Ethernet and Switching

Ross Bagurdes
NETWORK ENGINEER

@bagurdes

Module Goals

CSMA/CD

Collision Domains

Duplex and Speed

The Ethernet Frame

Switch Operation

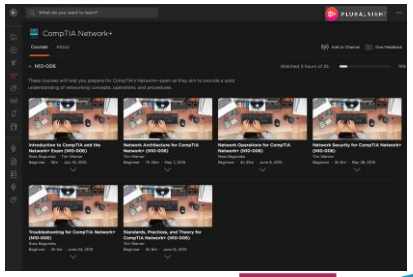
OSI Model

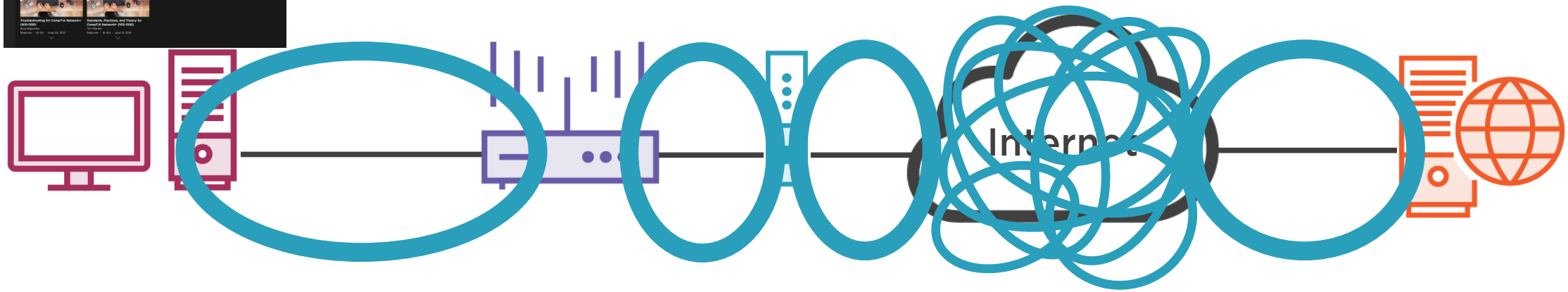
1.3

7	Application Layer
6	Presentation Layer
5	Session Layer
4	Transport Layer
3	Network Layer
2	Data Link Layer
1	Physical Layer

1.3

https://www.pluralsight.com/

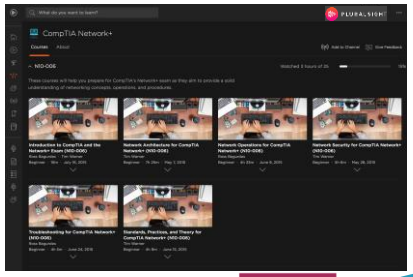


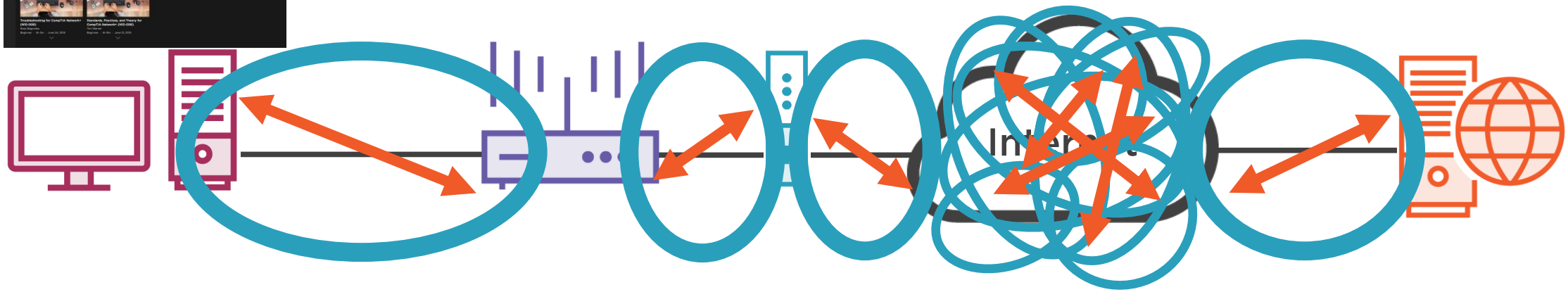


Data Link Layer

1.3

https://www.pluralsight.com/

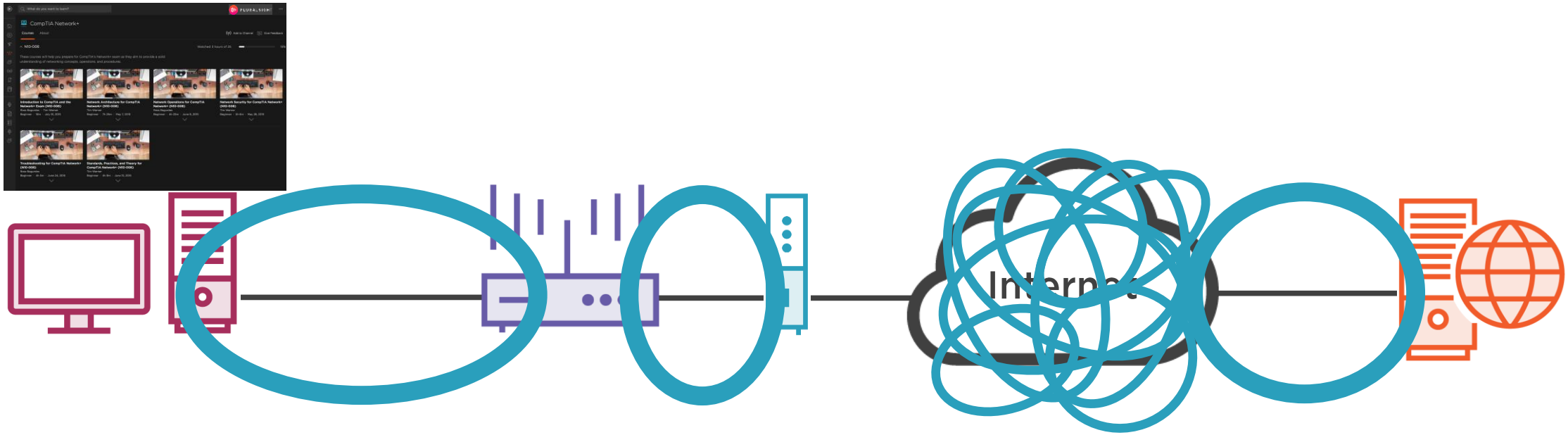




Data Link Layer

1.3

https://www.pluralsight.com/

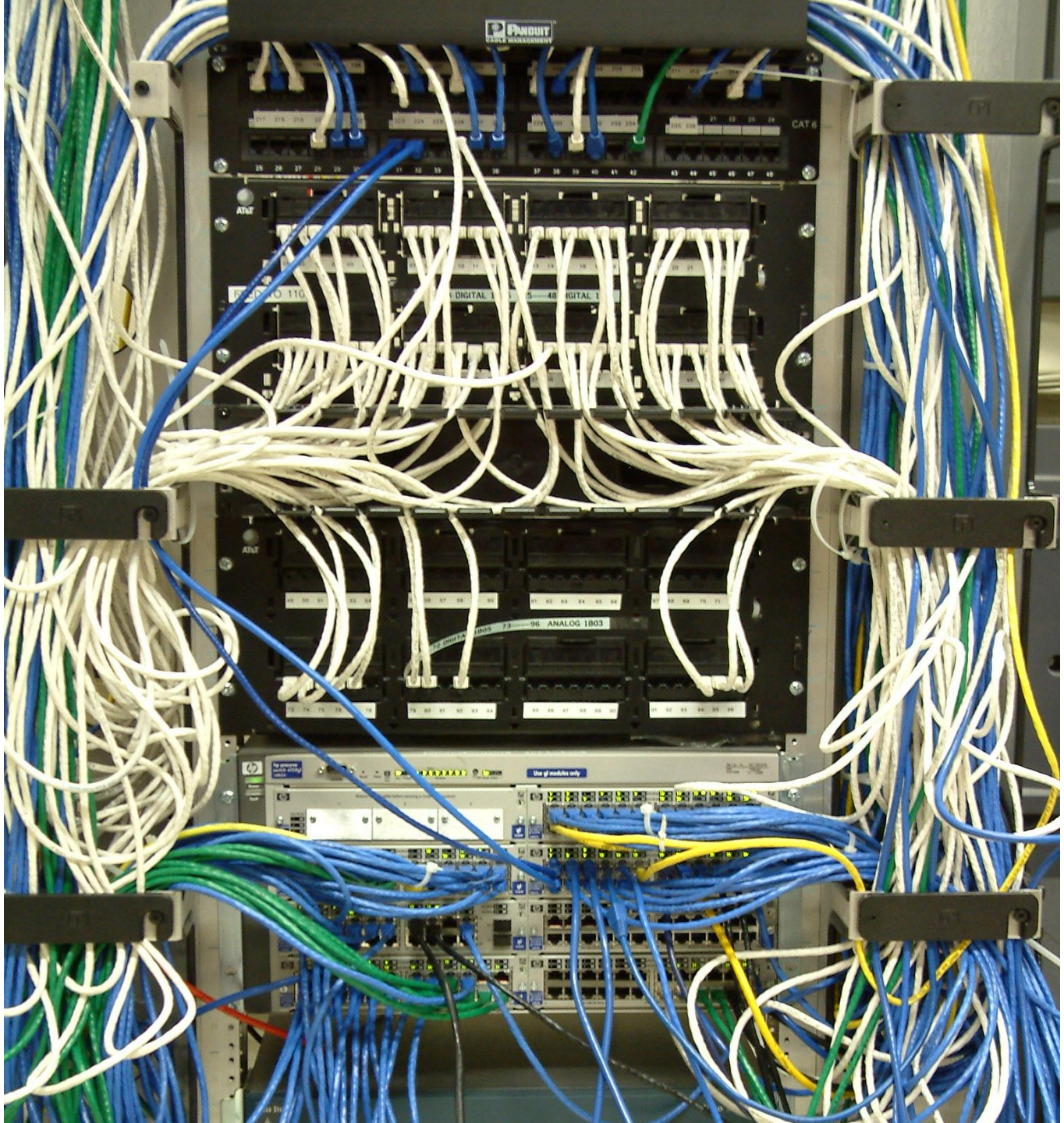


Ethernet

1.3


1.3

1.3



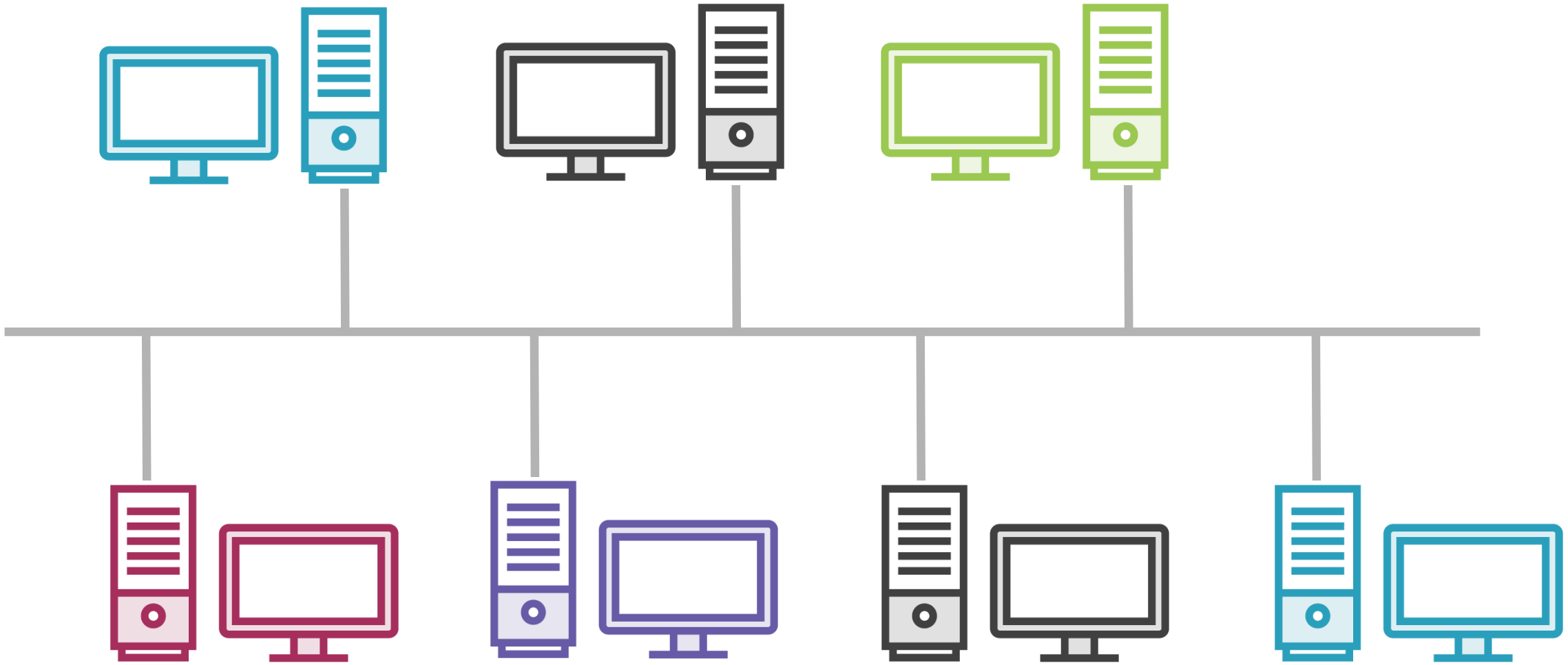
1.3

1.3

CSMA/CD

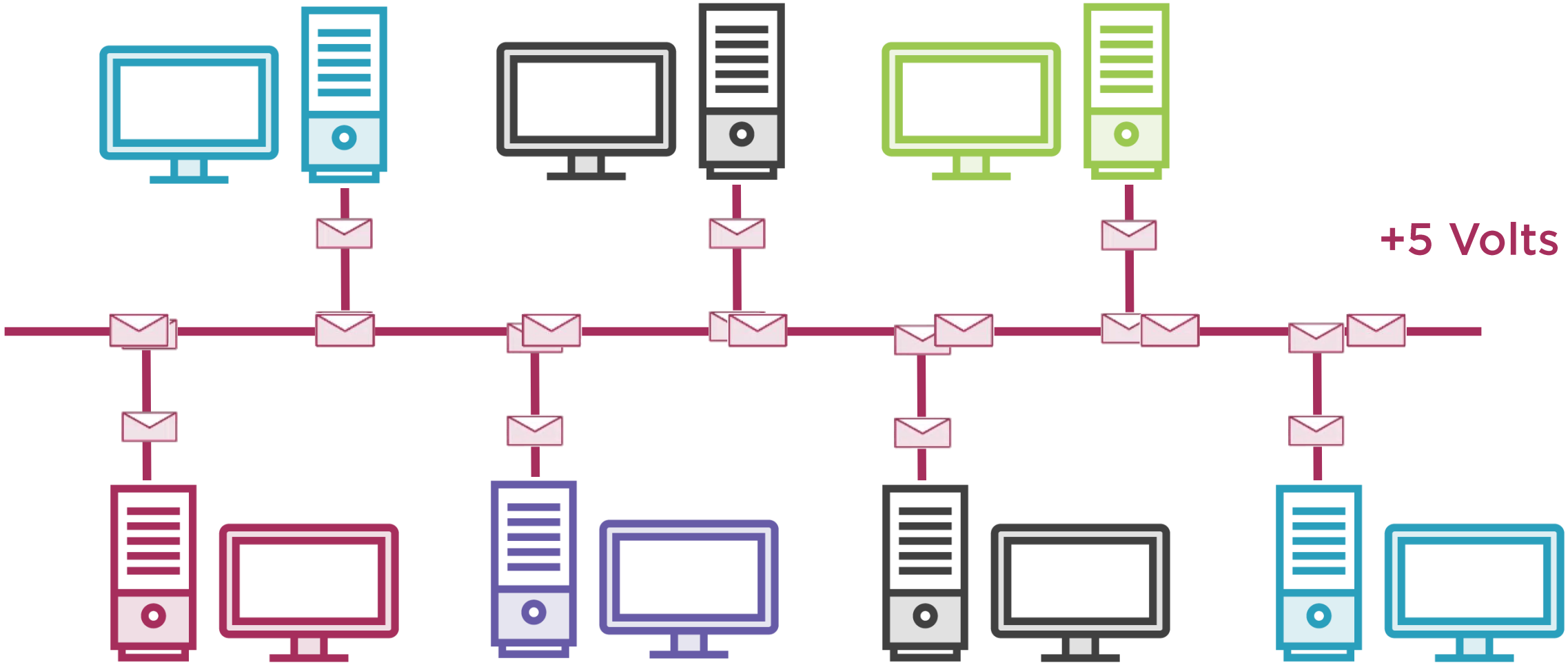
CSMA/CD
Carrier Sense Multiple Access with Collision Detection

1.3



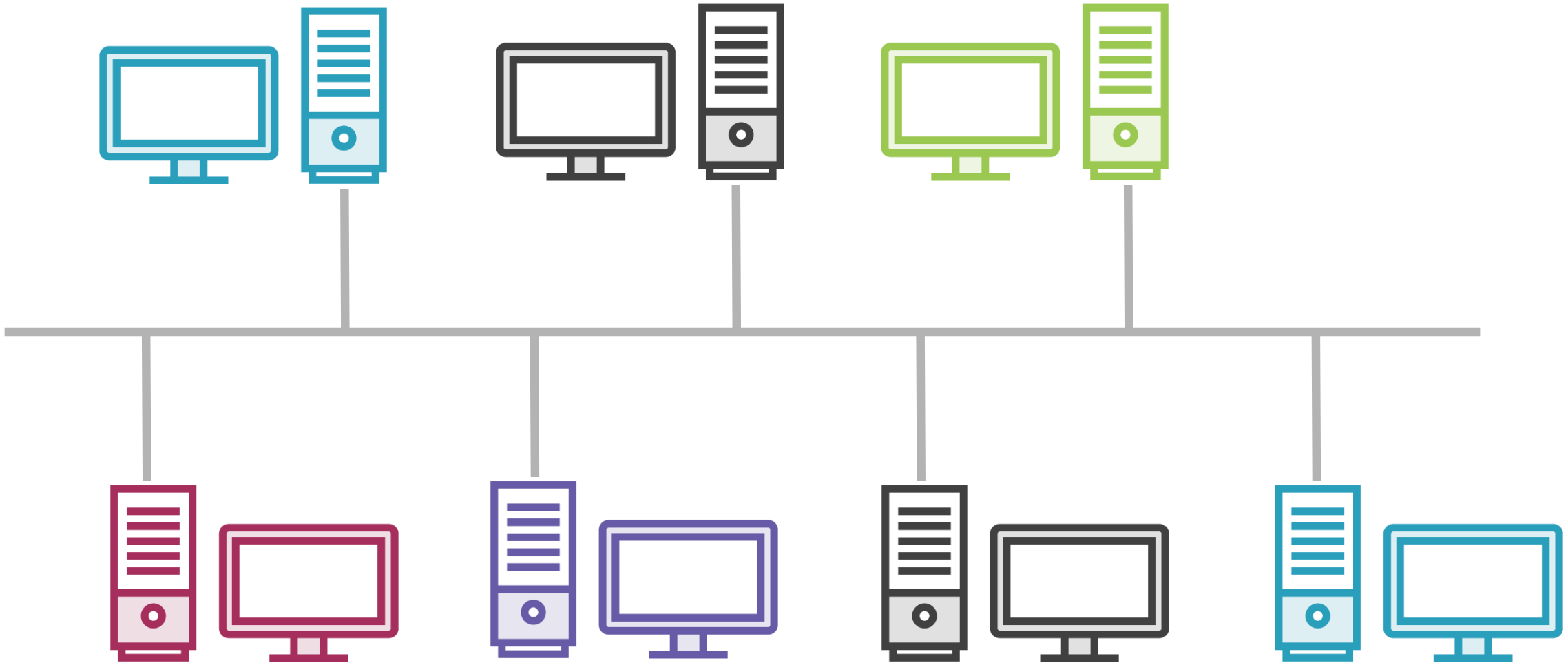
CSMA/CD
Carrier Sense Multiple Access with Collision Detection

1.3



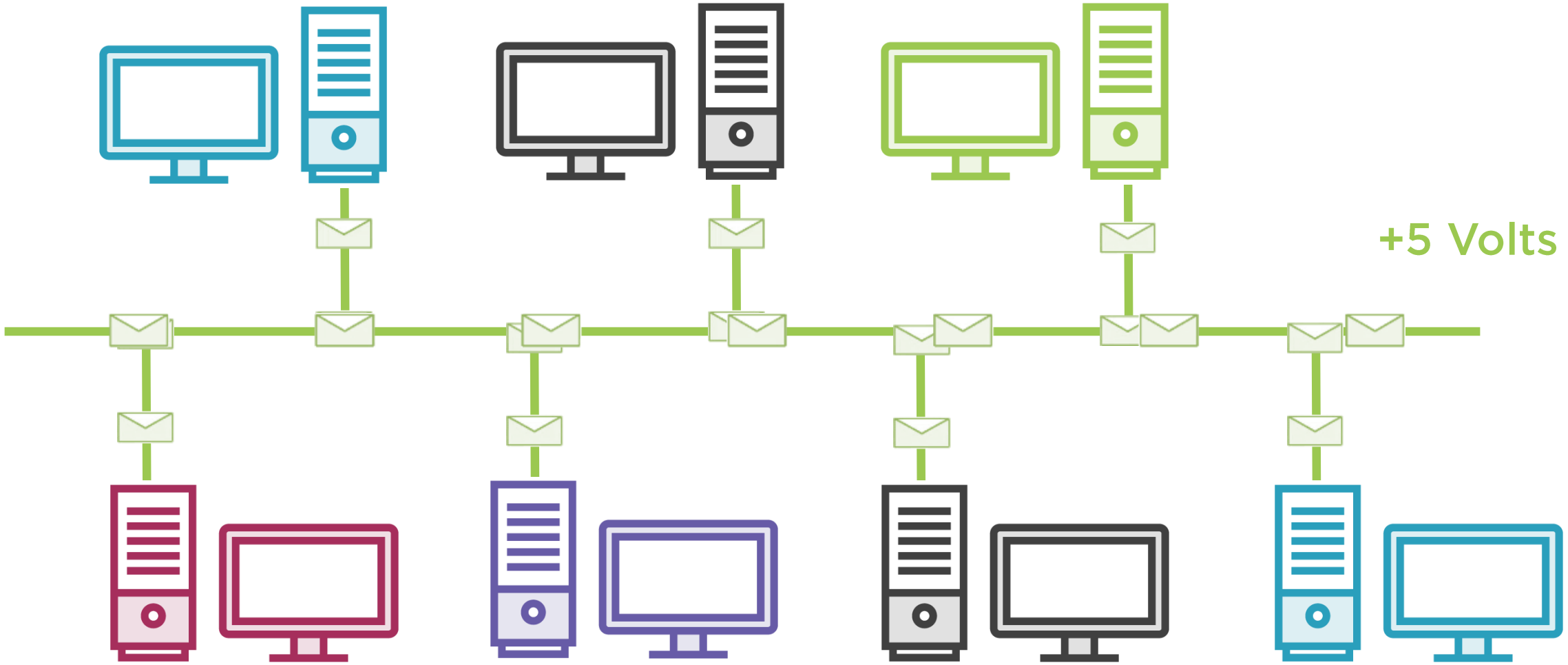
CSMA/CD
Carrier Sense Multiple Access with Collision Detection

1.3



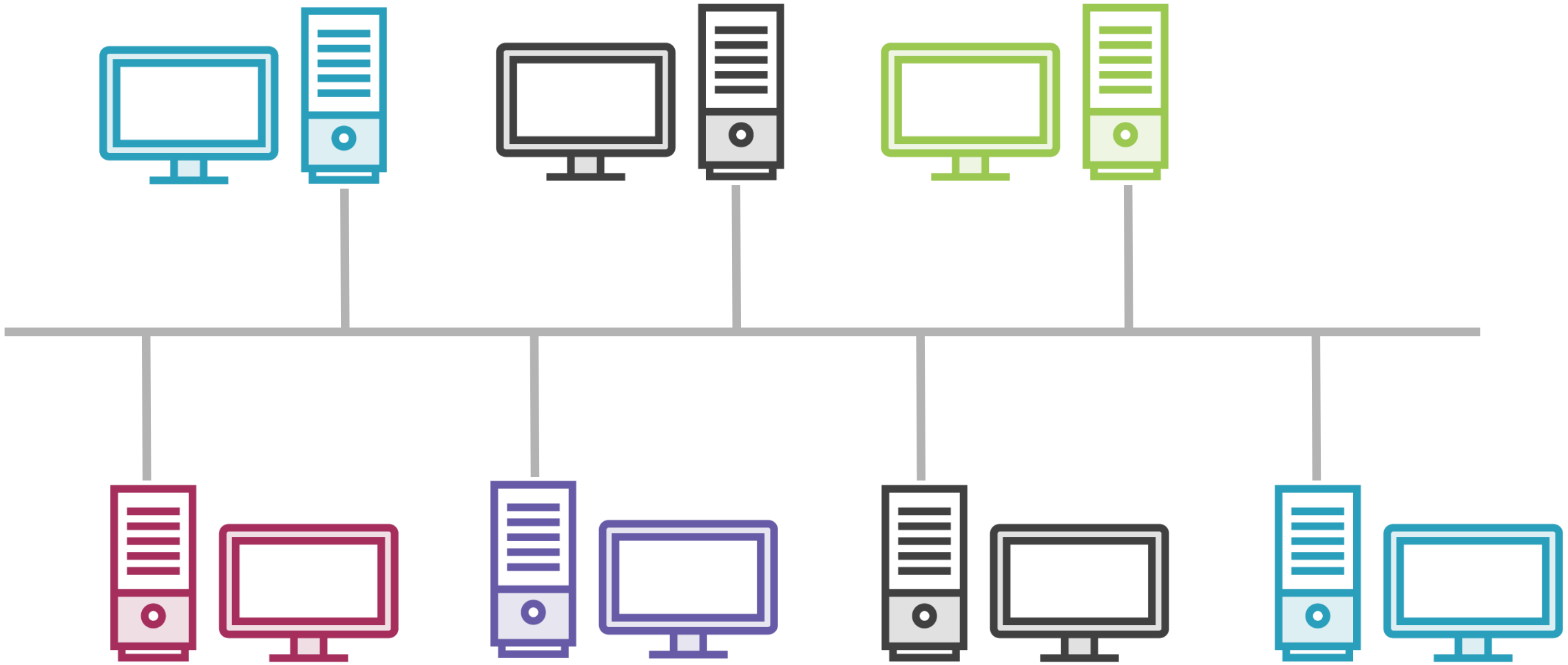
CSMA/CD
Carrier Sense Multiple Access with Collision Detection

1.3

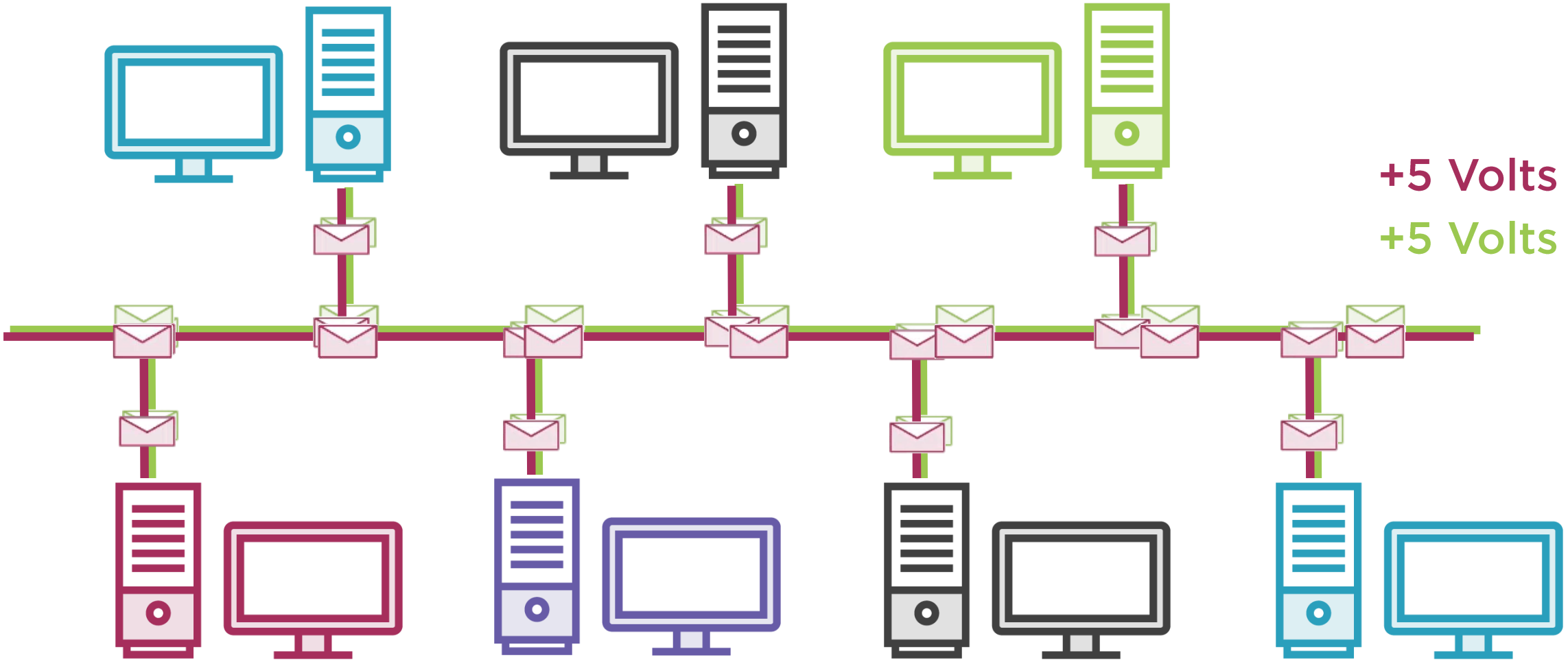


CSMA/CD
Carrier Sense Multiple Access with Collision Detection

1.3

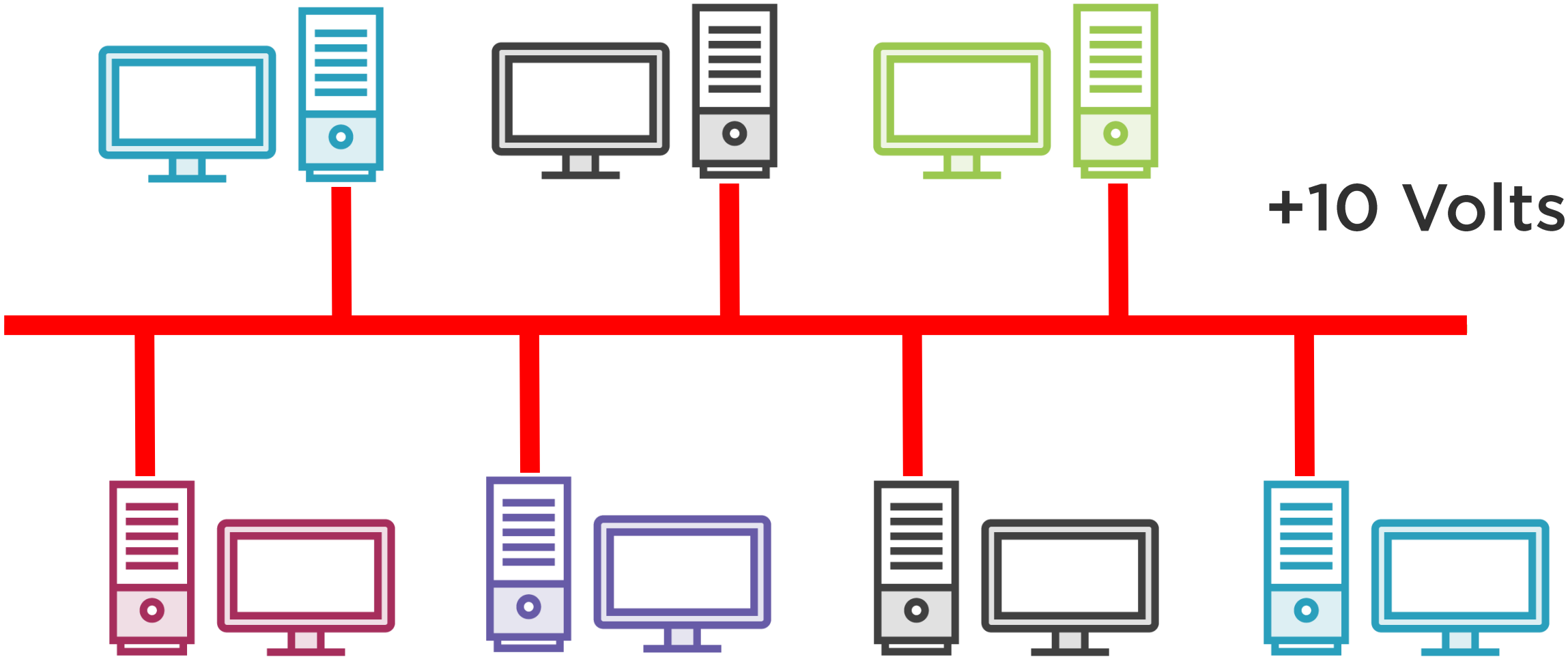


CSMA/CD
Carrier Sense Multiple Access with Collision Detection



CSMA/CD
Carrier Sense Multiple Access with Collision Detection

1.3



CSMA/CD
Carrier Sense Multiple Access with Collision Detection

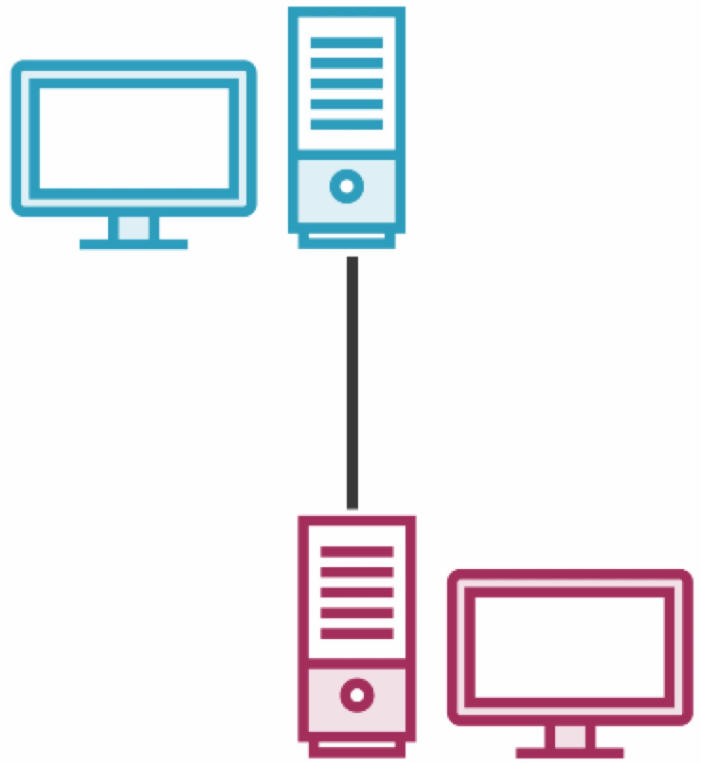
1.3

Collision Domain

A group of networked devices that will simultaneously detect a voltage spike.

1.3

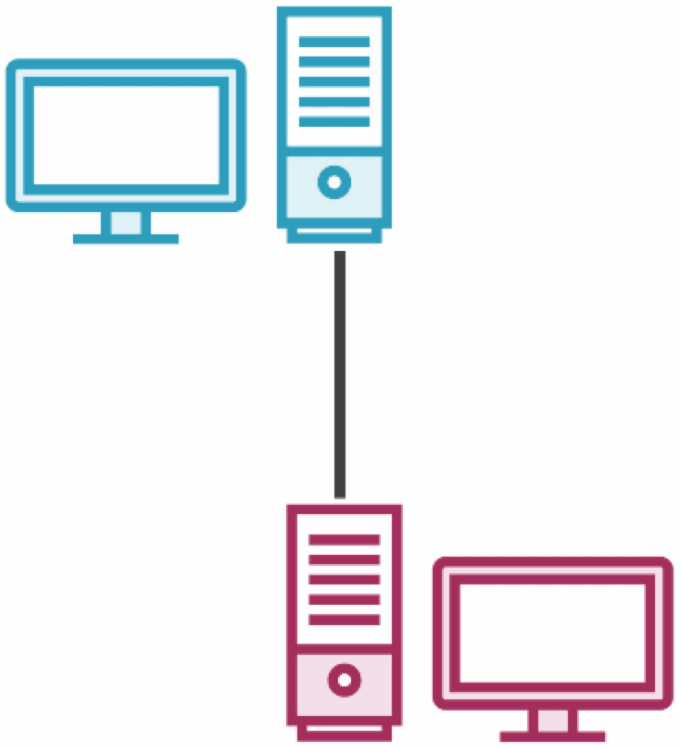
Duplex and Speed



Half duplex

One device communicates at a time

“Walkie talkie”



Full duplex

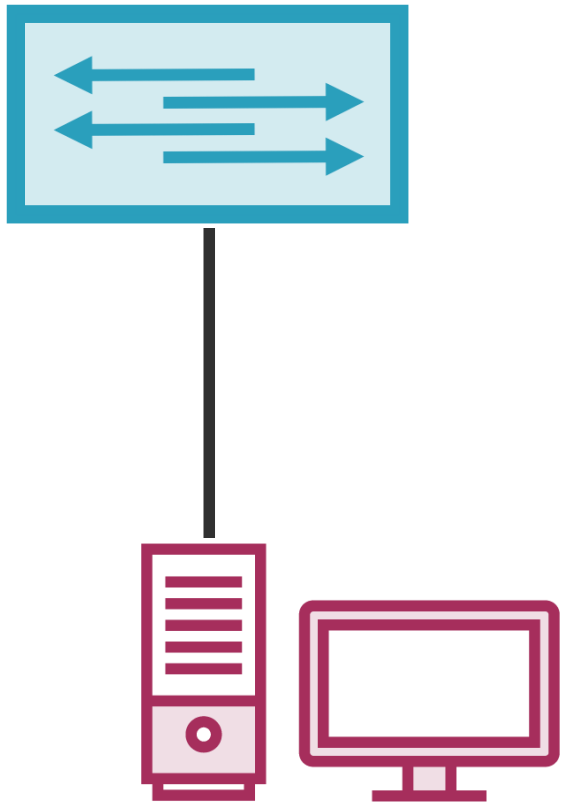
Two devices communicate at same time

“Telephone”

Modern Collision Domain

1.3

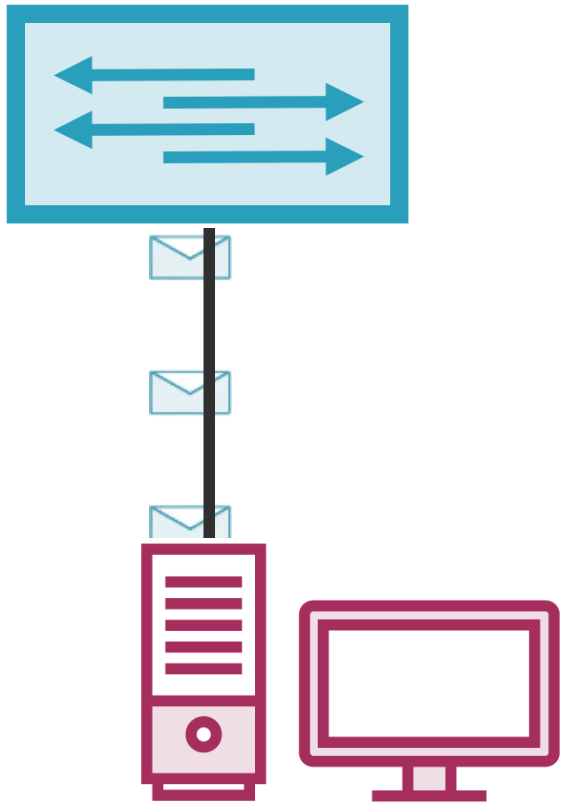
Half Duplex



Modern Collision Domain

1.3

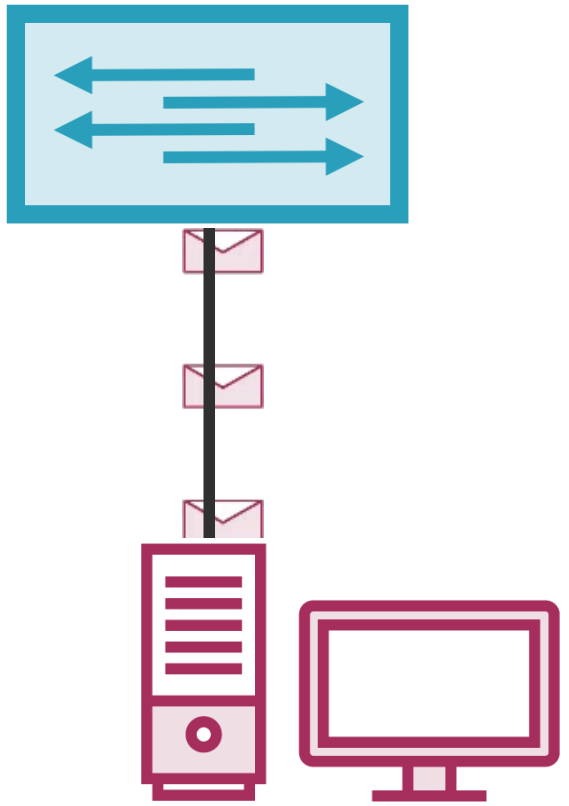
Half Duplex



Modern Collision Domain

1.3

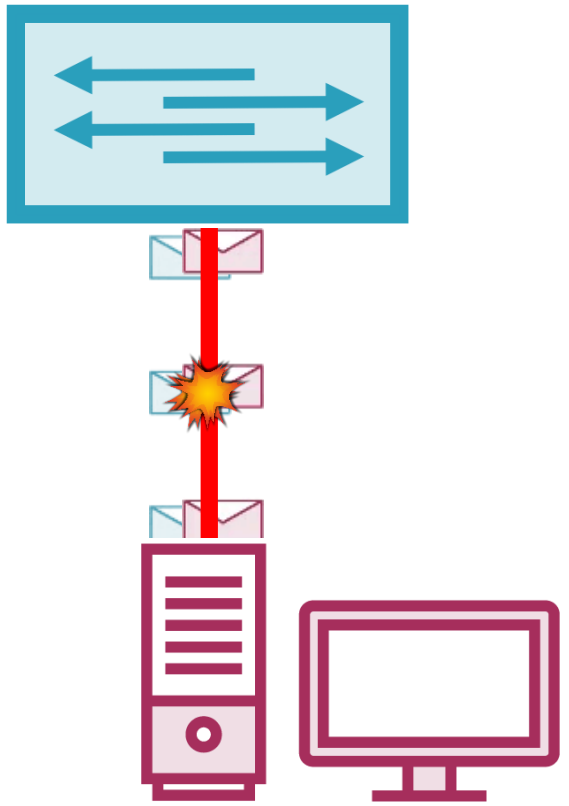
Half Duplex



Modern Collision Domain

1.3

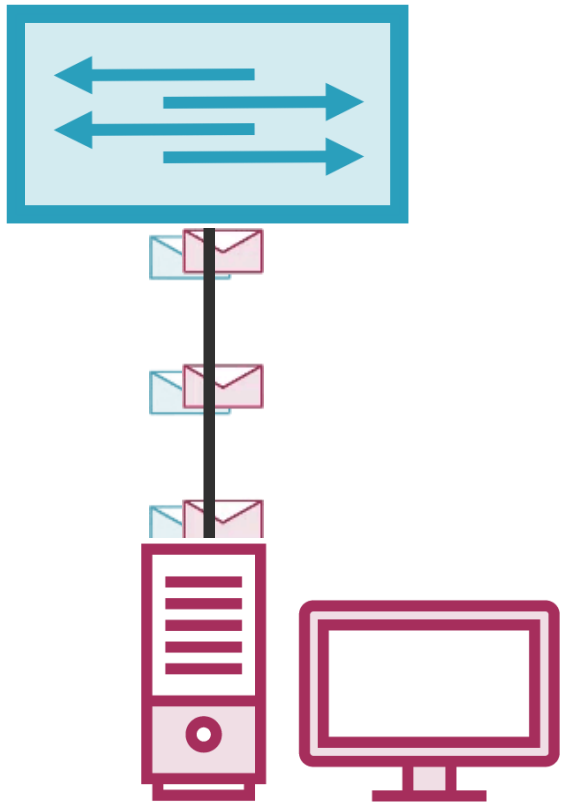
Half Duplex



Modern Collision Domain

1.3

Full Duplex



Ethernet Speed

1.3

Name	Speed
Ethernet	10Mbps
FastEthernet	100Mbps
GigabitEthernet	1Gbps
10GigabitEthernet	10Gbps
40GigabitEthernet	40Gbps

Ethernet Speed

Name	Speed
Ethernet	10Mbps
FastEthernet	100Mbps
GigabitEthernet	1Gbps
10GigabitEthernet	10Gbps
40GigabitEthernet	40Gbps

Requires Full Duplex

1.3

Ethernet II Frame

1.3


Destination MAC Address
Source MAC Address
Type
Data (Packet)
FCS
48 bits
48 bits
16 bits
MAX 1500 Bytes

1.3


Destination MAC Address
Source MAC Address
Type
Data (Packet)
FCS
48 bits
48 bits
16 bits
MAX 1500 Bytes

Ethernet II Frame

1.3

Destination MAC Address	Source MAC Address	Type	Data (Packet)	FCS
48 bits	48 bits	16 bits	MAX 1500 Bytes	32 bits

Ethernet II Frame

1.3

Frame

A chunk of data, with a data link layer header

Ethernet II Frame

1.3

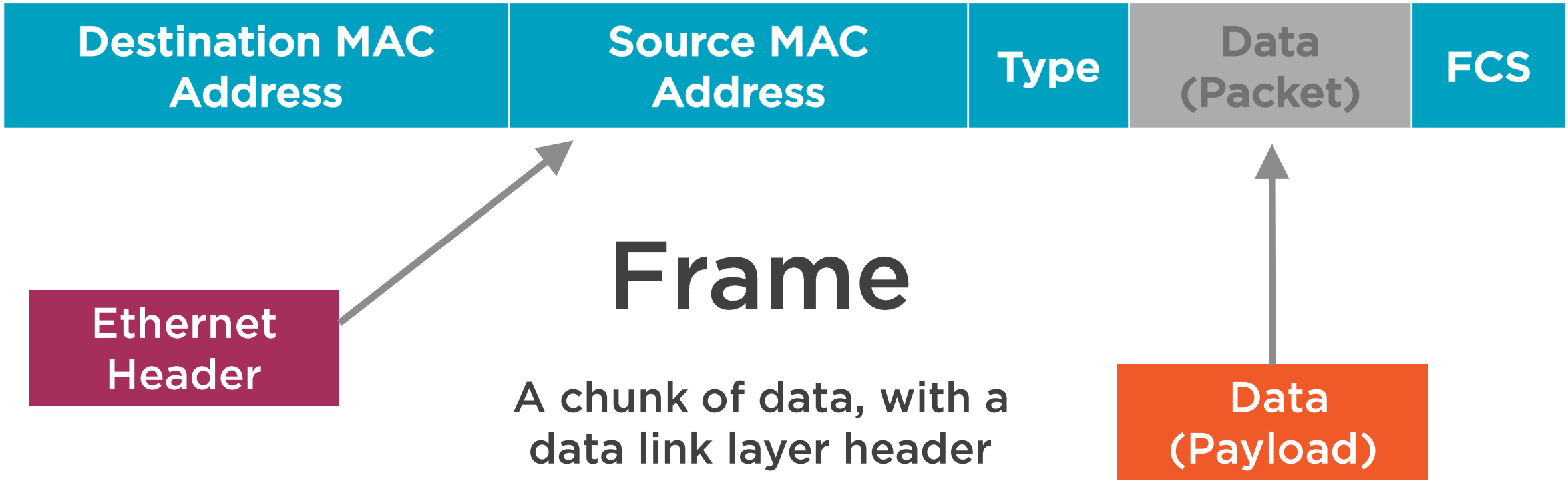
Ethernet Header

Frame

A chunk of data, with a data link layer header

Ethernet II Frame

1.3



Ethernet II Frame

1.3

Destination MAC Address	Source MAC Address	Type	Data (Packet)	FCS
Manufacturer ID: Serial Number 00:10:D9 : D7:52:7A 0000 0000 0001 0000 1101 1001 1101 0111 0101 0010 0111 1010	48 bits	16 bits	MAX 1500 Bytes	32 bits

MAC Address

1.3

Manufacturer ID	Serial Number
00:10:D9 : D7:52:7A	
0000 0000 0001 0000 1101 1001 1101 0111 0101 0010 0111 1010	

Ethernet II Frame

1.3

Destination MAC Address	Source MAC Address	Type	Data (Packet)	FCS
Manufacturer ID: Serial Number 00:10:D9 : D7:52:7A 0000 0000 0001 0000 1101 1001 1101 0111 0101 0010 0111 1010	48 bits	16 bits	MAX 1500 Bytes	32 bits

Type Field

1.3

Destination MAC Address	Source MAC Address	Type	Data (Packet)	FCS
48 bits	48 bits	16 bits	MAX 1500 Bytes	32 bits

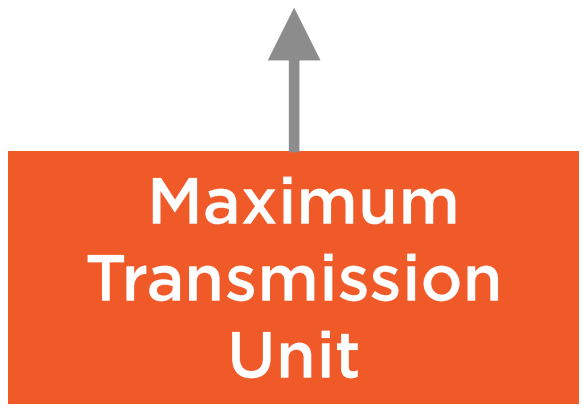
Frame Check Sequence
Cyclical Redundancy Check (CRC)

Destination MAC Address	Source MAC Address	Type	Data (Packet)	FCS
48 bits	48 bits	16 bits	MAX 1500 Bytes	32 bits

Ethernet II Frame

1.3

Destination MAC Address	Source MAC Address	Type	Data (Packet)	FCS
48 bits	48 bits	16 bits	MAX 1500 Bytes	32 bits



Ethernet II Frame

1.3

Destination MAC Address	Source MAC Address	Type	Data (Packet)	FCS
48 bits	48 bits	16 bits	MAX 1500 Bytes	32 bits

Protocol Data Unit

1.5

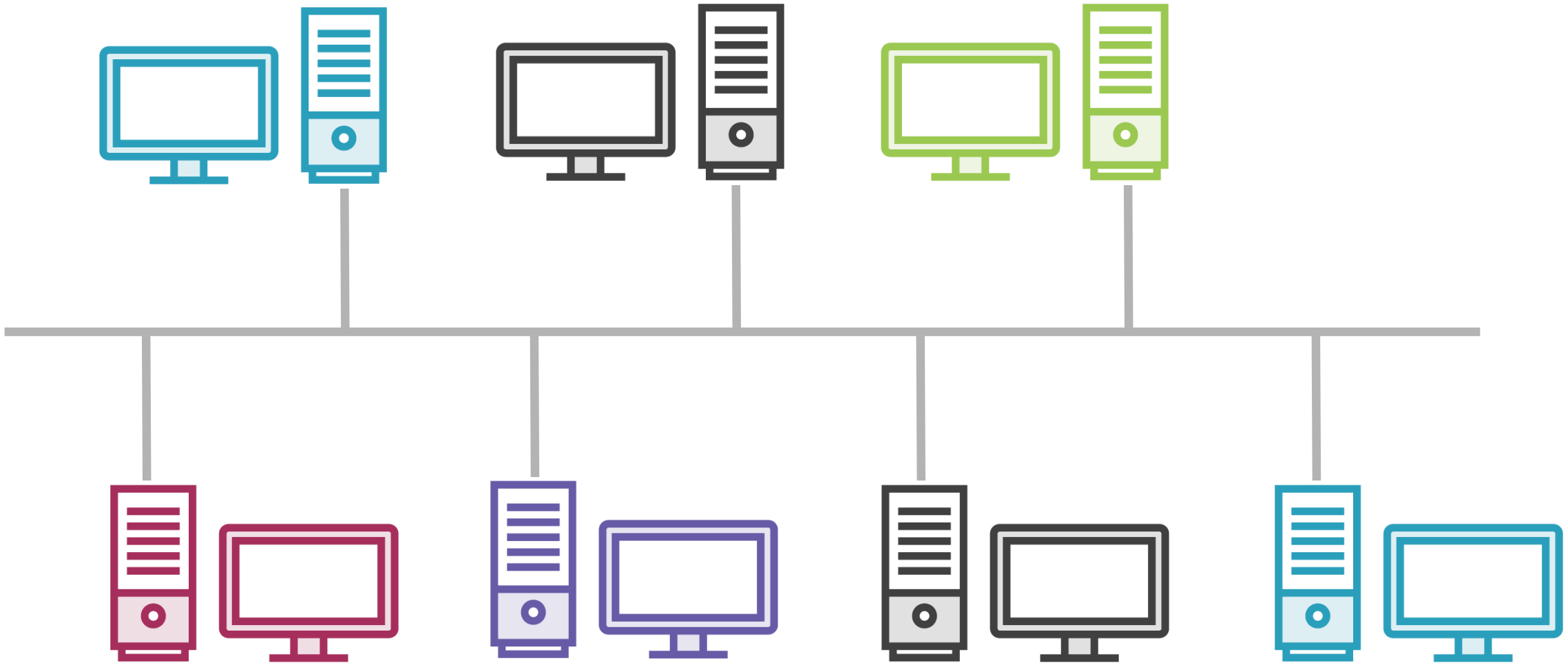
Network Topologies

Network Topologies

- Bus
- Ring
- Star

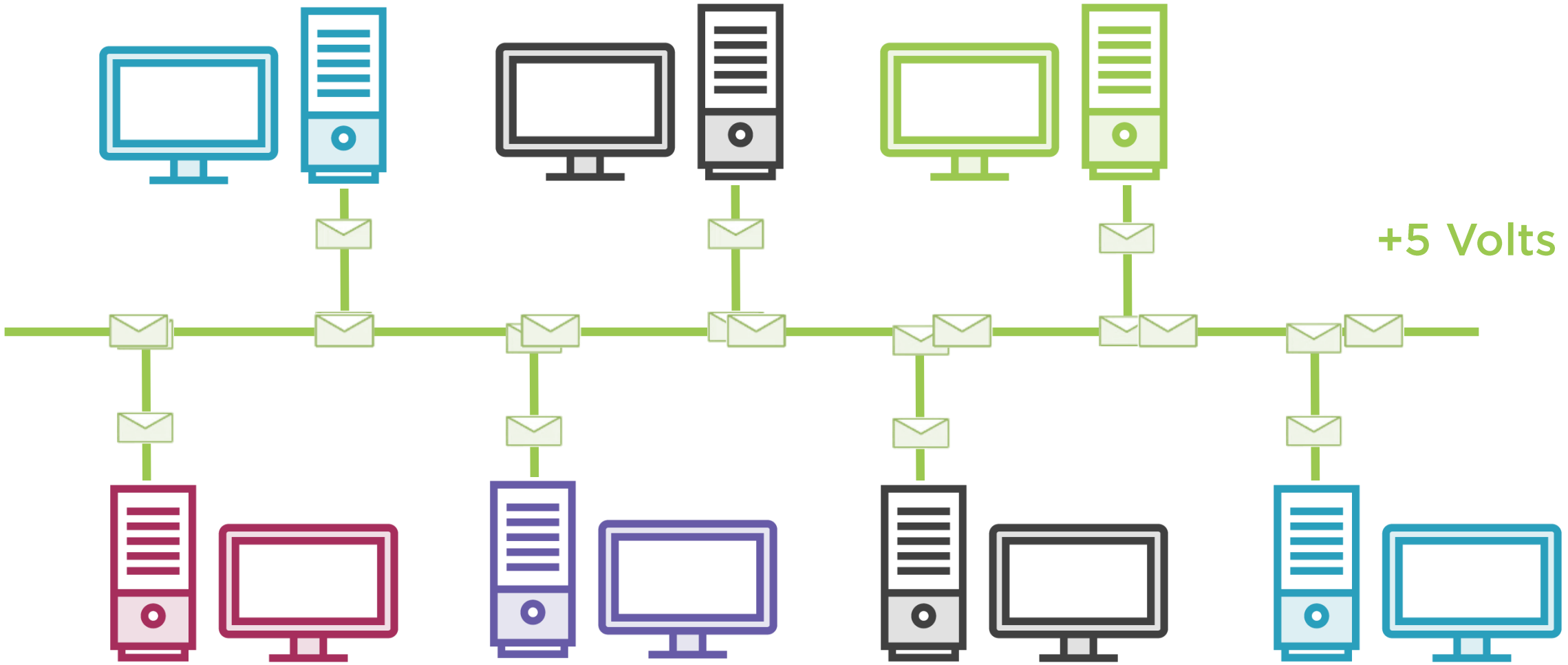
Bus Topology

1.5



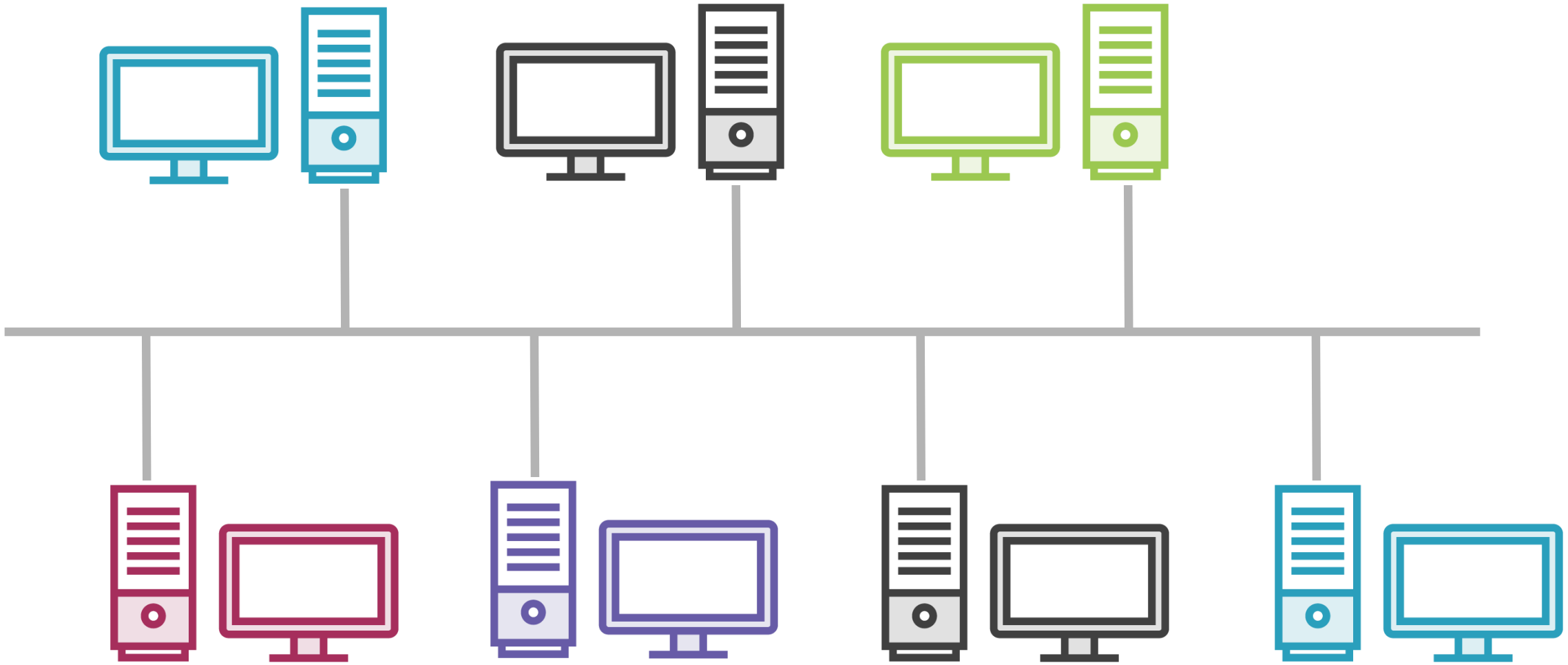
Bus Topology

1.5



Bus Topology

1.5

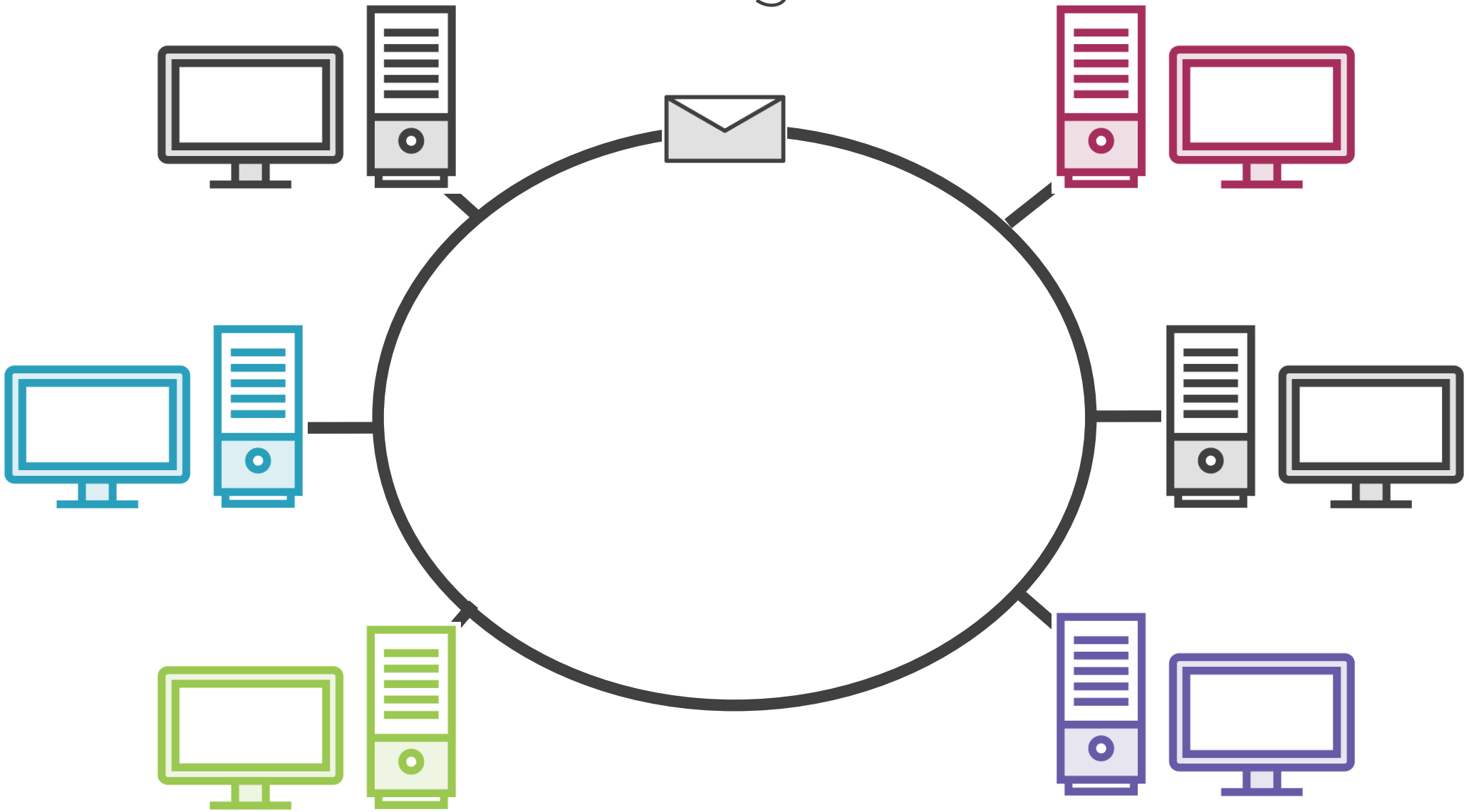


Bus Topology

1.5

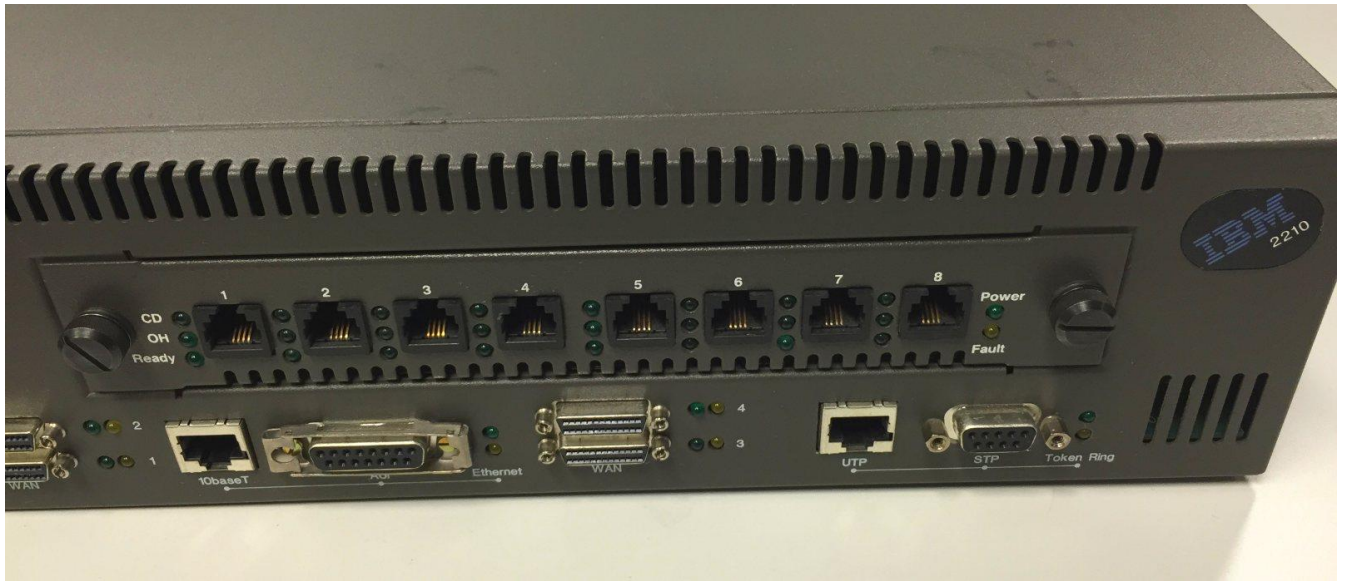
10Base5 and 10Base2 hardware

Ring



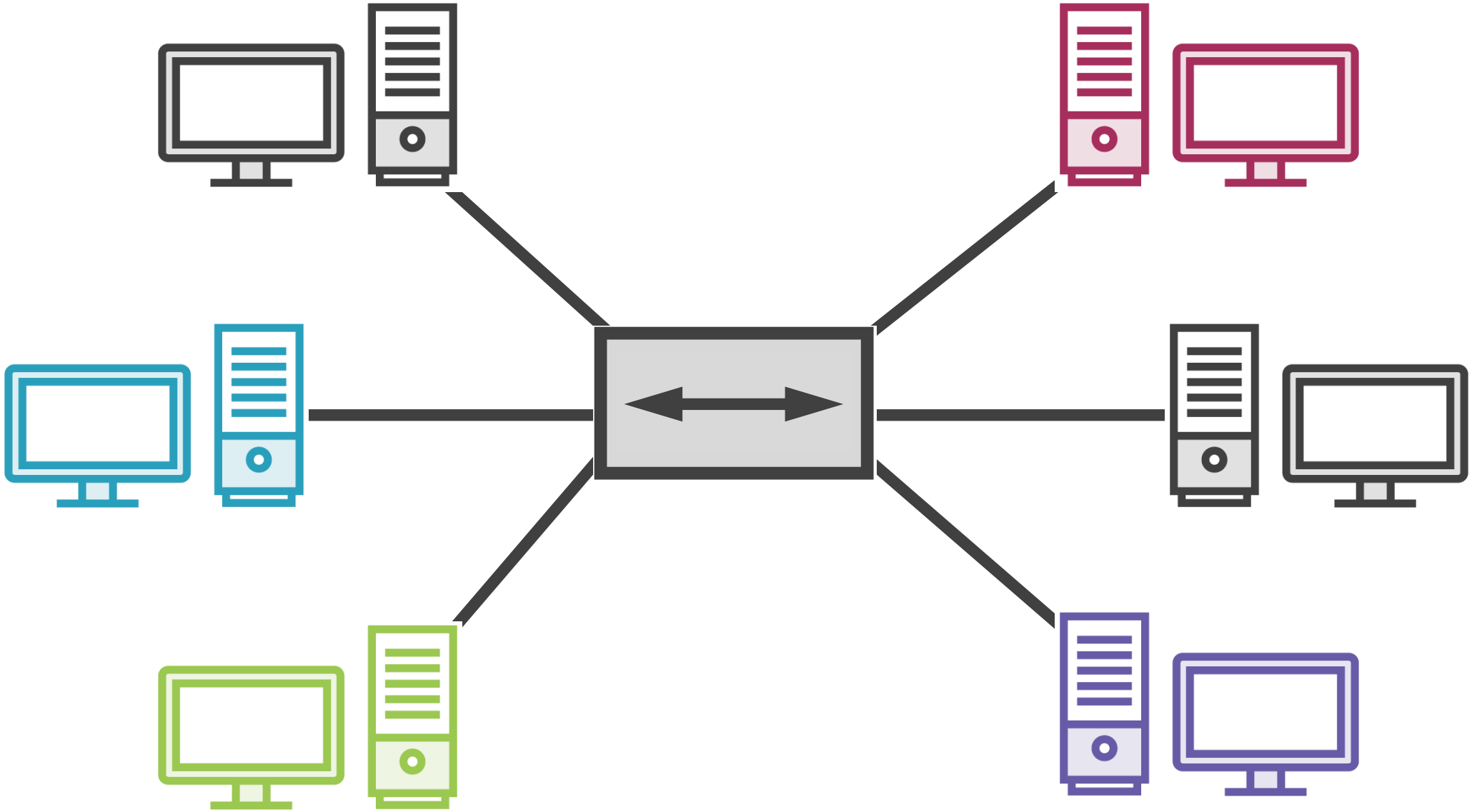
IBM Token Ring MAU

1.5



Star

1.5



Star

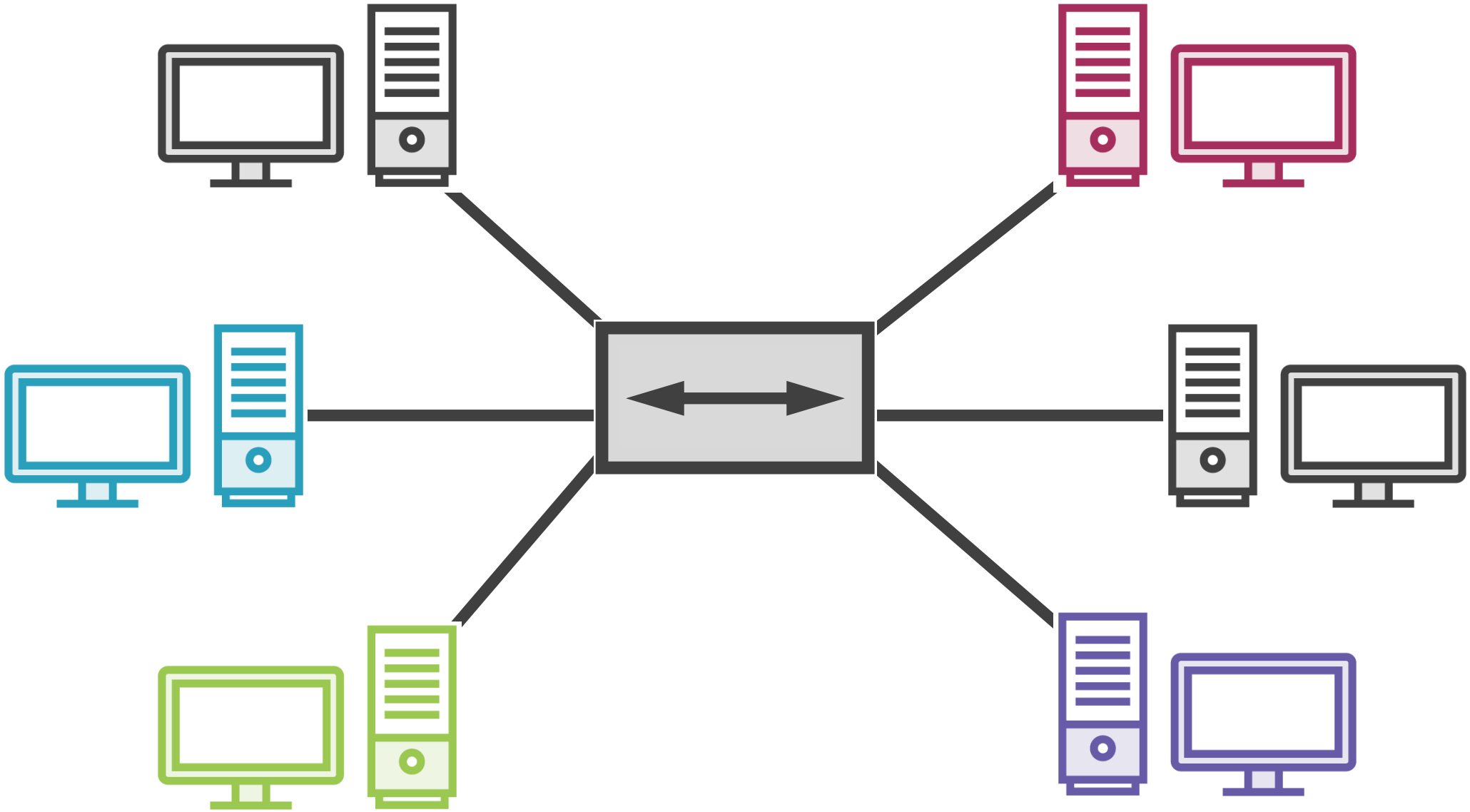
1.5

1.3

Layer 2 Switch

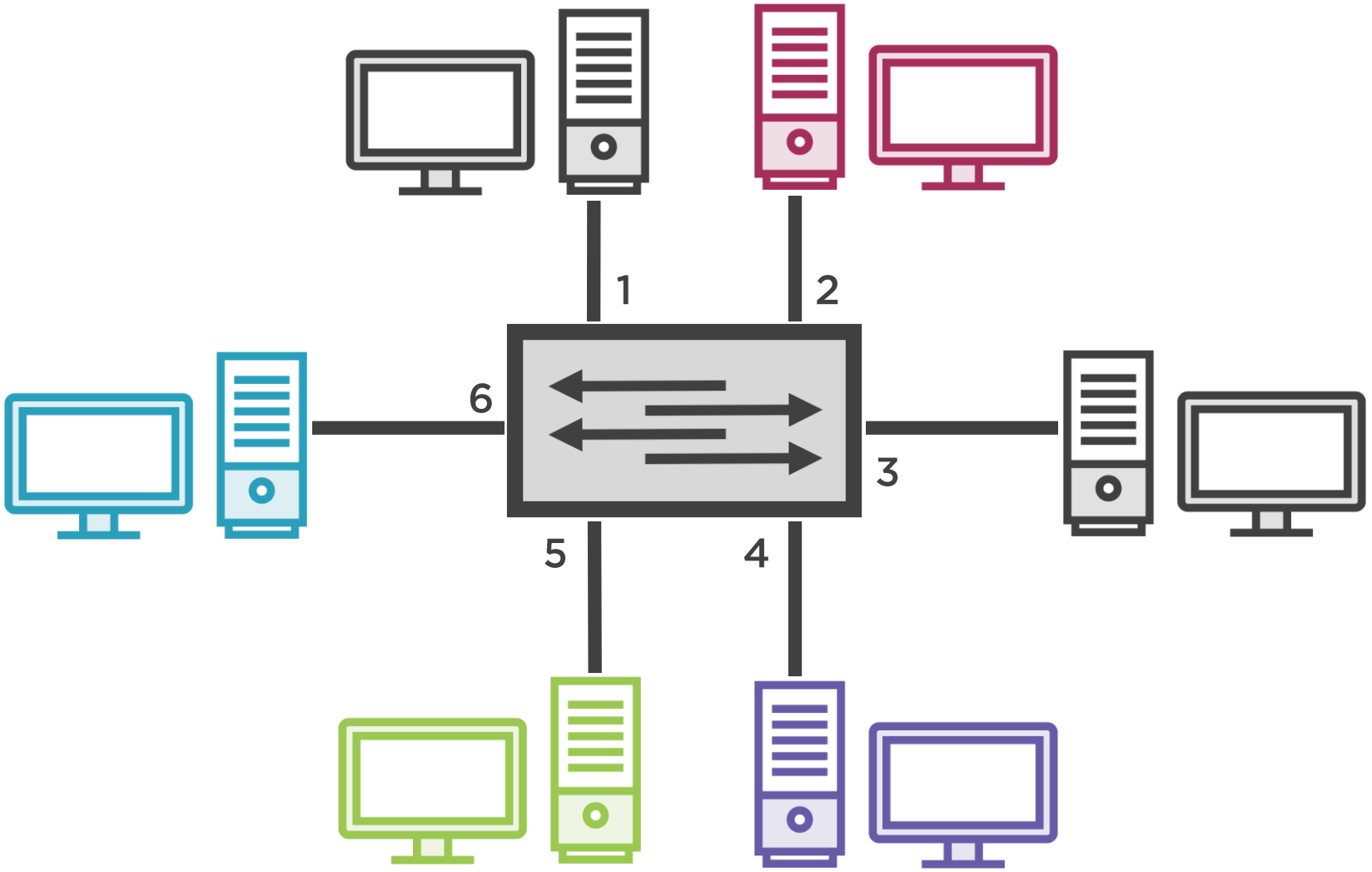
Star with Hub

1.3



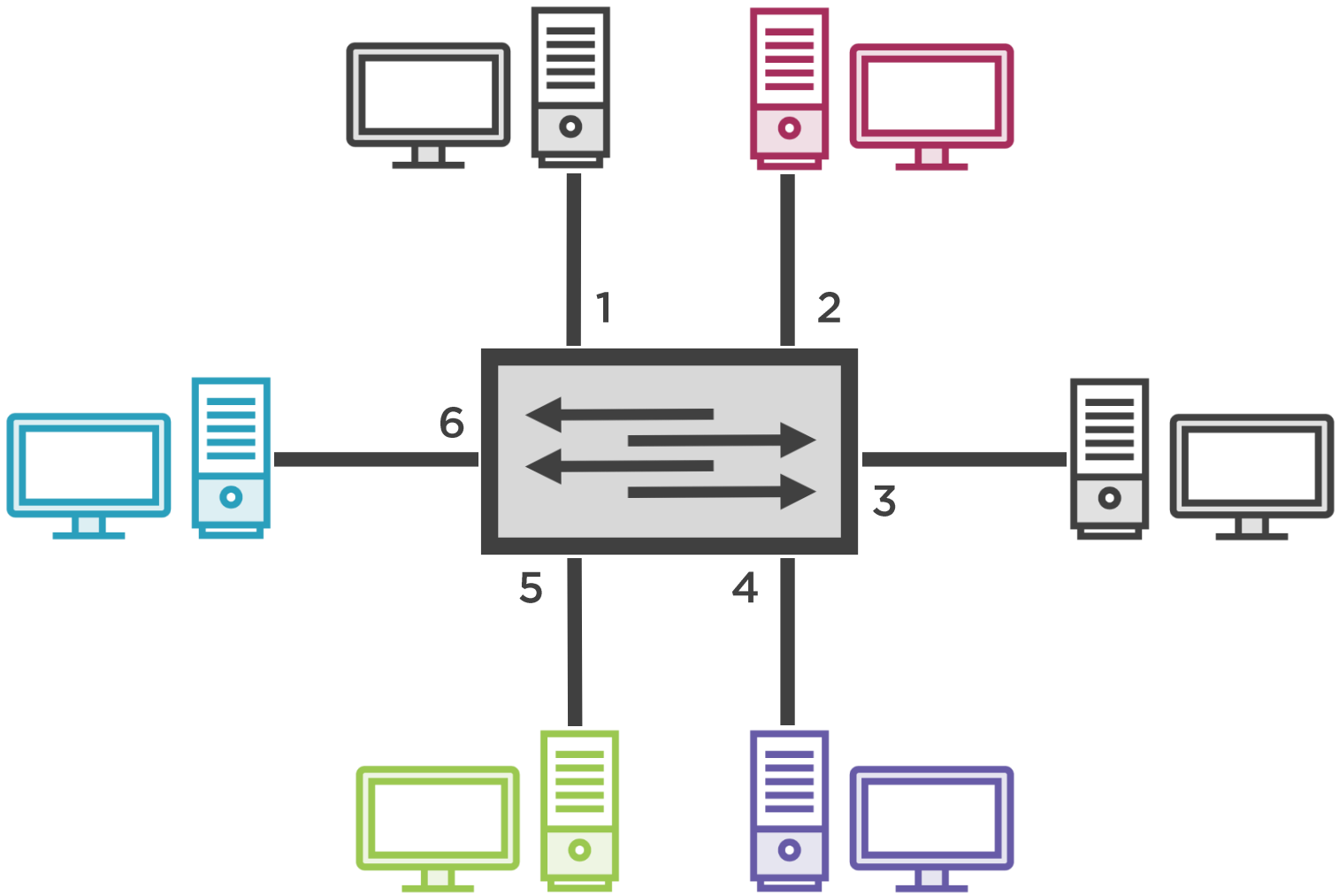
Ethernet Switch

1.3



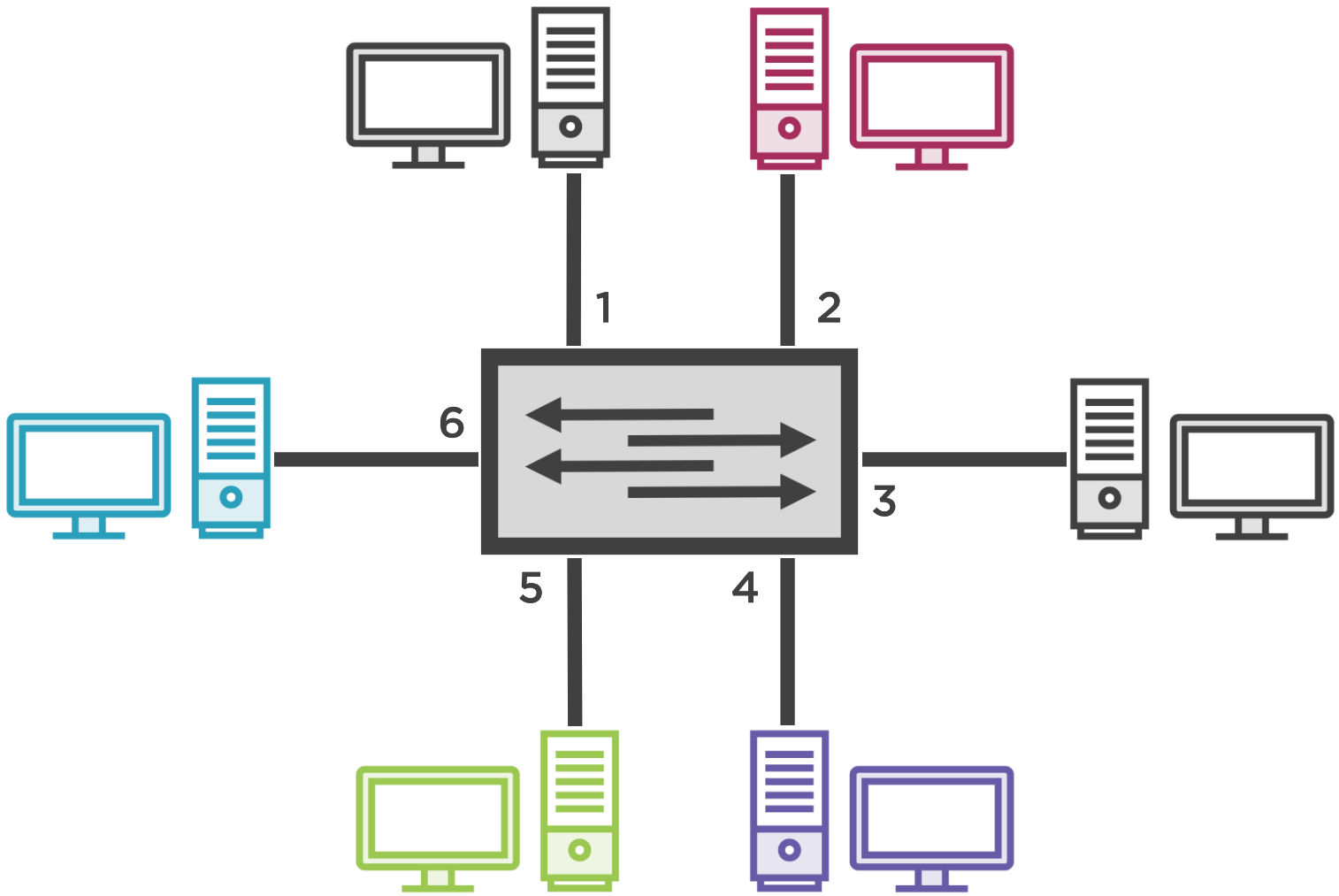
MAC Address Table

1.3



MAC Address Table

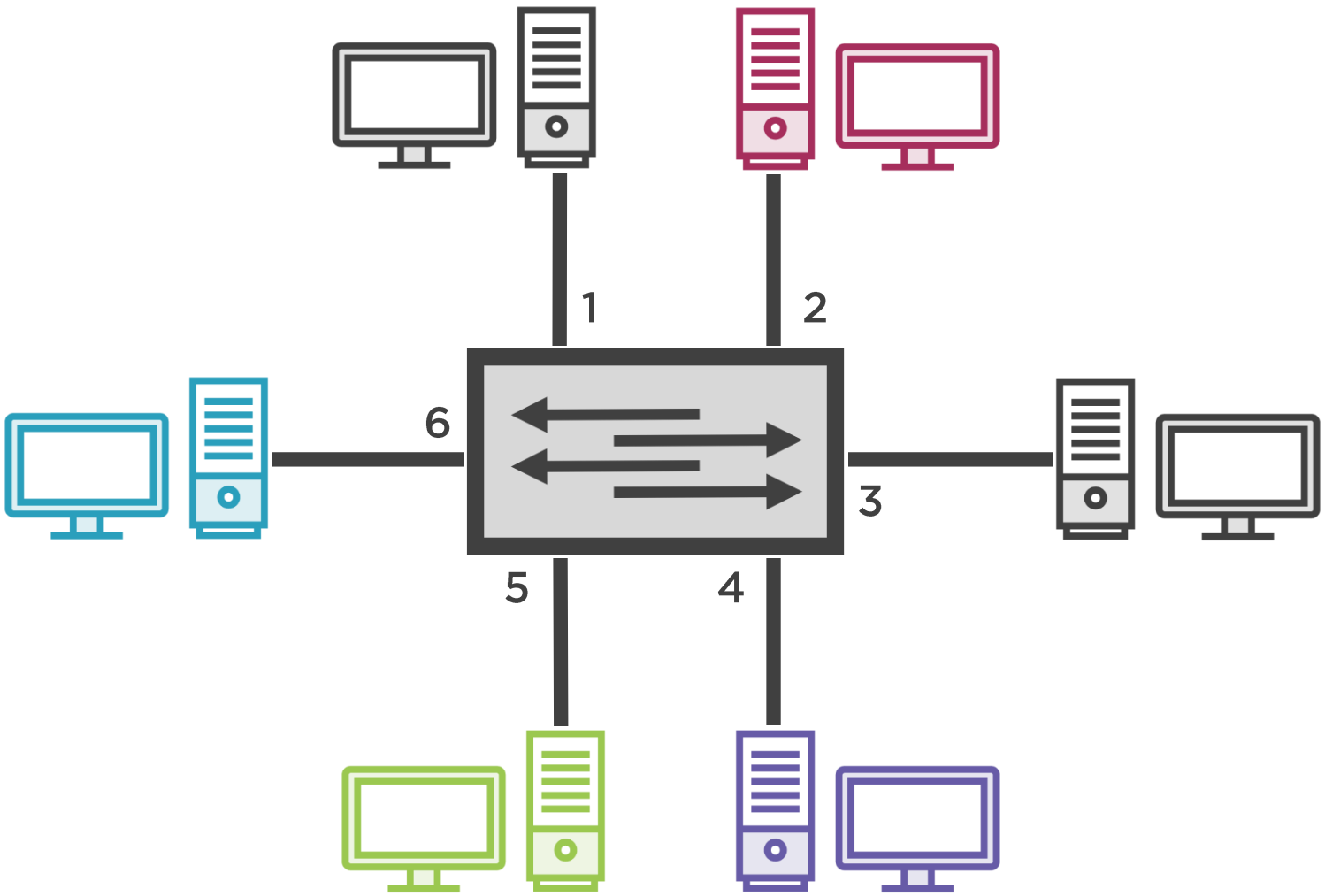
1.3



Port	MAC

MAC Address Table

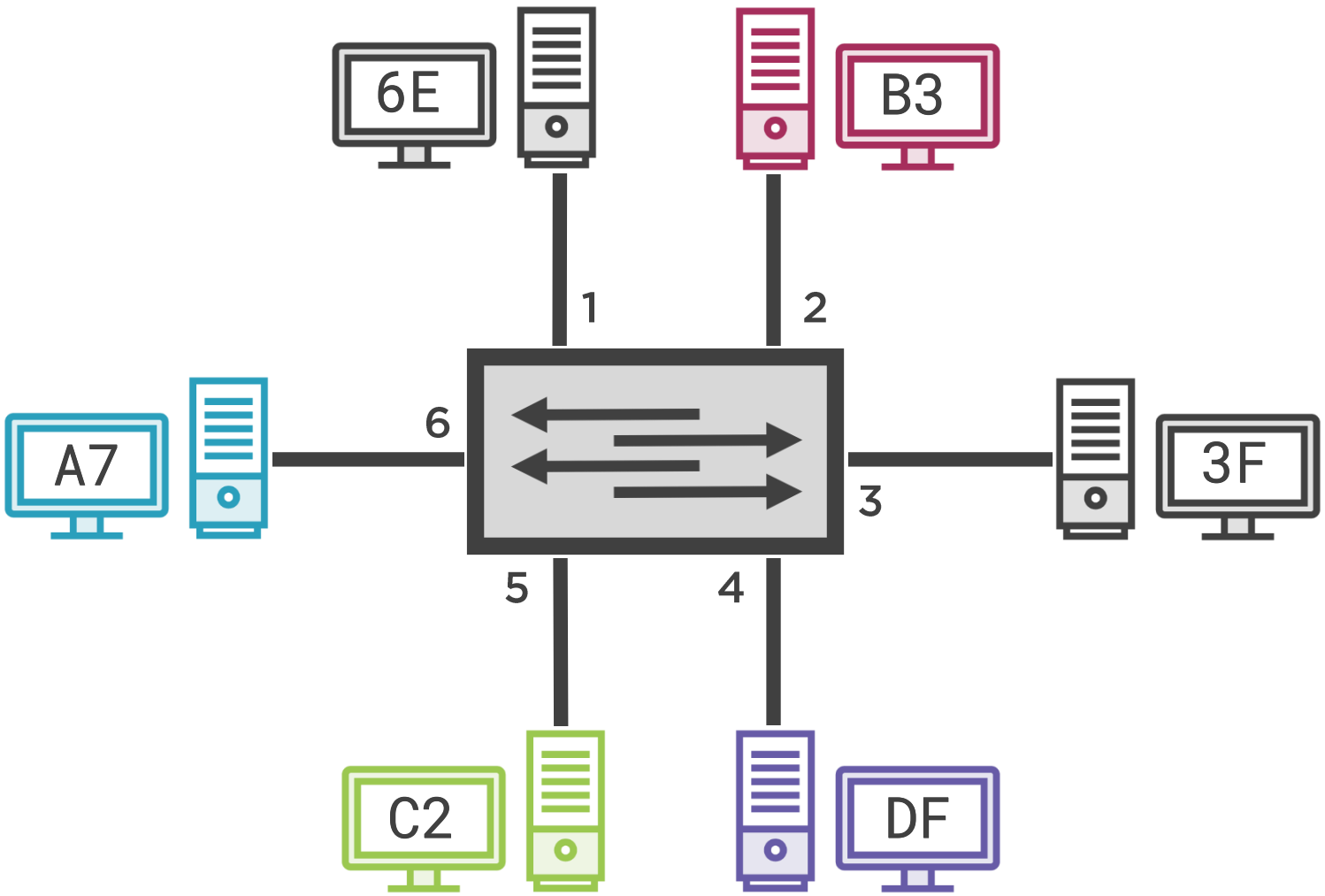
1.3



Port	MAC
1	
2	
3	
4	
5	
6	

MAC Address Table

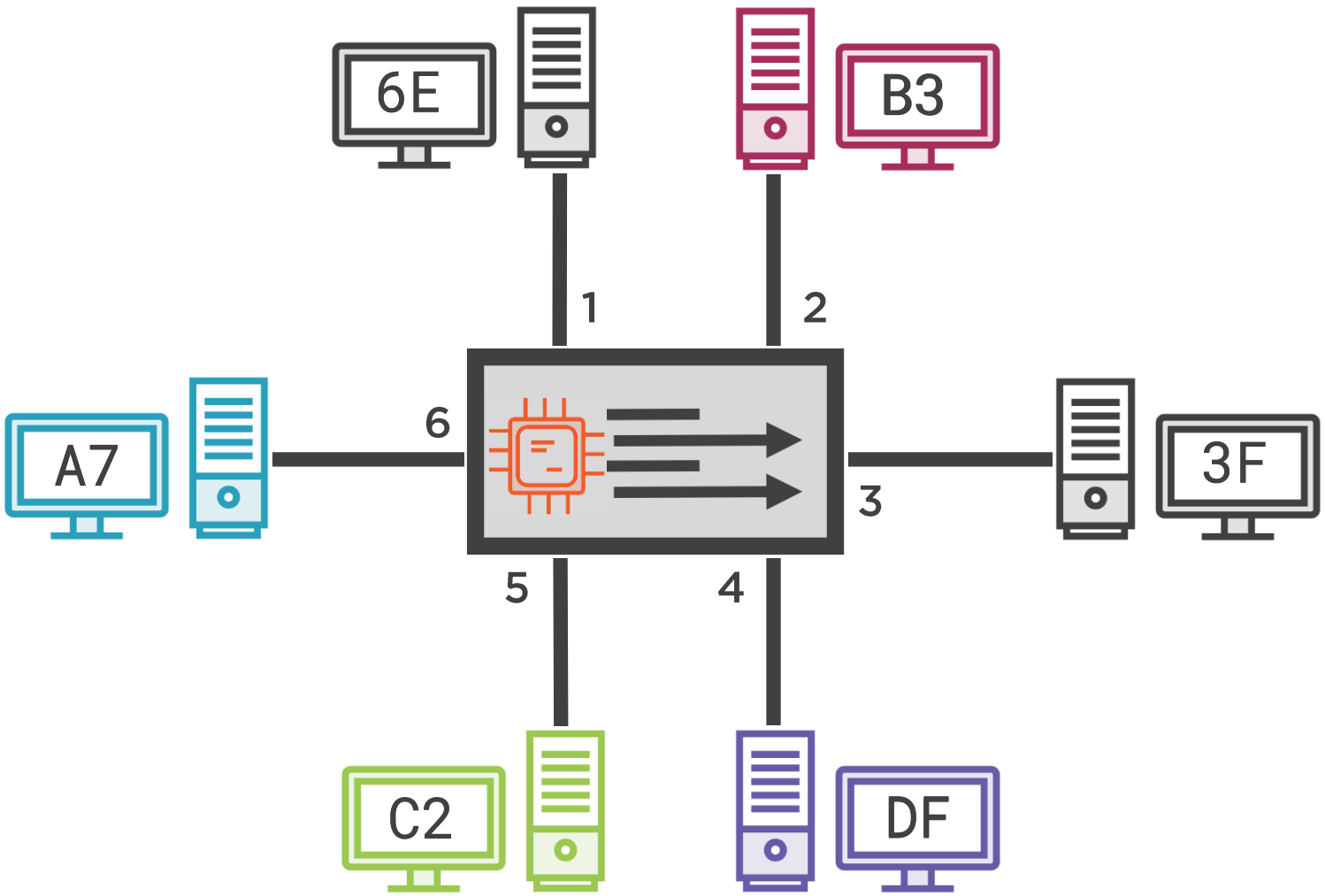
1.3



Port	MAC
1	
2	
3	
4	
5	
6	

MAC Address Table

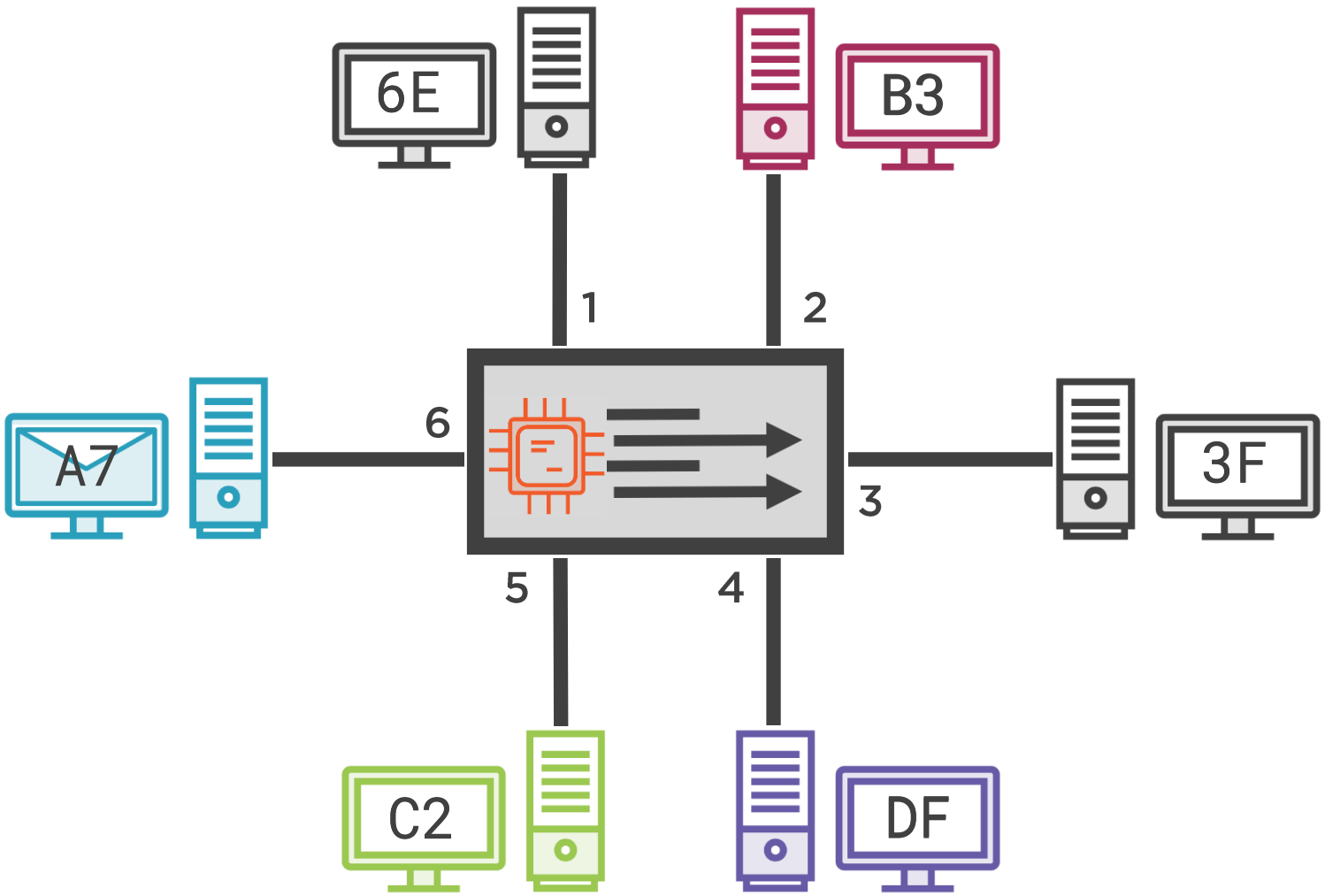
1.3



Port	MAC
1	
2	
3	
4	
5	
6	

MAC Address Table

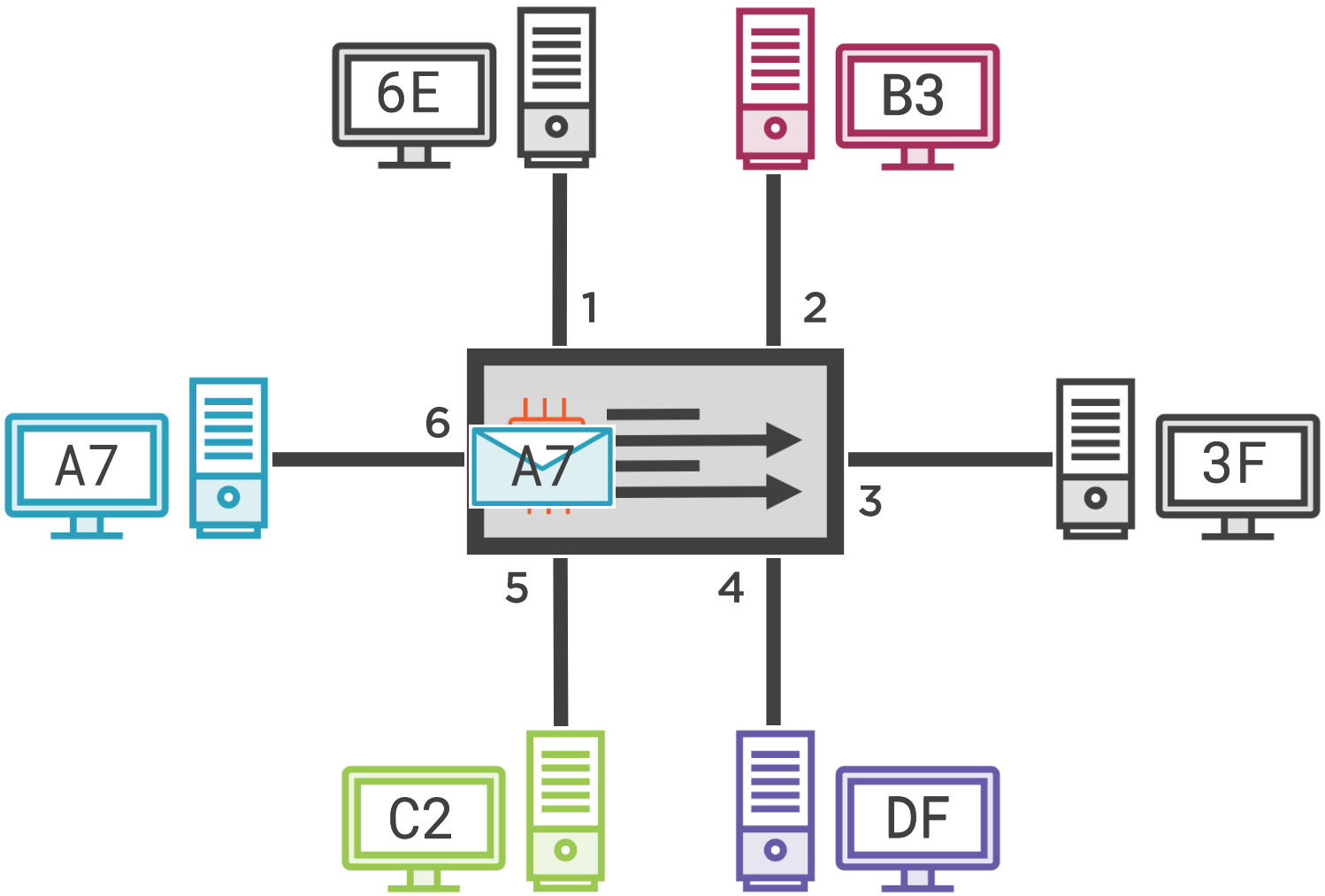
1.3



Port	MAC
1	
2	
3	
4	
5	
6	

MAC Address Table

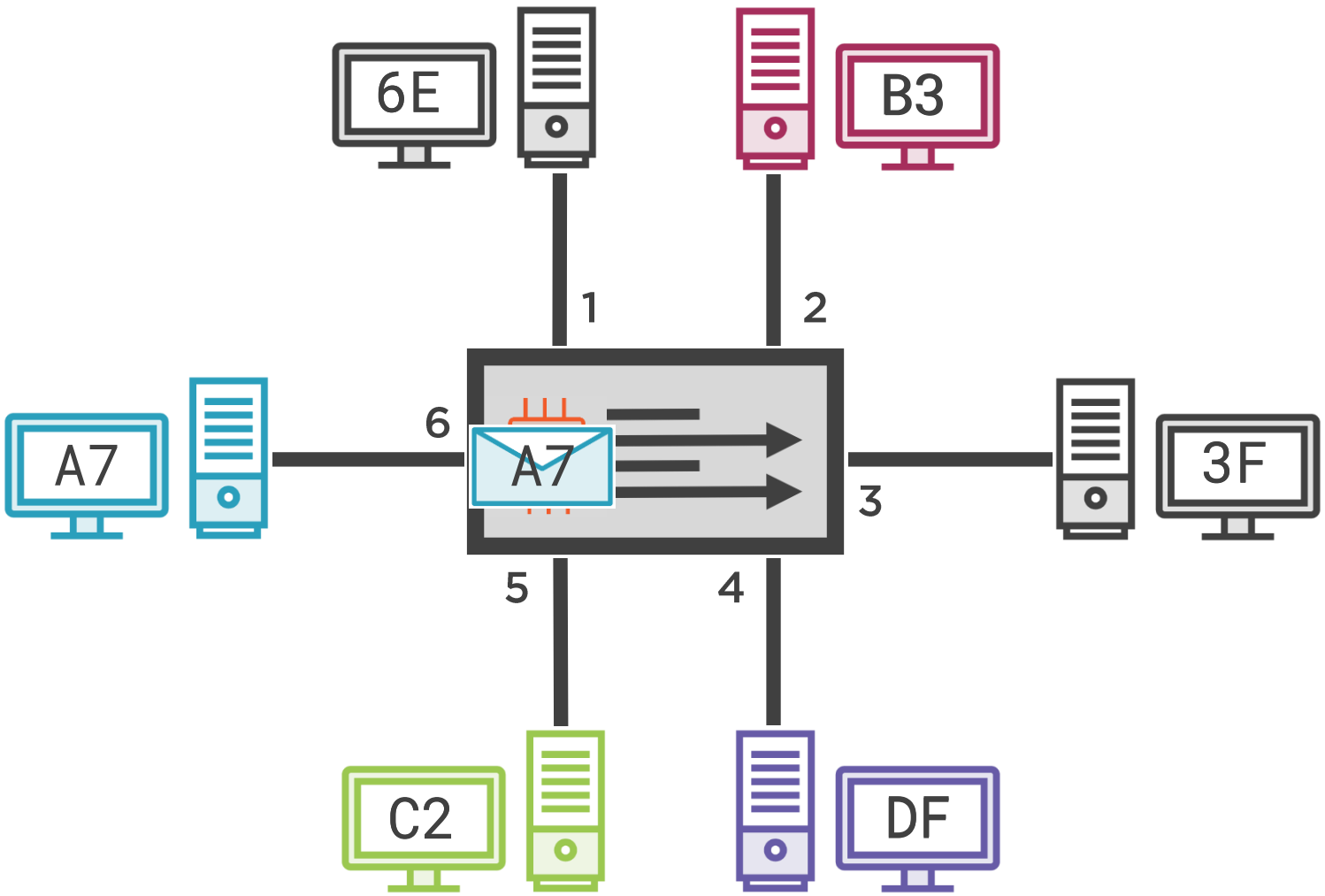
1.3



Port	MAC
1	
2	
3	
4	
5	
6	

MAC Address Table

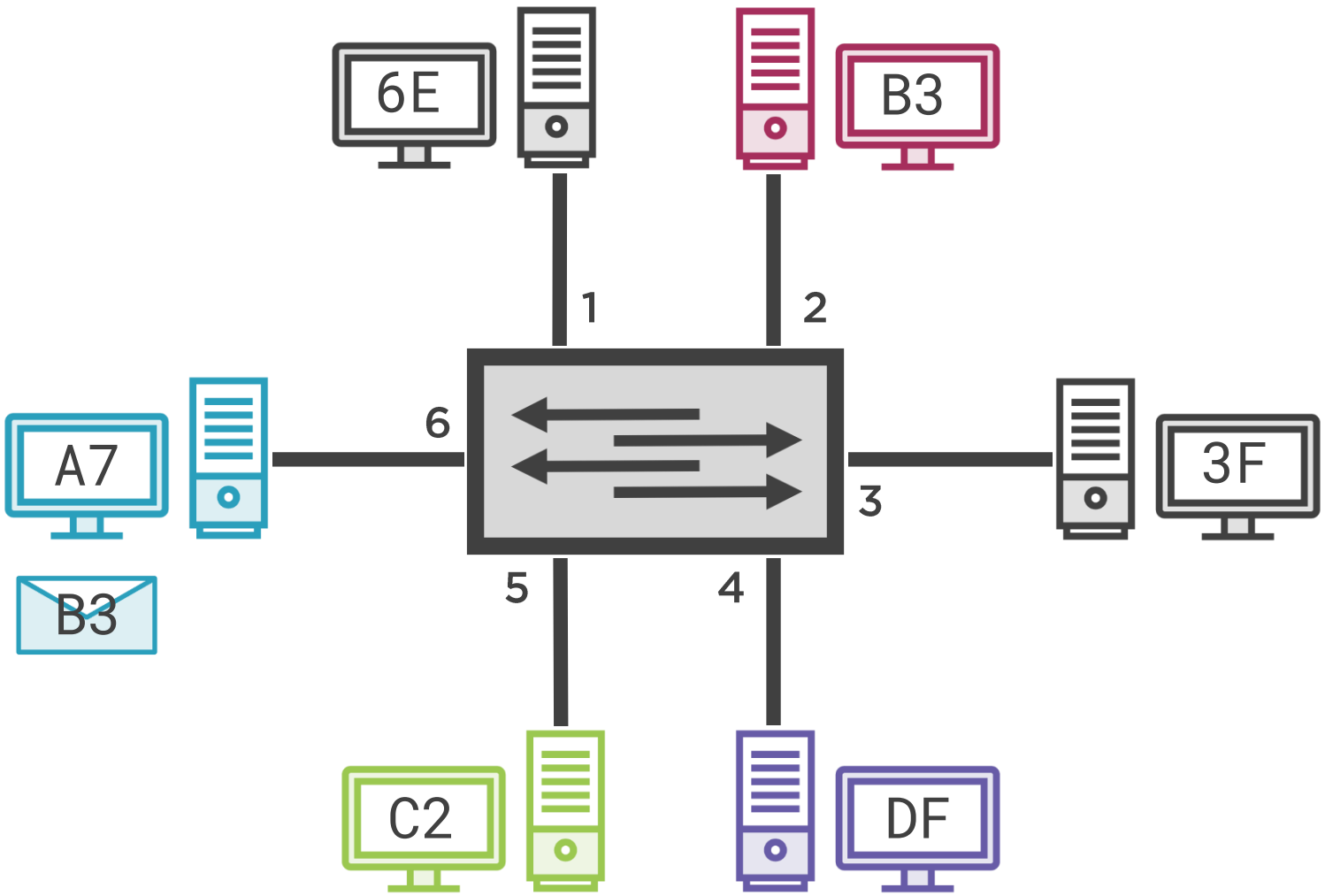
1.3



Port	MAC
1	
2	
3	
4	
5	
6	A7

MAC Address Table

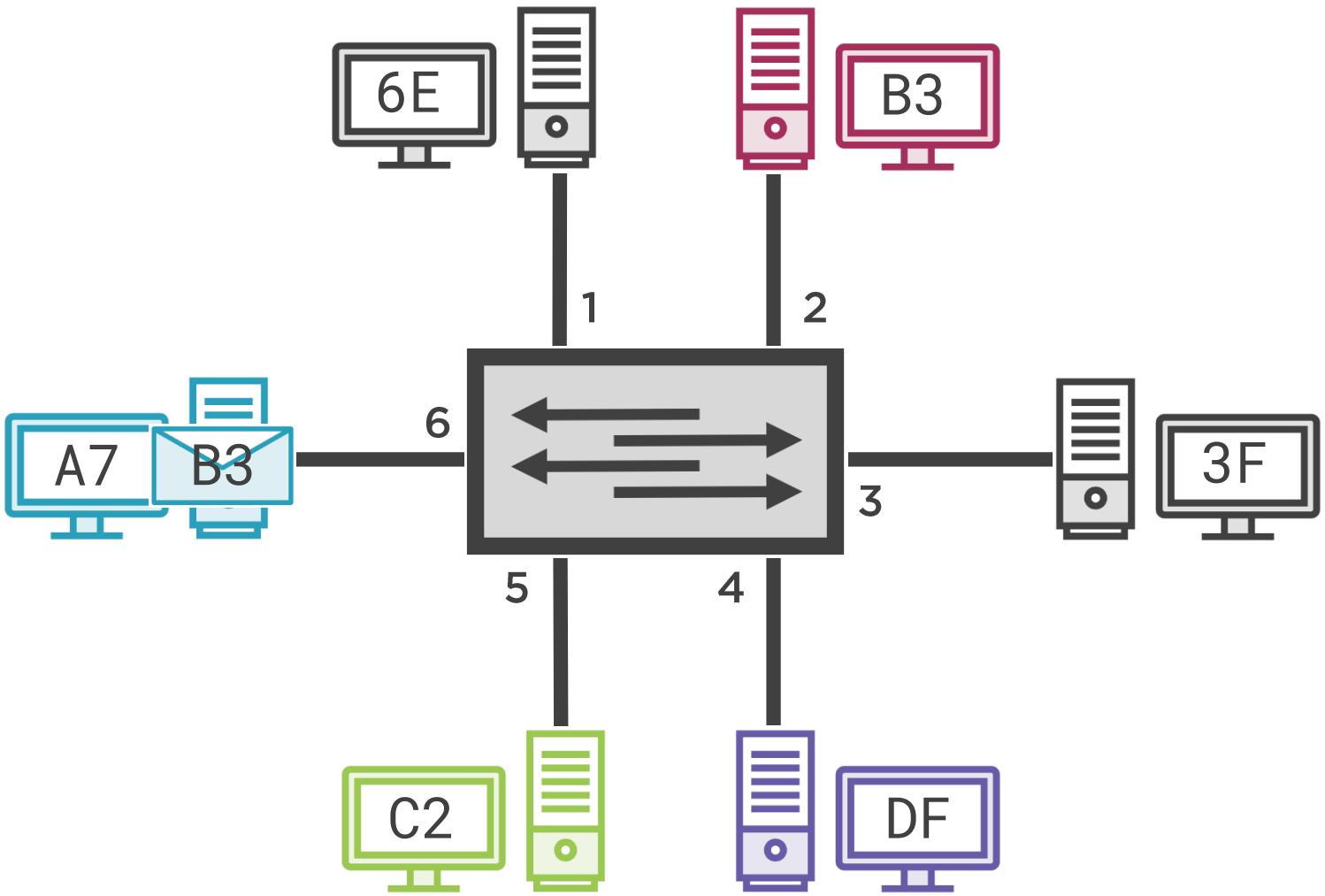
1.3



Port	MAC
1	6E
2	B3
3	3F
4	DF
5	C2
6	A7

MAC Address Table

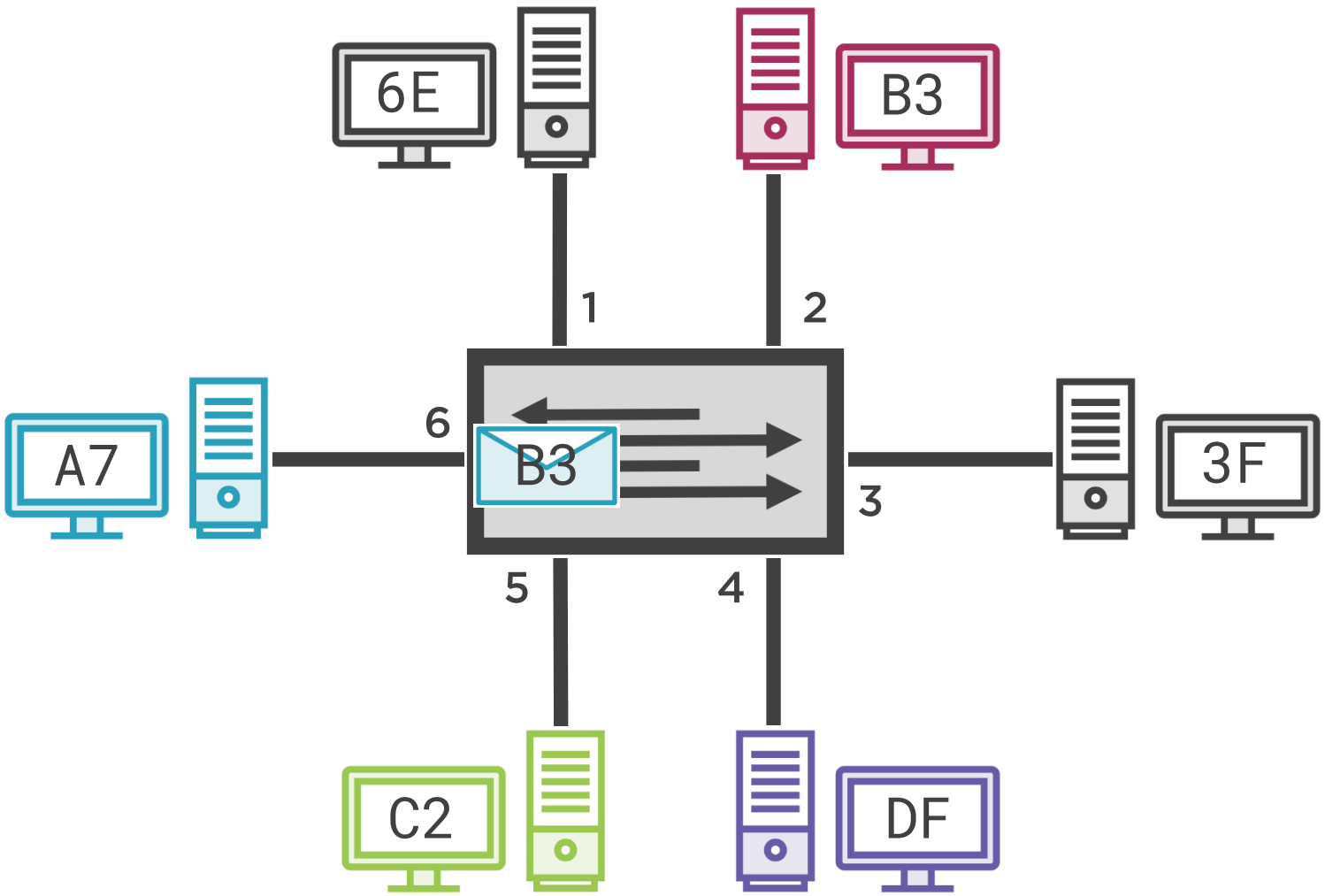
1.3



Port	MAC
1	6E
2	B3
3	3F
4	DF
5	C2
6	A7

MAC Address Table

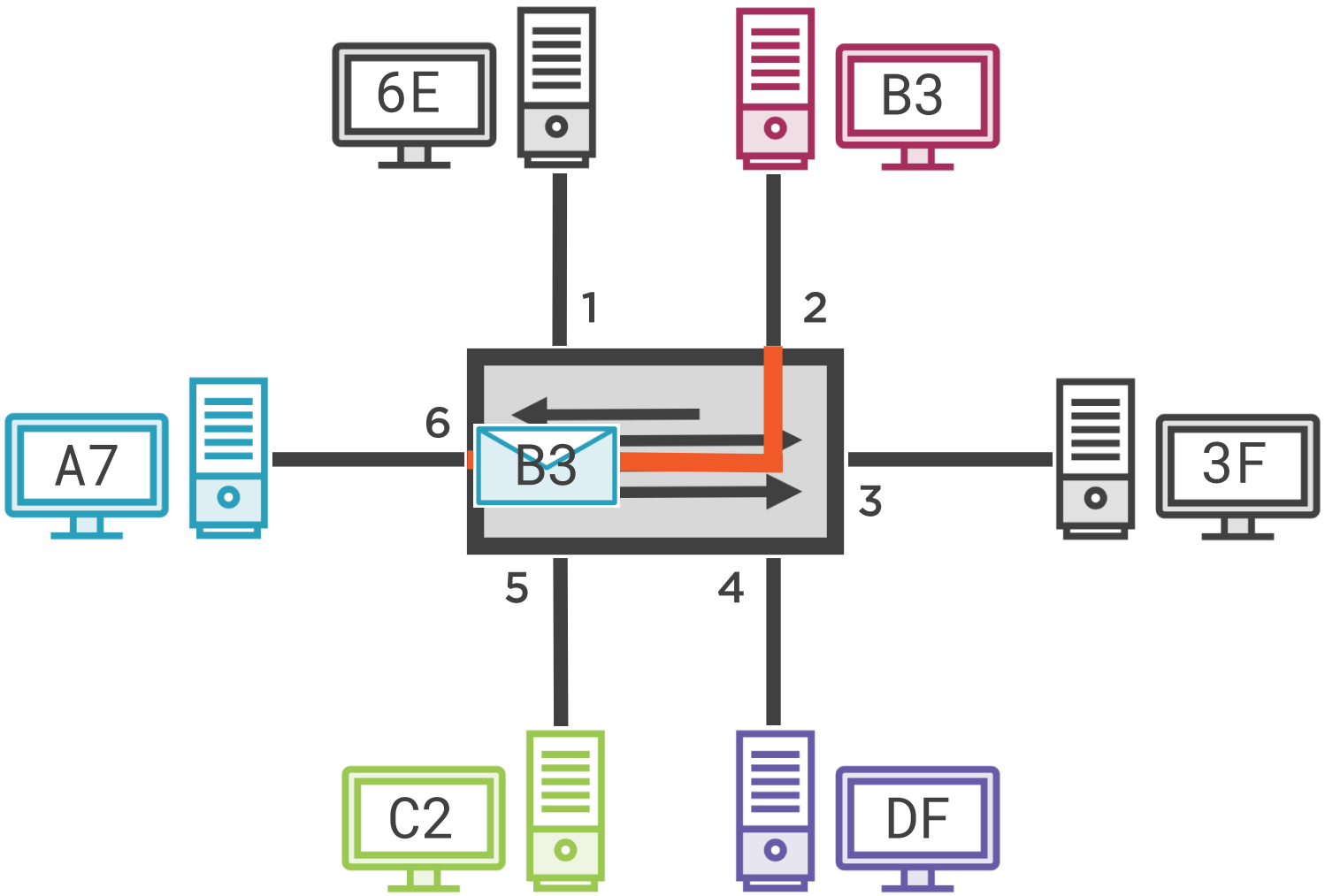
1.3



Port	MAC
1	6E
2	B3
3	3F
4	DF
5	C2
6	A7

MAC Address Table

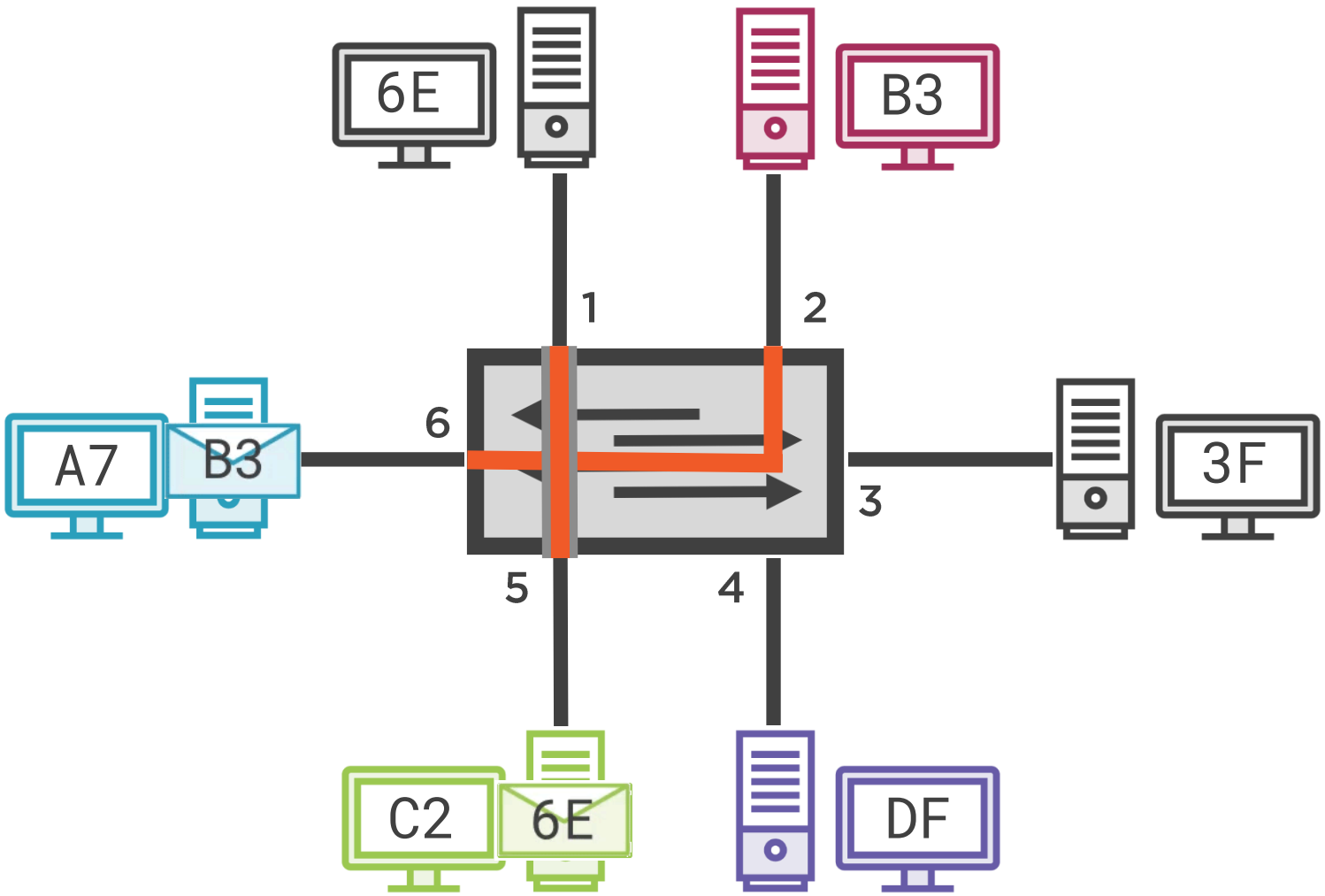
1.3



Port	MAC
1	6E
2	B3
3	3F
4	DF
5	C2
6	A7

MAC Address Table

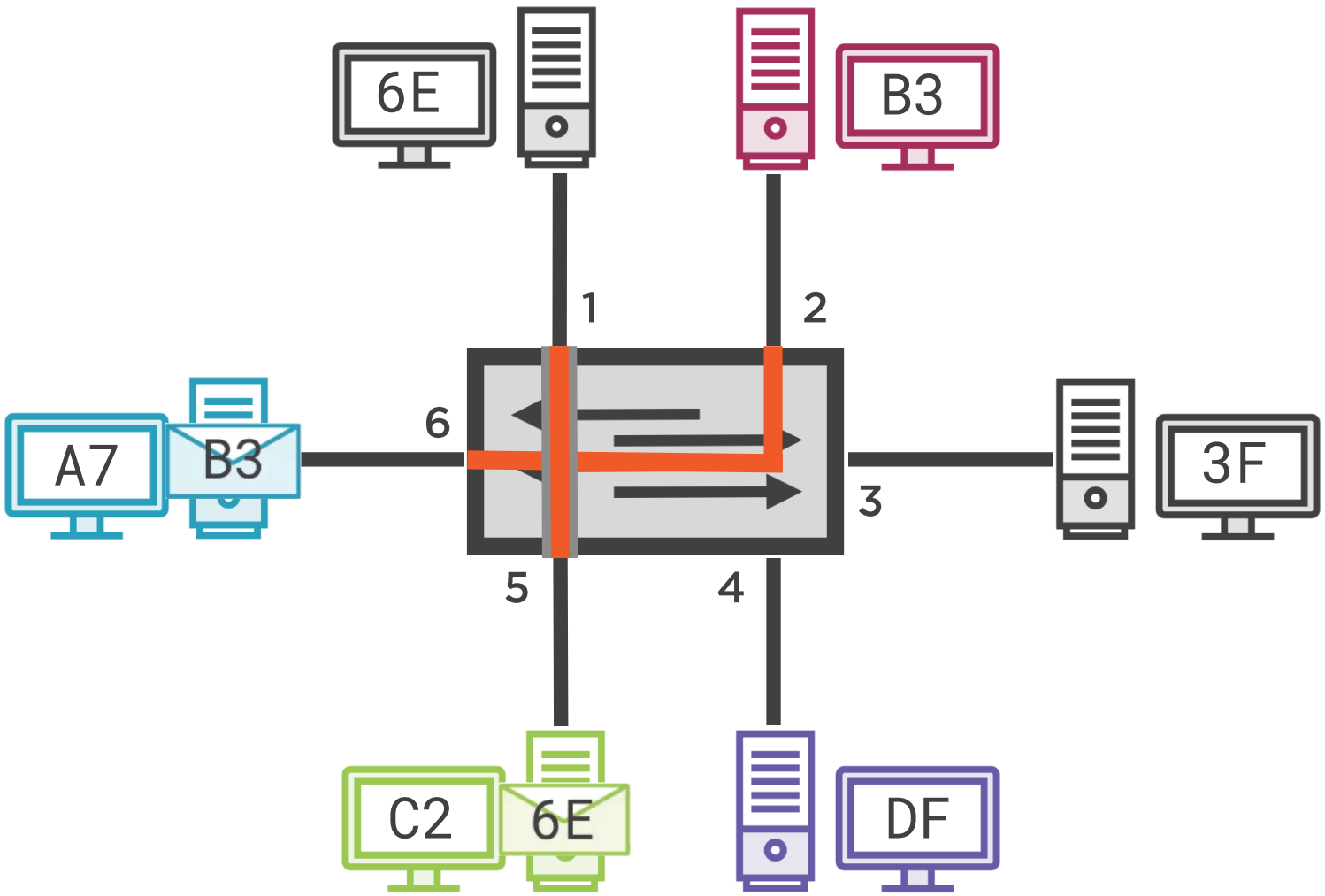
1.3



Port	MAC
1	6E
2	B3
3	3F
4	DF
5	C2
6	A7

MAC Address Table

1.3



Port	MAC
1	6E
2	B3
3	3F
4	DF
5	C2
6	A7

1.3

Broadcasts

Ethernet II Frame

1.3

Destination MAC Address	Source MAC Address	Type	Data (Packet)	FCS
FFFF FFFF FFFF	48 bits	16 bits	MAX 1500 Bytes	32 bits

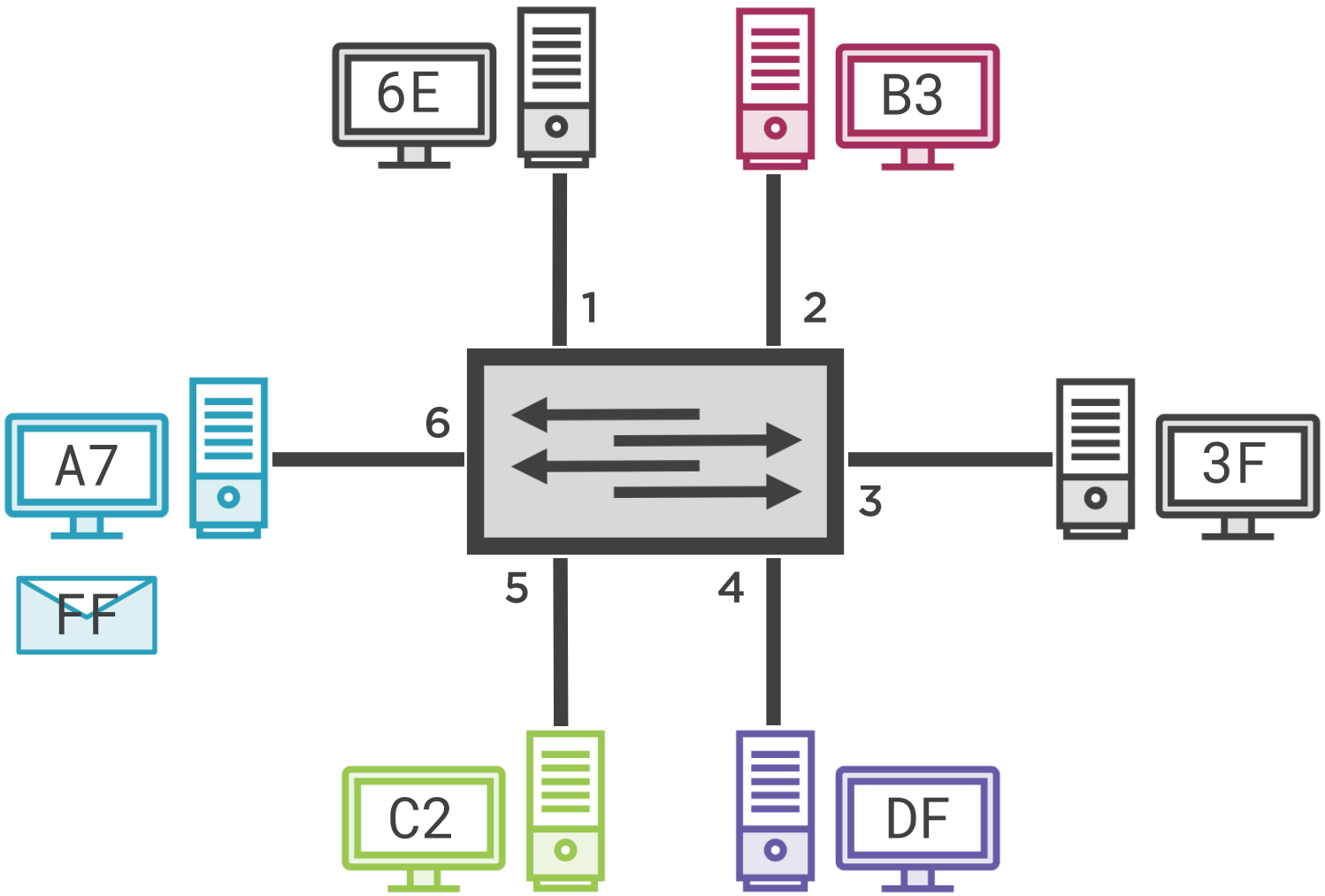
Layer 2 Broadcast Address

Broadcast

When the destination MAC address of the frame is all F's, the frame is sent out all active interfaces, except the receiving interface.

MAC Address Table

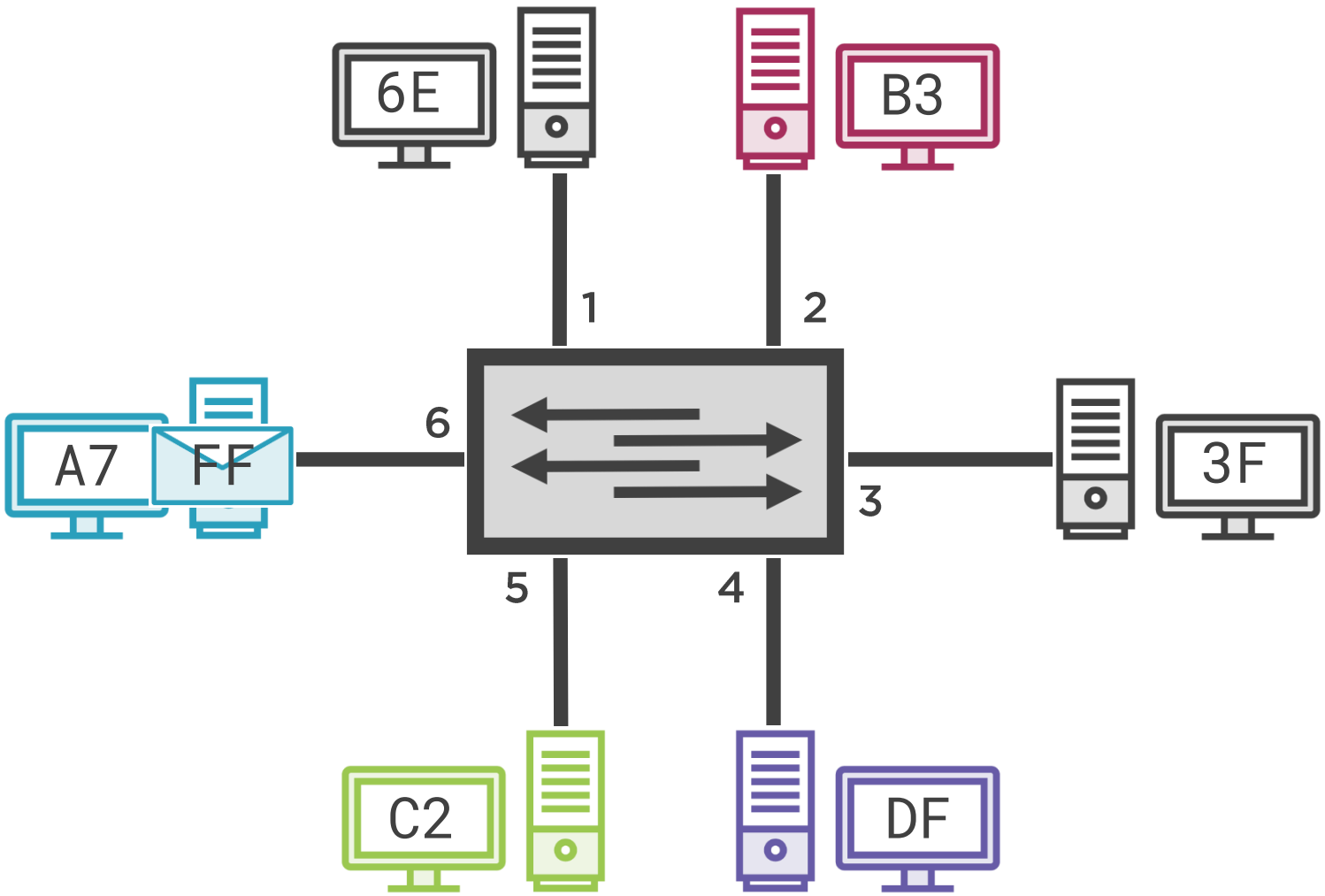
1.3



Port	MAC
1	6E
2	B3
3	3F
4	DF
5	C2
6	A7

MAC Address Table

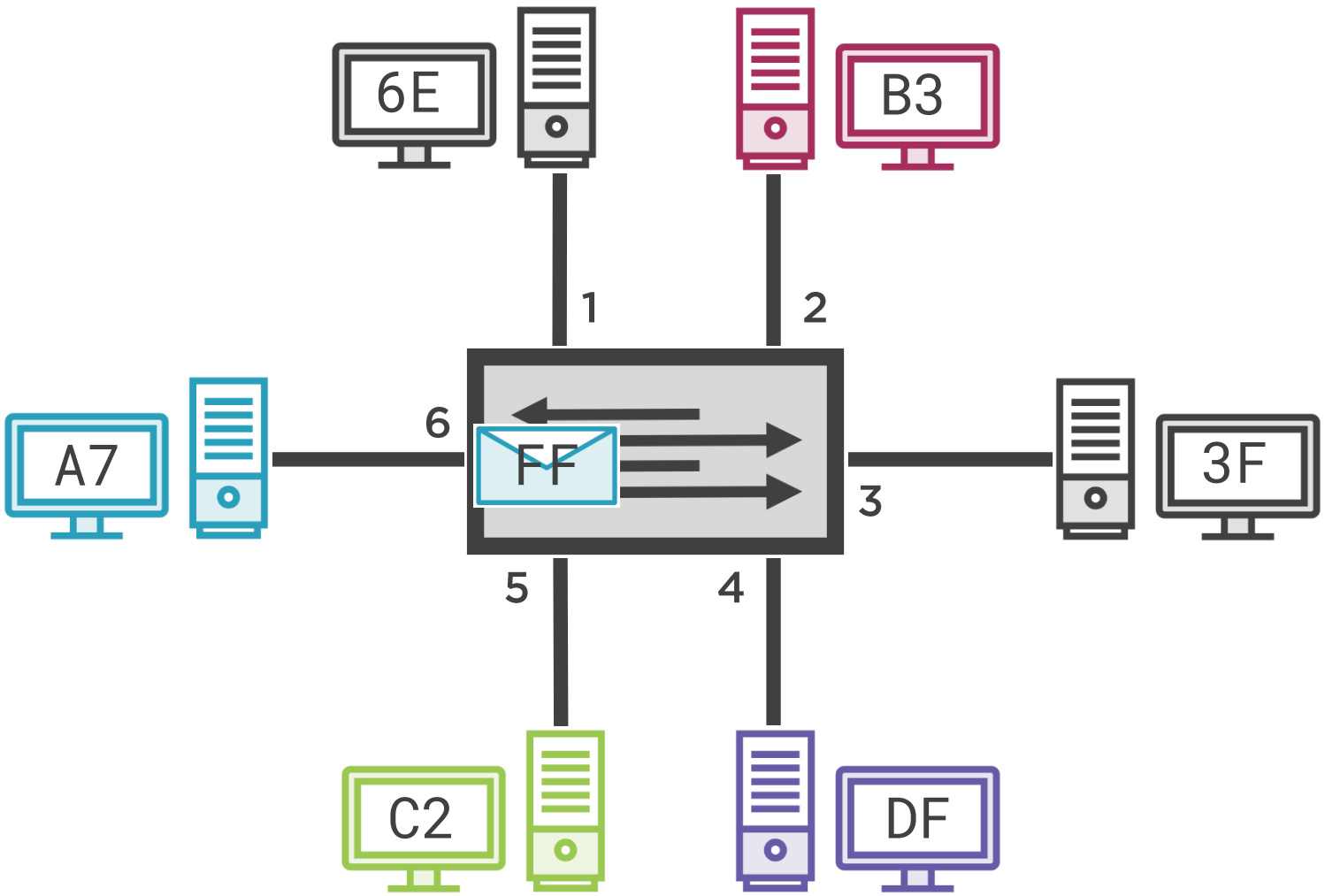
1.3



Port	MAC
1	6E
2	B3
3	3F
4	DF
5	C2
6	A7

MAC Address Table

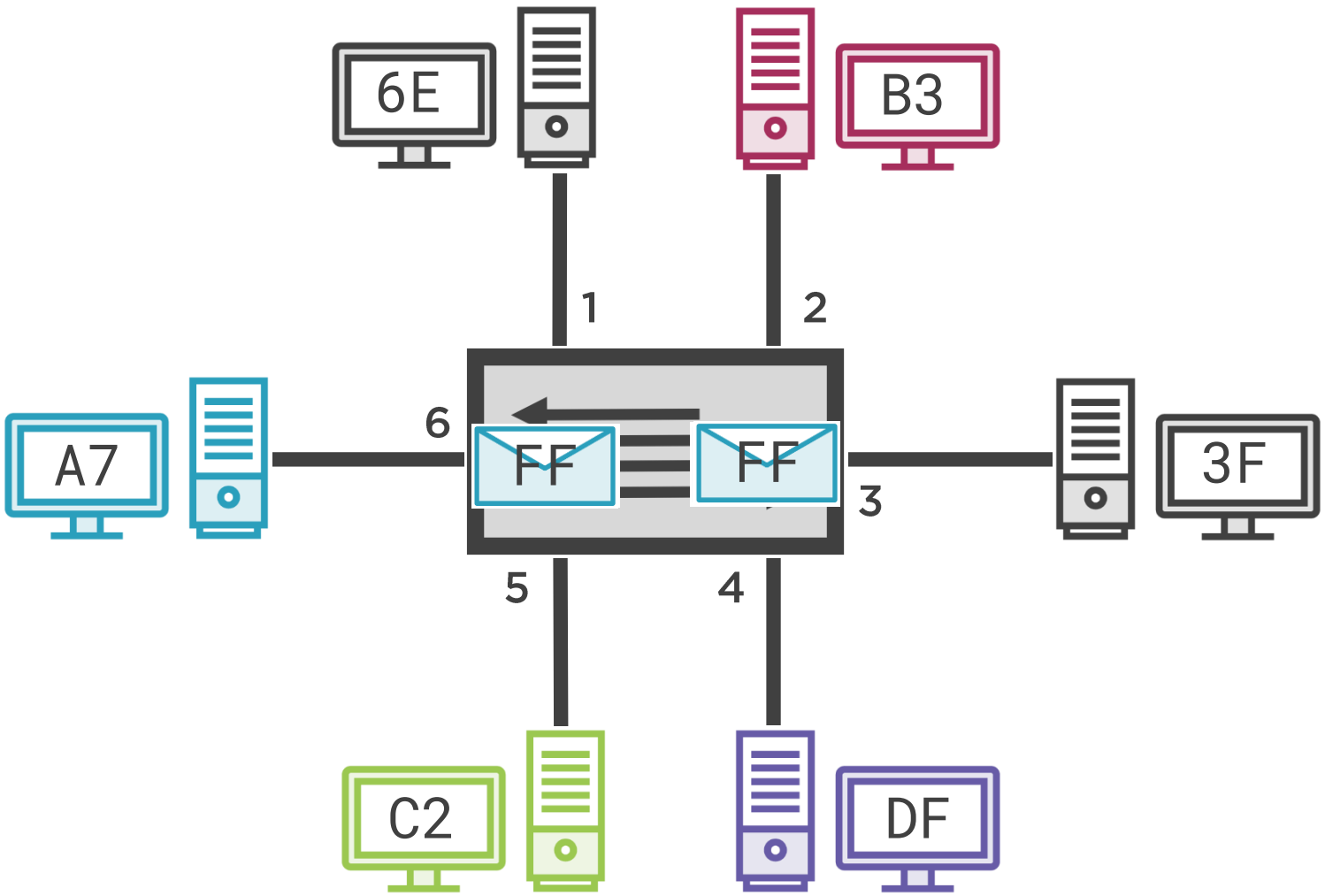
1.3



Port	MAC
1	6E
2	B3
3	3F
4	DF
5	C2
6	A7

MAC Address Table

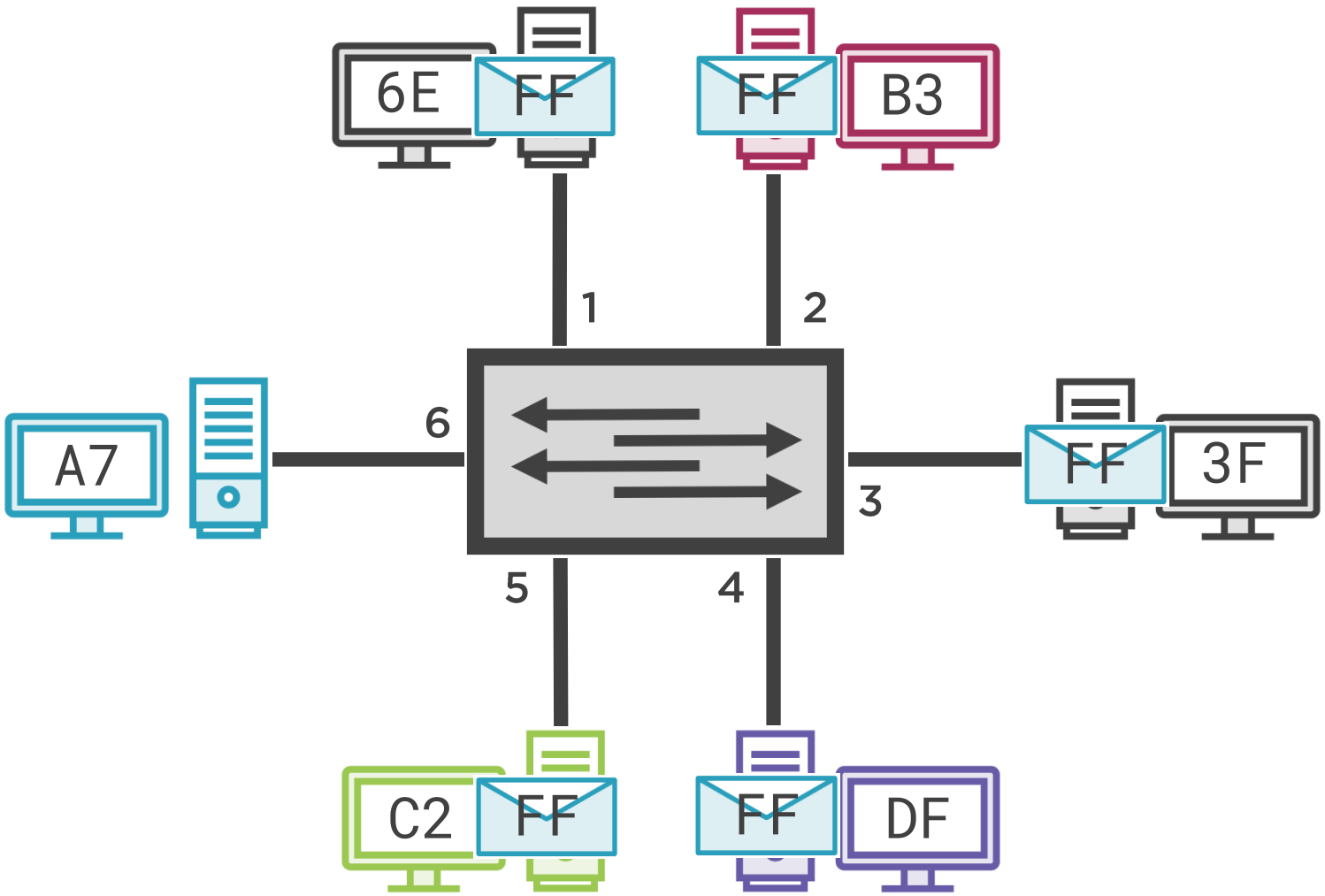
1.3



Port	MAC
1	6E
2	B3
3	3F
4	DF
5	C2
6	A7

MAC Address Table

1.3



Port	MAC
1	6E
2	B3
3	3F
4	DF
5	C2
6	A7

Broadcast Domain

Group of networked devices which will receive a layer 2 broadcast message.

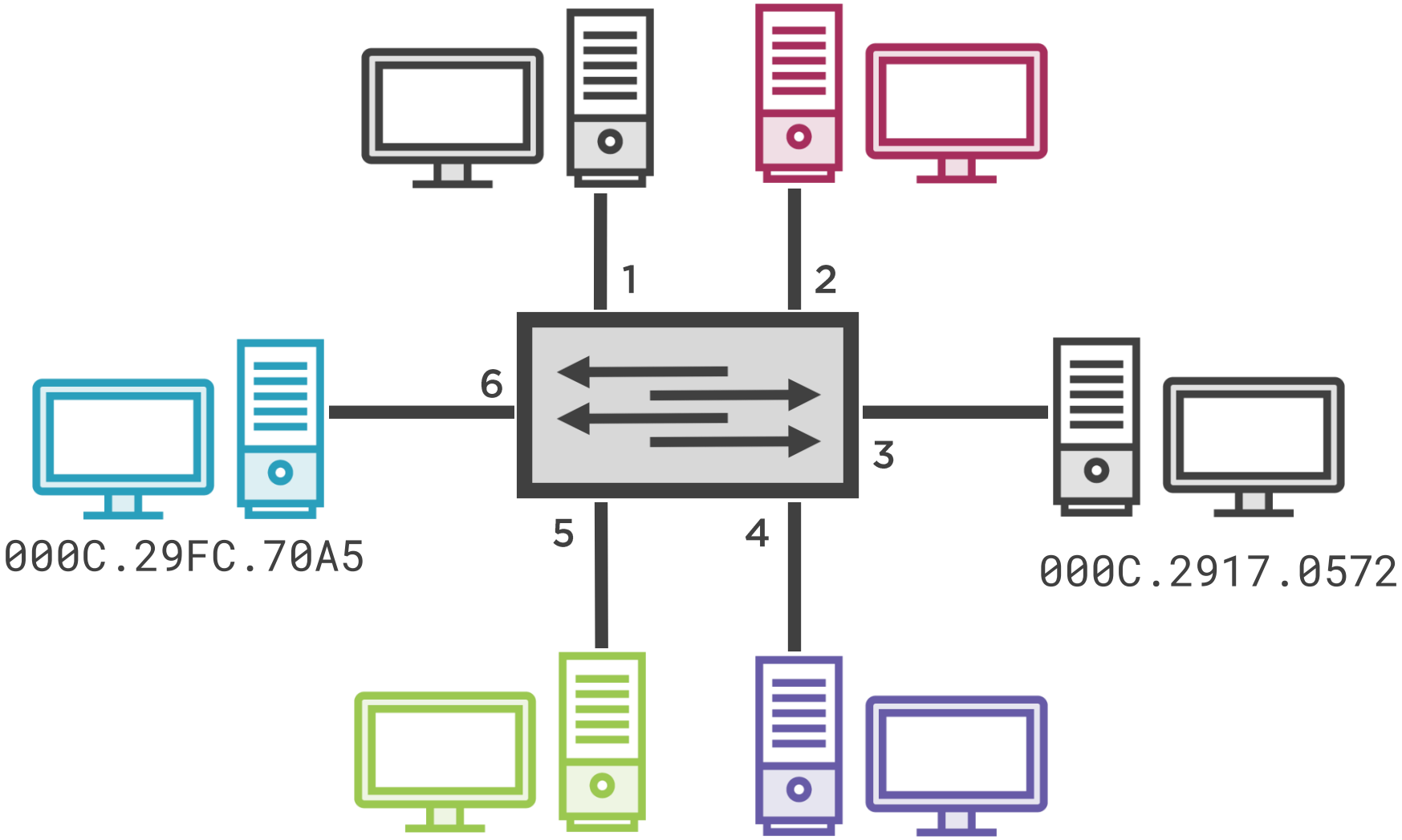
1.3

Demo

Examine the MAC Address Table

Ethernet Switch

1.3

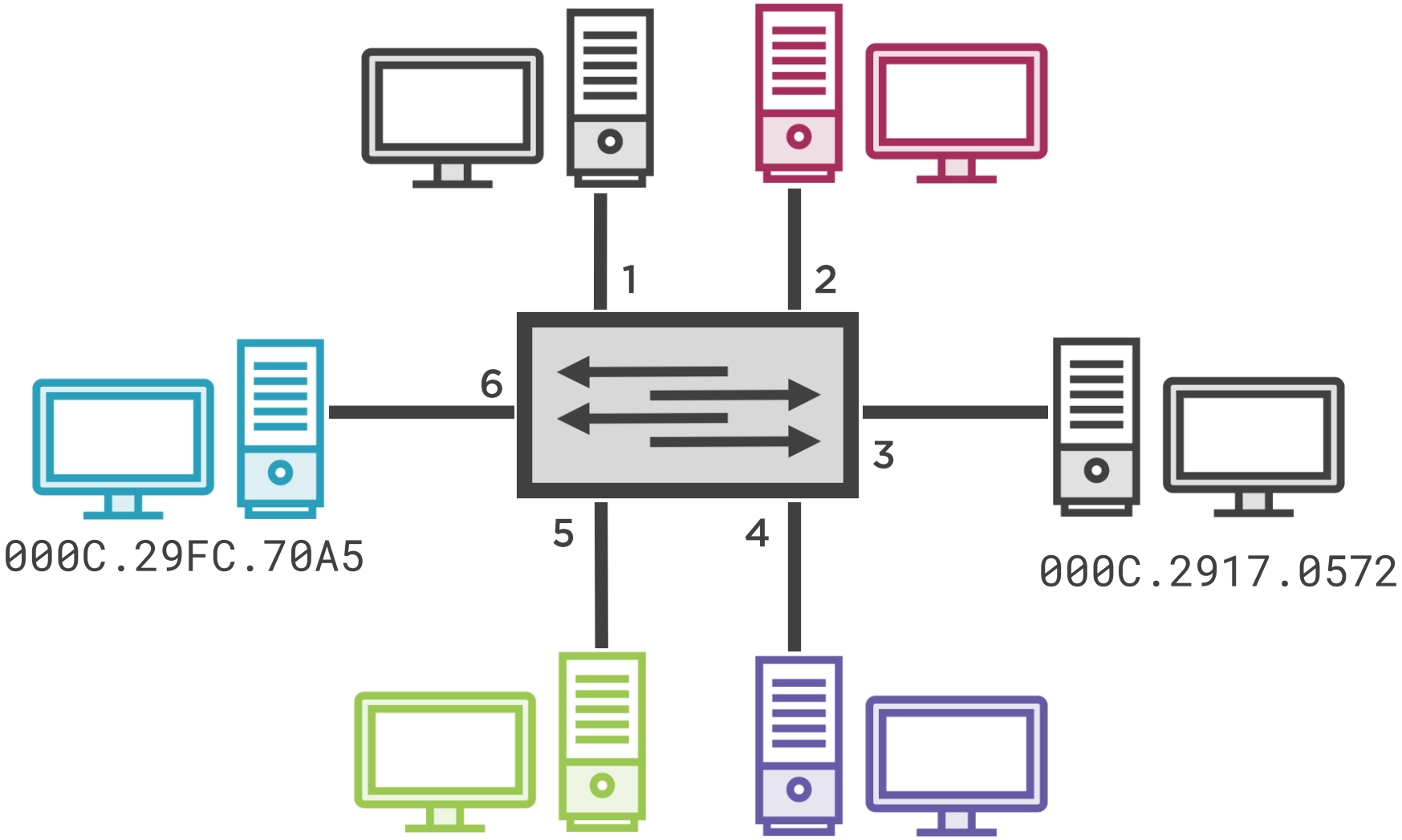


Ethernet Switch

1.3

Ethernet Switch

1.3



Summary

CSMA/CD

Collision Domains

Duplex and Speed

The Ethernet Frame