

# Describe Protocols and Port Numbers

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**Ross Bagurdes**  
Network Engineer

@bagurdes



## Module Goals



### Application Layer Protocols

- Data Transfer Protocols
- Authentication Protocols
- Network Service Protocols
- Network Management Protocols
- Audio/Visual Protocols
- Database Protocols

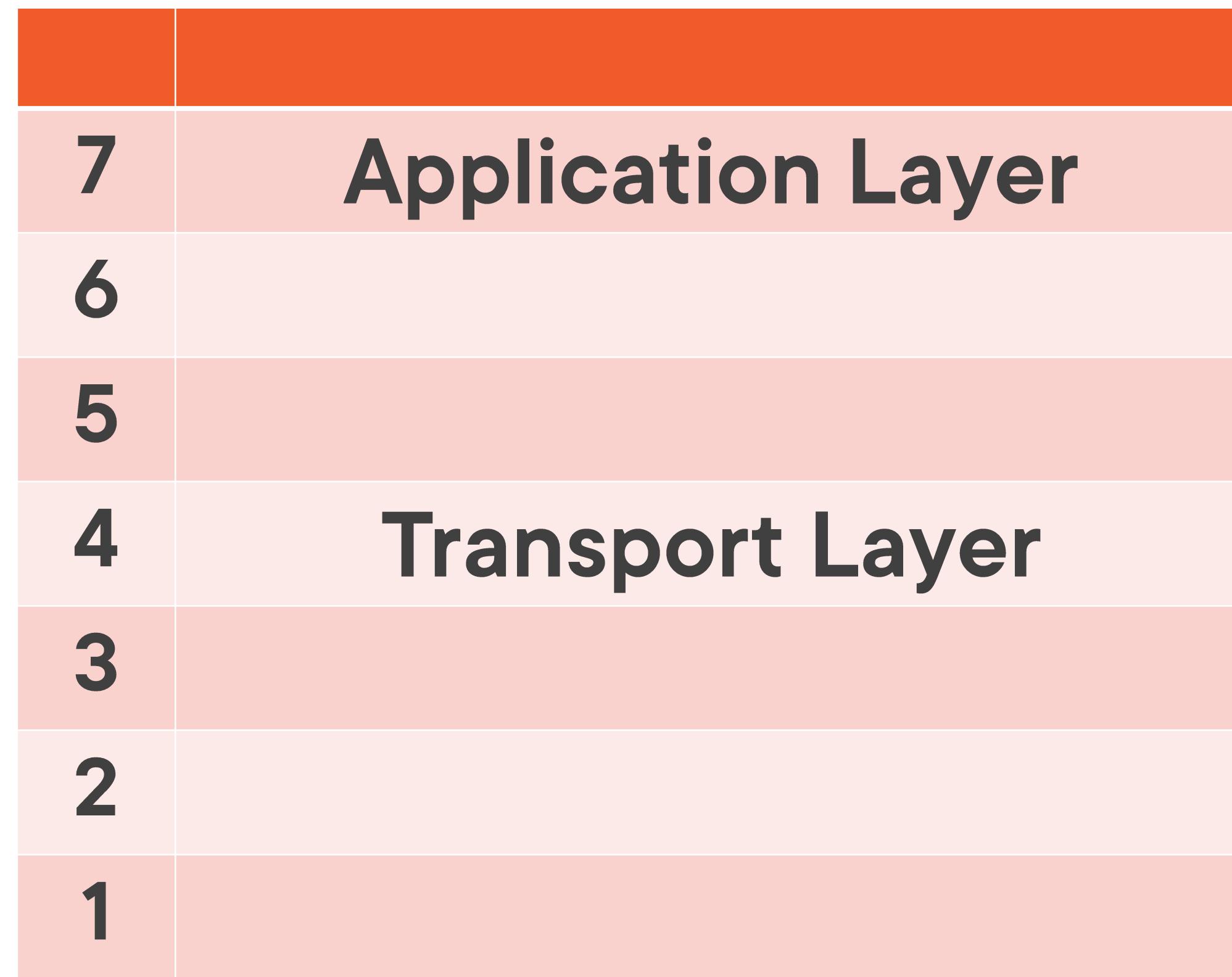


# OSI Model

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



# OSI Model



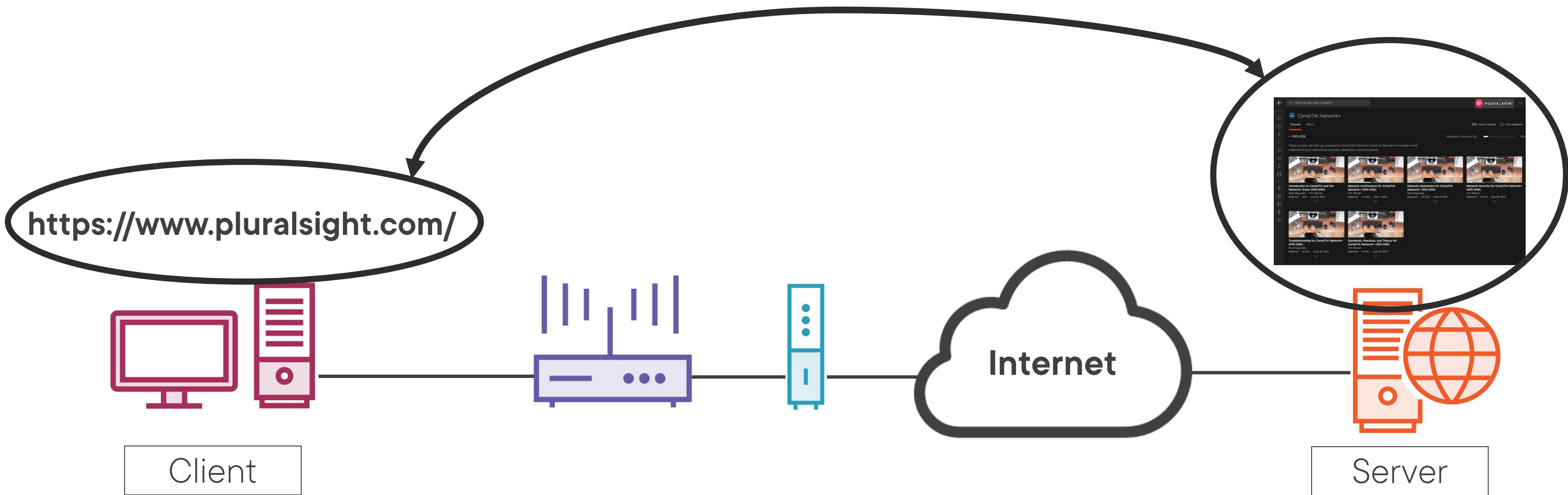
# Application Layer Protocols

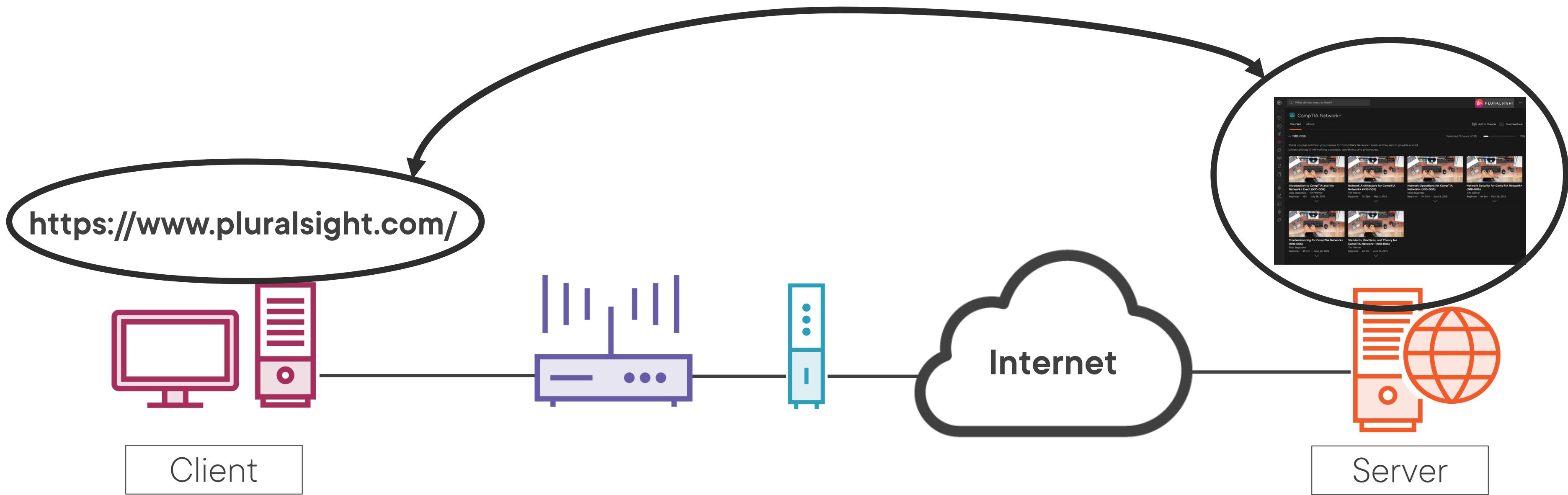
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# Transferring Data

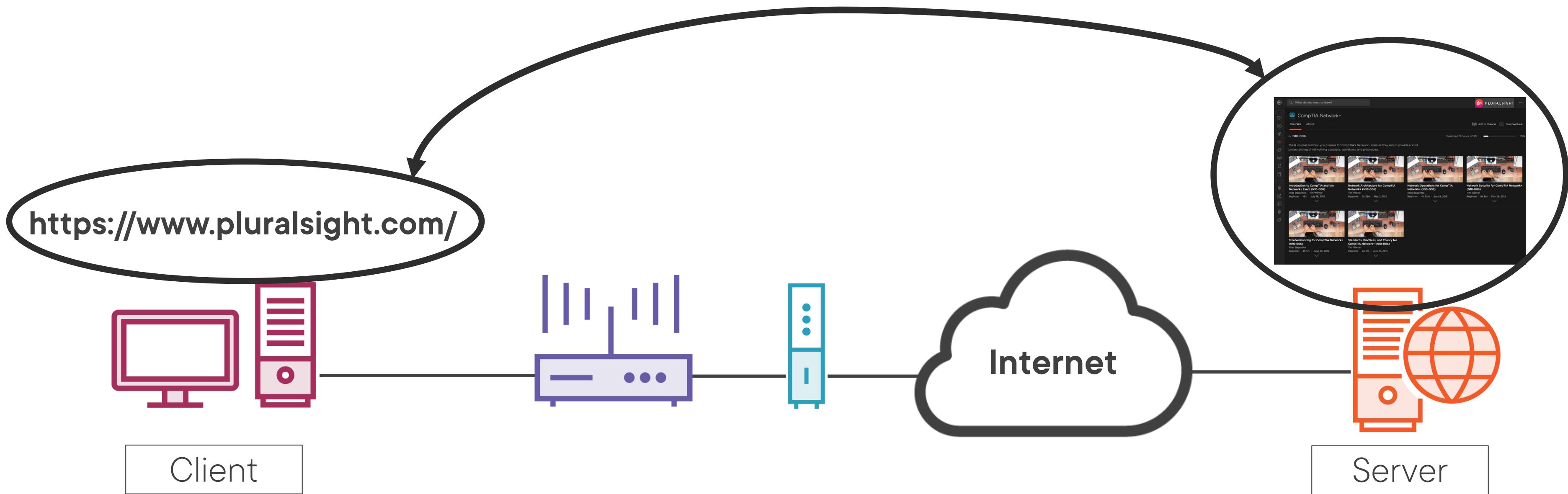






HTTP    HTTPS

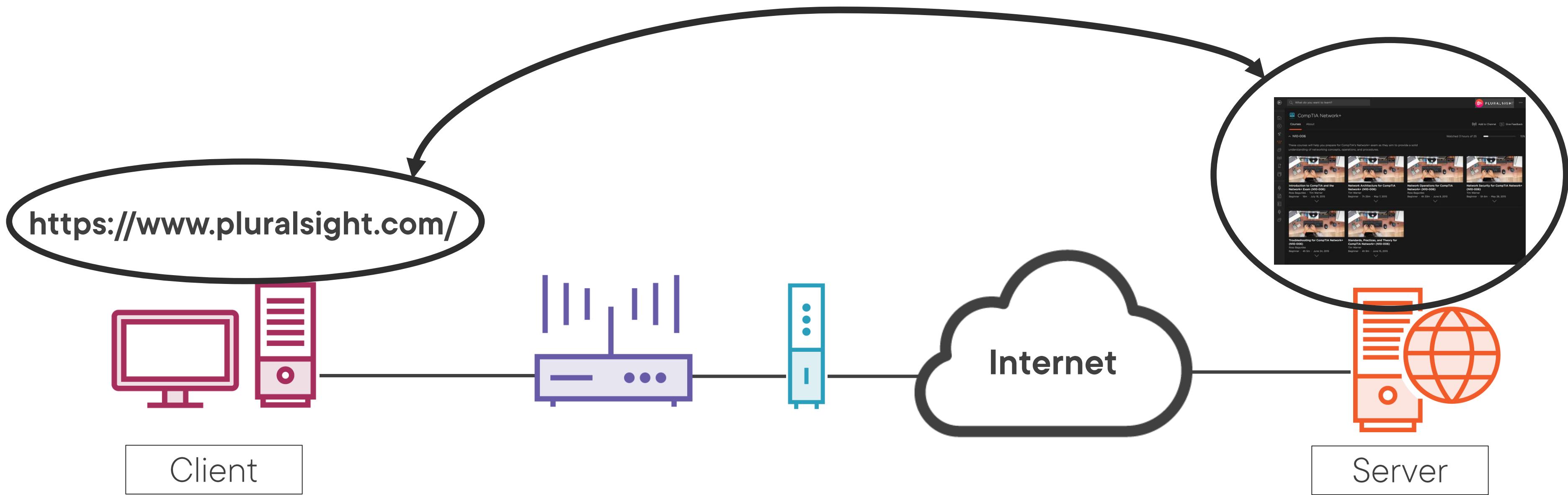




# HTTP    HTTPS

Hypertext Transfer Protocol (secure)

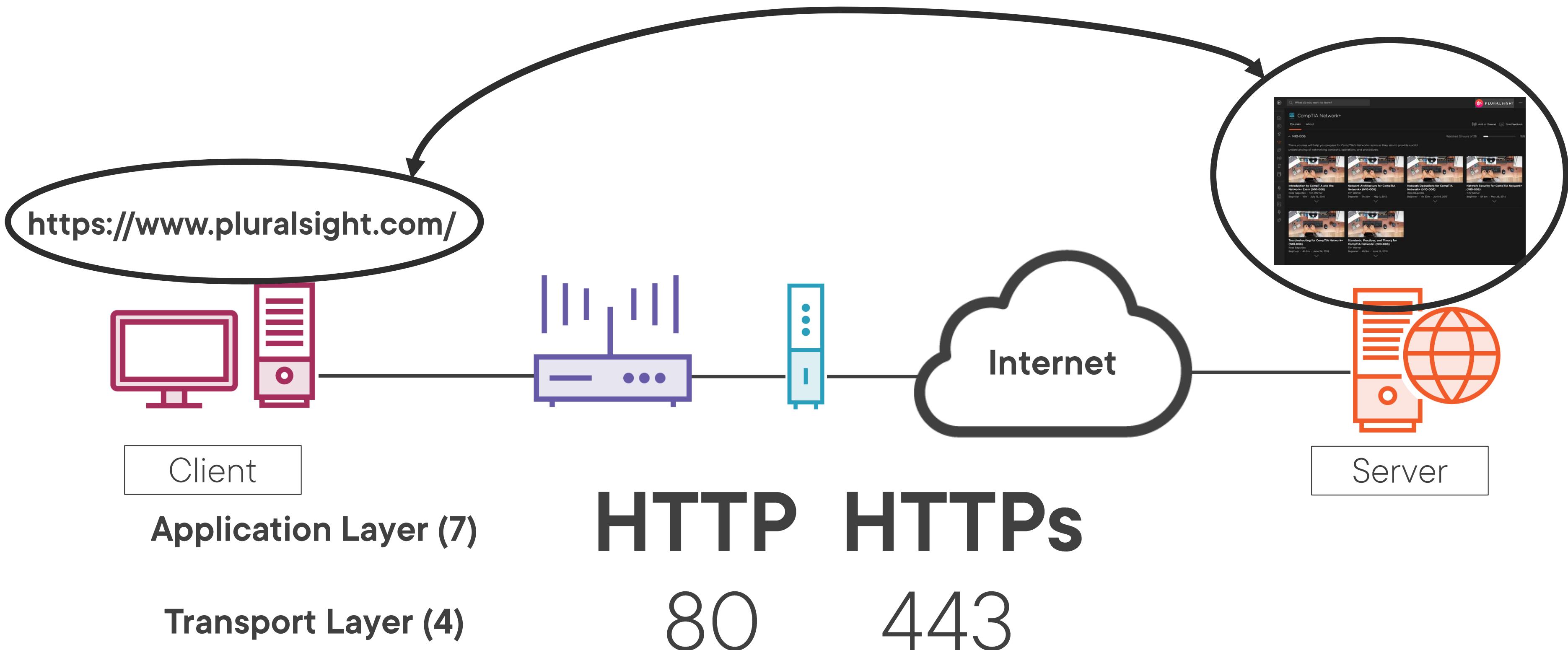


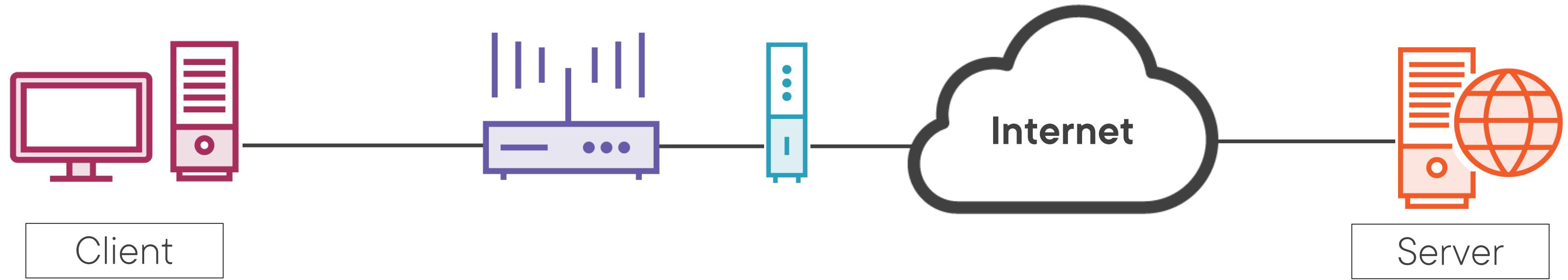


Application Layer (7)

HTTP    HTTPS





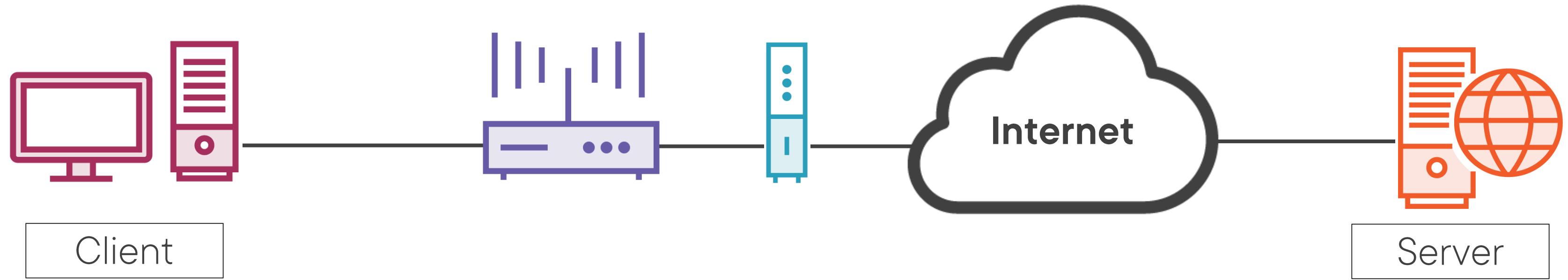


**HTTPs**      443

**SSL**

**TLS**





**HTTPs**      443

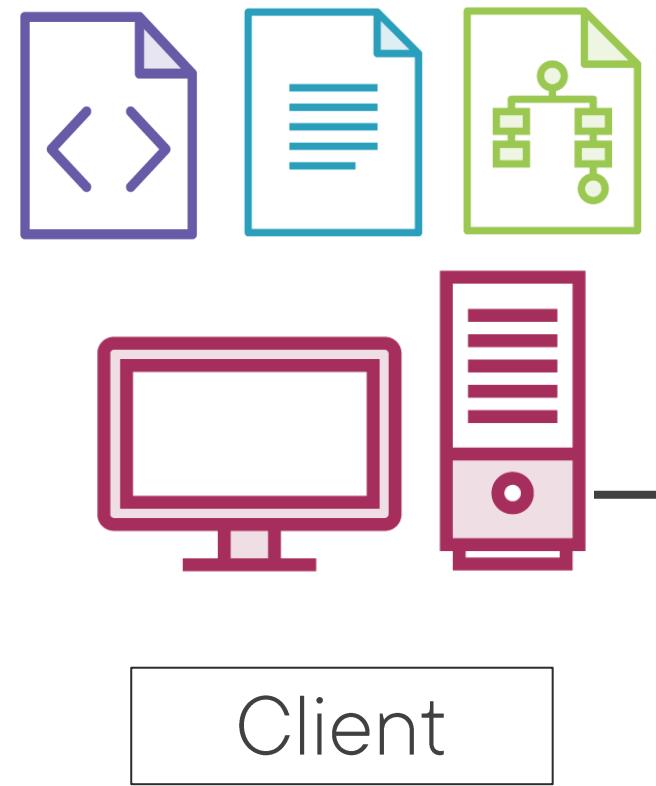
**TLS**





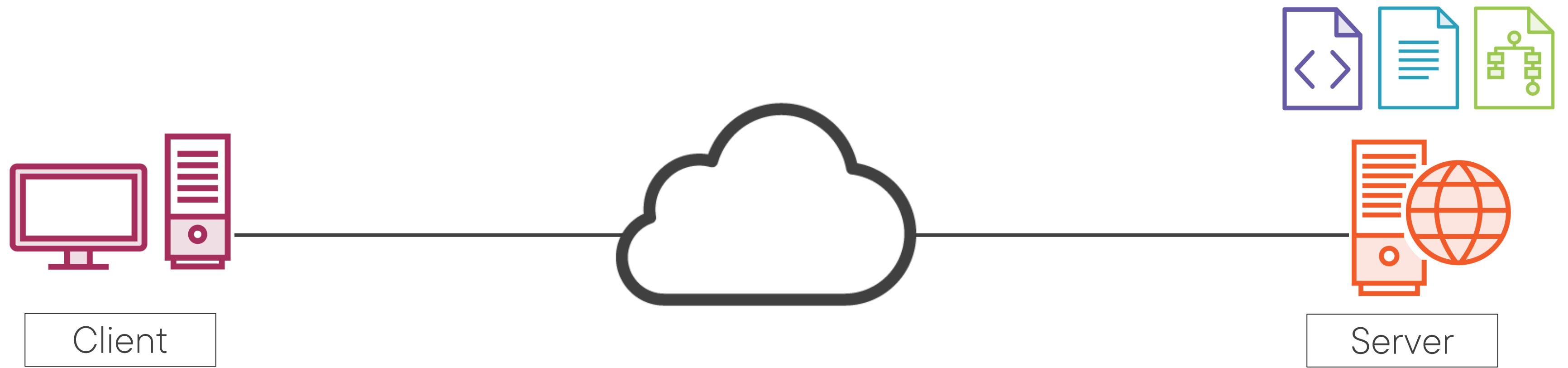
# File Transfer





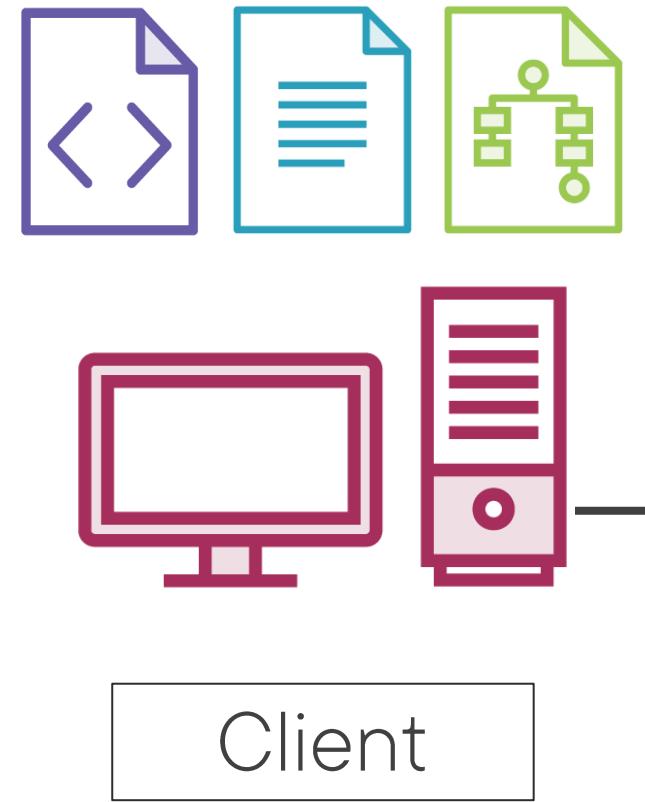
# File Transfer





# File Transfer





# File Transfer





## File Transfer

**FTP    sFTP    TFTP**





## File Transfer

**FTP**

20/21

**sFTP**

22

**TFTP**

69





## File Transfer

**FTP**

20 /21

**sFTP**

22

**TFTP**

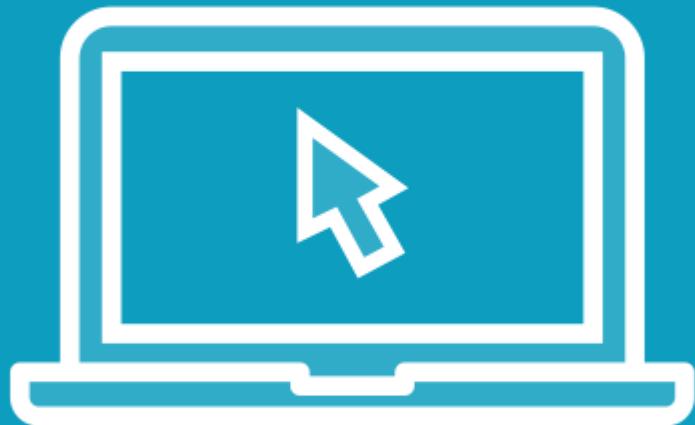
69

**SMB**

445



Demo



**Examine FTP and SMB operation**





# Email





Email

**POP3**

**IMAP**

**SMTP**





**POP3      IMAP**





Email

SMTP





Email

SMTP





Email

SMTP





Email

SMTP





**POP3**

110/995

**IMAP**

143/993

**SMTP**

25/465



# Authentication

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# Authentication





## Authentication

**LDAP**

**LDAPs**





## Authentication

**LDAP**

**LDAPs**

Lightweight Directory Access Protocol





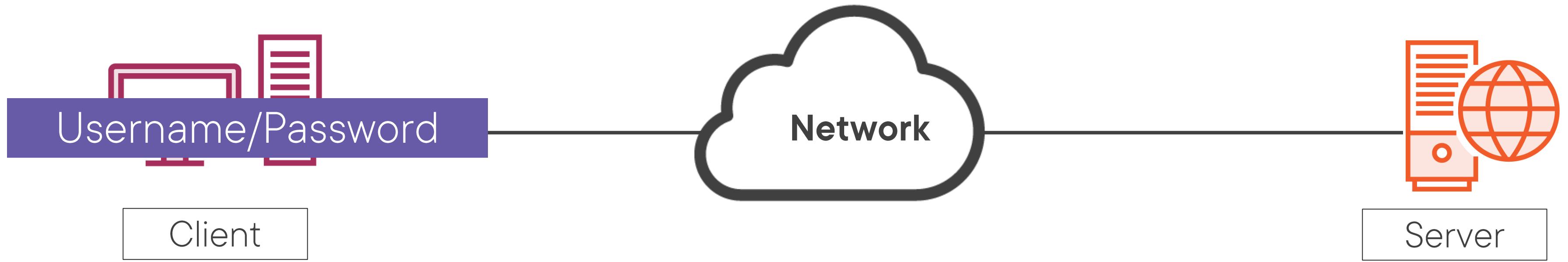
## Authentication

**LDAP**

**LDAPs**

Lightweight Directory Access Protocol





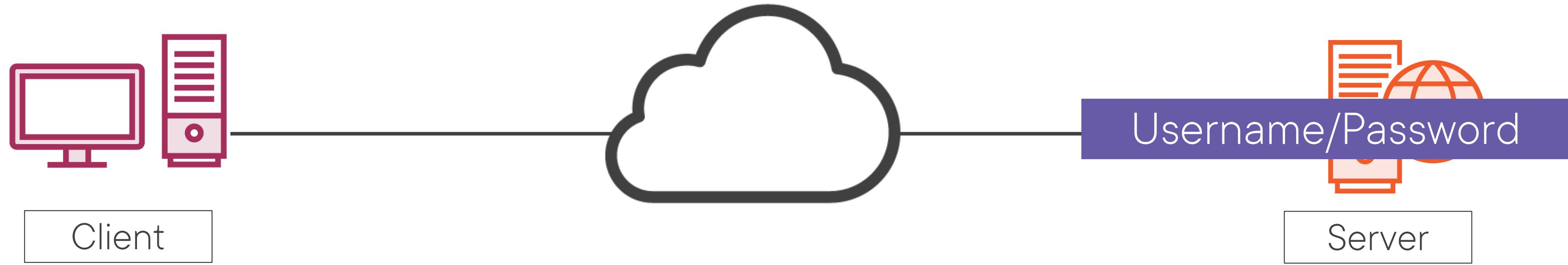
## Authentication

**LDAP**

**LDAPs**

Lightweight Directory Access Protocol





## Authentication

**LDAP**

**LDAPs**

Lightweight Directory Access Protocol





## Authentication

**LDAP**

**LDAPs**

Lightweight Directory Access Protocol





# Authentication

**LDAP**

**LDAPs**

Lightweight Directory Access Protocol





## Authentication

**LDAP**

389

**LDAPs**

636



# Network Services

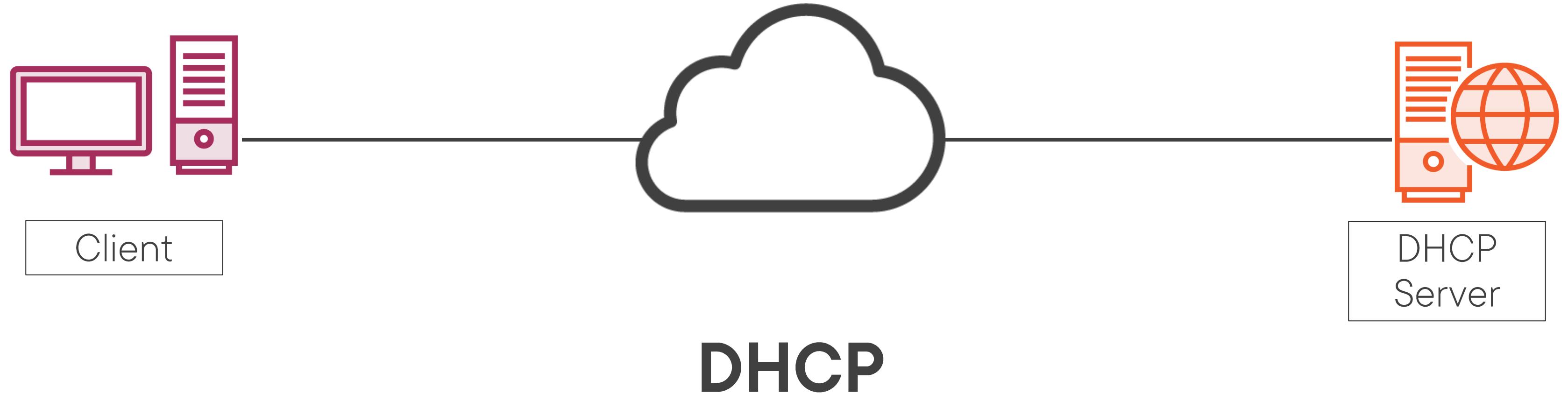
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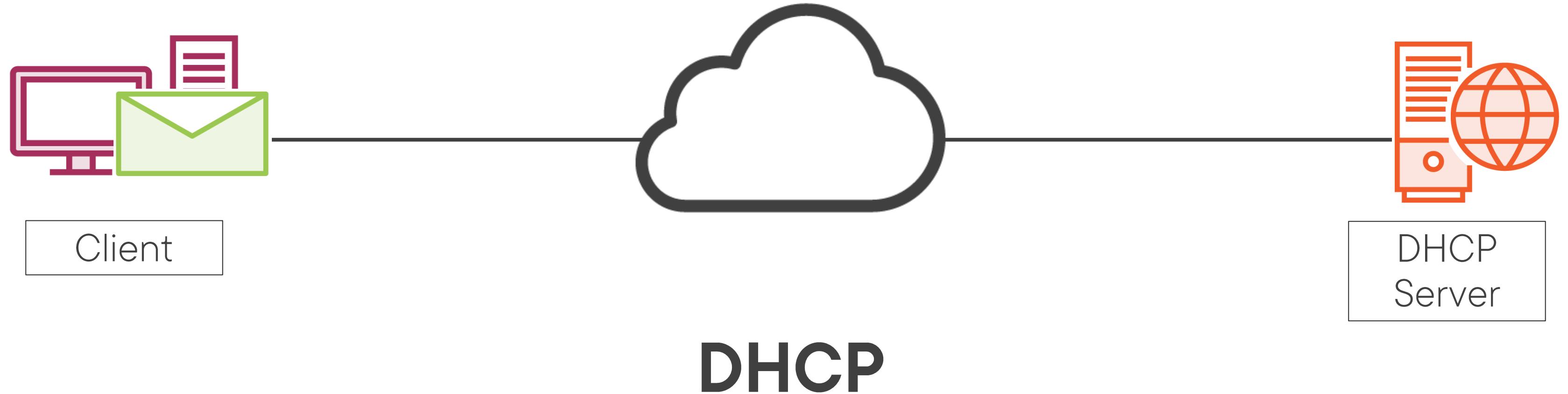


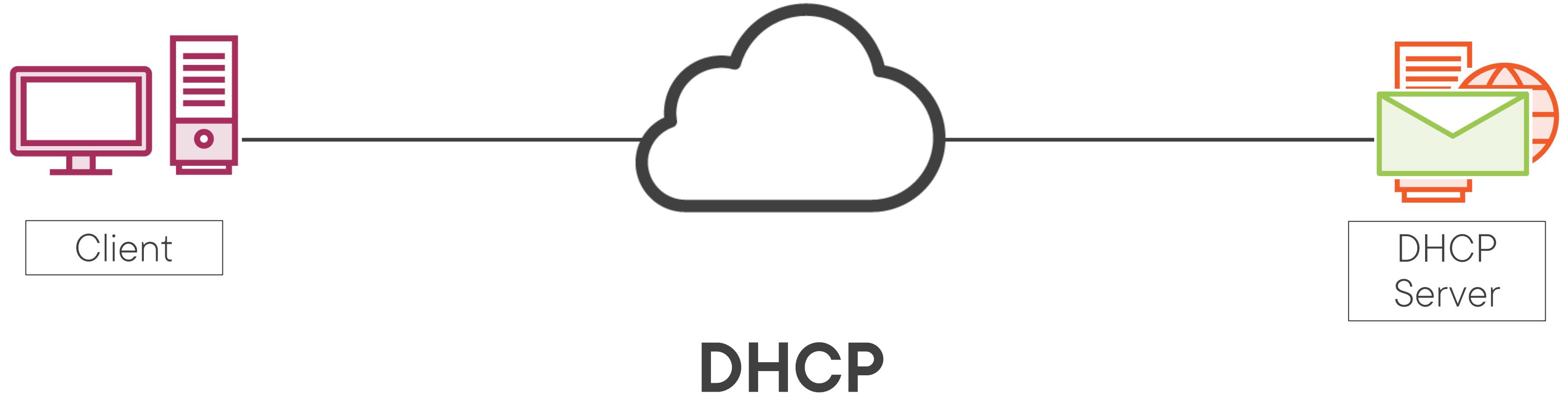


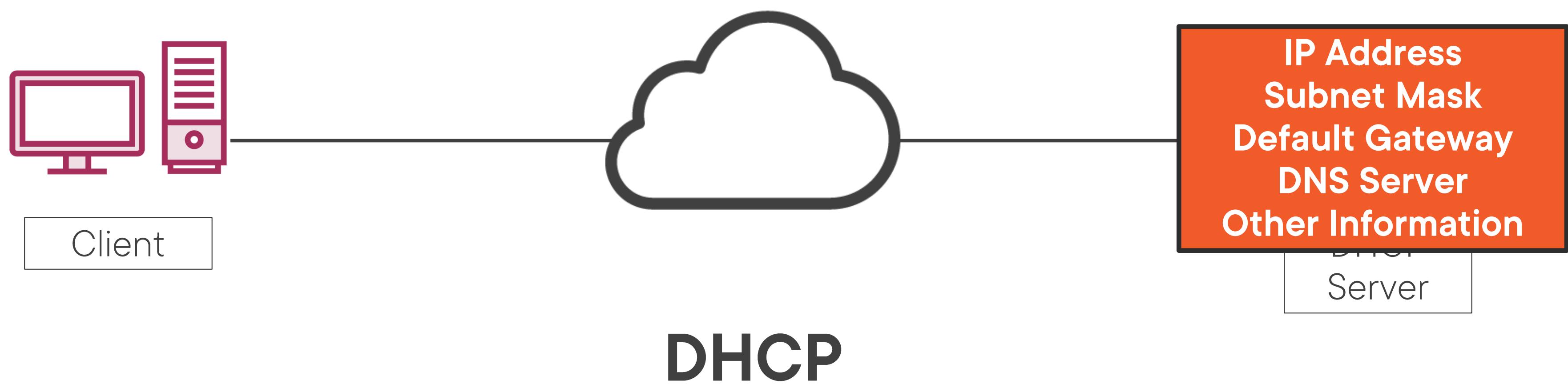
# Dynamic Host Configuration Protocol

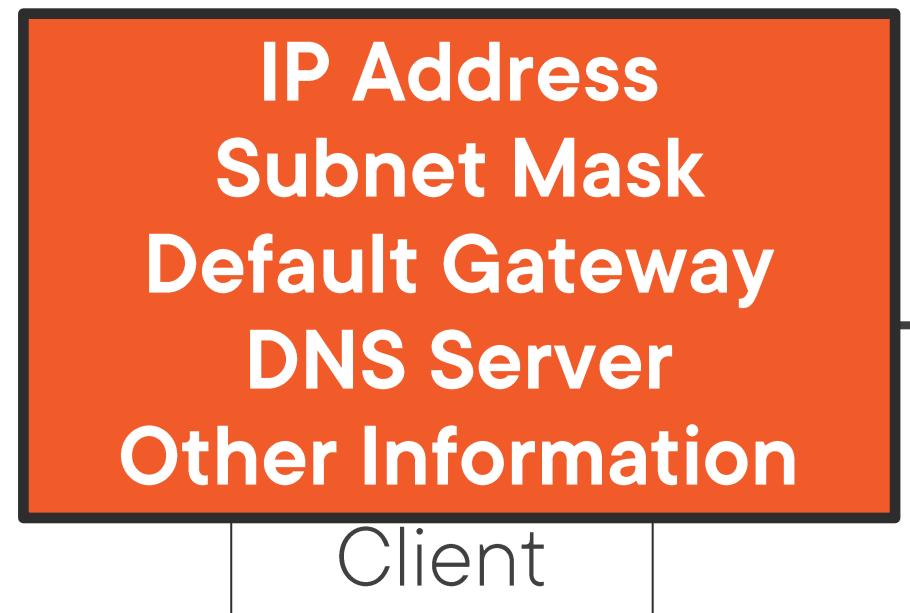












DHCP  
Server

# DHCP

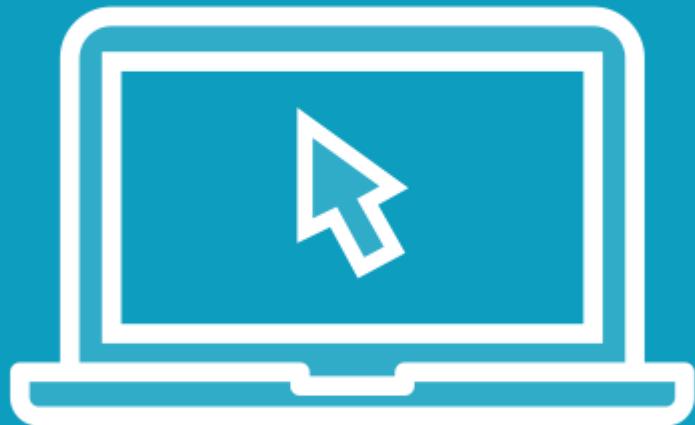




**DHCP**    67/68



Demo



**Examine IP configuration via DHCP**





# Domain Name System



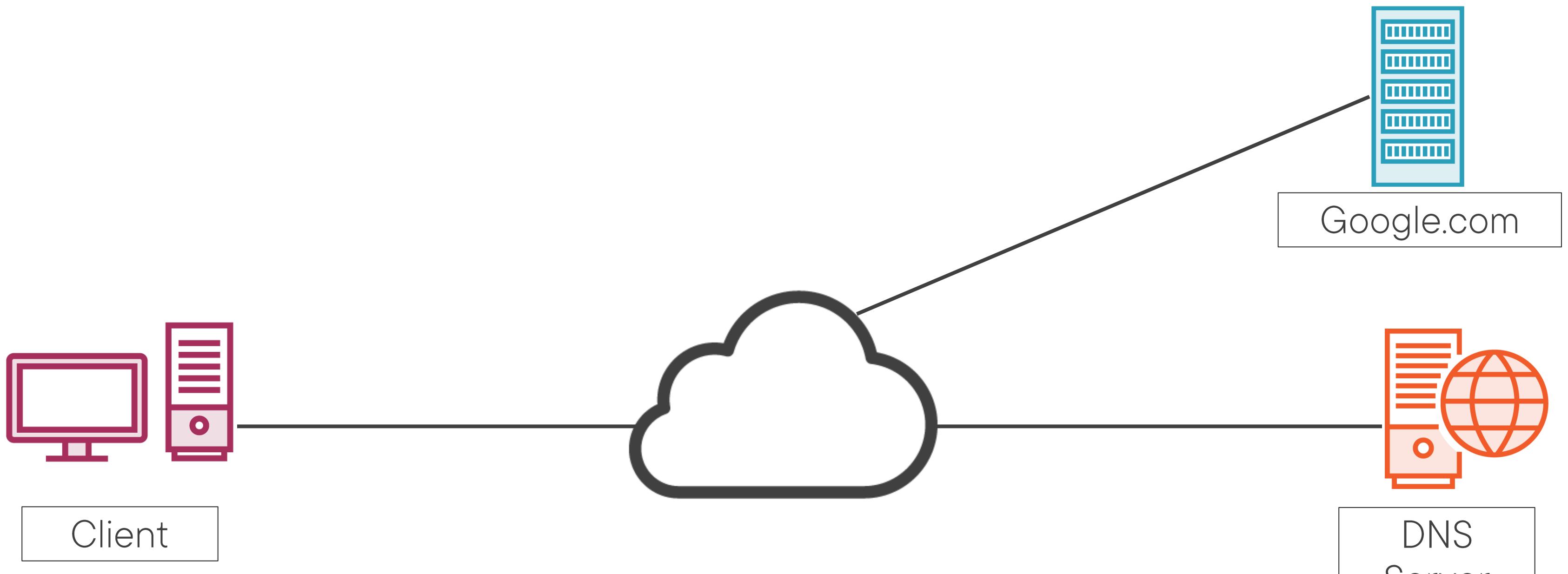


Client

DNS

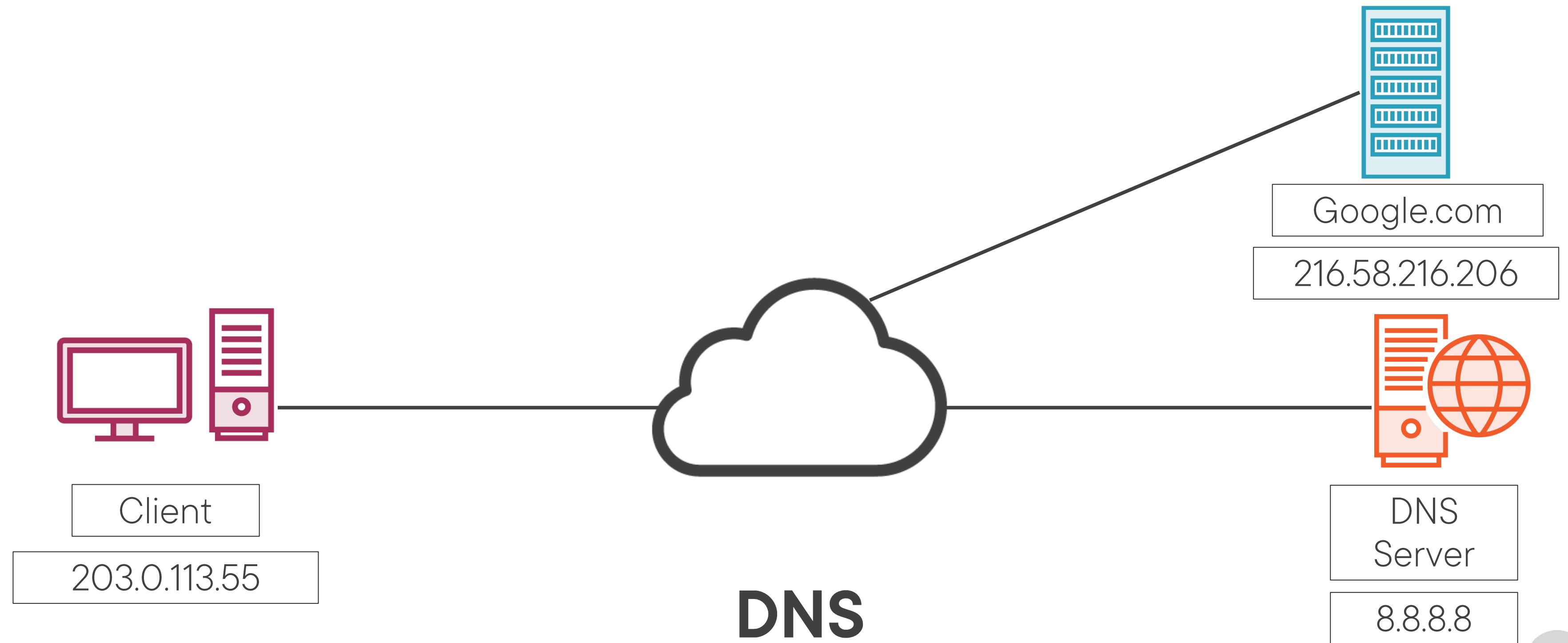
DNS  
Server

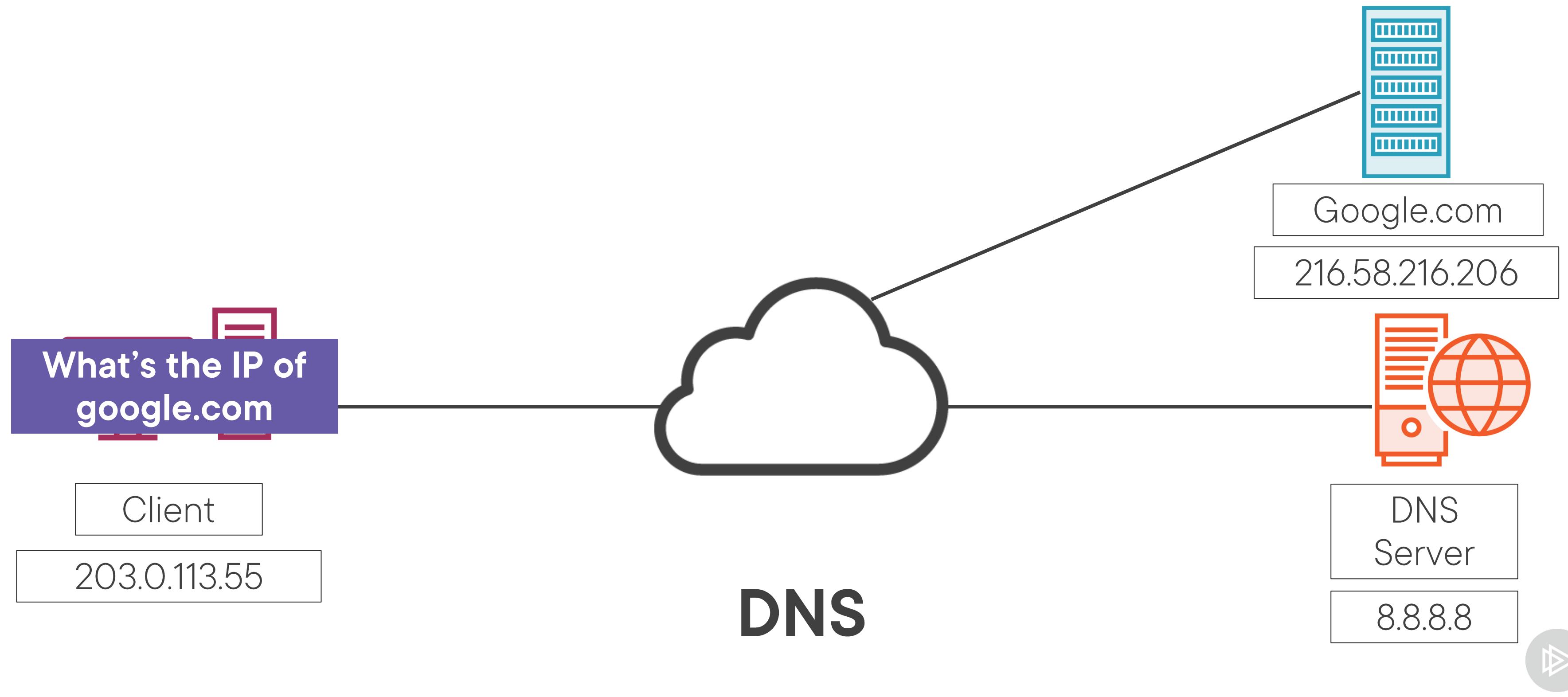


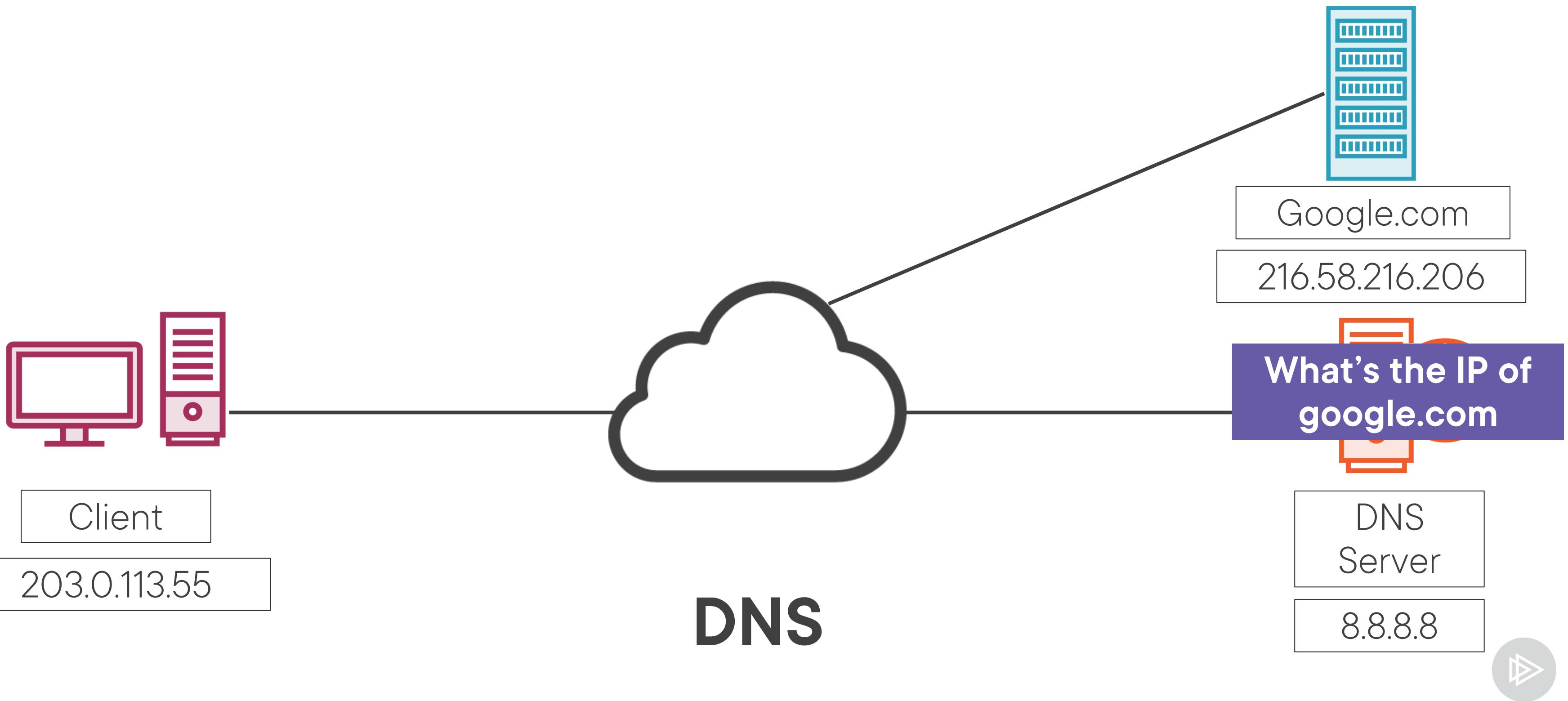


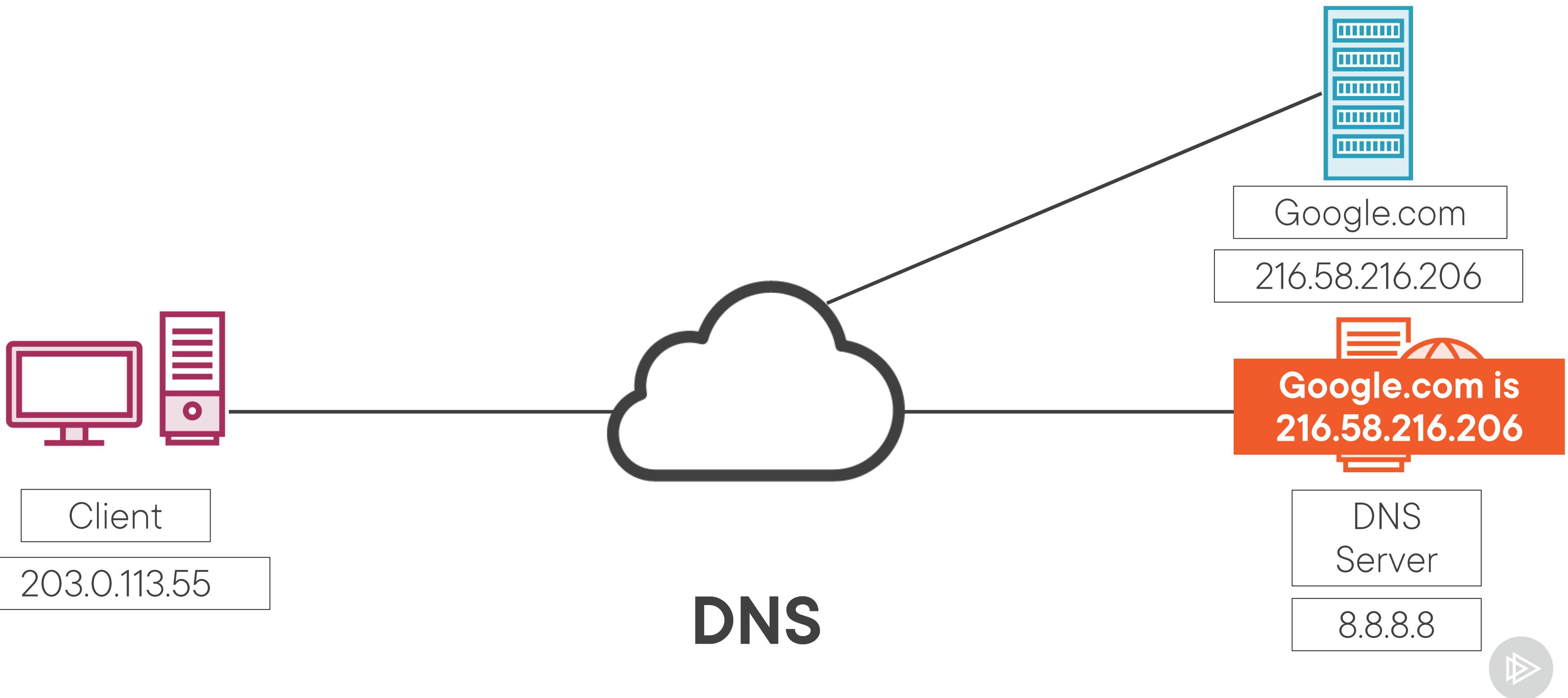
# DNS

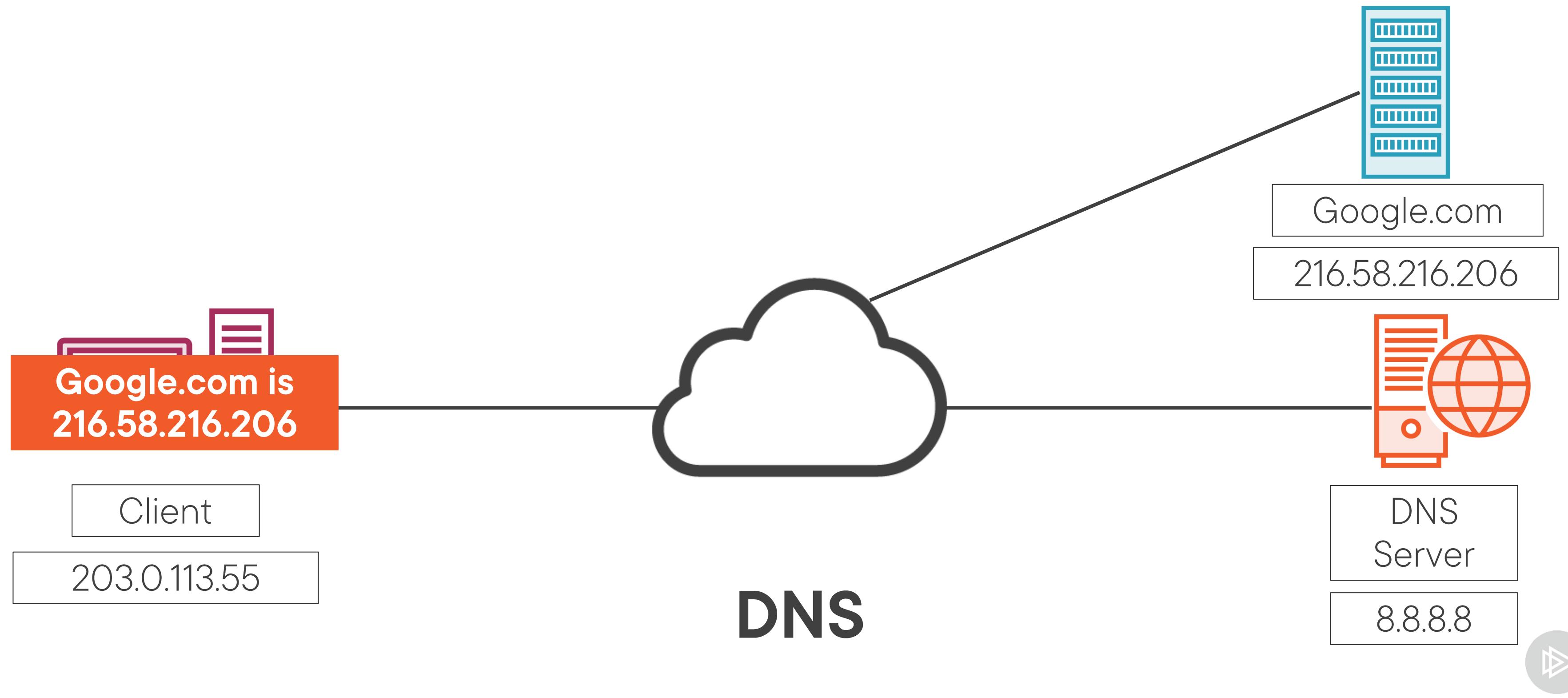


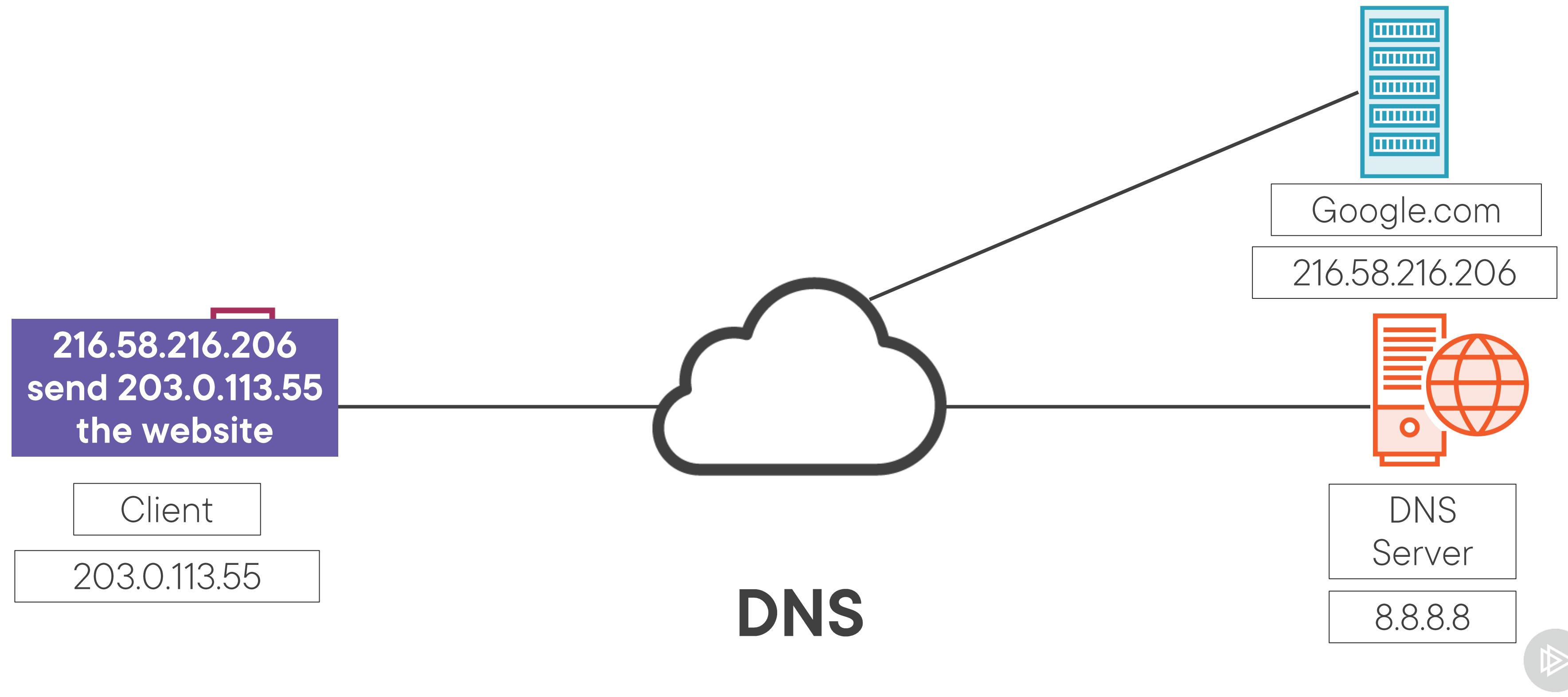


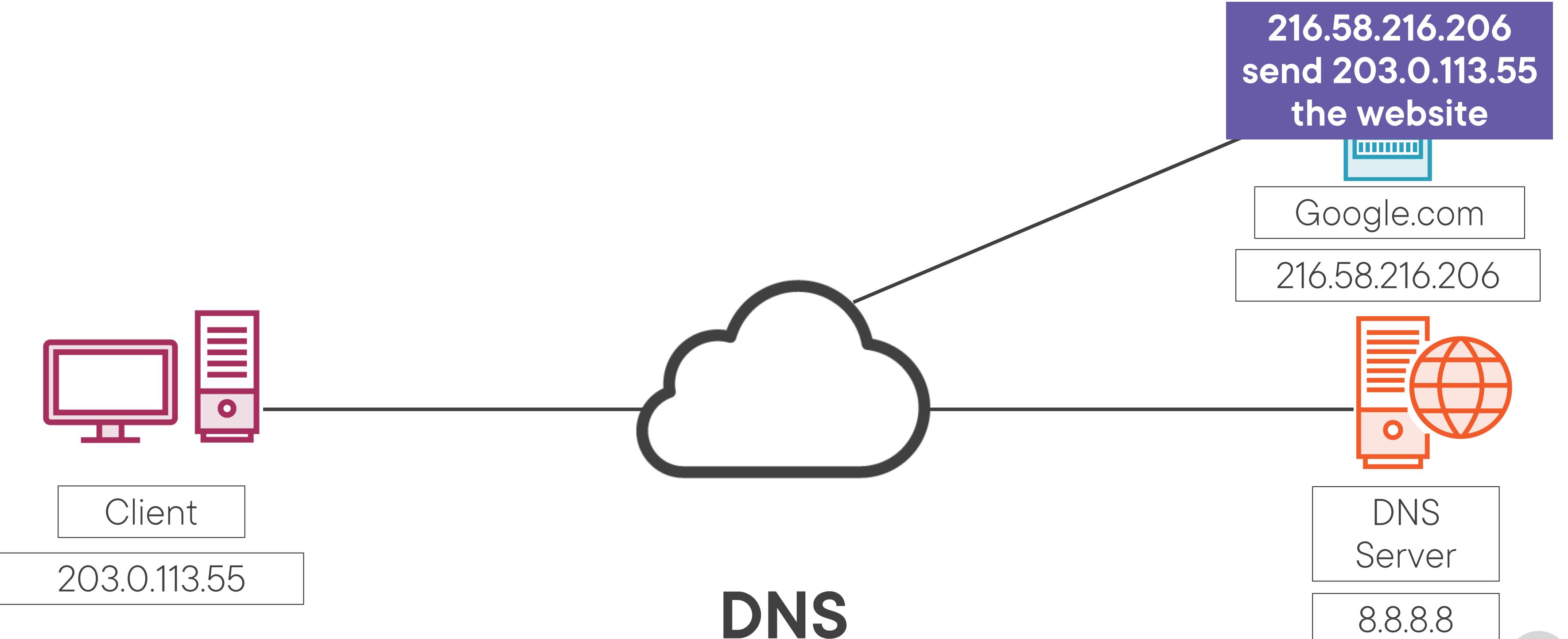


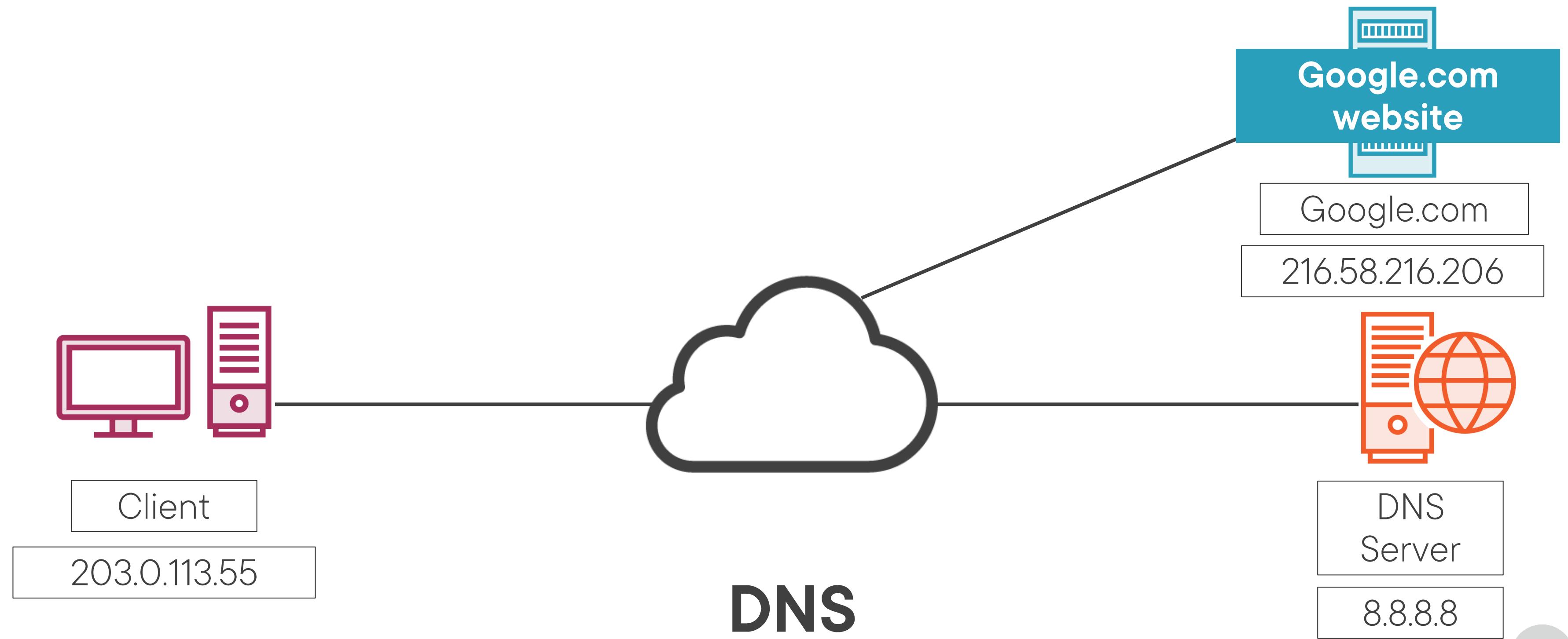


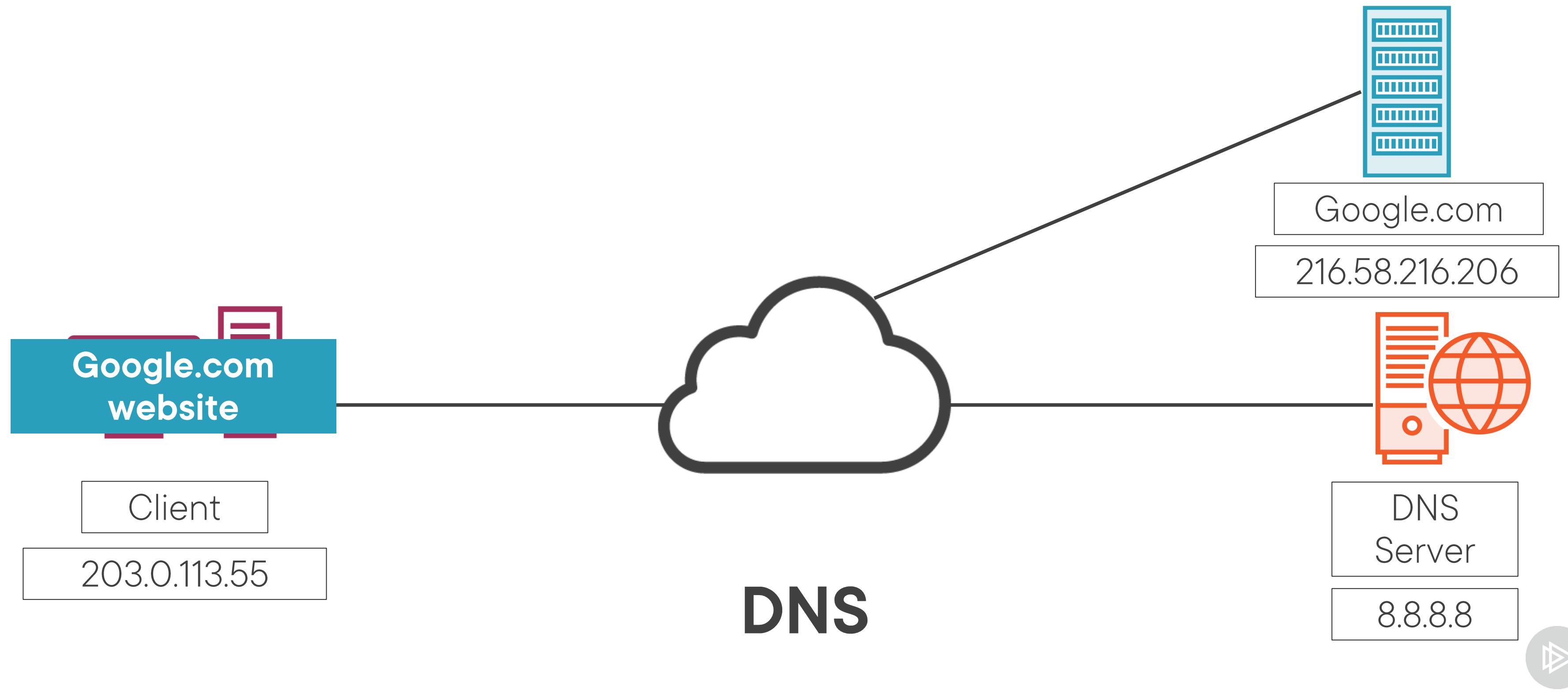


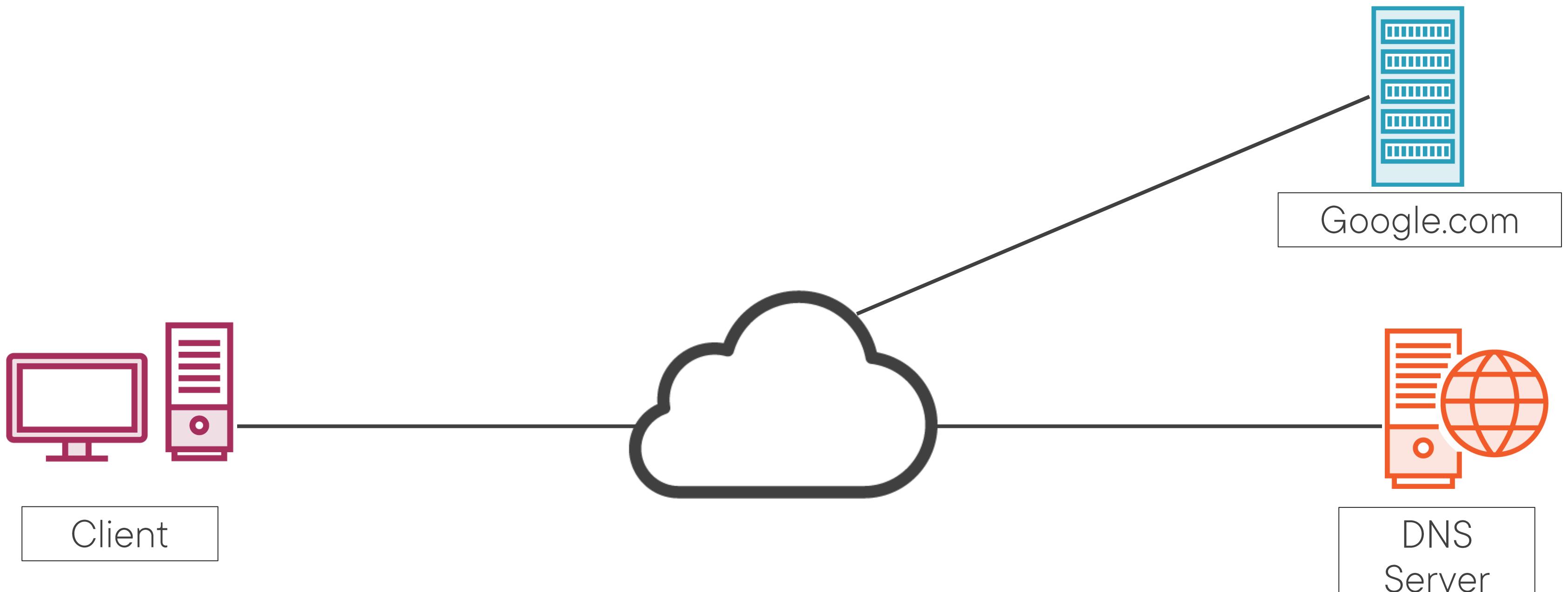








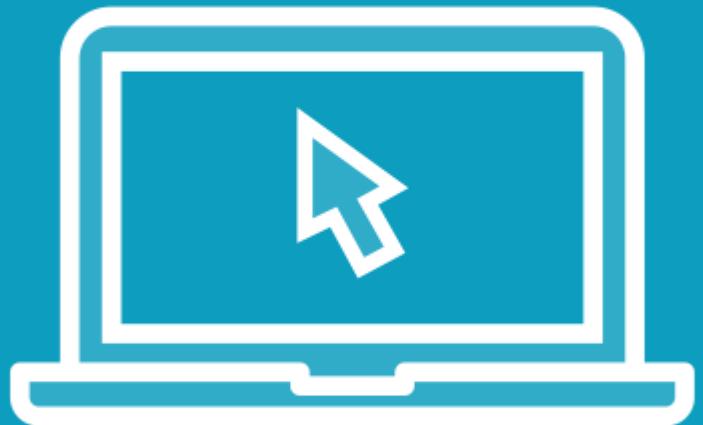




DNS 53



Demo



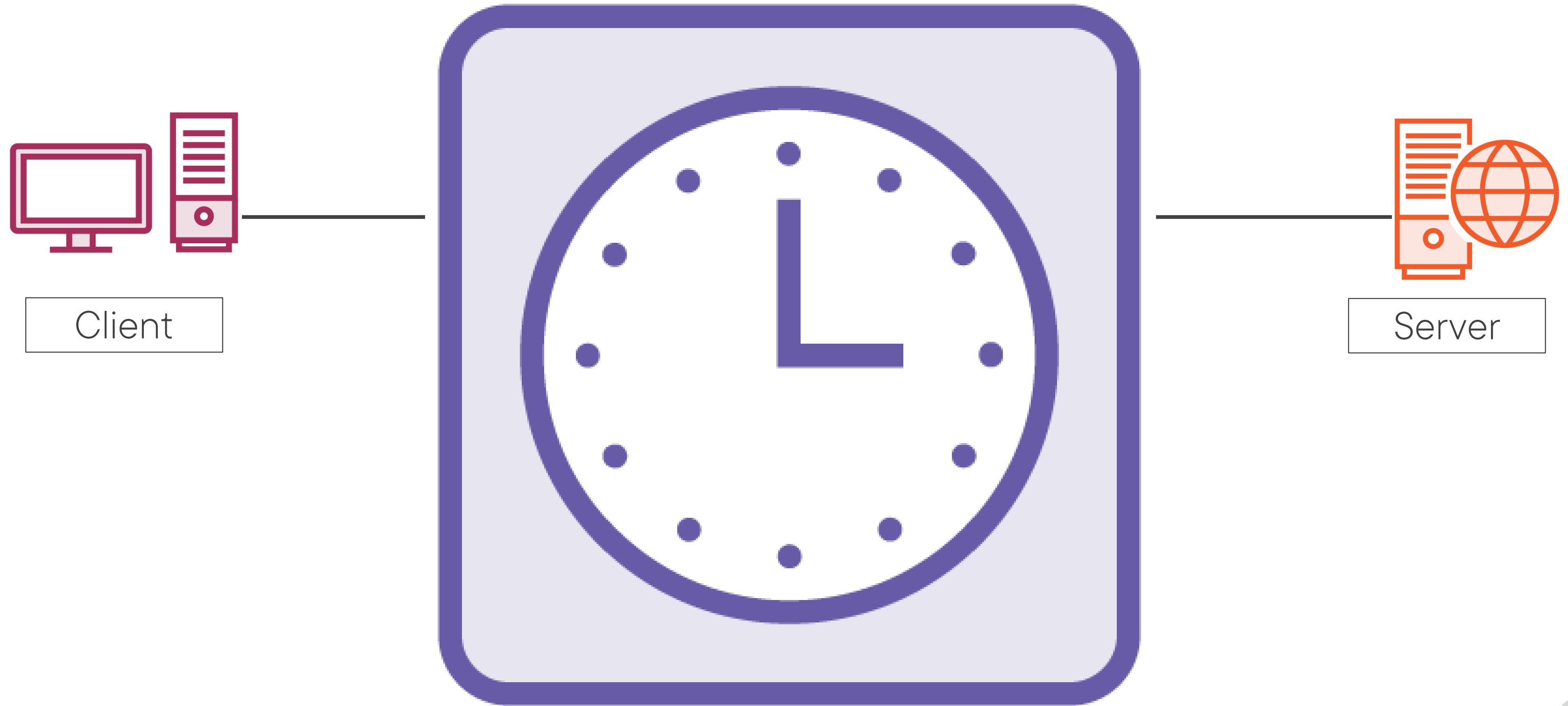
**Examine DNS with NSlookup**

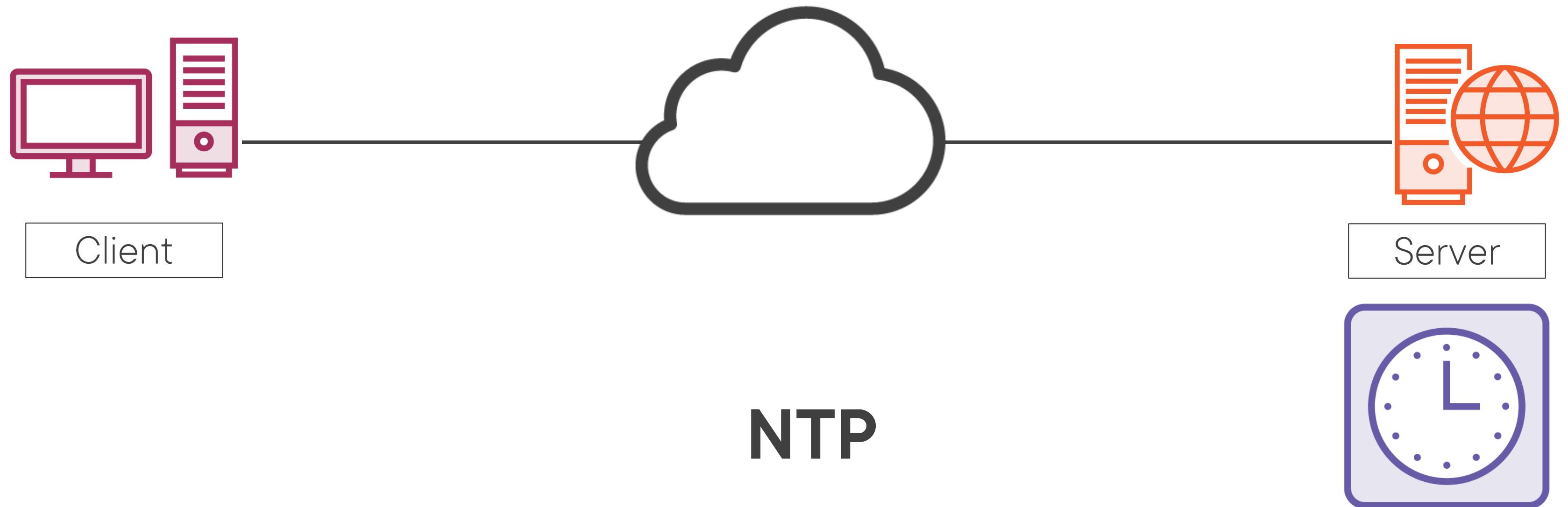




# Network Time Protocol







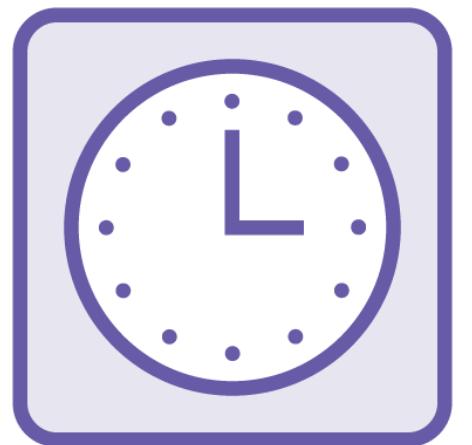
  
**What time is  
it?**

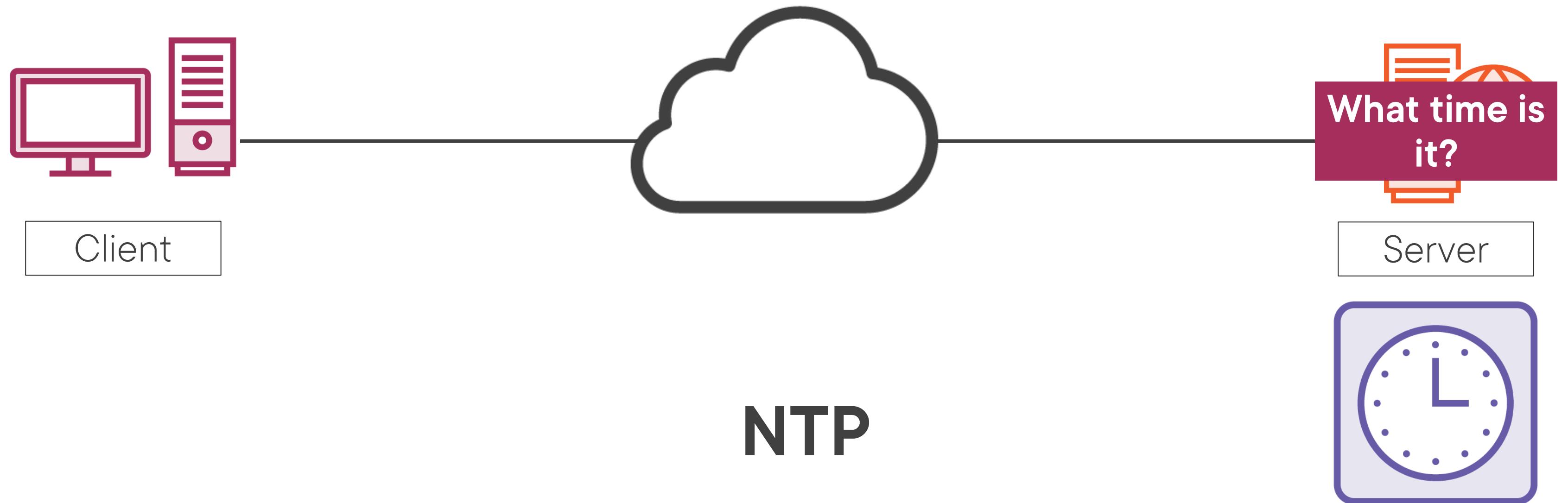
Client

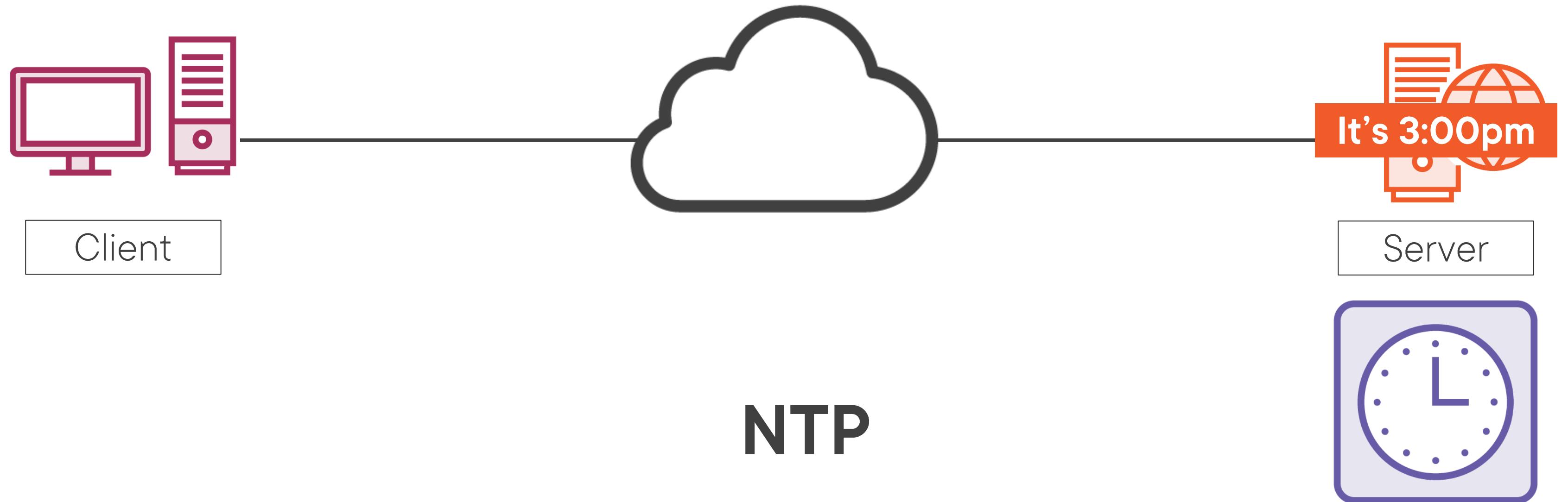


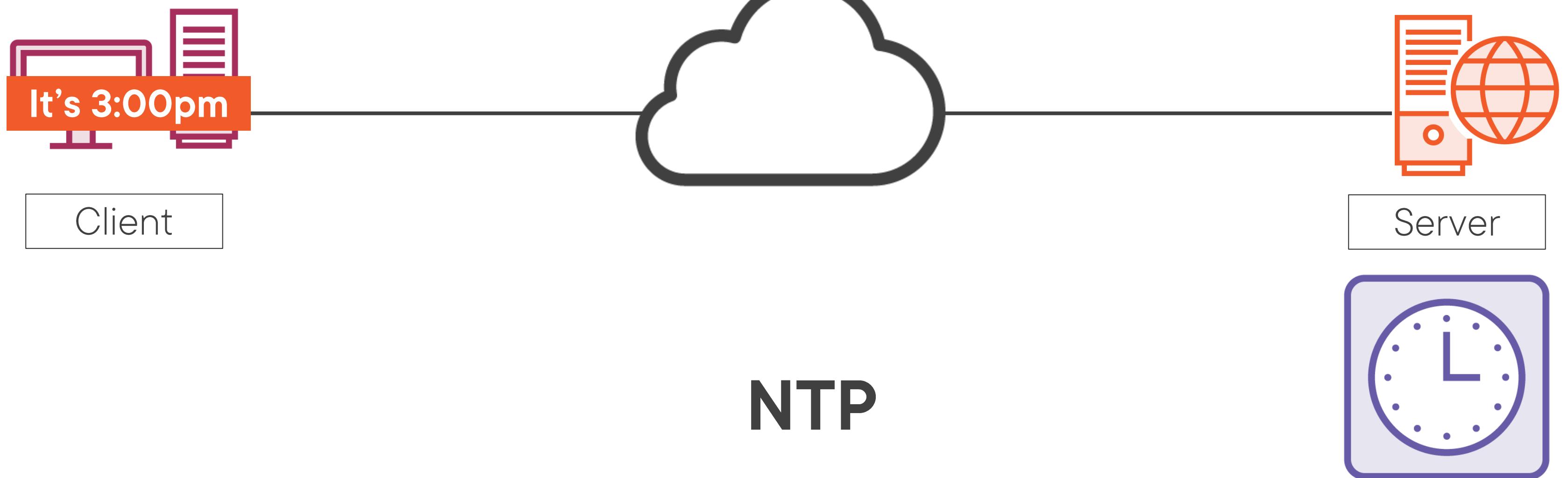
Server

**NTP**



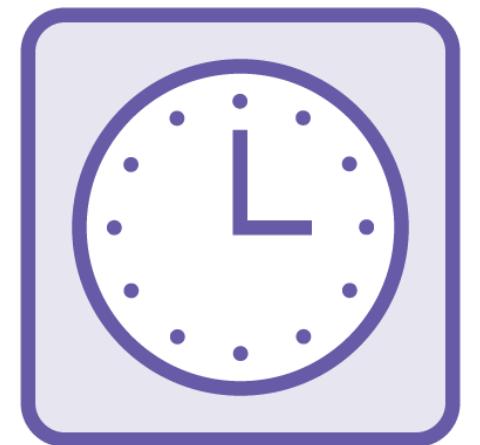


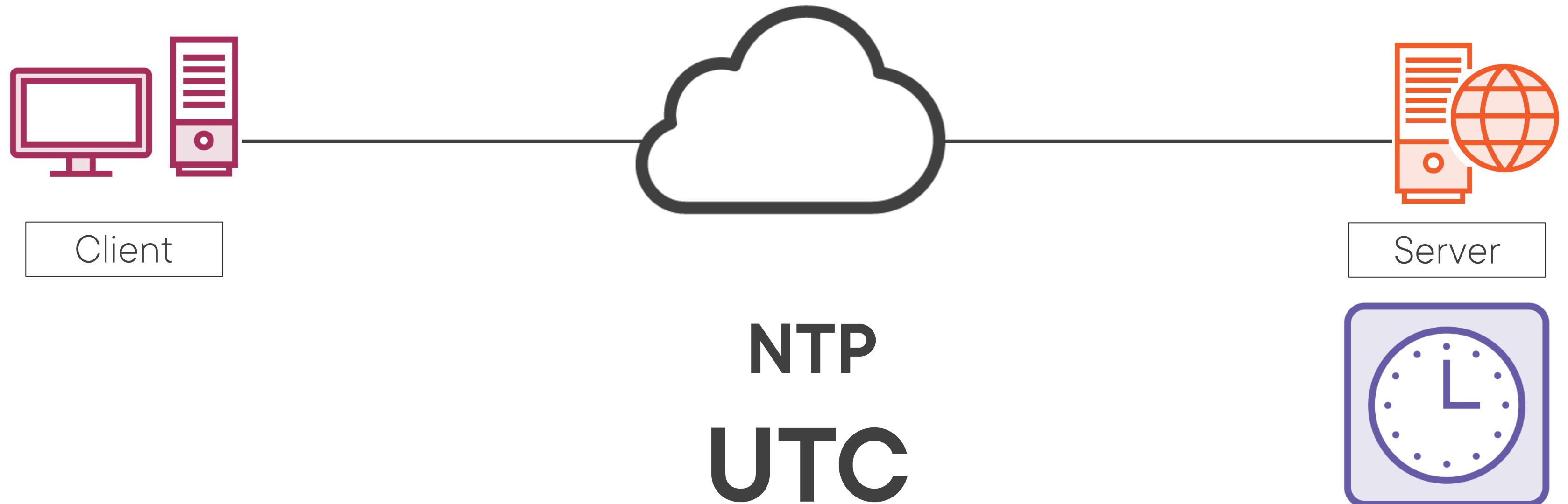


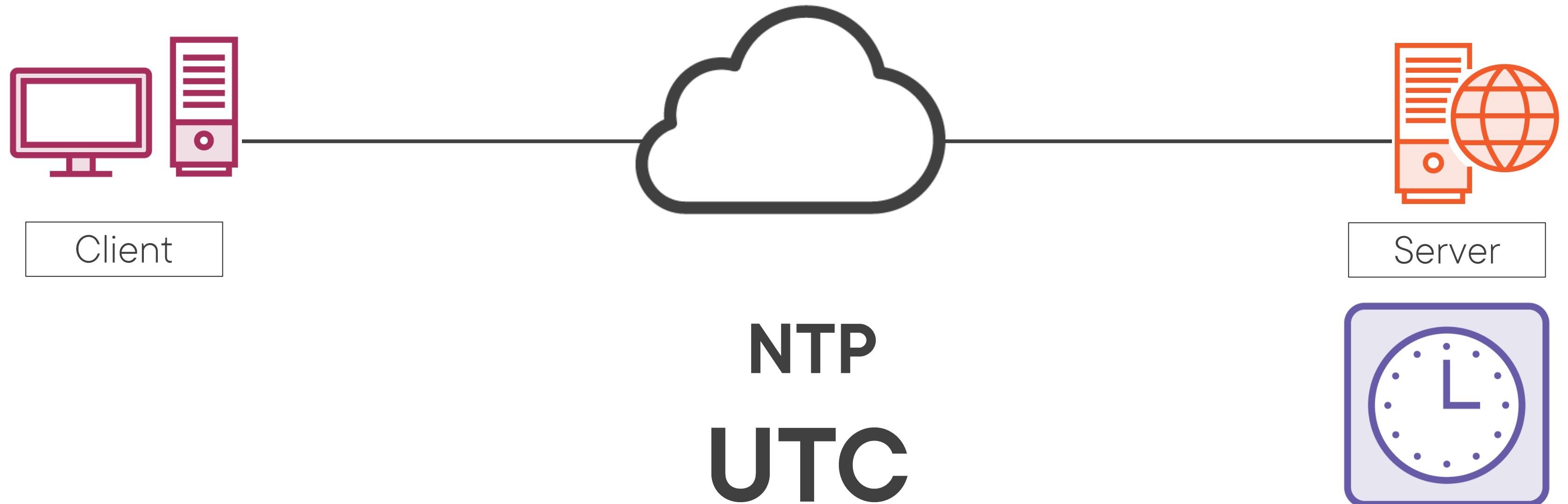




NTP  
Coordinated  
Universal Time















**Greenwich,  
England**

The image shows a world map with a vertical red line representing the Prime Meridian. A green arrow points from a green rectangular box labeled "Greenwich, England" to a red dot on the map, which is located in the United Kingdom. An orange rectangular box labeled "Prime Meridian" is positioned at the bottom left of the map area.

Prime Meridian

Greenwich,  
England

A world map with a vertical red line representing the Prime Meridian. A green arrow points from a green box labeled "Greenwich, England" to a red dot on the map at the intersection of the Prime Meridian and the equator.

Prime Meridian

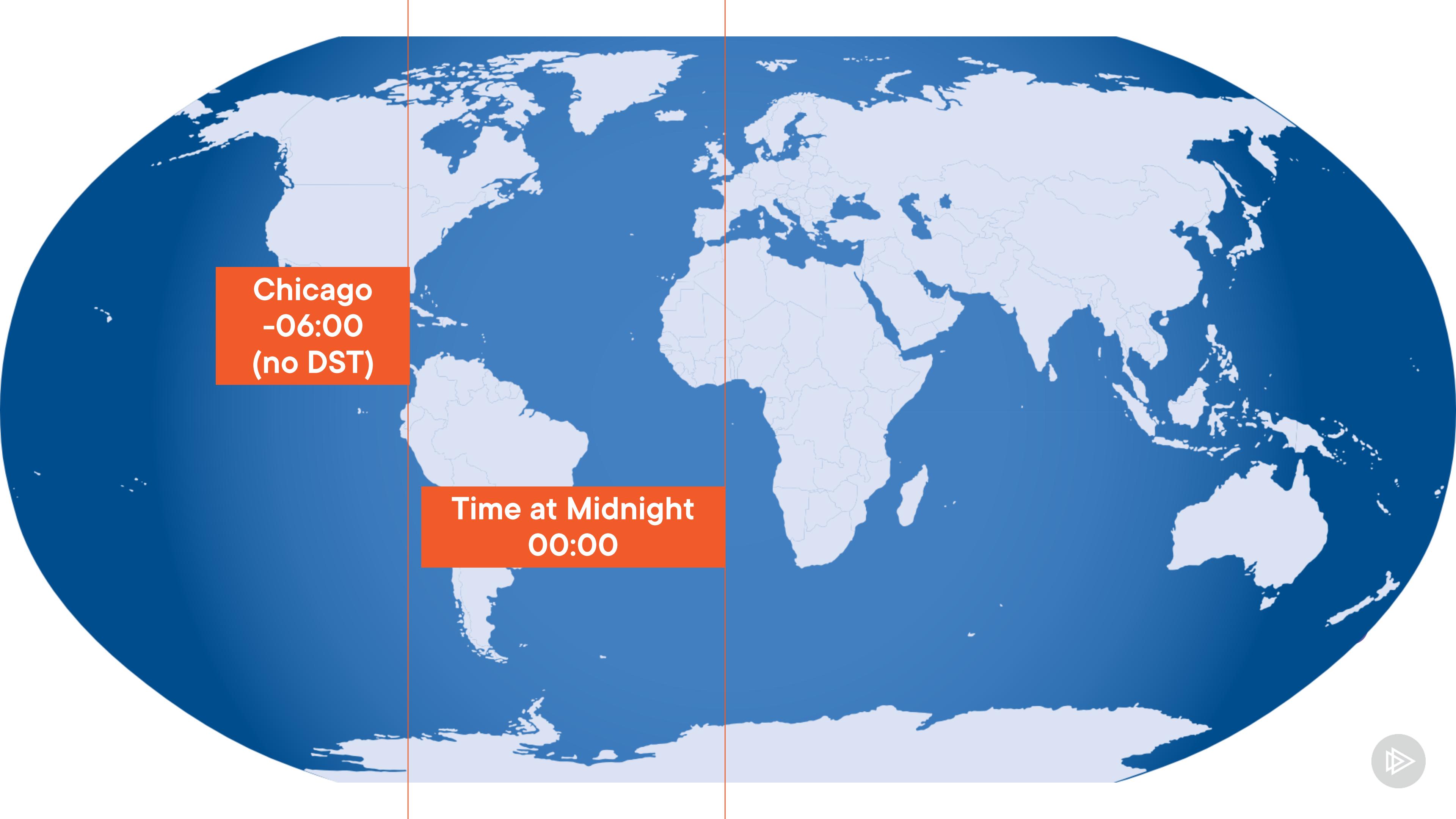
Time at Midnight  
00:00

Greenwich,  
England



**Time at Midnight**  
00:00





**Chicago**  
-06:00  
(no DST)

**Time at Midnight**  
00:00





**Utah**  
**-07:00**  
**(no DST)**

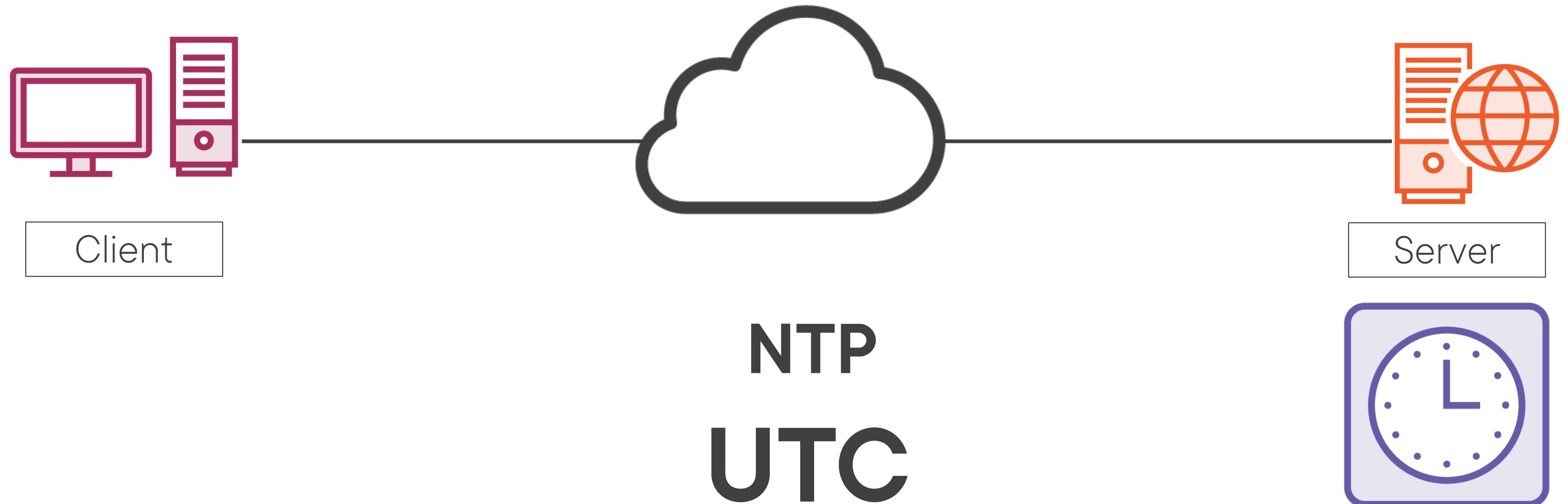
**Time at Midnight**  
**00:00**





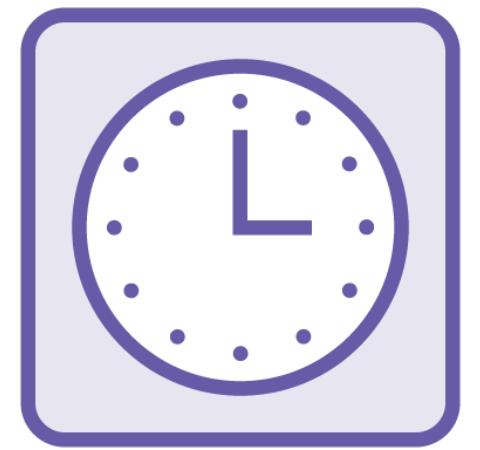
Time at Midnight  
00:00

New Delhi  
+05:30  
(no DST)





NTP 123



# Network Management

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# Telnet

# Secure Shell





# Telnet

# SSH





**Telnet**

**SSH**  
**encrypted**





# Telnet

23

# SSH

22



## **Network Administrator Workstation**



# **Telnet**

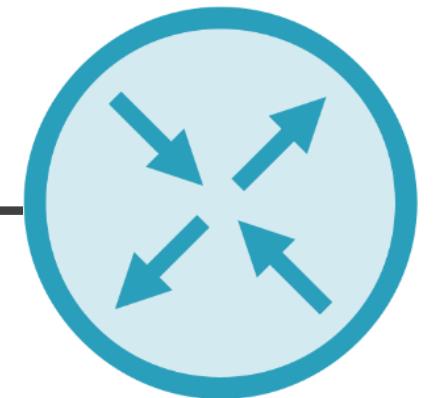
# **SSH**



## **Network Administrator Workstation**



Client



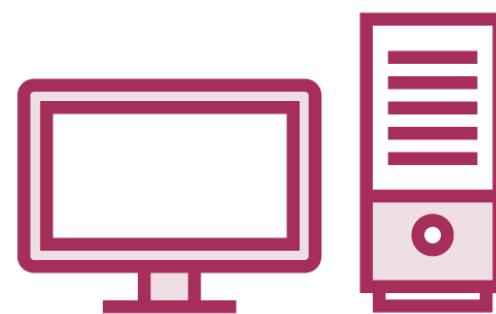
Server

# Telnet

# SSH

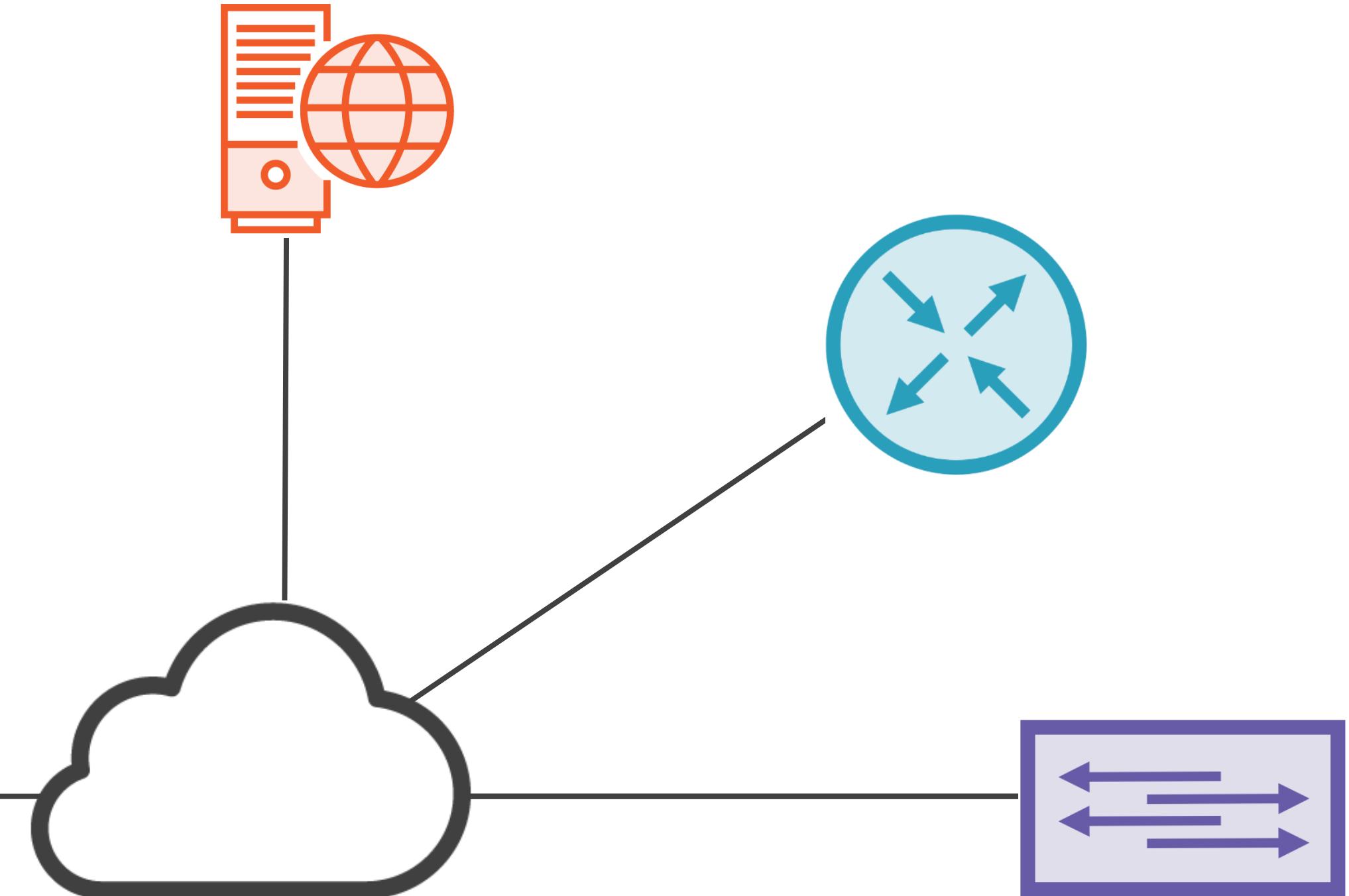


**Network Administrator  
Workstation**



Client

**Telnet**



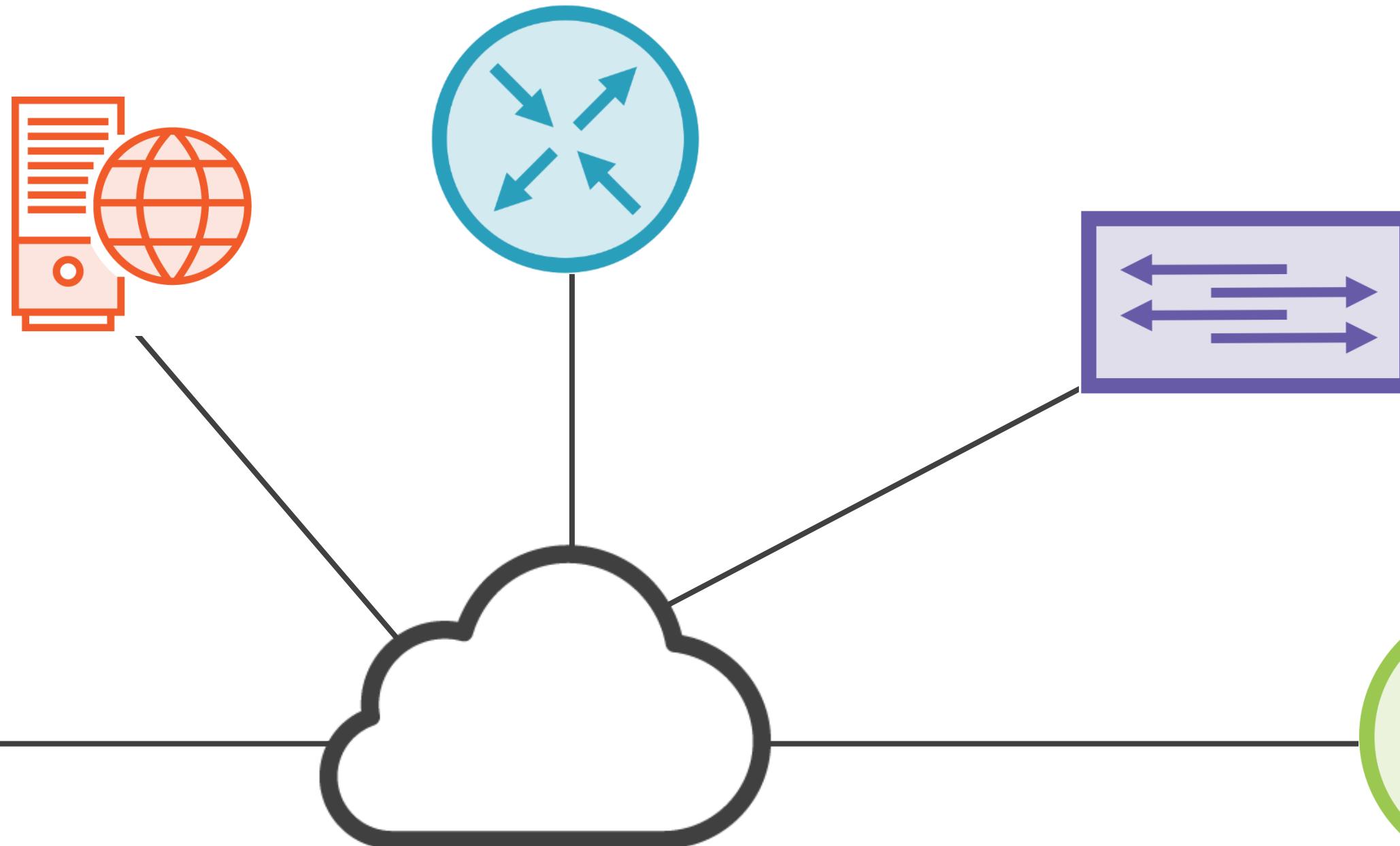
**SSH**



**Network Administrator  
Workstation**



Client

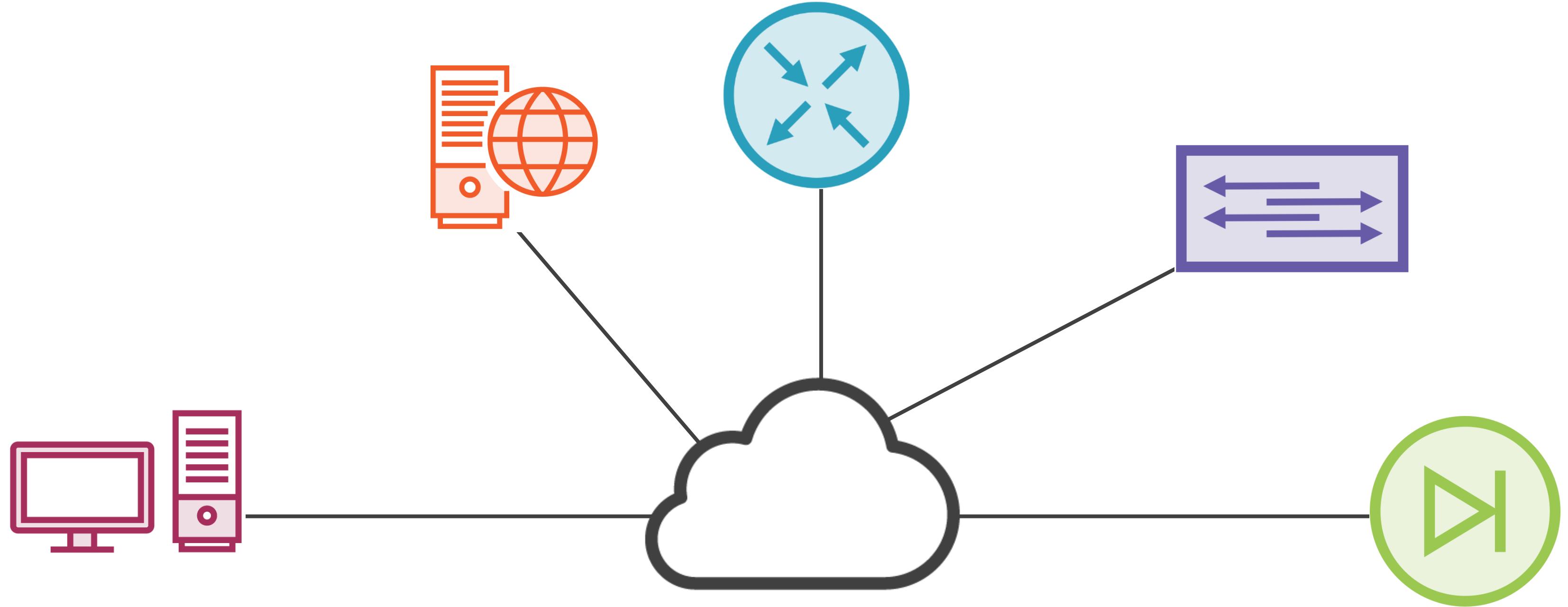


Server

**Telnet**

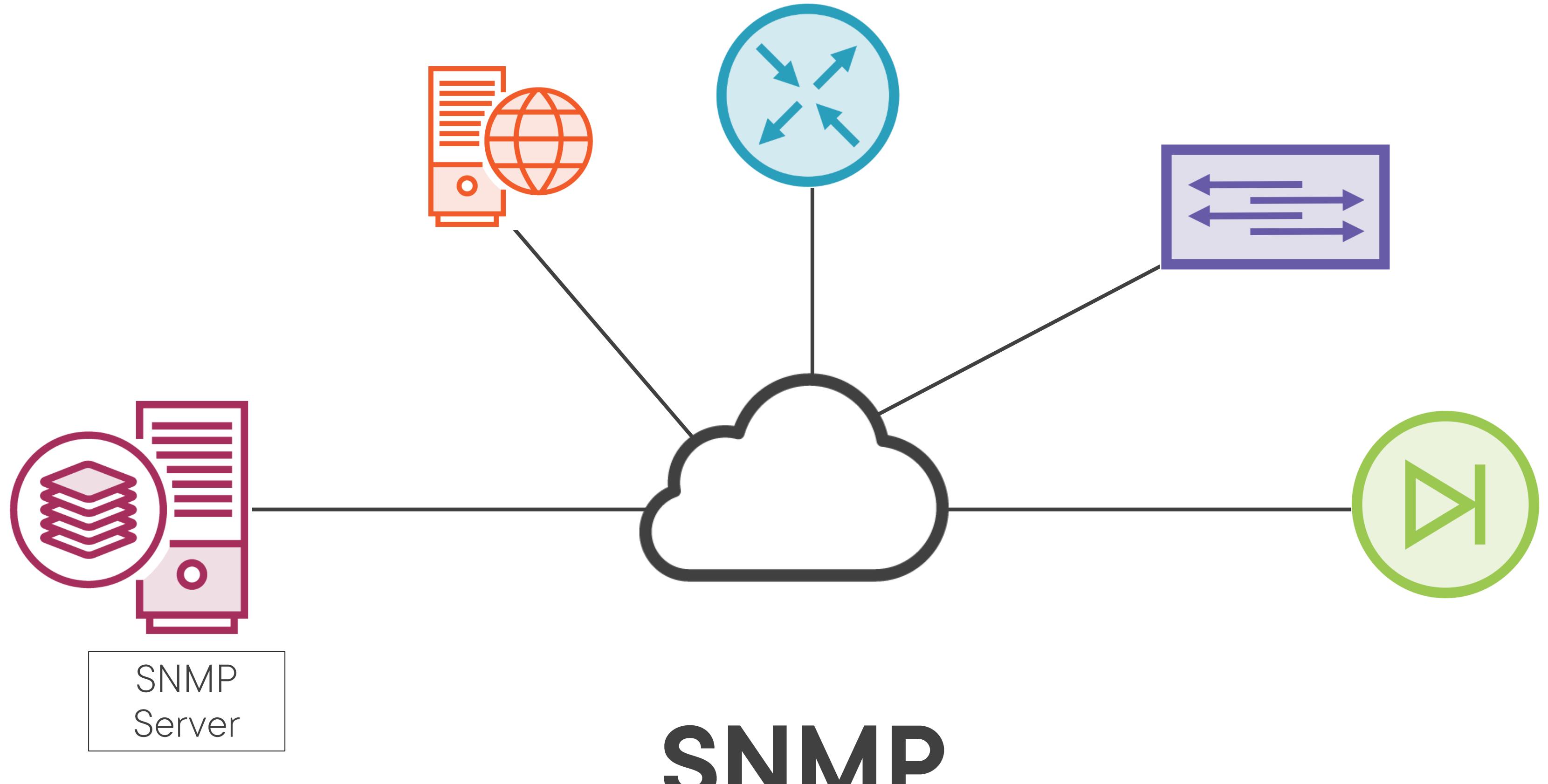
**SSH**

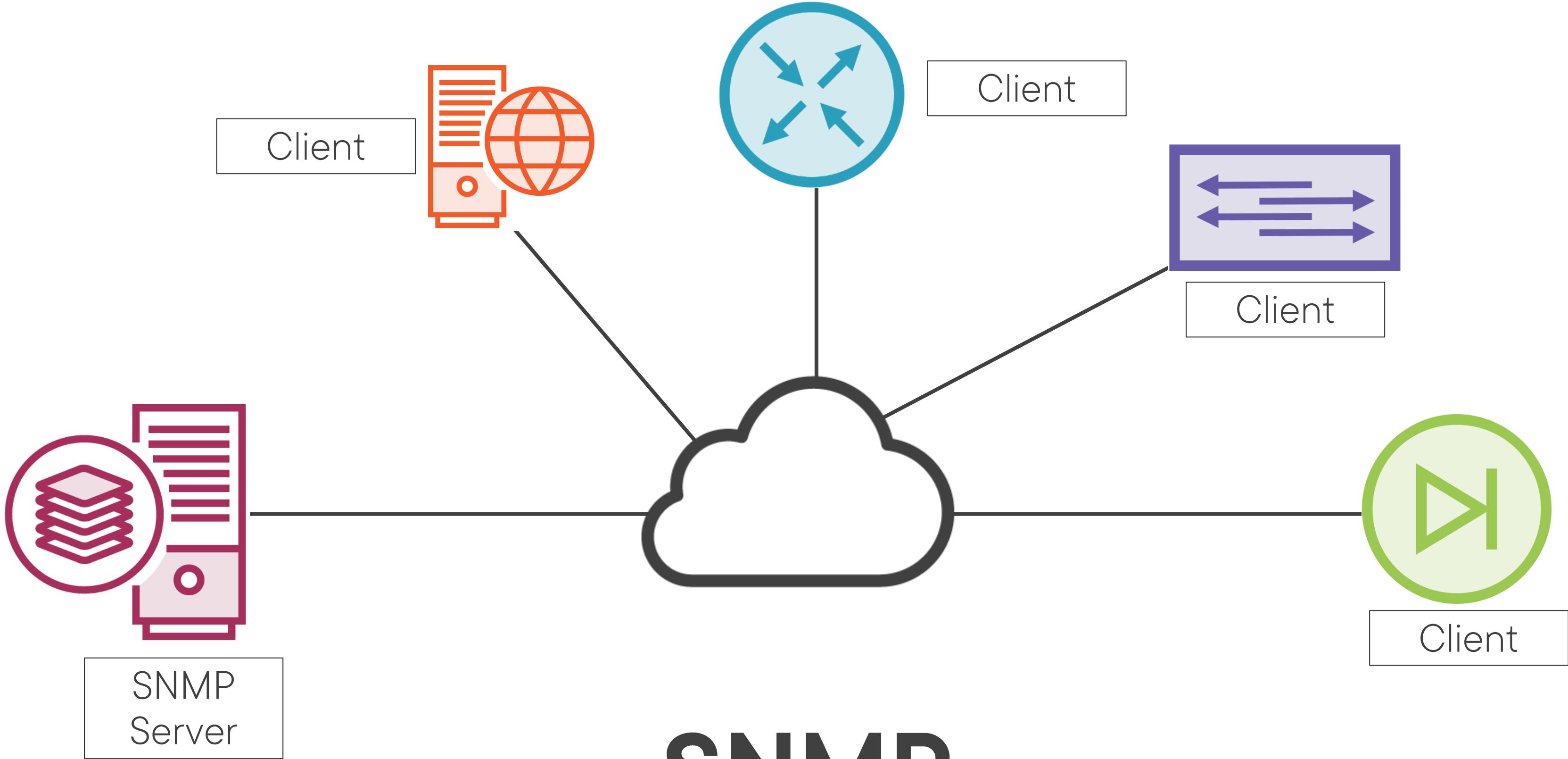


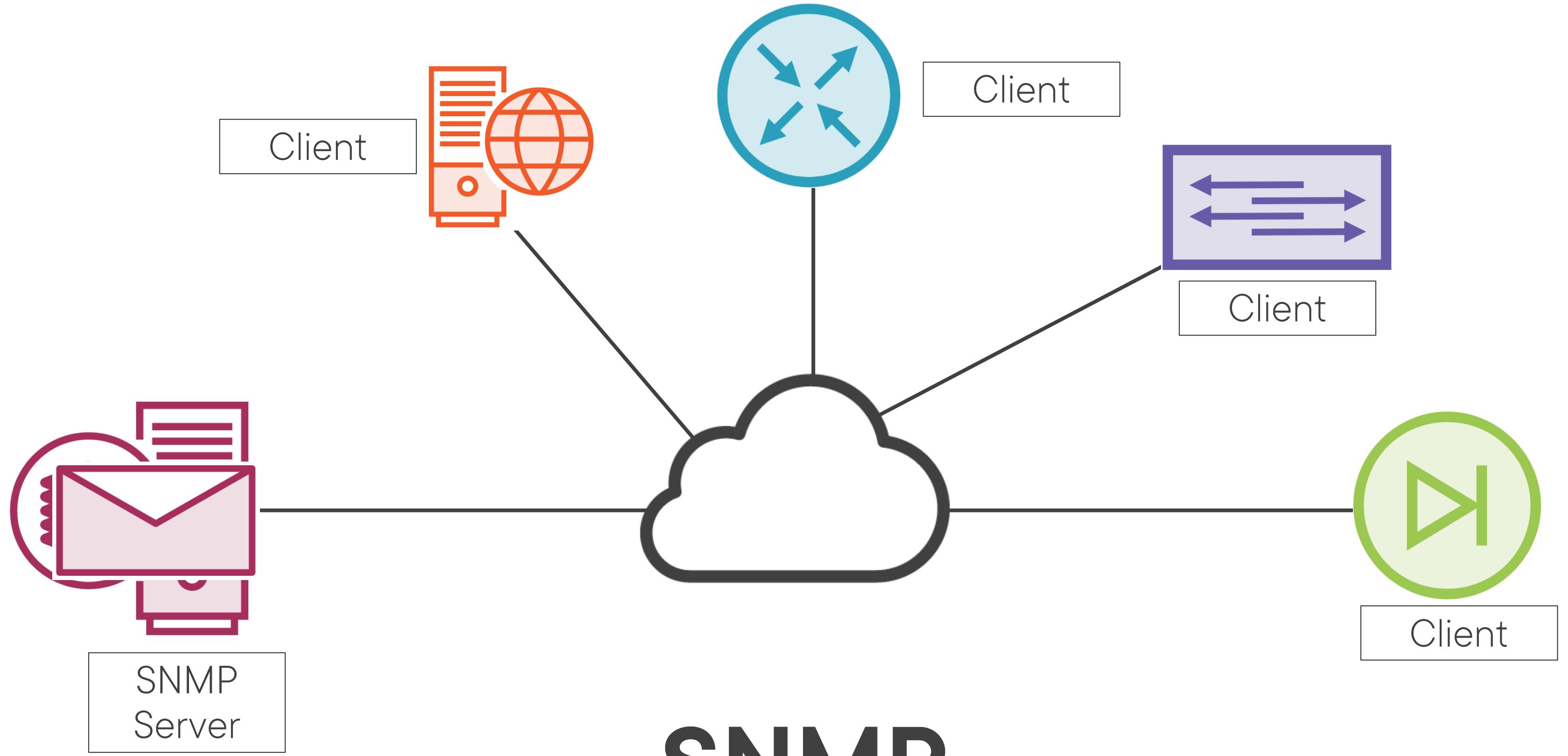


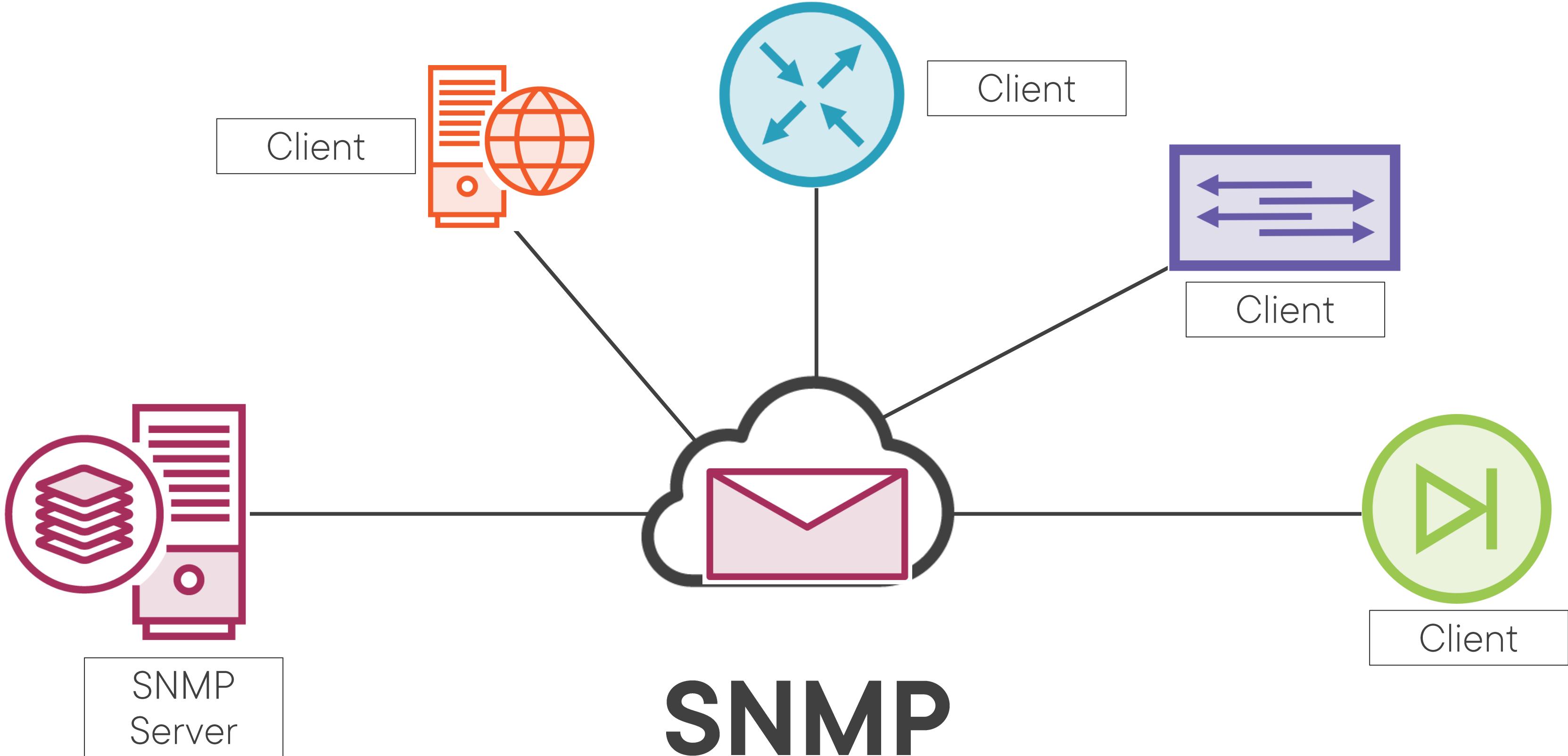
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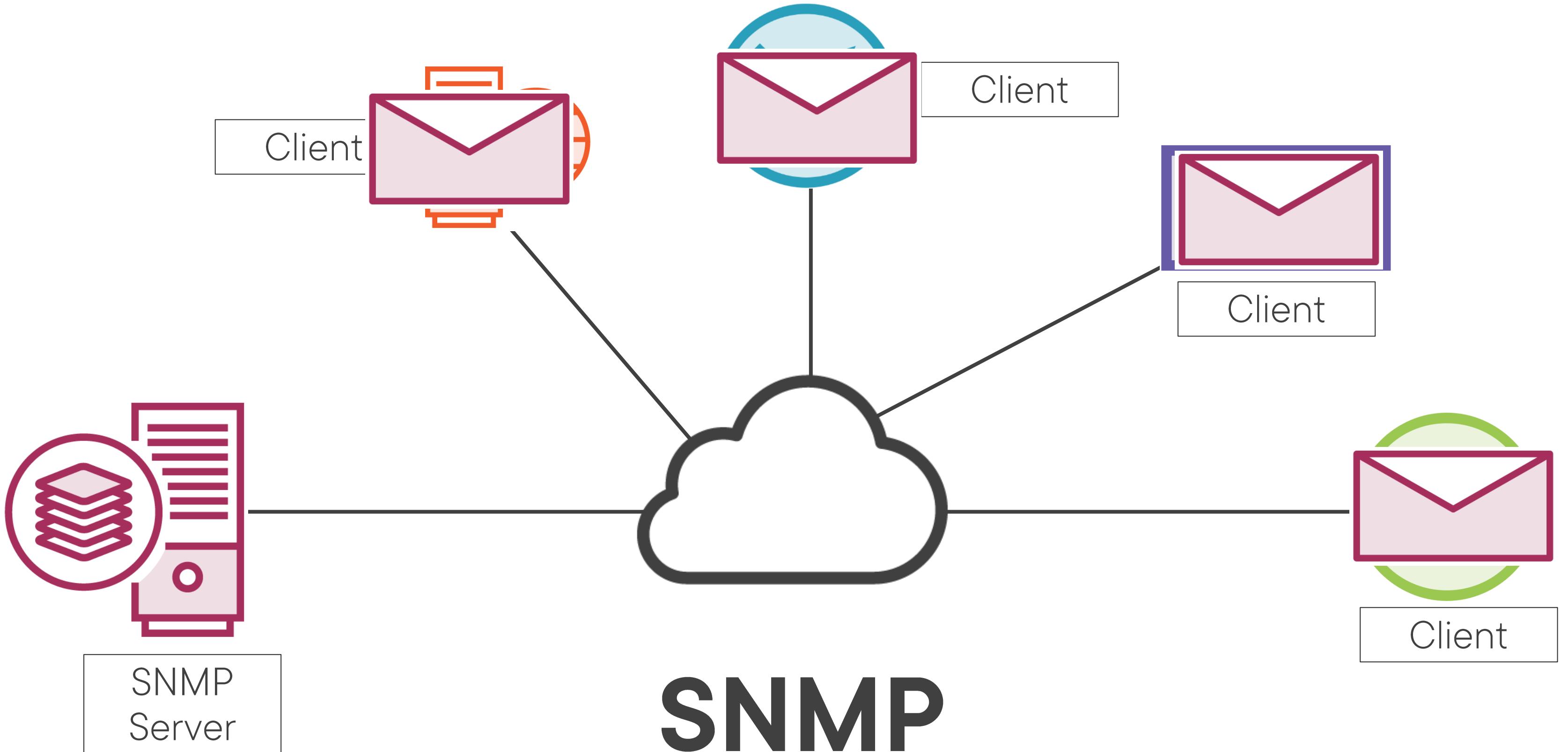




# SNMP

## “Walk the Tree”

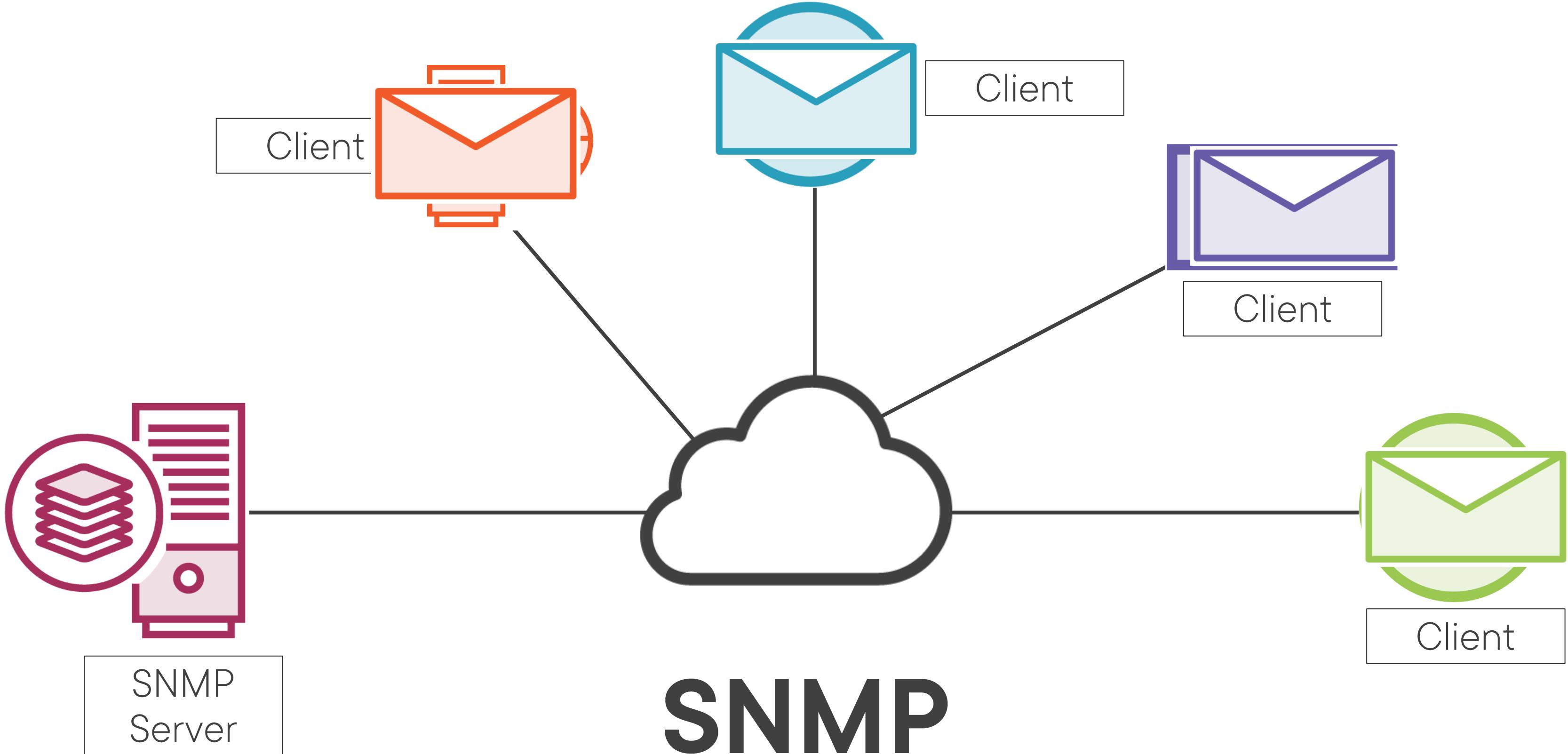




# SNMP

## “Walk the Tree”

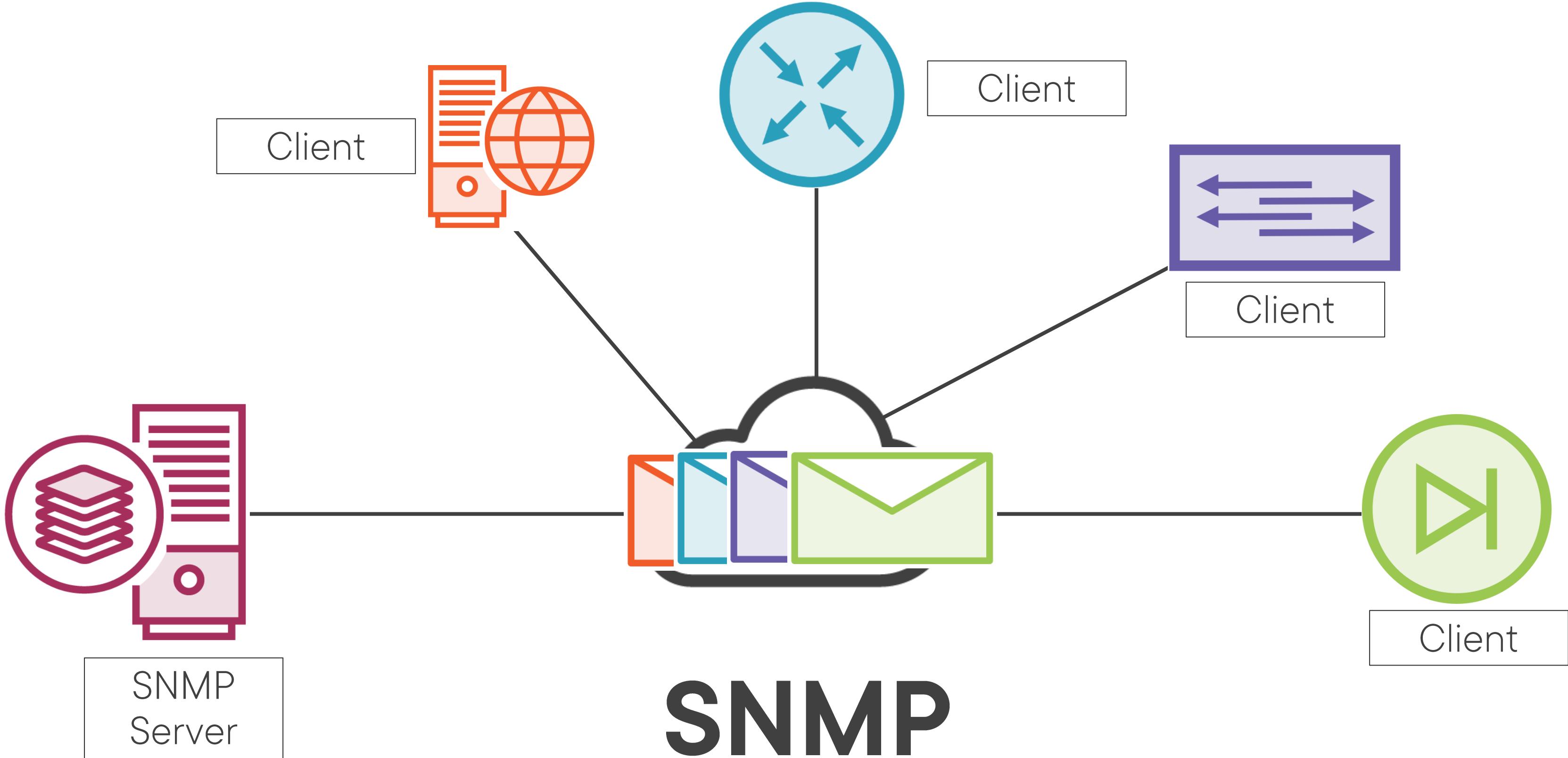




# SNMP

## “Walk the Tree”

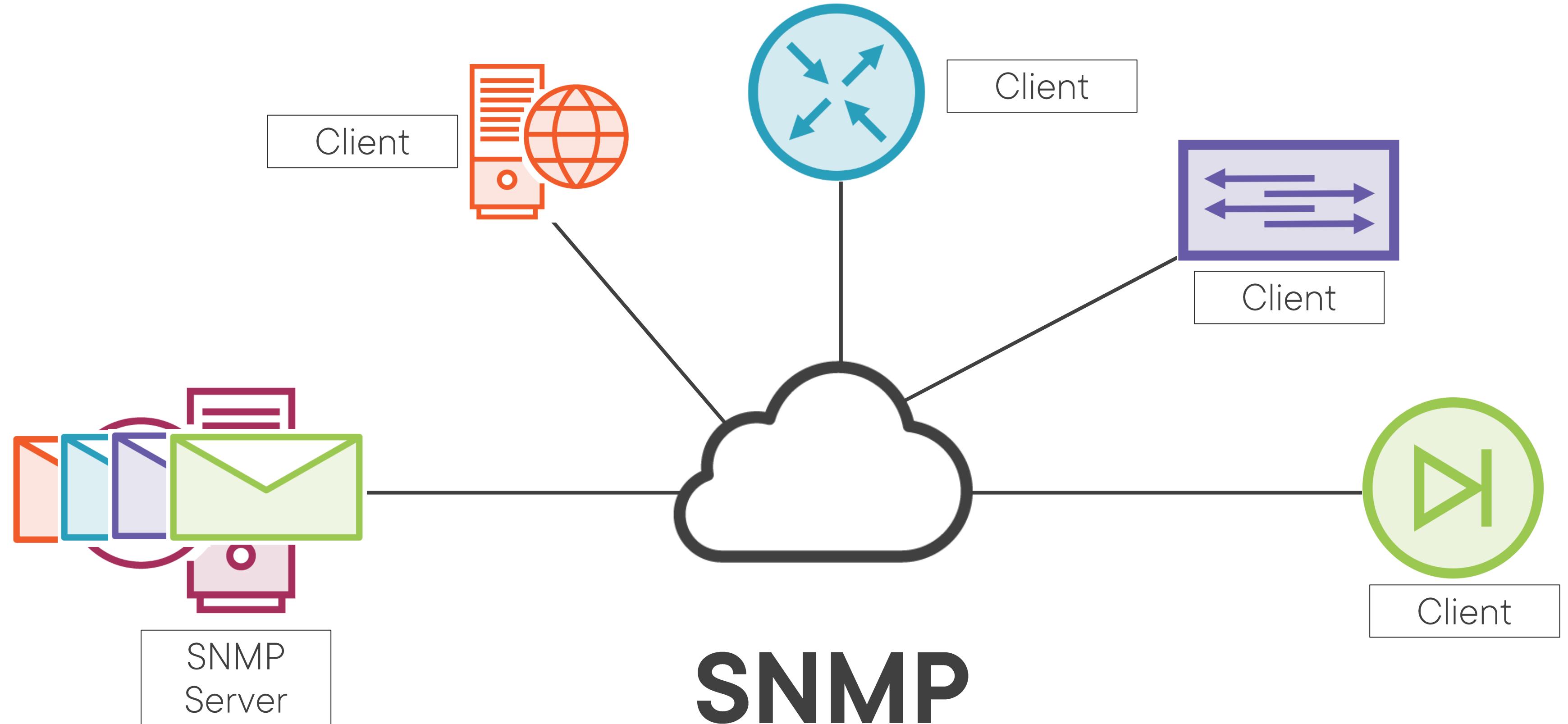




# SNMP

## “Walk the Tree”

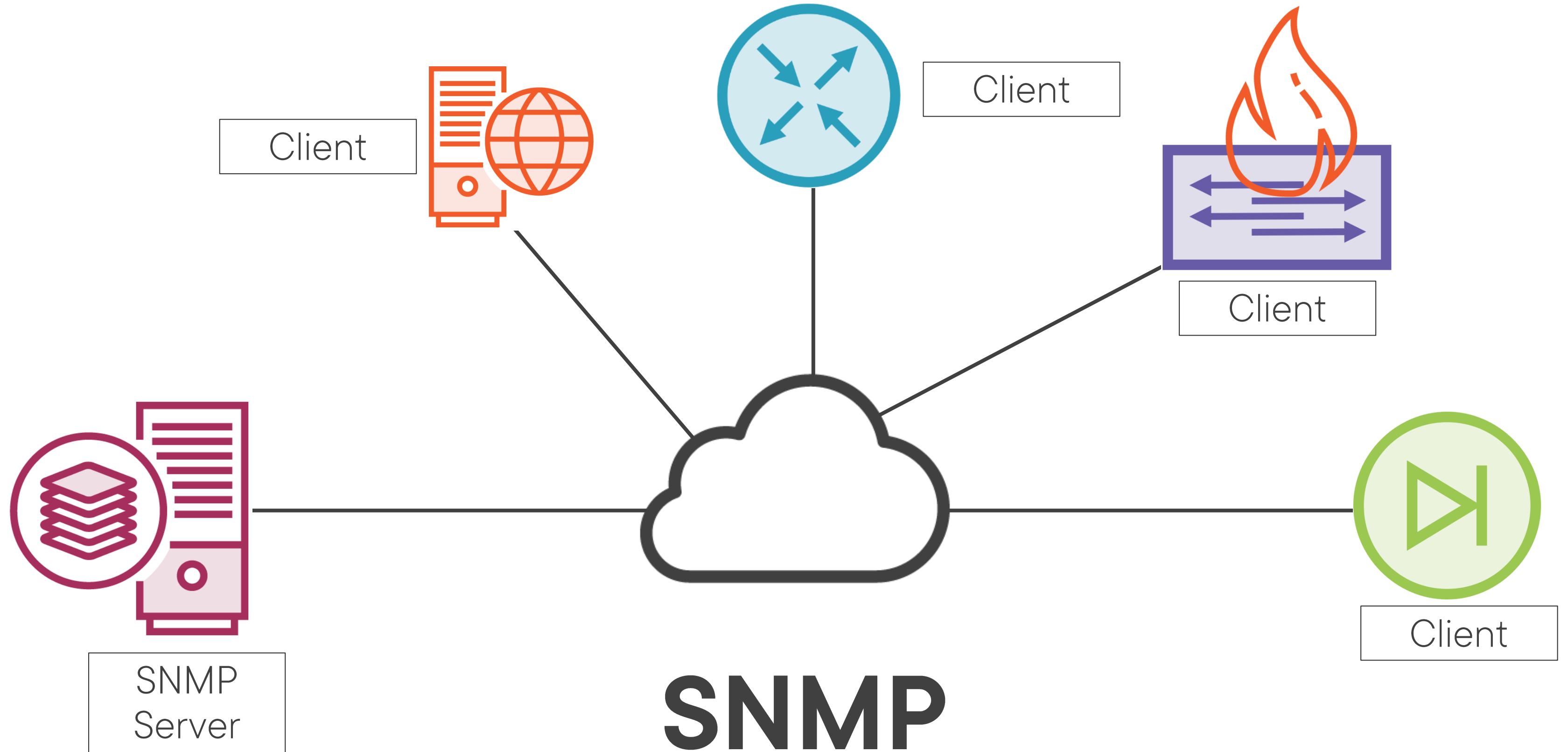


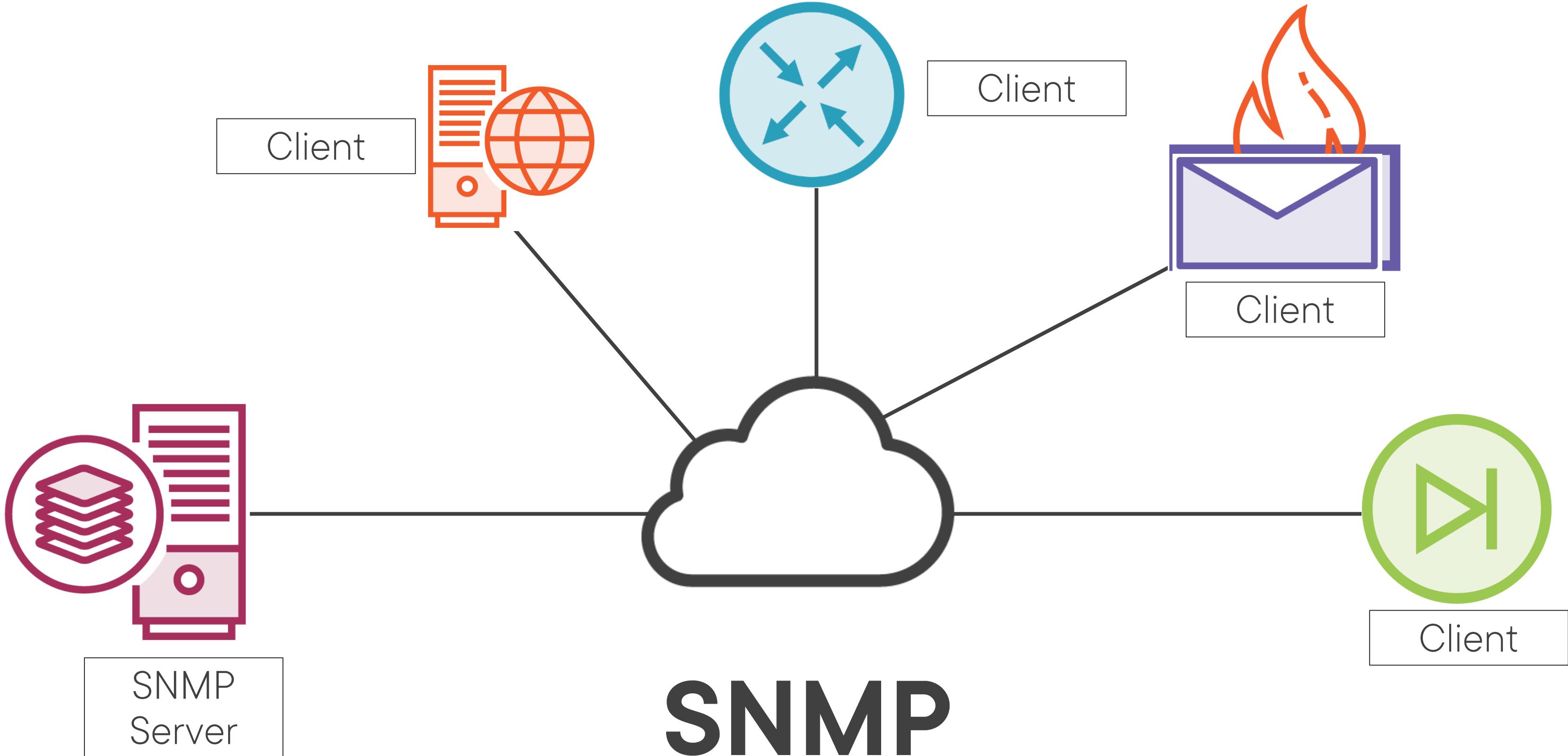


# SNMP

## “Walk the Tree”

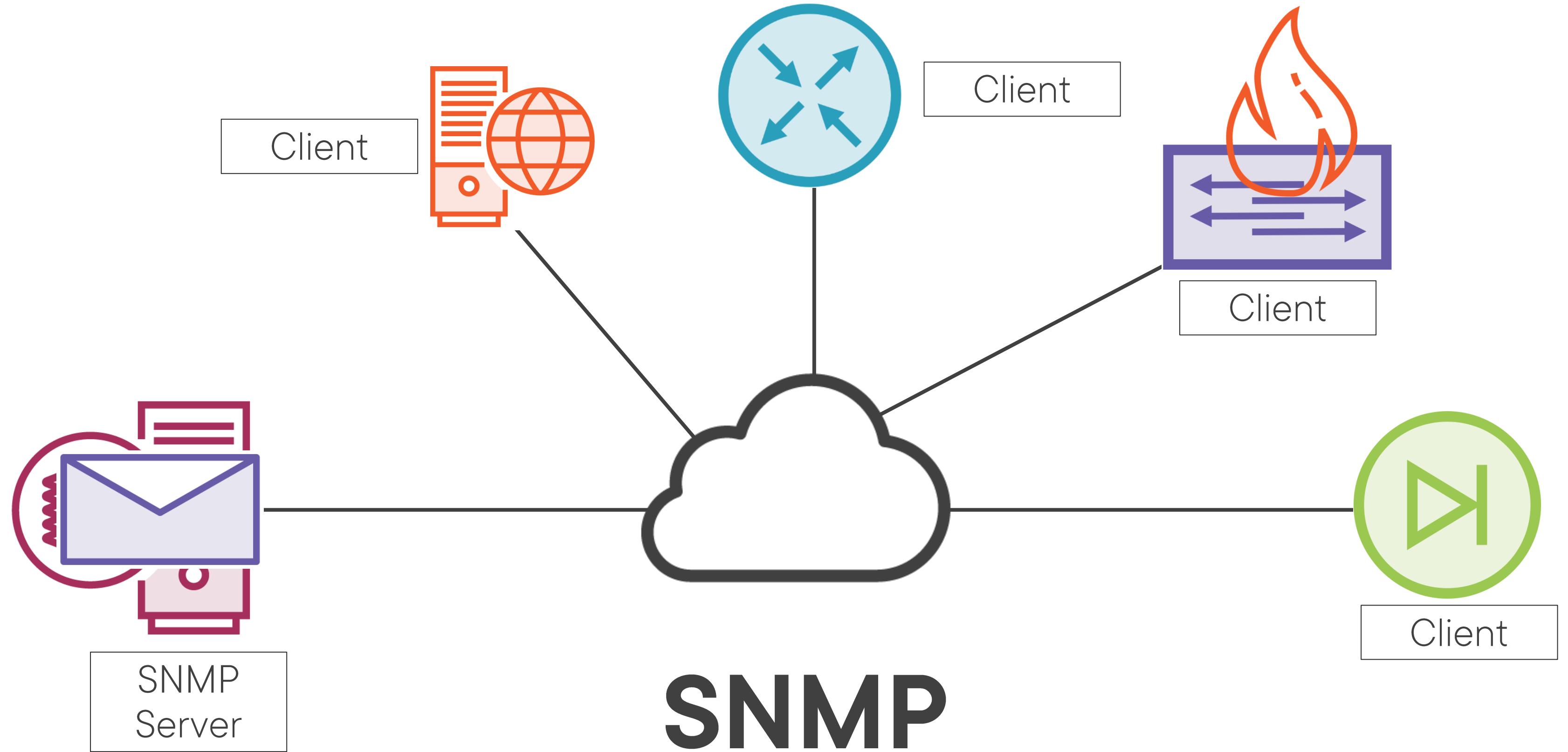


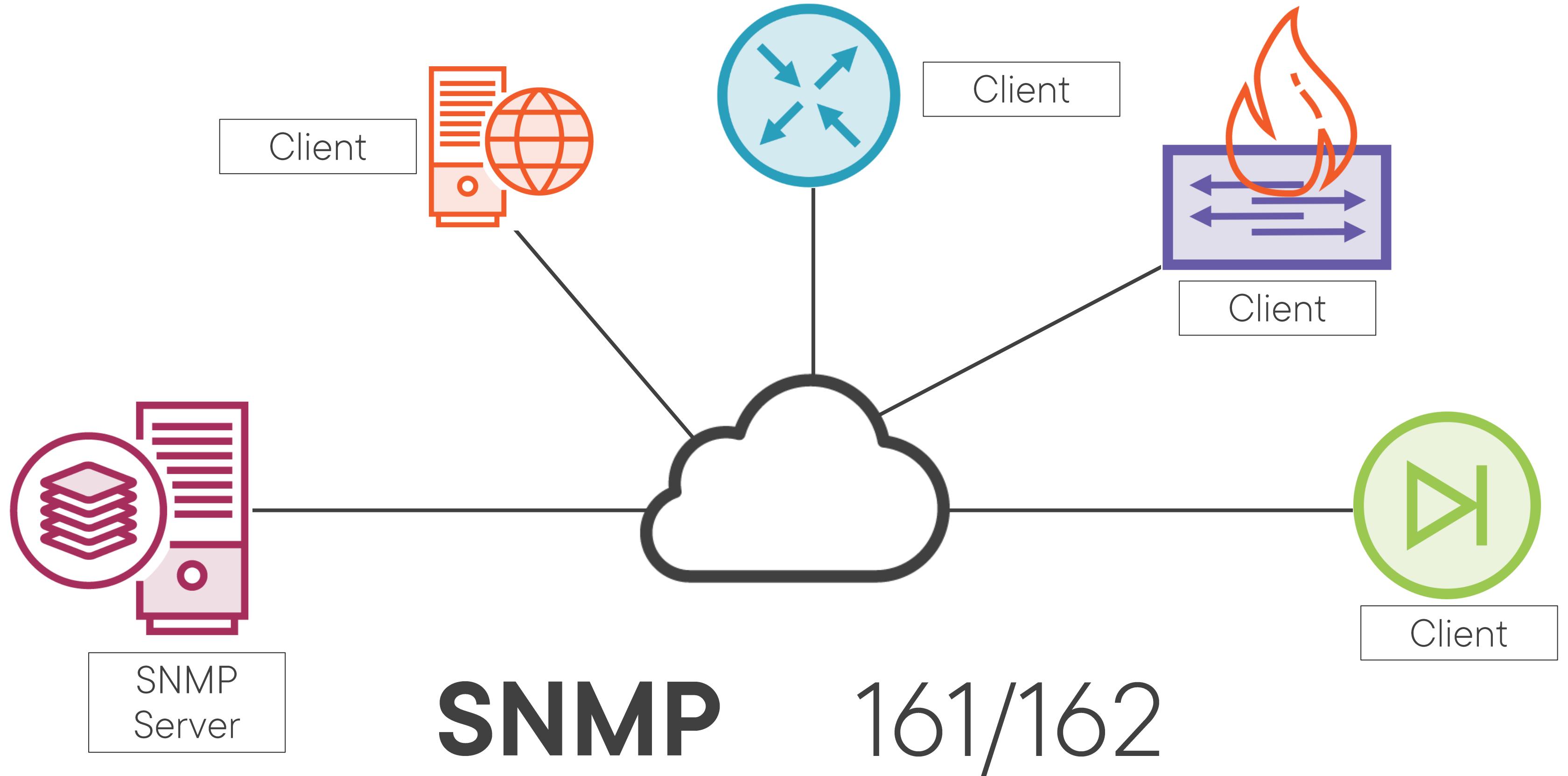


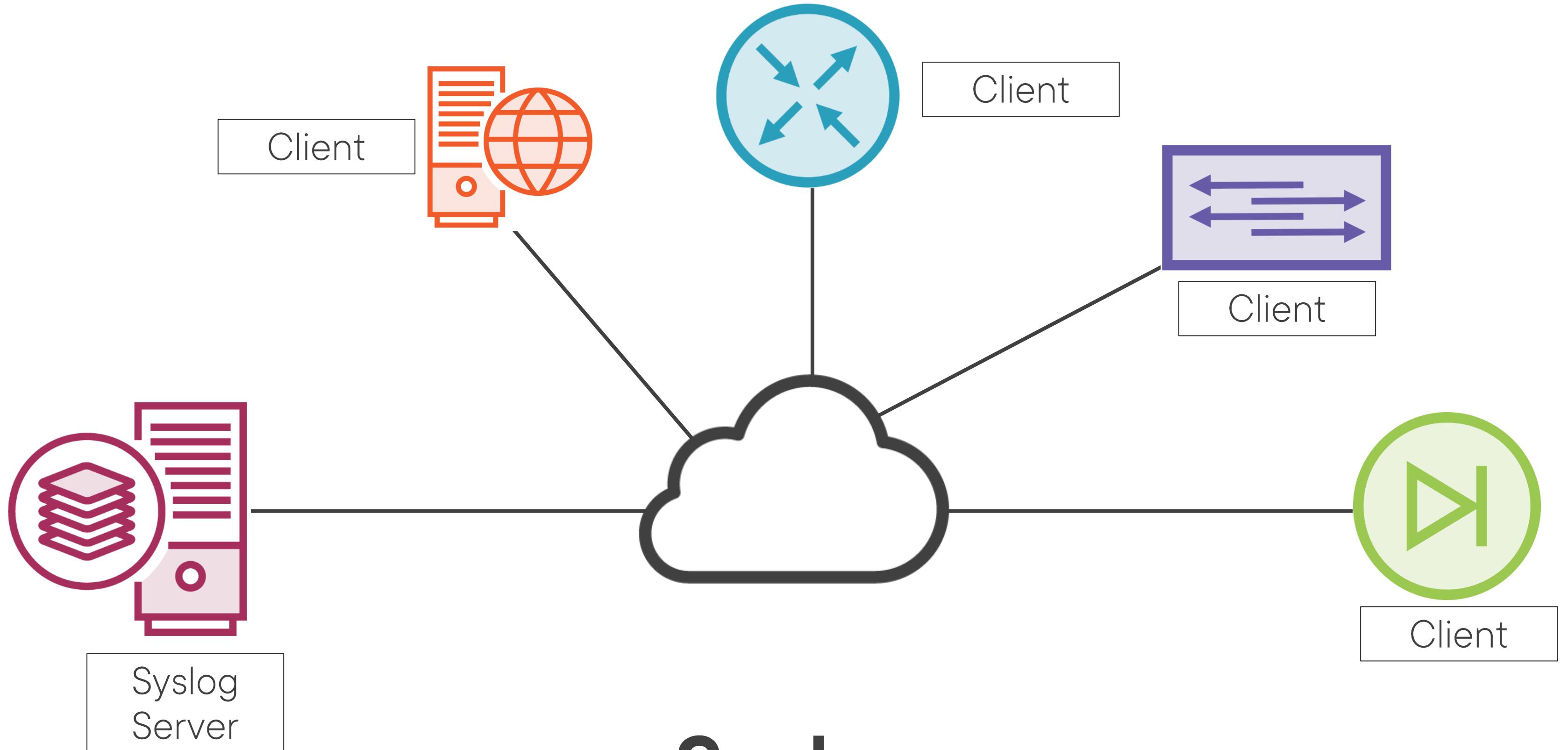


# SNMP Trap



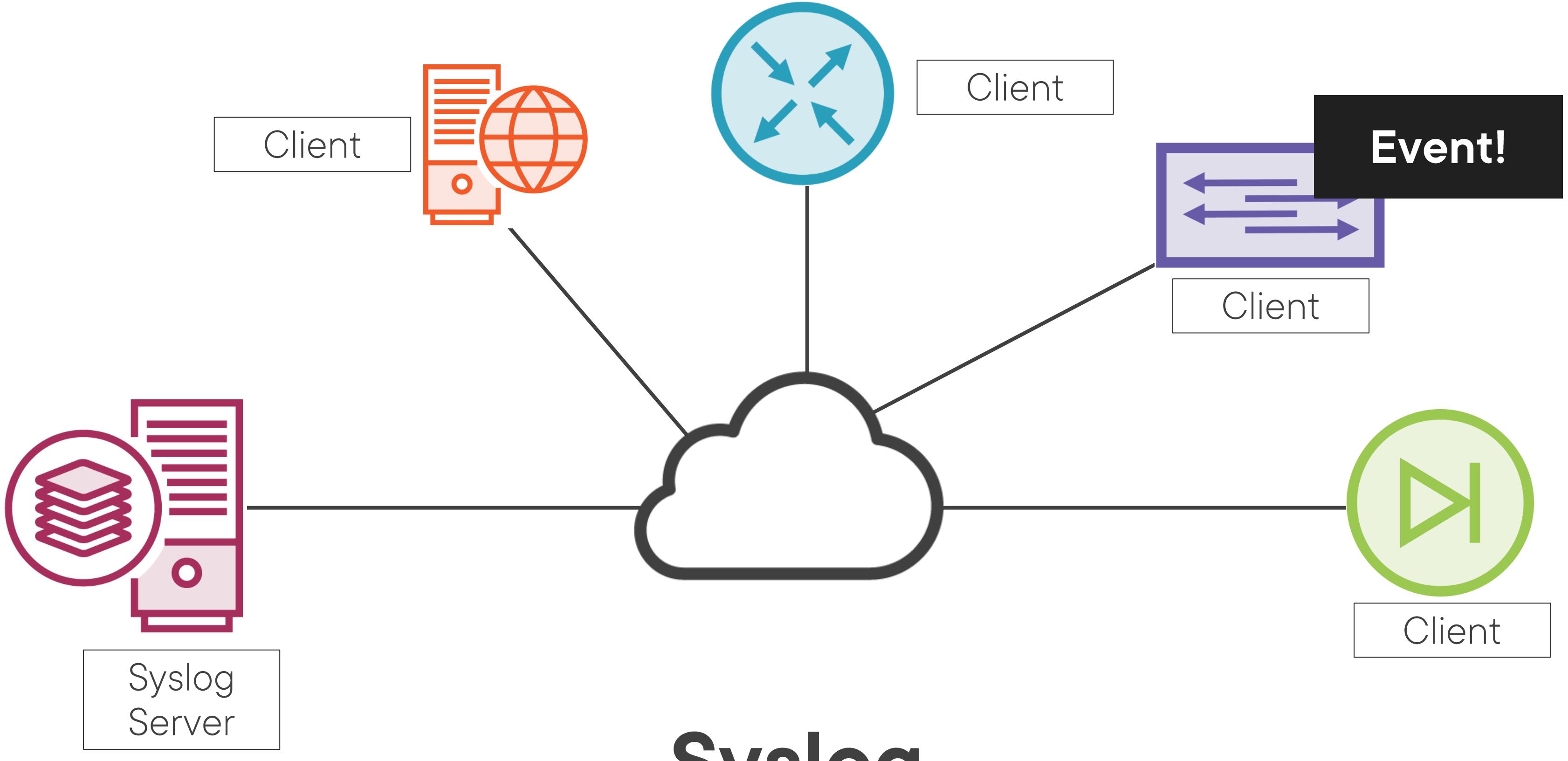


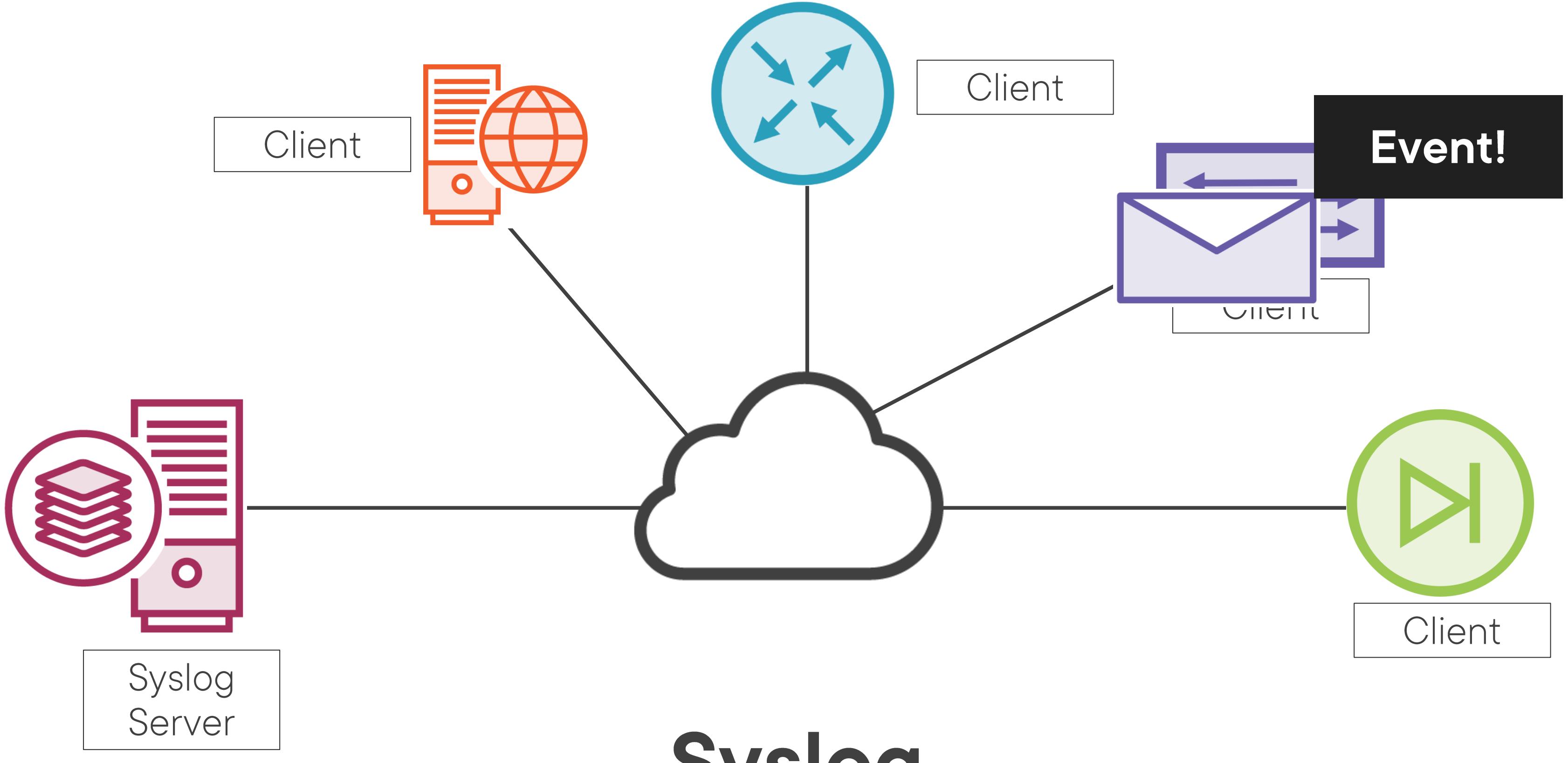


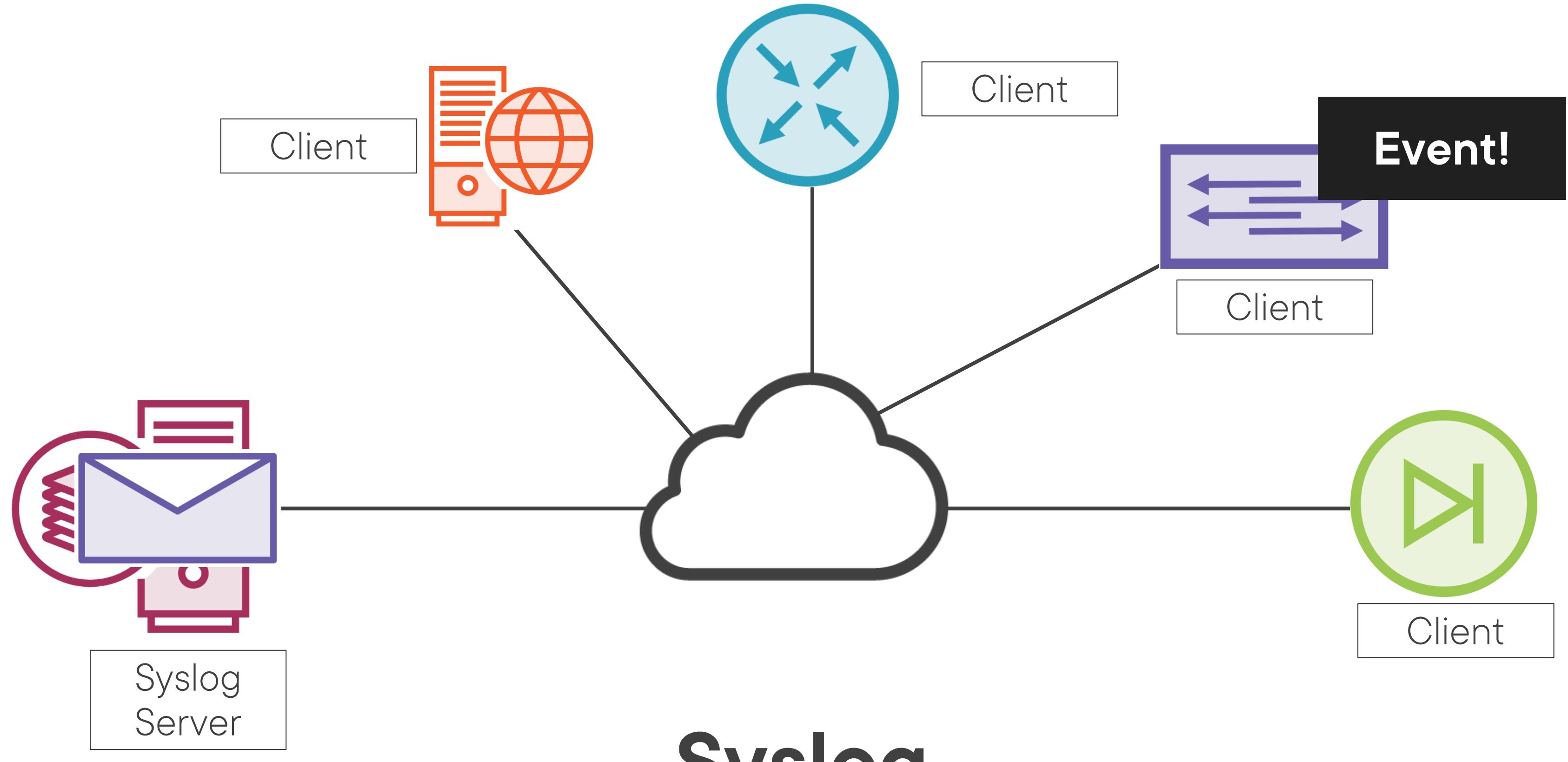


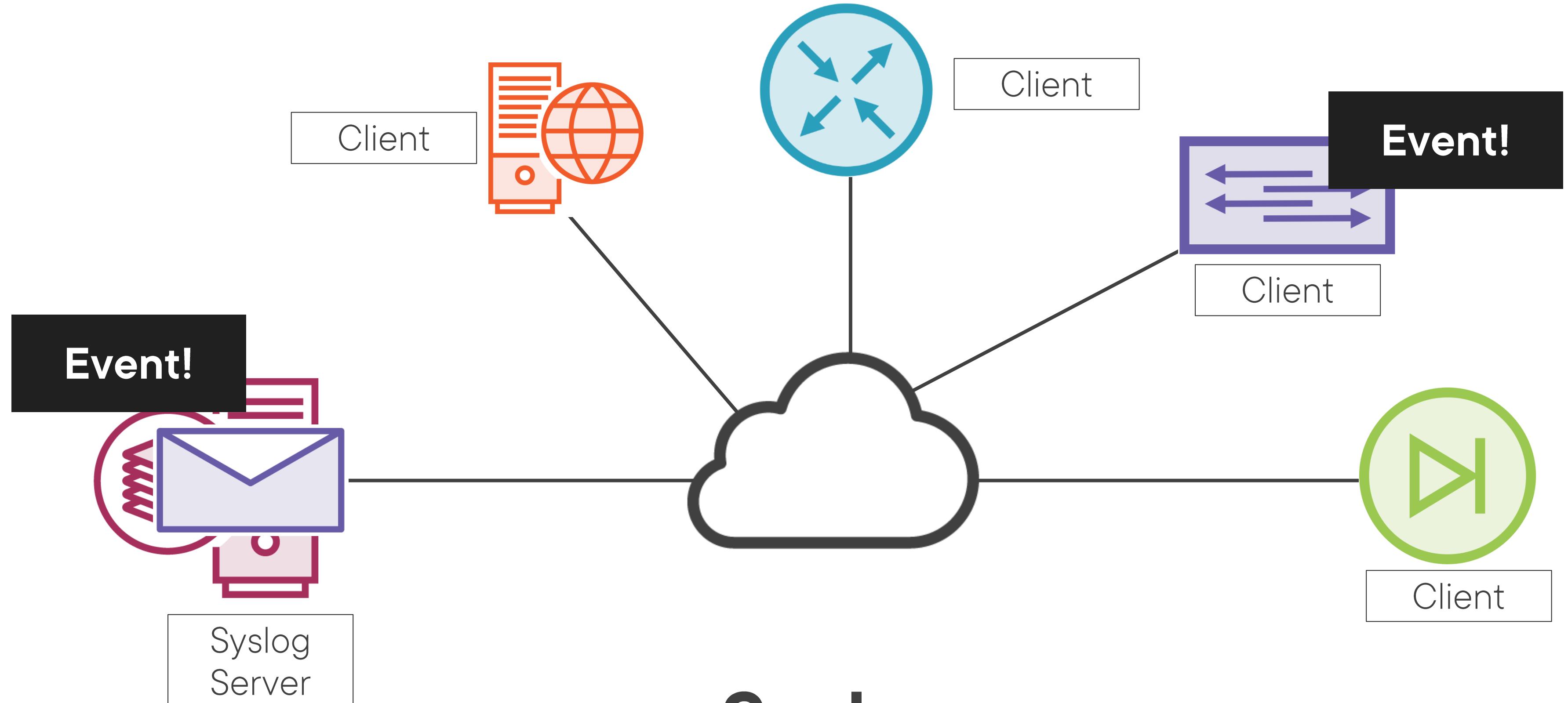
# Syslog

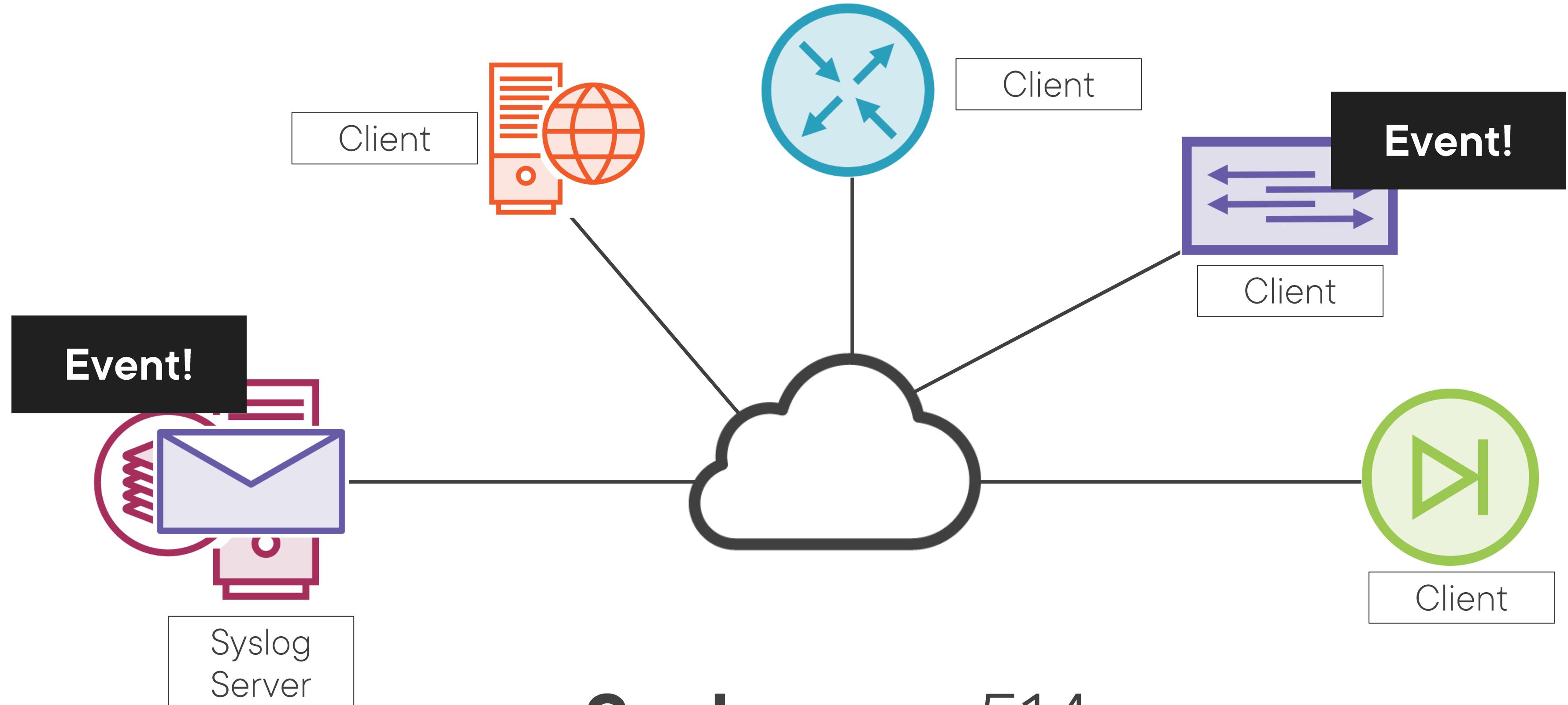












514



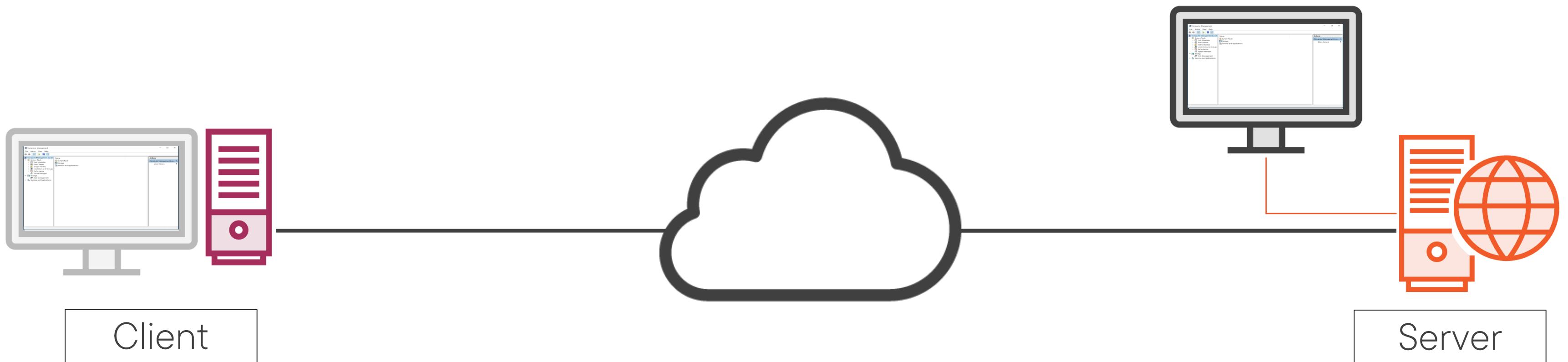
# RDP



# RDP

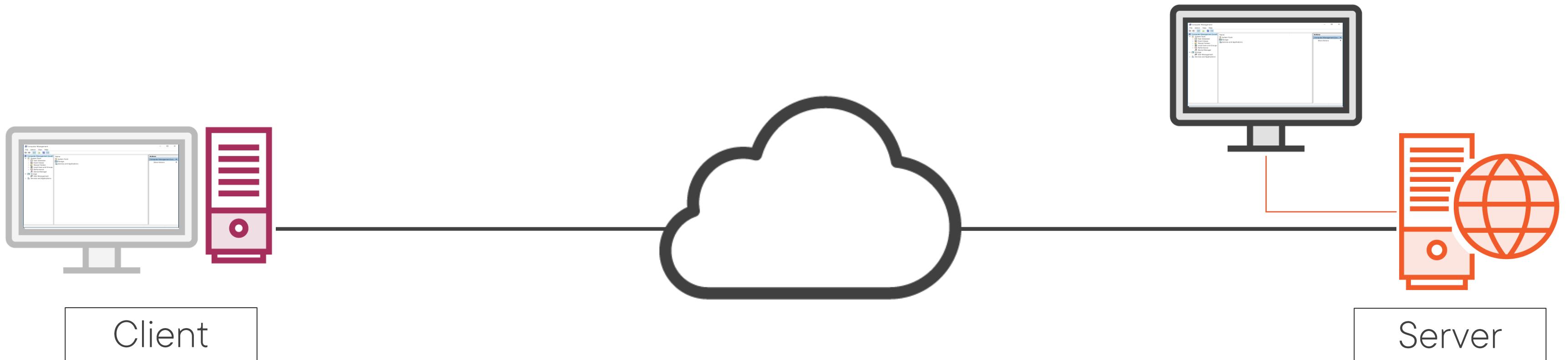


# RDP



# RDP

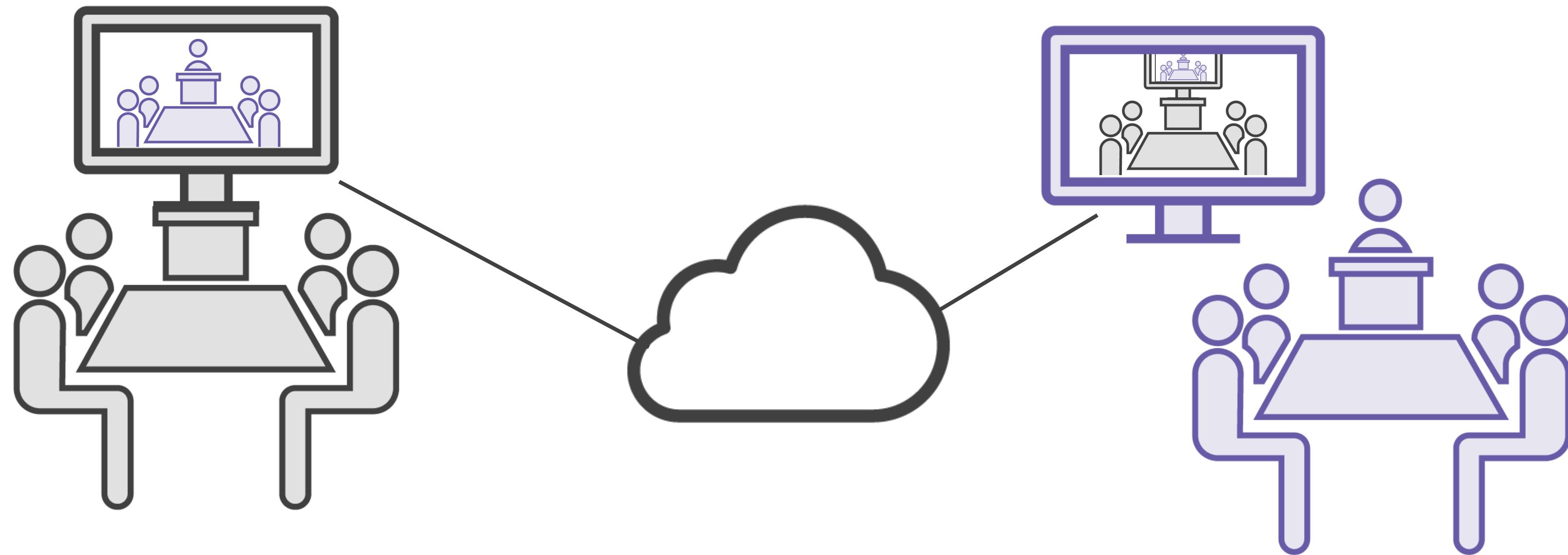
# 3389

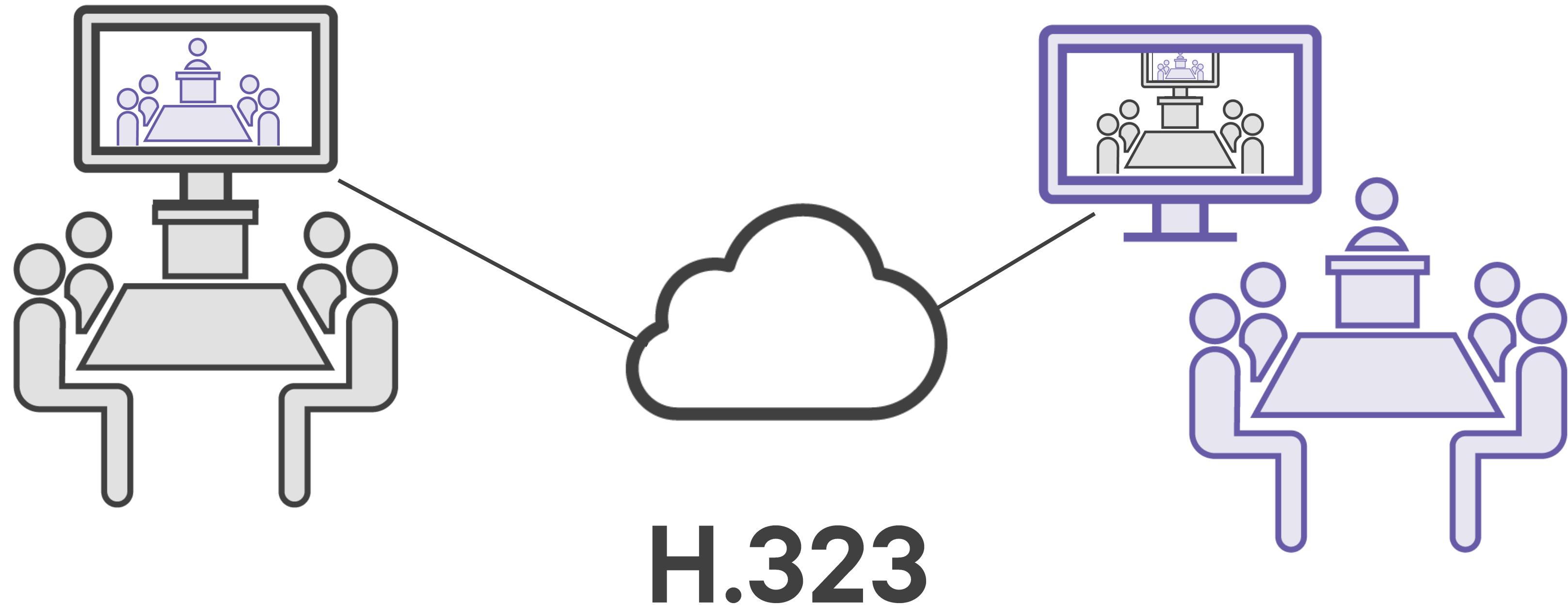


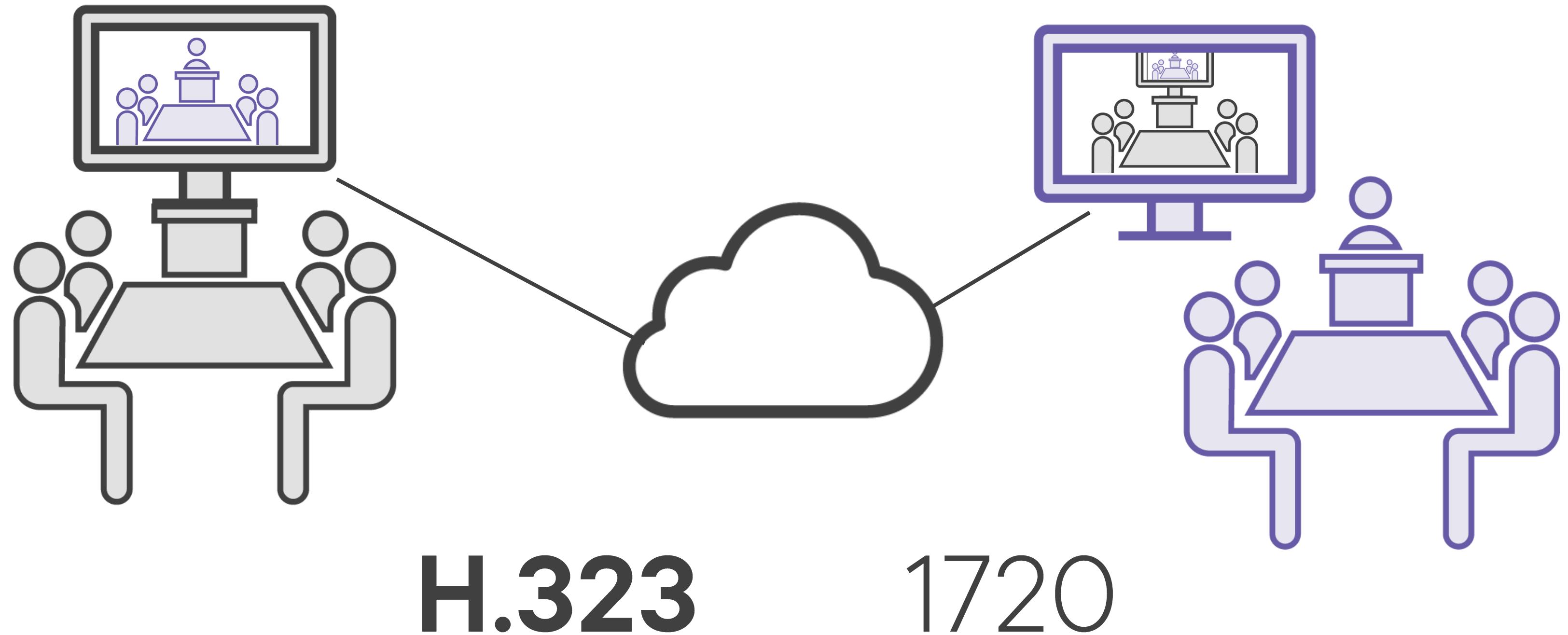
# Audio/Visual

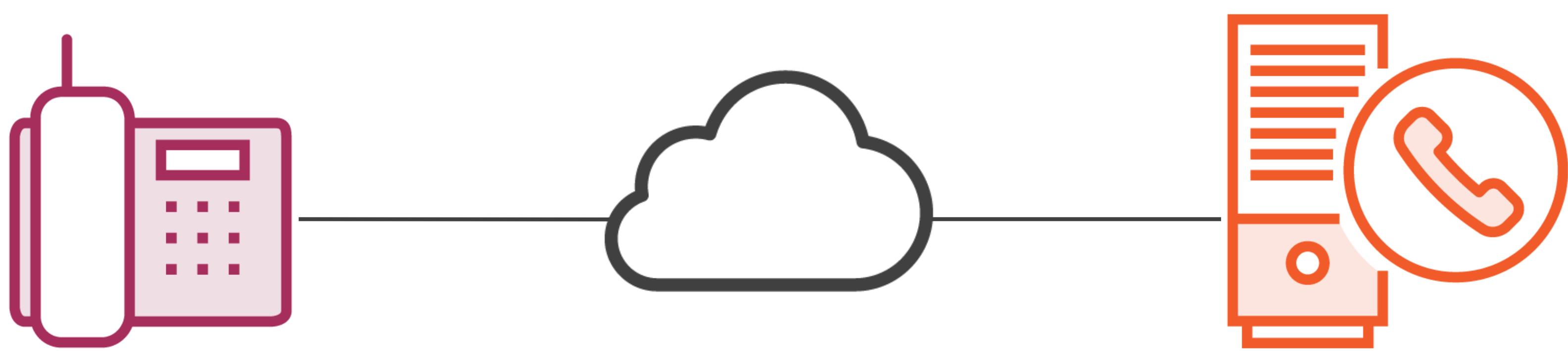
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**SIP**

**5060 / 5061**



# SQL Databases



# SQL

## Structured Query Language





**mySQL**

**SQLnet**

**SQL Server**





**mySQL**

3306

**SQLnet**

1521

**SQL Server**

1433



# Summary



## Application Layer Protocols

- Data Transfer Protocols
- Authentication Protocols
- Network Service Protocols
- Network Management Protocols
- Audio/Visual Protocols
- Database Protocols

