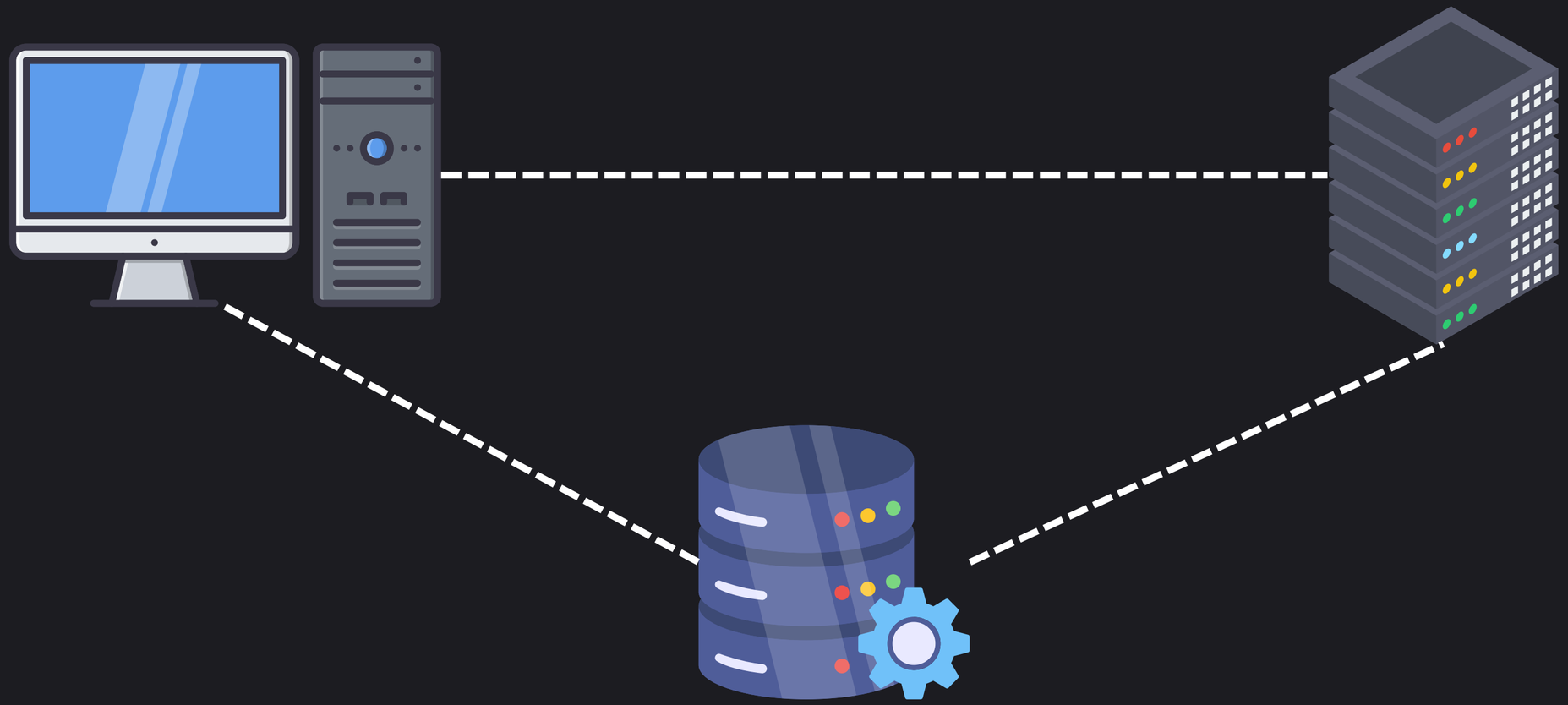
NETWORKING BASICS

ESSENTIAL NETWORKING BASICS

Layer	Details
Application Layer	HTTP FTP, SMTP | DNS | Ports (80, 21, 25) | Application Data
Transport Layer	TCP (Reliable, Sequence Numbers, Acknowledgments) | UDP (Faster, Unreliable)
Internet Layer	IP (IPv4/IPv6) | IP Addresses (Public/Private, Static/Dynamic) Routing, IP Header | ICMP
Link (Network) Layer	Ethernet | MAC Address | Switches
Physical Hardware	Computers | Routers | Firewalls | LANs

NETWORKING BASICS

NETWORKING BASICS



IP ADDRESS

IP ADDRESS

192.168.1.1

172.16.254.1

IP ADDRESS

192.168.1.1

172.16.254.1

IPv4 - 32-bit

IP ADDRESS

192.168.1.1

172.16.254.1

IPv4 - 32-bit -> 4B

IP ADDRESS

192.168.1.1

172.16.254.1

IPv4 - 32-bit -> 4B

IPv6 - 128-bit

IP ADDRESS

192.168.1.1

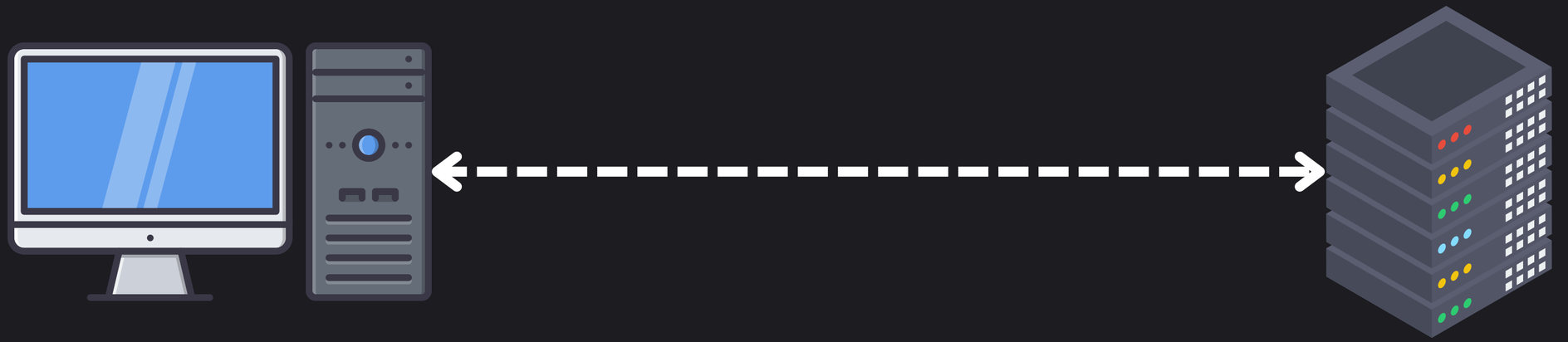
172.16.254.1

IPv4 - 32-bit -> 4B

IPv6 - 128-bit -> 340T

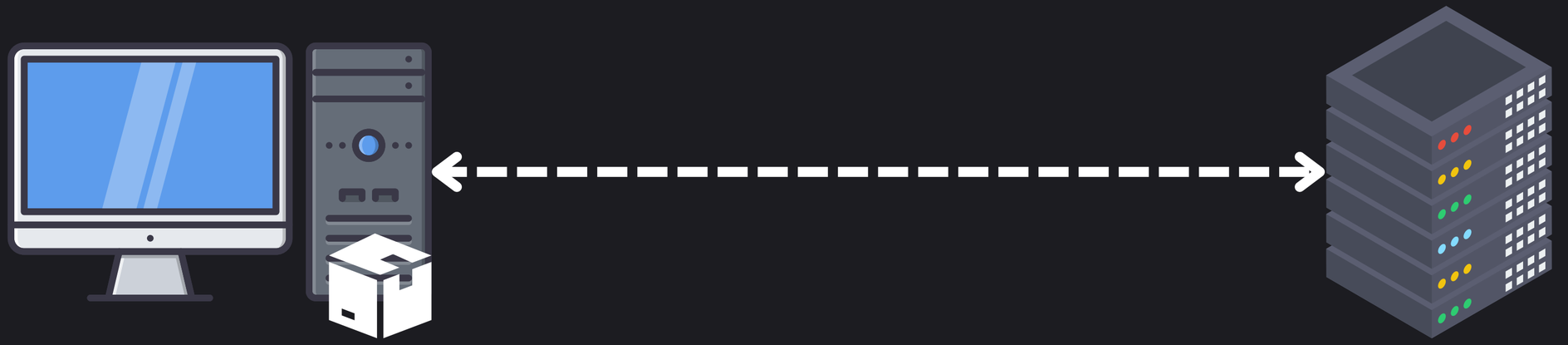
192.168.1.1

172.16.254.1



192.168.1.1

172.16.254.1

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172.16.254.1

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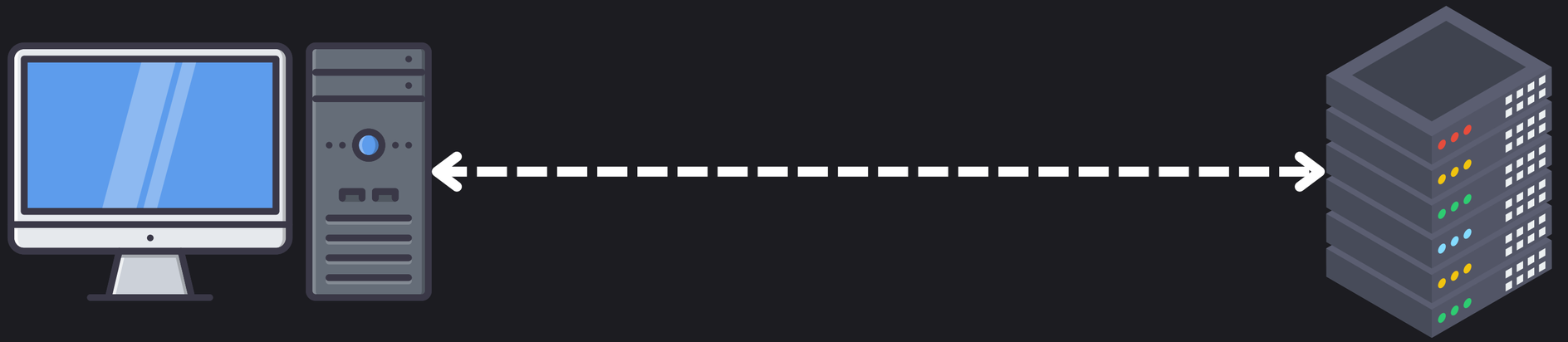
172.16.254.1



192.168.1.1

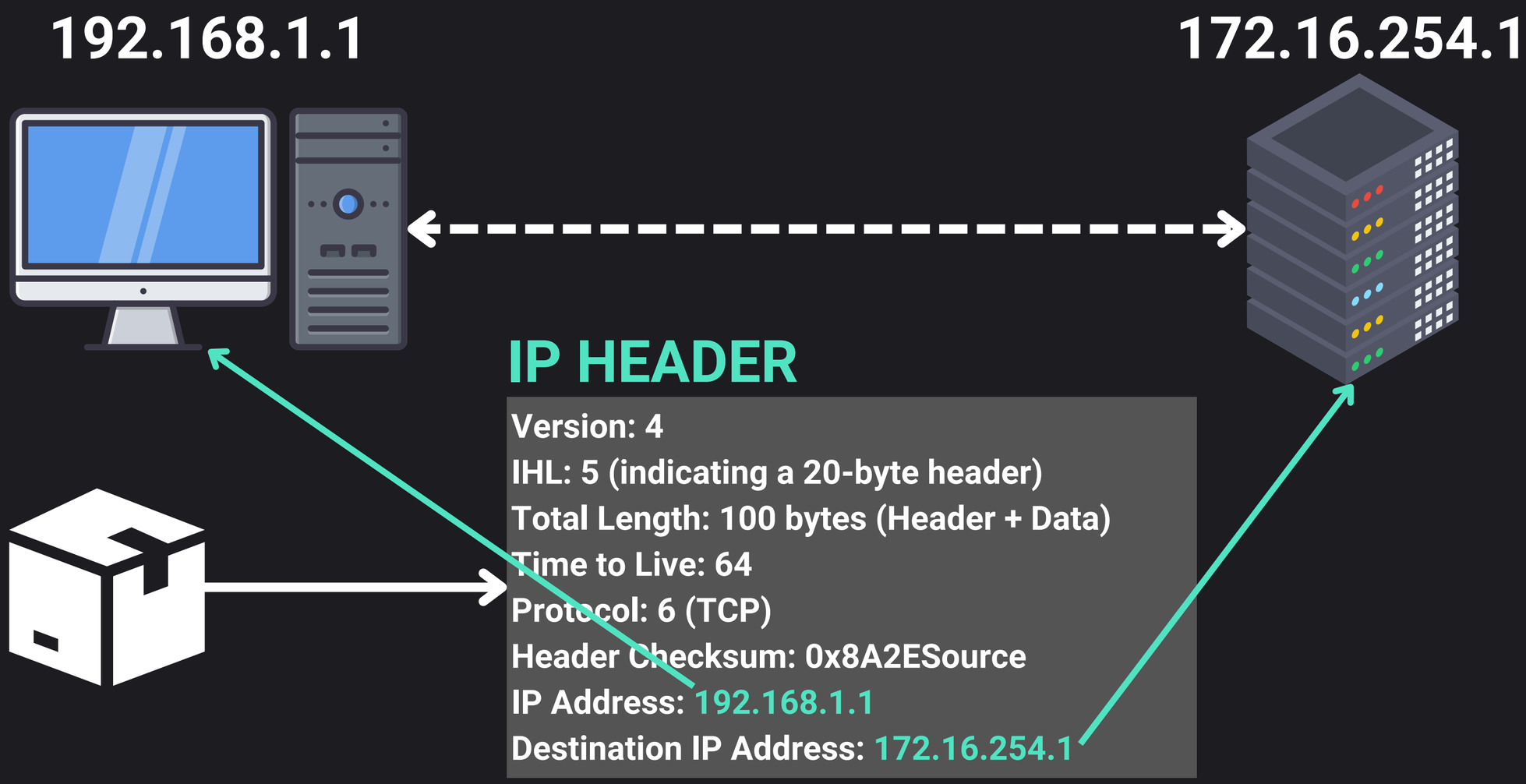
172.16.254.1

192.168.1.1

172.16.254.1

IP HEADER

Version: 4
IHL: 5 (indicating a 20-byte header)
Total Length: 100 bytes (Header + Data)
Time to Live: 64
Protocol: 6 (TCP)
Header Checksum: 0x8A2ESource
IP Address: 192.168.1.1
Destination IP Address: 172.16.254.1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INTERNET PROTOCOL (IP)

192.168.1.1

172.16.254.1

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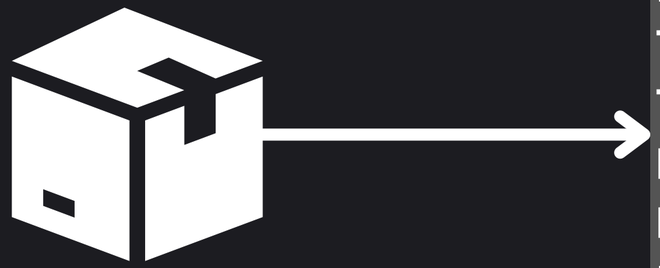
Destination IP Address: 172.16.254.1

INTERNET PROTOCOL (IP)

set of rules that defines how data is sent and received

192.168.1.1

172.16.254.1



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APPLICATION LAYER

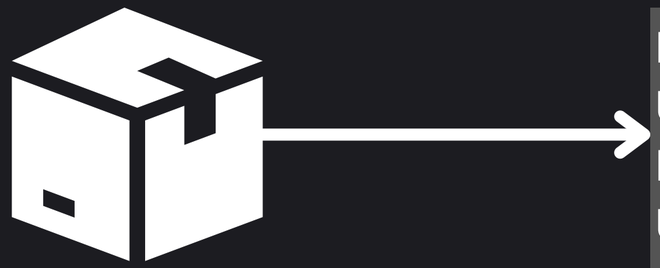
192.168.1.1

172.16.254.1

APPLICATION LAYER

192.168.1.1

172.16.254.1



APPLICATION LAYER (HTTP DATA)

HTTP Method: GET
URI: /example-page.html
Host: www.example.com
User-Agent: Mozilla/5.0 (Windows ...)
Accept-Language: en-US,en;q=0.9

TRANSPORT LAYER

TRANSPORT LAYER

TCP
(Transmission Control Protocol)

UDP
(User Datagram Protocol)

TCP

(TRANSMISSION CONTROL PROTOCOL)

192.168.1.1

172.16.254.1

TCP

(TRANSMISSION CONTROL PROTOCOL)

192.168.1.1

172.16.254.1

TCP HEADER

Source Port: 53728
Destination Port: 80
Sequence Number: 123456789
Acknowledgment Number: 987654321
Flags: 0x18 (ACK, PSH)
Checksum: 0x1A2B

TCP

192.168.1.1

172.16.254.1

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192.168.1.1

172.16.254.1

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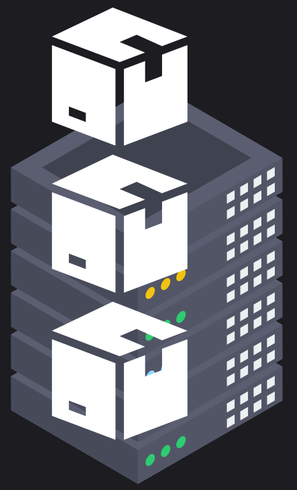
192.168.1.1



172.16.254.1

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TCP

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172.16.254.1

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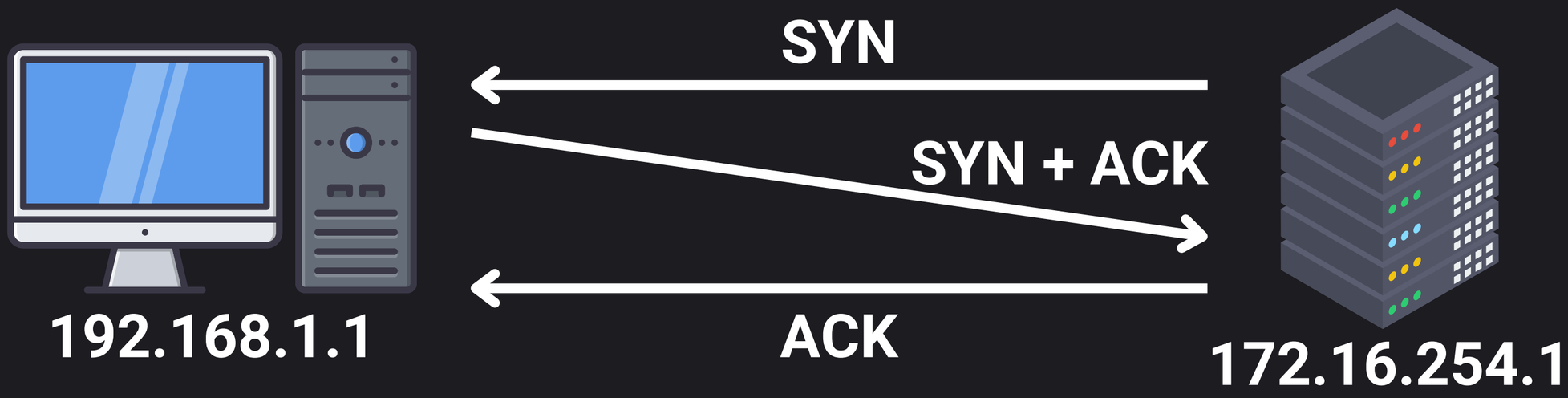


3-way handshake

UDP

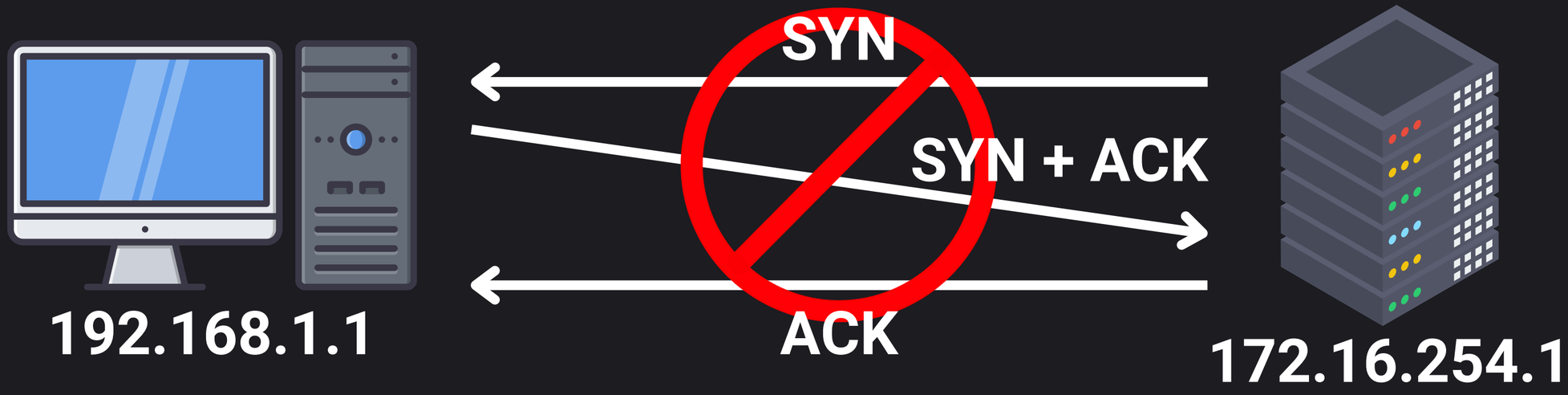
(USER DATAGRAM PROTOCOL)

192.168.1.1

172.16.254.1

UDP

(USER DATAGRAM PROTOCOL)



UDP

(USER DATAGRAM PROTOCOL)

192.168.1.1

172.16.254.1

UDP

(USER DATAGRAM PROTOCOL)

192.168.1.1

172.16.254.1

UDP

(USER DATAGRAM PROTOCOL)

192.168.1.1

172.16.254.1

192.168.1.1

172.16.254.1

DNS

(DOMAIN NAME SYSTEM)

192.168.1.1

172.16.254.1

DNS

(DOMAIN NAME SYSTEM)

192.168.1.1

172.16.254.1

DNS

(DOMAIN NAME SYSTEM)

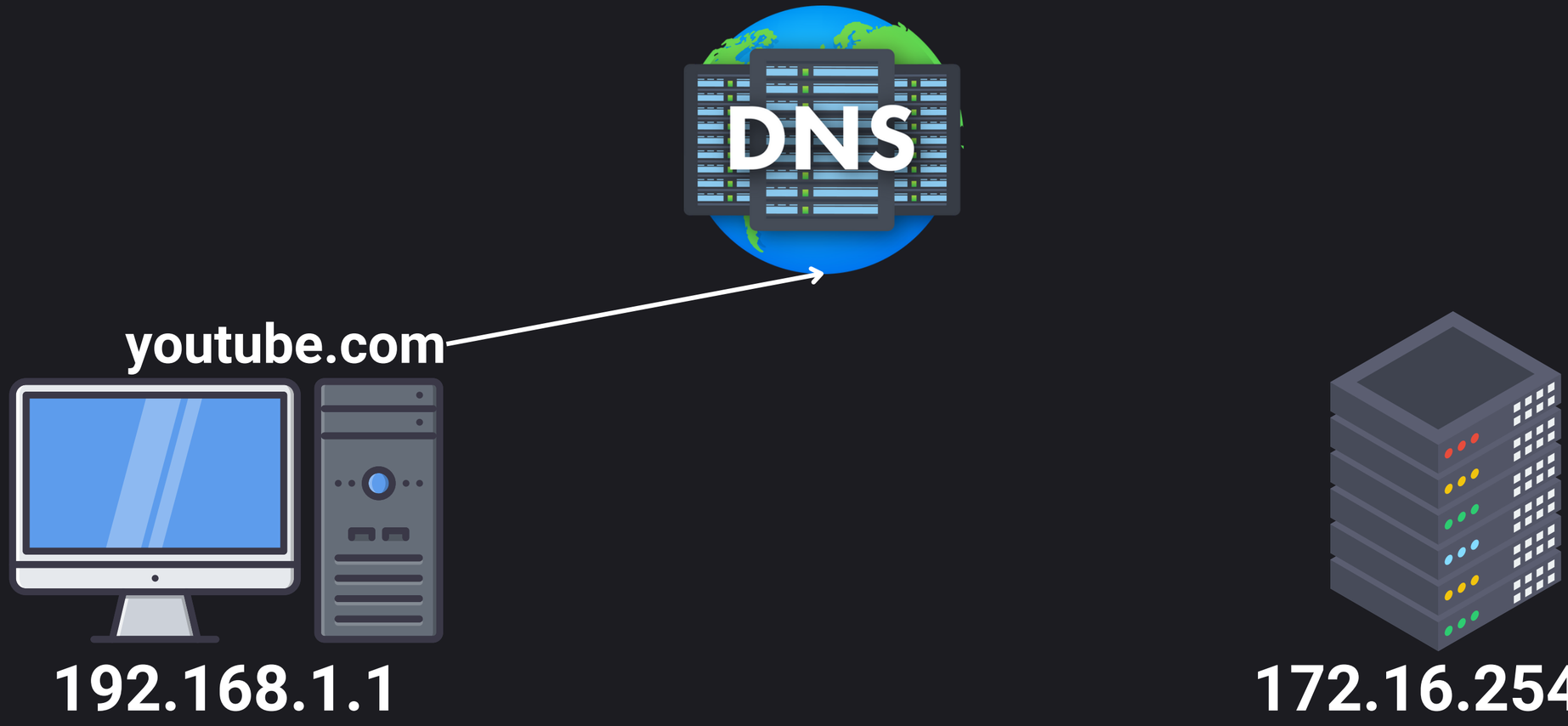
youtube.com ⇄ 192.168.5.1

192.168.1.1

172.16.254.1

DNS

(DOMAIN NAME SYSTEM)



DNS -> ICANN

(INTERNET CORPORATION FOR ASSIGNED NAMES AND NUMBERS)

192.168.1.1

172.16.254.1

A Record: Maps a domain name to an IPv4 address

192.168.1.1

172.16.254.1

AAAA Record: Maps a domain name to an IPv6 address

A Record: Maps a domain name to an IPv4 address

192.168.1.1

172.16.254.1

NETWORKING INFRASTRUCTURE

NETWORKING INFRASTRUCTURE

Public IP address 172.16.254.1

Private IP address 172.16.254.1

NETWORKING INFRASTRUCTURE

Static IP address

172.16.254.1

Dynamic IP address

172.16.254.1

192.168.1.1

NETWORKING INFRASTRUCTURE

Local Area Network (LAN)

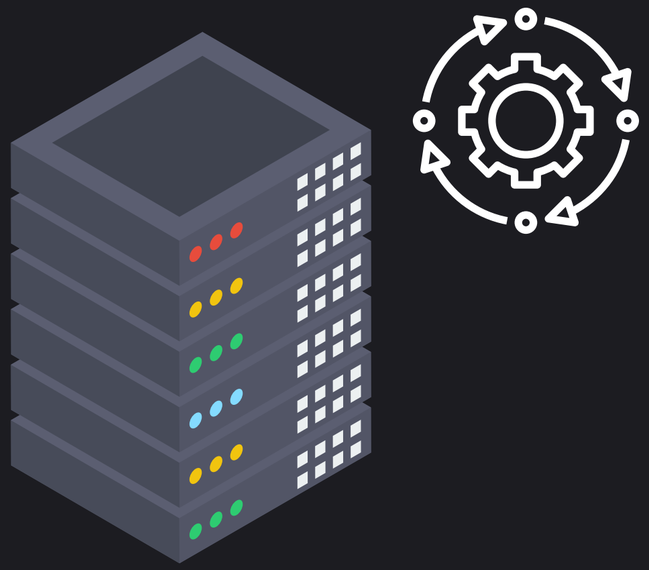
NETWORKING INFRASTRUCTURE

Local Area Network (LAN)

Firewall

monitoring and controlling incoming and outgoing network traffic based on security policies

NETWORKING INFRASTRUCTURE



NETWORKING INFRASTRUCTURE

PORTS

HTTP - 80
HTTPS - 443
SSH - 22
MYSQL - 3306

SIMPLIFIED LAYER DIAGRAM

Application Layer	• HTTP, FTP, SMTP • DNS • Ports (80, 21, 25) • Application Data
Transport Layer	• TCP (Reliable, 3-way Handshake) (Sequence Numbers, Acknowledgments) • UDP (Faster, Unreliable)
Internet Layer	• IP (IPv4/IPv6) • IP Address (Public/Private, Static/Dynamic) • (Routing, IP Header)
Link (Network)	Ethernet | MAC Address | Switches
Physical Hardware	Computers, Routers, Firewalls, LANs