TCP and UDP

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NETWORK ENGINEER

@bagurdes

Transport Layer Protocols

- Transmission Control Protocol (TCP)
- User Datagram Protocol (UDP)

Protocol Hierarchy

OSI Model

1.1

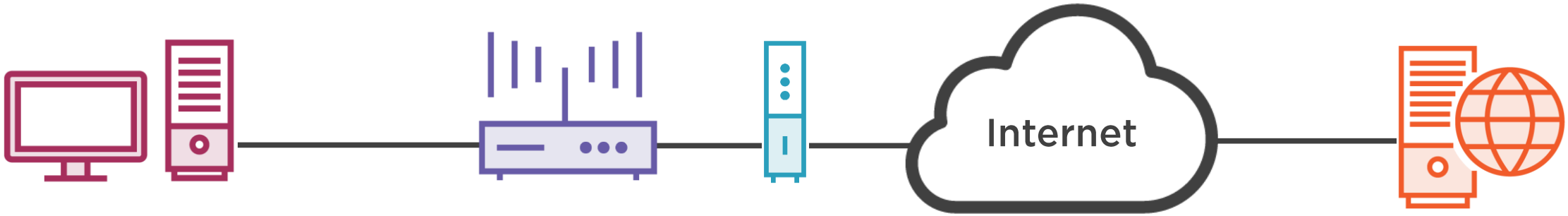
7	Application Layer
6	Presentation Layer
5	Session Layer
4	Transport Layer
3	Network Layer
2	Data Link Layer
1	Physical Layer

1.1

Transport Layer Protocols

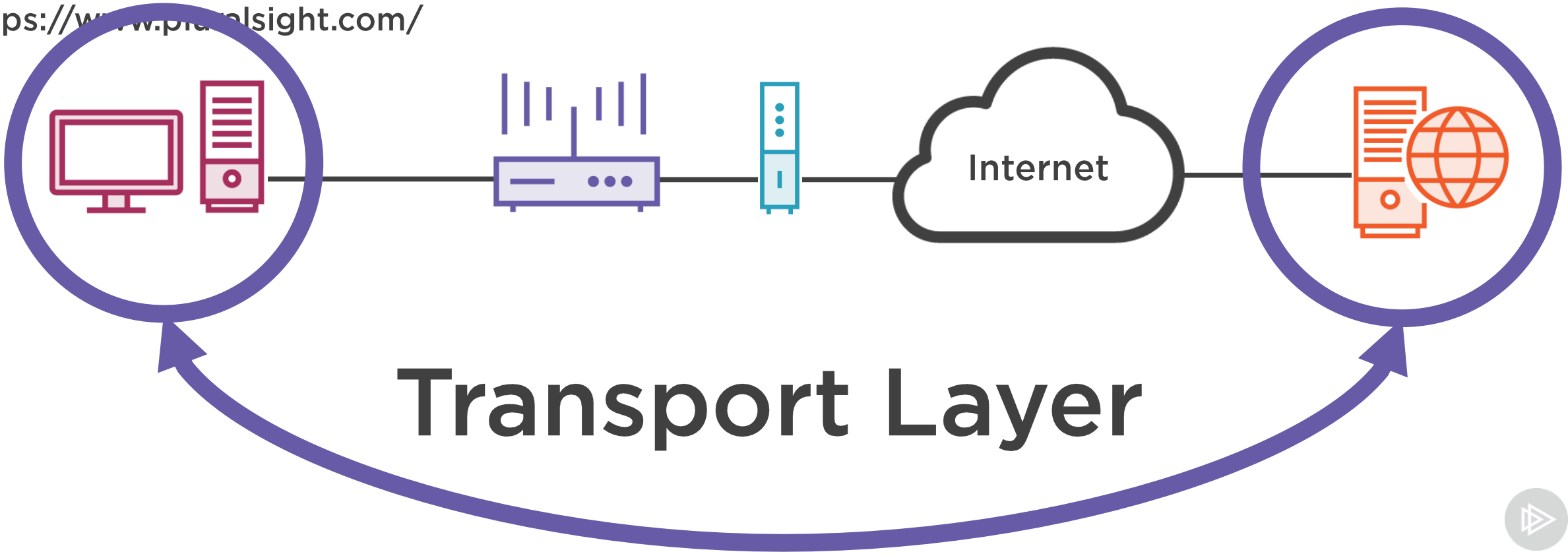
1.1

https://www.pluralsight.com/



Transport Layer

https://www.pluralsight.com/



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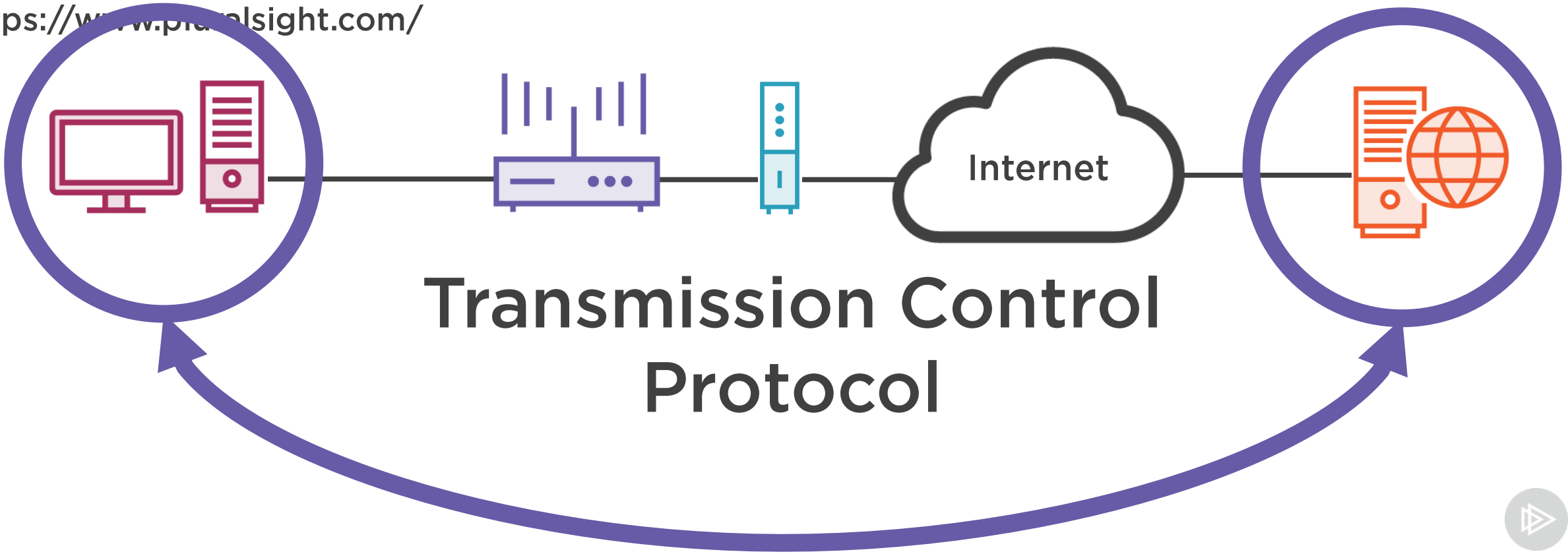

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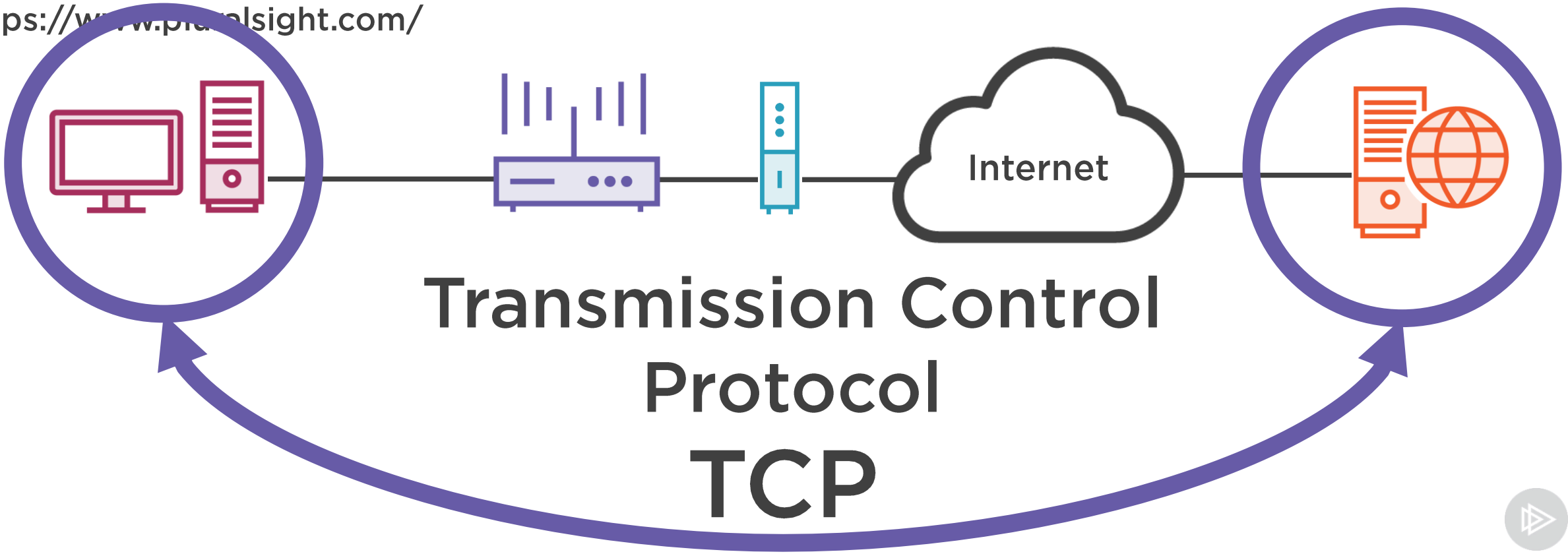
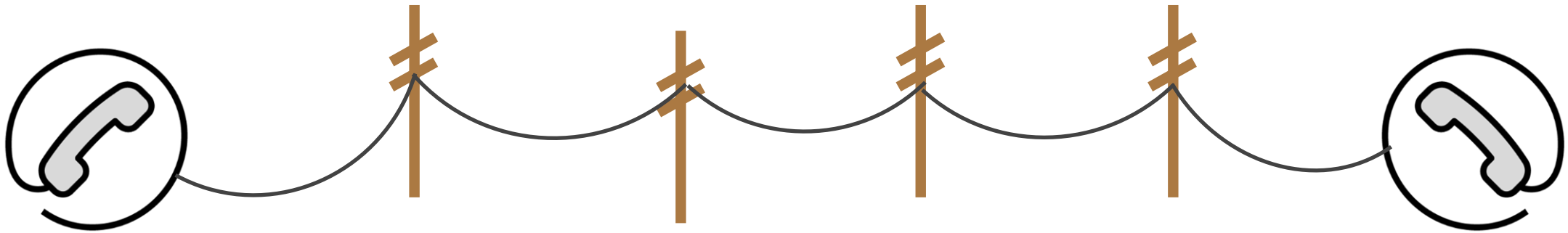


Establishing Communication

1.1



Telephone

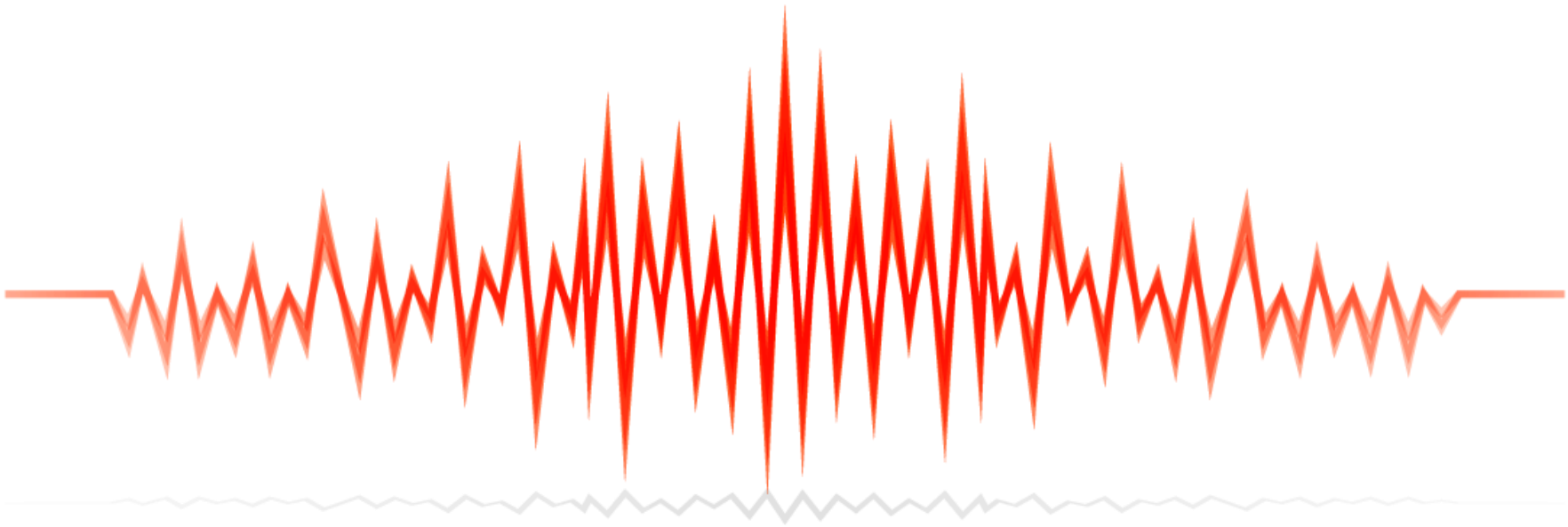
867-5309

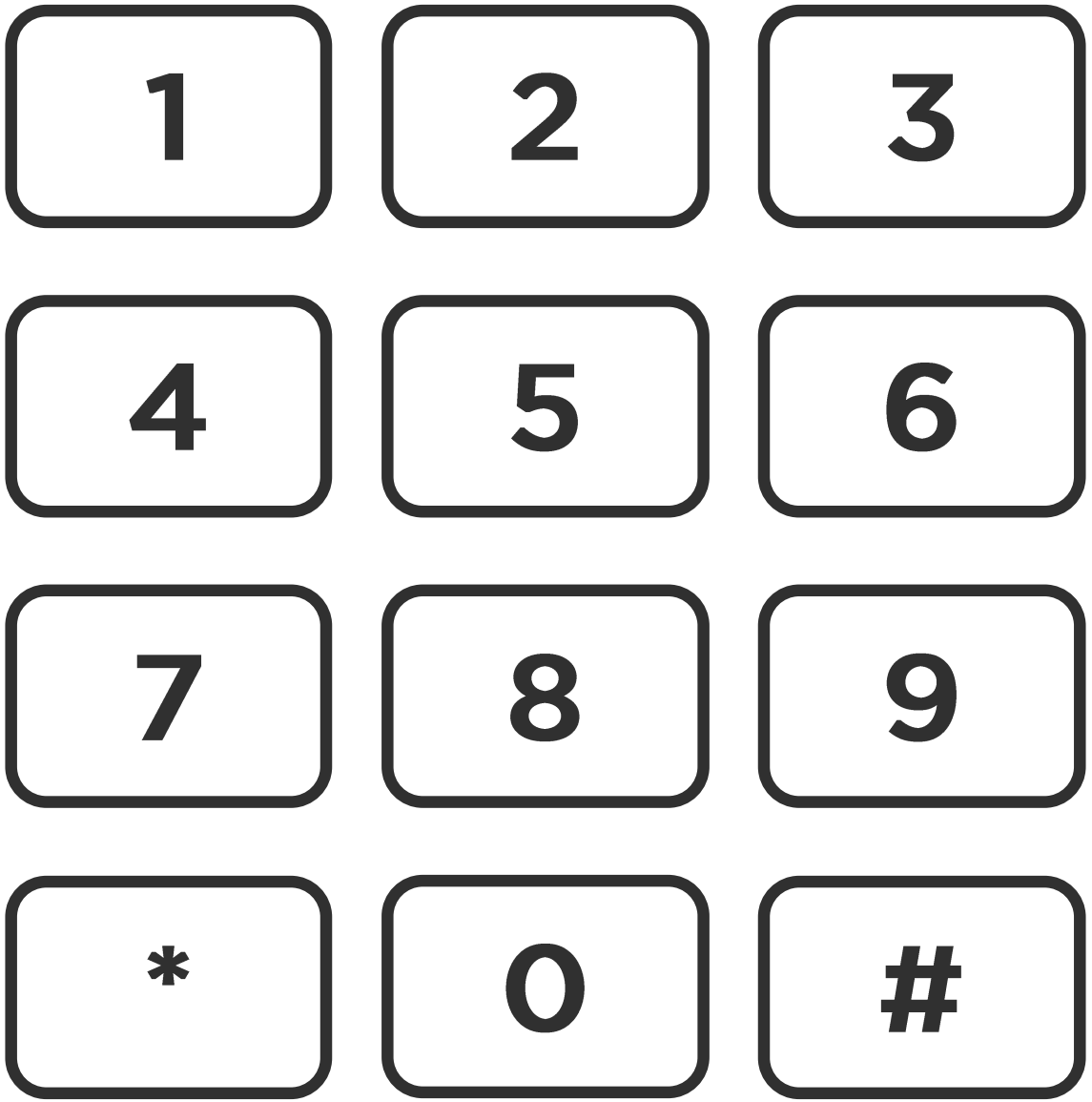
Homer

Marge

1.1

1.1




1
2
3
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5
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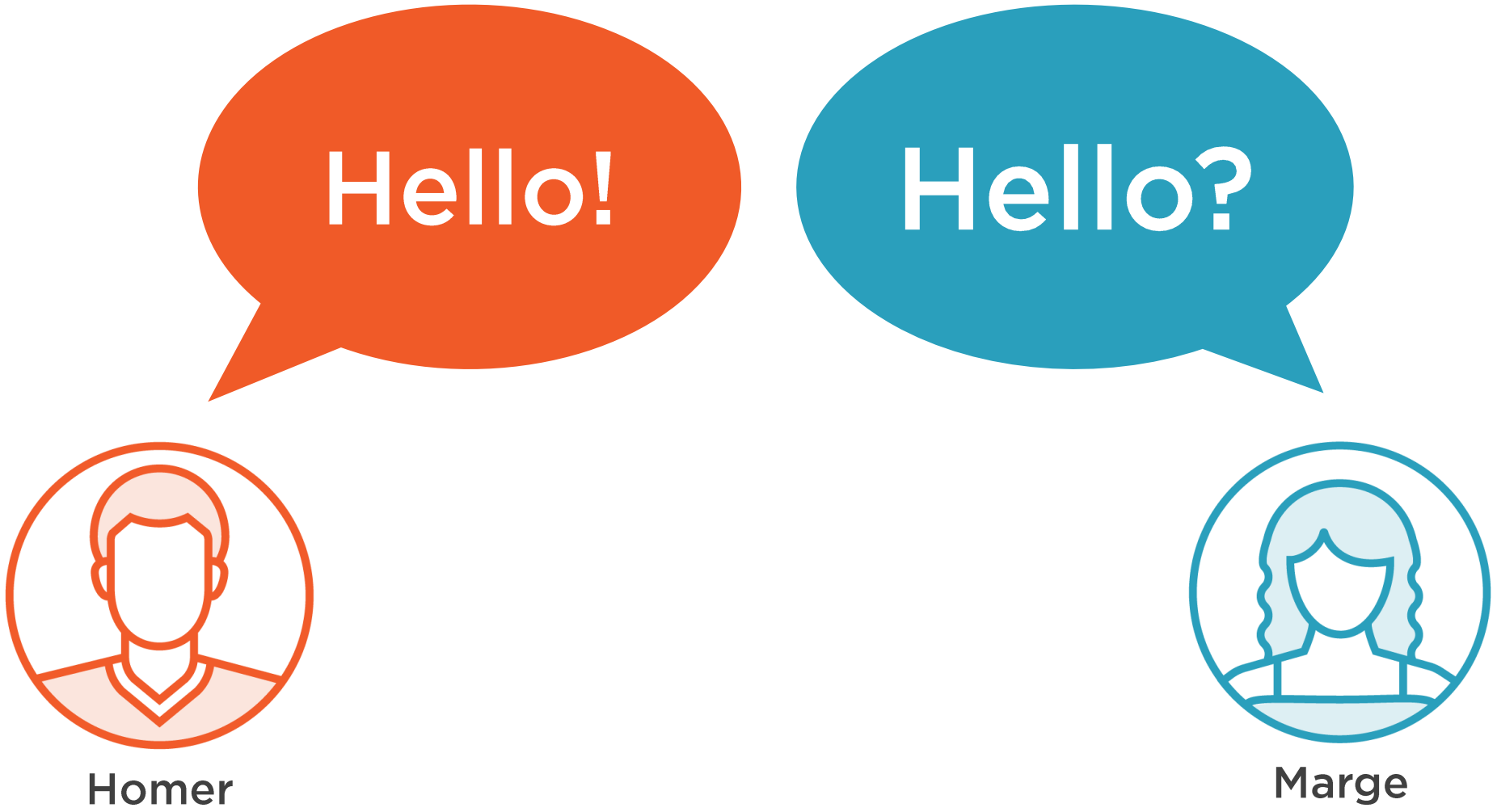
1.1

Marge

Conversation Protocol

1.1



Conversation Protocol

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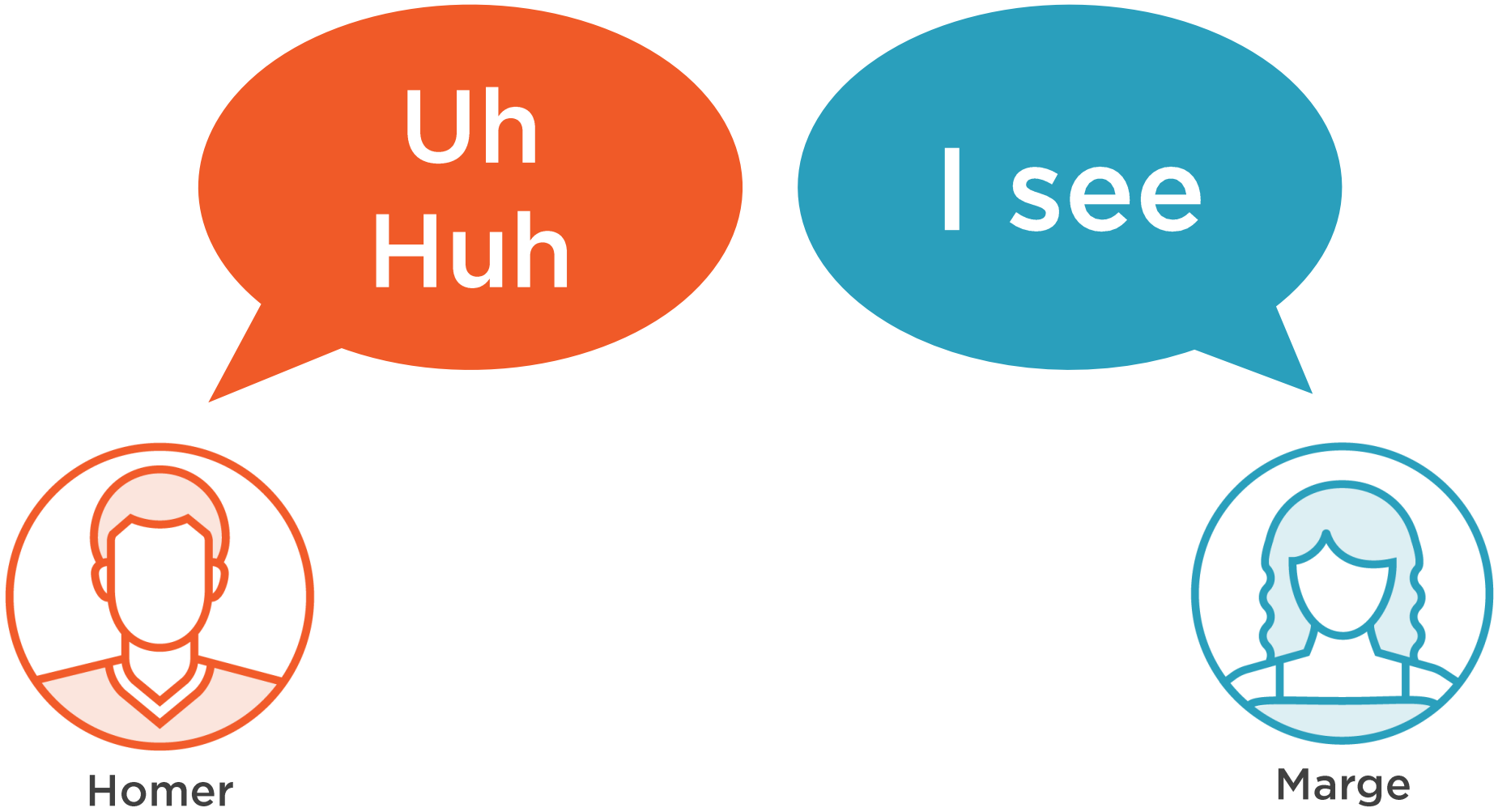

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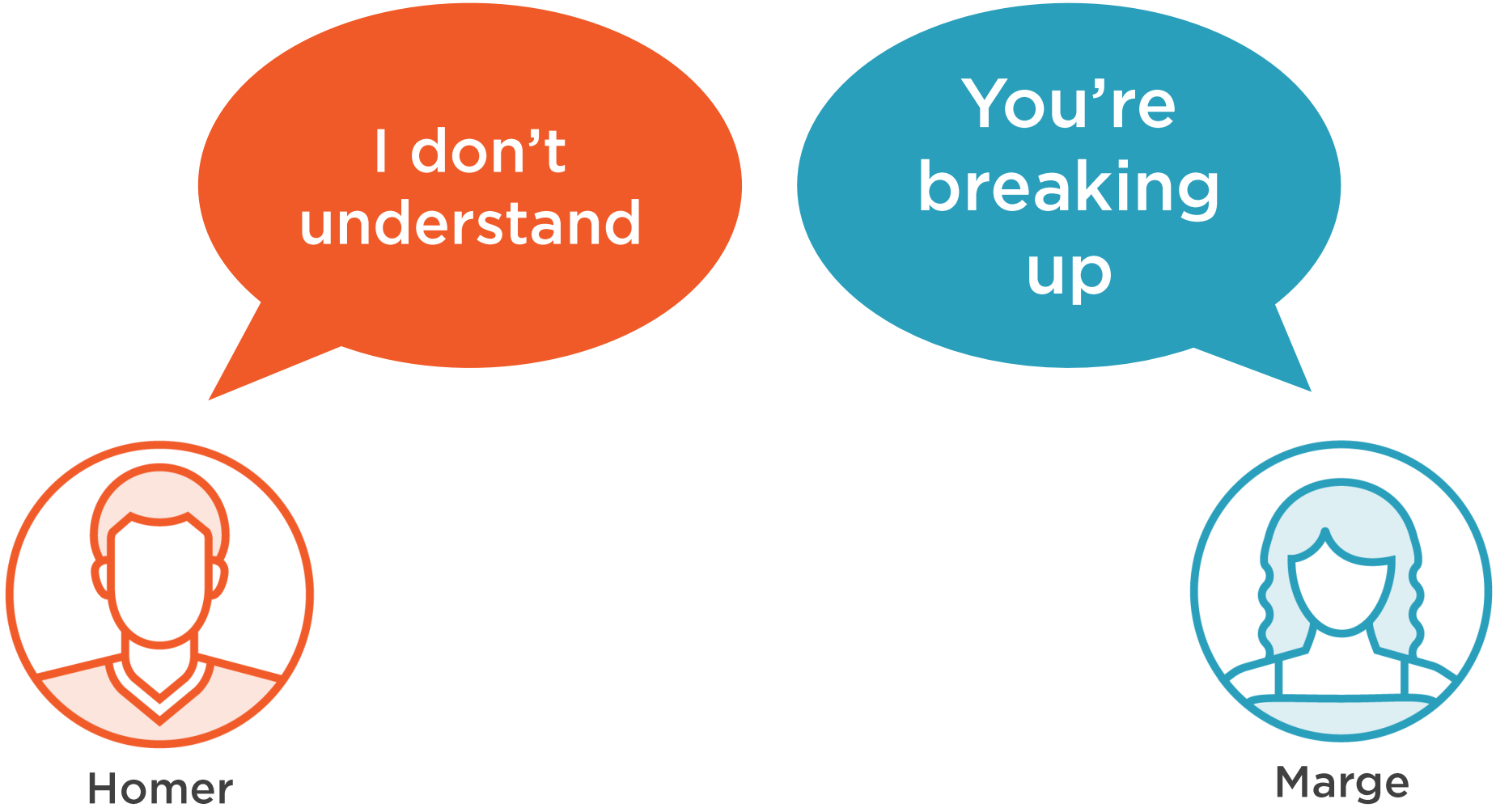


Conversation Protocol

Good Bye

Bye

Homer

Marge

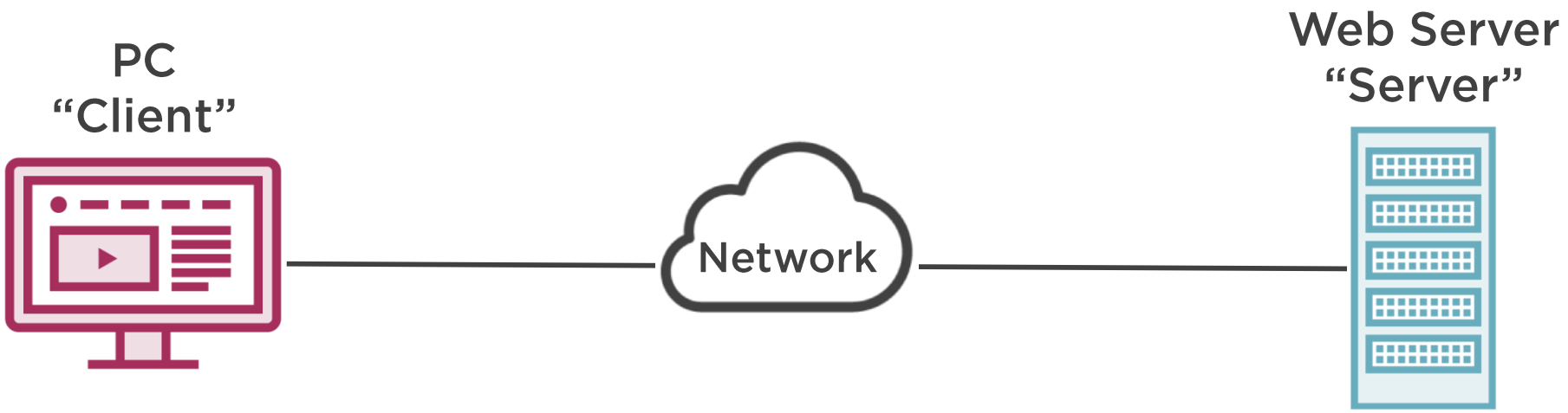
1.1

The 3-way Handshake

Transmission Control Protocol (TCP)

1.1

The 3-way Handshake



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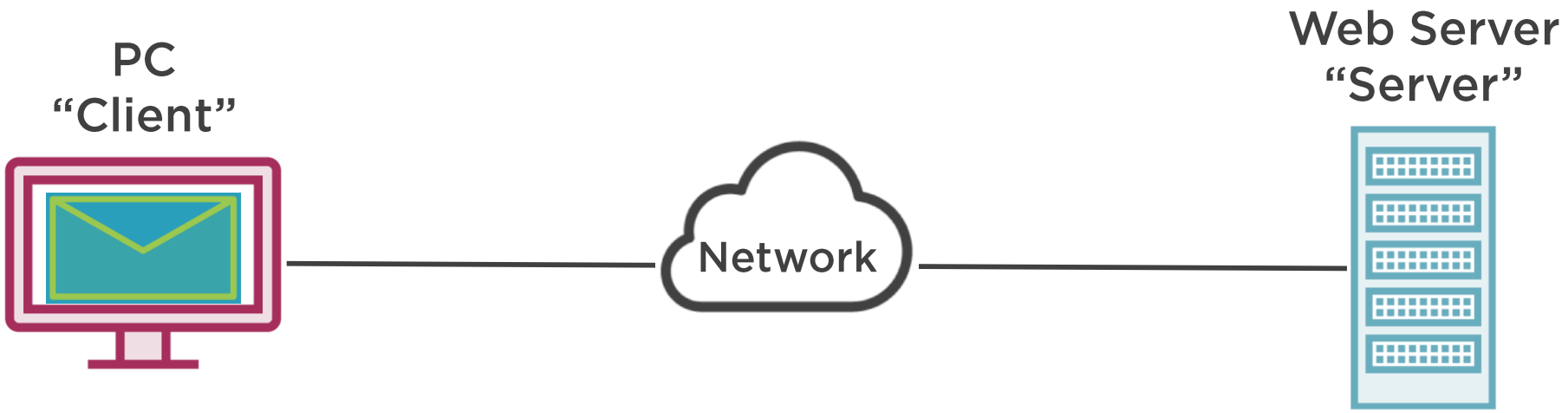
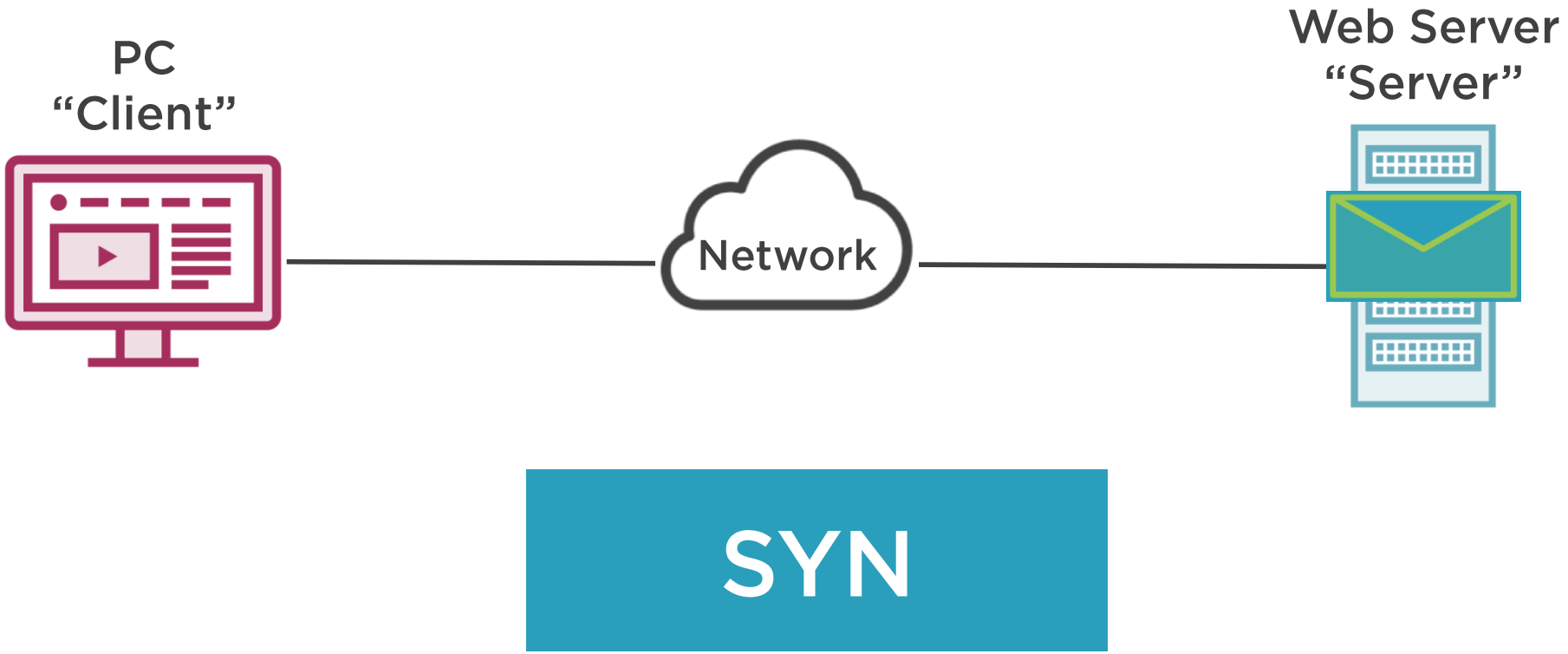


Transmission Control Protocol (TCP)

1.1

The 3-way Handshake
SYN Sent



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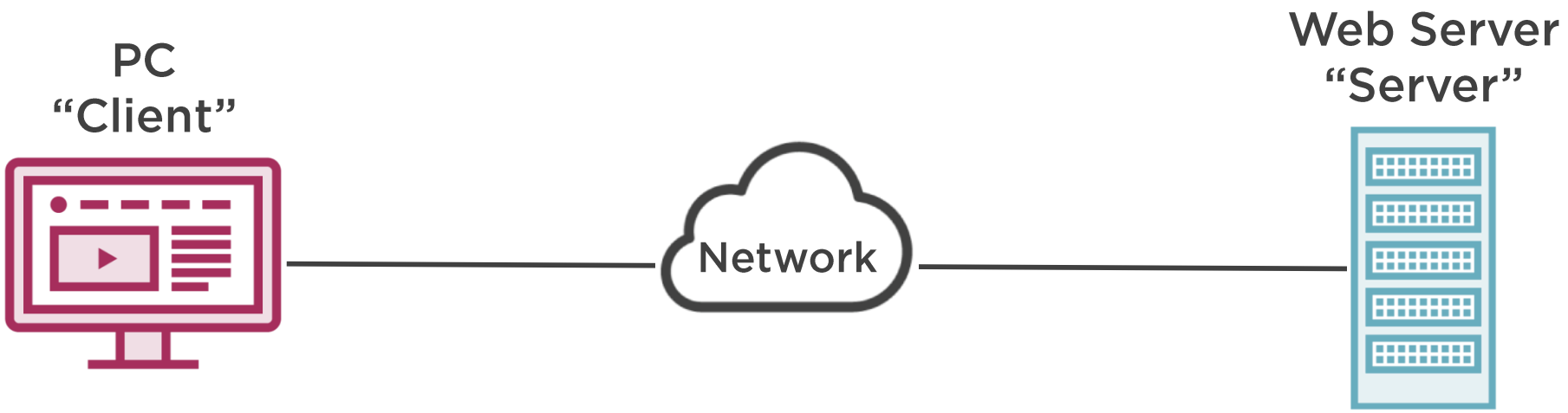

Transmission Control Protocol (TCP)

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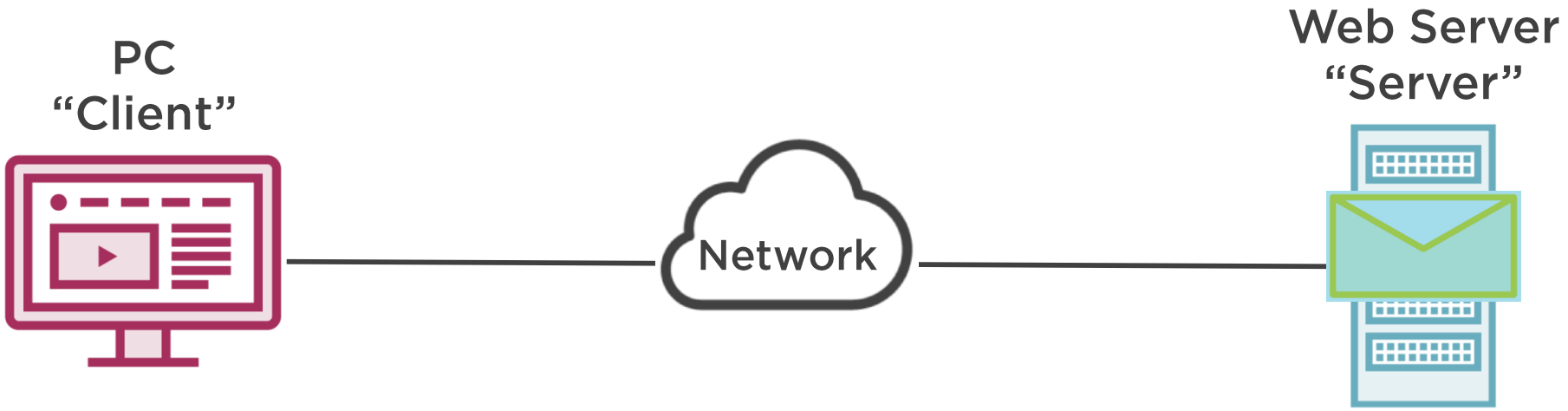
The 3-way Handshake
SYN Received



Transmission Control Protocol (TCP)

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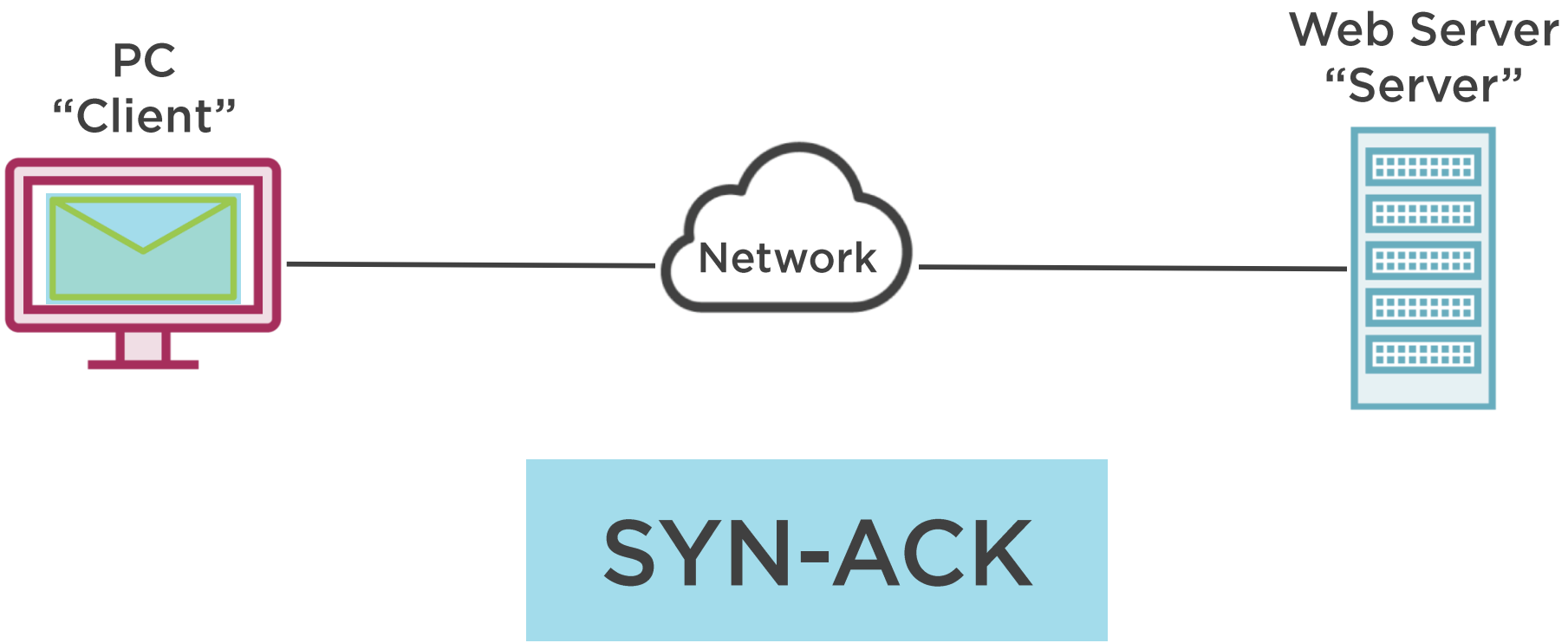

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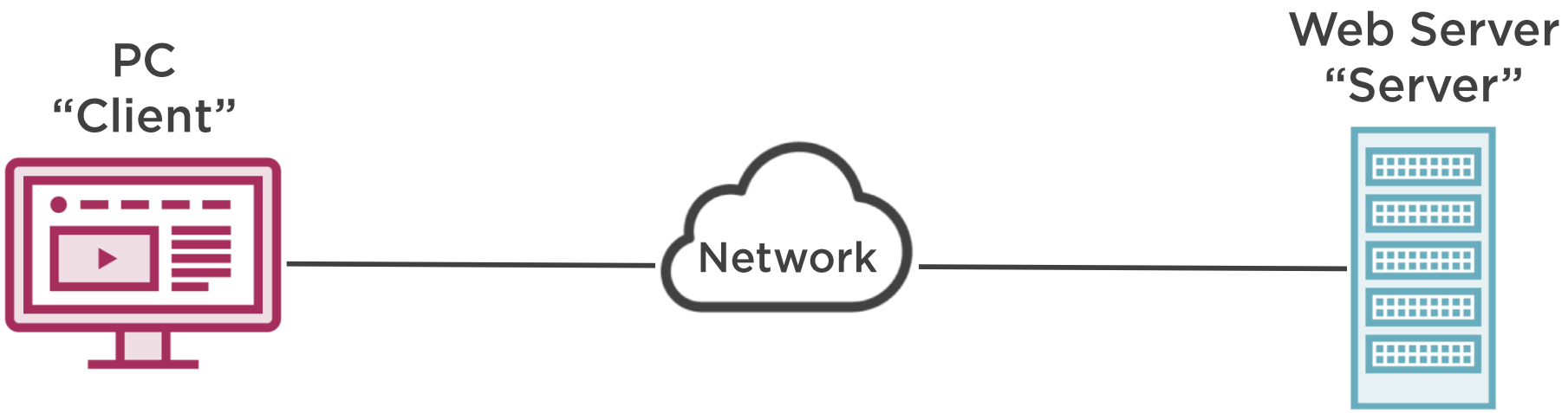

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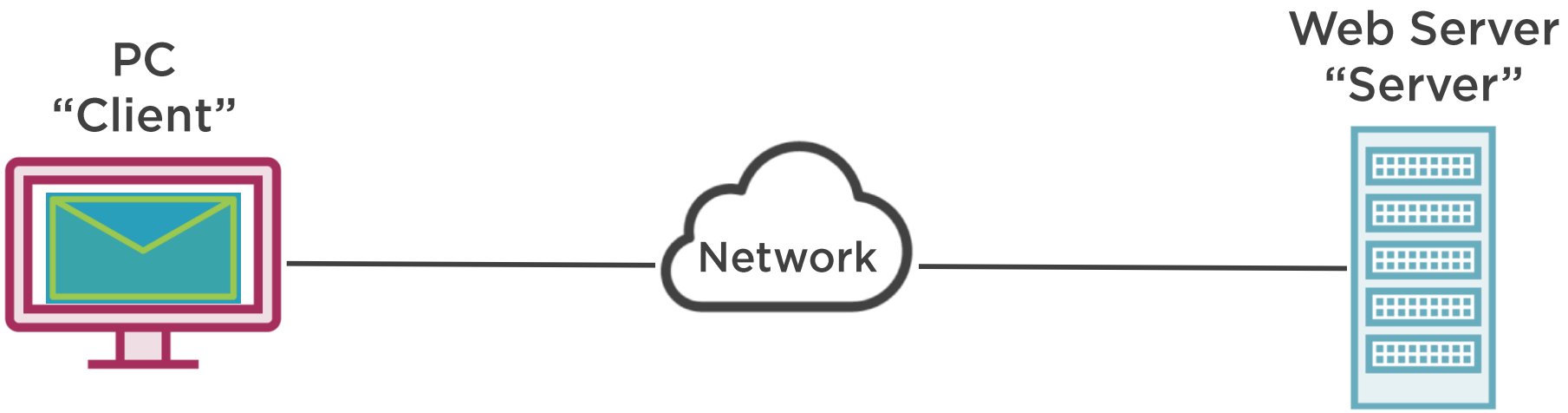

Transmission Control Protocol (TCP)

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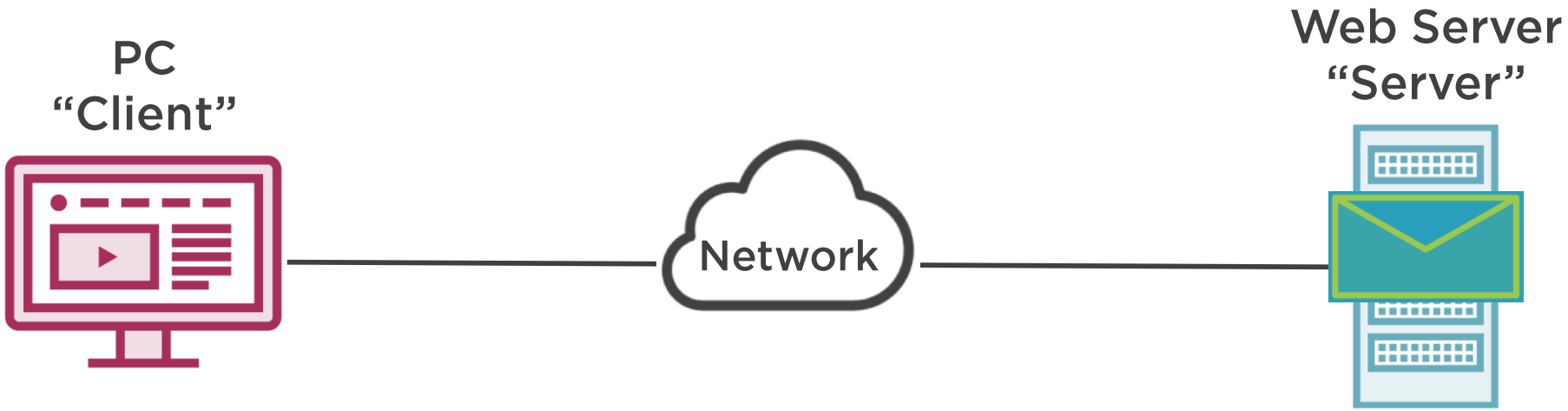
The 3-way Handshake
Session Established



ACK

Transmission Control Protocol (TCP)

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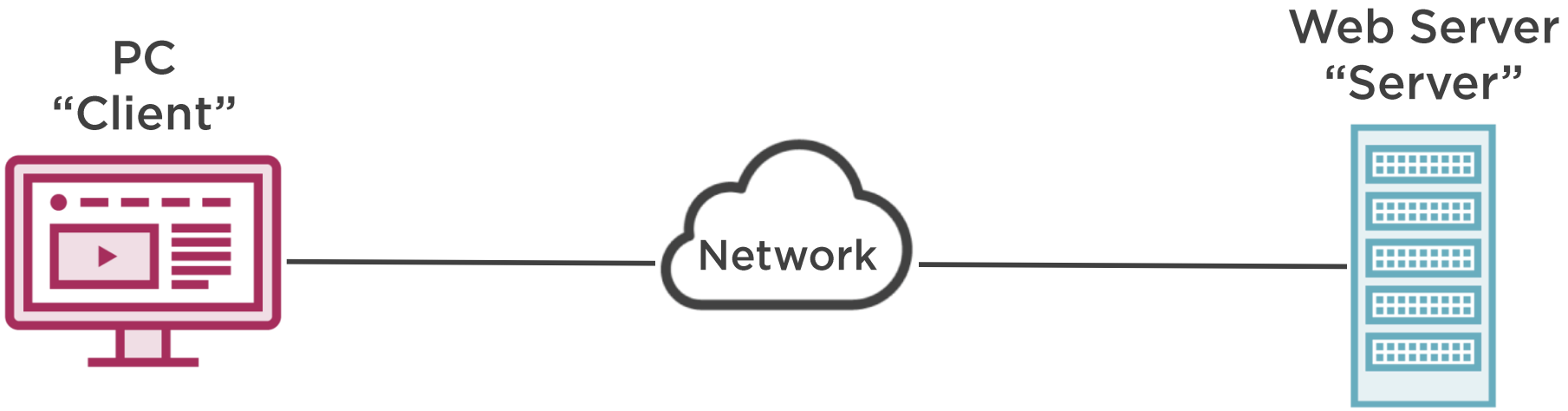

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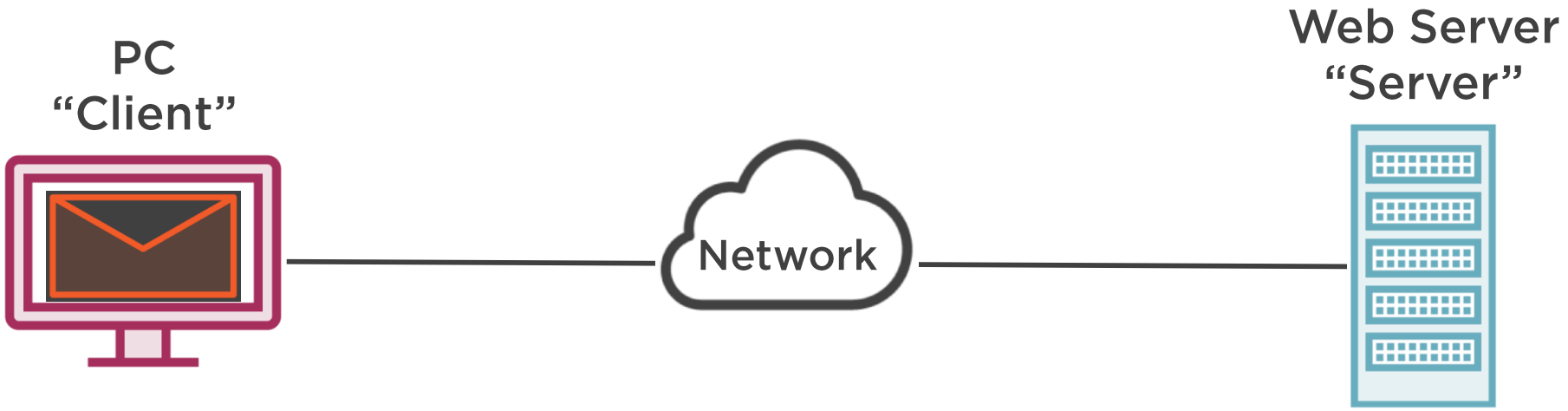

Send me the website

Transmission Control Protocol (TCP)

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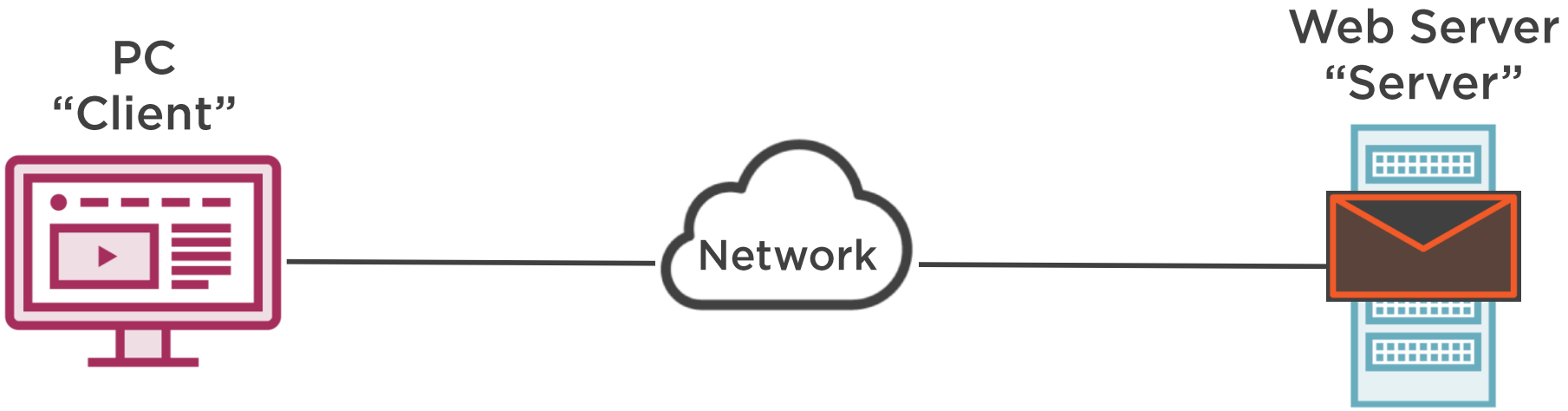
The 3-way Handshake
Session Established



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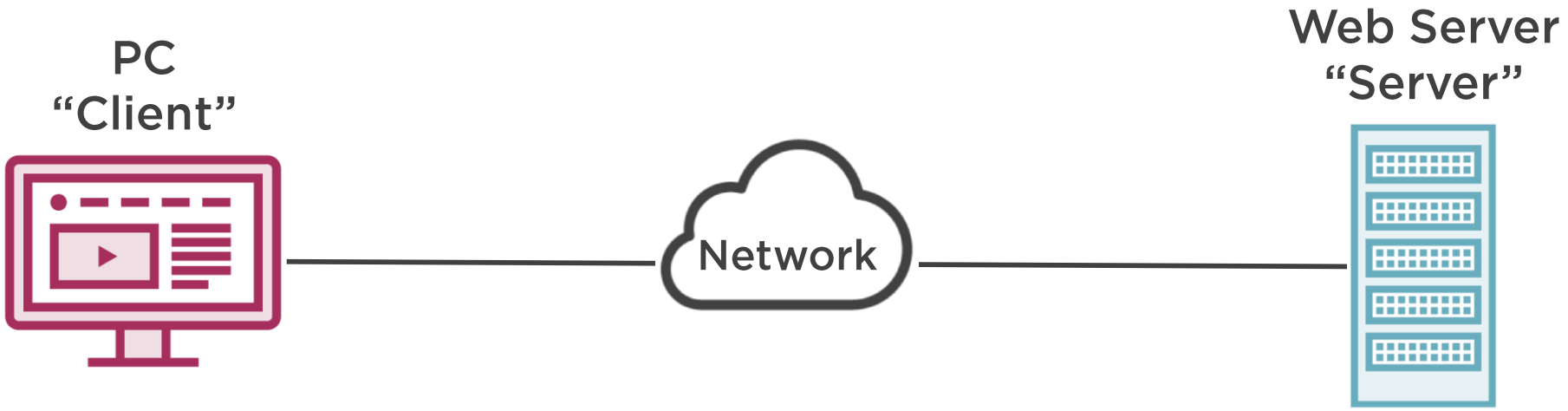

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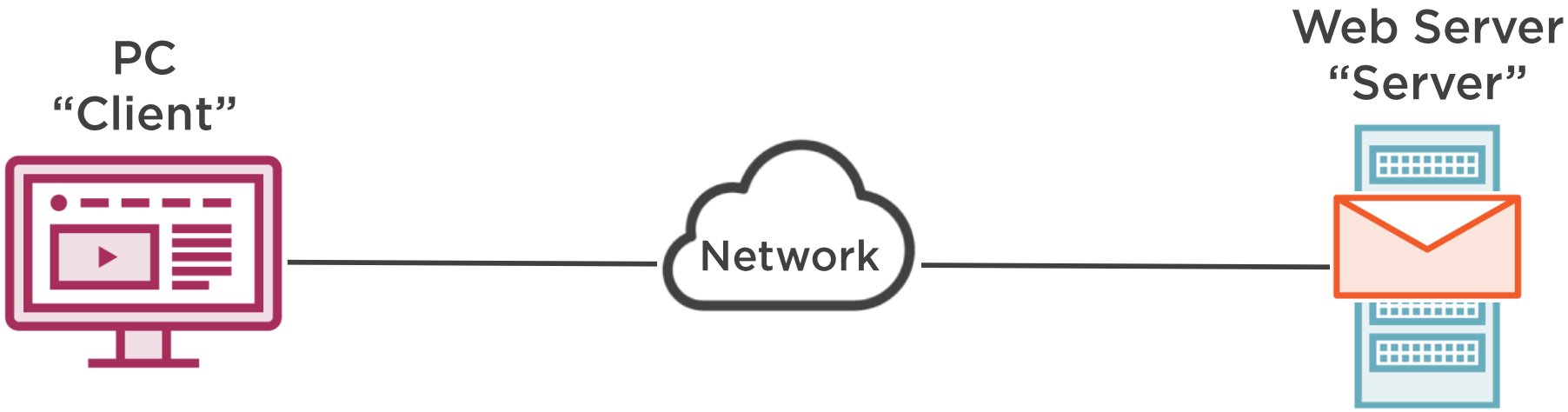

Here’s the website

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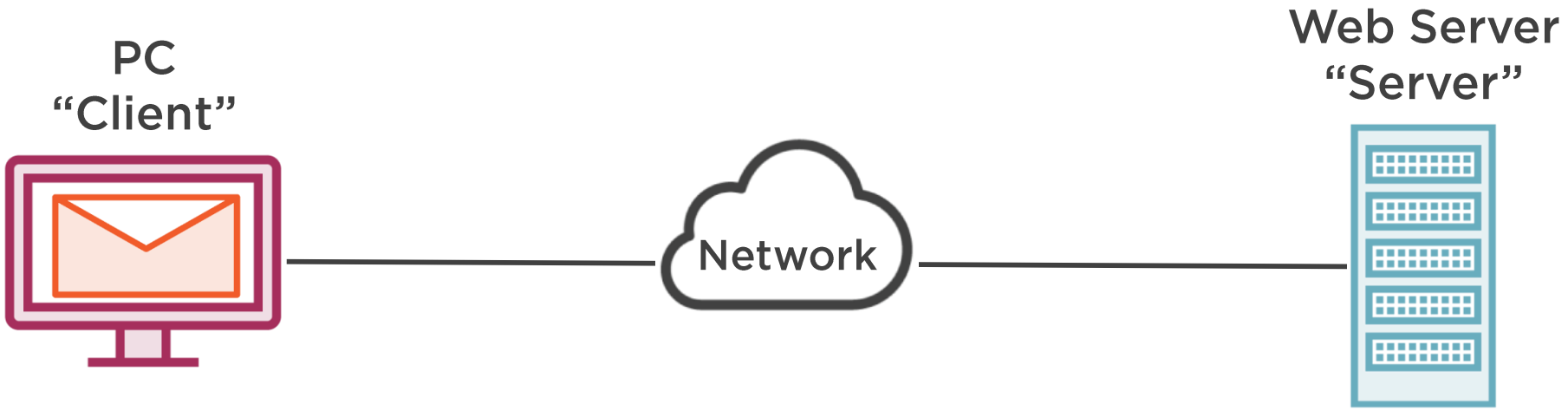

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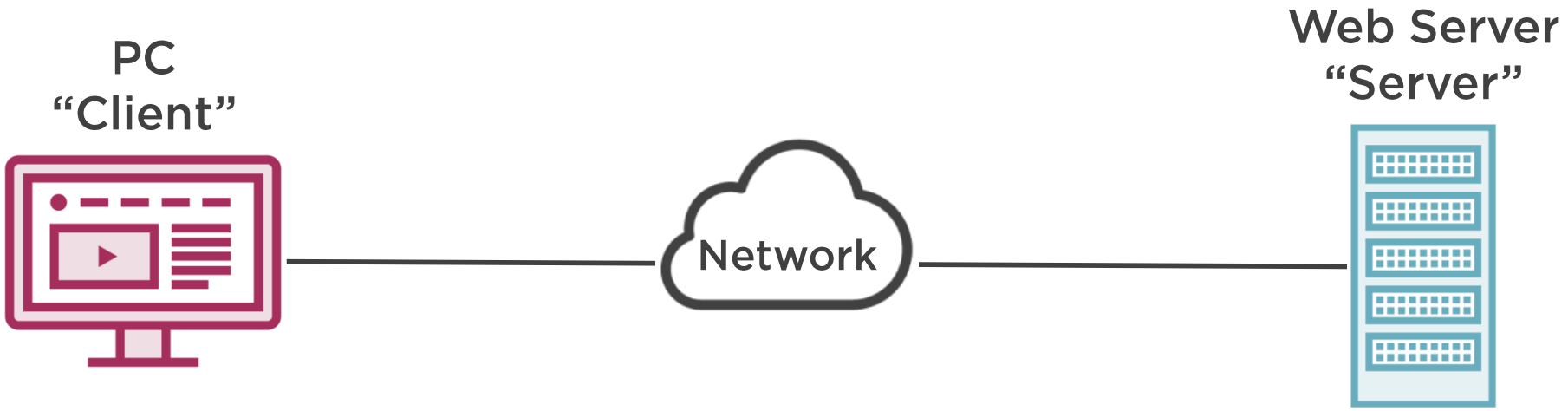
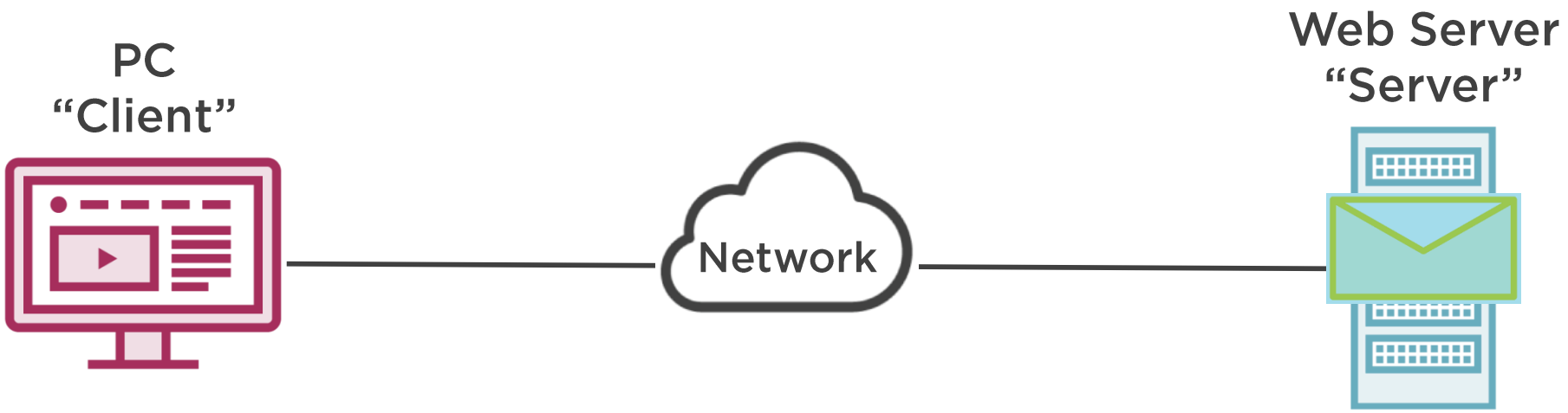


Transmission Control Protocol (TCP)

1.1

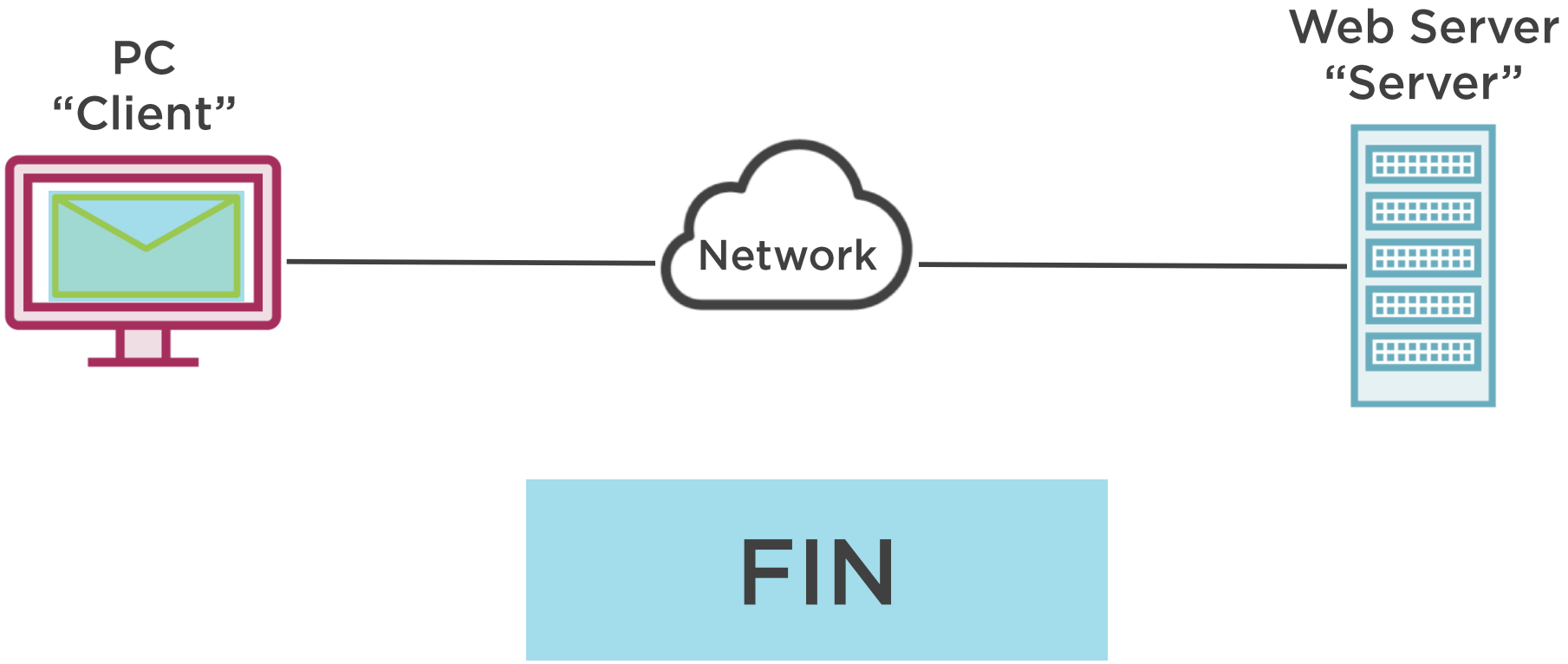
The 4-way Disconnect



Transmission Control Protocol (TCP)

1.1

The 4-way Disconnect
FIN-WAIT



Transmission Control Protocol (TCP)

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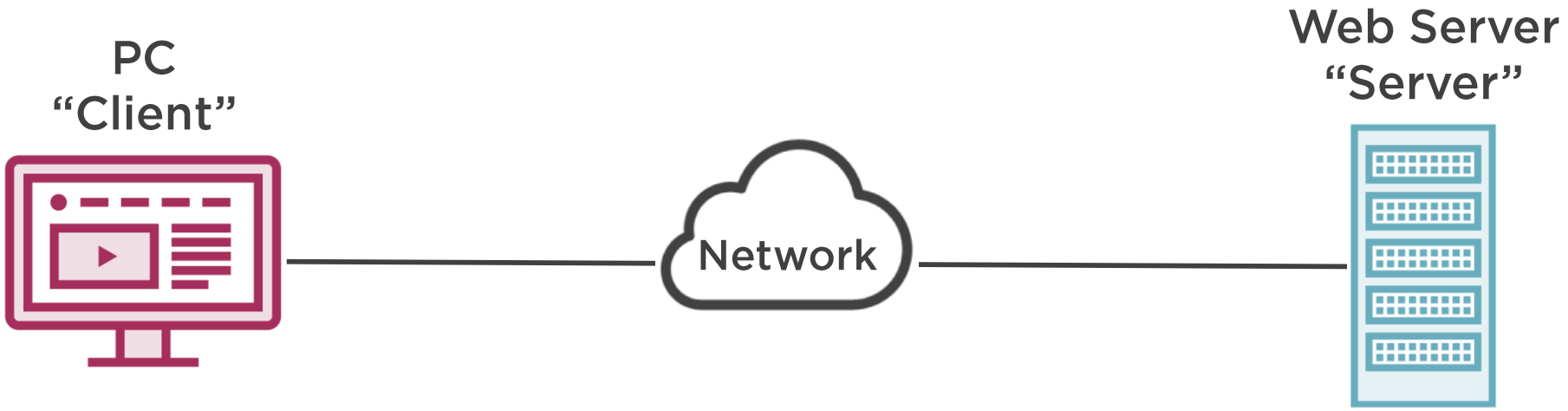
The 4-way Disconnect
FIN-WAIT



Transmission Control Protocol (TCP)

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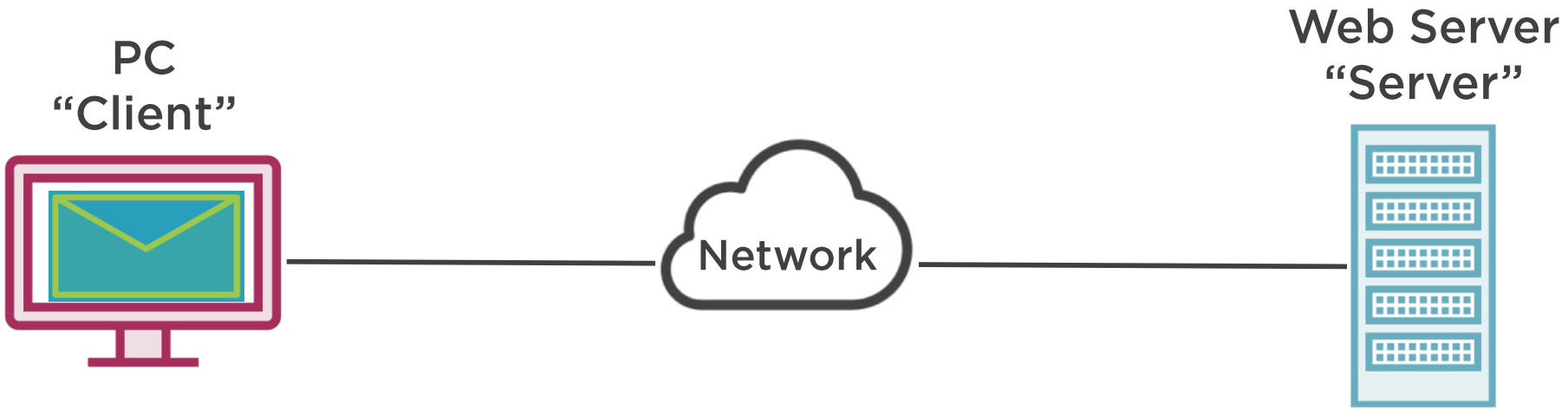

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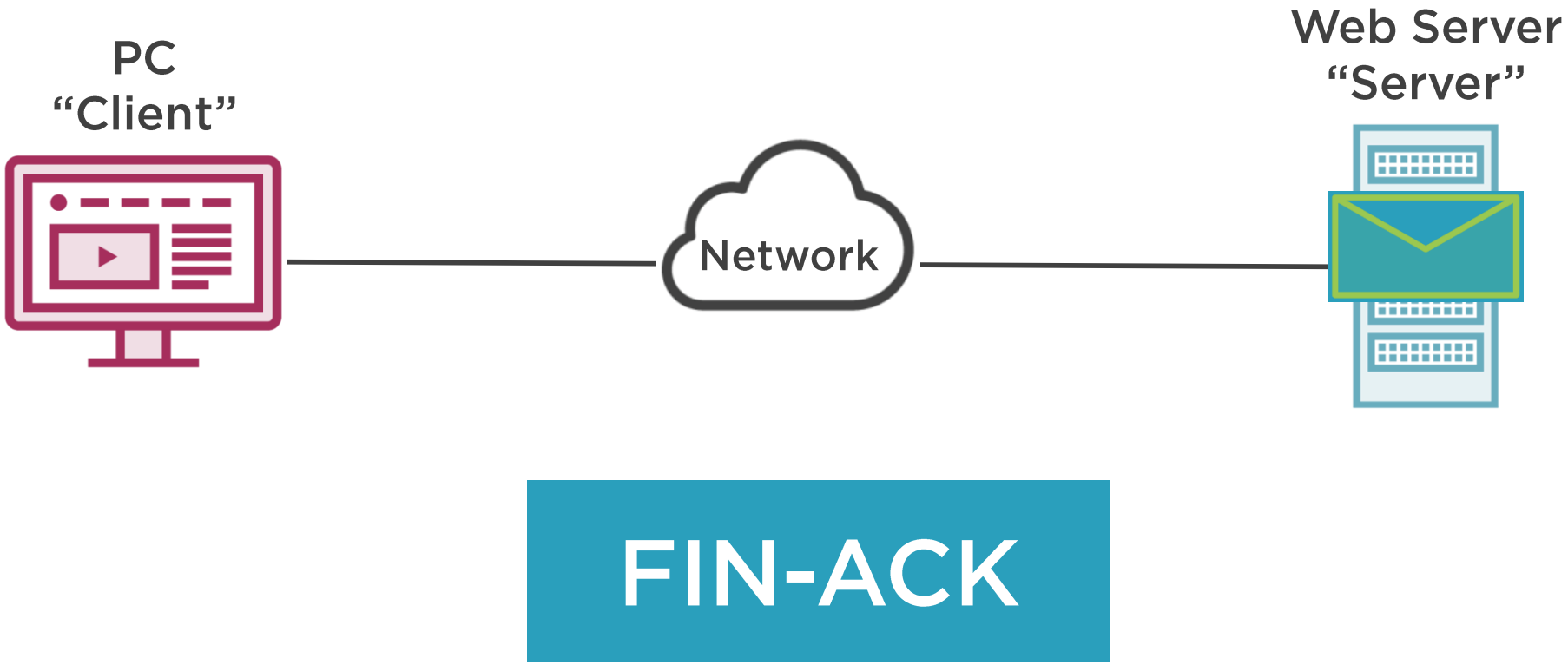

Transmission Control Protocol (TCP)

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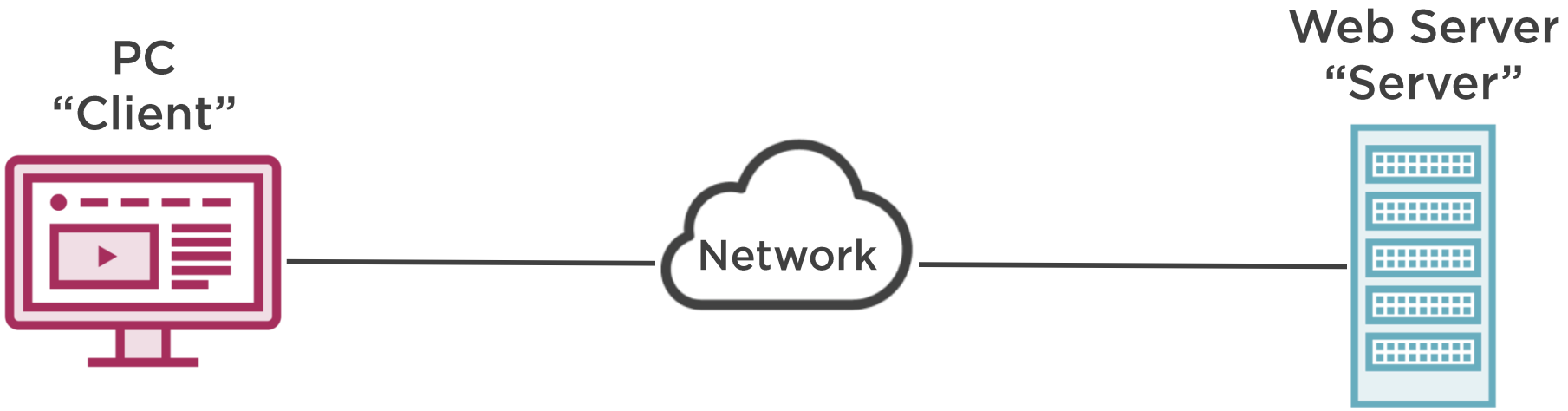
The 4-way Disconnect
FIN-WAIT



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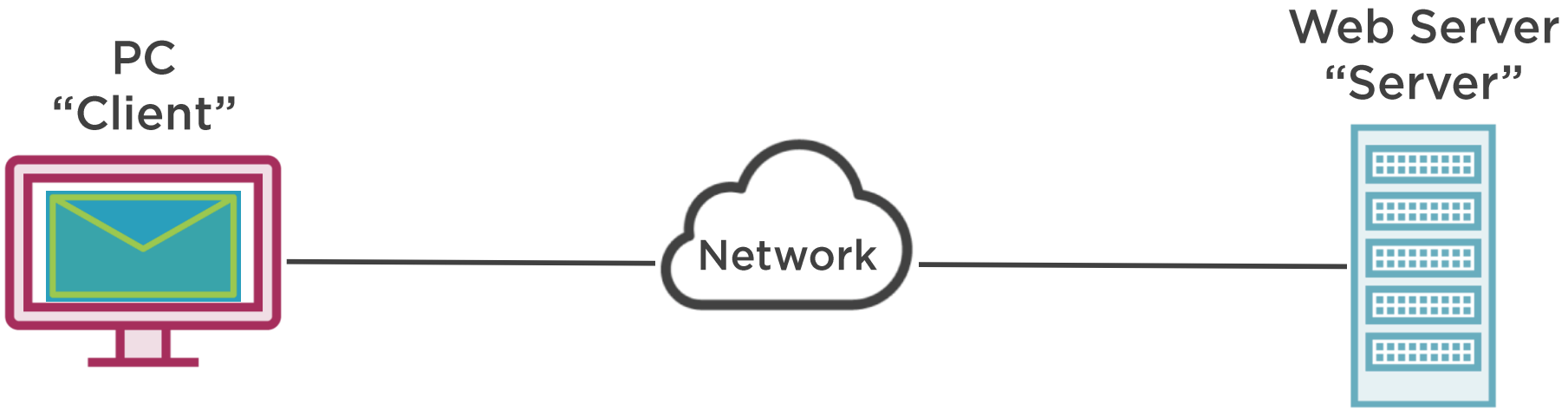

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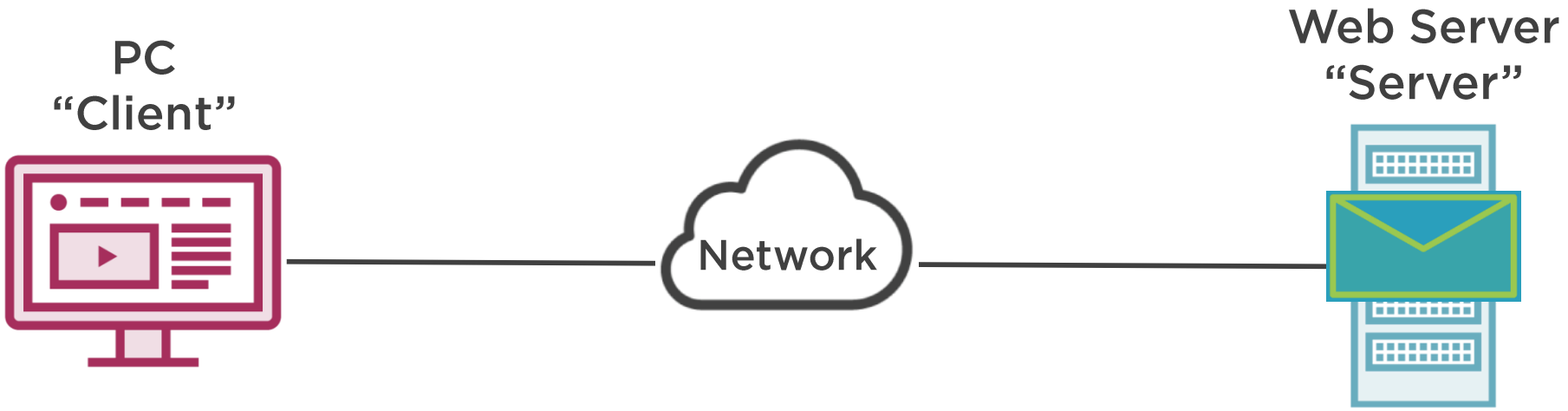
FIN-WAIT



FIN

Transmission Control Protocol (TCP)

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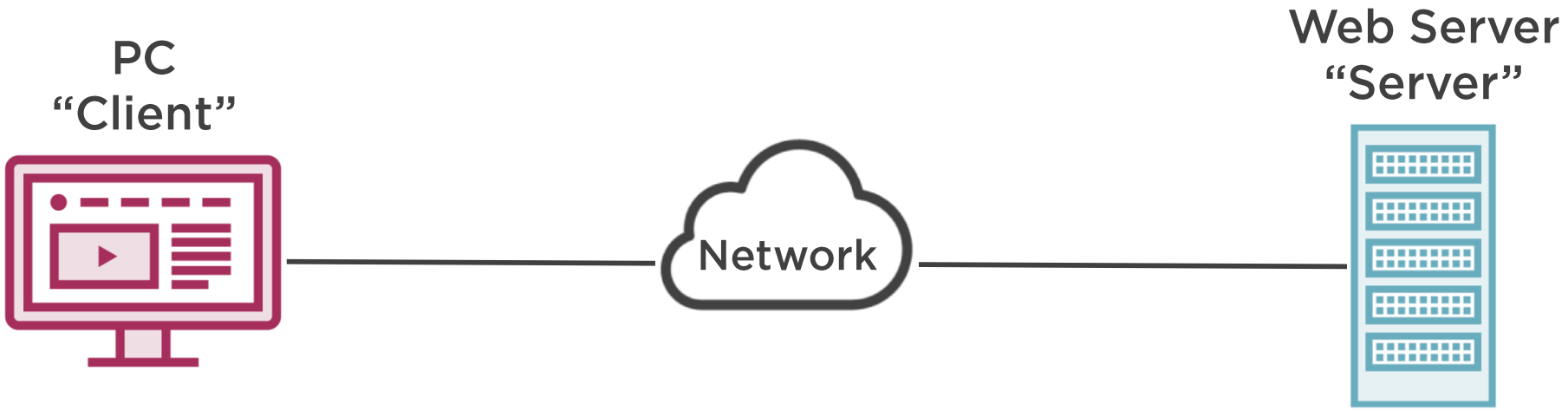
The 4-way Disconnect
FIN-WAIT



Transmission Control Protocol (TCP)

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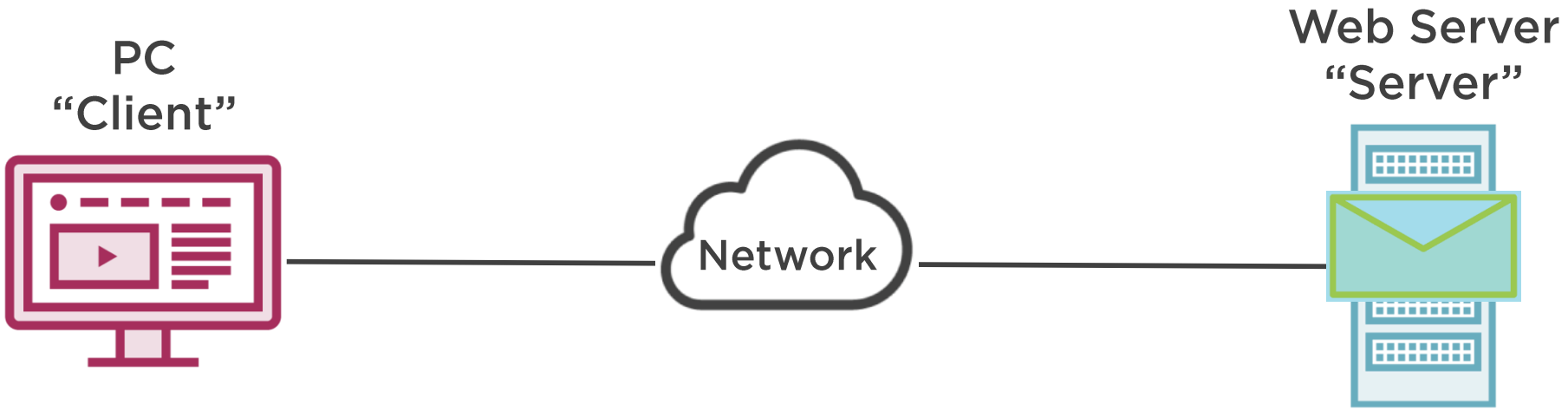
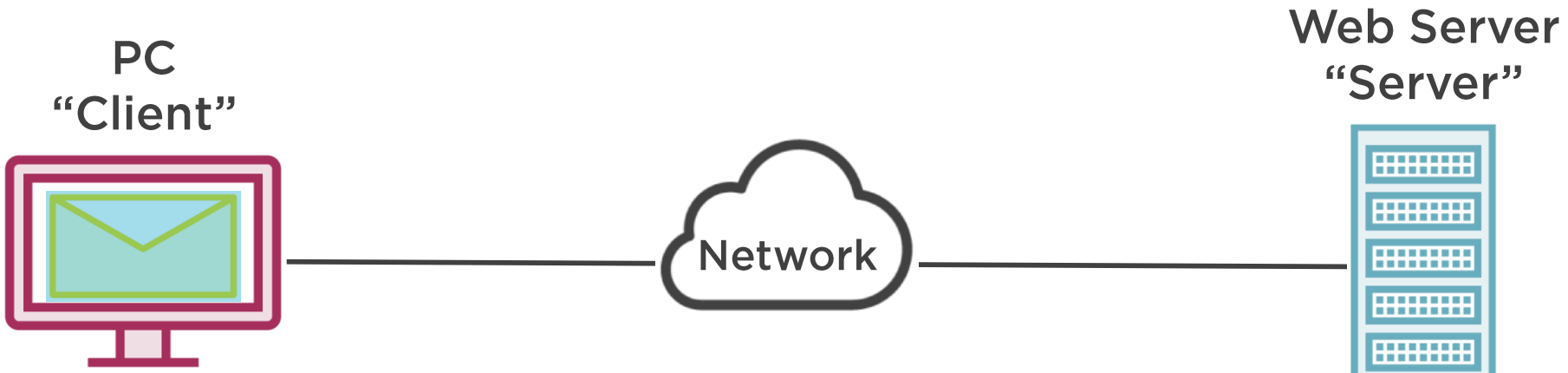


Transmission Control Protocol (TCP)

1.1

The 4-way Disconnect
Closed



FIN-ACK

Transmission Control Protocol (TCP)

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The 4-way Disconnect
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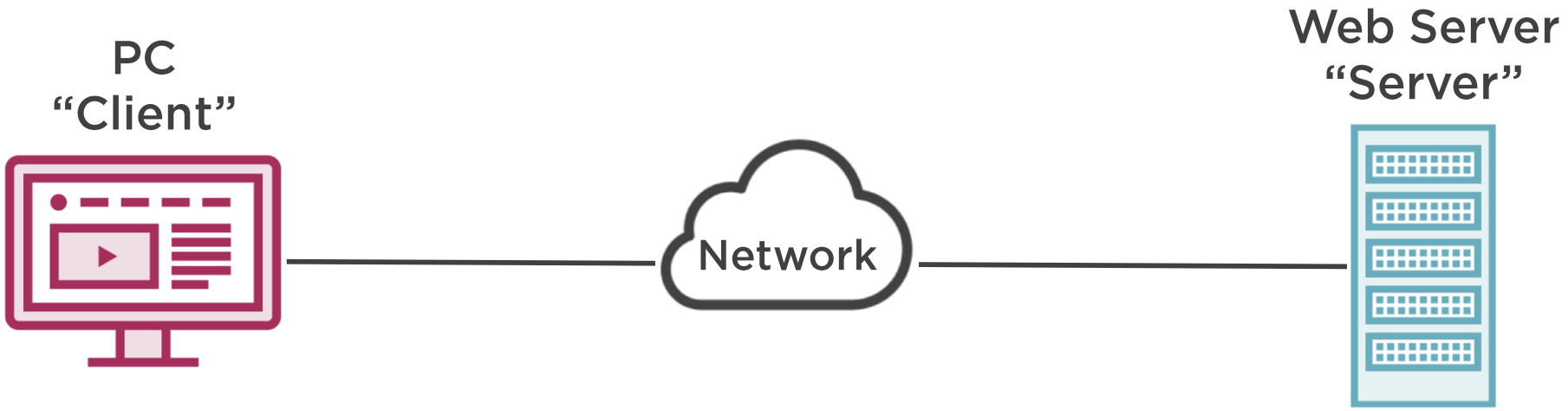
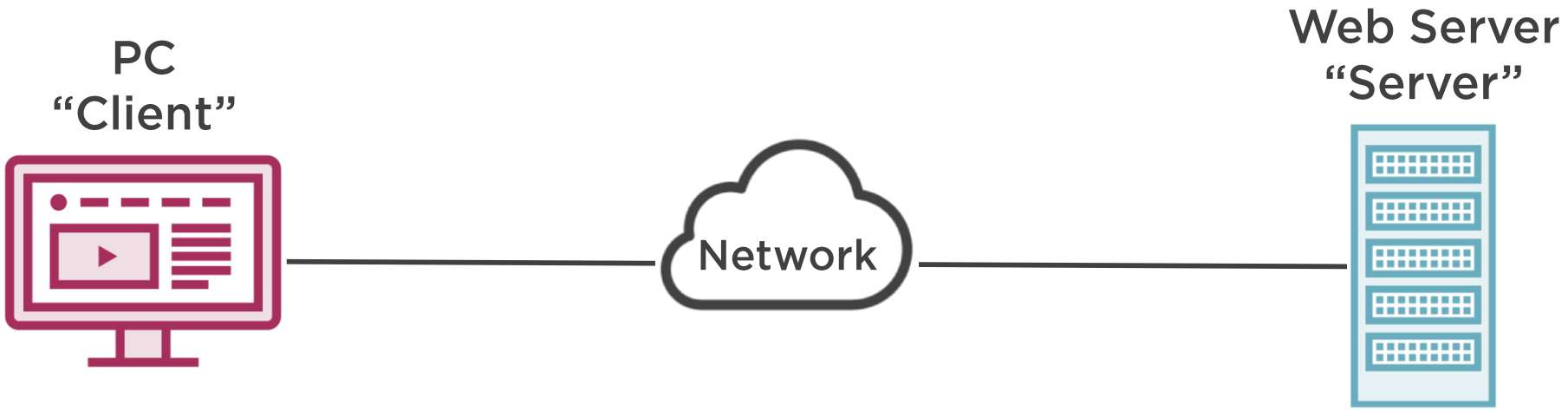


Transmission Control Protocol (TCP)

1.1

TCP Reset
Session Established



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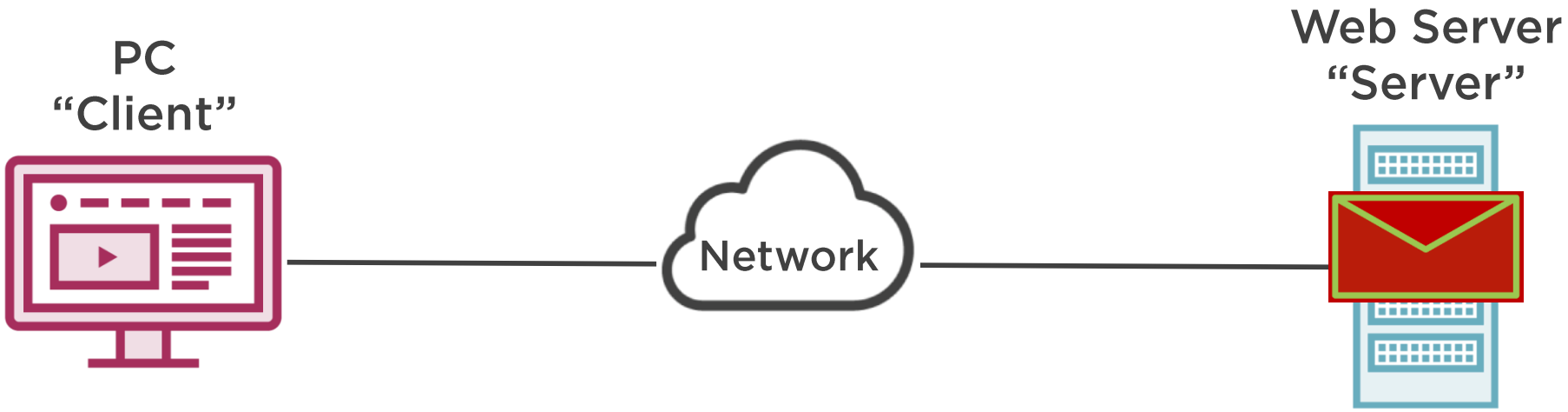

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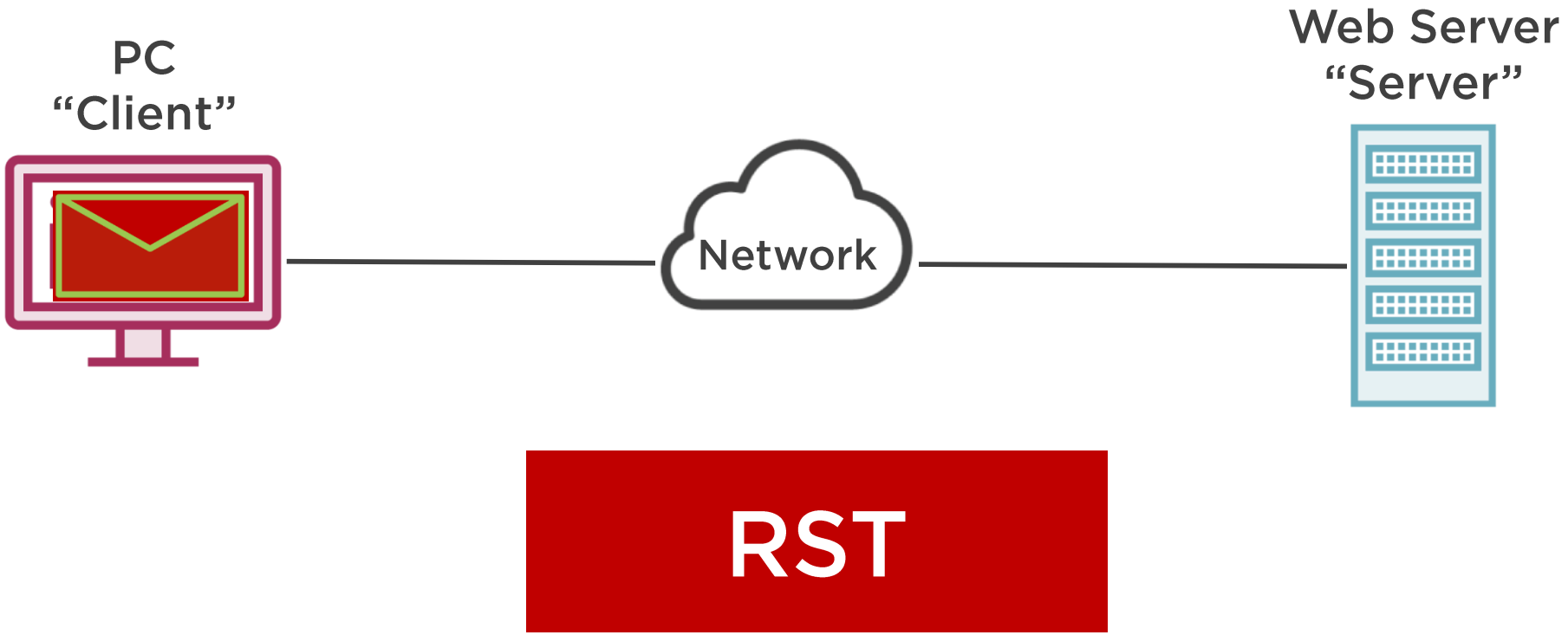

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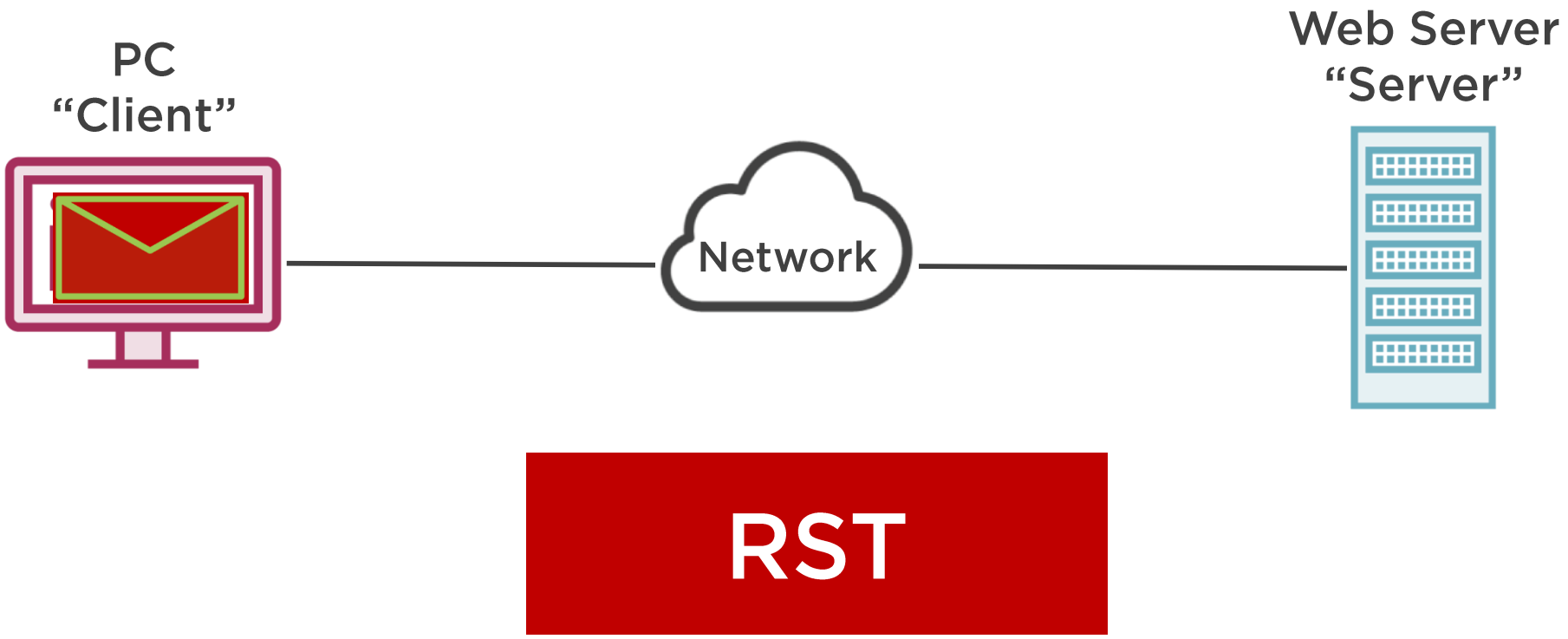

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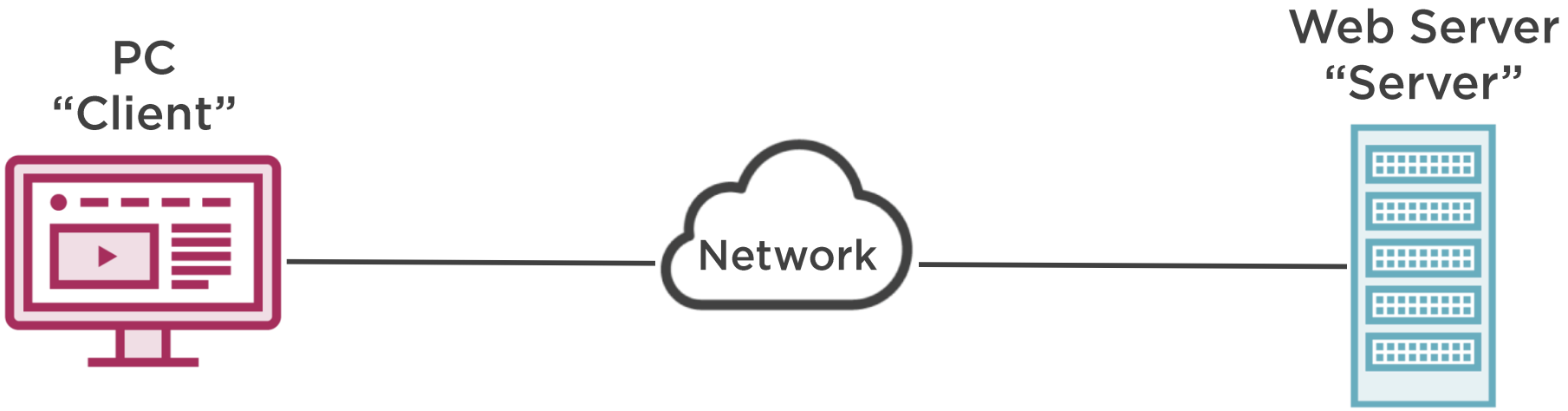

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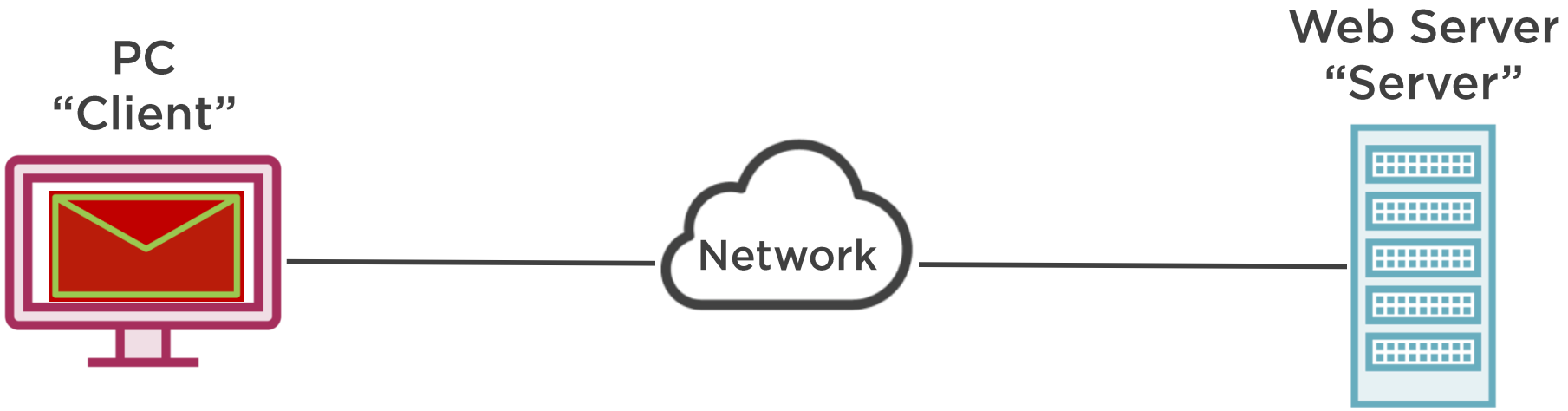

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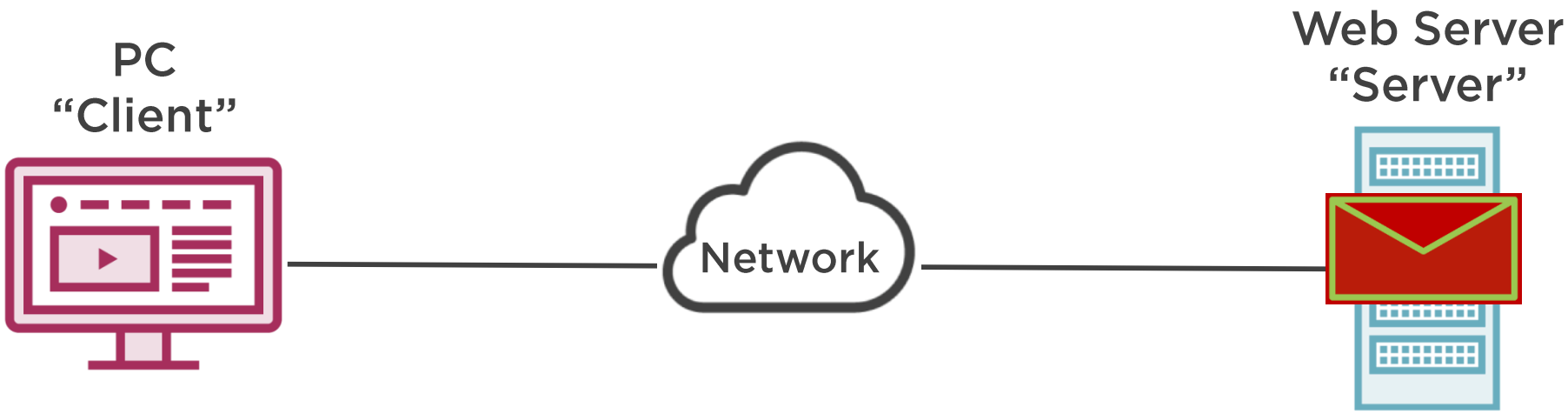
TCP Reset
Closed



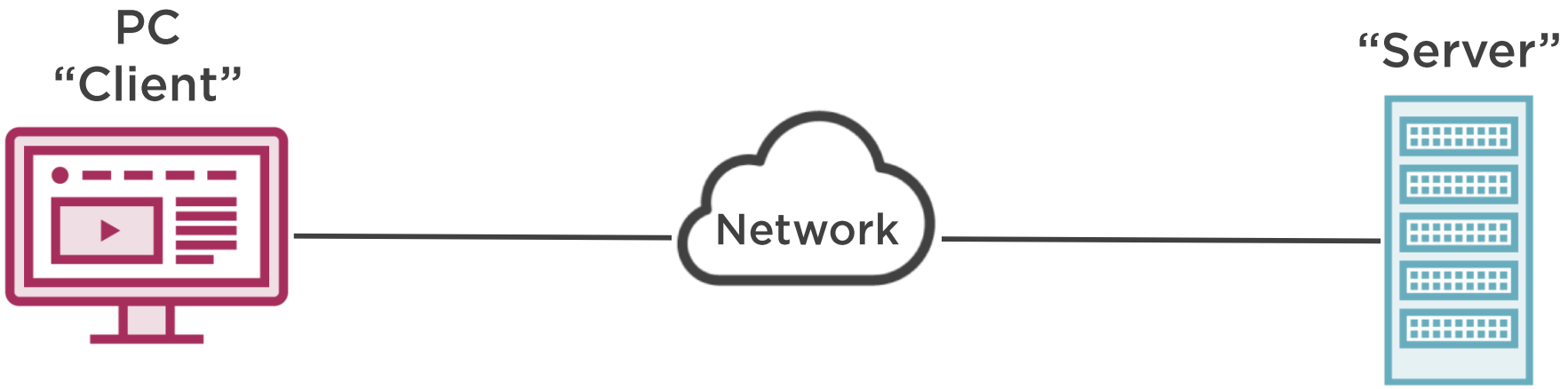
RST

1.1

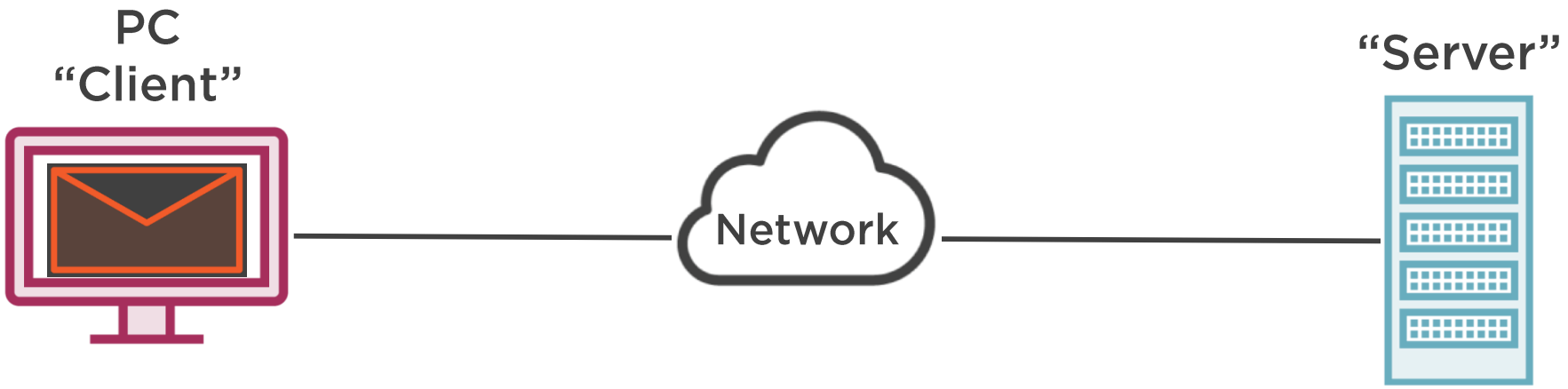
Introducing User Datagram Protocol (UDP)

User Datagram Protocol (UDP)

1.1



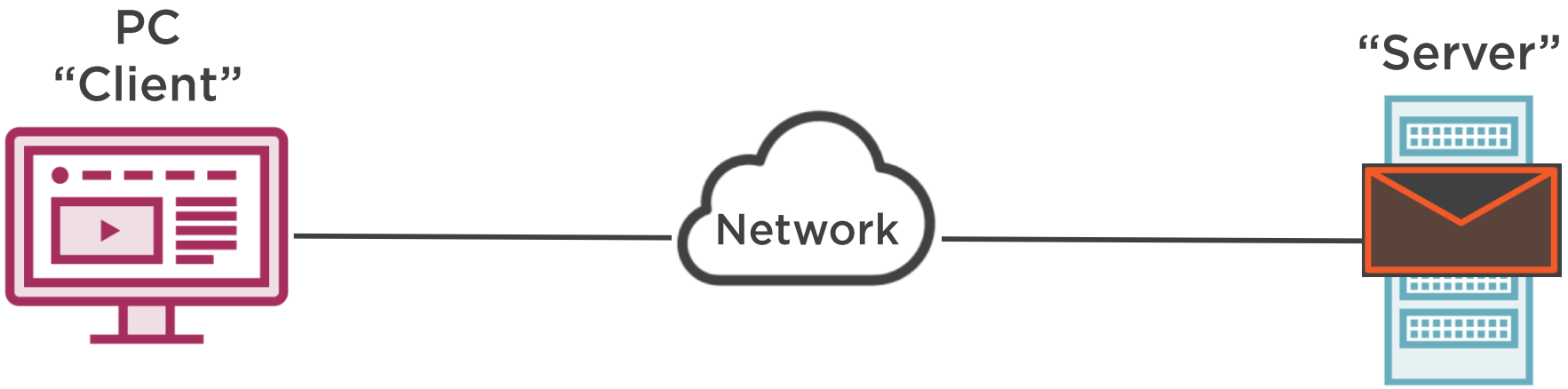
User Datagram Protocol (UDP)



Send me the data

User Datagram Protocol (UDP)

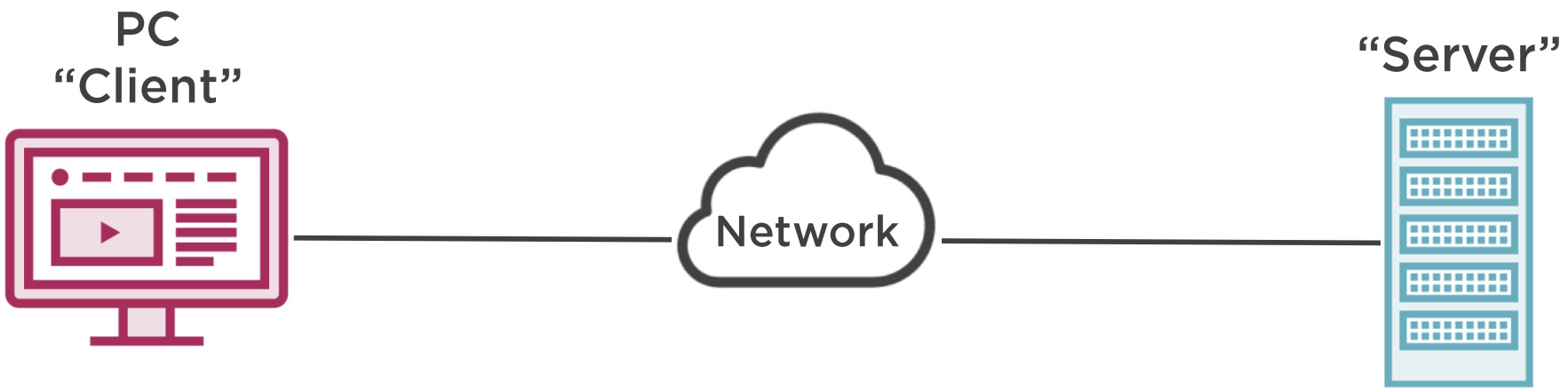
1.1



Send me the data

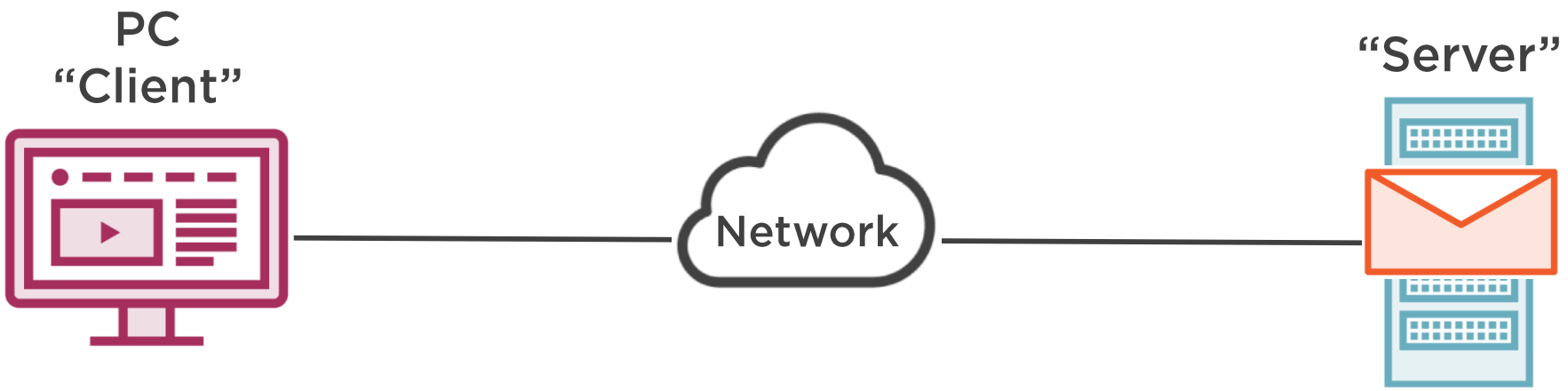
User Datagram Protocol (UDP)

1.1

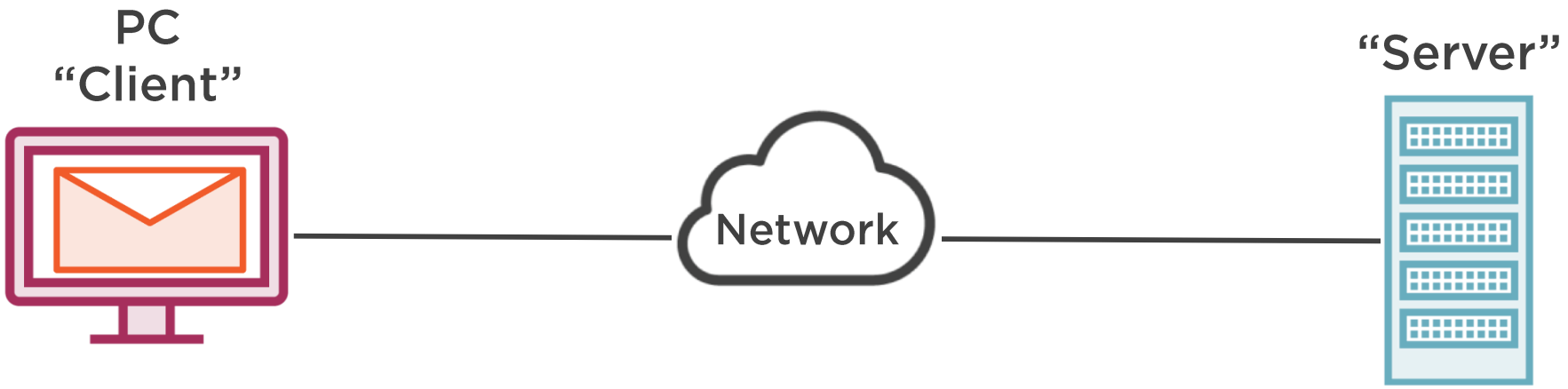


User Datagram Protocol (UDP)

1.1

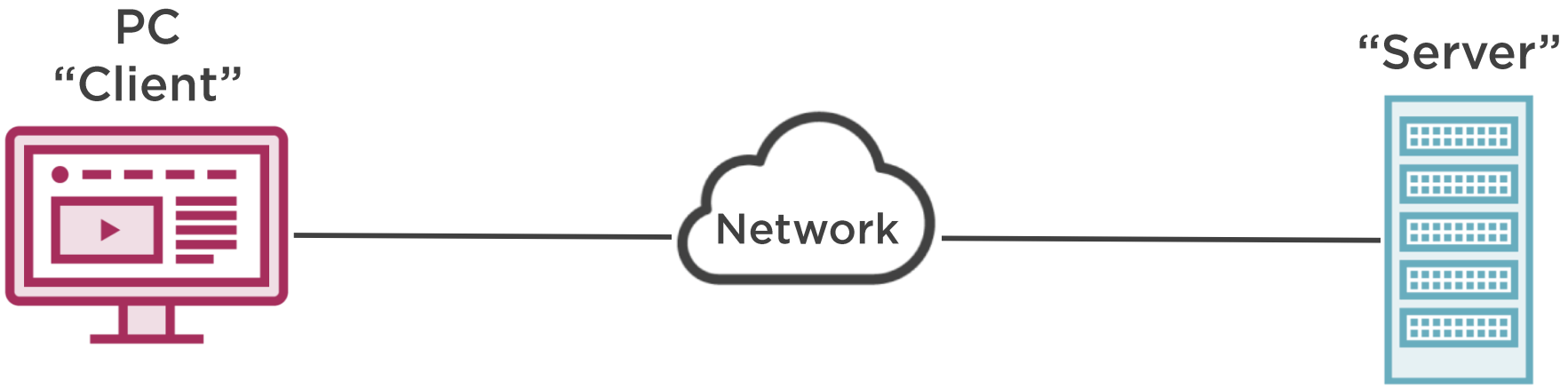


User Datagram Protocol (UDP)



Here’s the data

User Datagram Protocol (UDP)



No 3-way handshake

No reliable communication

No sequence numbers, no acknowledge numbers

Used for efficient data transfer

1.1

Transport Layer Addressing:

Port Numbers

Port Numbers

0 – 65,535

Server Port Numbers Well Known / Registered Port Numbers	Client Port Numbers Ephemeral Port Numbers

Port Numbers

0 – 65,535

Server Port Numbers	Client Port Numbers
Well Known / Registered	Ephemeral Port
Port Numbers	Numbers

Port Numbers

0 – 65,535

Server Port Numbers Well Known / Registered Port Numbers	Client Port Numbers Ephemeral Port Numbers
Well Known 0 – 1023 Registered 1,024 – 49,151	Ephemeral 49,152 - 65,535

Port Numbers

1.1

Well Known
0 – 1023

Registered
1,024 – 49,151

Application Protocol	Port Number
HTTP	80
HTTPs	443
FTP	20 , 21
SSH	22
Telnet	23

Port Numbers

1.1

Well Known
0 – 1023

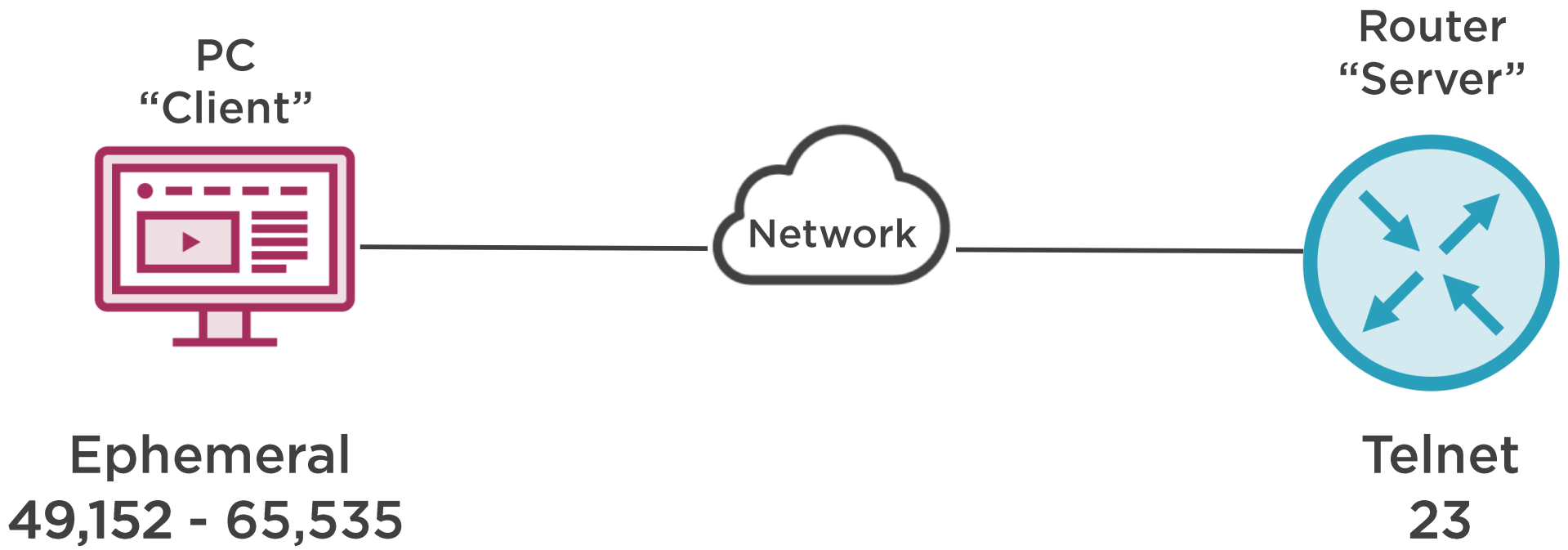
Registered
1,024 – 49,151

Application Protocol	Port Number
HTTP	80
HTTPs	443
FTP	20 , 21
SSH	22
Telnet	23

Custom Applications
“Official and Unofficial”

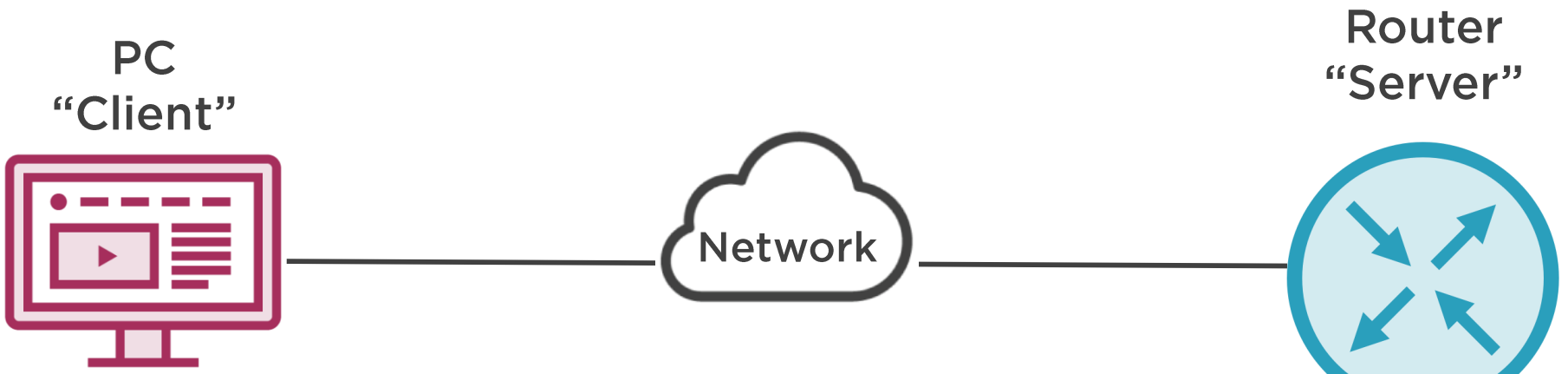
Transmission Control Protocol (TCP)

1.1



Transmission Control Protocol (TCP)

1.1



Ephemeral
49,152 - 65,535

Telnet
23

Source Port 49,152

Destination Port 23

Application Layer Protocol Dependency

Protocol Dependencies

1.1

HTTP	HTTPs	FTP	SFTP	SMB	POP3	IMAP	SMTP	LDAPs	LDAP	TFTP

Protocol Dependencies

1.1

HTTP	HTTPs	FTP	SFTP	SMB	POP3	IMAP	SMTP	LDAPs	LDAP	TFTP
80	443	20 , 21	22	445	110/ 995	143/ 993	25/ 587	636	389	69

Protocol Dependencies

1.1

HTTP	HTTPs	FTP	SFTP	SMB	POP3	IMAP	SMTP	LDAPs	LDAP	TFTP
80	443	20 , 21	22	445	110/ 995	143/ 993	25/ 587	636	389	69
TCP									TCP/ UDP	UDP

Protocol Dependencies

1.1

HTTP	HTTPs	FTP	SFTP	SMB	POP3	IMAP	SMTP	LDAPs	LDAP	TFTP
80	443	20 , 21	22	445	110/ 995	143/ 993	25/ 587	636	389	69
TCP									TCP/ UDP	UDP
IP										

Protocol Dependencies

1.1

Telnet	SSH	RDP	DNS	SIP	H.323	SNMP	DHCP	NTP
23	22	3389	53	5060	1719	161	68, 69	123
TCP			TCP/ UDP				UDP	
IP								

1.1

Summary

Transport Layer Protocols

- Transmission Control Protocol (TCP)
- User Datagram Protocol (UDP)

Protocol Hierarchy