

Network Services



Ross Bagurdes

NETWORK ENGINEER

@Bagurdes



Module Goals



OSI Model Review

Network Topologies

Network Address Translation

Access Control Lists

Traffic Shaping

Dynamic Host Configuration Protocol

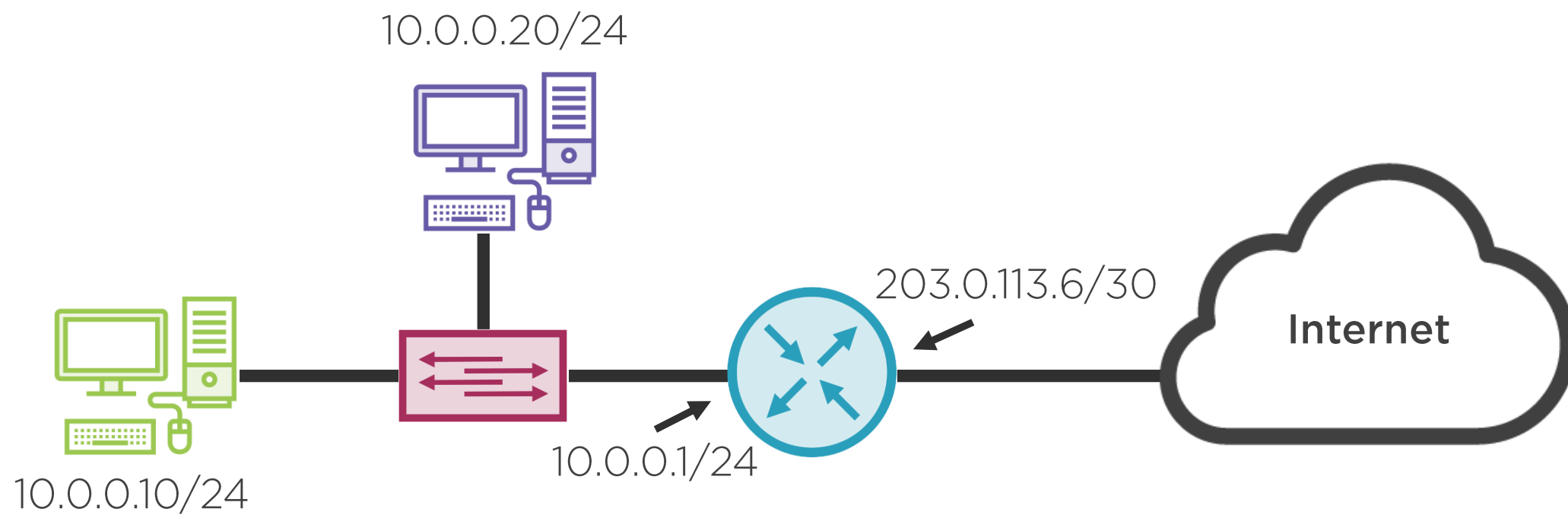
Domain Name System



OSI Model

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

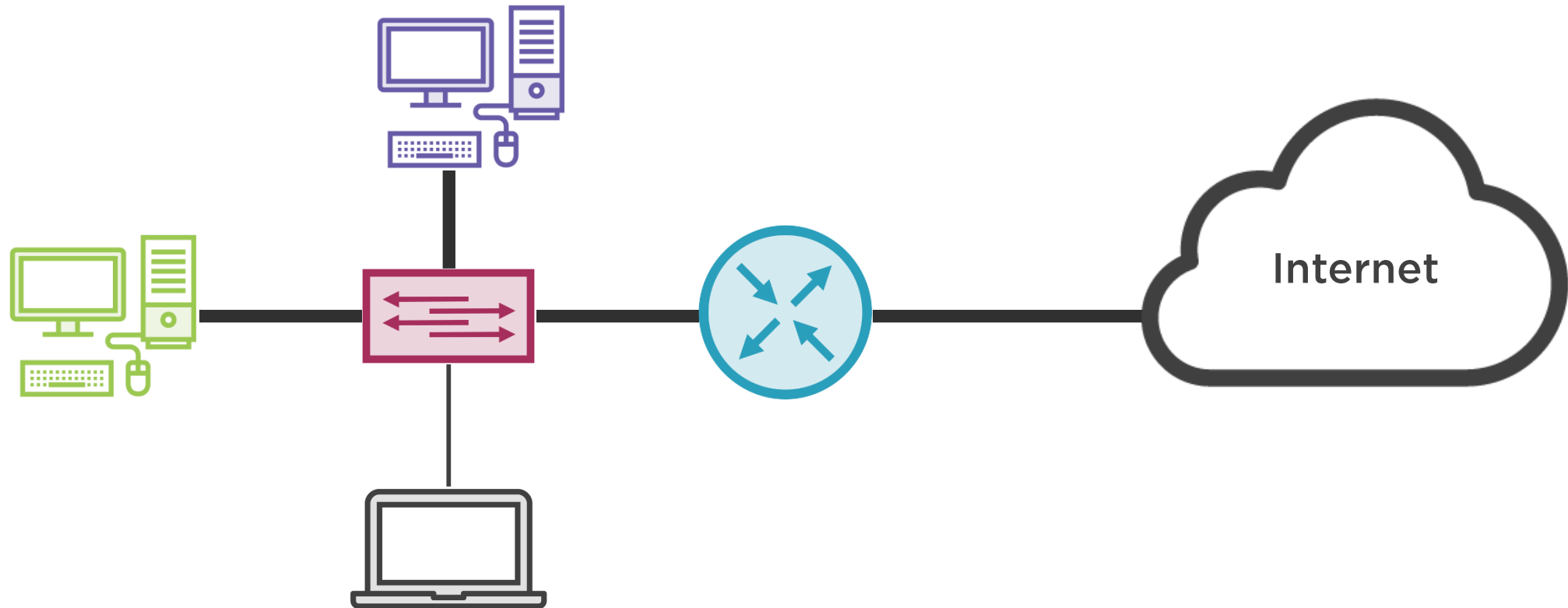




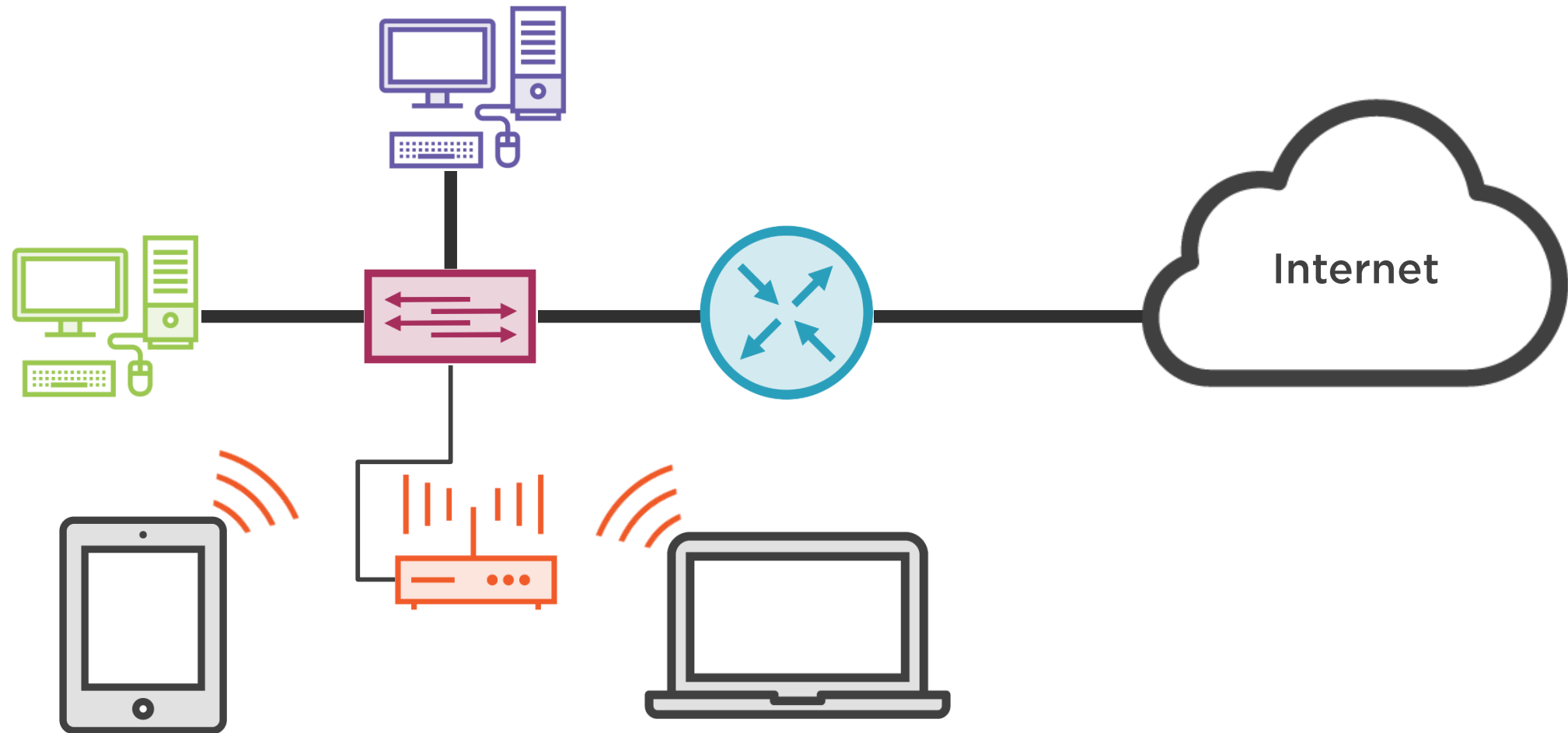
Network Topologies



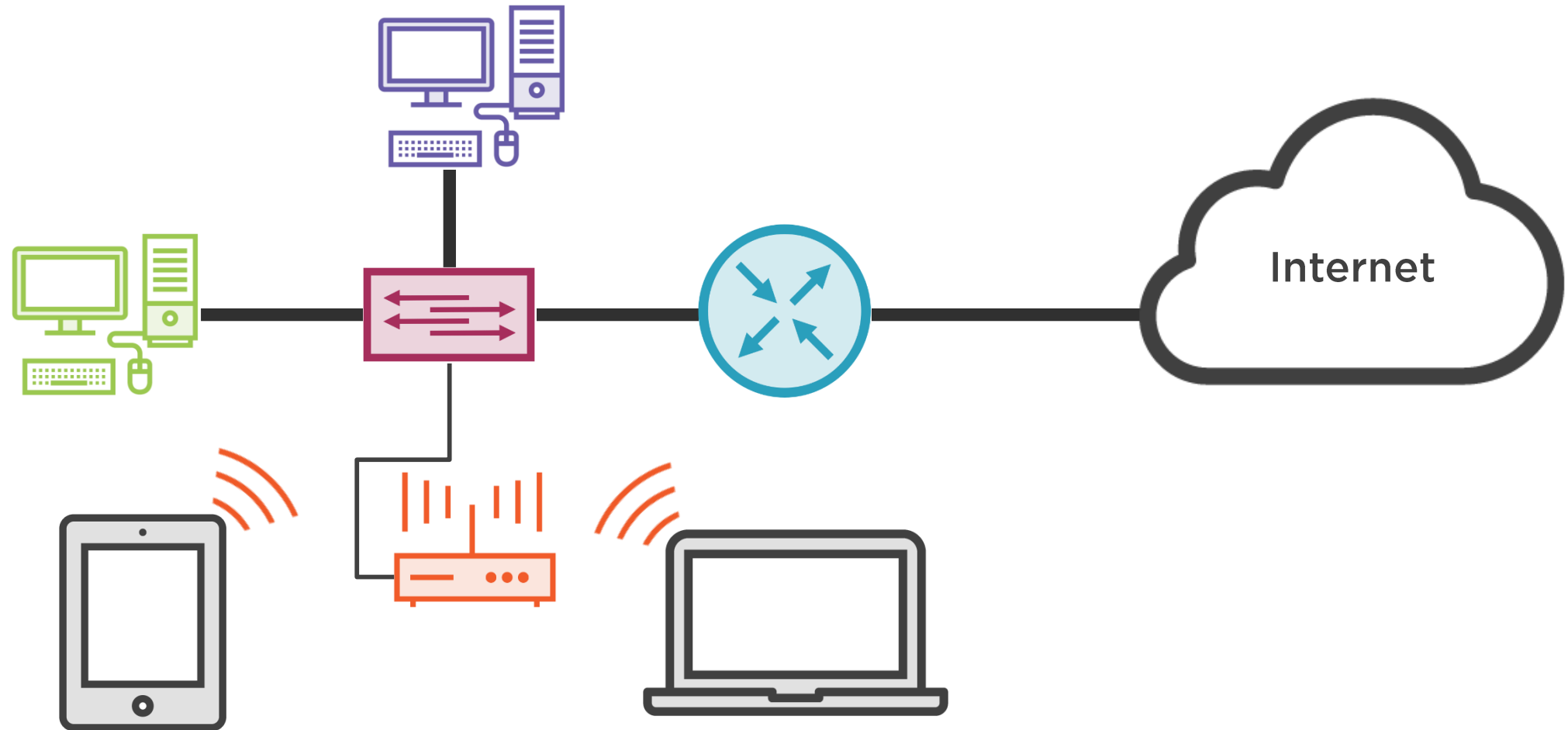
Local Area Network LAN

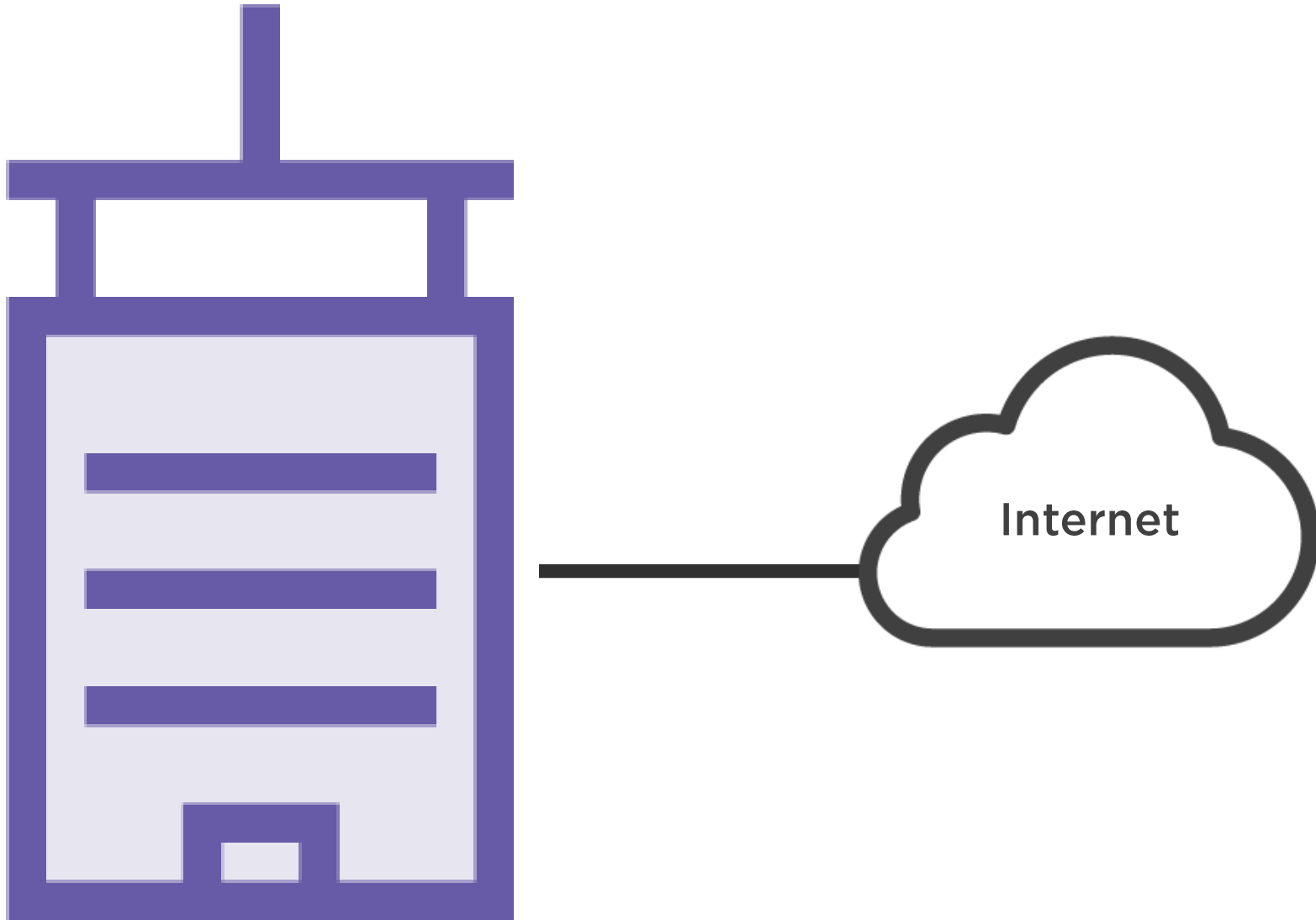


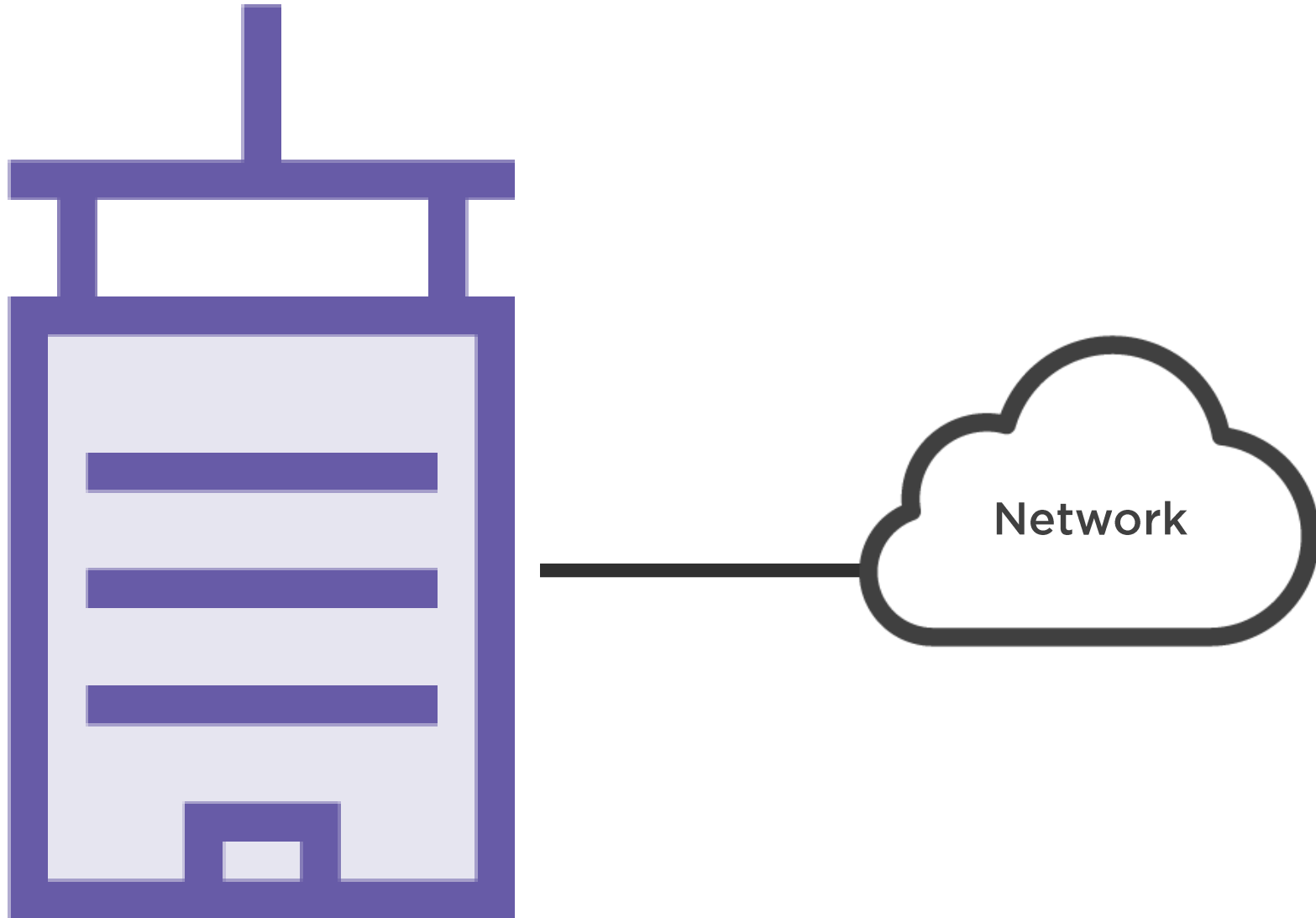
Local Area Network LAN



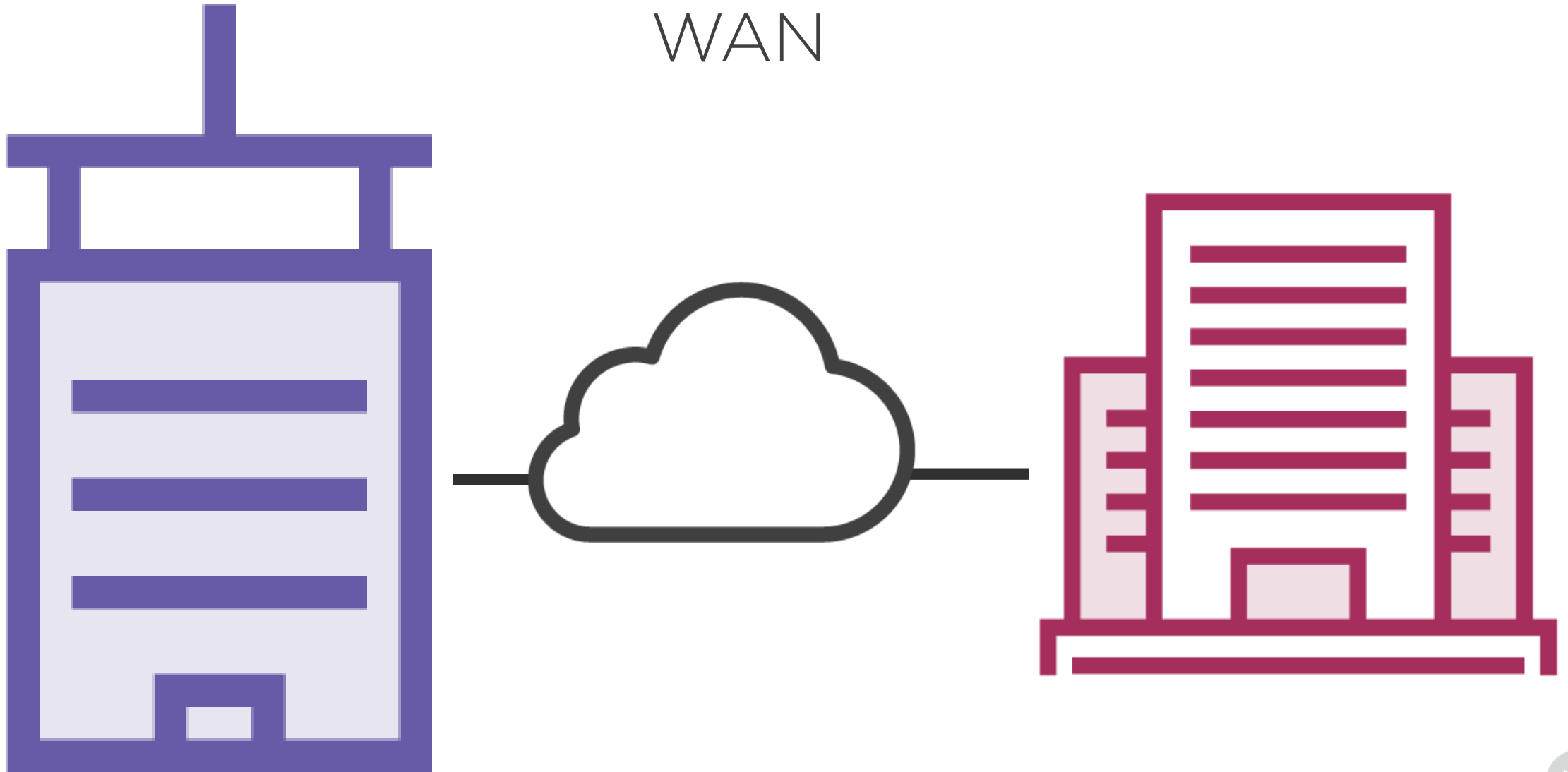
Wireless Local Area Network WLAN







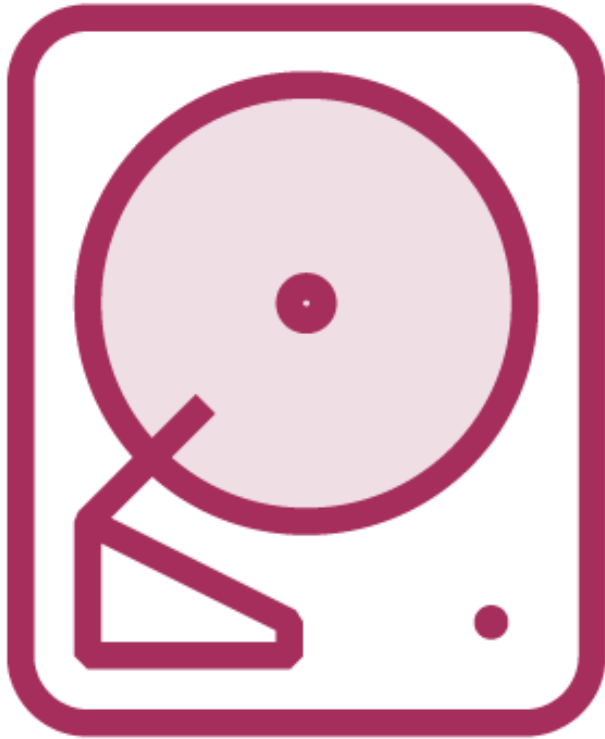
Wide Area Network WAN





Wide Area Networks

- Campus Area Network (CAN)
- Metropolitan Area Network (MAN)



- Storage Area Network (SAN)
- Personal Area Network (PAN)

Network Services

Network Address
Translation



Private IP Address

Private IP Address Range

10.0.0.0/8

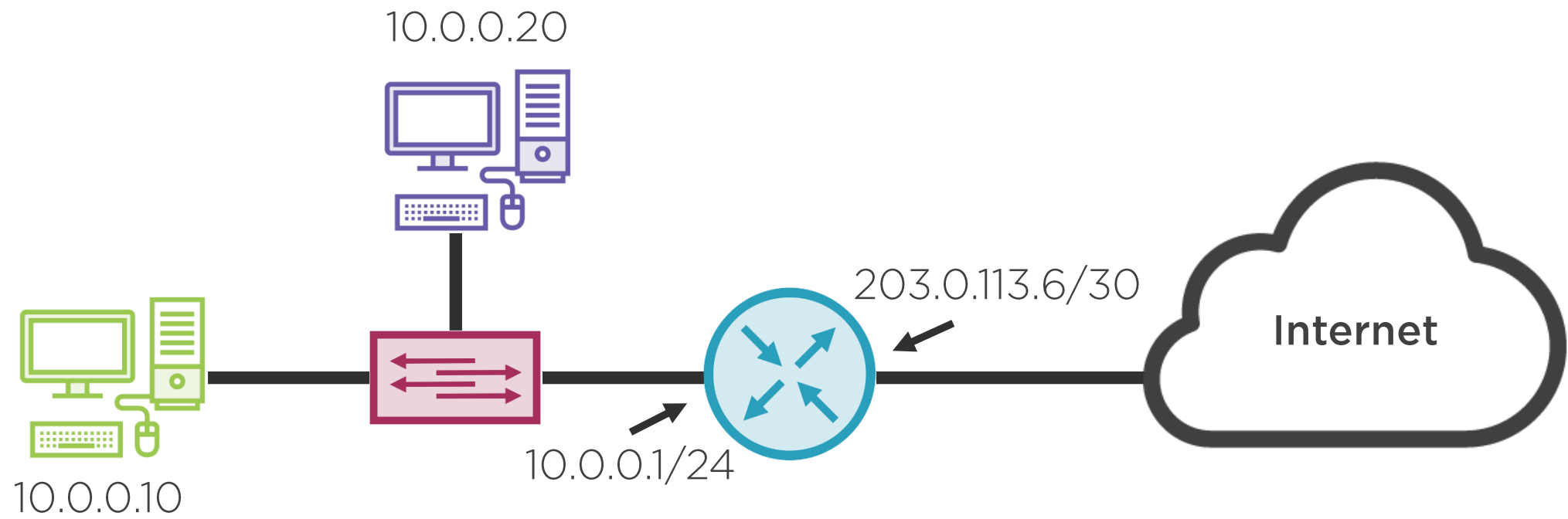
172.16.0.0/12

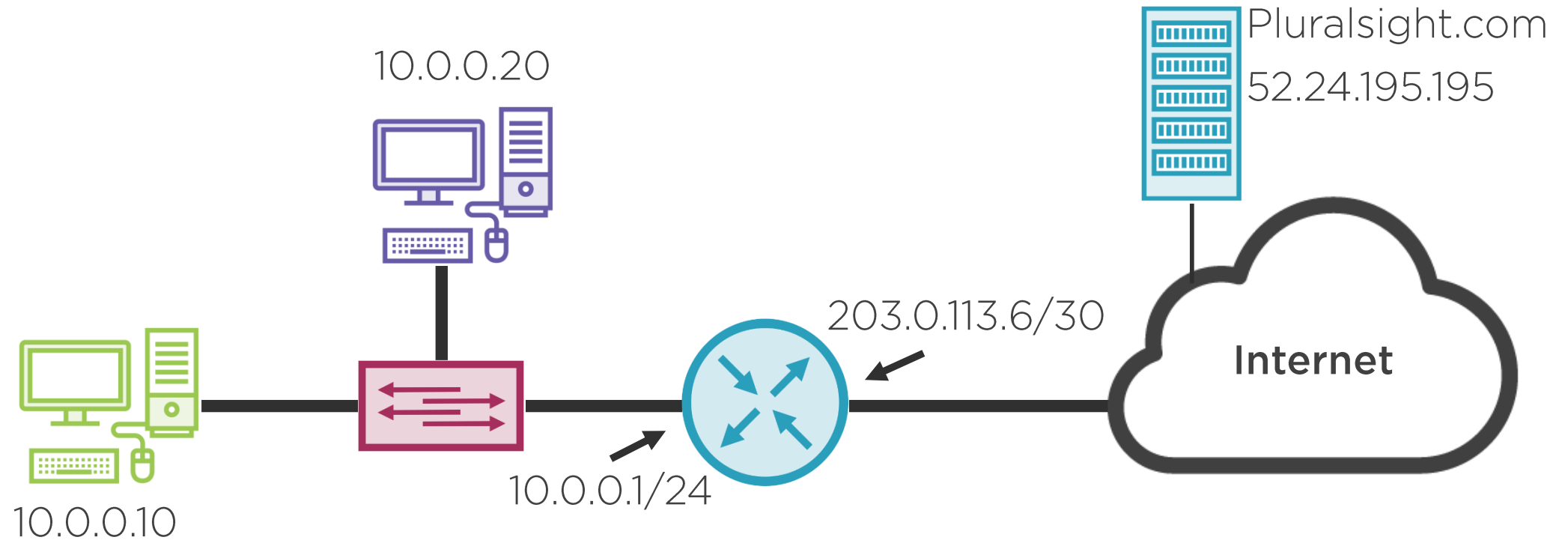
192.168.0.0/16

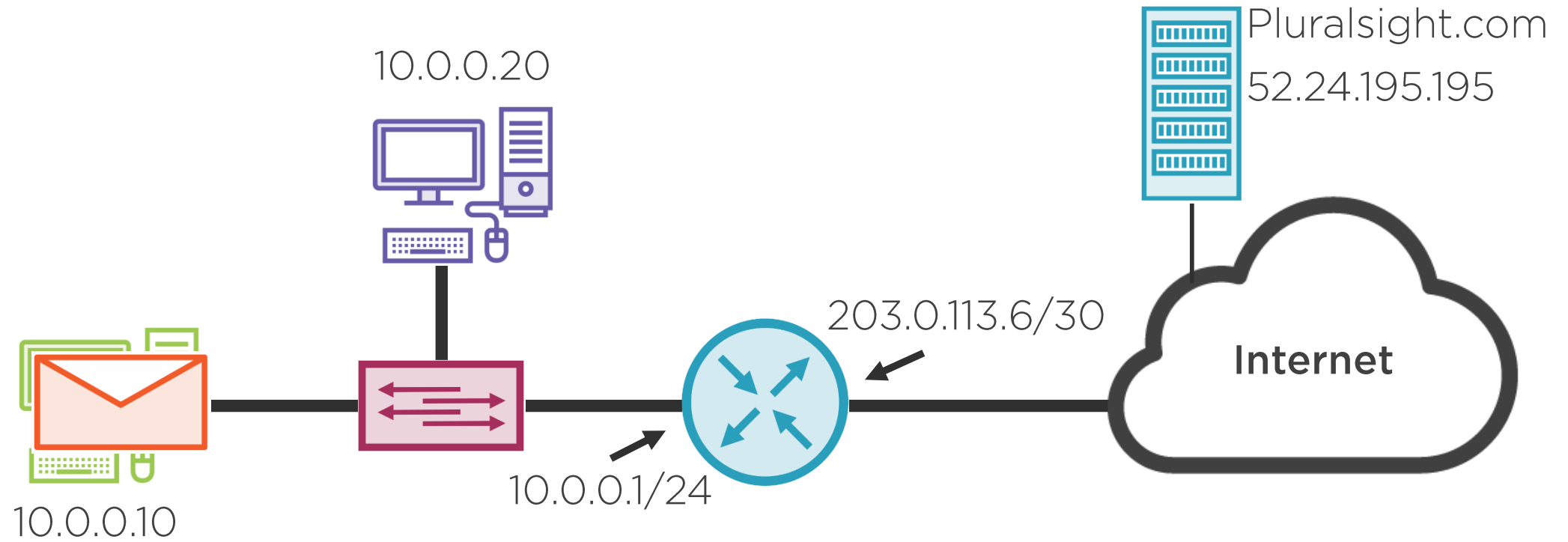
APIPA

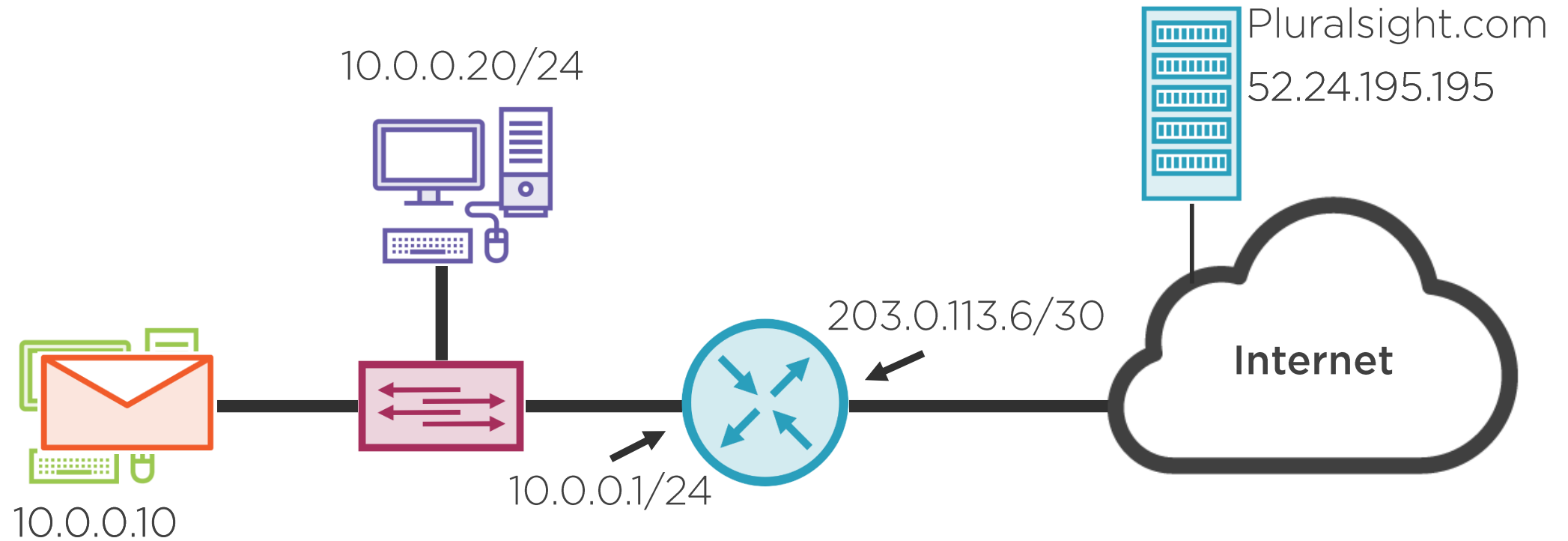
169.254.0.0/16





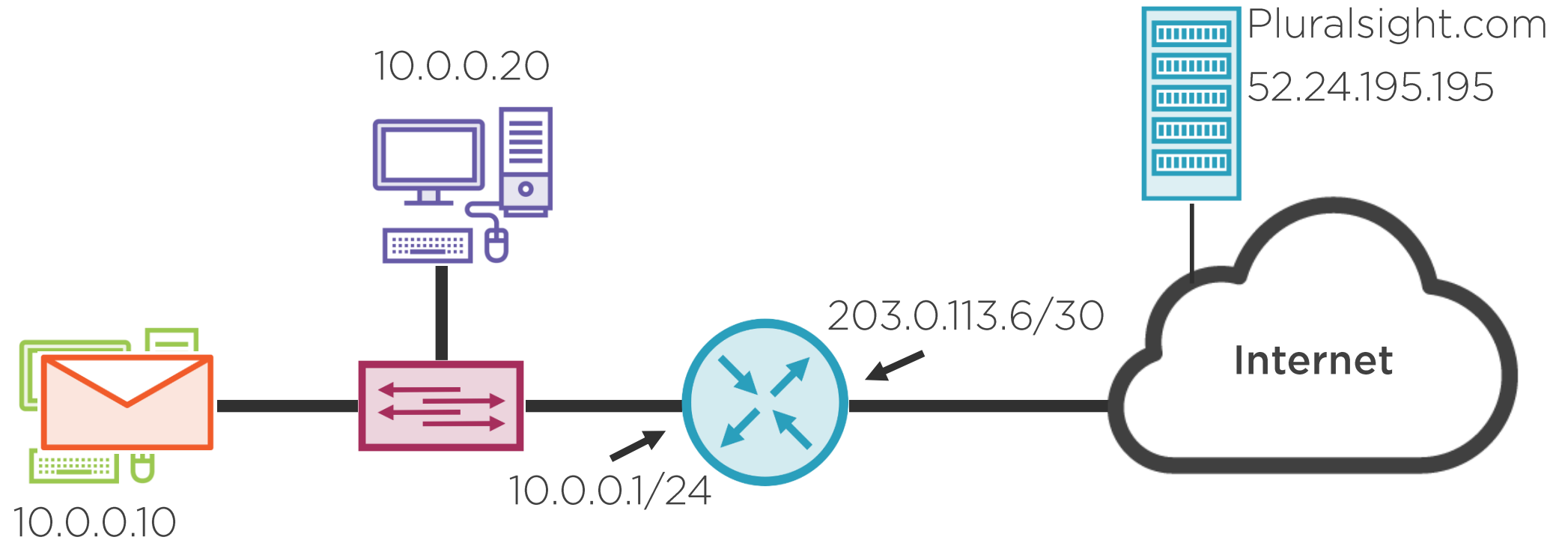






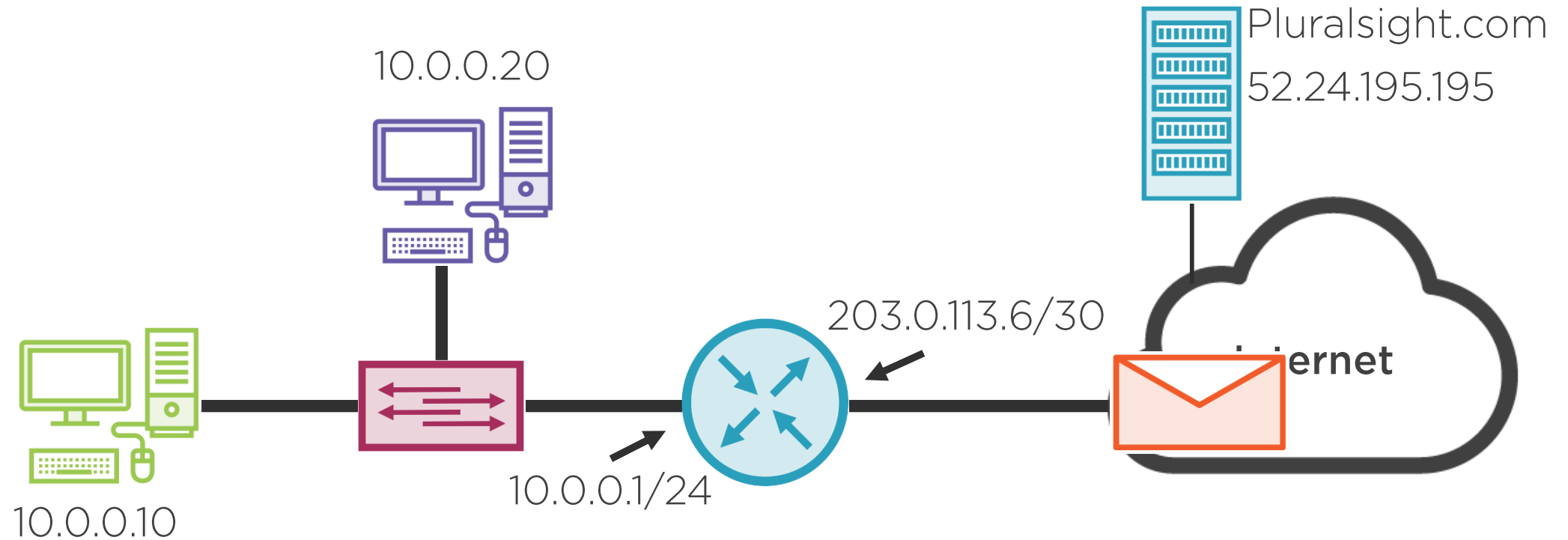
Source IP	Destination IP





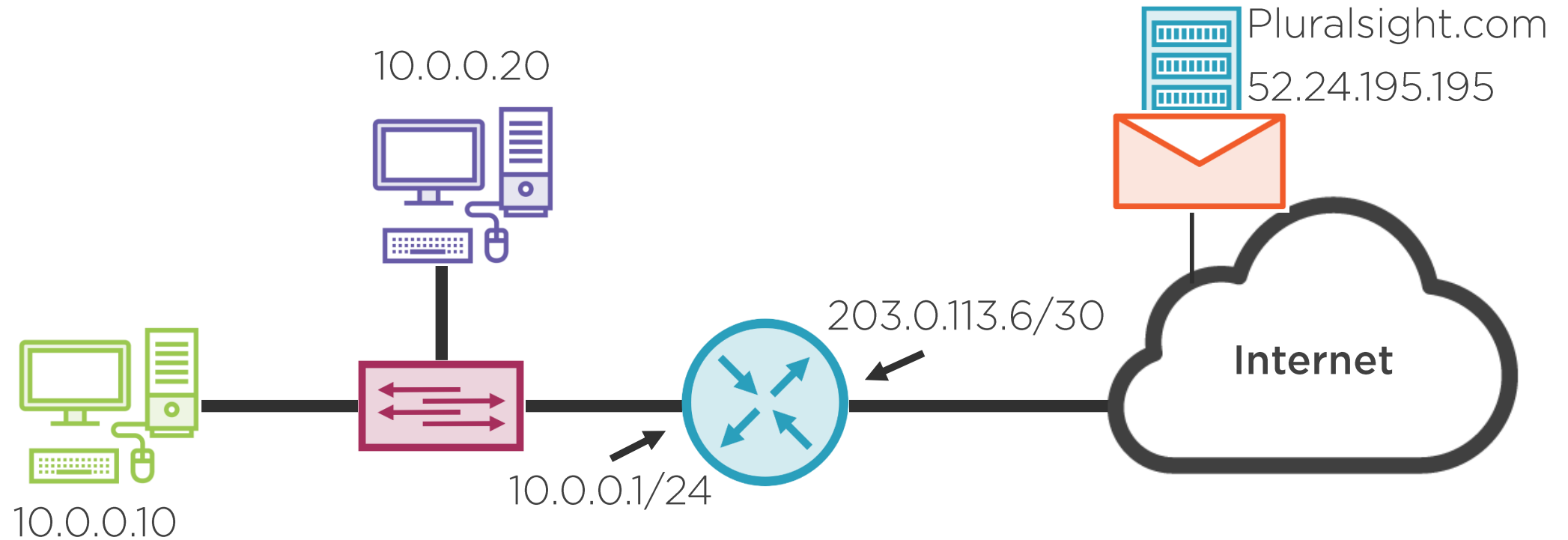
Source IP	Destination IP
10.0.0.10	52.24.195.195





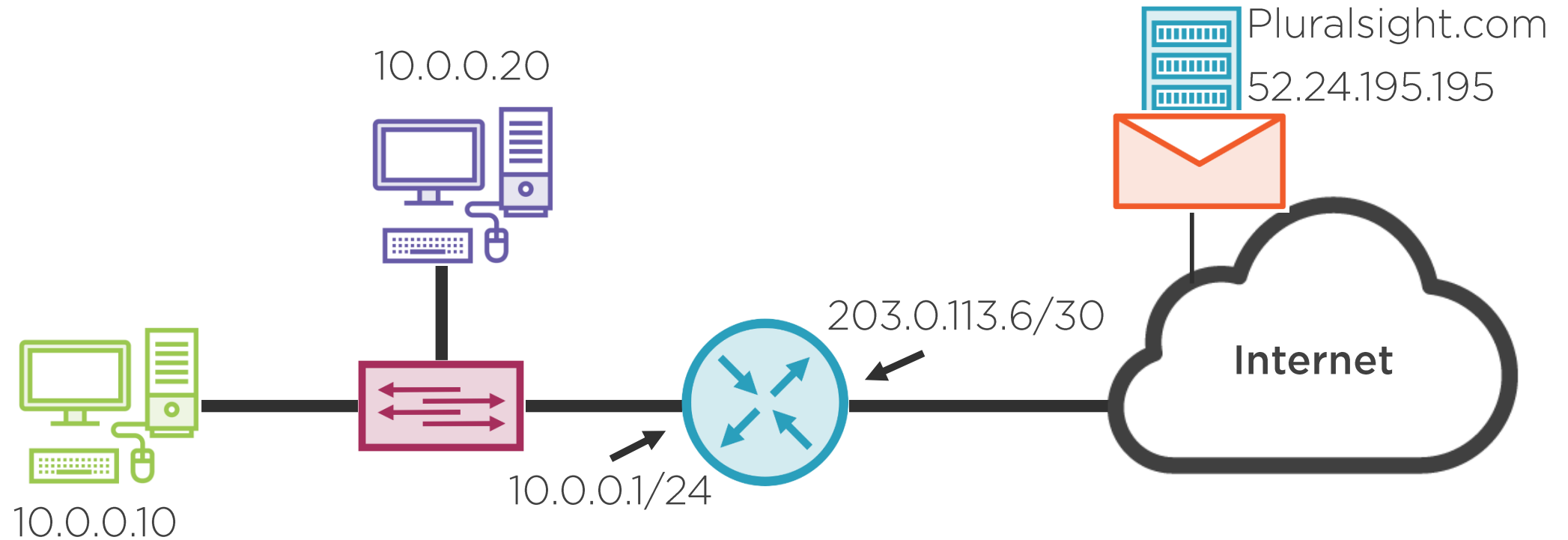
Source IP	Destination IP
10.0.0.10	52.24.195.195





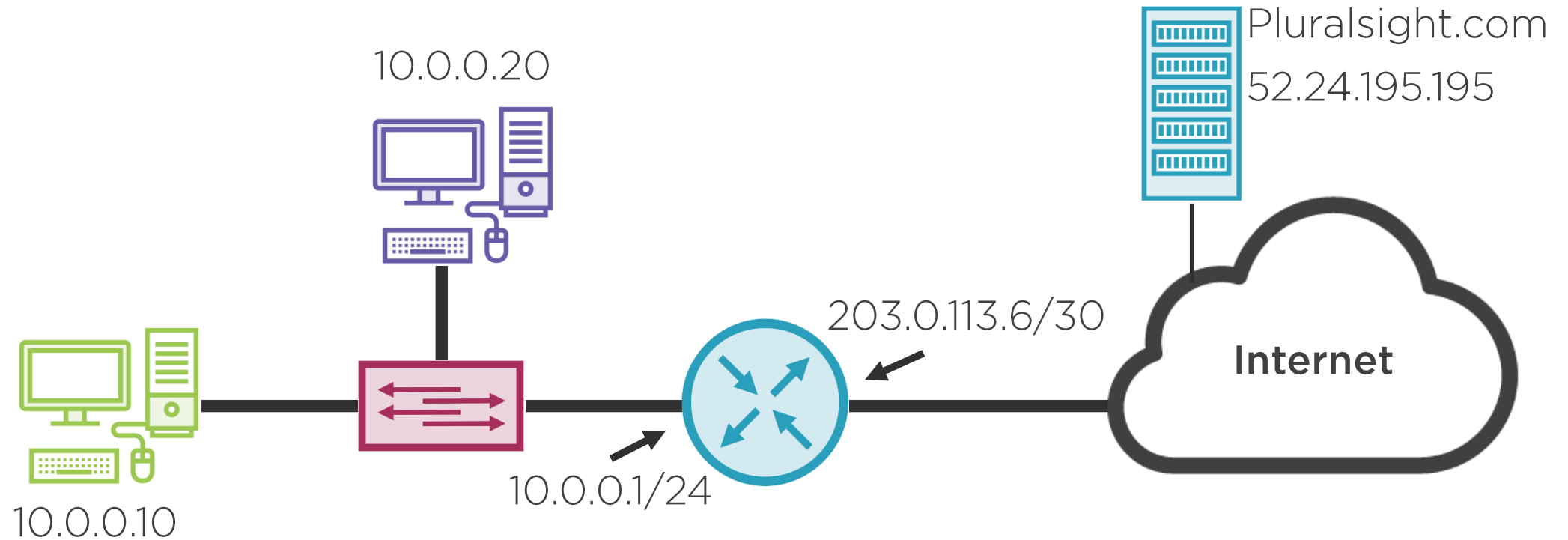
Source IP	Destination IP
10.0.0.10	52.24.195.195





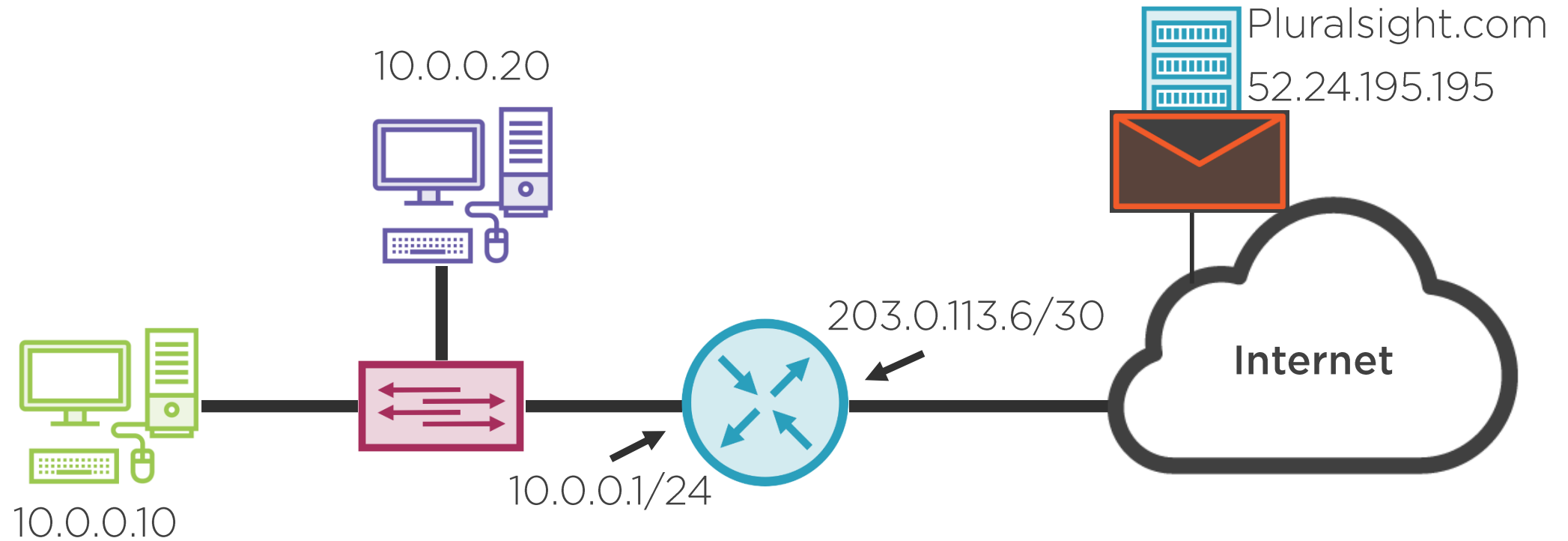
Source IP	Destination IP
10.0.0.10	52.24.195.195





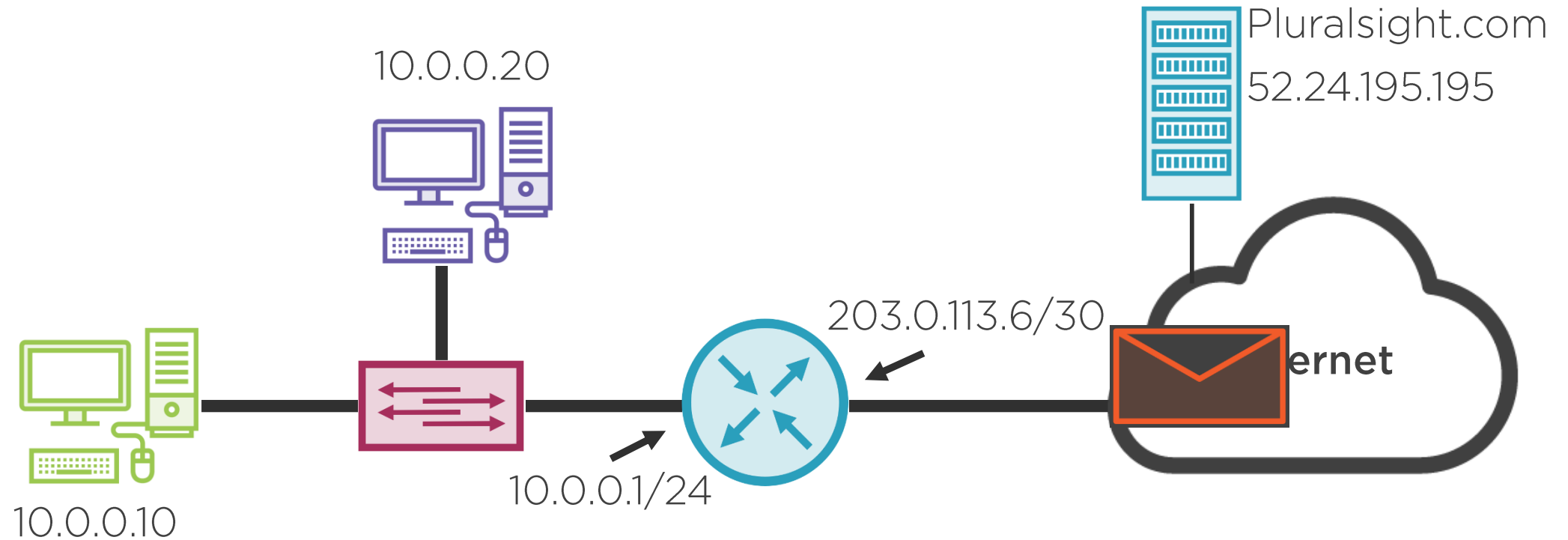
Source IP	Destination IP
10.0.0.10	52.24.195.195





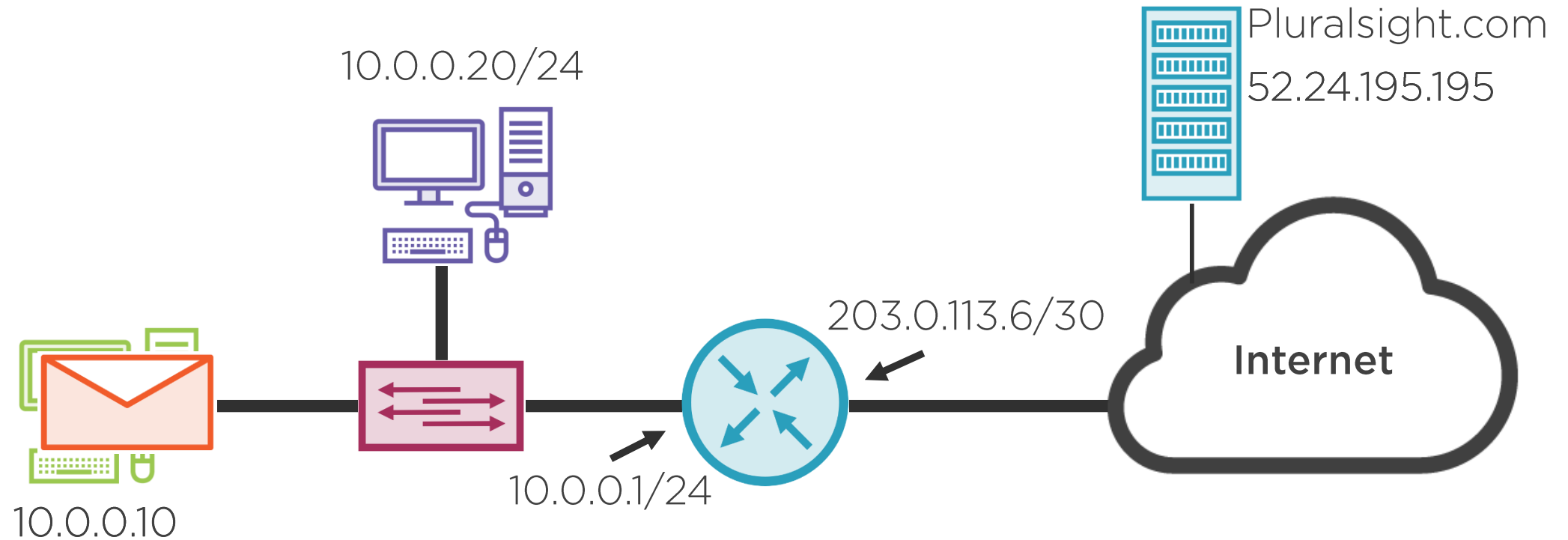
Source IP	Destination IP
52.24.195.195	10.0.0.10





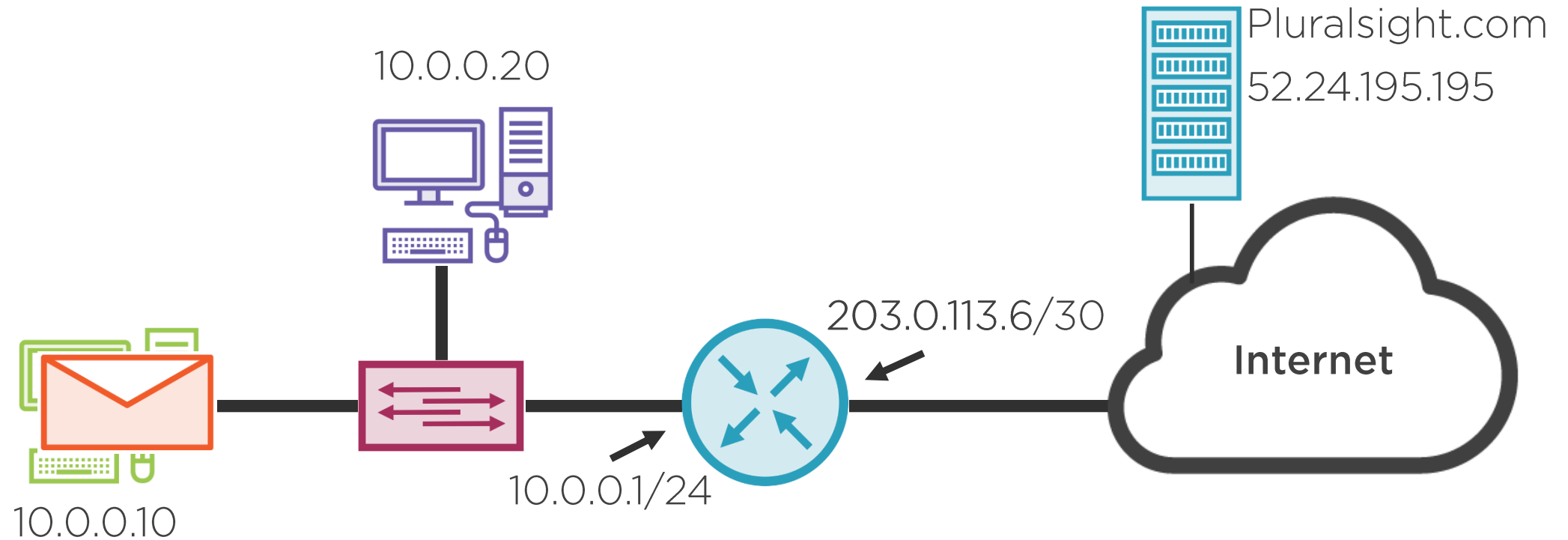
Source IP	Destination IP
52.24.195.195	10.0.0.10





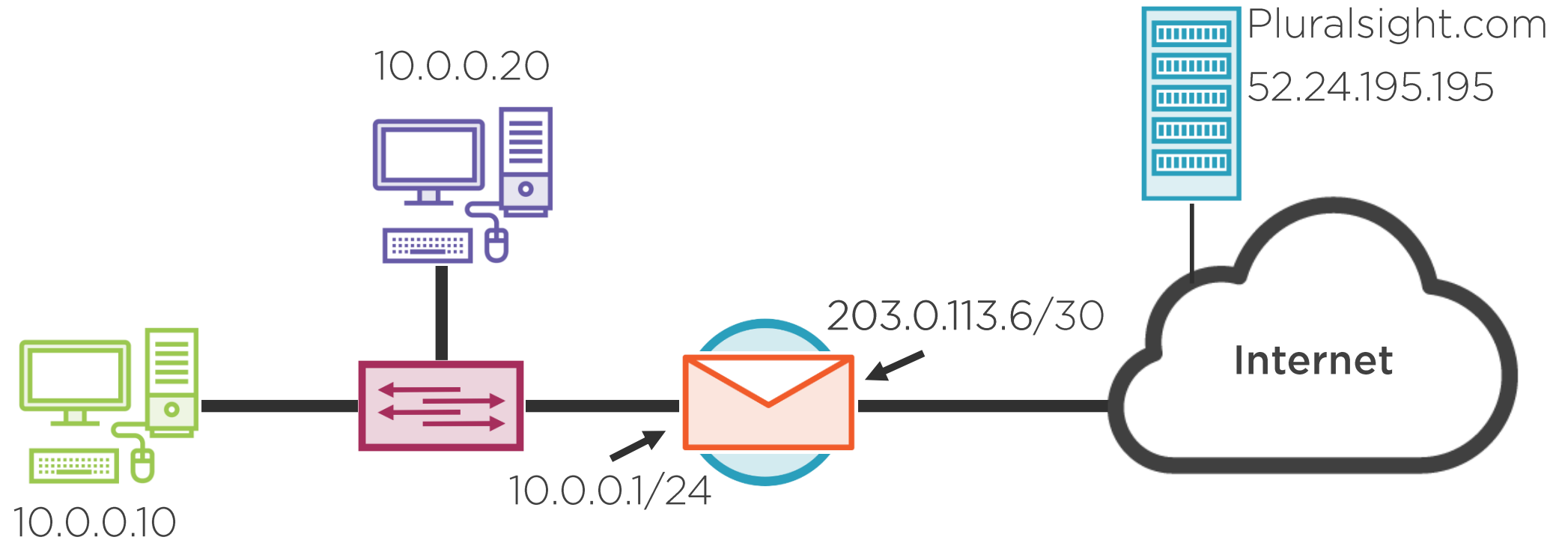
Source IP	Destination IP





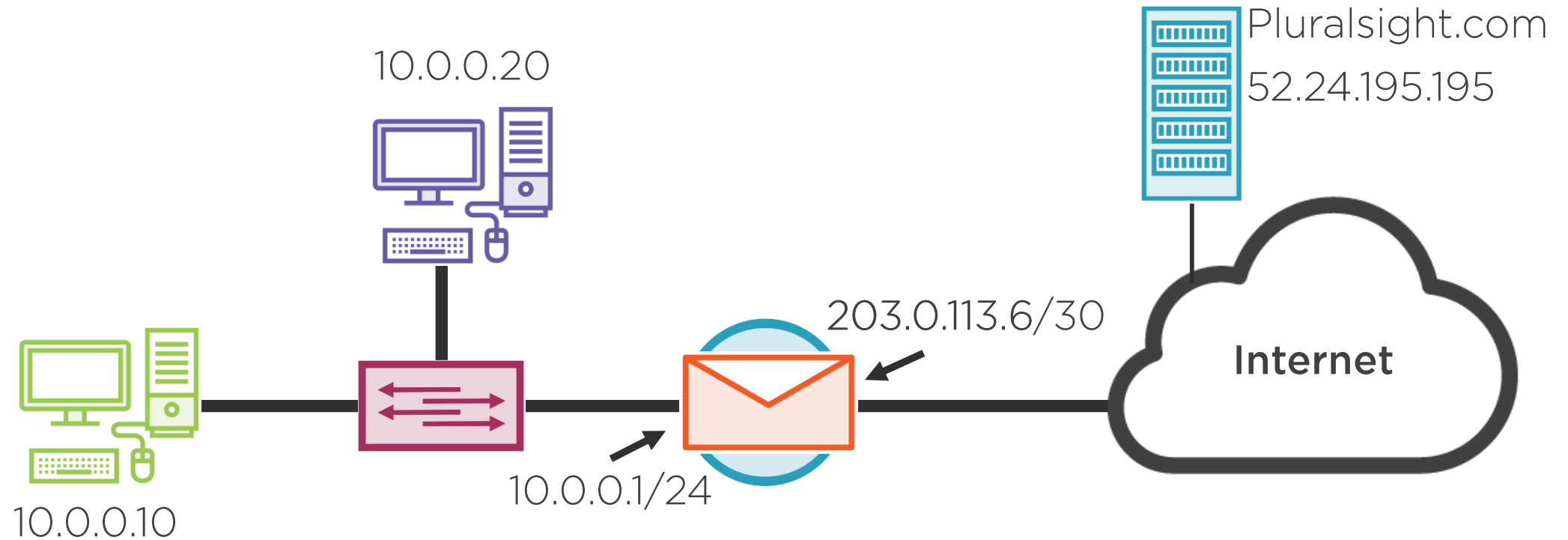
Source IP	Destination IP
10.0.0.10	52.24.195.195





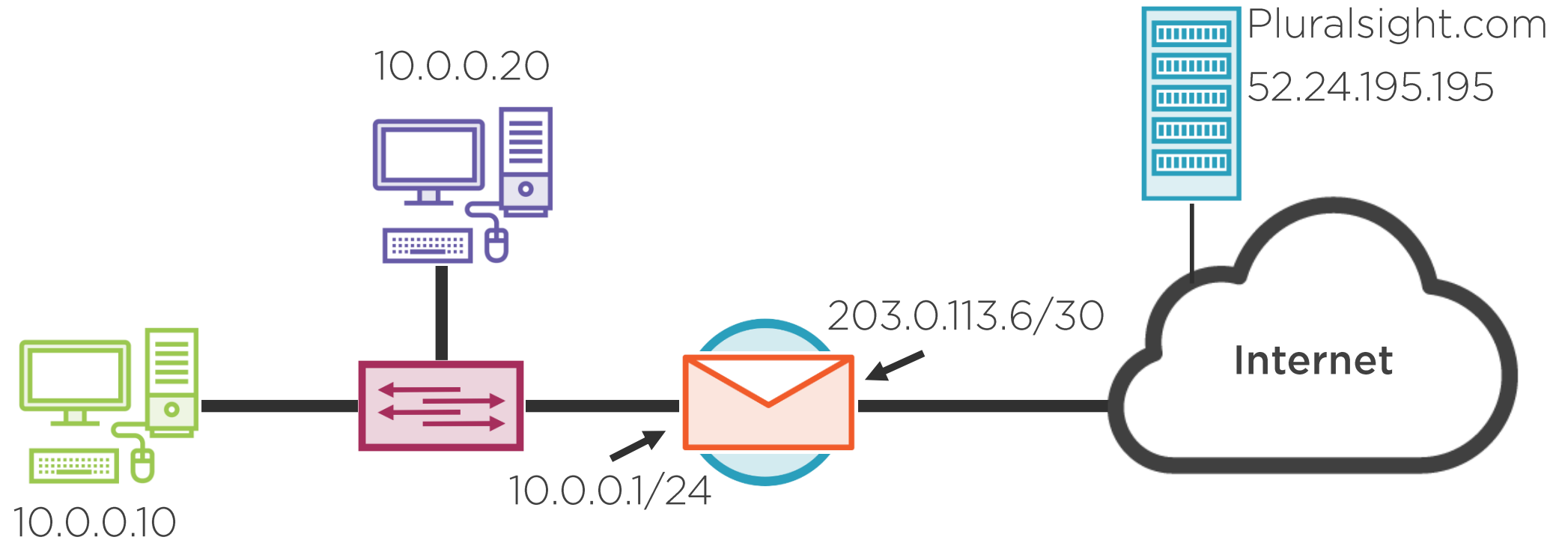
Source IP	Destination IP
10.0.0.10	52.24.195.195





Source IP	Destination IP
10.0.0.10	52.24.195.195

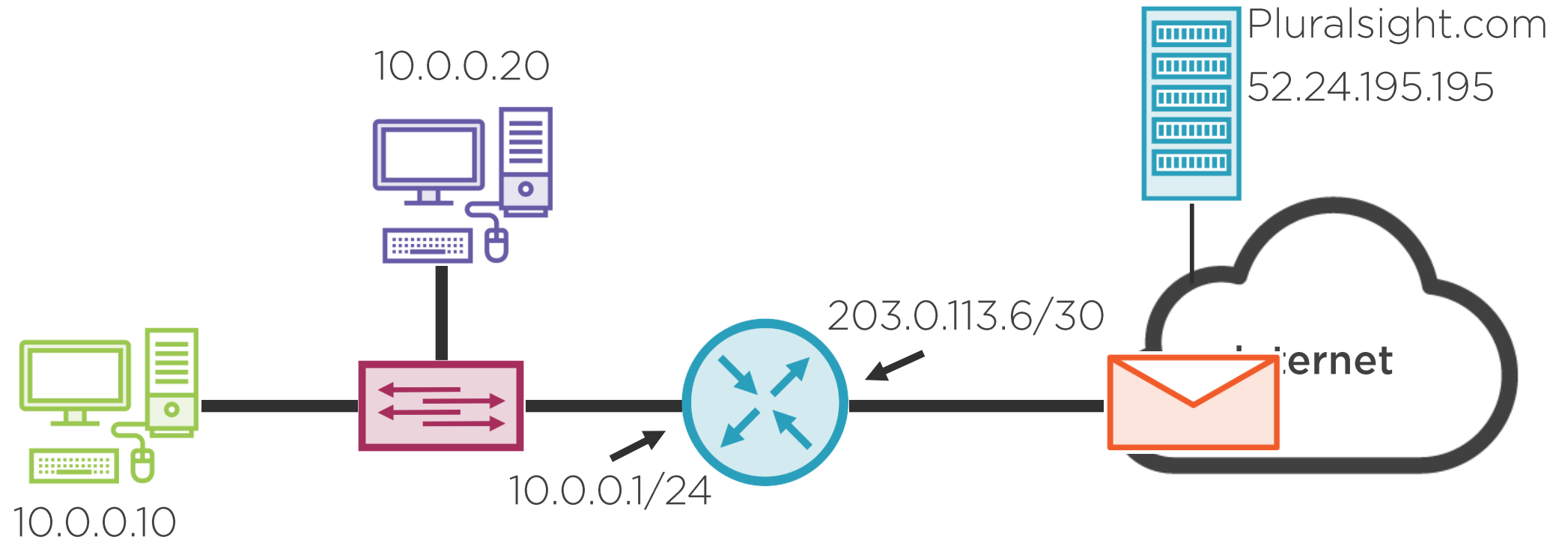




Source IP	Destination IP
203.0.113.6	52.24.195.195

10.0.0.10

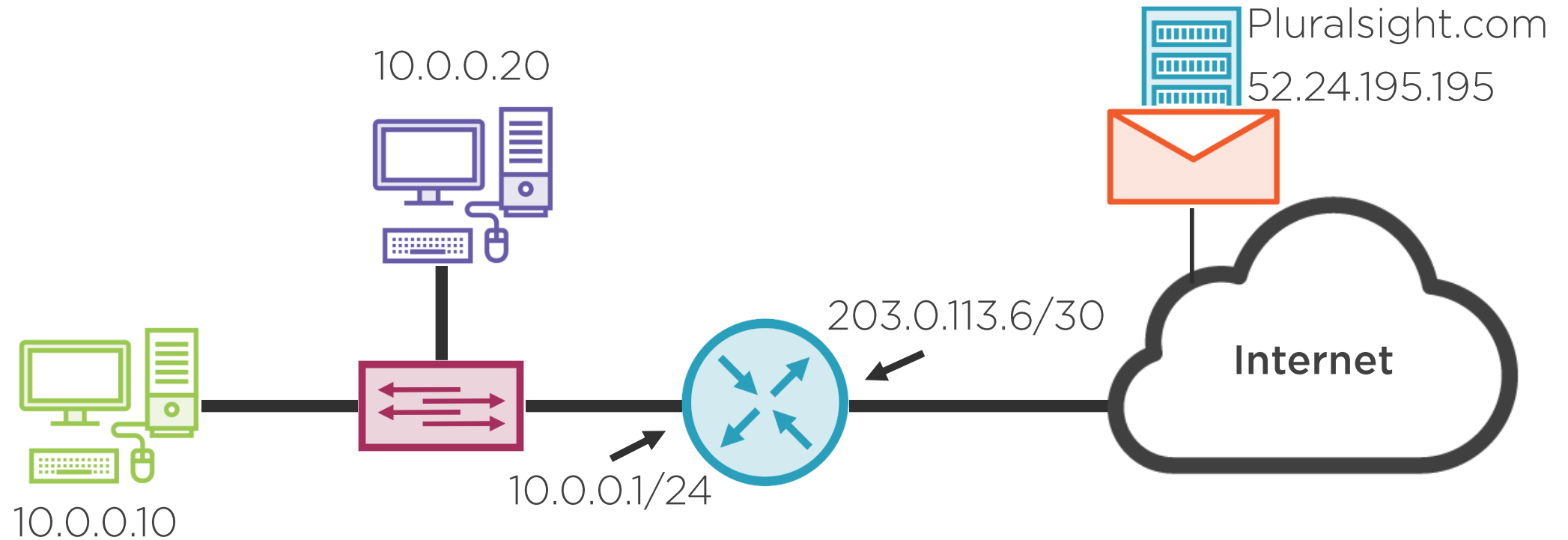




Source IP	Destination IP
203.0.113.6	52.24.195.195

10.0.0.10

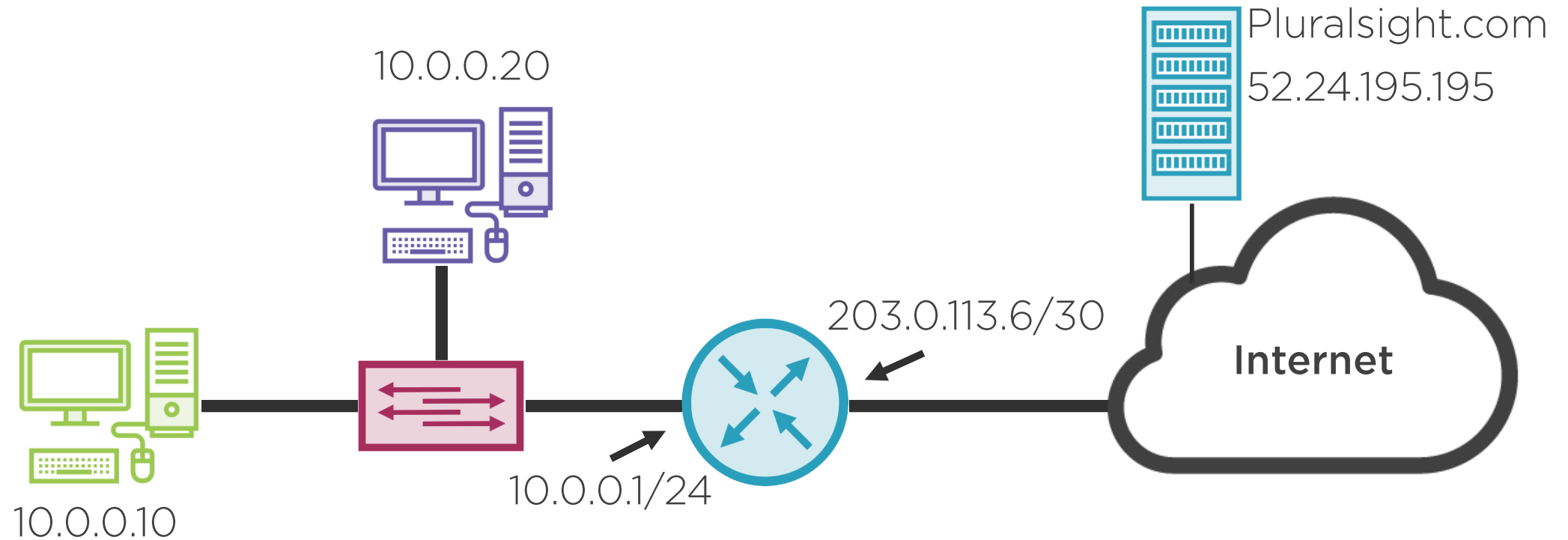




Source IP	Destination IP
203.0.113.6	52.24.195.195

10.0.0.10

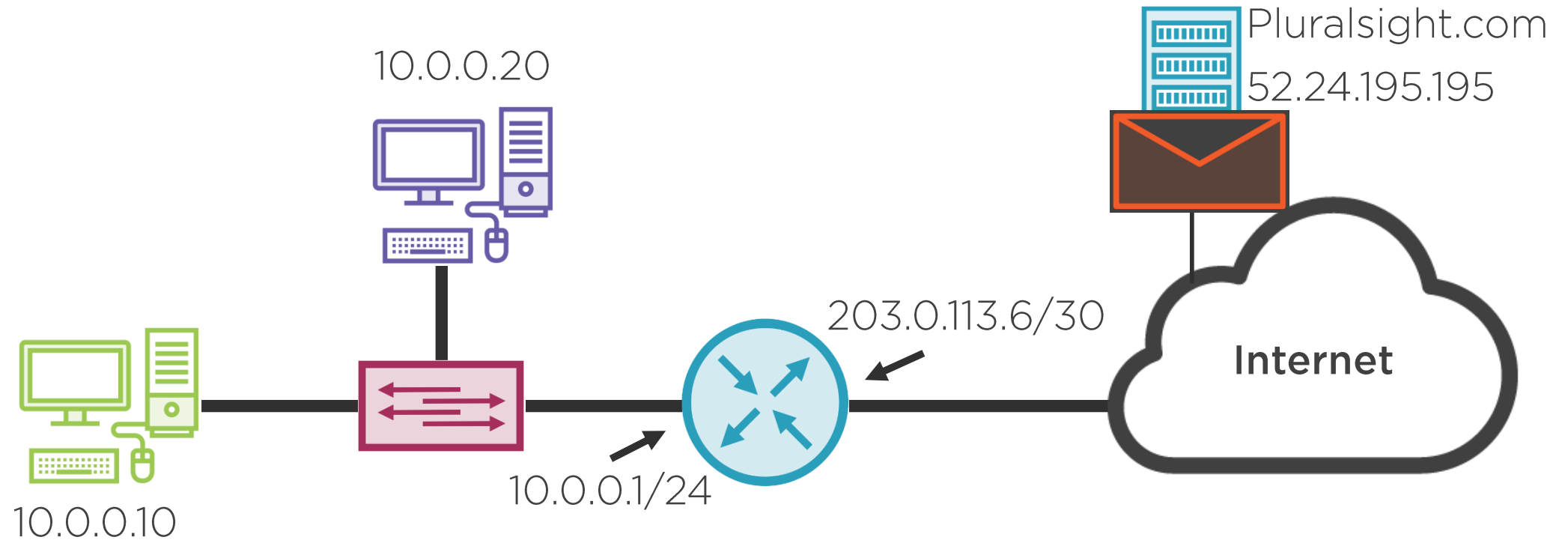




Source IP	Destination IP
203.0.113.6	52.24.195.195

10.0.0.10

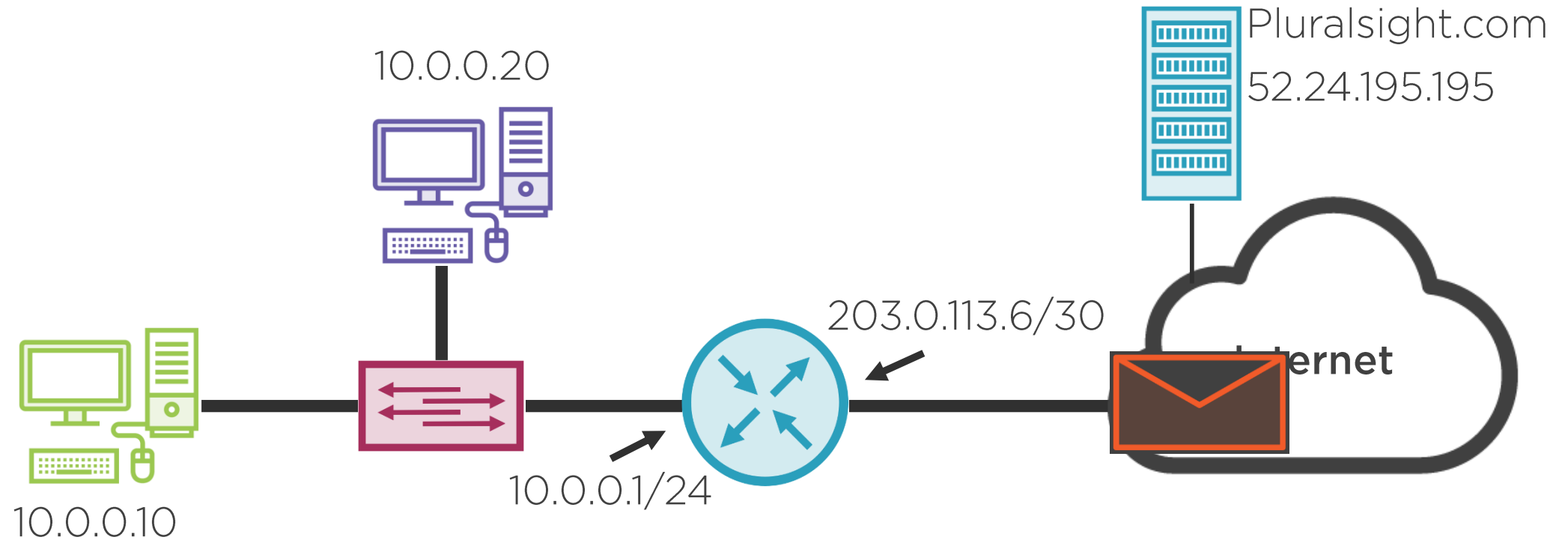




Source IP	Destination IP
52.24.195.195	203.0.113.6

10.0.0.10

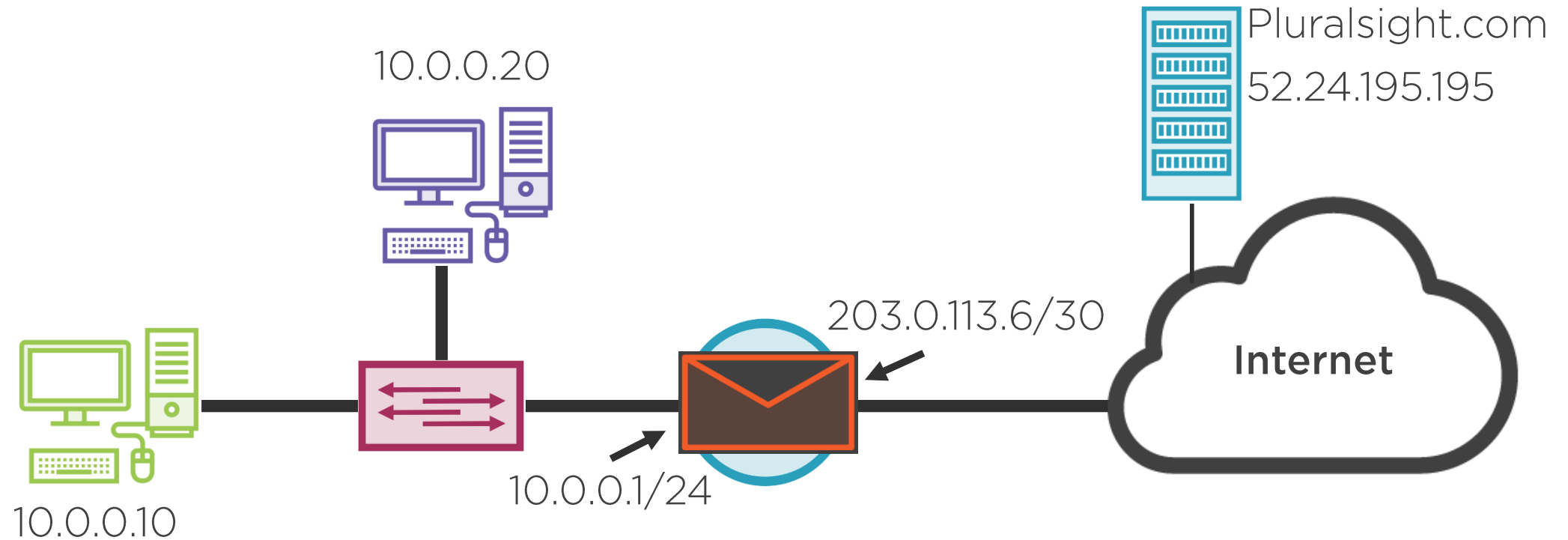




Source IP	Destination IP
52.24.195.195	203.0.113.6

10.0.0.10

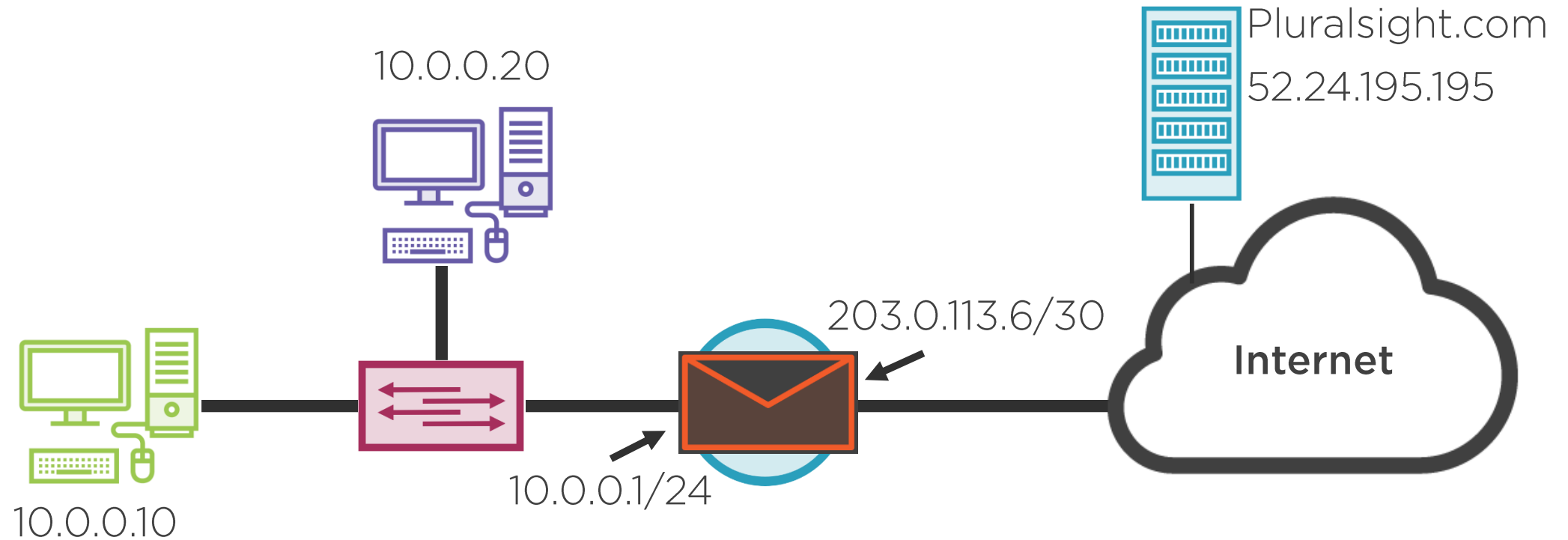




Source IP	Destination IP
52.24.195.195	203.0.113.6

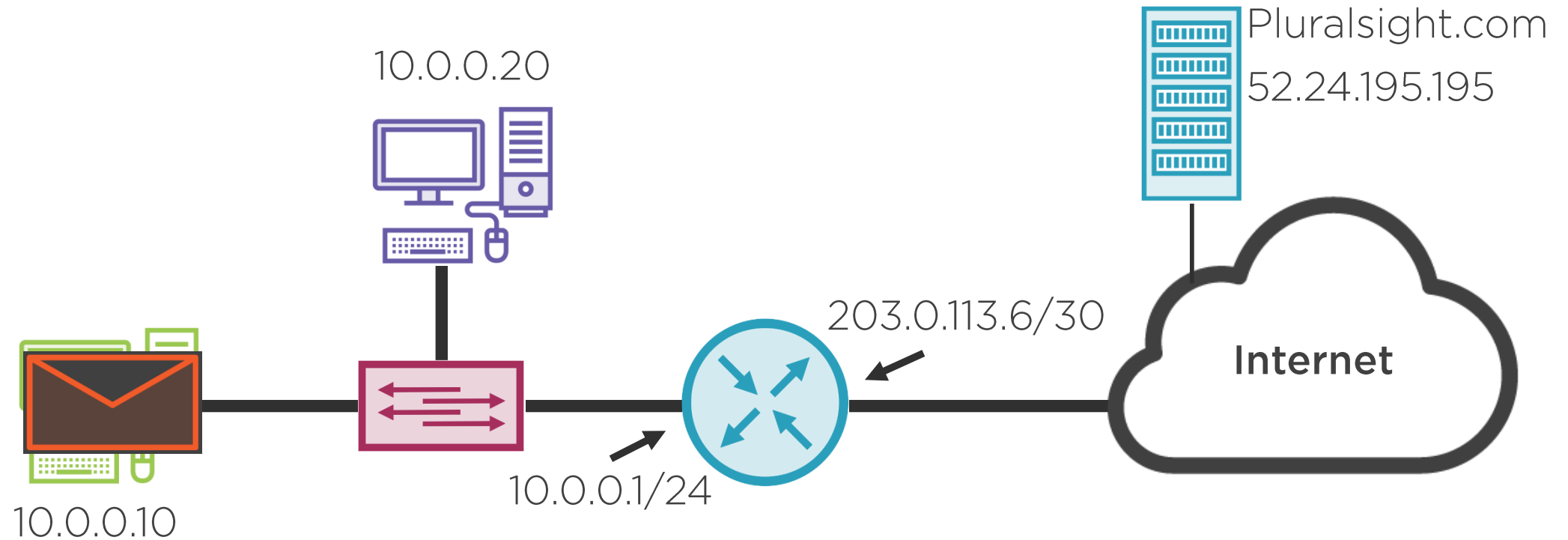
10.0.0.10





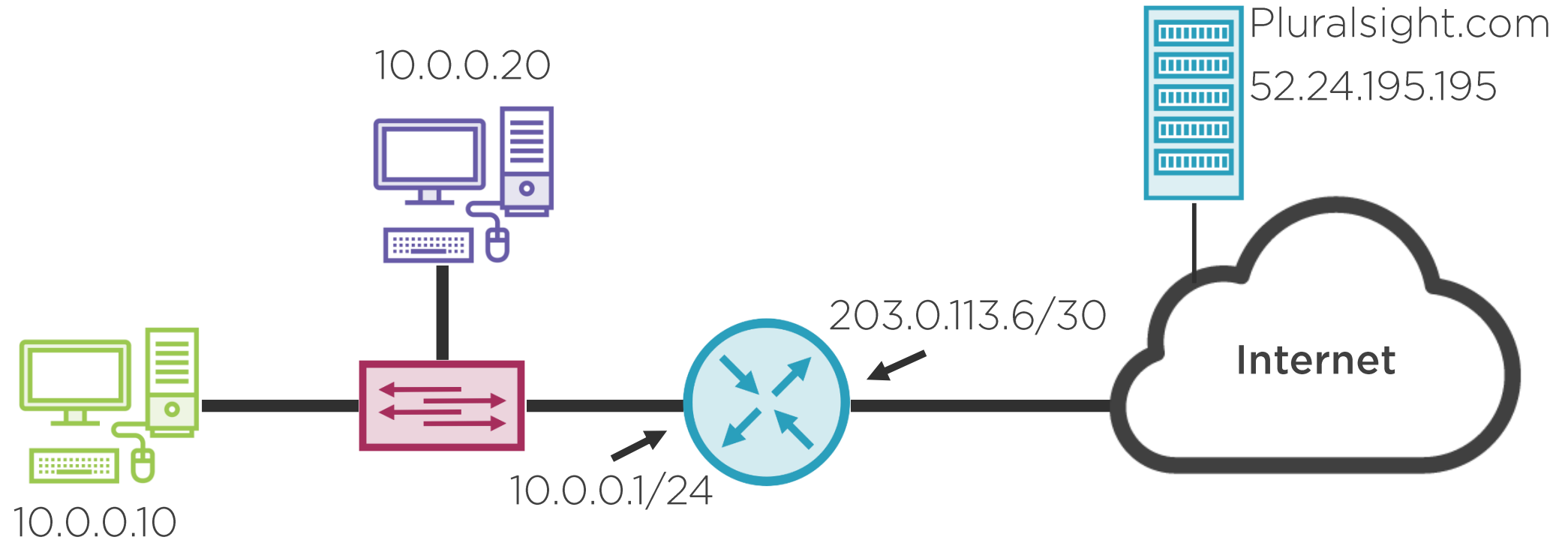
Source IP	Destination IP
52.24.195.195	10.0.0.10





Source IP	Destination IP
52.24.195.195	10.0.0.10

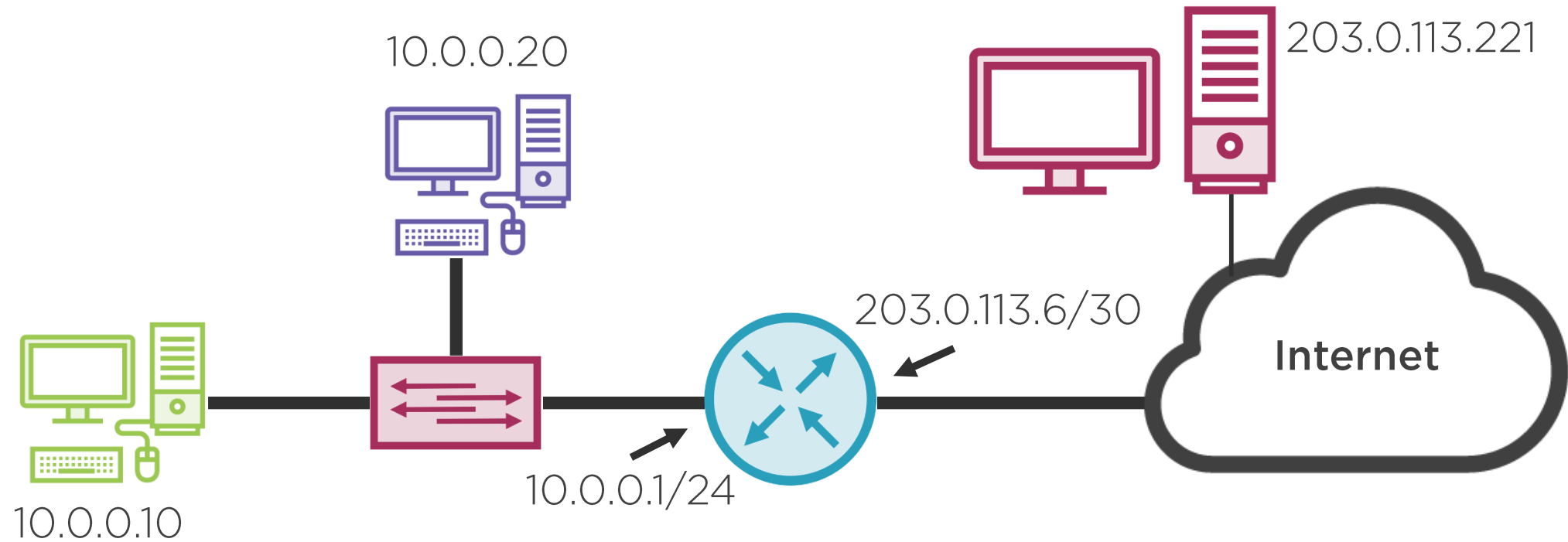




Network Address Translation

Port Address Translation





Network Address Translation

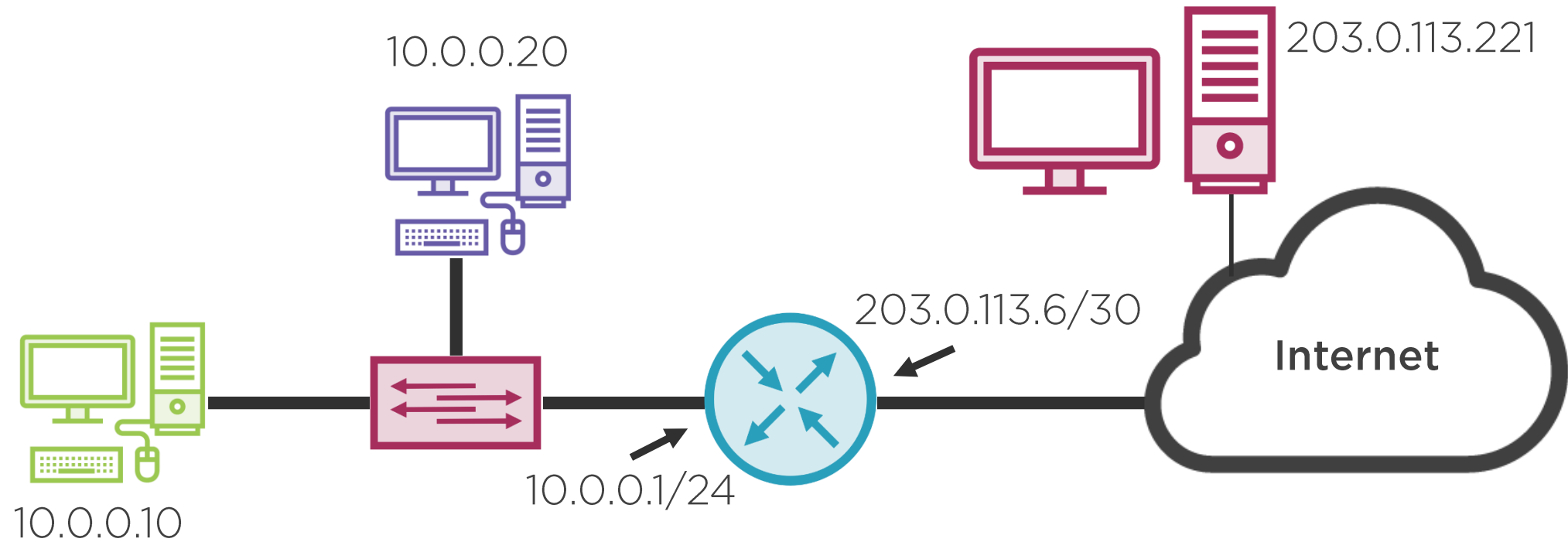
Port Address Translation



Port Forwarding



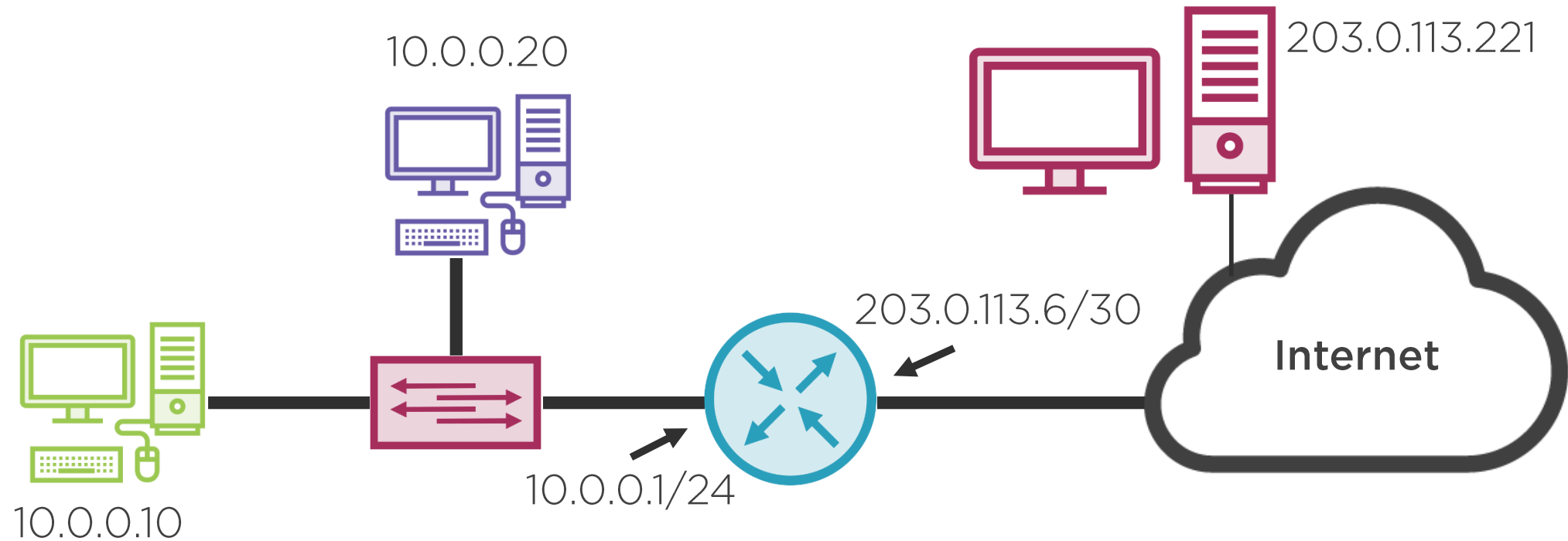
Port Forwarding



Source IP	Destination IP



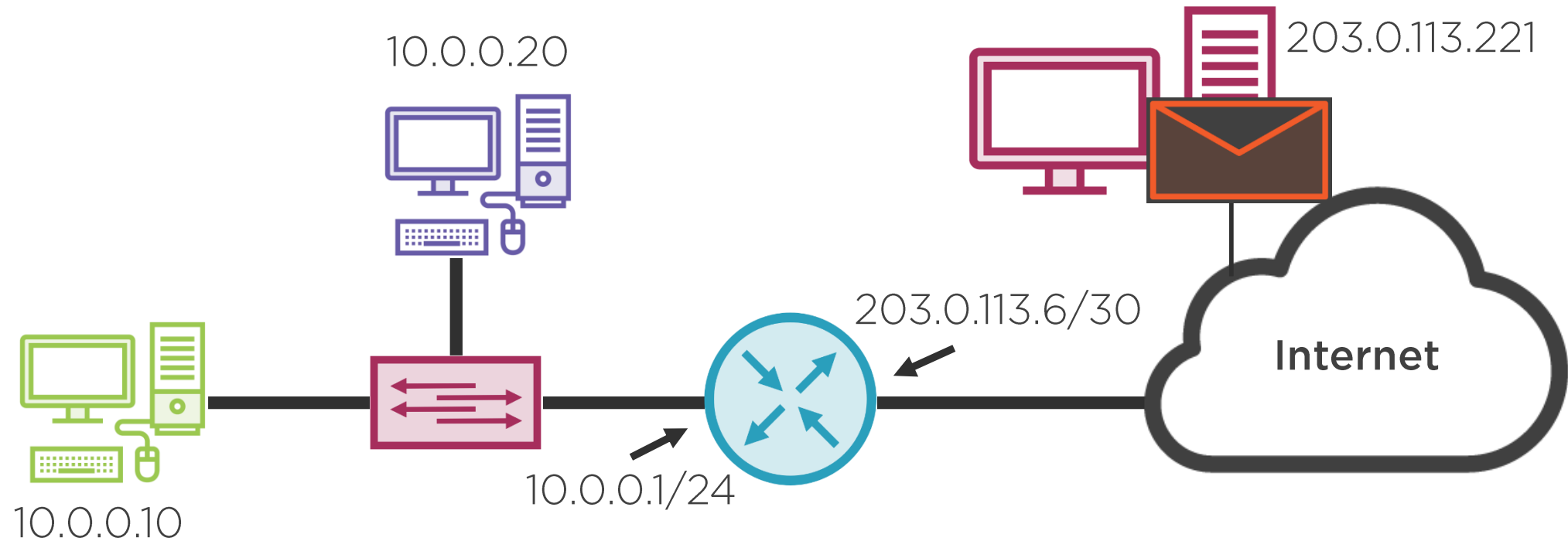
Port Forwarding



Source Socket	Destination Socket



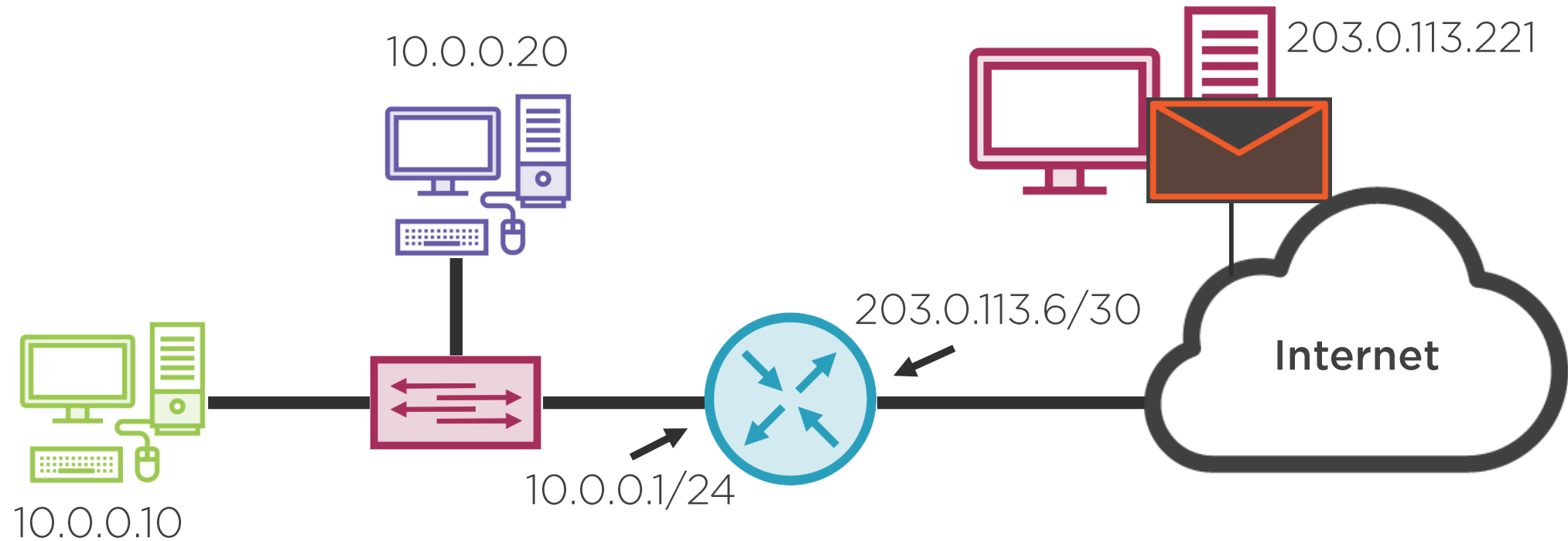
Port Forwarding



Source Socket	Destination Socket



Port Forwarding

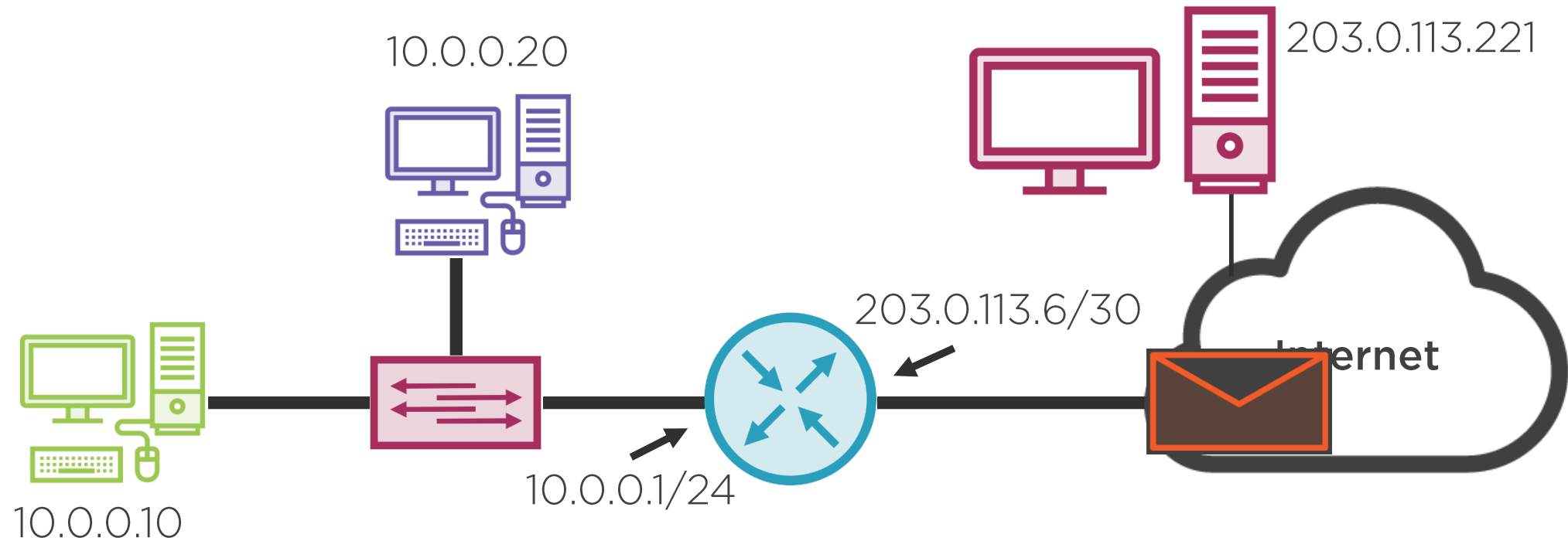


Source Socket	Destination Socket
203.0.113.221:59001	203.0.113.6:9293

TRANSPORT LAYER PORT NUMBER



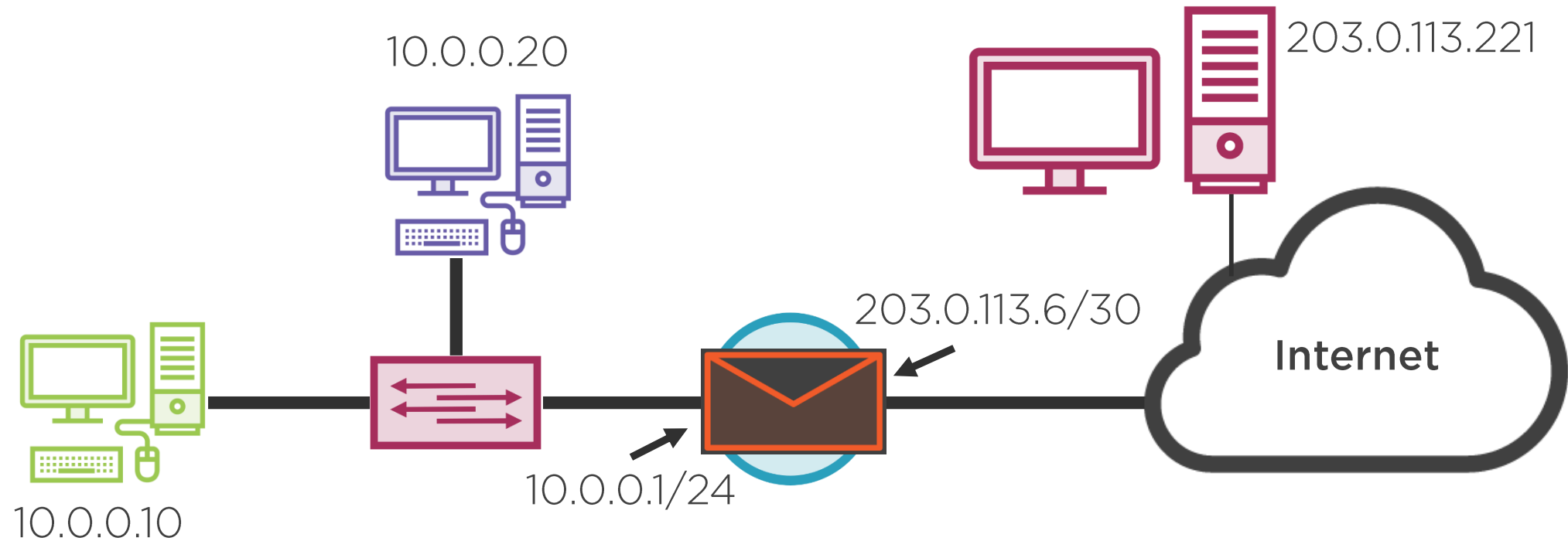
Port Forwarding



Source Socket	Destination Socket
203.0.113.221:59001	203.0.113.6:9293



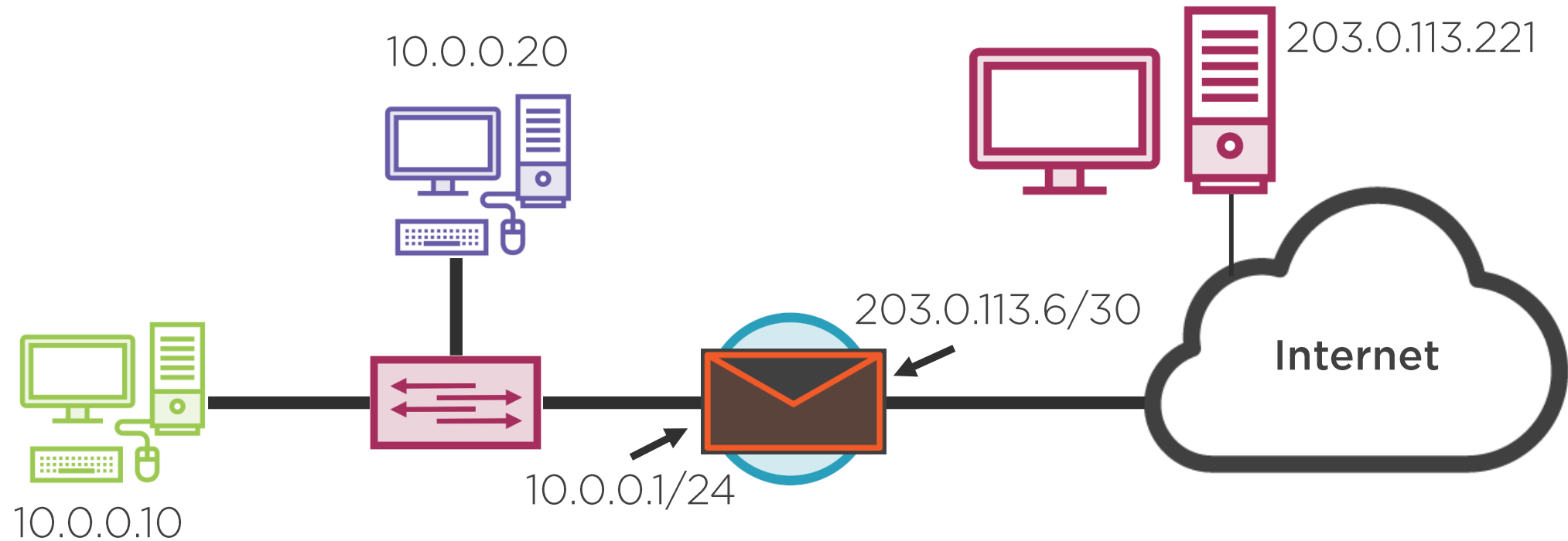
Port Forwarding



Source Socket	Destination Socket
203.0.113.221:59001	203.0.113.6:9293



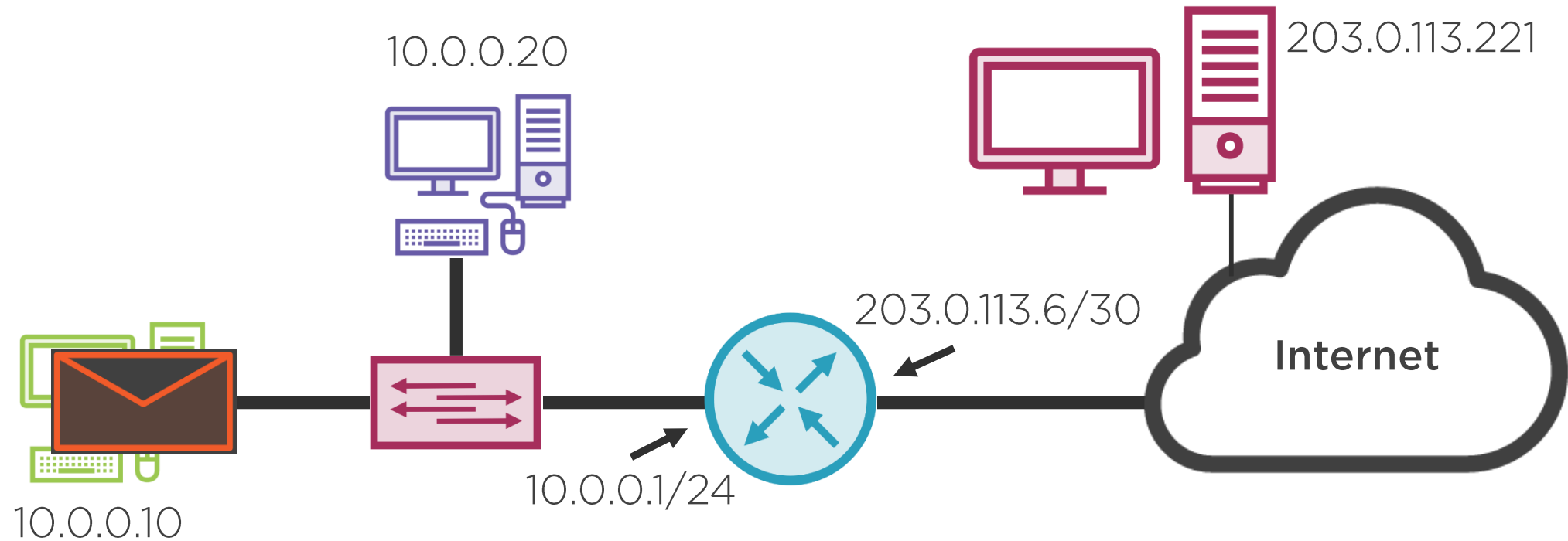
Port Forwarding



Source Socket	Destination Socket
203.0.113.221:59001	10.0.0.10:9293



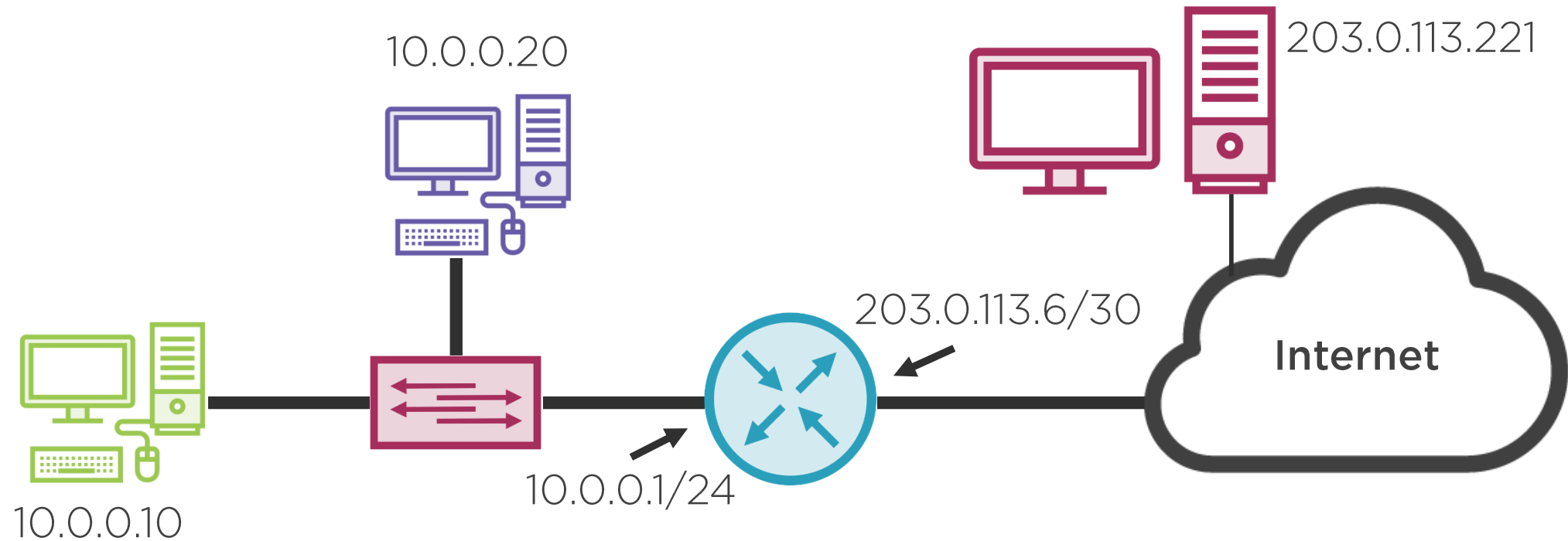
Port Forwarding



Source Socket	Destination Socket
203.0.113.221:59001	10.0.0.10:9293



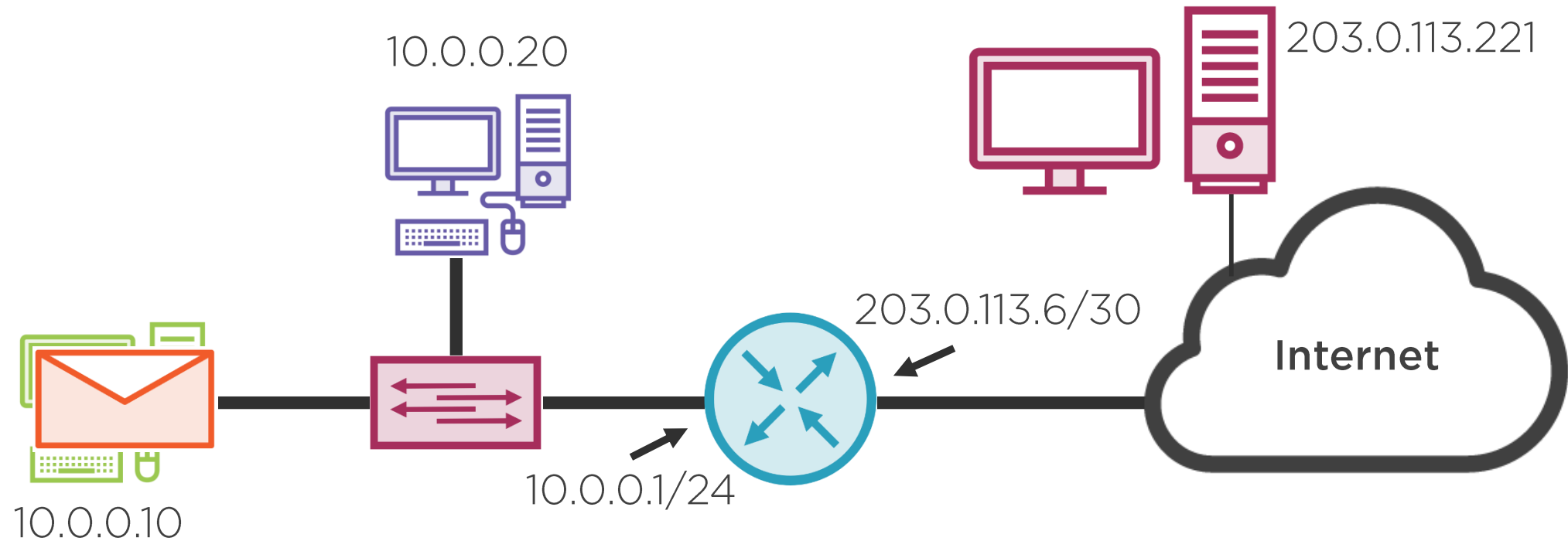
Port Forwarding



Source Socket	Destination Socket
203.0.113.221:59001	10.0.0.10:9293



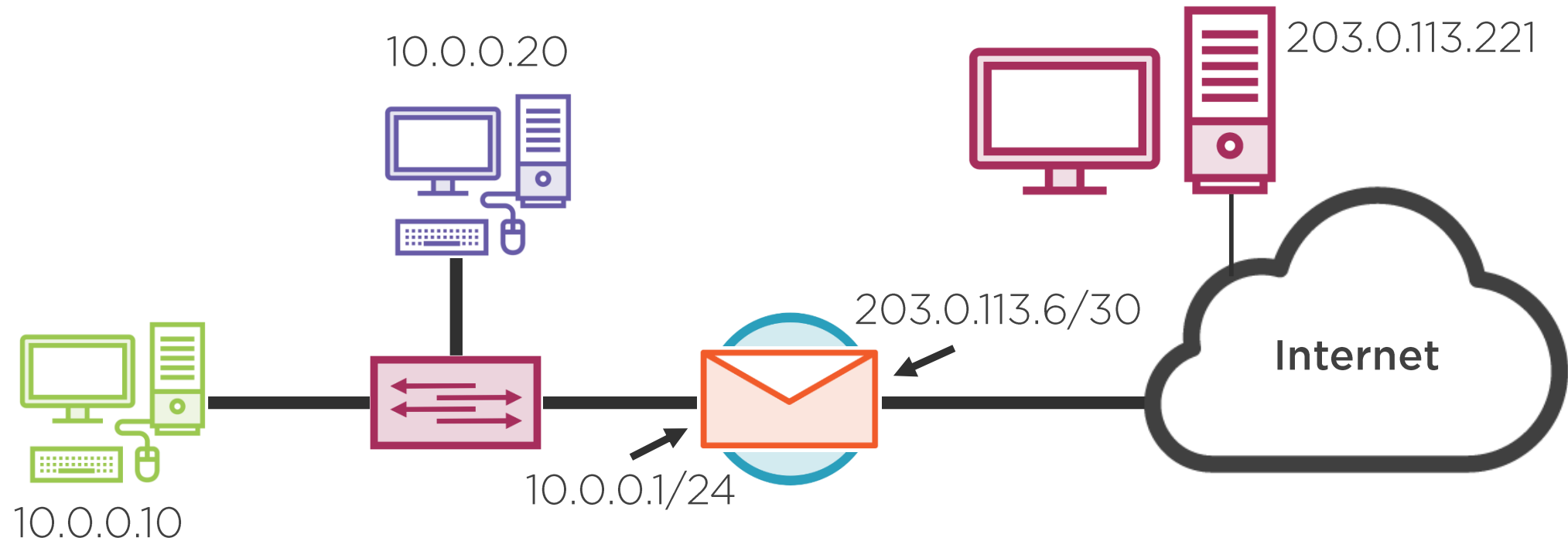
Port Forwarding



Source Socket	Destination Socket
10.0.0.10:9293	203.0.113.221:59001



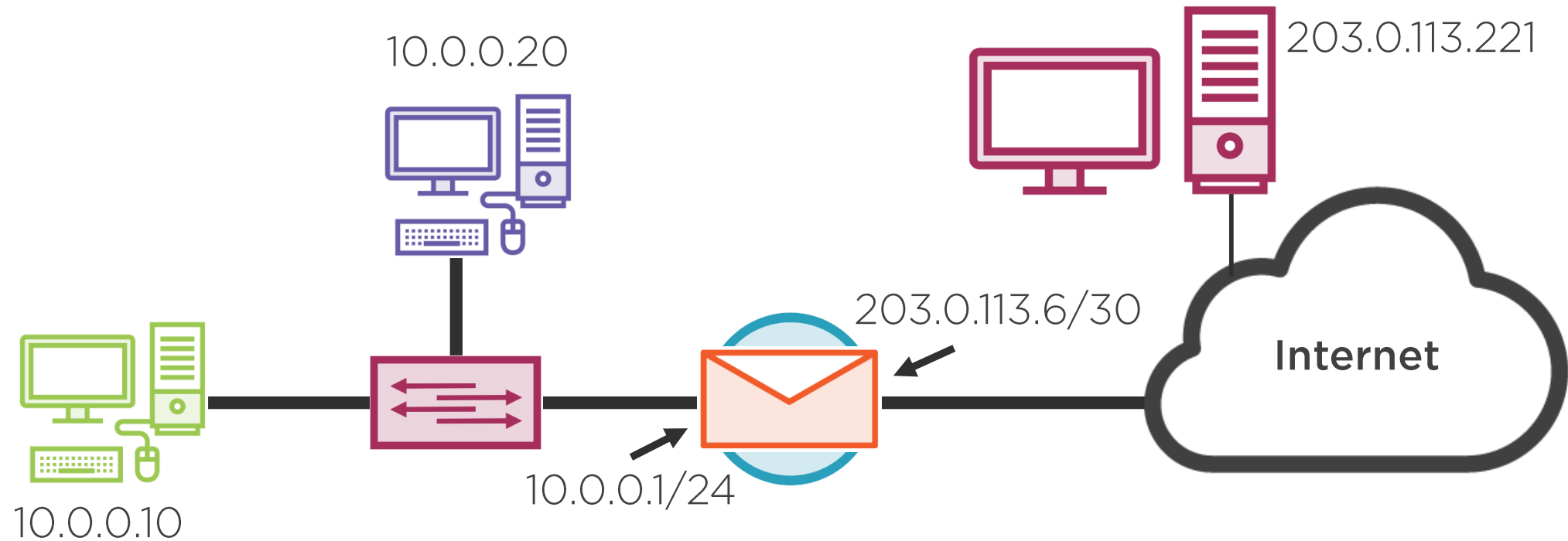
Port Forwarding



Source Socket	Destination Socket
10.0.0.10:9293	203.0.113.221:59001



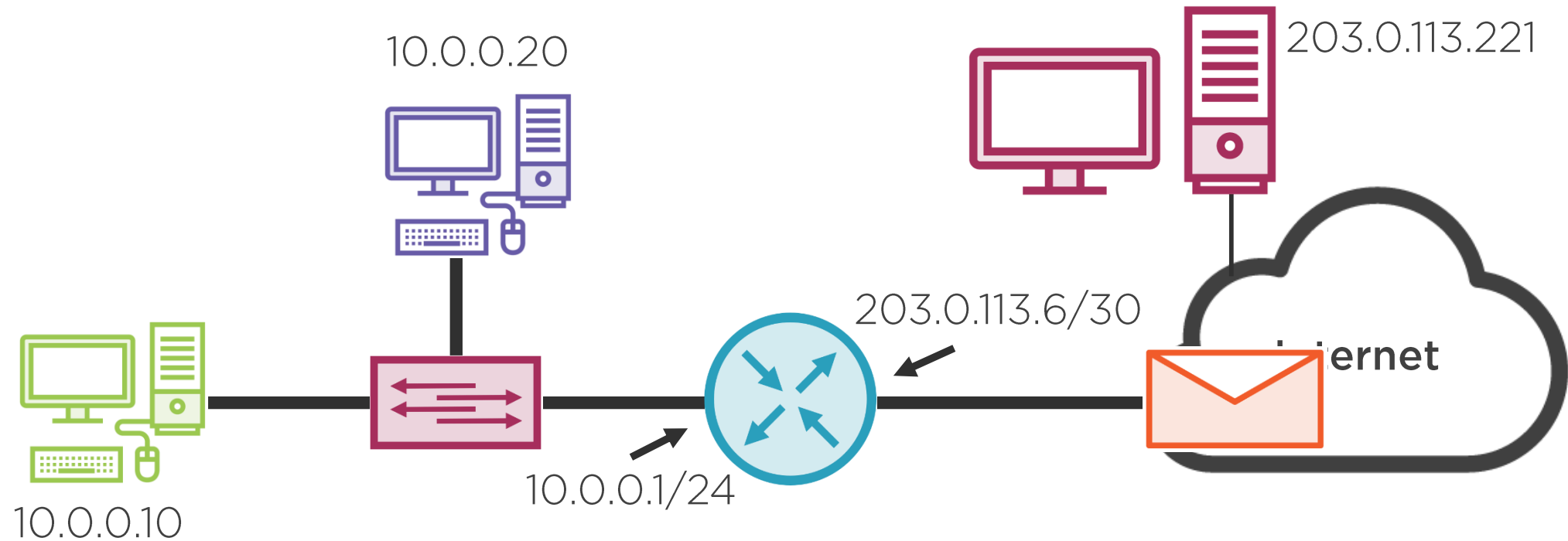
Port Forwarding



Source Socket	Destination Socket
203.0.113.6:9623	203.0.113.221:59001



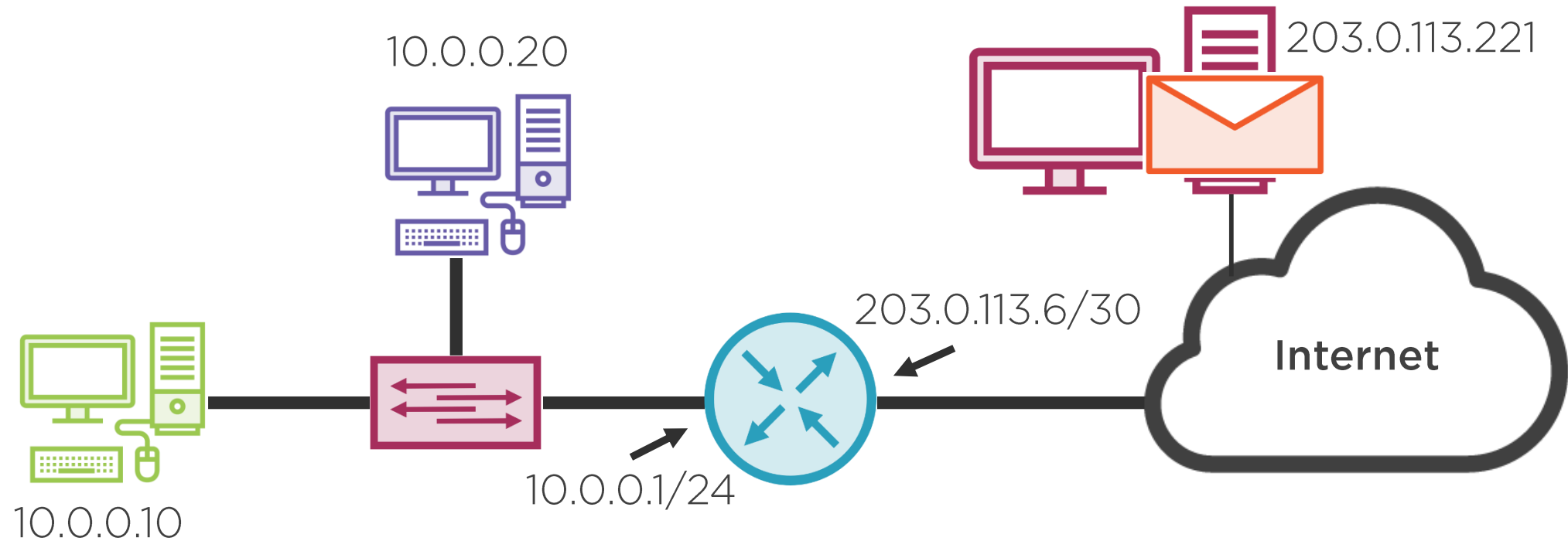
Port Forwarding



Source Socket	Destination Socket
203.0.113.6:9623	203.0.113.221:59001



Port Forwarding



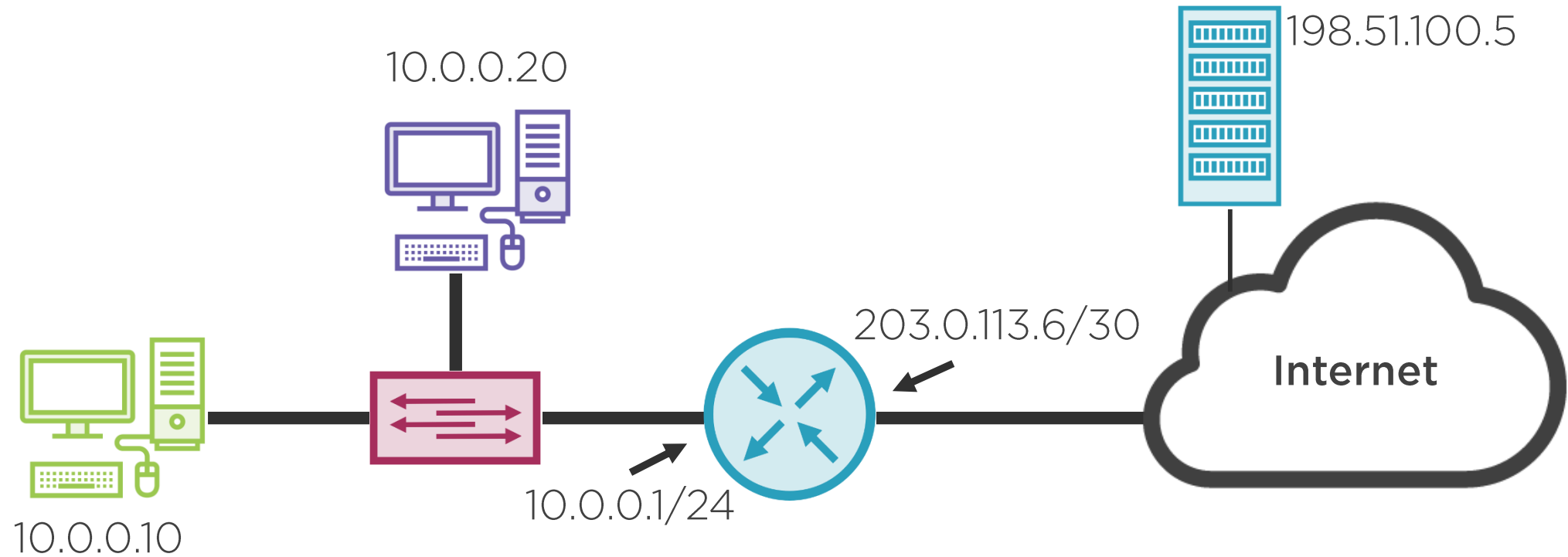
Source Socket	Destination Socket
203.0.113.6:9623	203.0.113.221:59001



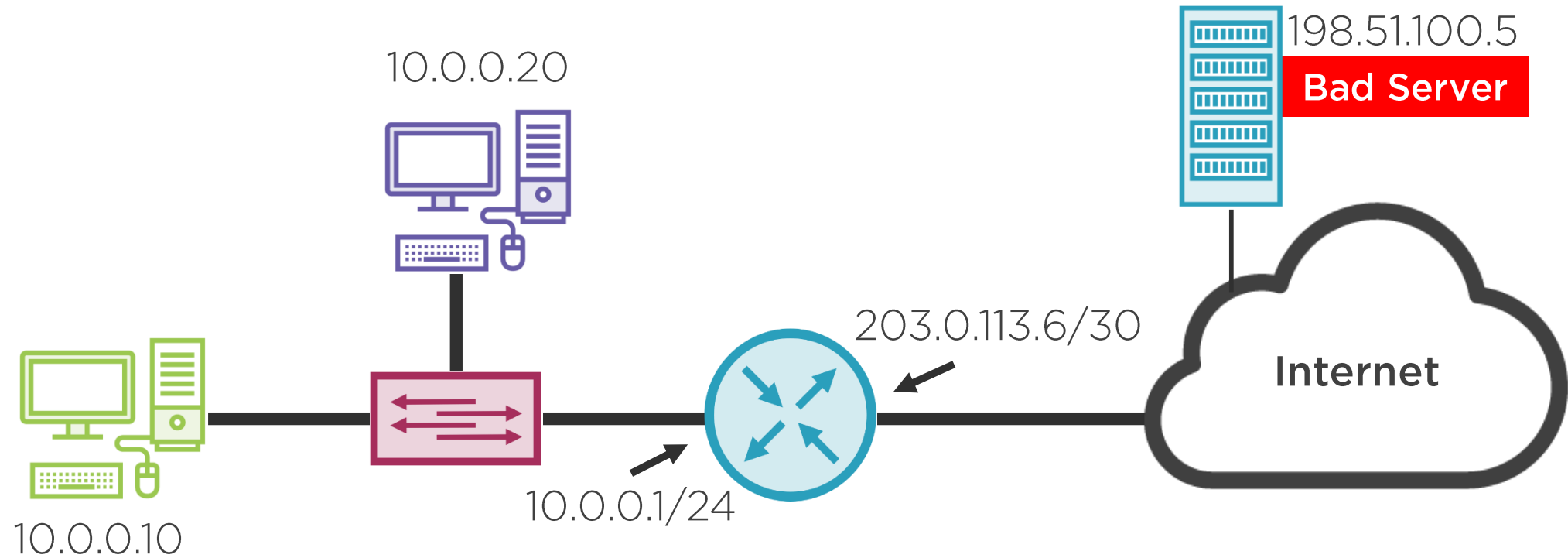
Access Control Lists



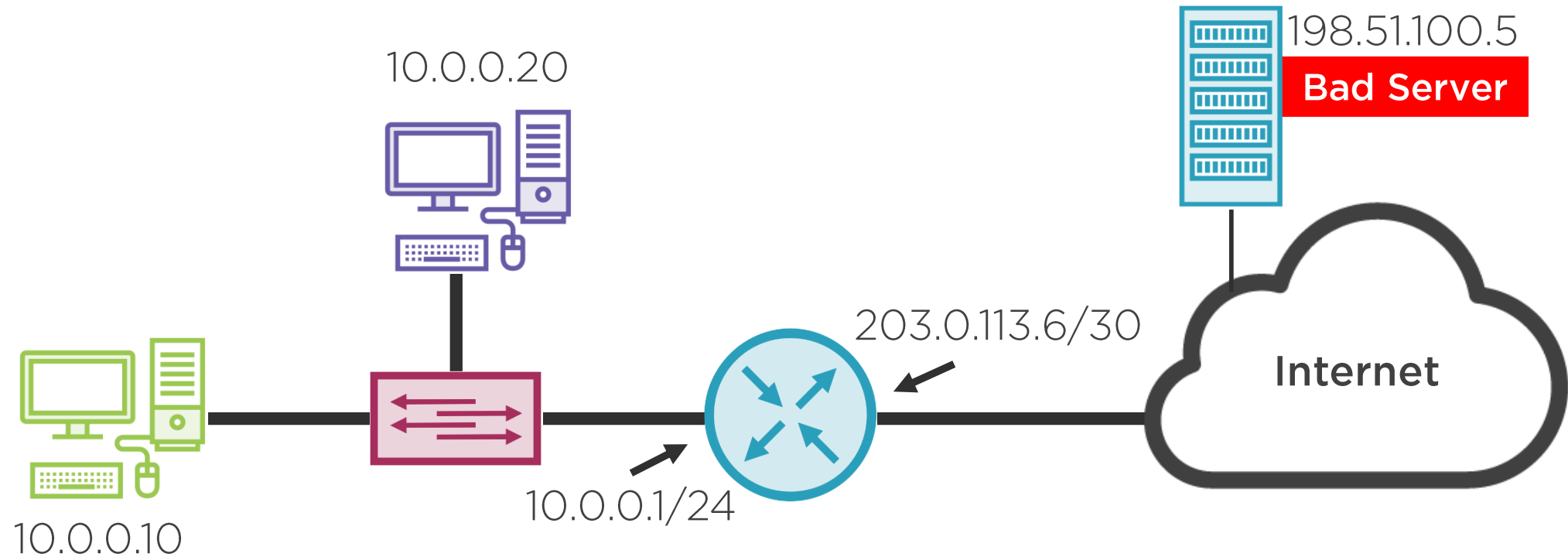
Access Control Lists



Access Control Lists



Access Control Lists



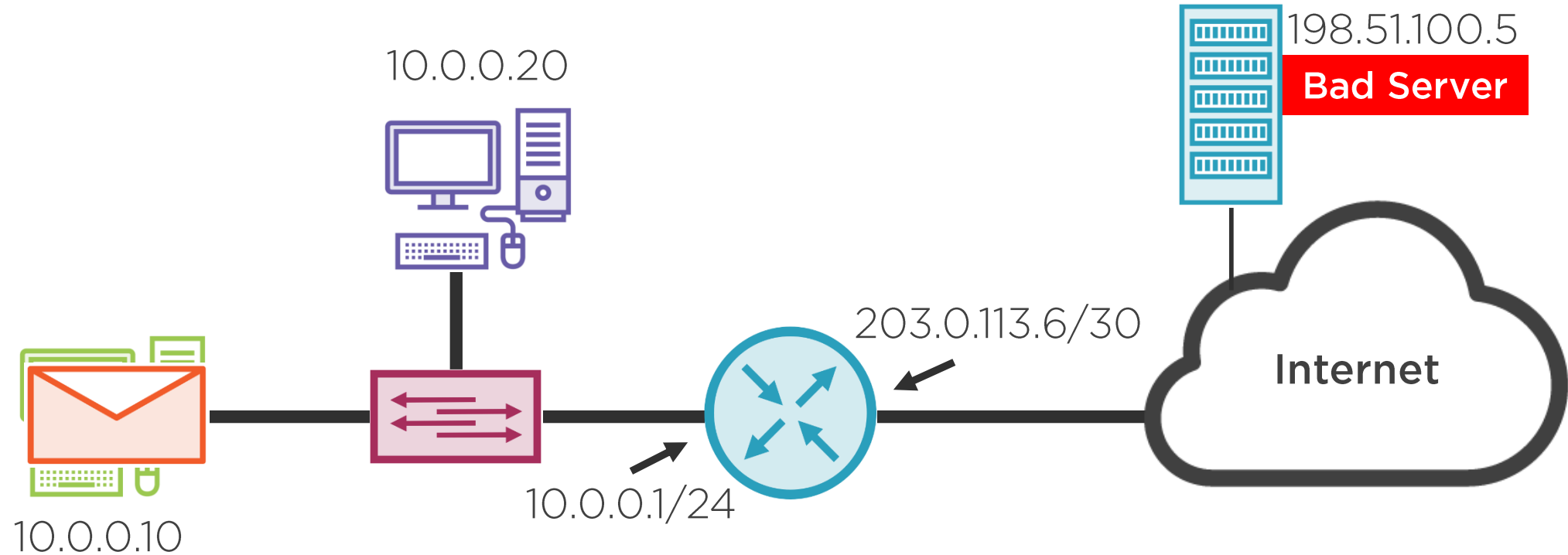
Access Control List

Deny Destination IP 198.51.100.5

Allow Other Traffic



Access Control Lists



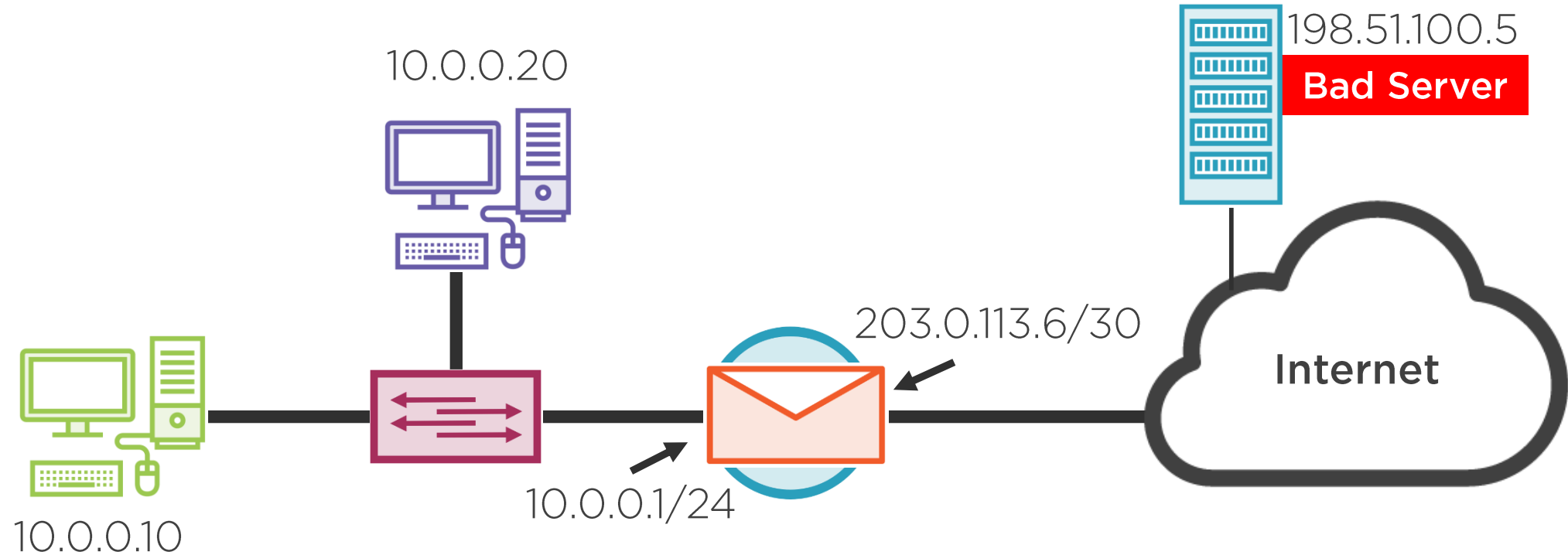
Access Control List

Deny Destination IP 198.51.100.5

Allow Other Traffic



Access Control Lists



Access Control List

Deny Destination IP 198.51.100.5

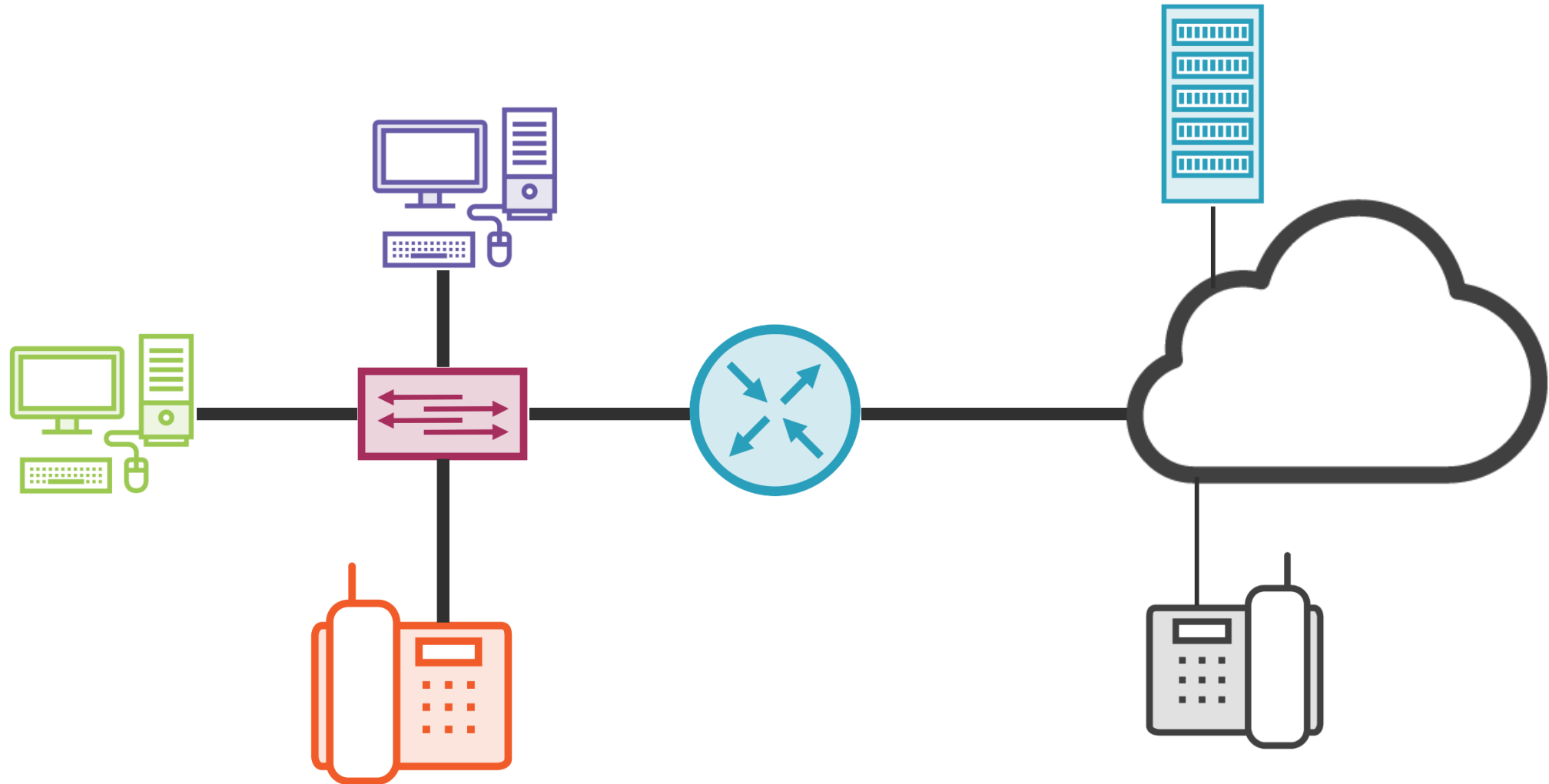
Allow Other Traffic



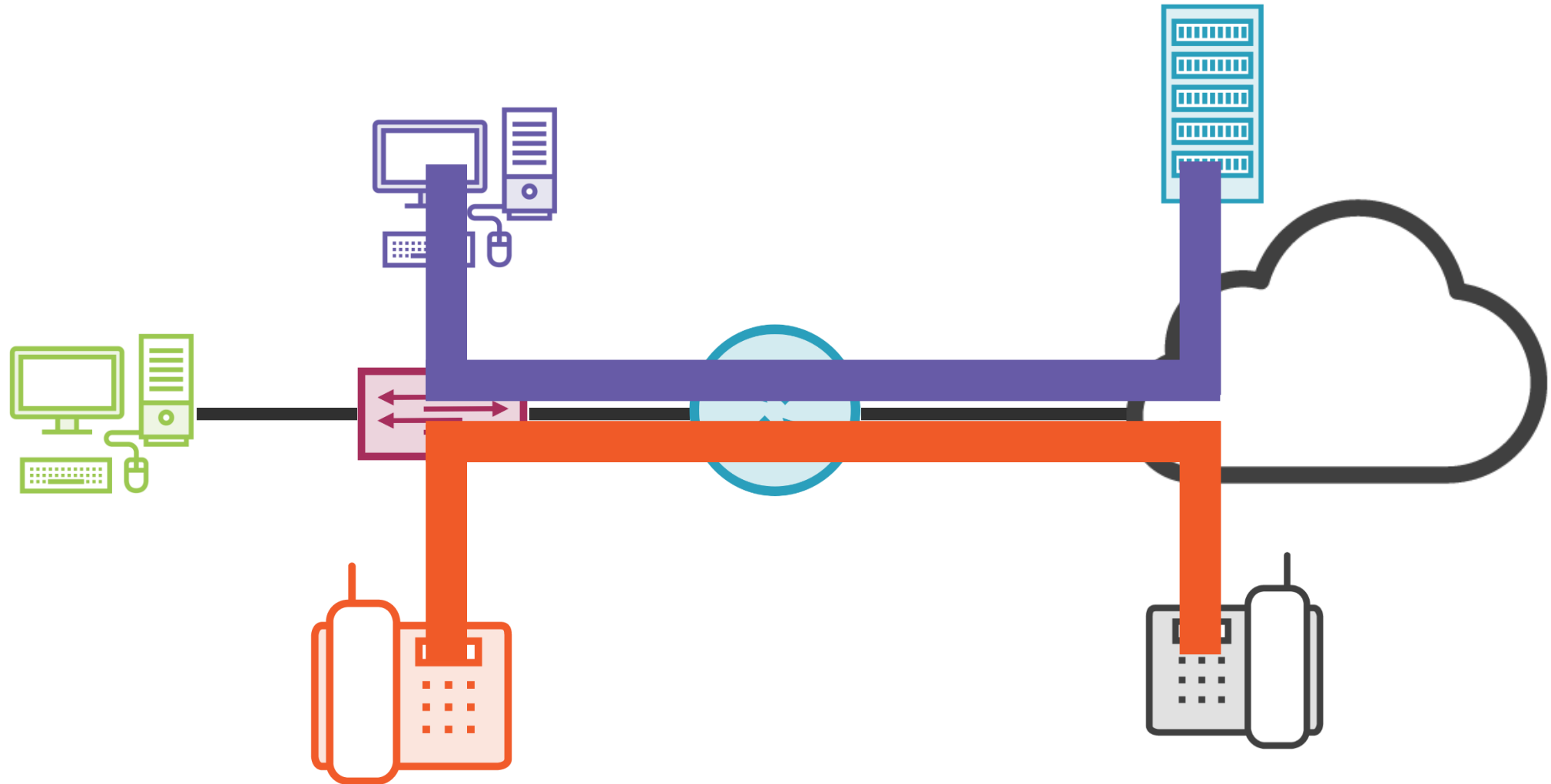
Traffic Shaping



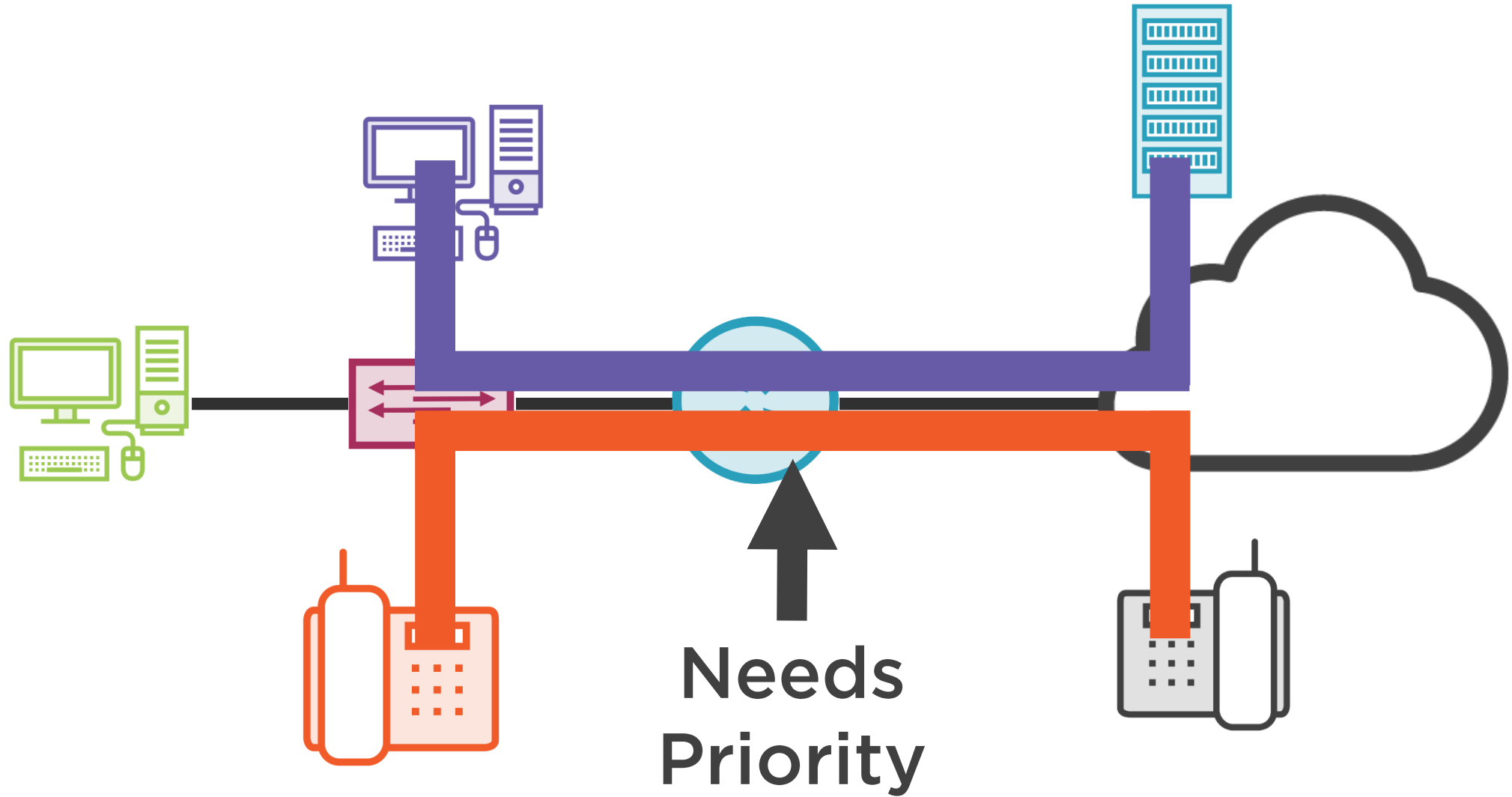
Shaping Traffic

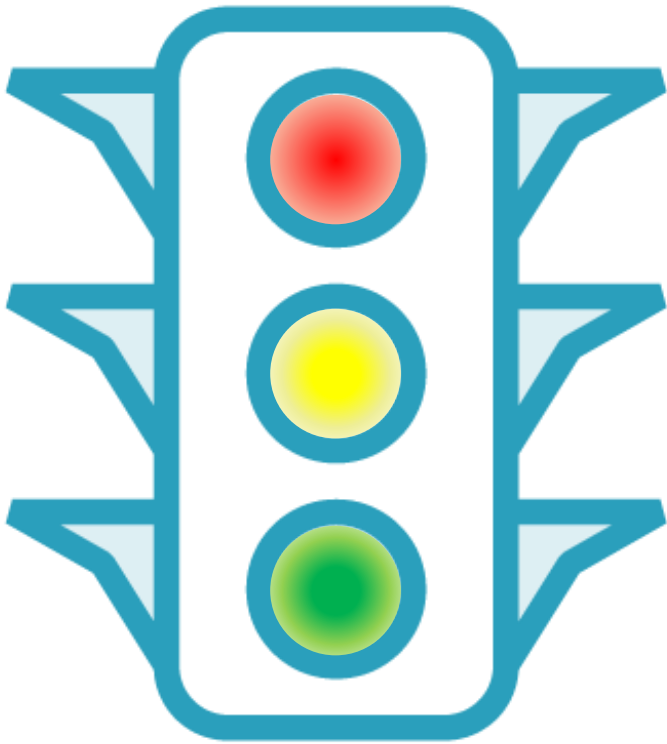


Shaping Traffic



Shaping Traffic





Traffic Shaping

Quality of Service (QoS)

- Diffserv

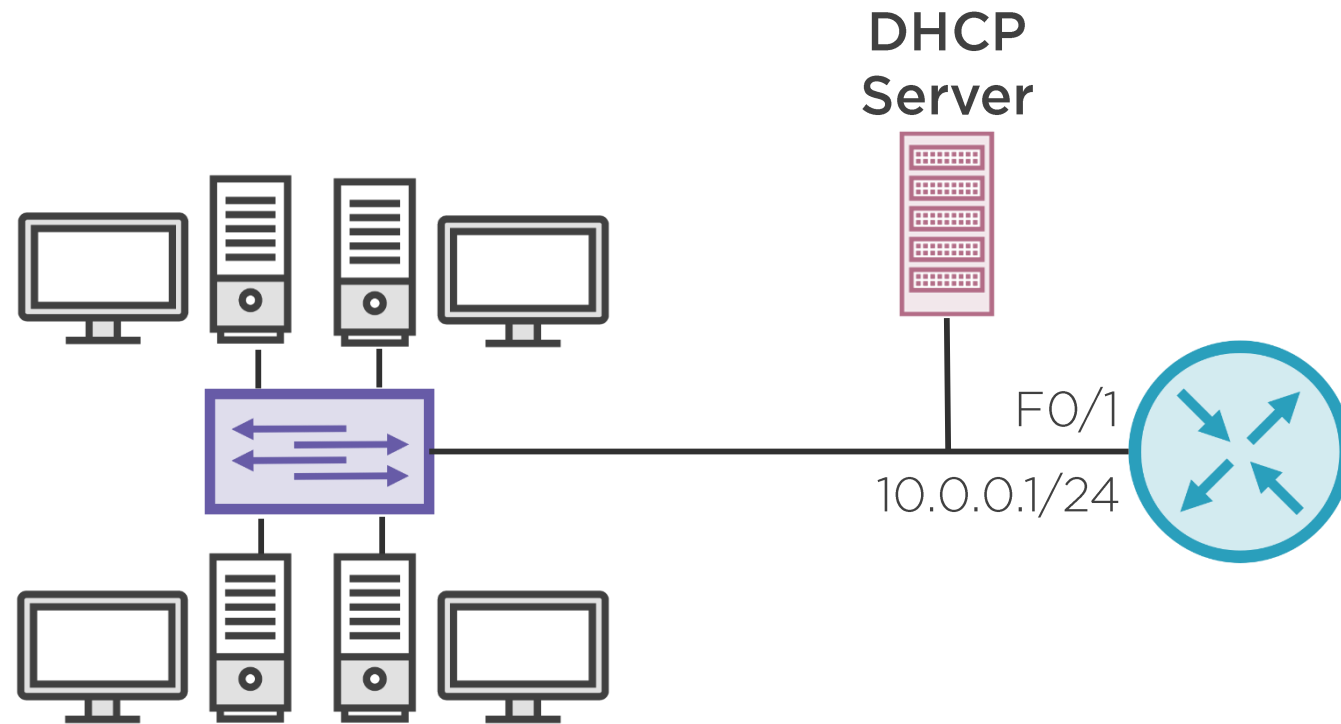
Class of Service (CoS)

- Type of identifier for QoS

Dynamic Host Configuration Protocol (DHCP)



DHCP



DHCP



Internet Protocol Version 4 (TCP/IPv4) Properties

General Alternate Configuration

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:

Subnet mask:

Default gateway:

☒ Obtain DNS server address automatically

☐ Use the following DNS server addresses:

Preferred DNS server:

Alternate DNS server:

☐ Validate settings upon exit

Advanced...

OK Cancel



CP
ver



uter



DHCP



DHCP



DHCP Offer

IP Address - 10.0.0.100/24
Default Gateway - 10.0.0.1
DNS - 8.8.8.8



DHCP

IP Address - 10.0.0.100/24
Default Gateway - 10.0.0.1
DNS - 8.8.8.8



IP Address - 10.0.0.100/24
Default Gateway - 10.0.0.1
DNS - 8.8.8.8



DHCP

IP Address - 10.0.0.100/24
Default Gateway - 10.0.0.1
DNS - 8.8.8.8



DHCP Binding

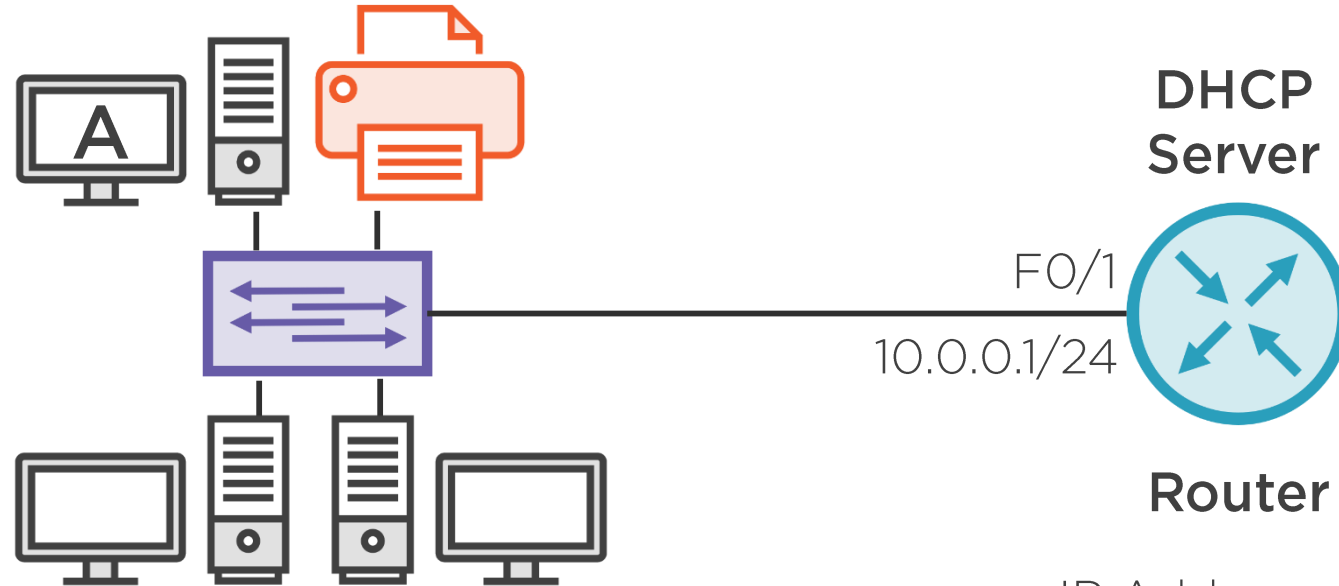
A

IP Address - 10.0.0.100/24
Default Gateway - 10.0.0.1
DNS - 8.8.8.8



DHCP

IP Address - 10.0.0.100/24
Default Gateway - 10.0.0.1
DNS - 8.8.8.8



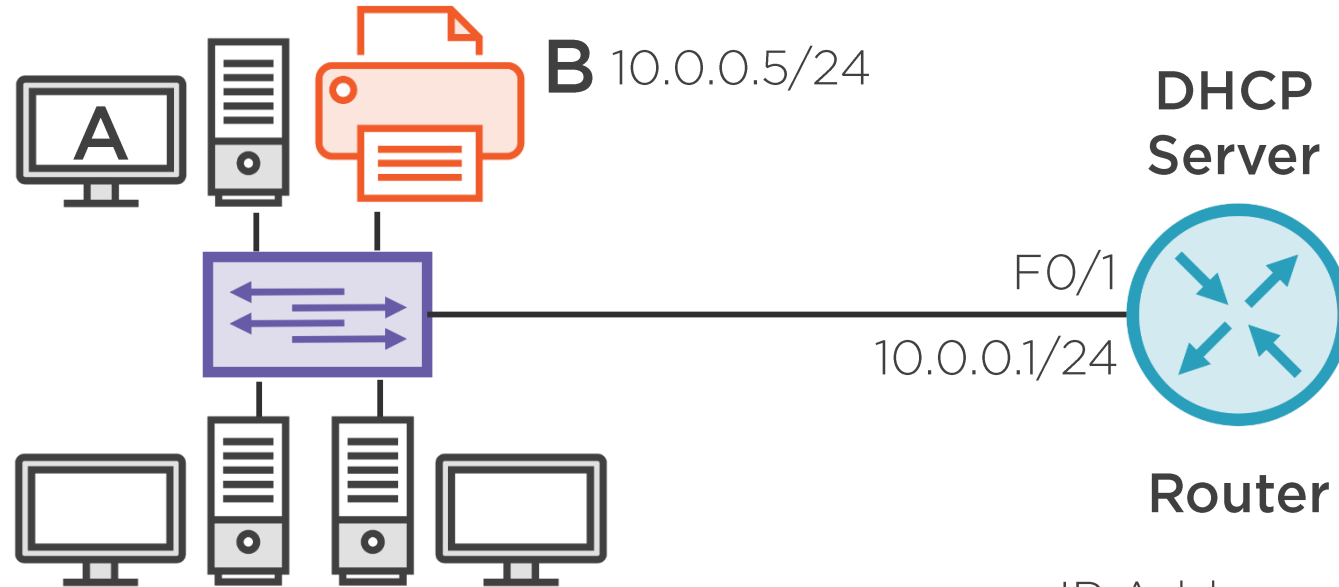
A

IP Address - 10.0.0.100/24
Default Gateway - 10.0.0.1
DNS - 8.8.8.8



DHCP

IP Address - 10.0.0.100/24
Default Gateway - 10.0.0.1
DNS - 8.8.8.8



B 10.0.0.5/24

**DHCP
Server**

F0/1

10.0.0.1/24

Router

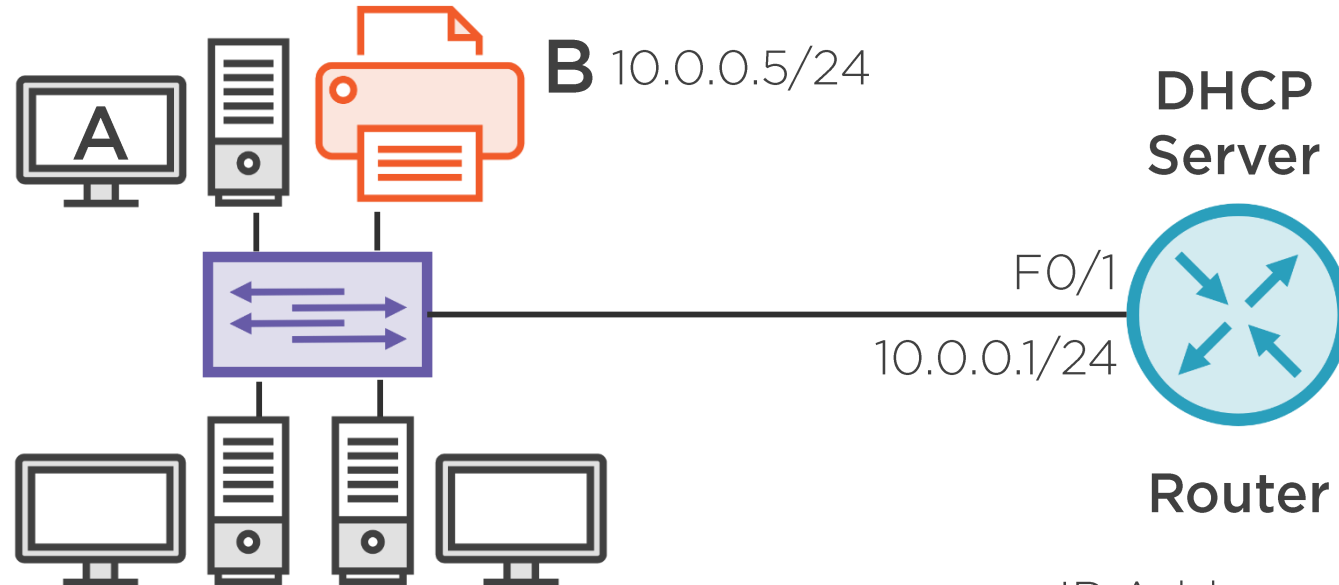
A

IP Address - 10.0.0.100/24
Default Gateway - 10.0.0.1
DNS - 8.8.8.8



DHCP

IP Address - 10.0.0.100/24
Default Gateway - 10.0.0.1
DNS - 8.8.8.8



A

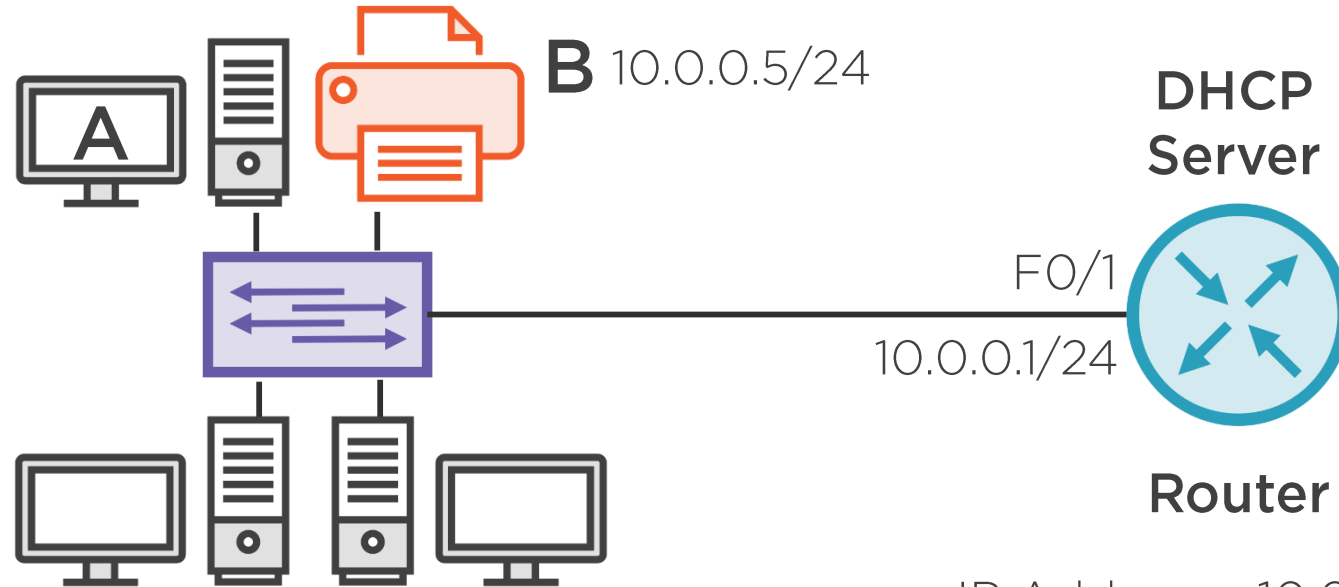
IP Address - 10.0.0.100/24
Default Gateway - 10.0.0.1
DNS - 8.8.8.8

B 10.0.0.5/24



DHCP

IP Address - 10.0.0.100/24
Default Gateway - 10.0.0.1
DNS - 8.8.8.8



B 10.0.0.5/24

**DHCP
Server**

F0/1

10.0.0.1/24

Router

A

IP Address - 10.0.0.100/24
Default Gateway - 10.0.0.1
DNS - 8.8.8.8

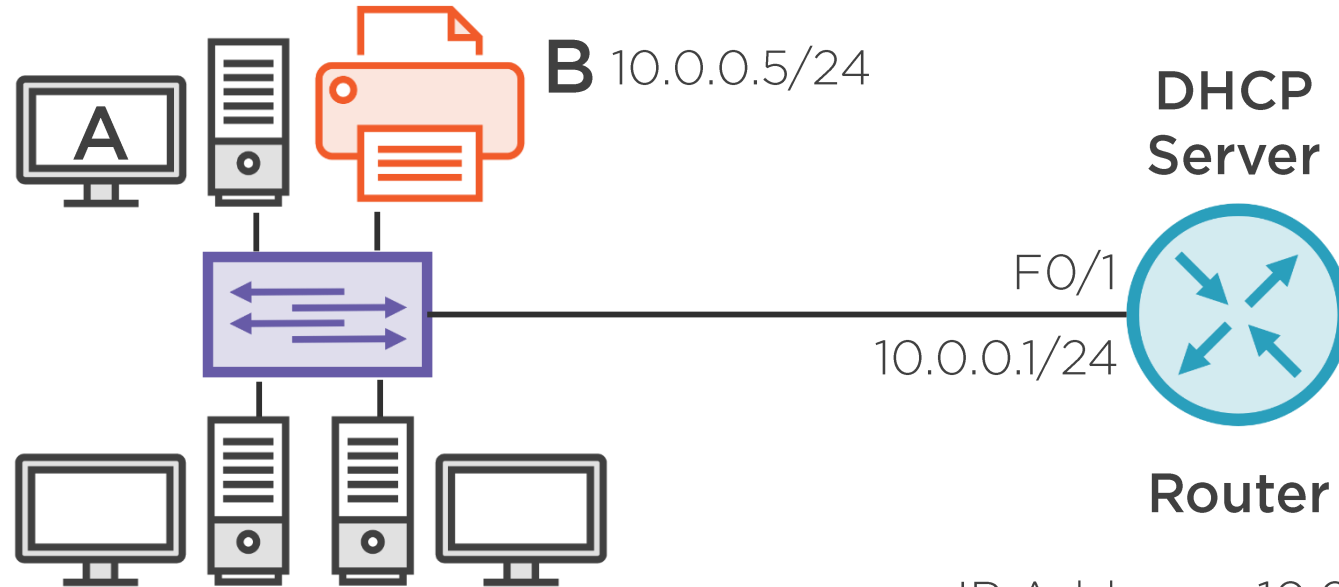
7 days

B 10.0.0.5/24



DHCP

7 days IP Address - 10.0.0.100/24
Default Gateway - 10.0.0.1
DNS - 8.8.8.8



B 10.0.0.5/24

**DHCP
Server**

F0/1

10.0.0.1/24

Router

A

IP Address - 10.0.0.100/24
Default Gateway - 10.0.0.1
DNS - 8.8.8.8

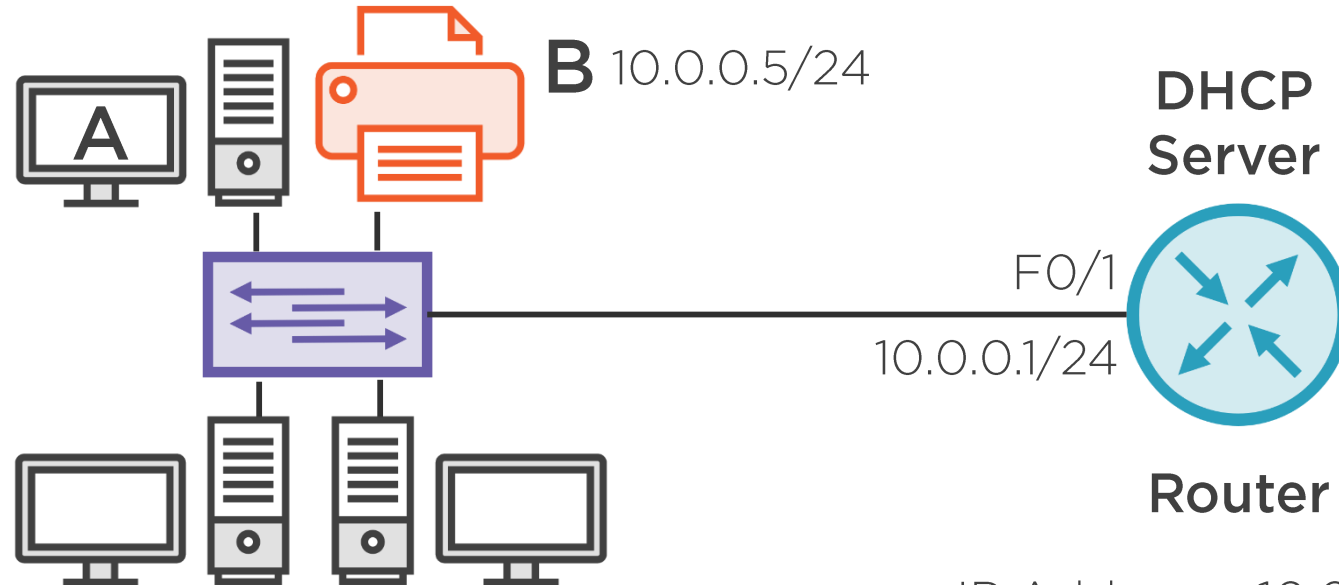
7 days

B 10.0.0.5/24



DHCP

7 days IP Address - 10.0.0.100/24
Default Gateway - 10.0.0.1
DNS - 8.8.8.8



B 10.0.0.5/24

A

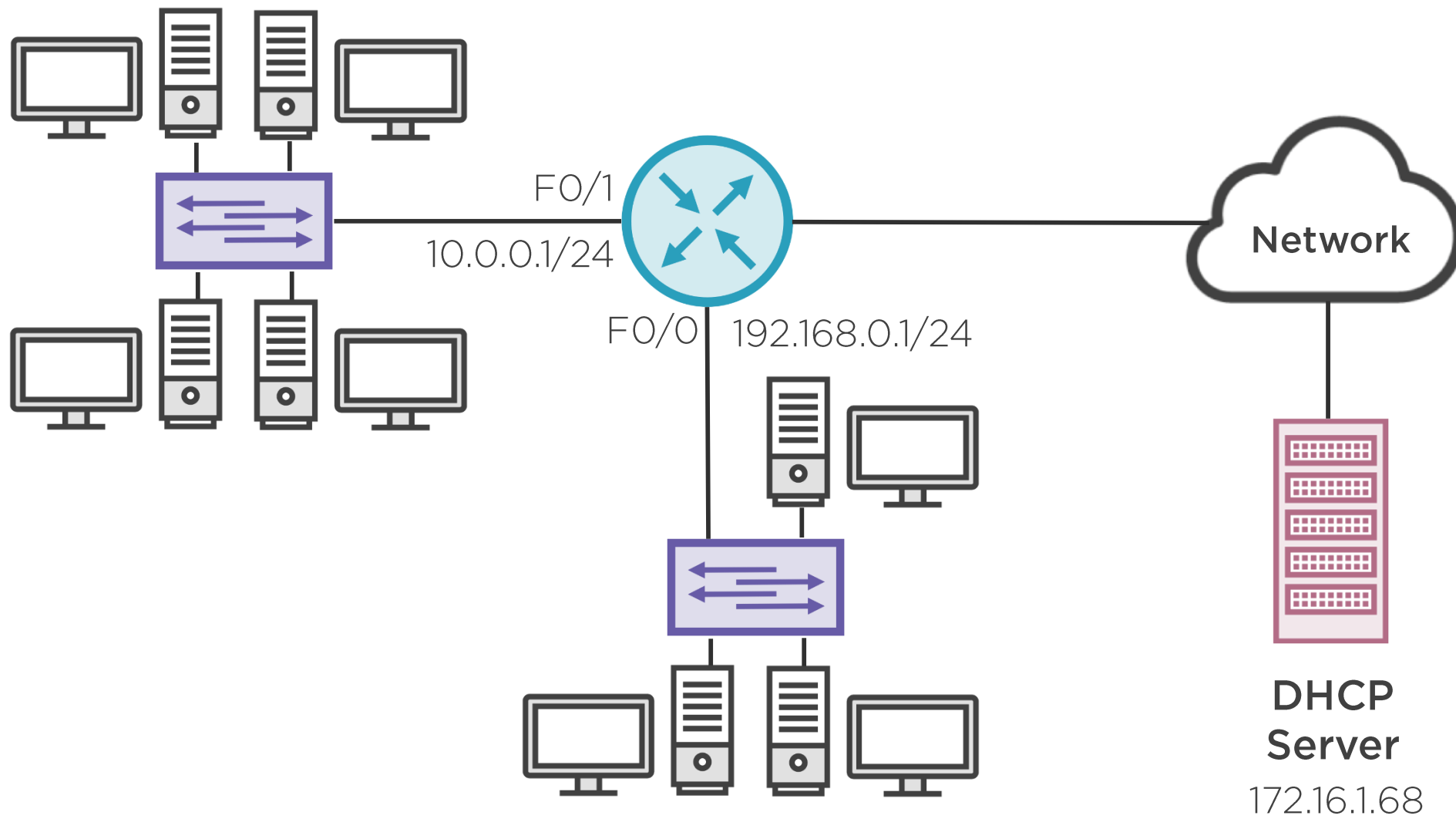
IP Address - 10.0.0.100/24
Default Gateway - 10.0.0.1
DNS - 8.8.8.8

7 days

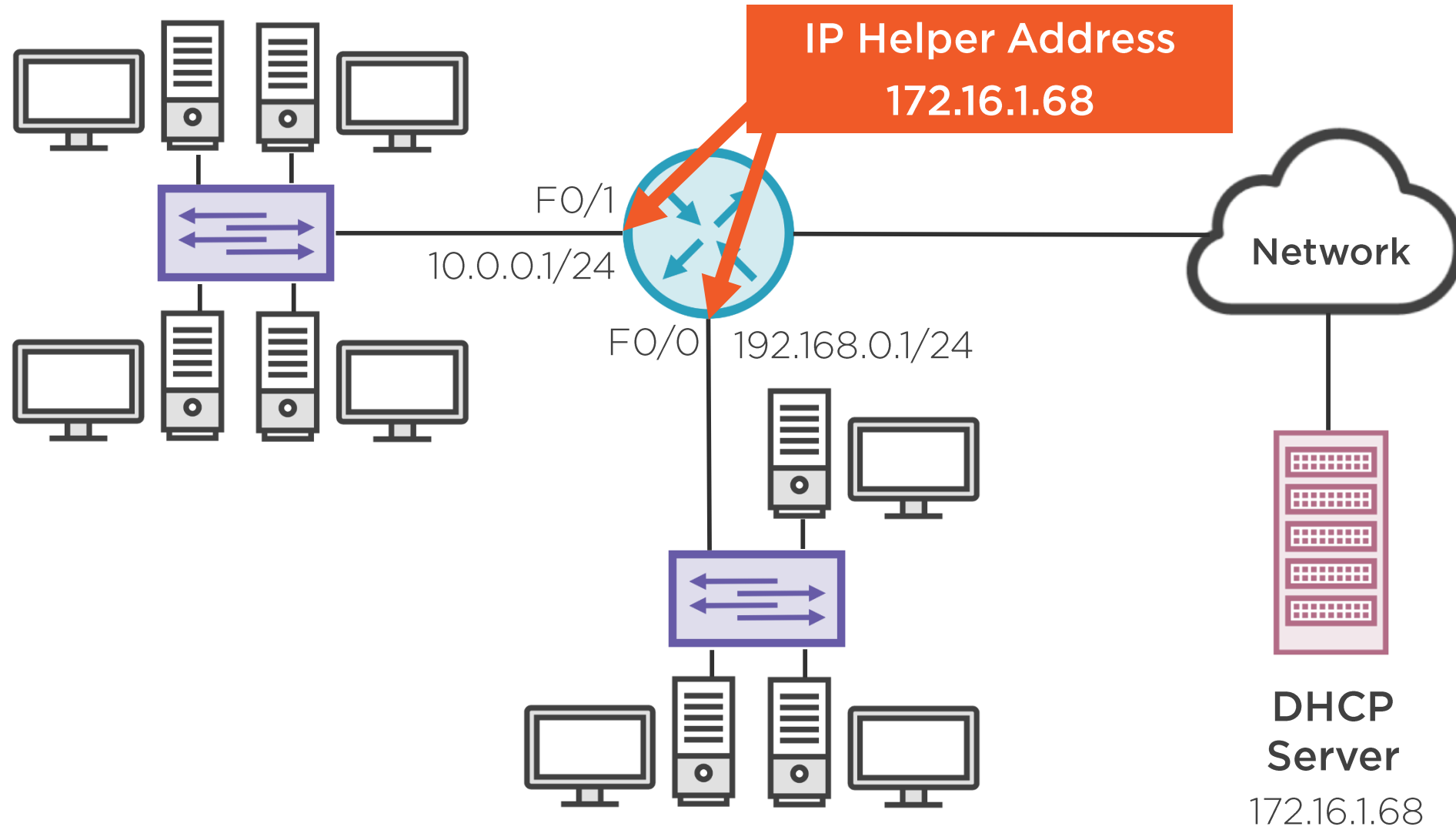
B 10.0.0.5/24



DHCP



DHCP



DNS Hierarchy

Uniform Resource Locator



Uniform Resource Locator (URL)



Uniform Resource Locator (URL)

www.pluralsight.com



Uniform Resource Locator (URL)

www.pluralsight.com

Top Level Domain (TLD)

.com .edu .org .net .gov .mil
.ca .jp .uk .in .au



Uniform Resource Locator (URL)

www.pluralsight.com



Uniform Resource Locator (URL)



www.pluralsight.com

Second Level Domain



Uniform Resource Locator (URL)

www.pluralsight.com

Second Level Domain

google.com

cisco.com

wikipedia.org

he.net



Uniform Resource Locator (URL)



www.pluralsight.com

Third Level Domain



Uniform Resource Locator (URL)



www.pluralsight.com

Third Level Domain

Hostname



Uniform Resource Locator (URL)

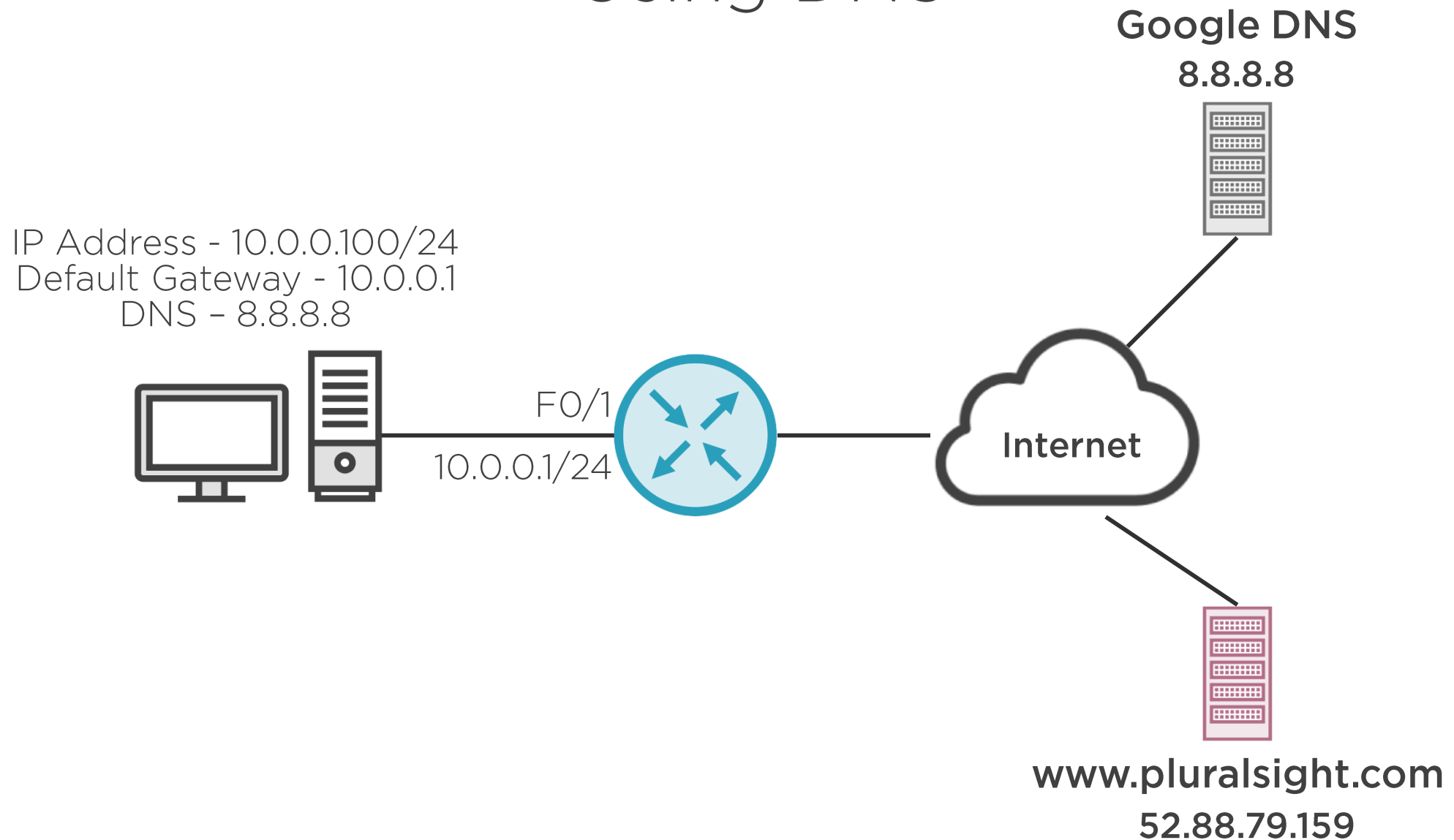


Uniform Resource Locator (URL)

www.engineering.university.edu



Using DNS



IP Address - 10.0.0.10
Default Gateway - 10
DNS - 8.8.8.8



Internet Protocol Version 4 (TCP/IPv4) Properties

General Alternate Configuration

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:

Subnet mask:

Default gateway:

☒ Obtain DNS server address automatically

☐ Use the following DNS server addresses:

Preferred DNS server:

Alternate DNS server:

☐ Validate settings upon exit

Advanced...

OK Cancel

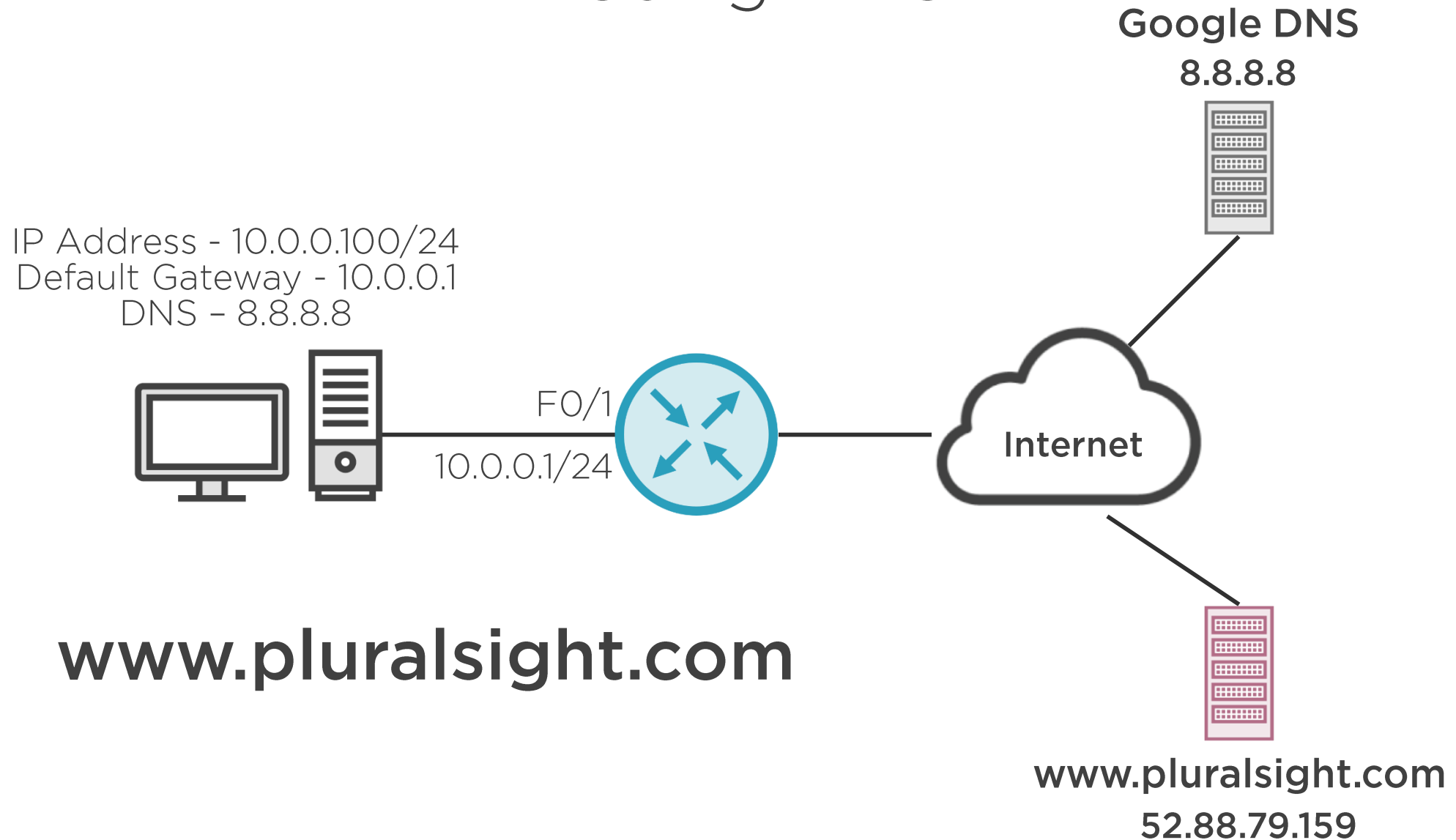
Google DNS
8.8.8.8



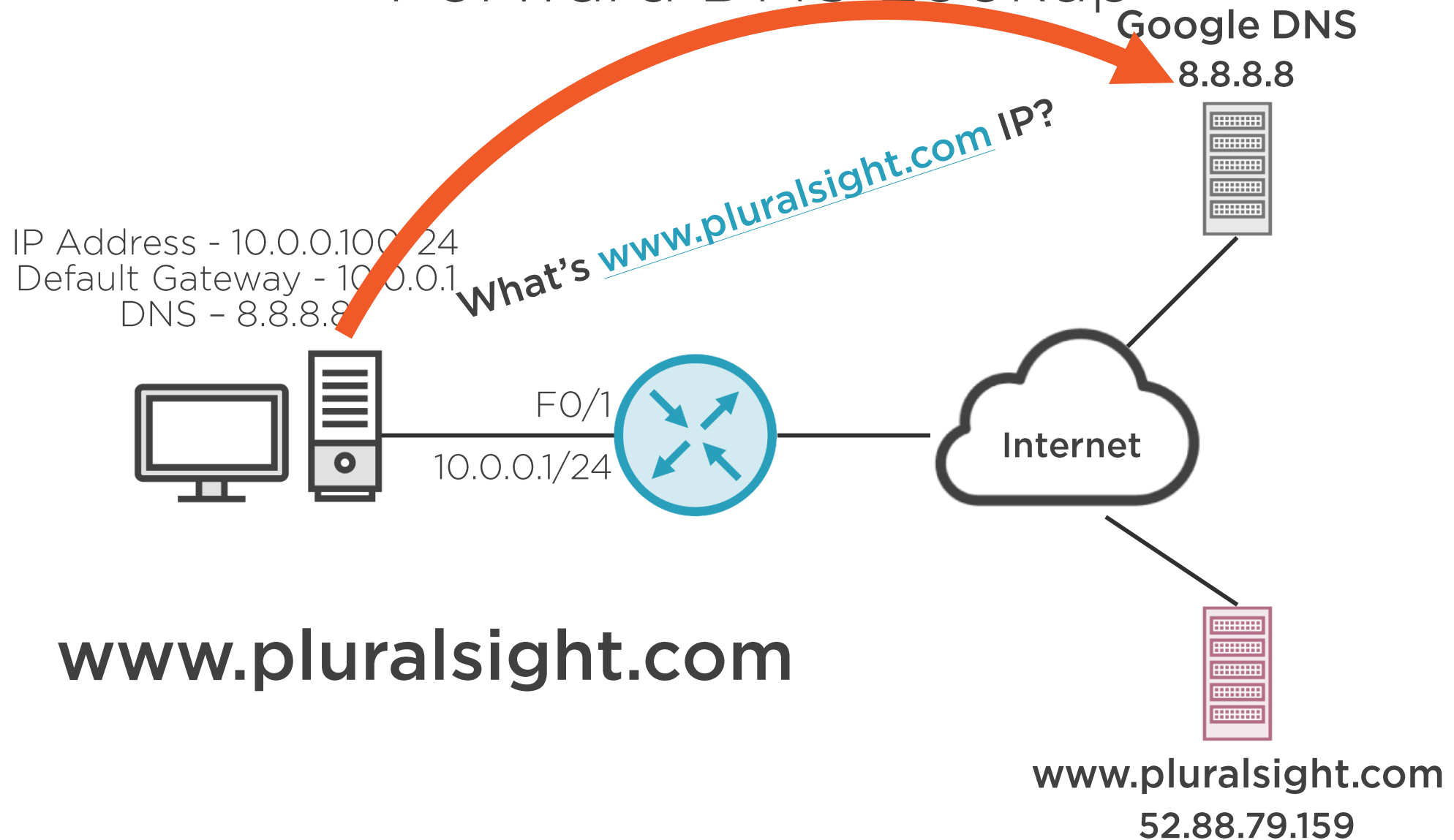
luralsight.com
52.88.79.159



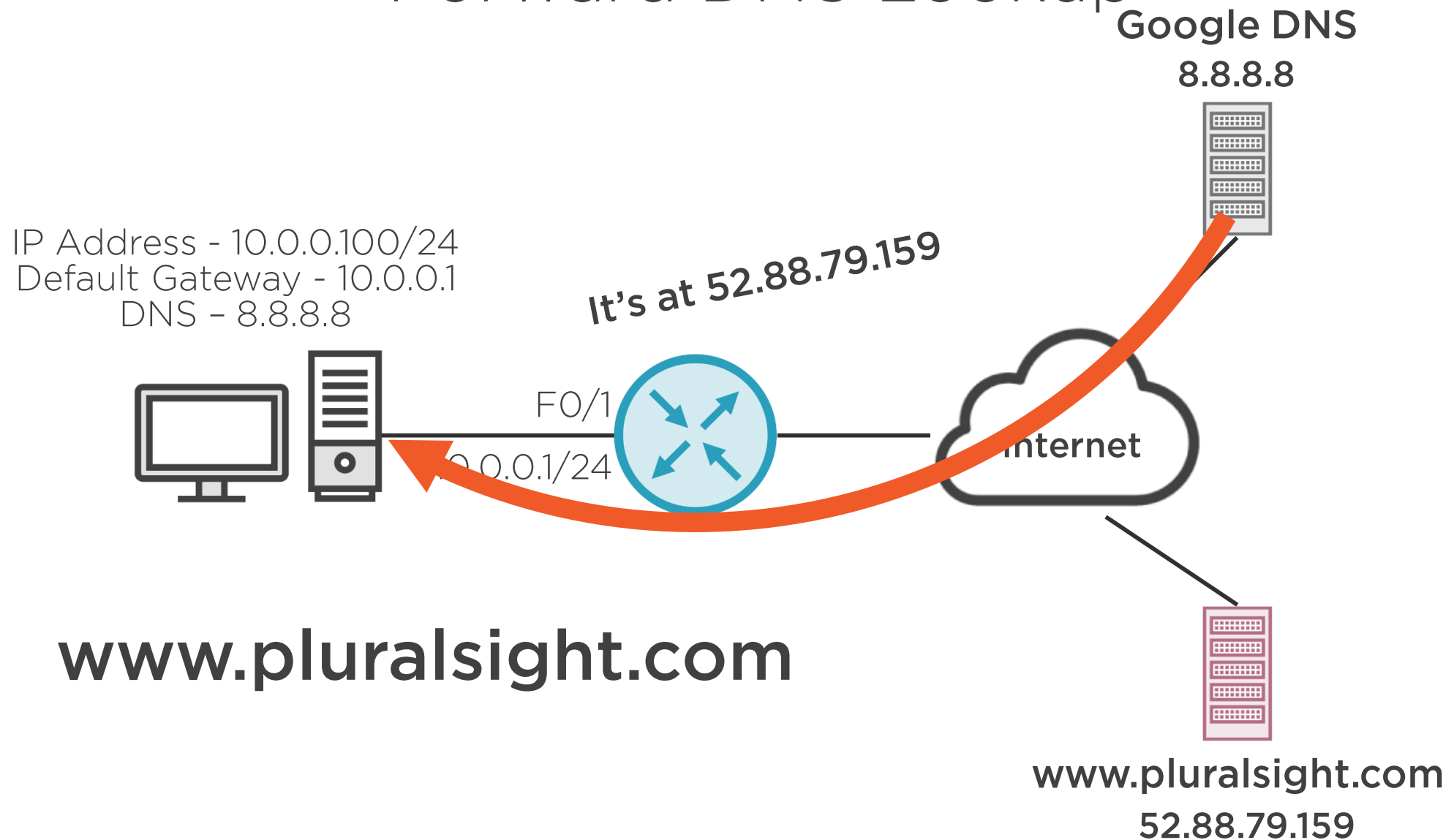
Using DNS



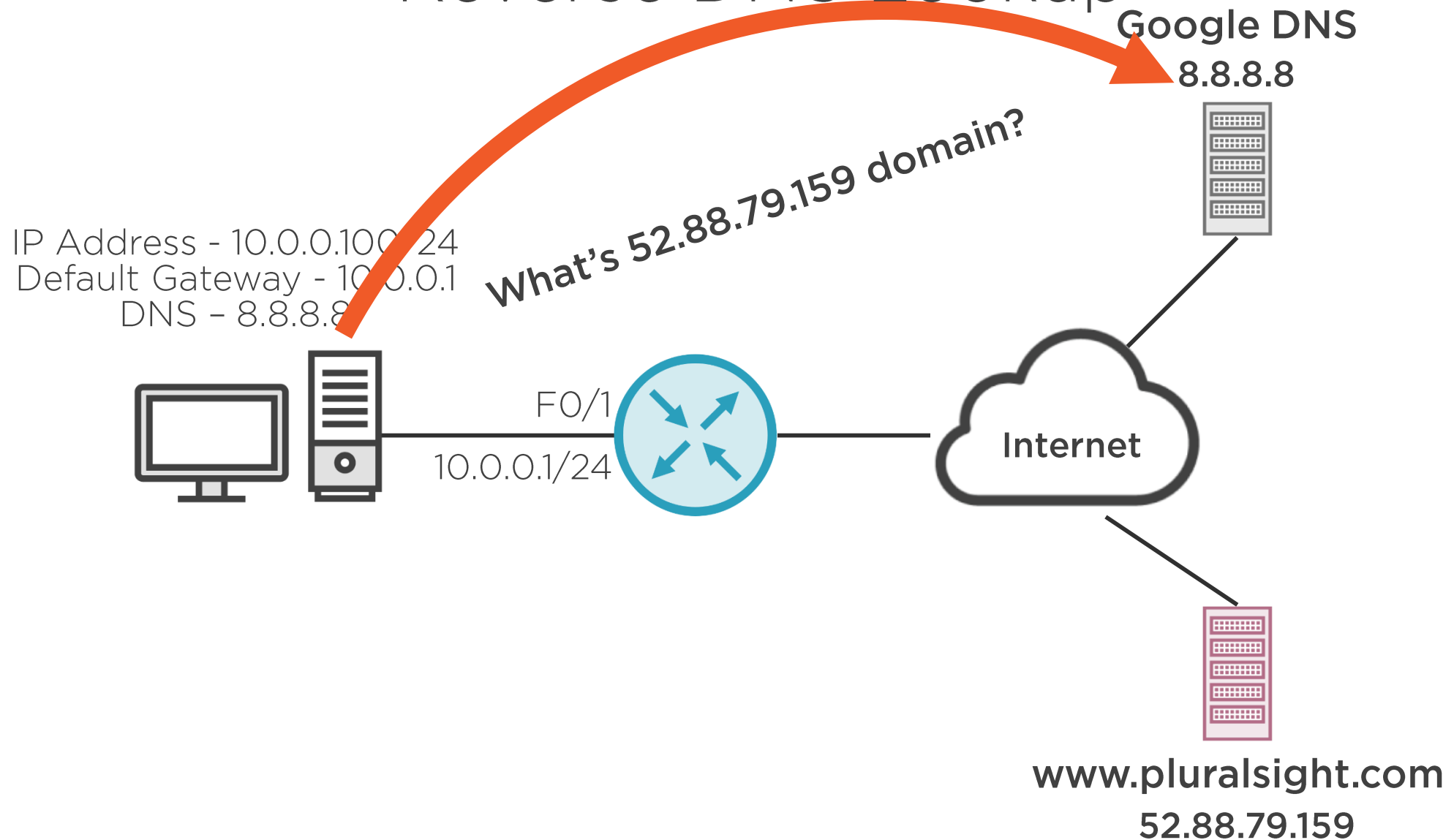
Forward DNS Lookup



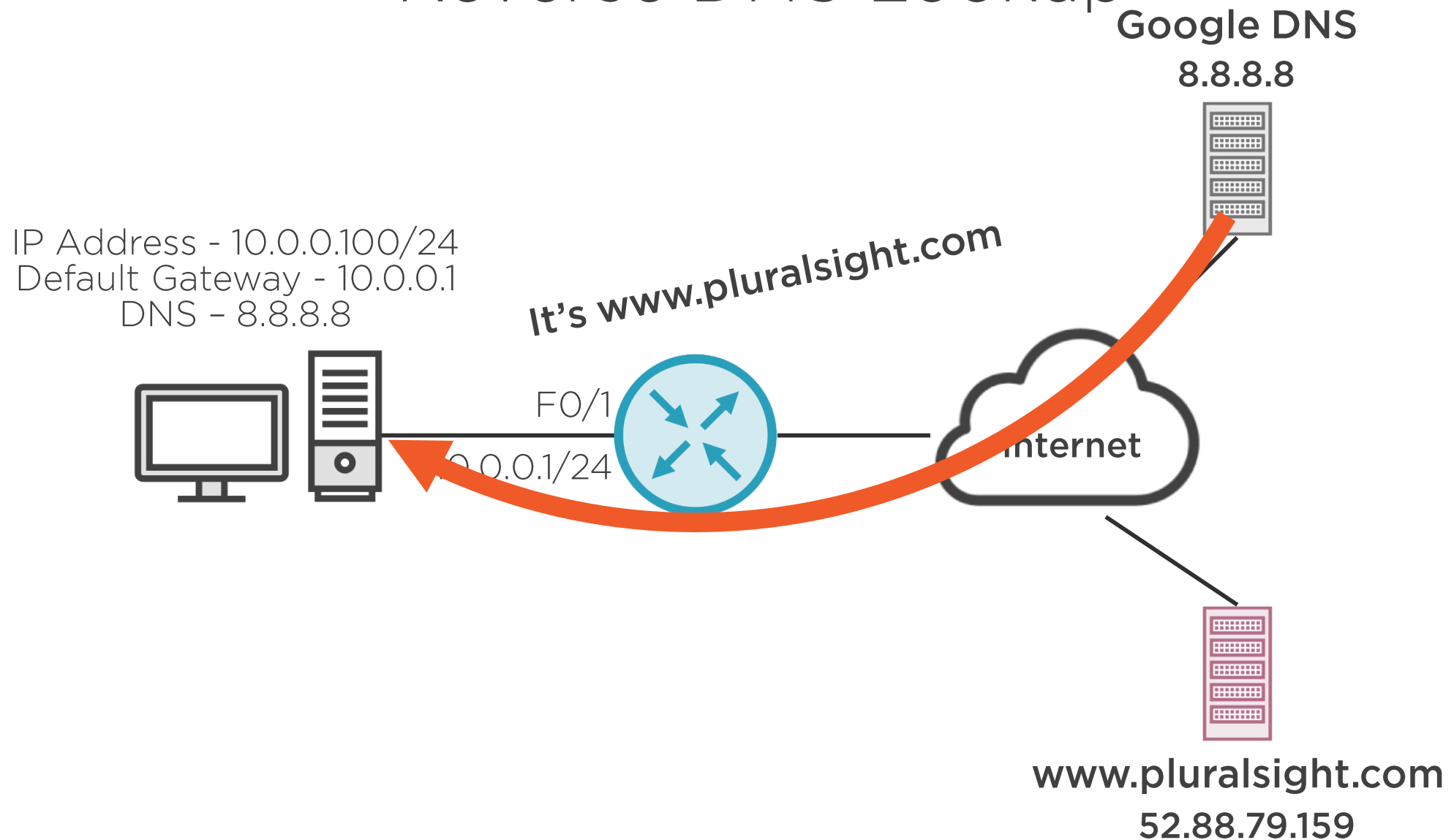
Forward DNS Lookup



Reverse DNS Lookup



Reverse DNS Lookup





DNS Record Types

A – IPv4 Record

AAAA – IPv6 Record

CNAME – Canonical Name Record

MX – Mail Exchange Record

NS – Identifies Authoritative Name Server

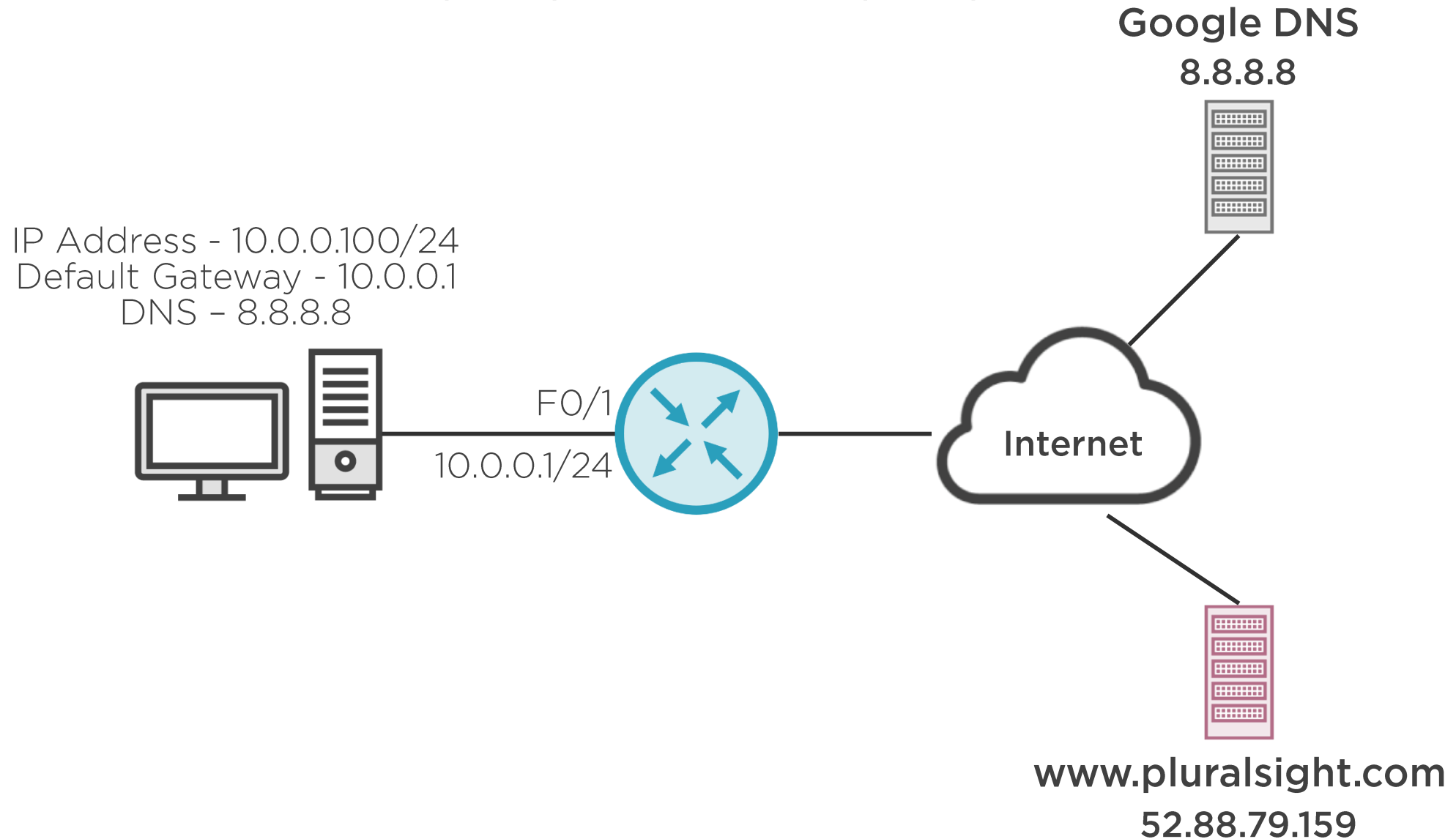
PTR – Pointer Record

SRV – Service Record

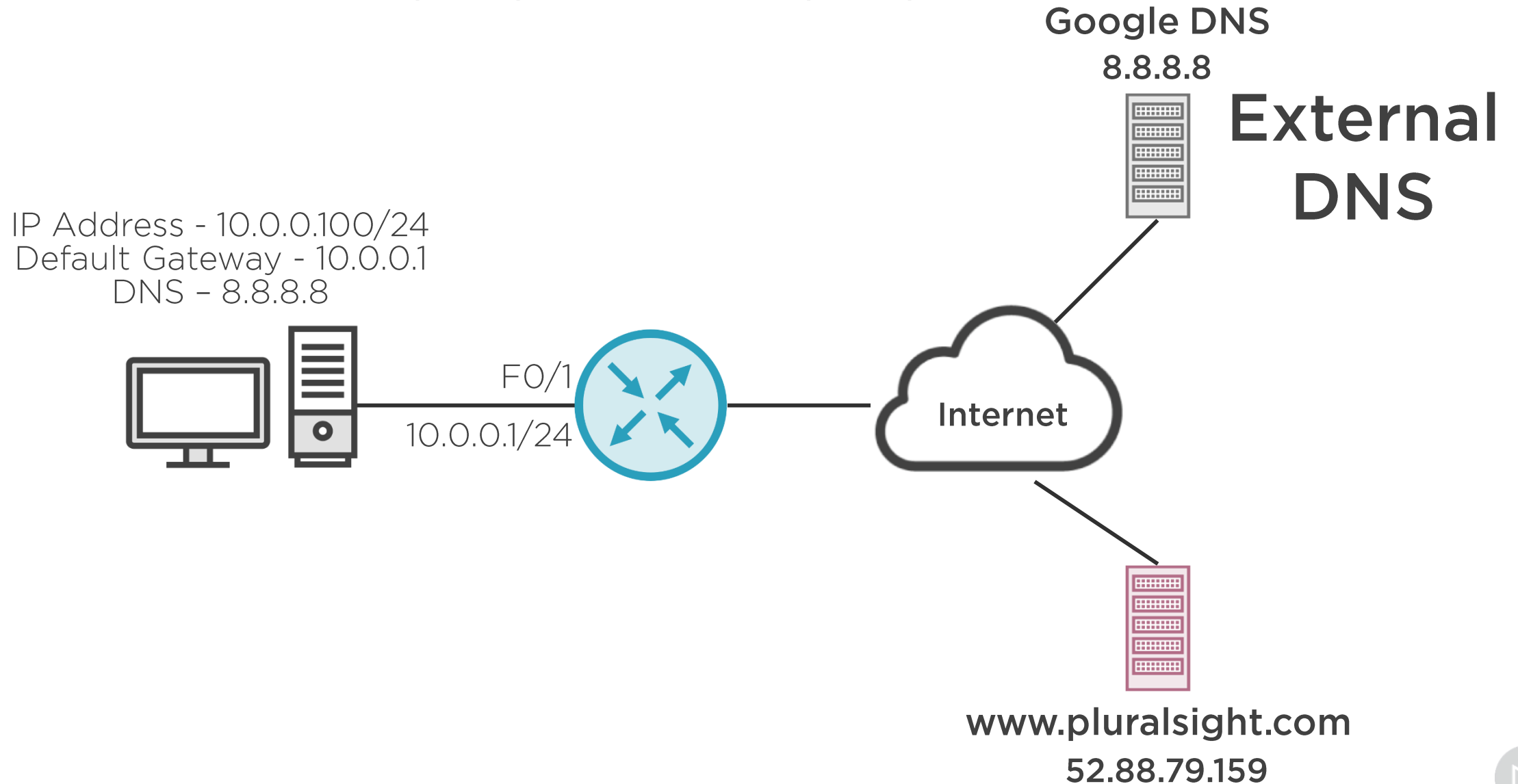
TXT – Text record for miscellaneous use



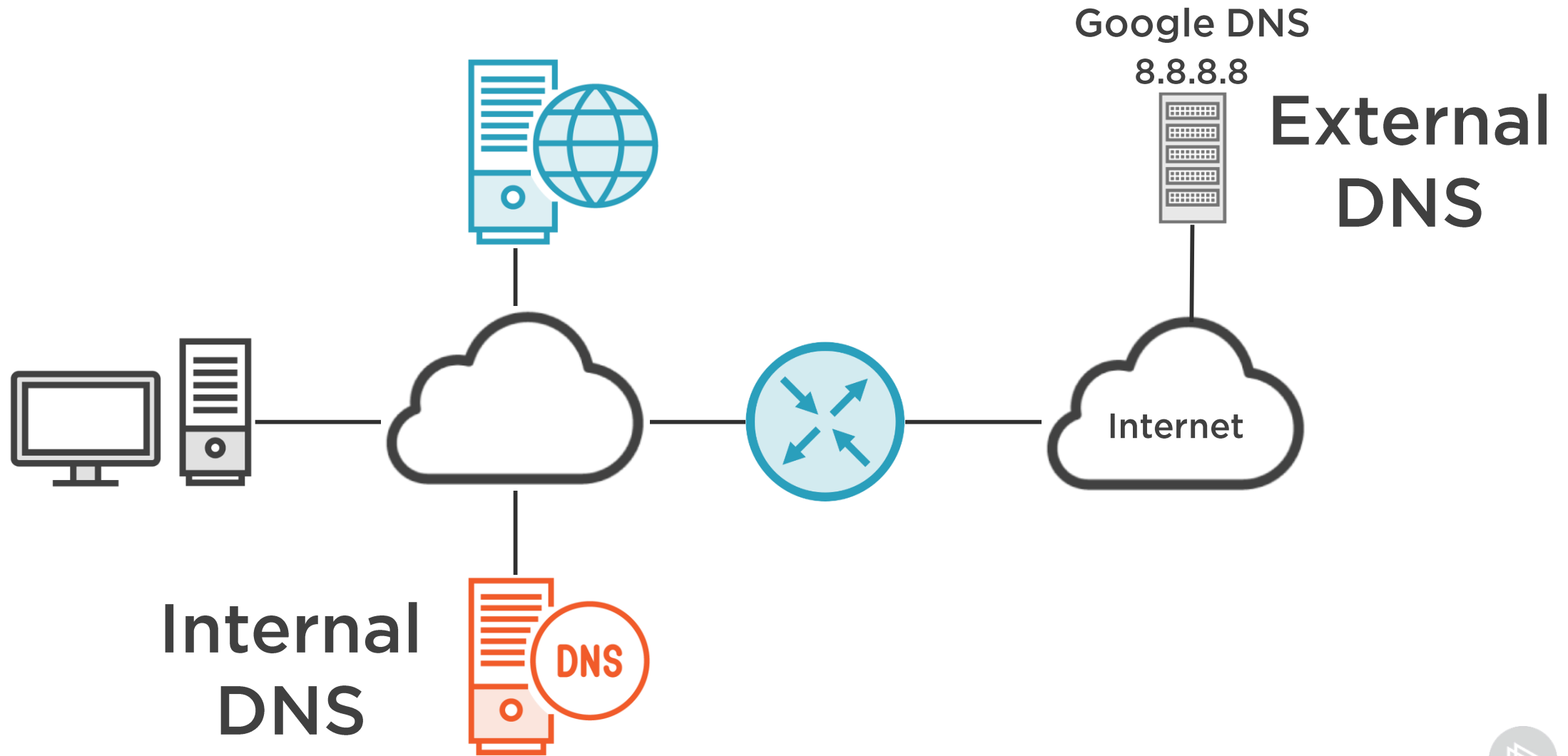
Internal vs. External DNS



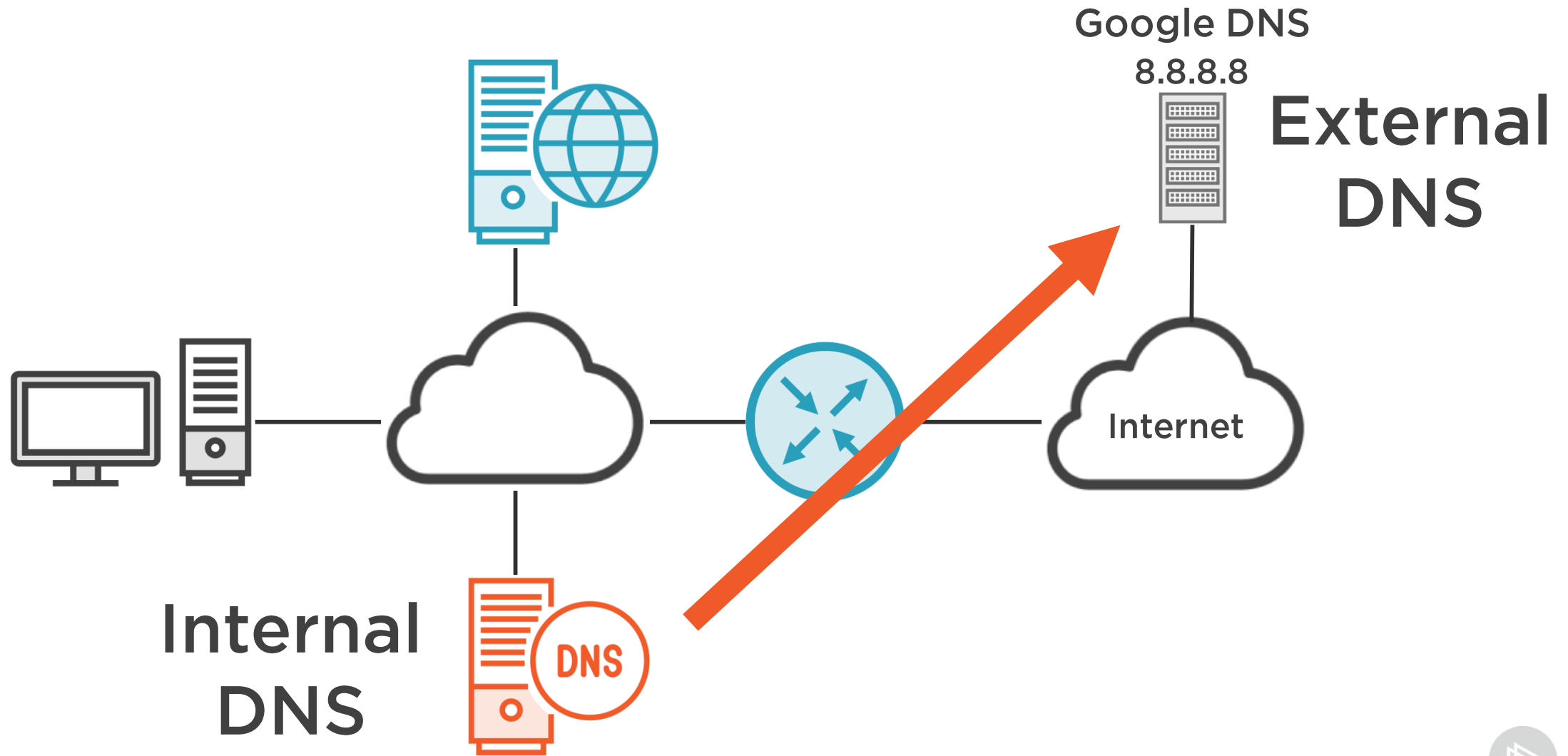
Internal vs. External DNS



Internal vs. External DNS



Internal vs. External DNS



Summary



OSI Model Review

Network Topologies

Network Address Translation

Access Control Lists

Traffic Shaping

Dynamic Host Configuration Protocol

Domain Name System

