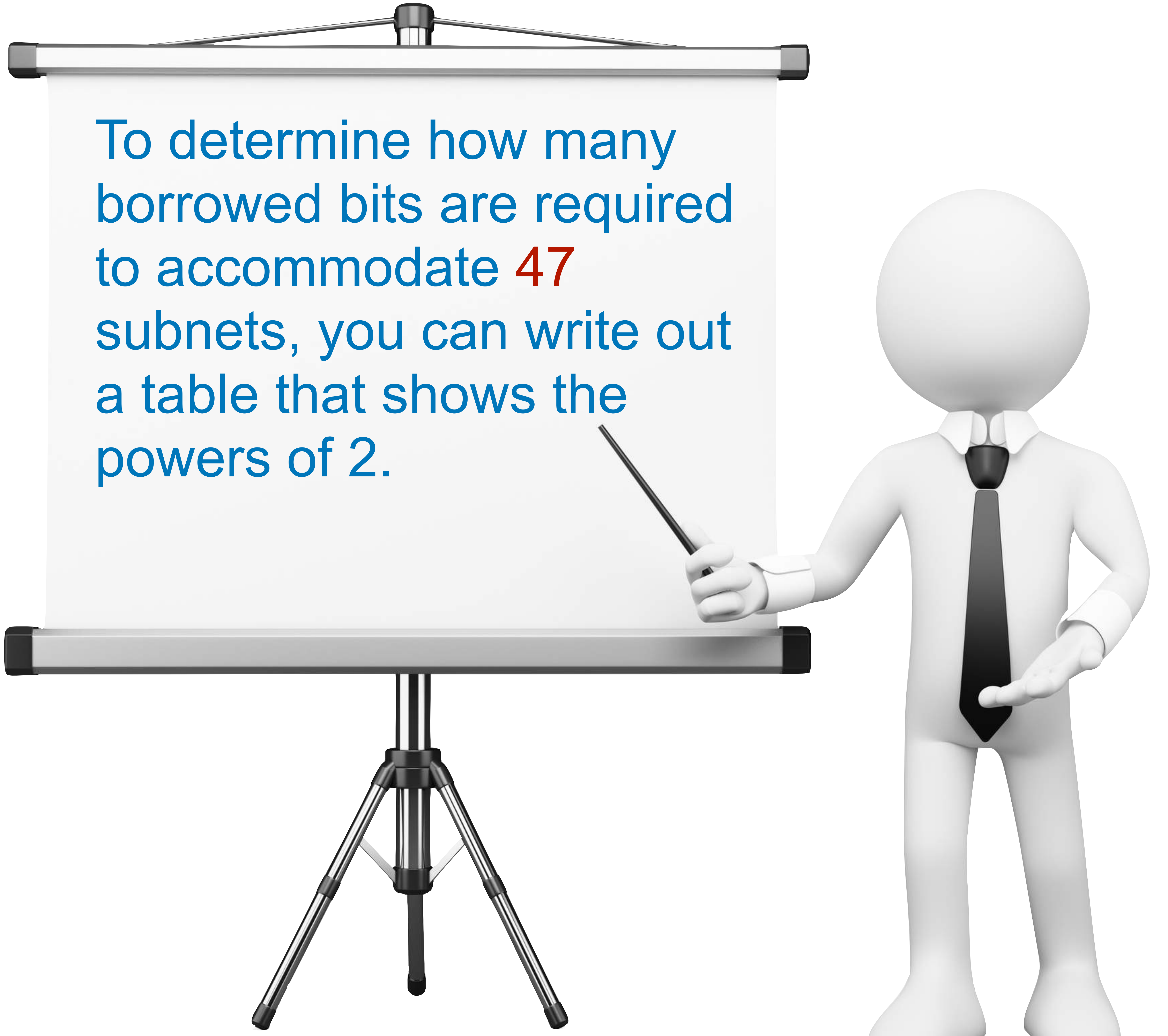
Subnet	Mask	Host Range
192.168.1.0	255.255.255.224	192.168.1.1 - 192.168.1.30
192.168.1.32	255.255.255.224	192.168.1.33 - 192.168.1.62
192.168.1.64	255.255.255.224	192.168.1.65 - 192.168.1.94
192.168.1.96	255.255.255.224	192.168.1.97 - 192.168.1.126
192.168.1.128	255.255.255.224	192.168.1.129 - 192.168.1.158
192.168.1.160	255.255.255.224	192.168.1.161 - 192.168.1.190
192.168.1.192	255.255.255.224	192.168.1.193 - 192.168.1.222
192.168.1.224	255.255.255.224	192.168.1.225 - 192.168.1.254

Practice Exercise #3



Practice Exercise #3

Borrowed Bits	Number of Subnets Created (2^s, where s is the number of borrowed bits)
0	1
1	2
2	4
3	8
4	16
5	32
6	64
7	128
8	256
9	512
10	1024
11	2048
12	4096

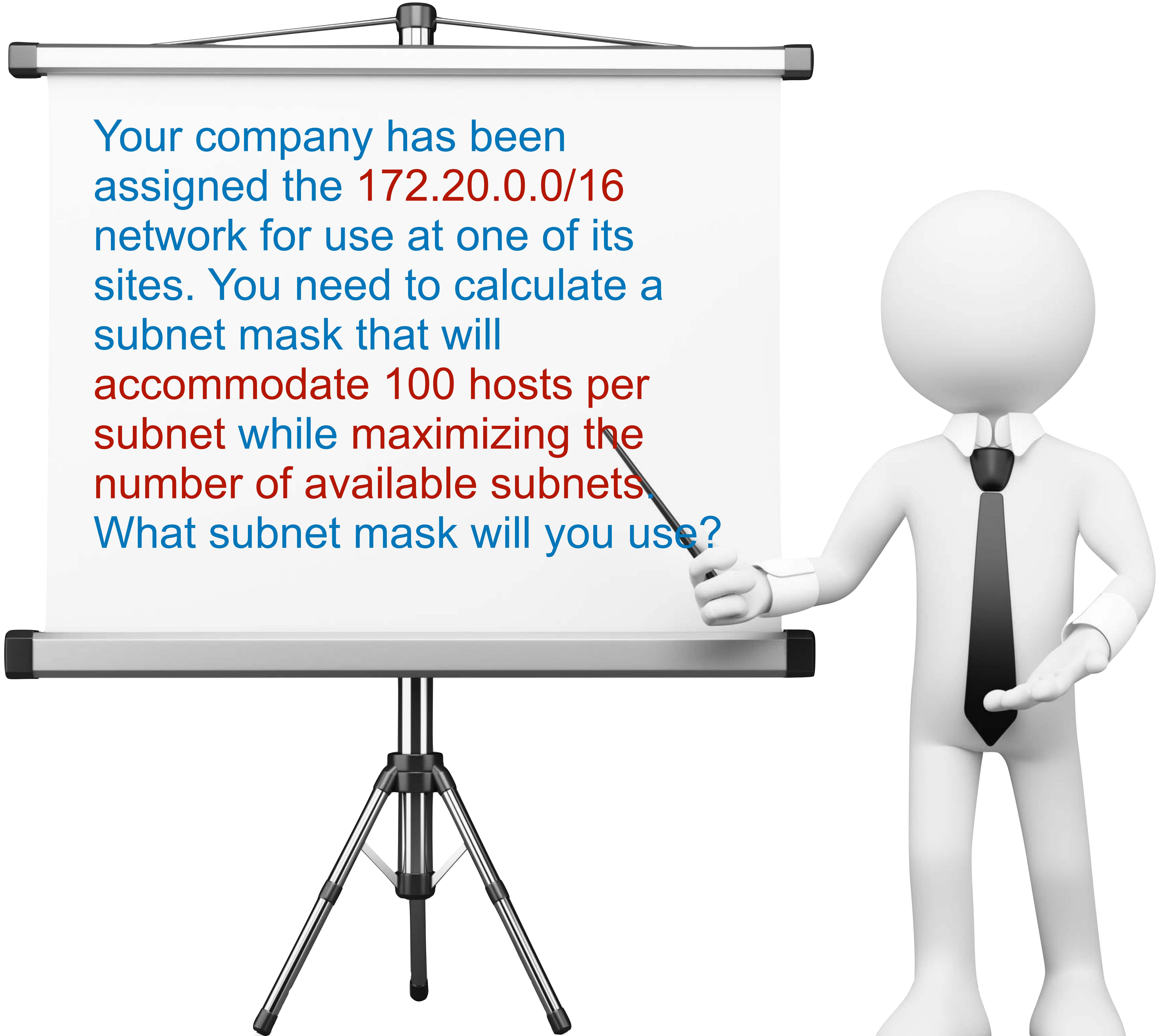


Practice Exercise #3

Borrowed Bits	Number of Subnets Created (2^s, where s is the number of borrowed bits)
0	1
1	2
2	4
3	8
4	16
5	32
6	64
7	128
8	256
9	512
10	1024
11	2048
12	4096

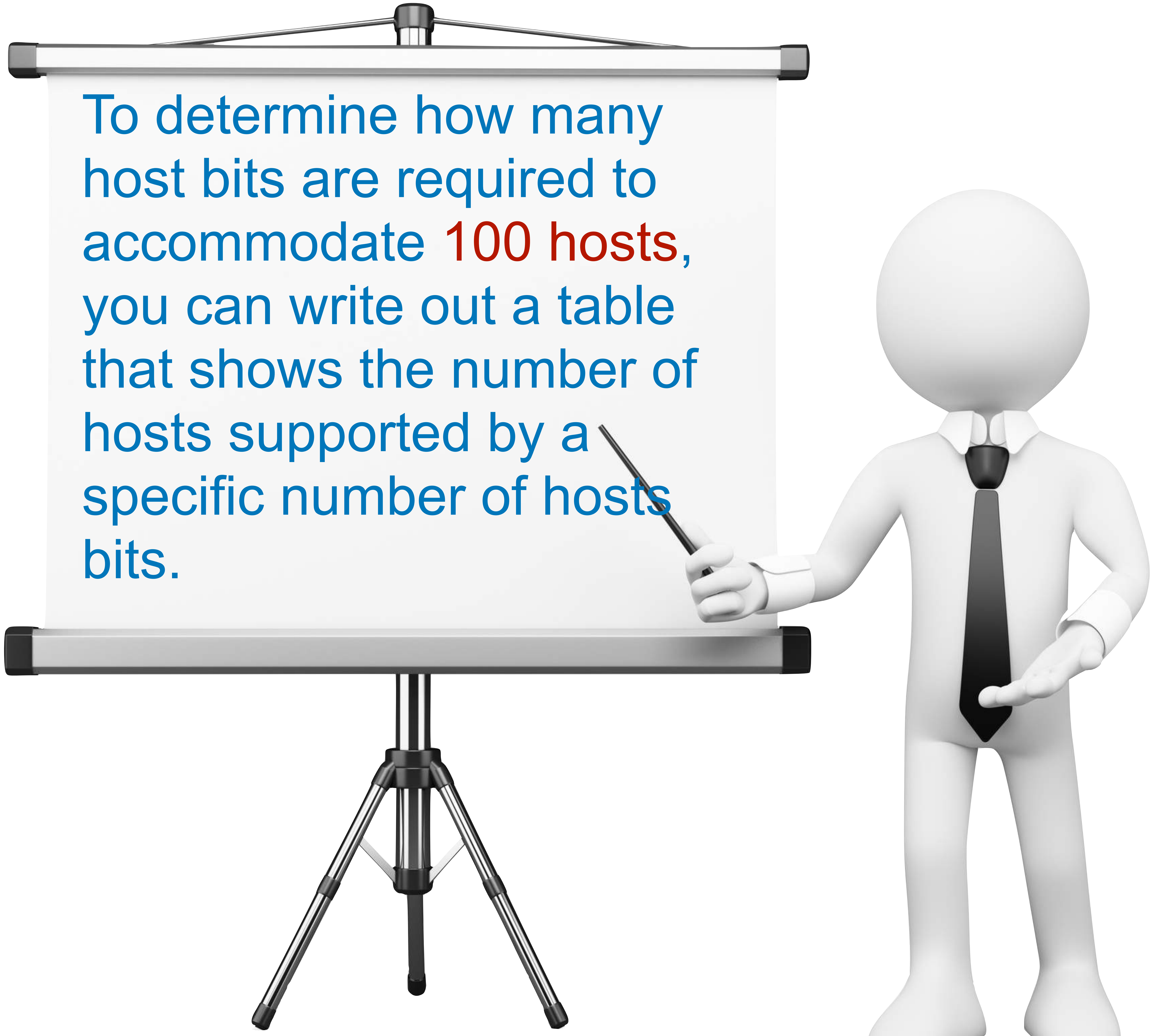
- You want to support 47 subnets.
- Five borrowed bits are not enough.
- Six borrowed bits are more than enough.
- Since five borrowed bits are not enough, you round up and use six borrowed bits.
- The first octet in the network address 172.20.0.0 has a value of 172, meaning that you are dealing with a Class B address. Since a Class B address has sixteen bits in its classful mask, you can add the six borrowed bits to the 16-bit classful mask, resulting in a 22-bit subnet mask.
- You can conclude that to meet the scenario's requirements, you should use a subnet mask of /22, which could also be written as 255.255.252.0.

Practice Exercise #4



Practice Exercise #4

Host Bits	Number of Supported Hosts ($2^h - 2$, where *h* is the number of host bits)
2	2
3	6
4	14
5	30
6	62
7	126
8	254
9	510
10	1022
11	2046
12	4094



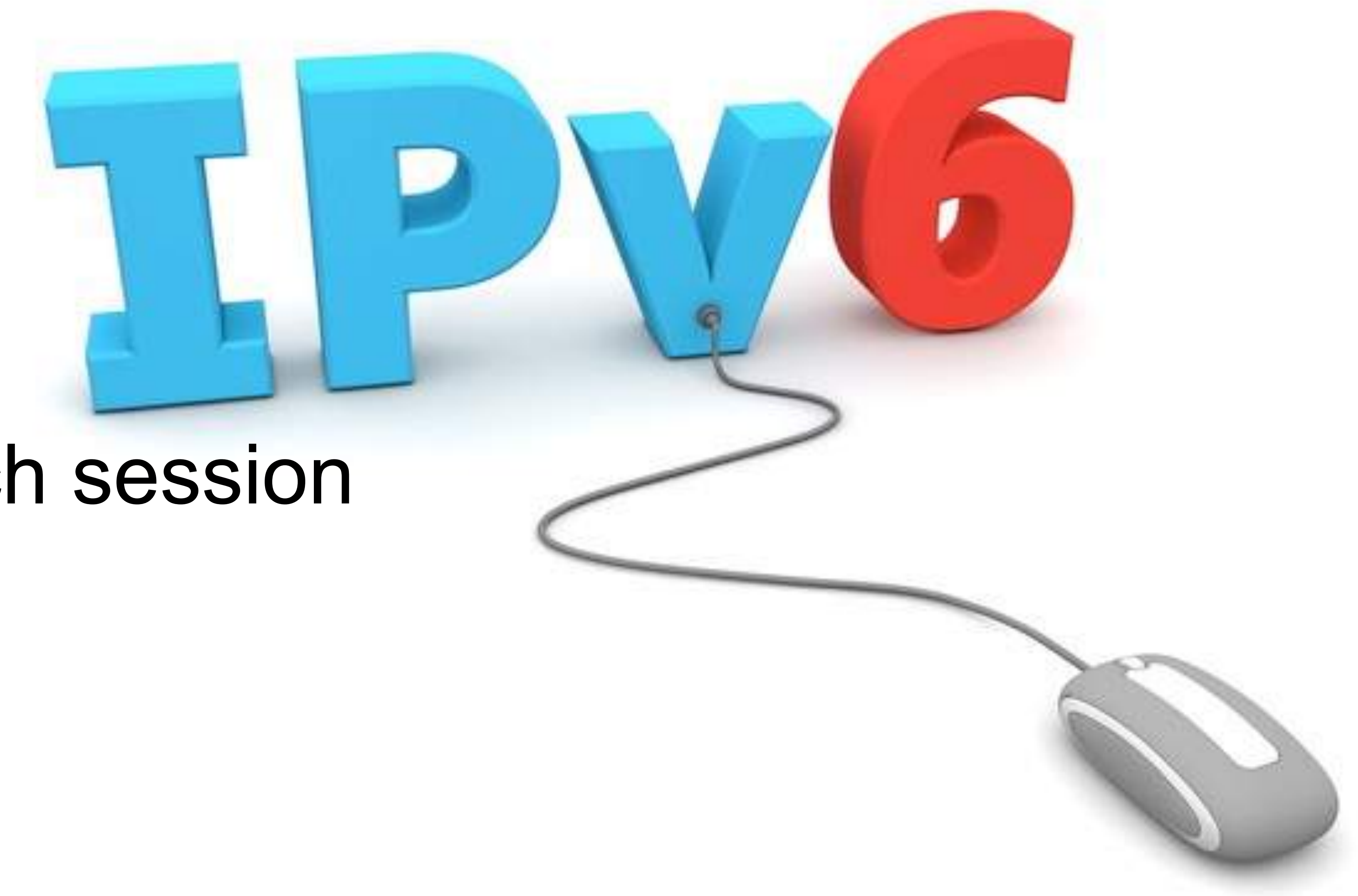
Practice Exercise #4

Host Bits	Number of Supported Hosts ($2^h - 2$, where *h* is the number of host bits)
2	2
3	6
4	14
5	30
6	62
7	126
8	254
9	510
10	1022
11	2046
12	4094

- You want to support 100 hosts.
- Six host bits are not enough.
- Seven host bits are more than enough.
- Since six host bits are not enough, you round up and use seven host bits.
- Since an IPv4 address has 32 bits, and you need seven host bits, you can calculate the number of subnet bits by subtracting the seven host bits from 32 (that is, the total number of bits in an IPv4 address). This results in a 25-bit subnet mask (that is, 32 total bits - 7 host bits = 25 subnet mask bits).
- Therefore, you can conclude that to meet the scenario's requirements, you should use a subnet mask of /25, which could also be written as 255.255.255.128.

Benefits of IPv6

- Increased address space: 5×10^{28} addresses for each person on the planet
- Simplified header
  - IPv4 Header: 12 Fields
  - IPv6 Header: 8 Fields
- No broadcasts
- Security and mobility features built-in
- No fragmentation: MTU discovery is performed for each session
- Can coexist with IPv4 during a migration
  - Dual stack
  - IPv6 over IPv4



IPv6 Address Structure

- IPv6 address structure
- XXXX.XXXX.XXXX.XXXX.XXXX.XXXX.XXXX.XXXX
  (Where X is a hexadecimal number in the range 0 – F)
- 32 hexadecimal digits X 4 bits per digit = 128 bits
- Example: 200A:0123:4040:0000:0000:0000:000A:000B

IPv6 Address Abbreviation Rules

- Leading zeros in a field can be omitted.
- Contiguous fields containing all zeros can be represented with a double colon. (**NOTE**: This can only be done once for a single IPv6 address.)

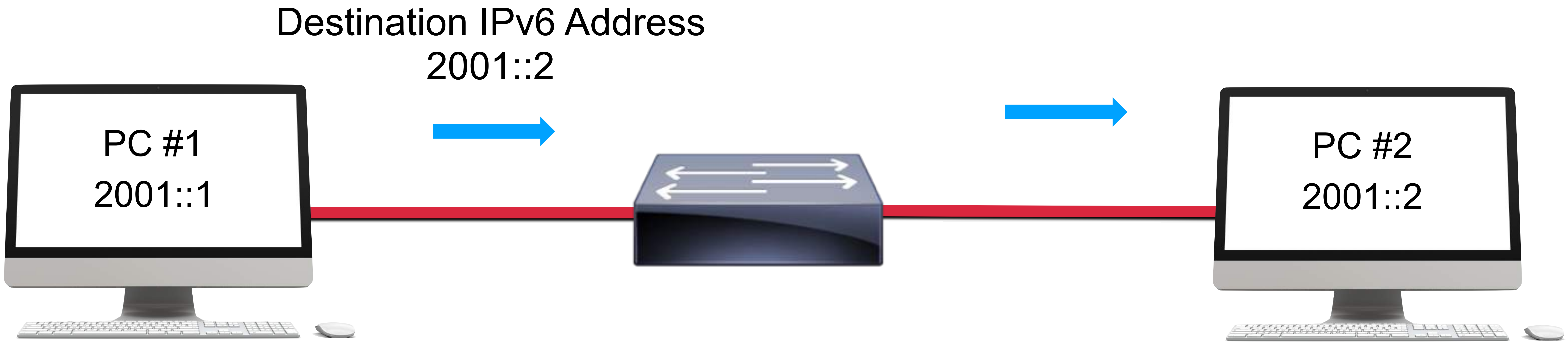
Example

- **Full Address**: 2345:0123:4040:0000:0000:0000:000A:000B
- **Abbreviated Address**: 2345:123:4040::A:B

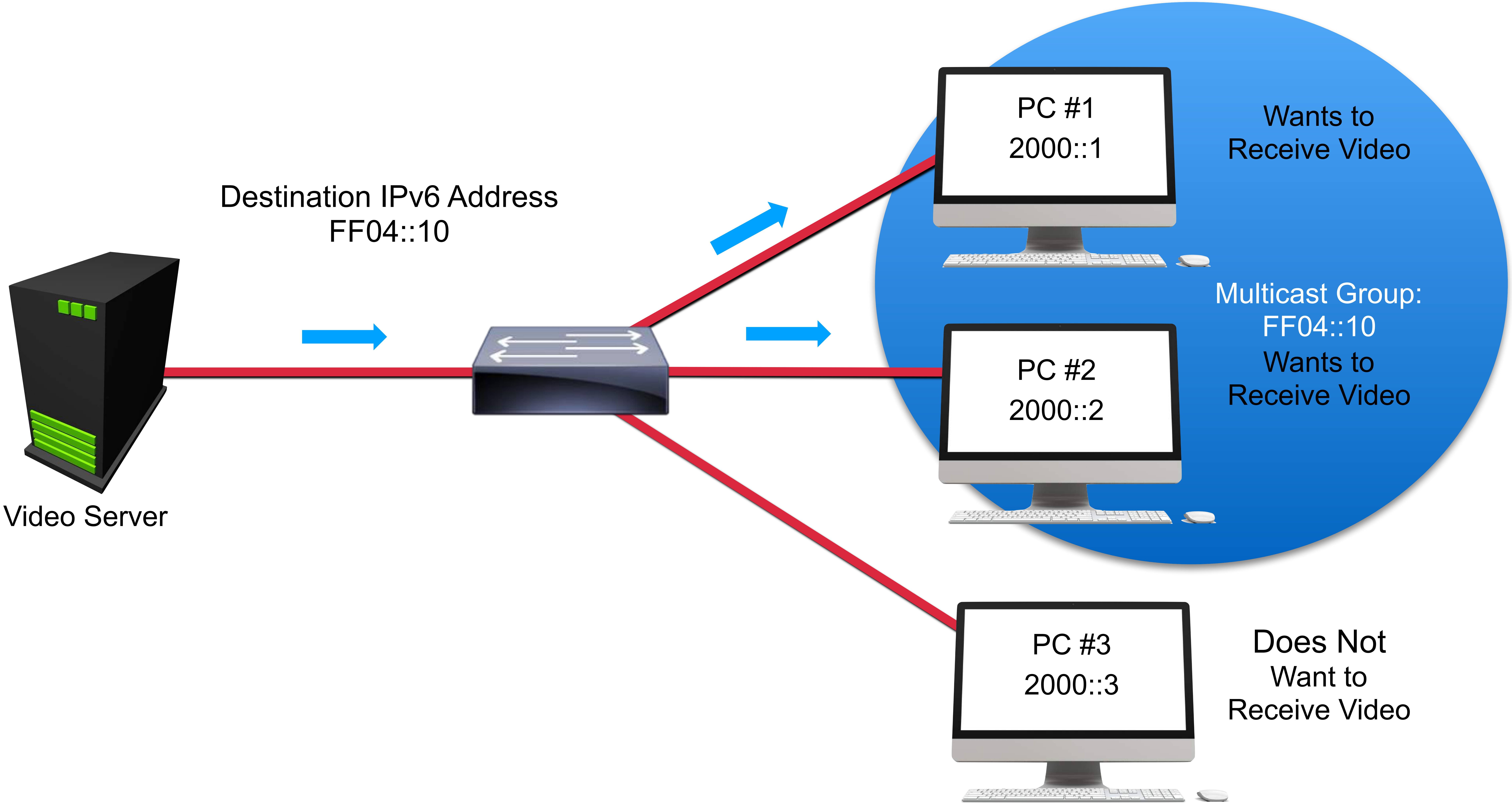
Class Exercise: Abbreviate the IPv6 Address

2000:0000:0000:0000:1234:0000:0000:000B

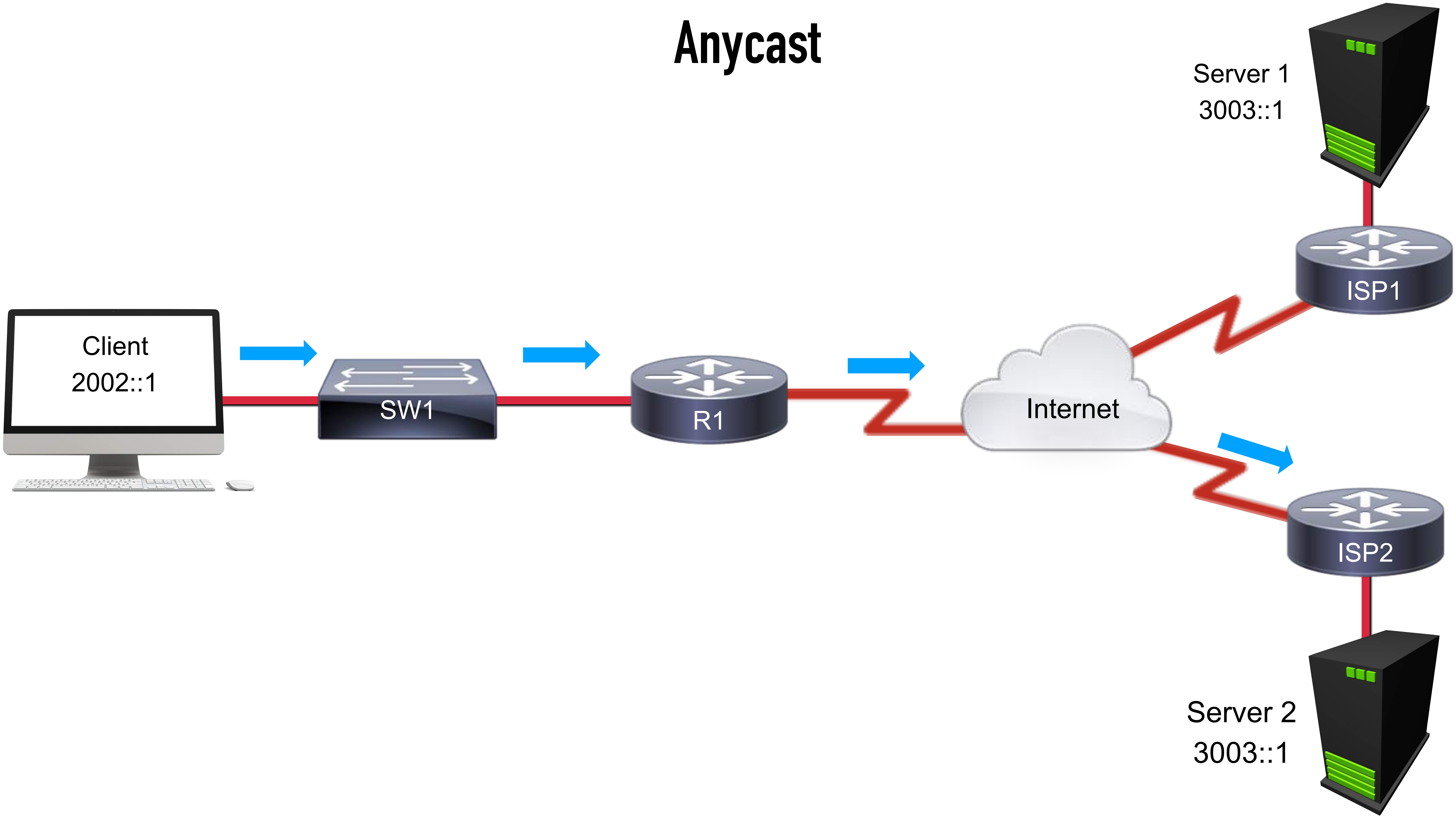
Unicast



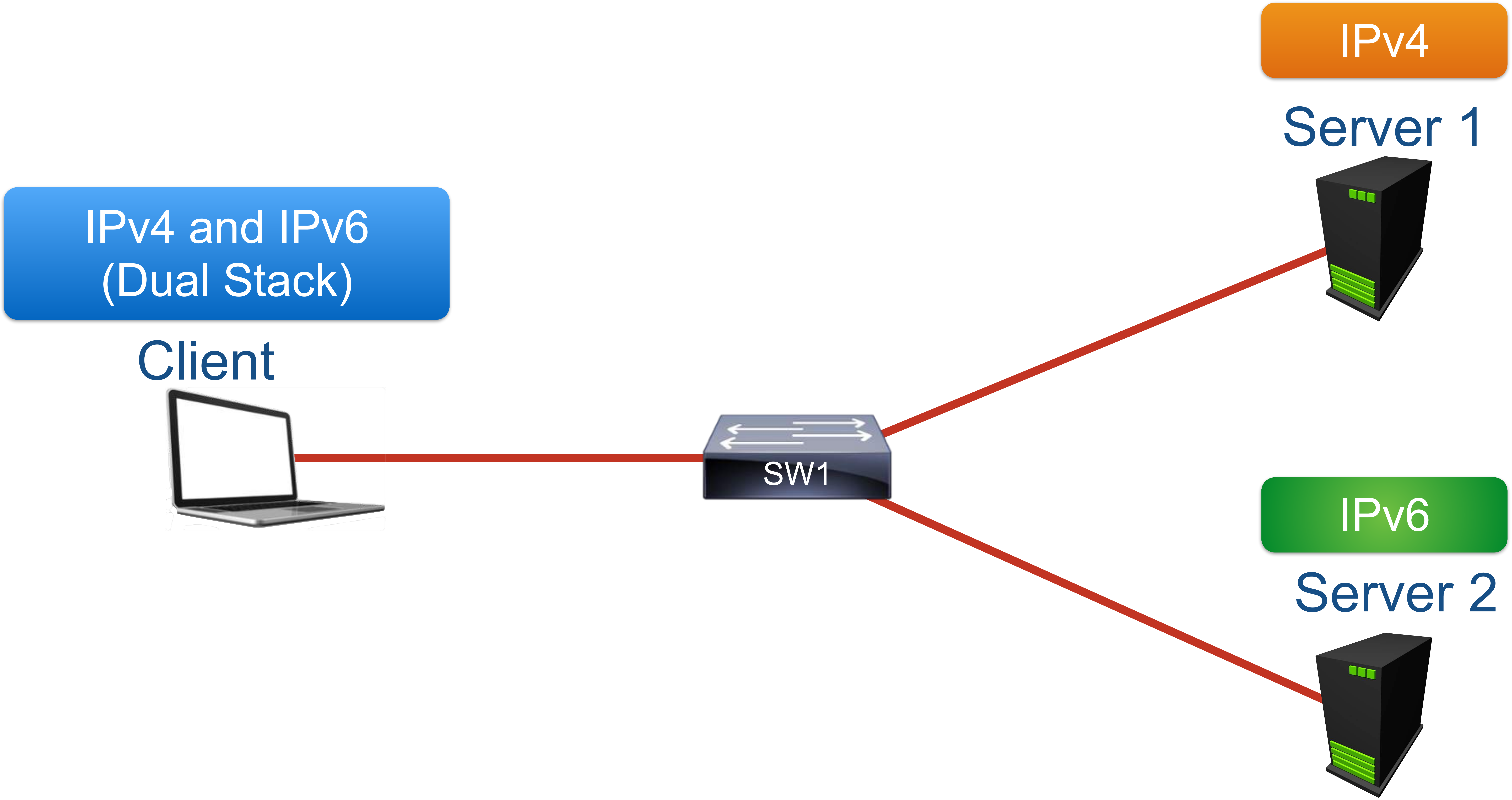
Multicast


PC #1
2000::1
Wants to
Receive Video
Destination IPv6 Address
FF04::10
Multicast Group:
FF04::10
PC #2
2000::2
Wants to
Receive Video
Video Server
PC #3
2000::3
Does Not
Want to
Receive Video

Anycast


Server 1
3003::1
ISP1
Client
2002::1
SW1
R1
Internet
ISP2
Server 2
3003::1

Dual Stack


IPv4
Server 1
IPv4 and IPv6
(Dual Stack)
Client
SW1
IPv6
Server 2

Tunneling IPv6 Through an IPv4 Network

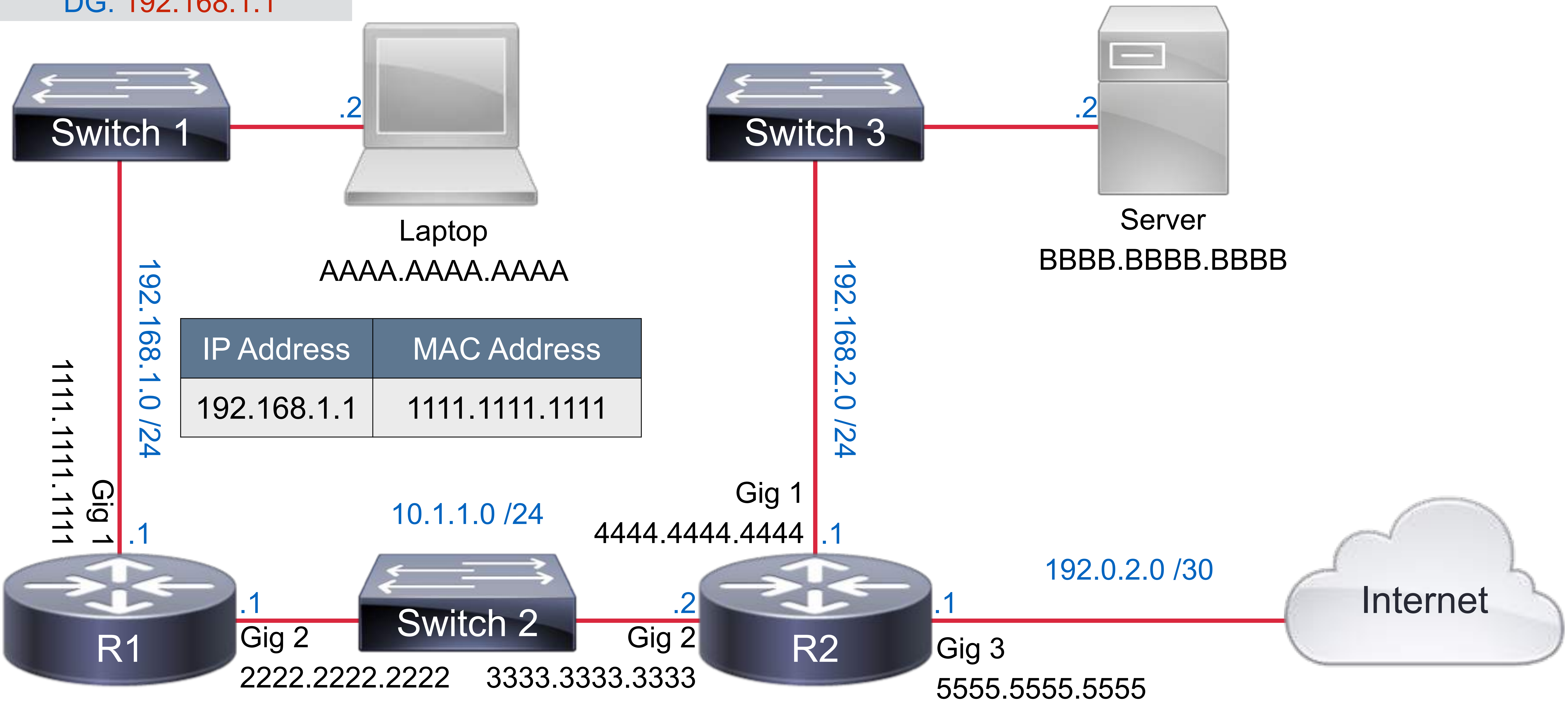
Only needed during a network's migration to IPv6

Module 9
Network Addressing

Module 10
Routing

Routing Packets

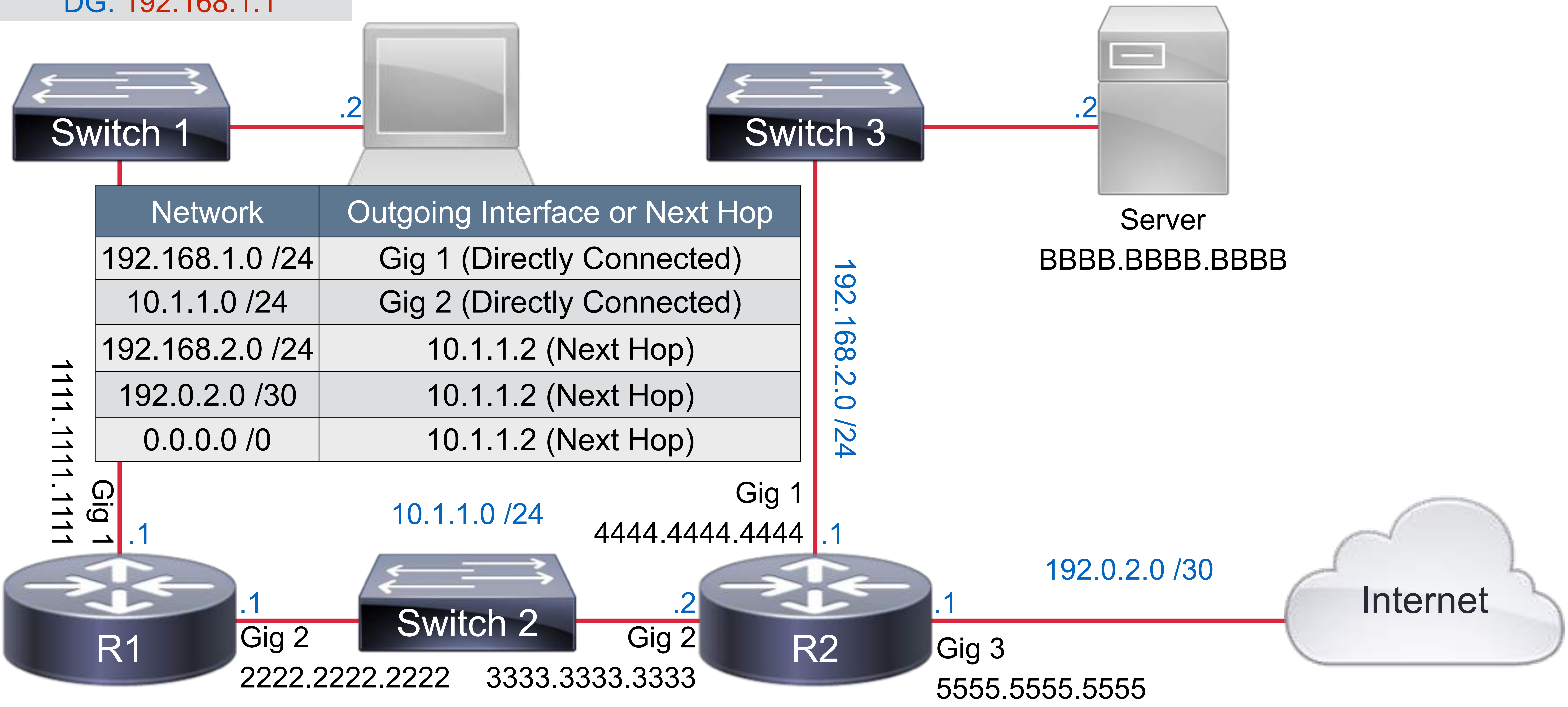
Source IP: 192.168.1.2
Destination IP: 192.168.2.2
DG: 192.168.1.1



IP Address	MAC Address
192.168.1.1	1111.1111.1111

Routing Packets

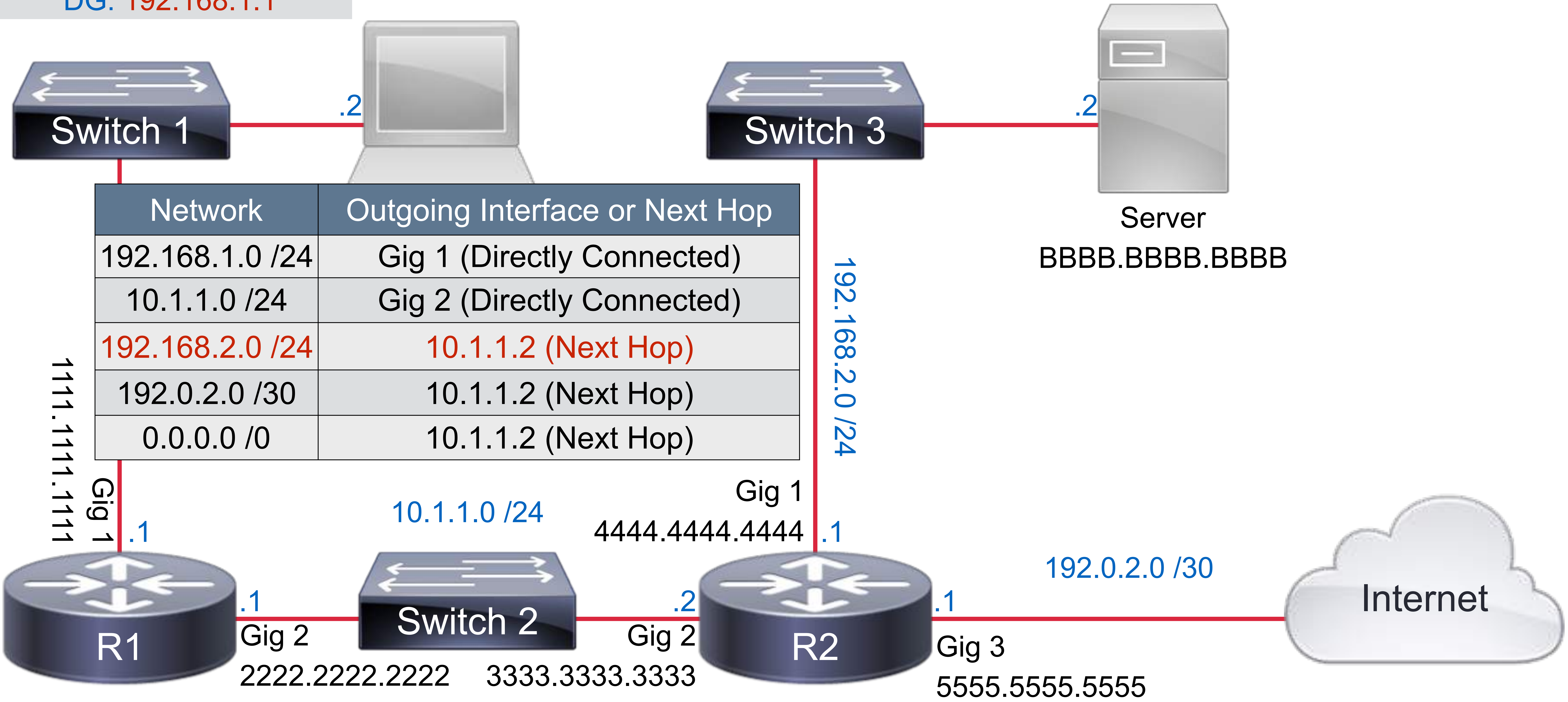
Source IP: 192.168.1.2
Destination IP: 192.168.2.2
DG: 192.168.1.1



Network	Outgoing Interface or Next Hop
192.168.1.0 /24	Gig 1 (Directly Connected)
10.1.1.0 /24	Gig 2 (Directly Connected)
192.168.2.0 /24	10.1.1.2 (Next Hop)
192.0.2.0 /30	10.1.1.2 (Next Hop)
0.0.0.0 /0	10.1.1.2 (Next Hop)

Routing Packets

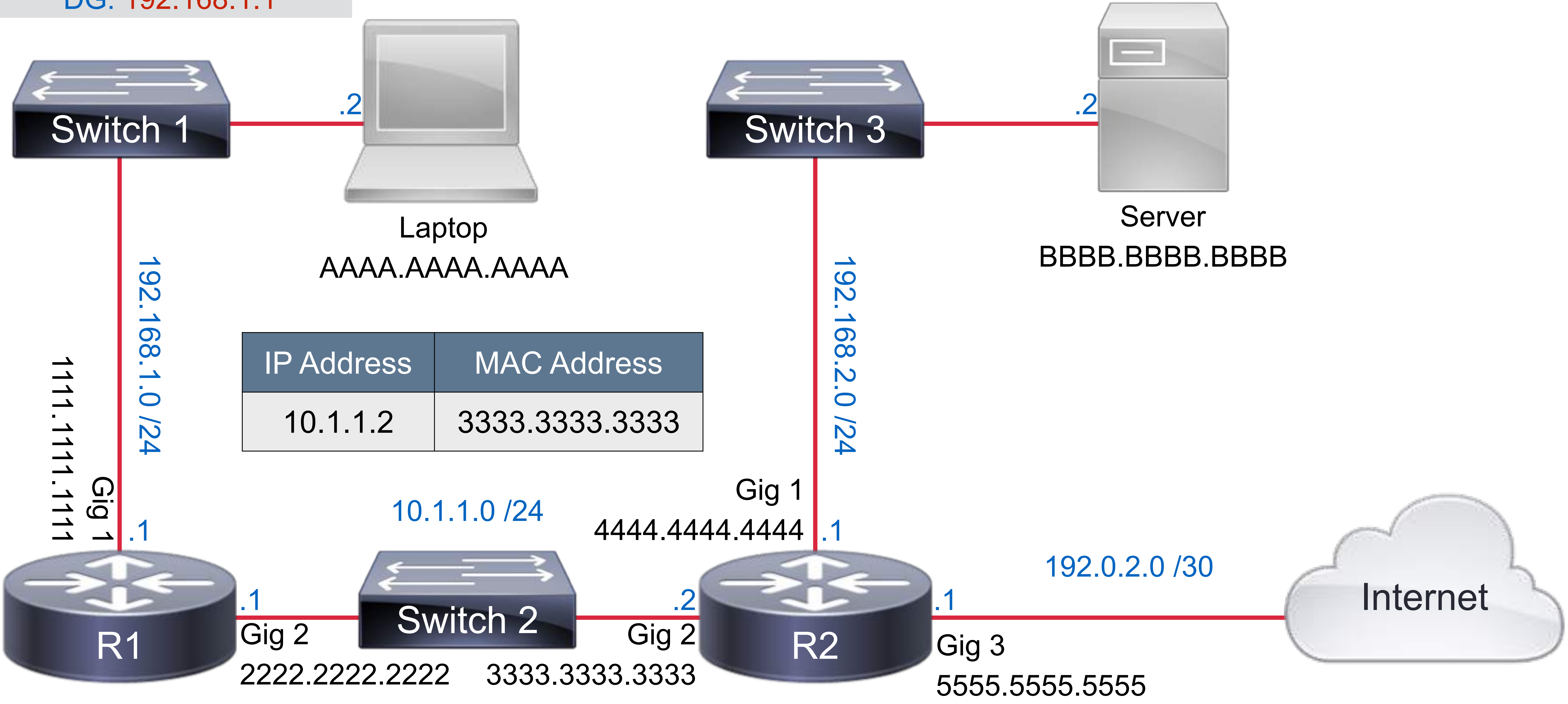
Source IP: 192.168.1.2
Destination IP: 192.168.2.2
DG: 192.168.1.1



Network	Outgoing Interface or Next Hop
192.168.1.0 /24	Gig 1 (Directly Connected)
10.1.1.0 /24	Gig 2 (Directly Connected)
192.168.2.0 /24	10.1.1.2 (Next Hop)
192.0.2.0 /30	10.1.1.2 (Next Hop)
0.0.0.0 /0	10.1.1.2 (Next Hop)

Routing Packets

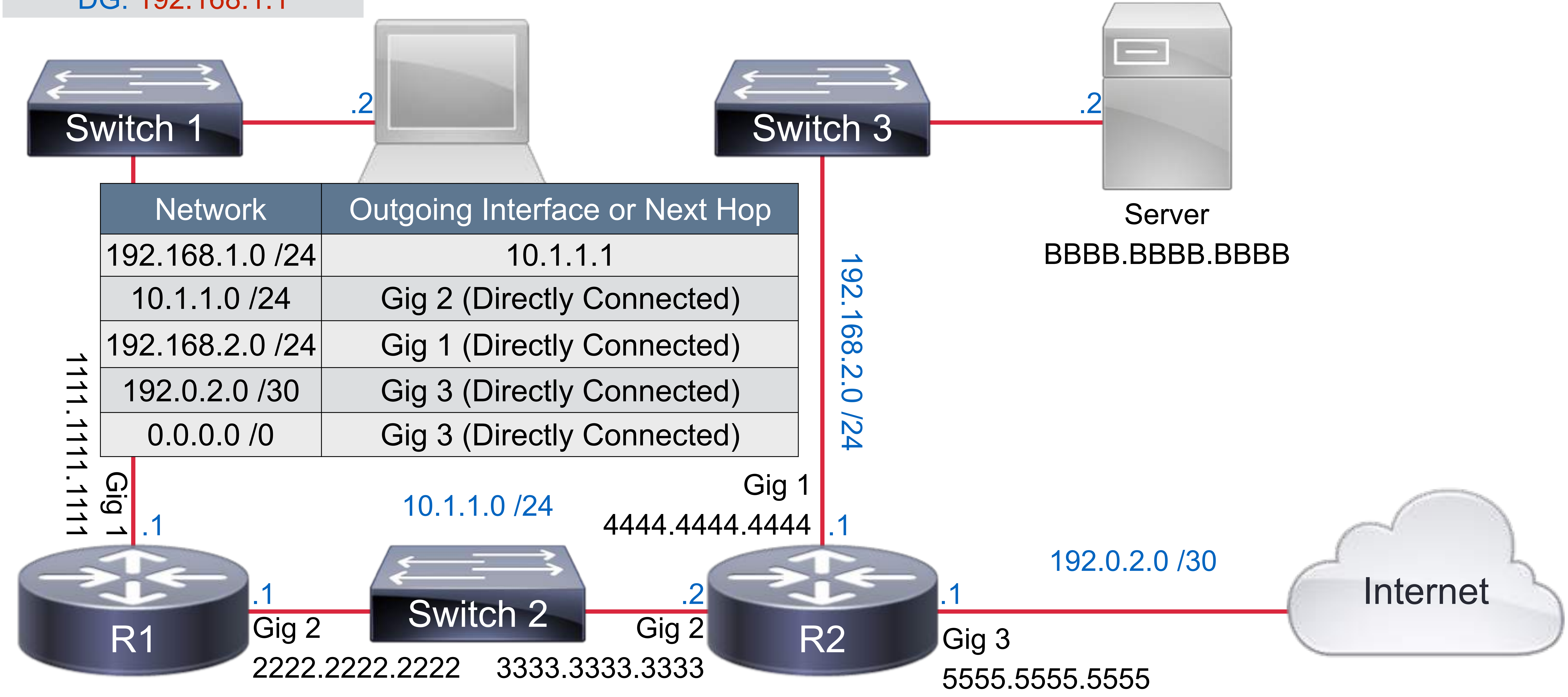
Source IP: 192.168.1.2
Destination IP: 192.168.2.2
DG: 192.168.1.1



IP Address	MAC Address
10.1.1.2	3333.3333.3333

Routing Packets

Source IP: 192.168.1.2
Destination IP: 192.168.2.2
DG: 192.168.1.1

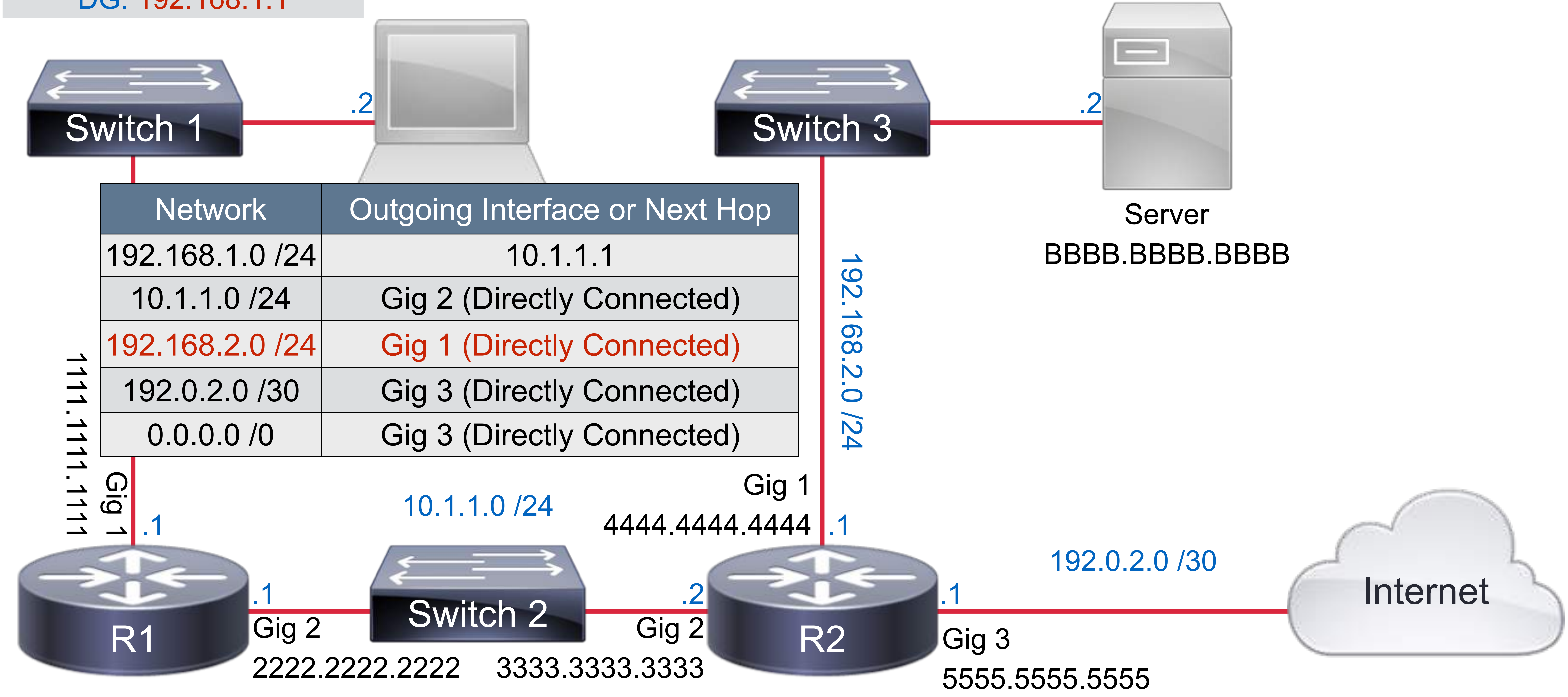


Network	Outgoing Interface or Next Hop
192.168.1.0 /24	10.1.1.1
10.1.1.0 /24	Gig 2 (Directly Connected)
192.168.2.0 /24	Gig 1 (Directly Connected)
192.0.2.0 /30	Gig 3 (Directly Connected)
0.0.0.0 /0	Gig 3 (Directly Connected)

Routing Packets

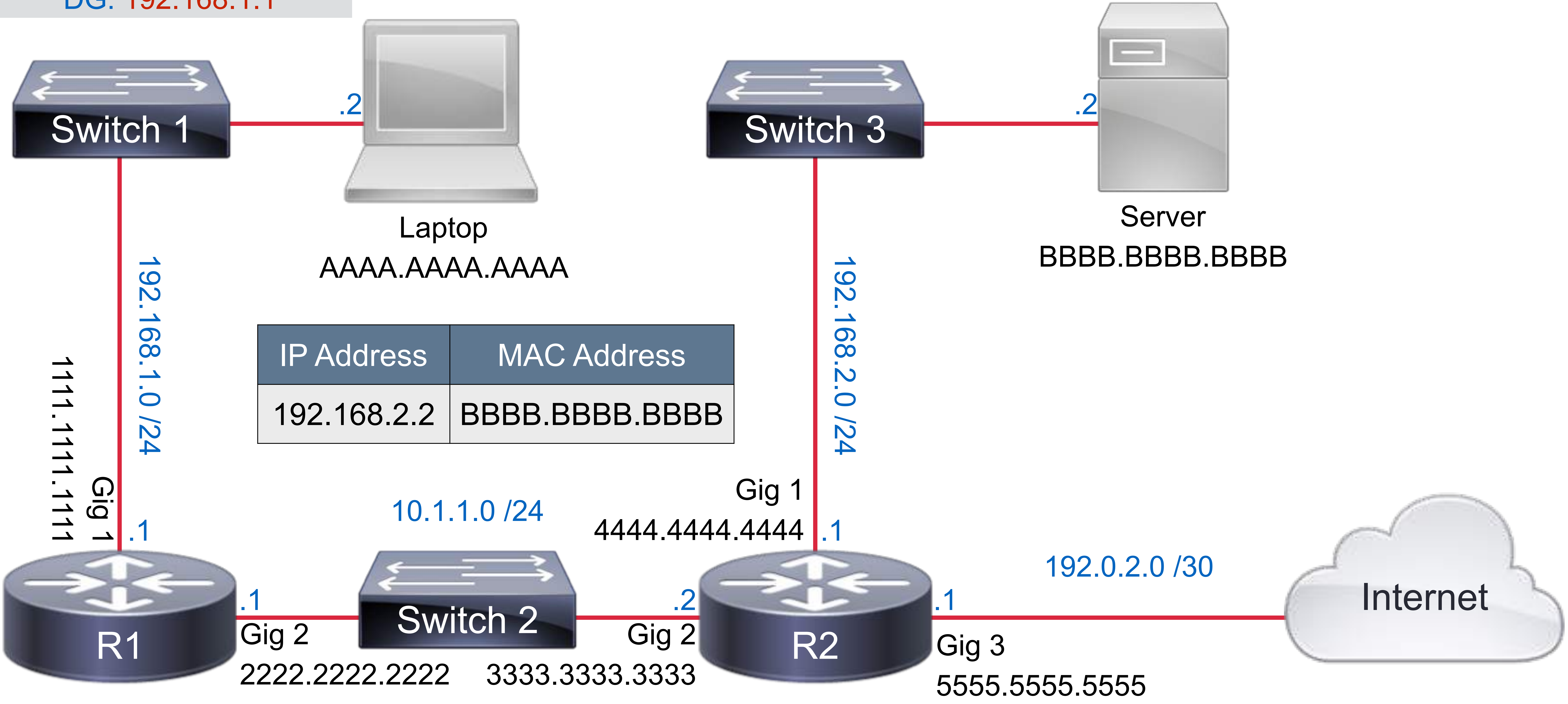
Source IP: 192.168.1.2
Destination IP: 192.168.2.2
DG: 192.168.1.1

Network	Outgoing Interface or Next Hop
192.168.1.0 /24	10.1.1.1
10.1.1.0 /24	Gig 2 (Directly Connected)
192.168.2.0 /24	Gig 1 (Directly Connected)
192.0.2.0 /30	Gig 3 (Directly Connected)
0.0.0.0 /0	Gig 3 (Directly Connected)



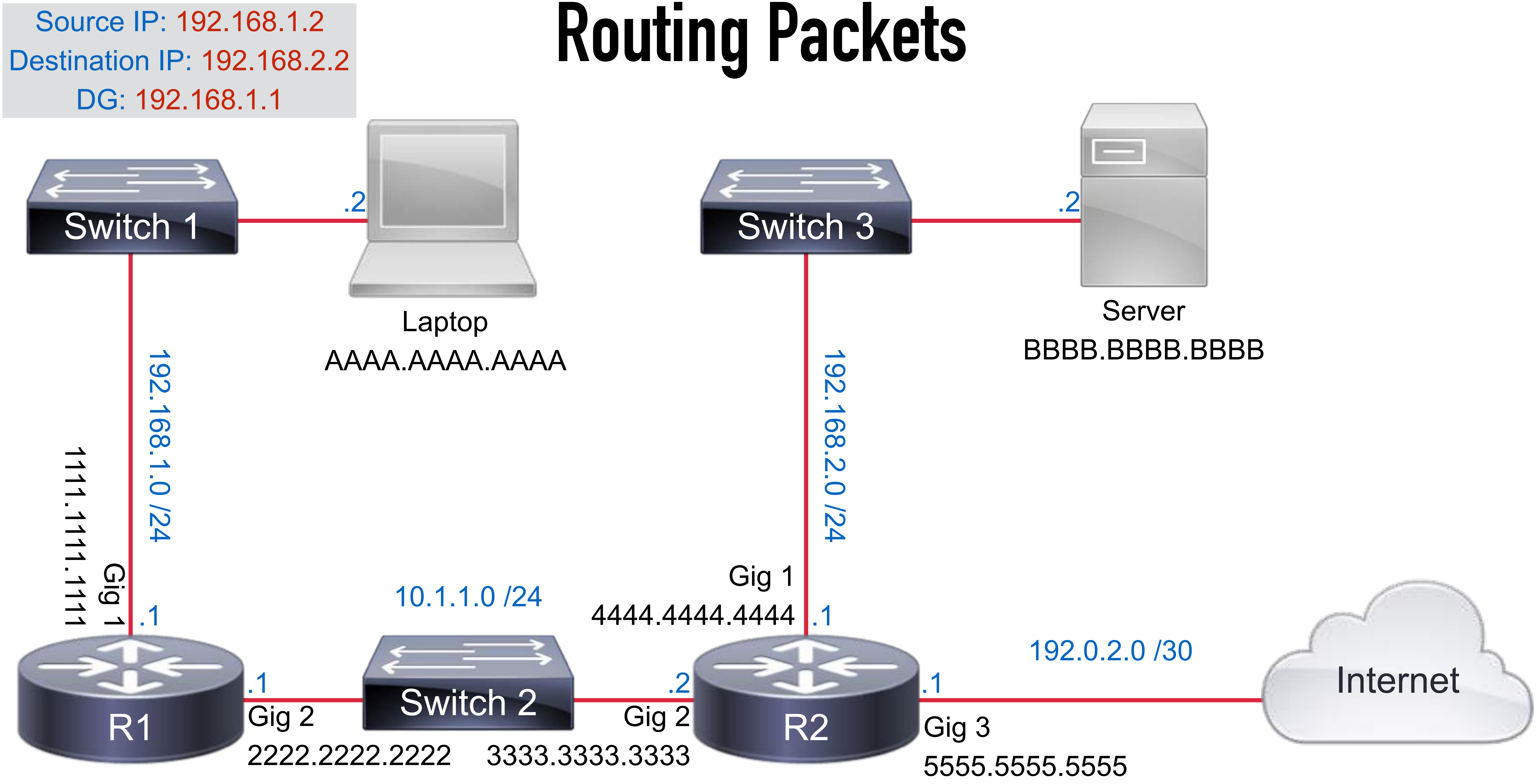
Routing Packets

Source IP: 192.168.1.2
Destination IP: 192.168.2.2
DG: 192.168.1.1

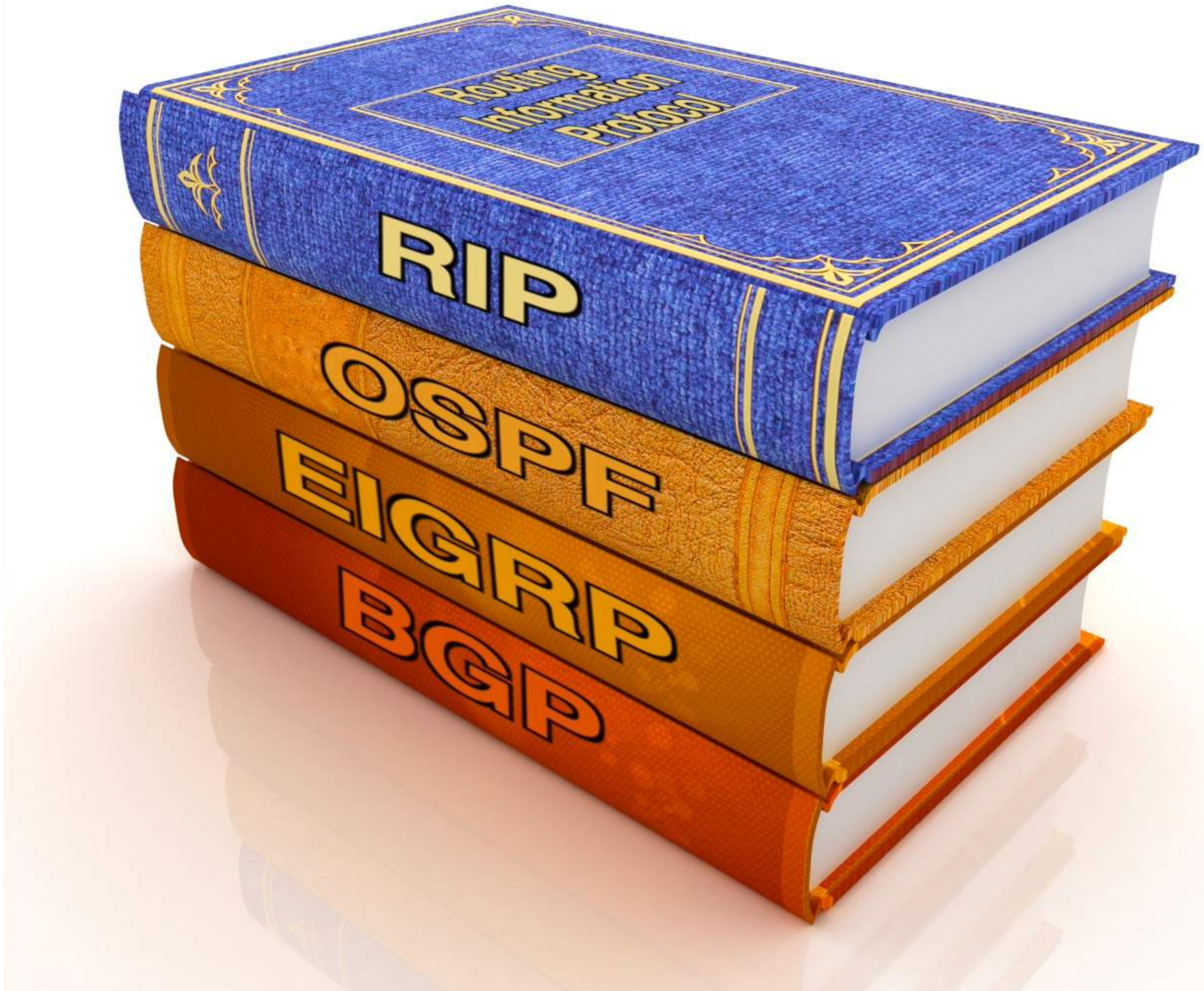


IP Address	MAC Address
192.168.2.2	BBBB.BBBB.BBBB

Routing Packets

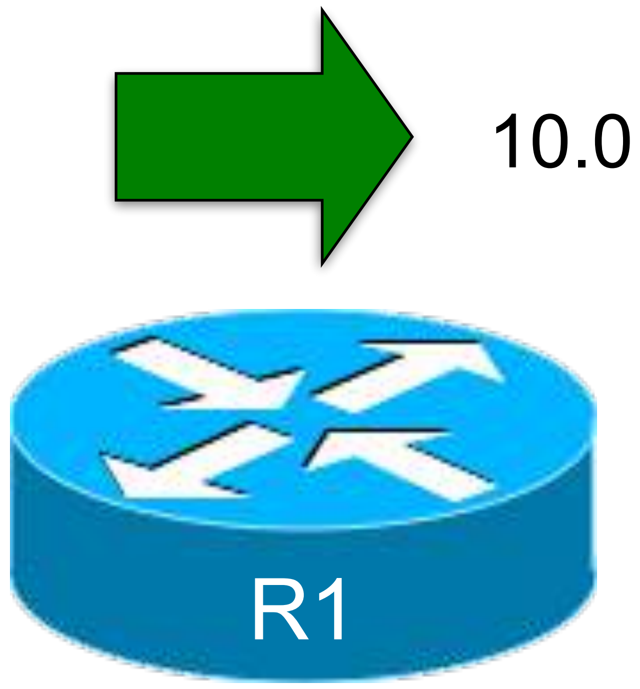


Selecting a Routing Protocol



Summarization

10.0.0.0 /24
10.0.1.0 /24
10.0.2.0 /24
10.0.3.0 /24



10.0.0.0 /22

3rd Octet

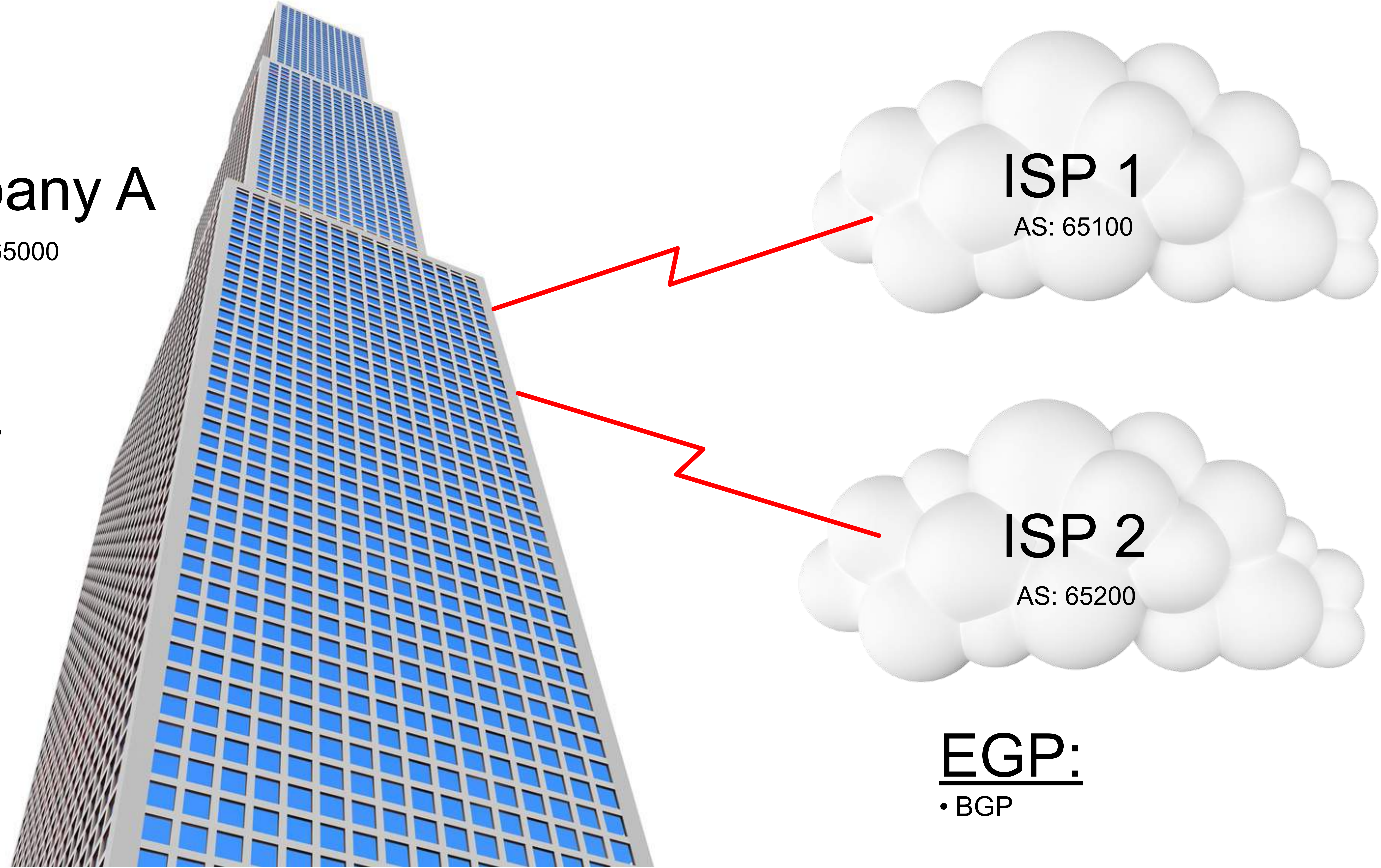
3rd Octet Value	128	64	32	16	8	4	2	1
0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	1
2	0	0	0	0	0	0	1	0
3	0	0	0	0	0	0	1	1

6 Bits in Common in the 3rd Octet

IGPs vs. EGPs

Company A

AS: 65000



IGPs:

- RIP
- OSPF
- EIGRP

EGP:

- BGP

Protocol Classification

Routing Protocol	Distance-Vector	Link-State	Path-Vector
RIP	✓		
OSPF		✓	
EIGRP	✓		
BGP			✓

RIP Characteristics

- Hop Count
- Full & Triggered Updates
- Split Horizon
- Poison Reverse

RIPv1

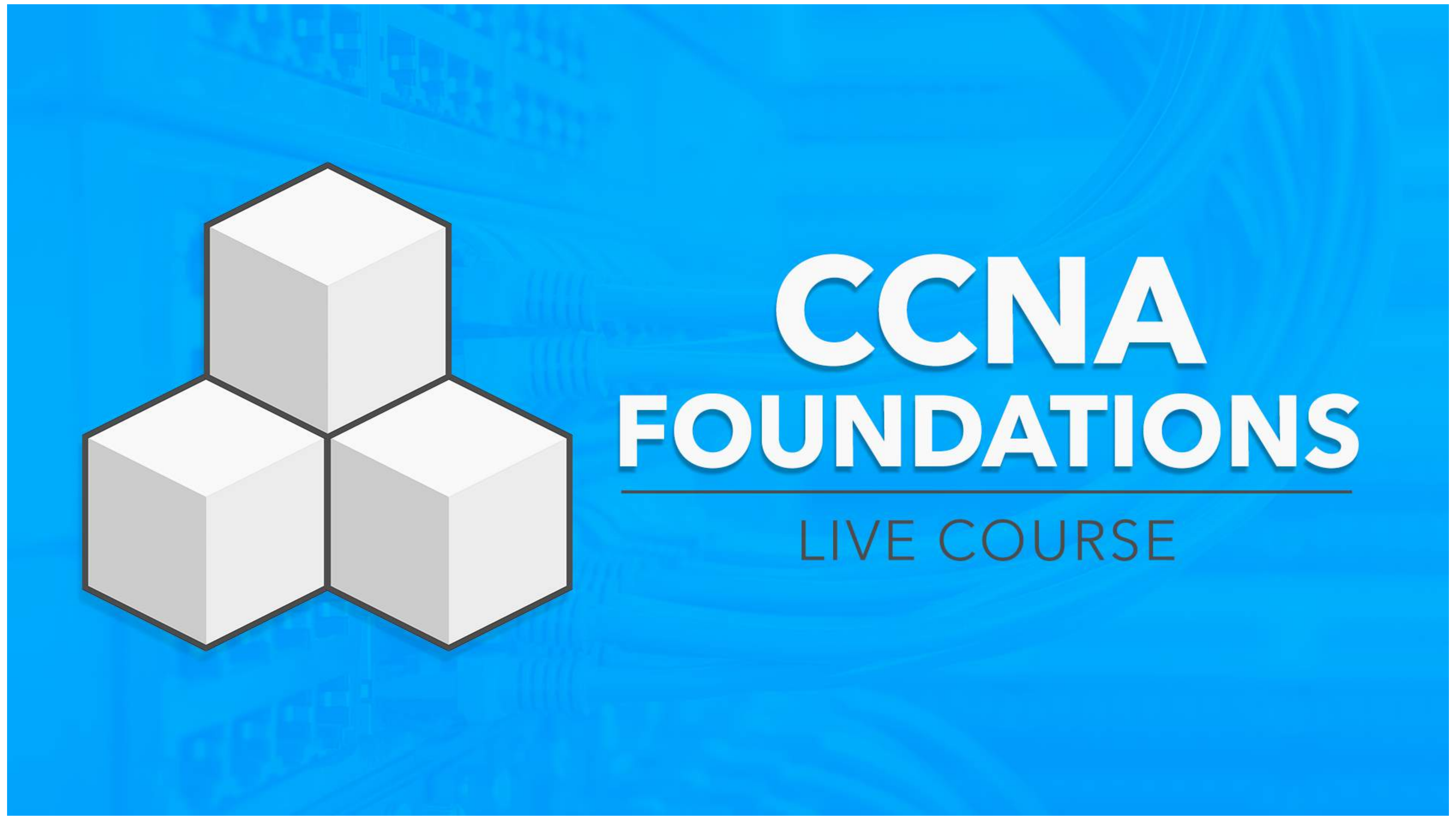
- Broadcasts
- No VLSM Support
- IPv4

RIPv2

- Multicasts (224.0.0.9)
- VLSM Support
- IPv4

RIPng

- Multicasts (FF02::9)
- IPv6



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