

IP Networking

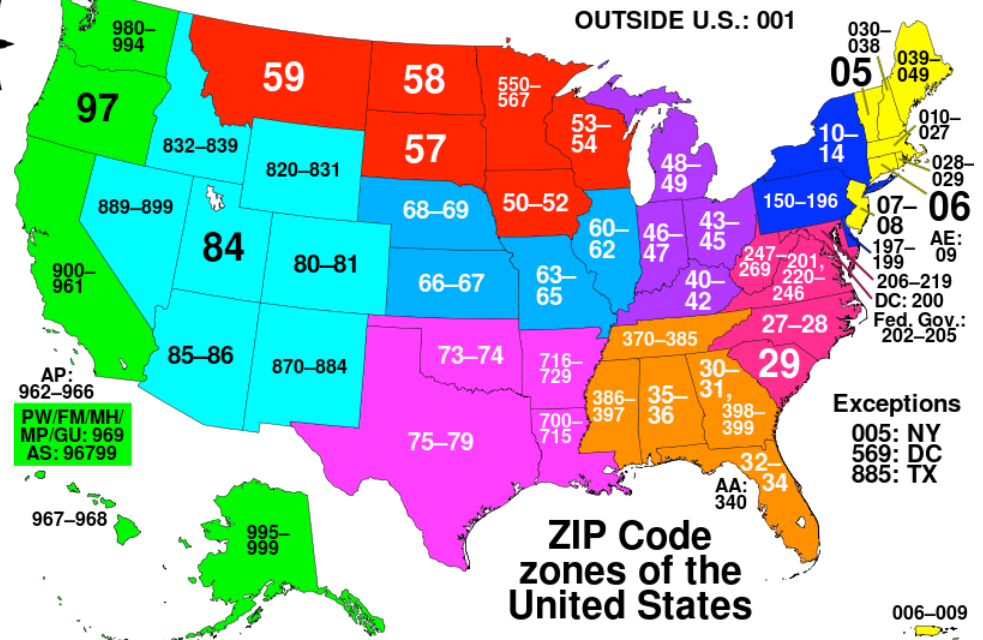
Layered Model Approach

- Most networks use layers of protocols and addresses to send data across the network

Layered Model Approach

John Doe
476 5th Ave
New York, NY 10018

Routing between zip codes, semis/planes



Layered Model Approach

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New York, NY 10018

Routing between zip codes, semis/planes



Delivering using mail truck



Layered Model Approach

John Doe
476 5th Ave
New York, NY 10018

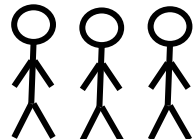
Routing between zip codes, semis/planes



Delivering using mail truck



Sorted by individual



Layered Model Approach

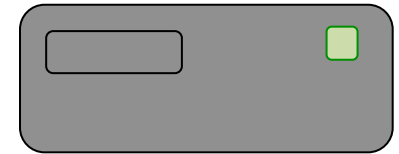
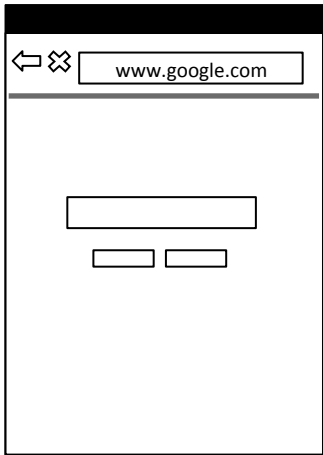
OSI Model	
7	Application
6	Presentation
5	Session
4	Transport
3	Network
2	Data Link
1	Physical

TCP/IP Model	
4	Application
3	Transport
2	Internet
1	Network Access

Layered Model Approach

OSI Model		Network Lingo		TCP/IP Model	
7	Application	7	Application	4	Application
6	Presentation				
5	Session				
4	Transport			3	Transport
3	Network	4	Transport	2	Internet
2	Data Link	3	Network	1	Network Access
1	Physical				
		2	Data Link		
		1	Physical		

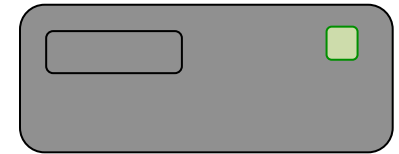
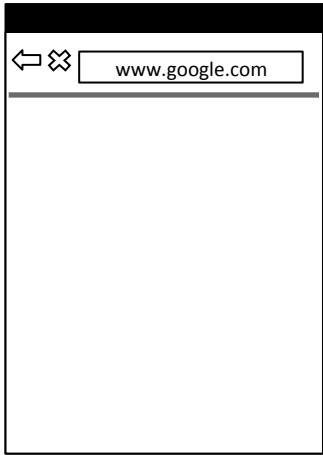
Layer 7- Application: HTTP



Web server:

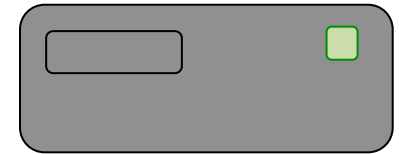
- Apache
- Nginx
- IIS

Layer 7- Application: HTTP

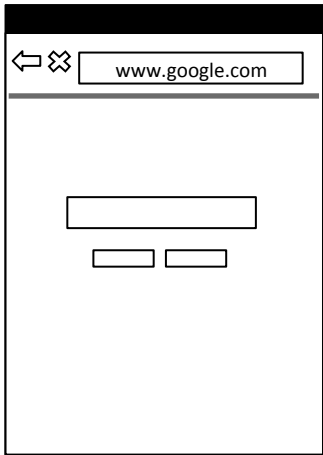


Layer 7- Application: HTTP

GET index.html HTTP/1.1
Host: google.com
User-Agent: Mozilla/5.0 (Windows)
Accept: text/xml, image/jpeg
Accept-Language: en-us



Layer 7- Application: HTTP



OK 200 HTTP/1.1

Server: Apache

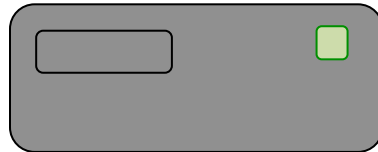
Date: Thu, 22 Mar 2018 17:00:00 EST

Content-Type: text/html

<!doctype html> <html lang="en">...

Layer 4- Transport: TCP

Port addressing allows for multiple network applications on a computer



Port addresses:

80: HTTP

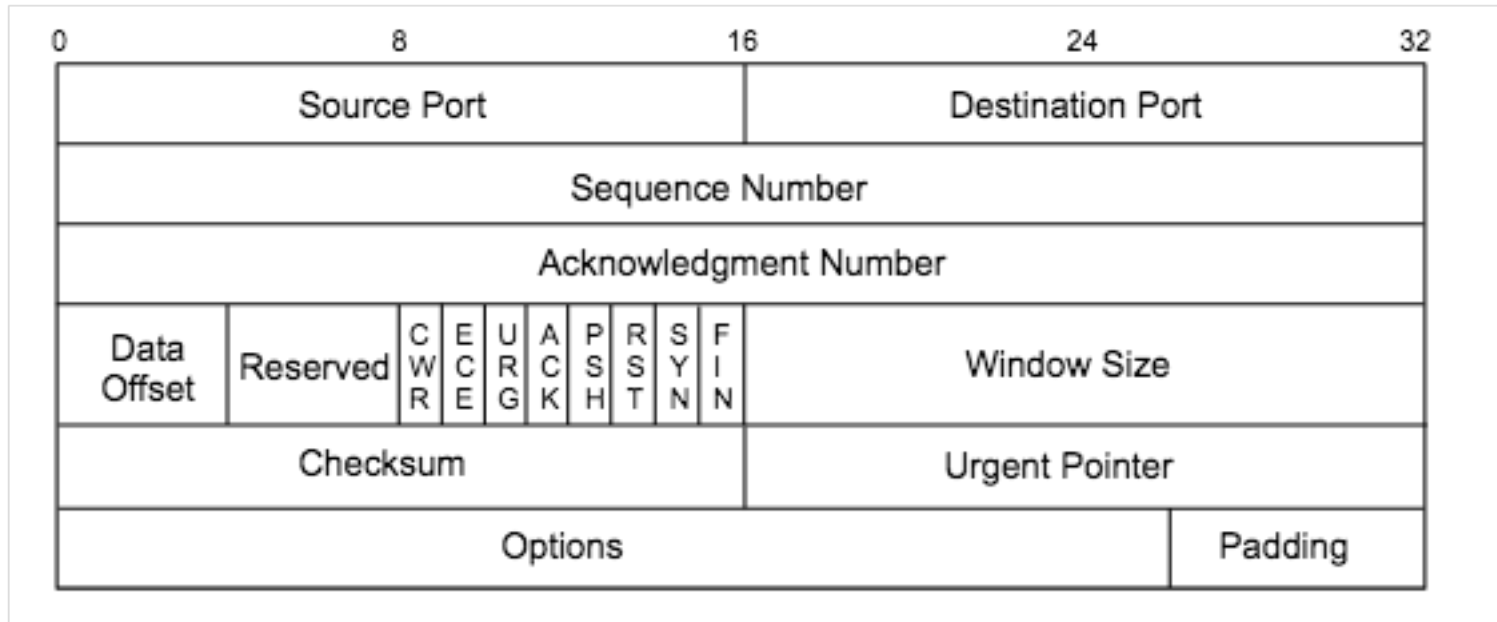
22: SSH

53: DNS

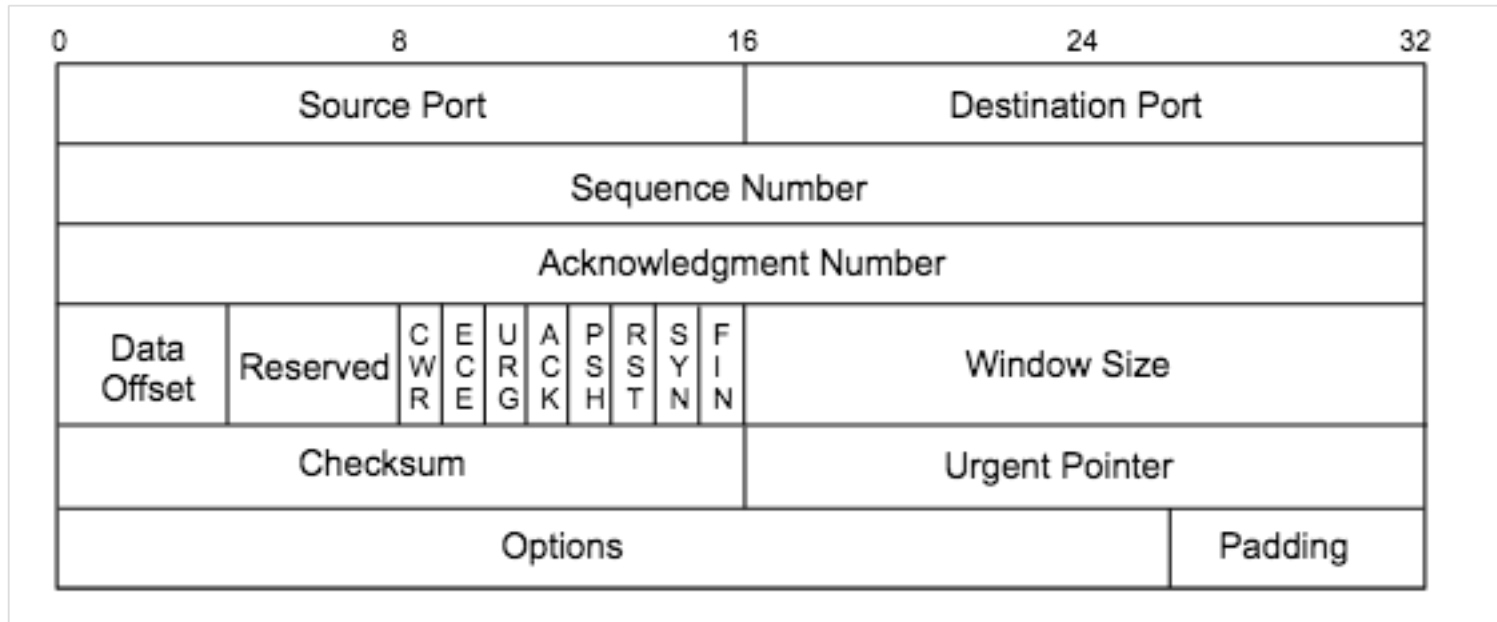
123: NTP

8080: HTTP

Layer 4- Transport: TCP Header

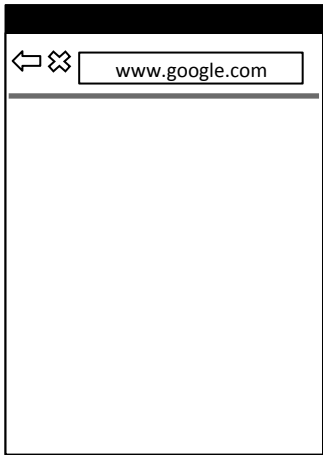


Layer 4- Transport: TCP vs UDP Header

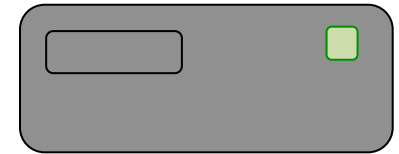


Source Port	Destination Port
Length	Checksum

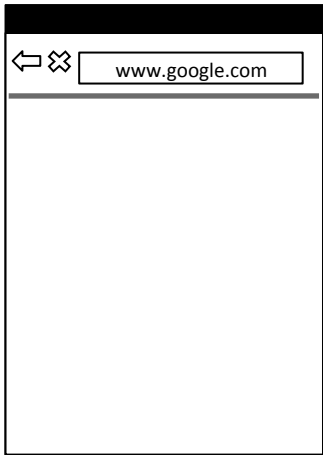
Layer 4- Transport: TCP



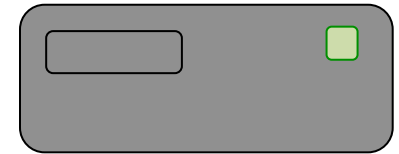
Data (none)
HTTP: Get Request
TCP Src: 41233 Dest: 80



Layer 4- Transport: TCP

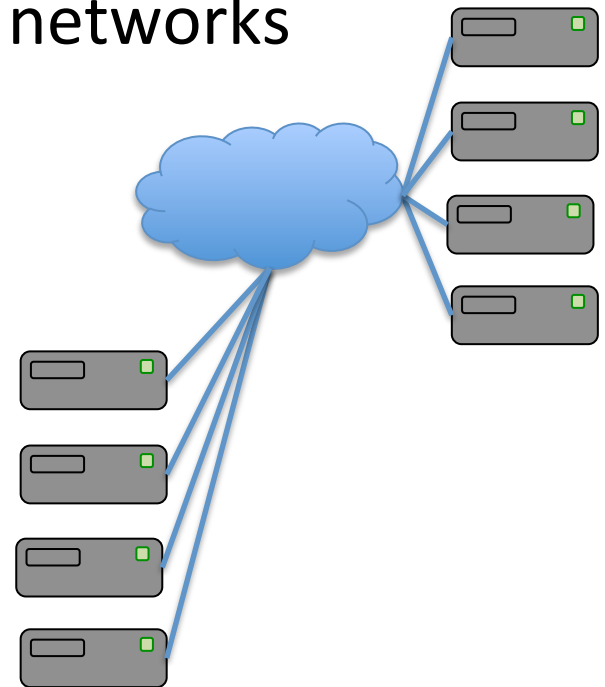
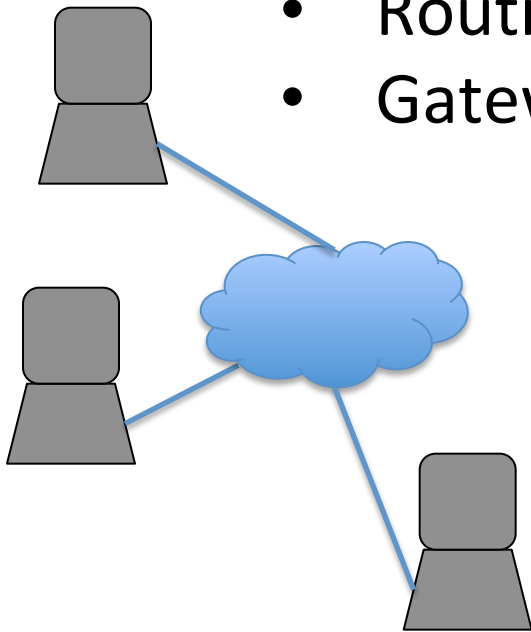


Data: HTML data
HTTP: OK 200
TCP Src: 80 Dest: 41233

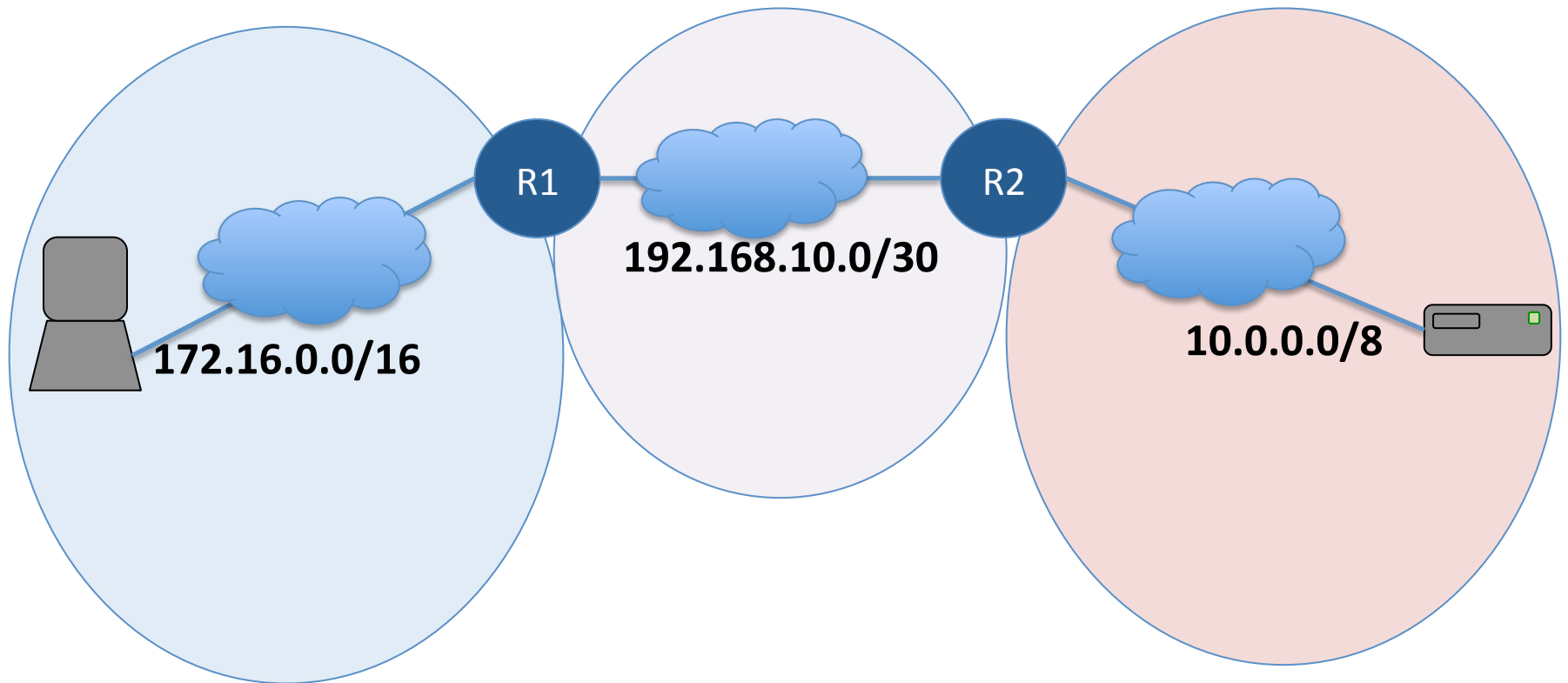


Layer 3- Network: IP

- Logical Addressing grouped into networks
- Routing between disparate networks
- Gateways to access other networks



Layer 3- Network: IP

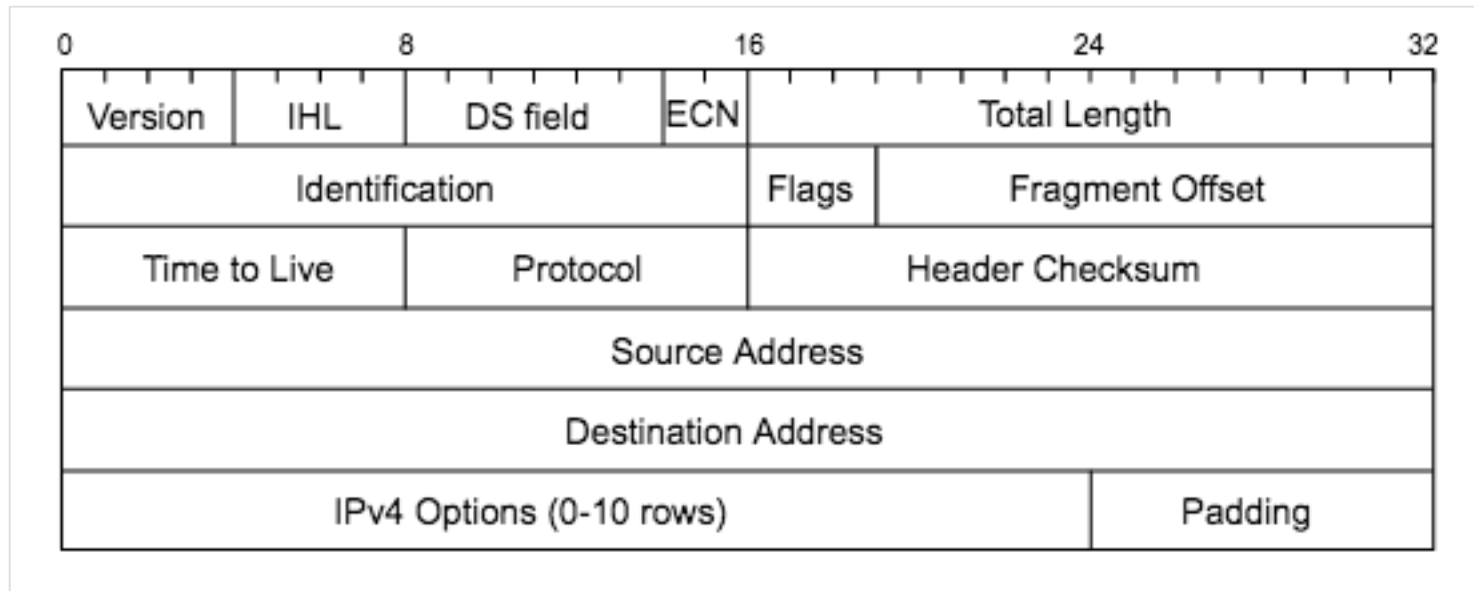


Layer 3- Network: IP

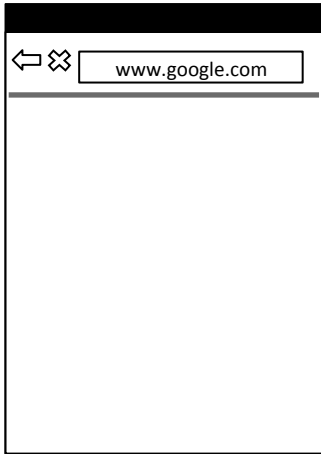
- IP Address contains both the Network Address and the Host Address
- Subnet mask divides the two addresses

Subnet	Net ID	Host ID
255.0.0.0 or /8	10.	0.1.2
255.255.0.0 or /16	172.16.	1.15
255.255.255.0 or /24	192.168.0.	10
255.255.255.128 or /25	192.168.0. 192.168.128.	10 27

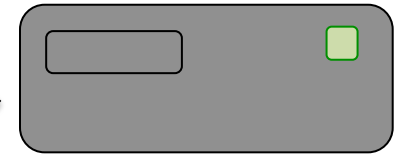
Layer 3- Network: IP



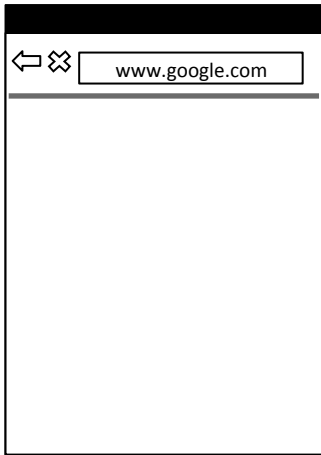
Layer 3- Network: IP



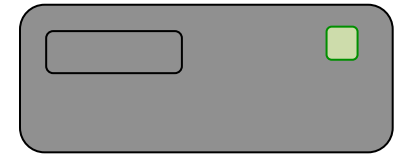
Data (none)
HTTP: Get Request
TCP: Src 41233, Dest 80
IP: Src 172.16.1.15 Dest 10.0.1.2



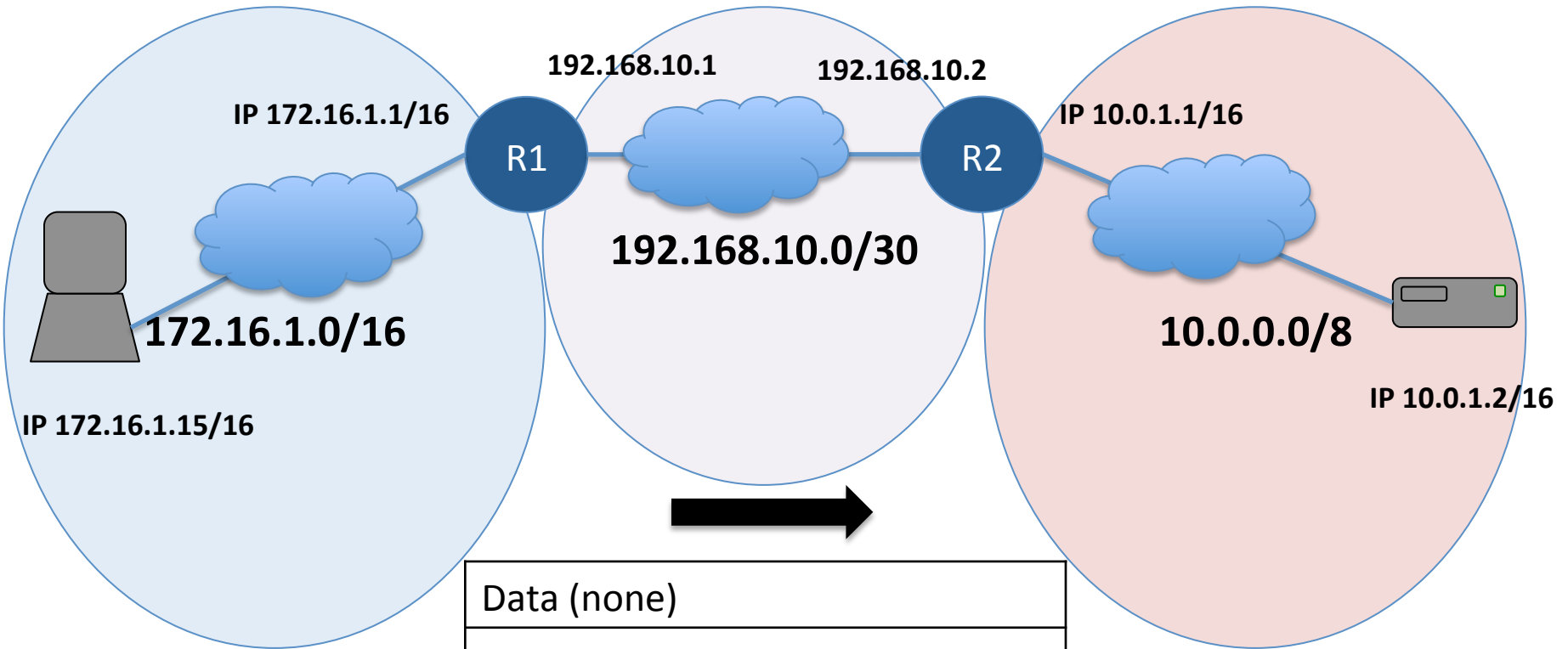
Layer 3- Network: IP



Data: HTML data
HTTP: OK 200
TCP: Src 80, Dest 41233
IP: Src 10.0.1.2 Dest 172.16.1.15



Layer 3- Network: IP

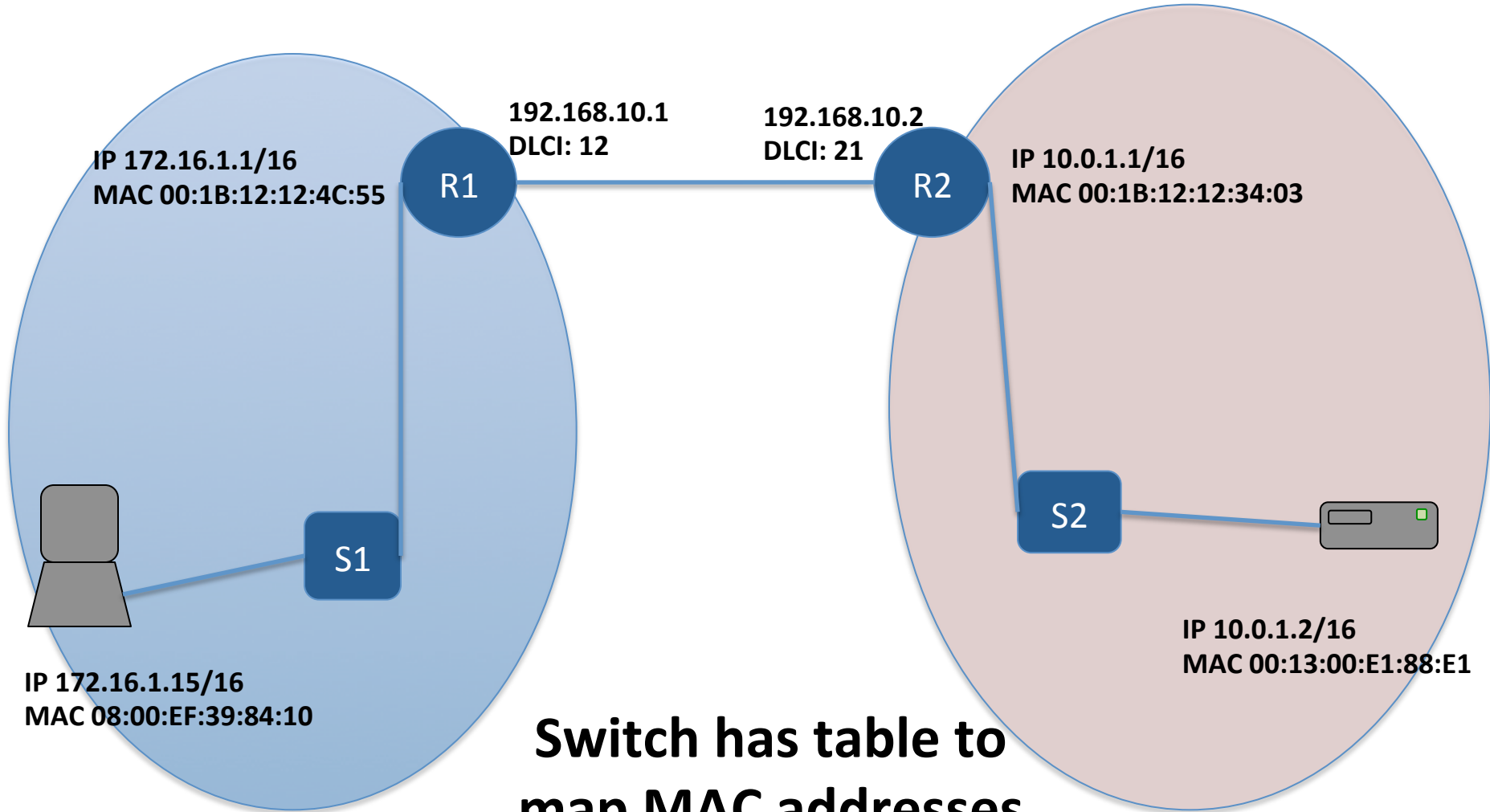


Data (none)
HTTP: Get Request
TCP: Src 41233, Dest 80
IP: Src 172.16.1.15 Dest 10.0.1.2

Layer 2: Ethernet

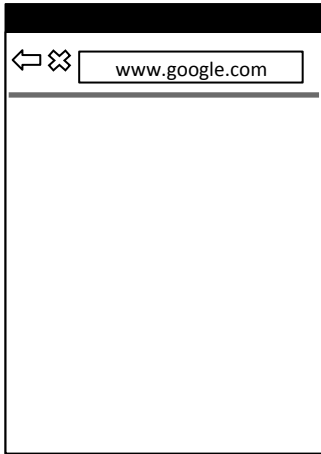
7	1	6	6	2	46-1500	4
Preamble	S O F	Destination address	Source address	Type	Data	FCS

Layer 2- Ethernet

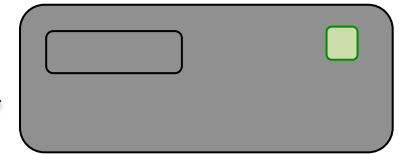


**Switch has table to
map MAC addresses
to ports**

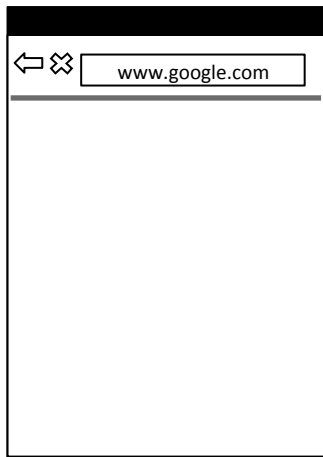
Layer 2- Ethernet



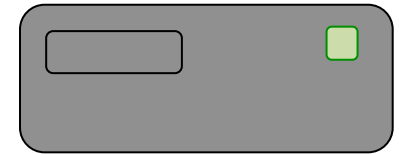
Data (none)
HTTP: Get Request
TCP: Src 41233, Dest 80
IP: Src 172.16.1.15, Dest 10.0.1.2
Ethernet: Dest: 00:1B:12:12:4C:55 Src: 08:00:EF:39:84:10



Layer 2- Ethernet



Data: HTML data
HTTP: OK 200
TCP: Src 80, Dest 41233
IP: Src 10.0.1.2, Dest 172.16.1.15
Ethernet: Dest: 00:1B:12:12:34:03 Src: 00:13:00:E1:88:E1



Layer 2- Ethernet

