



Lecture (03)

TCP/IP Network Model

By:

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Agenda

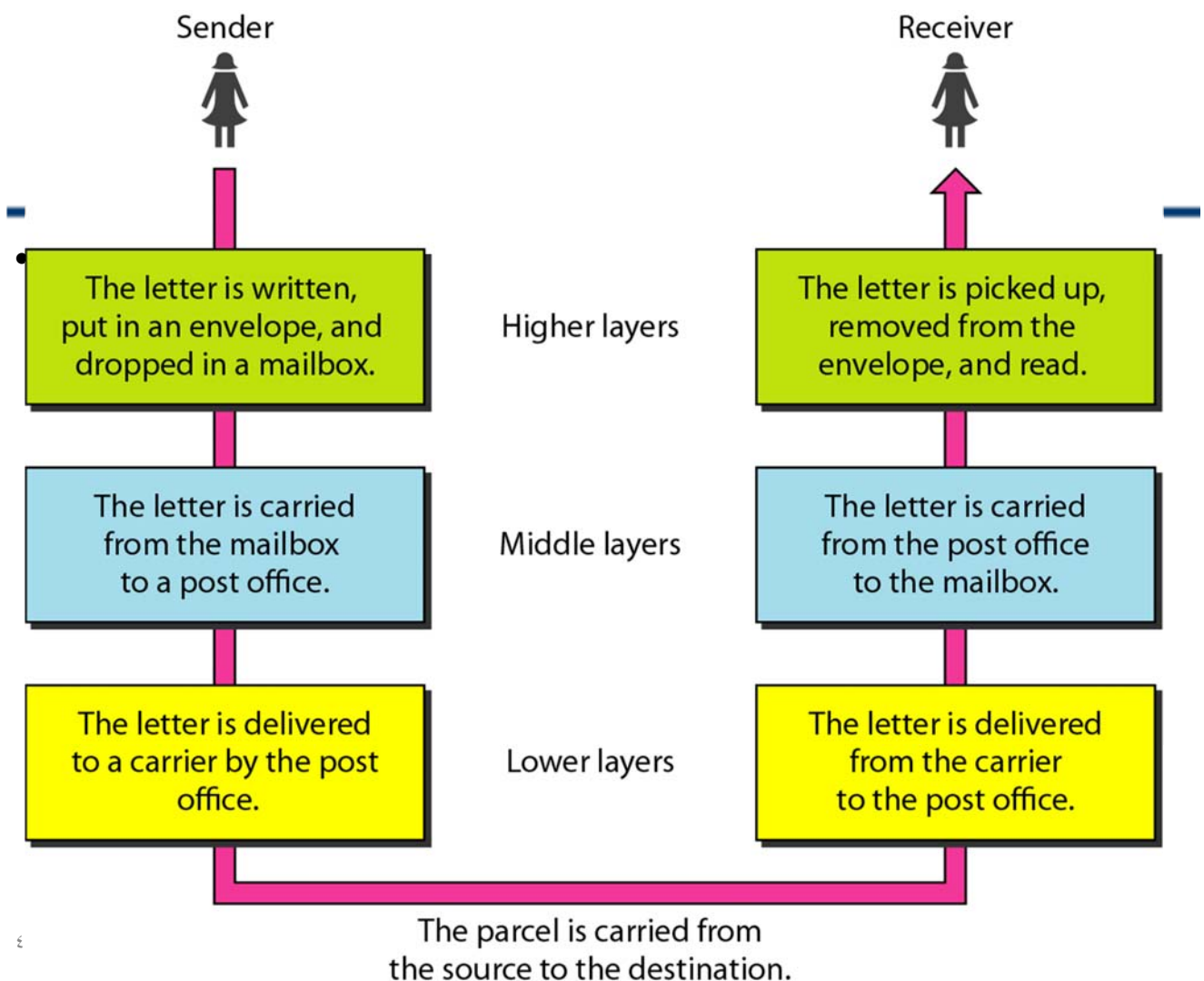
- Layering concept
- History
- Discovering the network layers
- Application Layer
- same-layer interaction concept;
- Transport Layer
- Adjacent layer interaction concept
- Internetwork Layer
- Network Interface Layer

Layering concept

- We use the concept of layers in our daily life. As an example, let us consider two friends who communicate through postal mail.
- The process of sending a letter to a friend would be complex if there were no services available from the post office.

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History

The International Organization for Standardization (ISO) took on this task starting as early as the late 1970s, beginning work on what would become known as the **Open Systems Interconnection (OSI)** networking model.

The ISO had a noble goal for the OSI: to standardize data networking protocols to allow communication between all computers across the entire planet.

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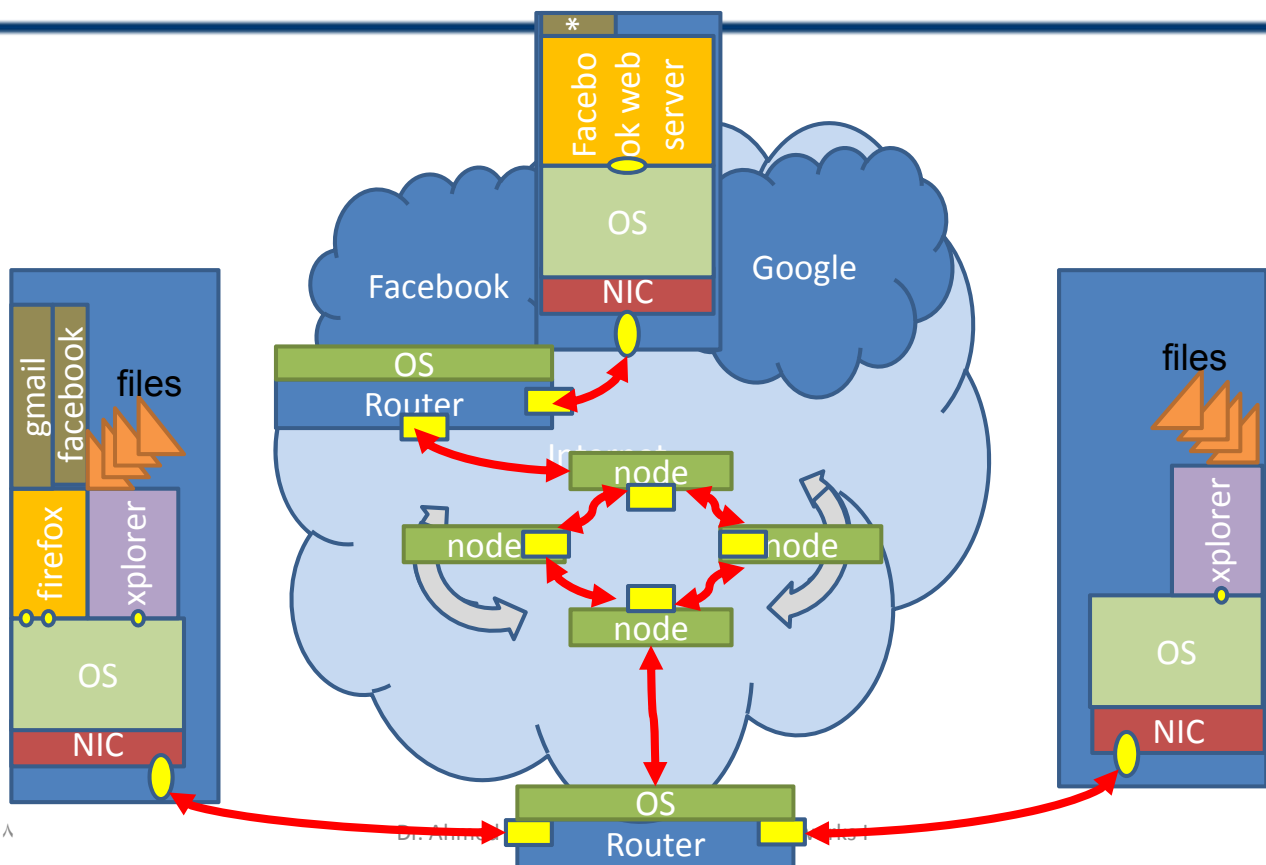
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- U.S. Defense Department did a less formal effort to create a standardized, public networking model sprouted forth from a contract.
 - Researchers at various universities volunteered to help further develop the protocols surrounding the original department's work.
 - These efforts resulting in a competing networking model called TCP/IP.

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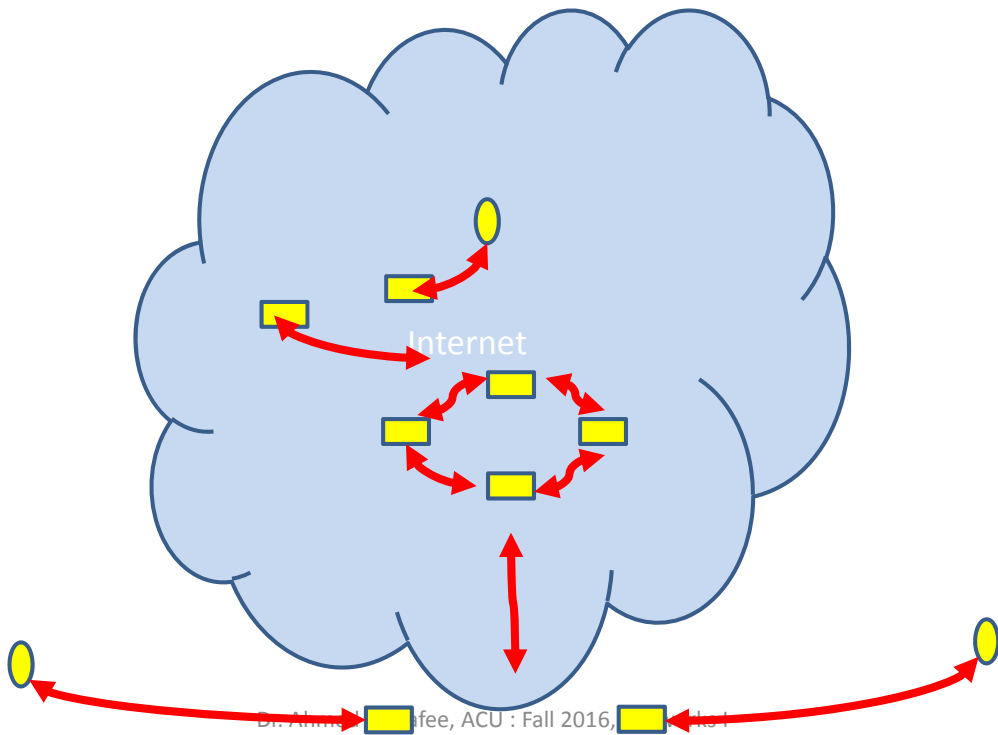
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The world now had many competing vendor networking models and two competing standardized networking models. So what happened? TCP/IP won the war.

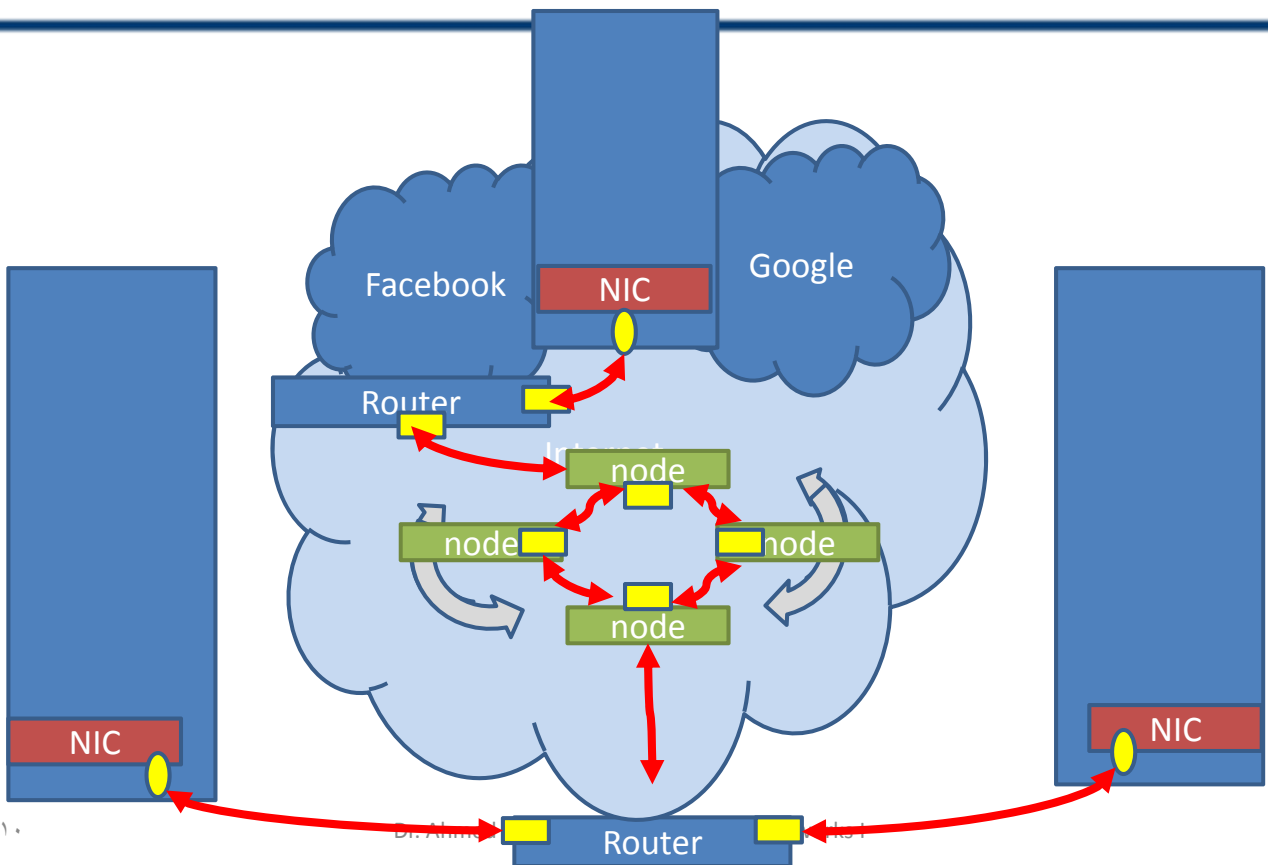
Discovering the network layers



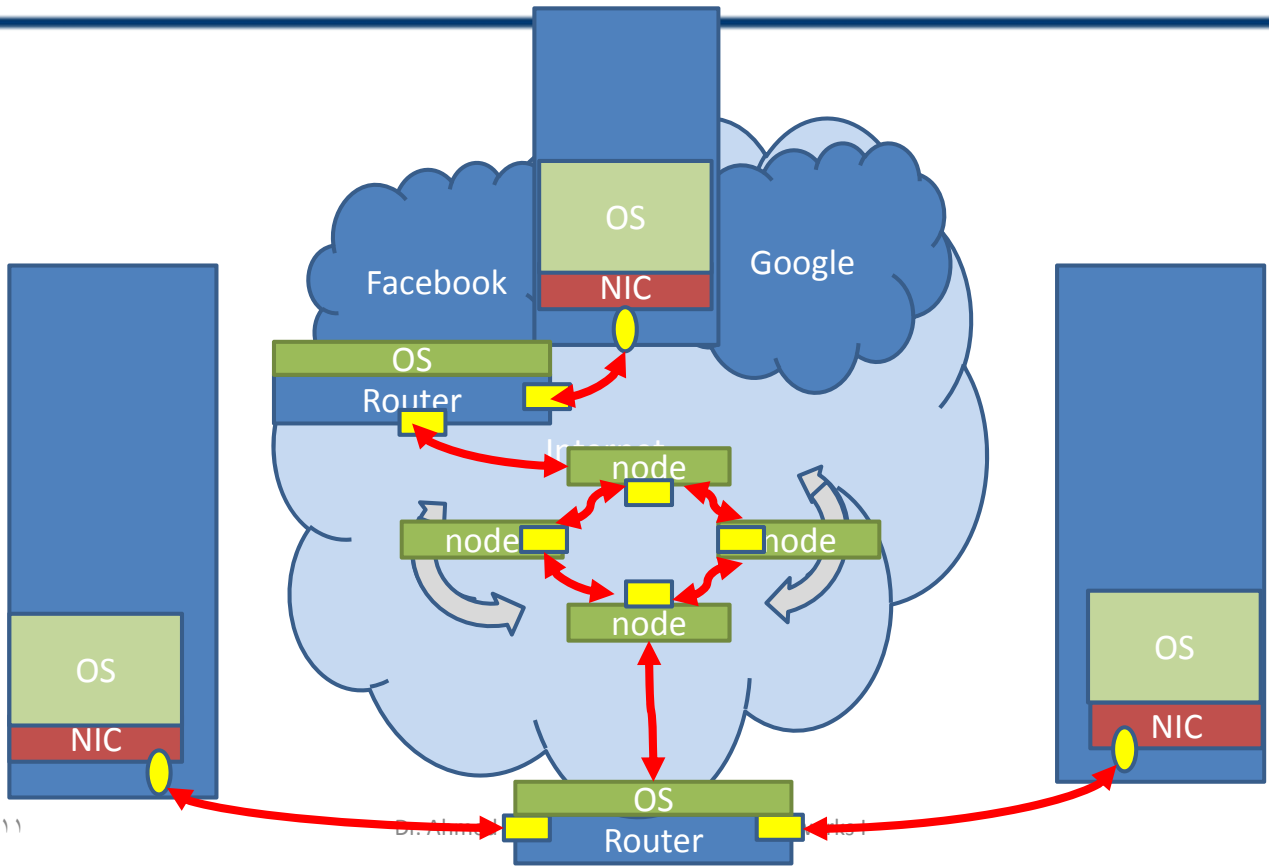
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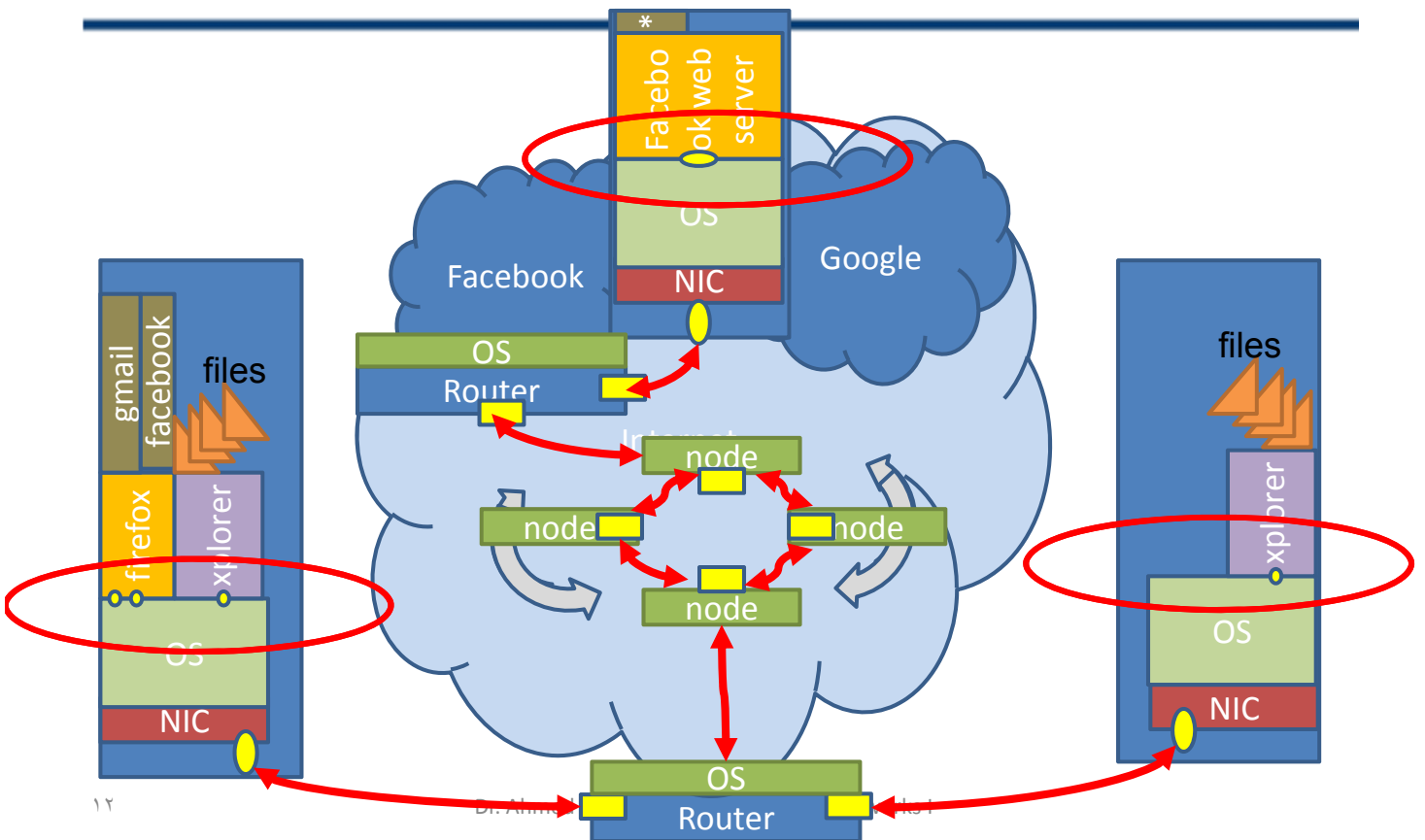
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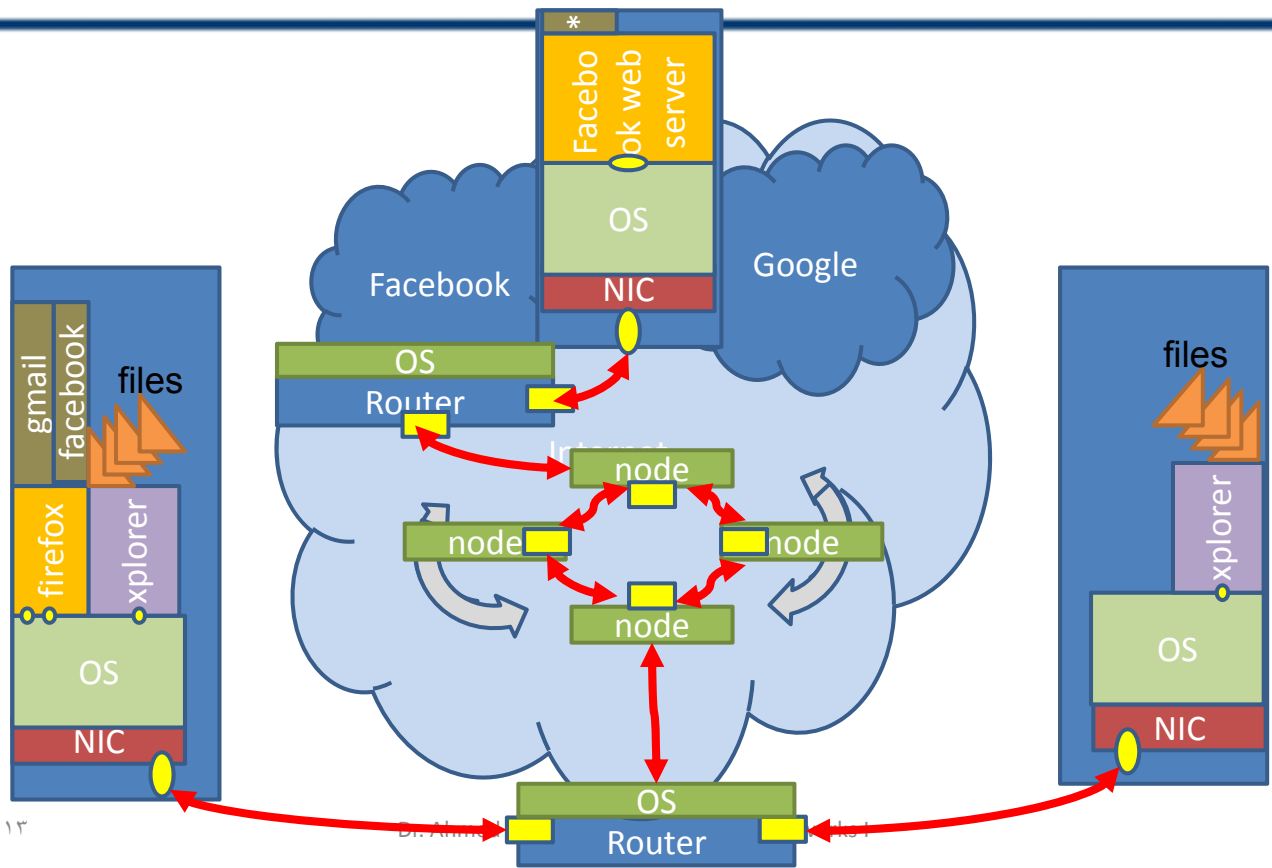


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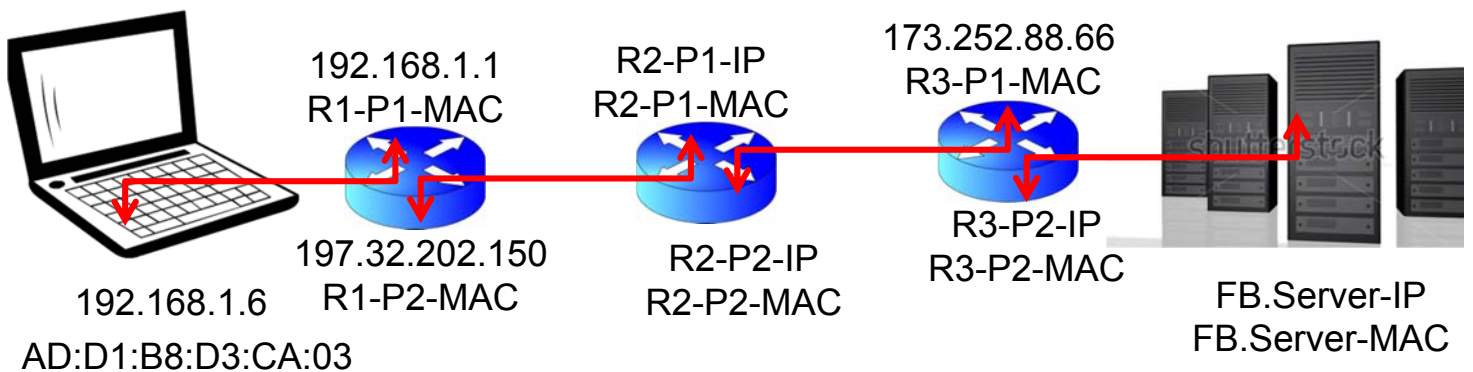


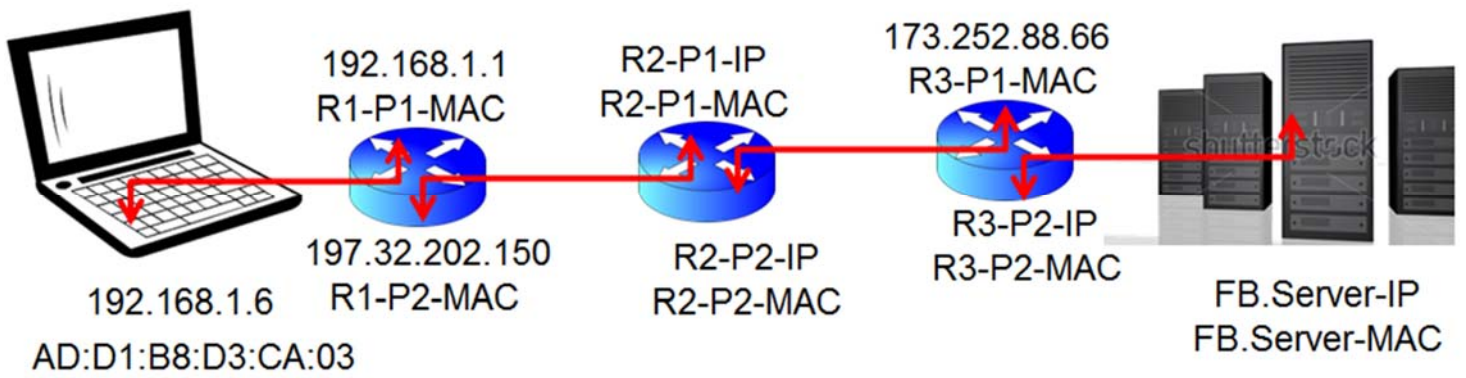
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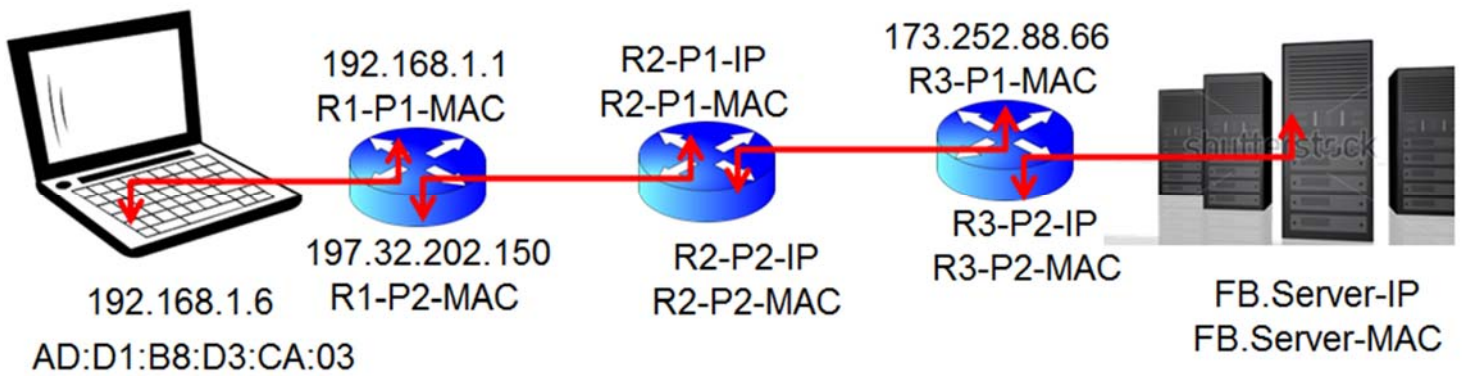


Discovering internet packets through internet

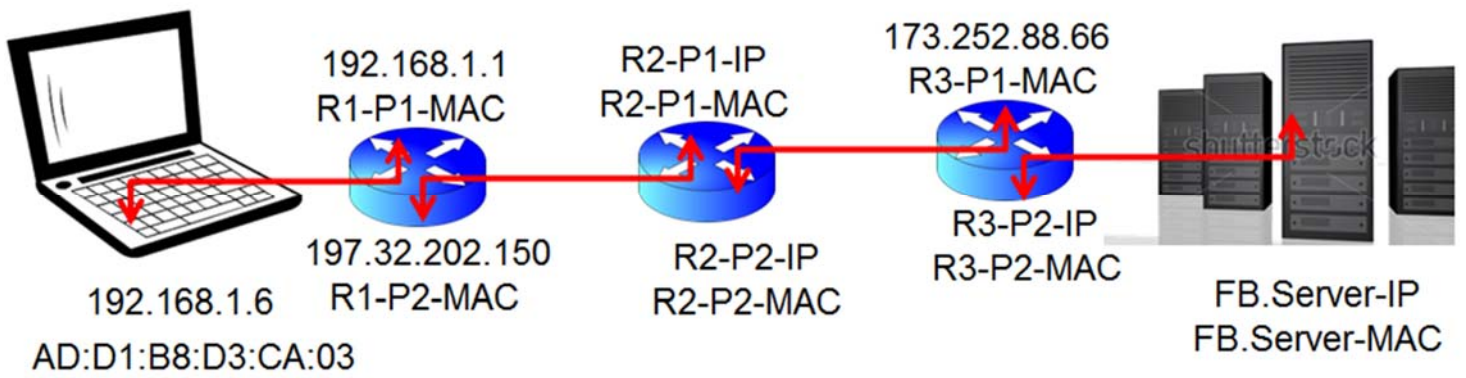




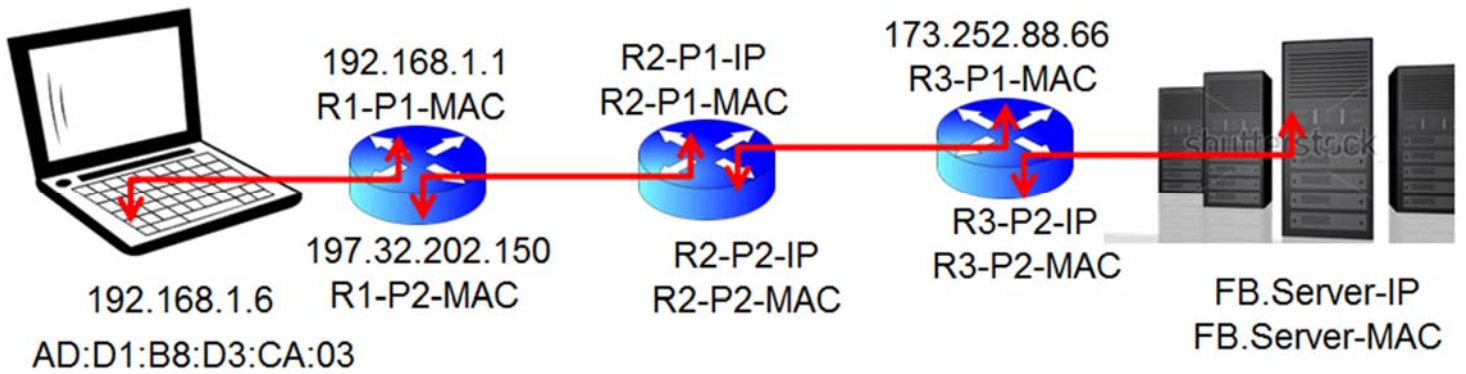
Sending



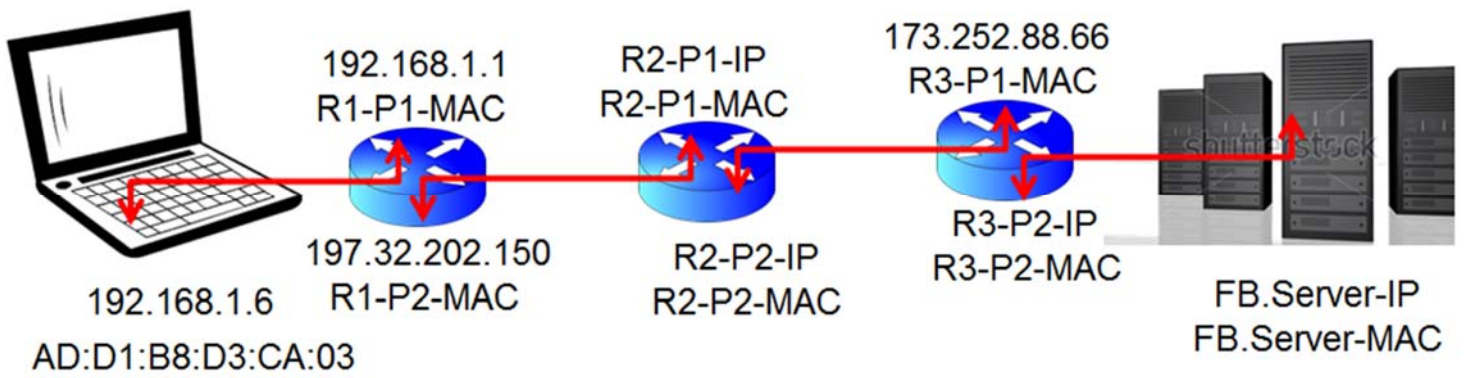
Source device	PC	Destination device	R1
	IP	MAC	data
Source Address	192.168.1.6	AD:D1:B8:D3:CA:03	
Destination Address	173.252.88.66	R1-P1-MAC	



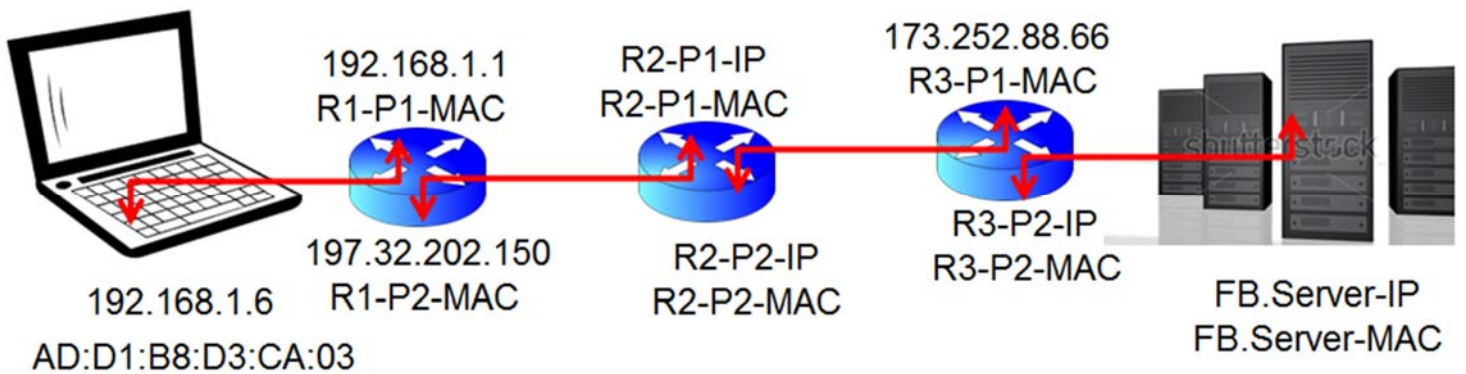
Source device	R1	Destination device	R2
	IP	MAC	data
Source Address	197.32.202.150	R1-P2-MAC	
Destination Address	173.252.88.66	R2-P1-MAC	



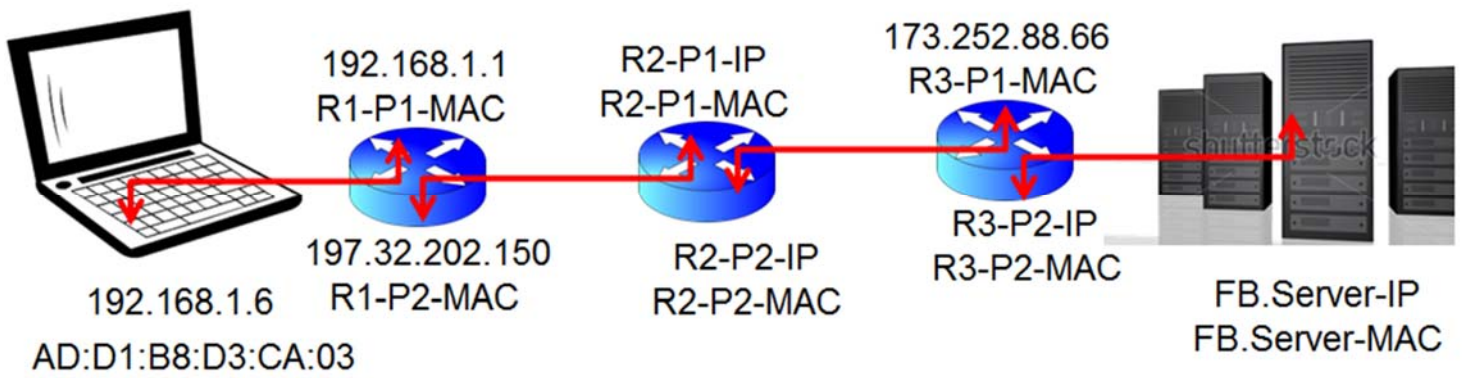
Source device	R2	Destination device	R3
	IP	MAC	data
Source Address	197.32.202.150	R2-P2-MAC	
Destination Address	173.252.88.66	R3-P1-MAC	



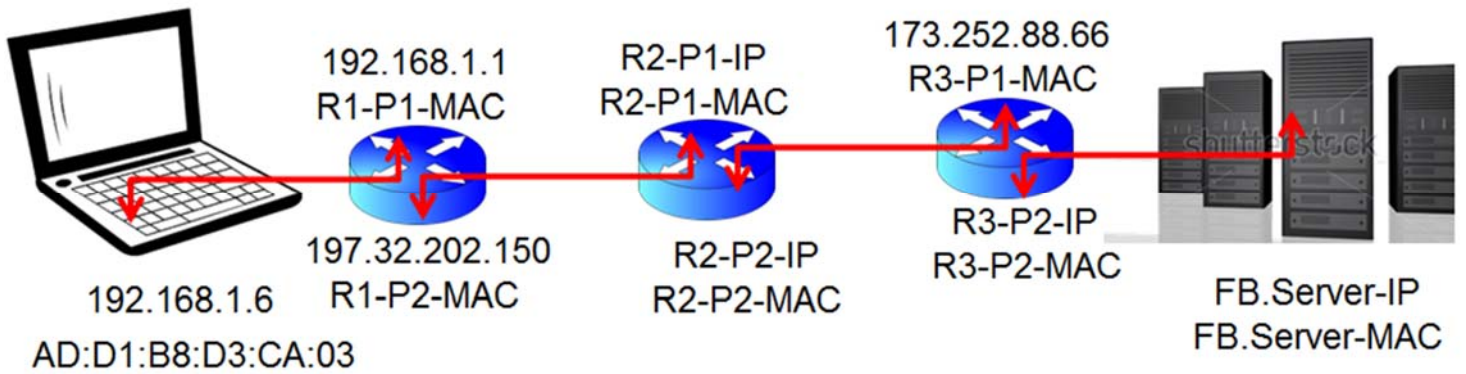
Source device	R3	Destination device	FB.SERVER
	IP	MAC	data
Source Address	197.32.202.150	R3-P2-MAC	
Destination Address	FB.SERVER-IP	FB.SERVER-MAC	



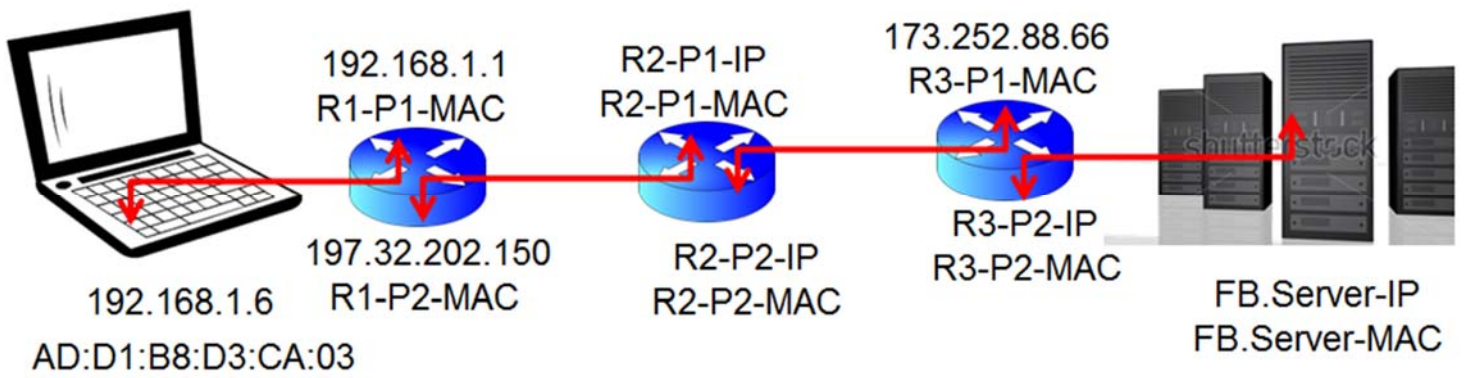
Reply



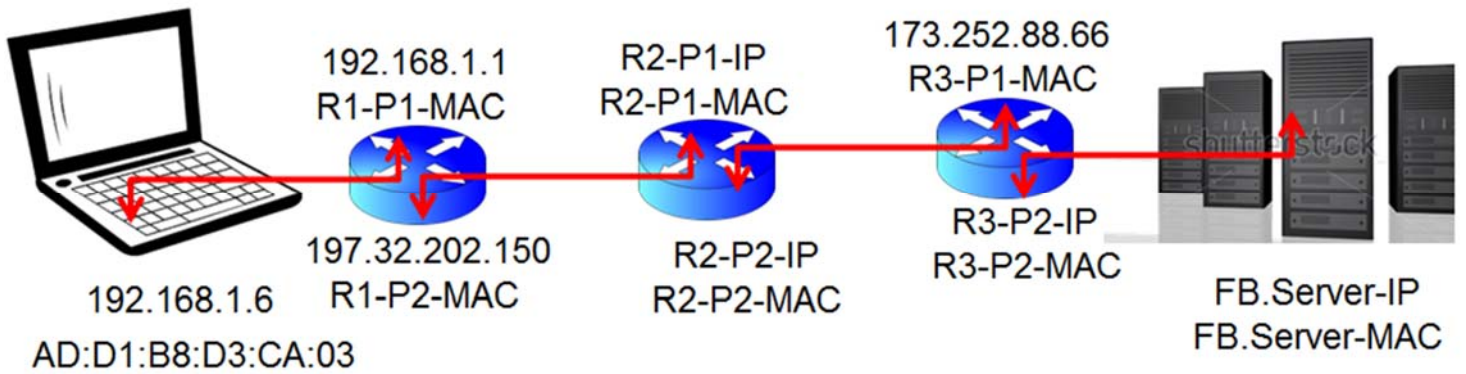
Source device	FB.SERVER	Destination device	R3
	IP	MAC	data
Source Address	FB.SERVER-IP	FB-SERVER-MAC	
Destination Address	197.32.202.150	R3-P2-MAC	



Source device	R3	Destination device	R2
	IP	MAC	data
Source Address	173.252.88.66	R3-P1-MAC	
Destination Address	197.32.202.150	R2-P2-MAC	



Source device	R2	Destination device	R1
	IP	MAC	data
Source Address	173.252.88.66	R2-P1-MAC	
Destination Address	197.32.202.150	R1-P2-MAC	

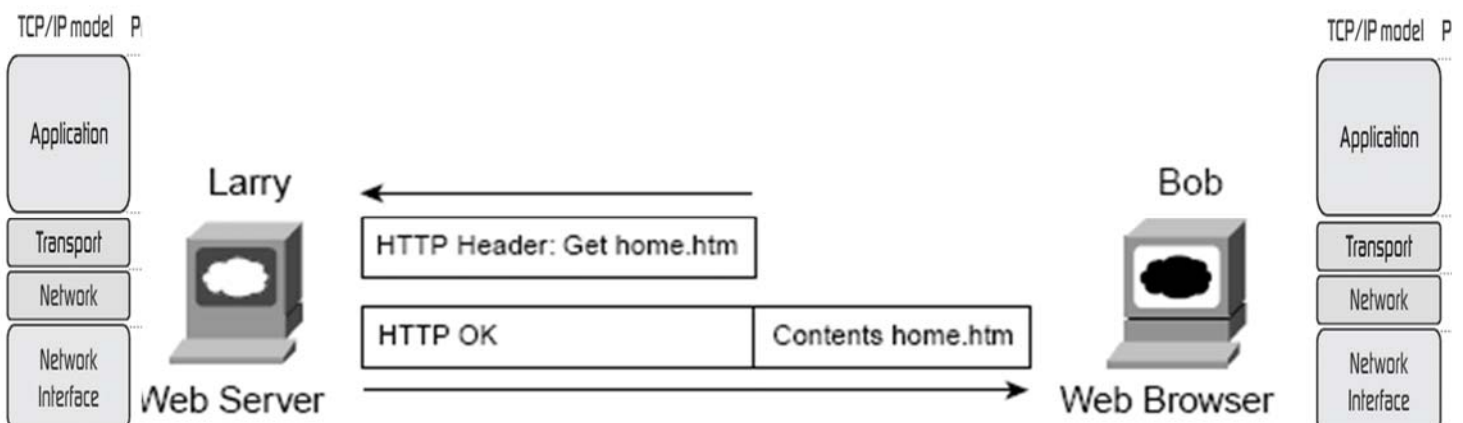


Source device	R1	Destination device	PC
	IP	MAC	data
Source Address	173.252.88.66	R1-P2-MAC	
Destination Address	192.168.1.6	AD:D1:B8:D3:CA:03	

Application Layer

- The most popular TCP/IP application today is the web browser.
- Many major software vendors either have already changed or are changing their software to support access from a web browser (web based app).
- Using a web browser is easy—you start a web browser on your computer and select a web site by typing in the name of the web site, and the web page appears.

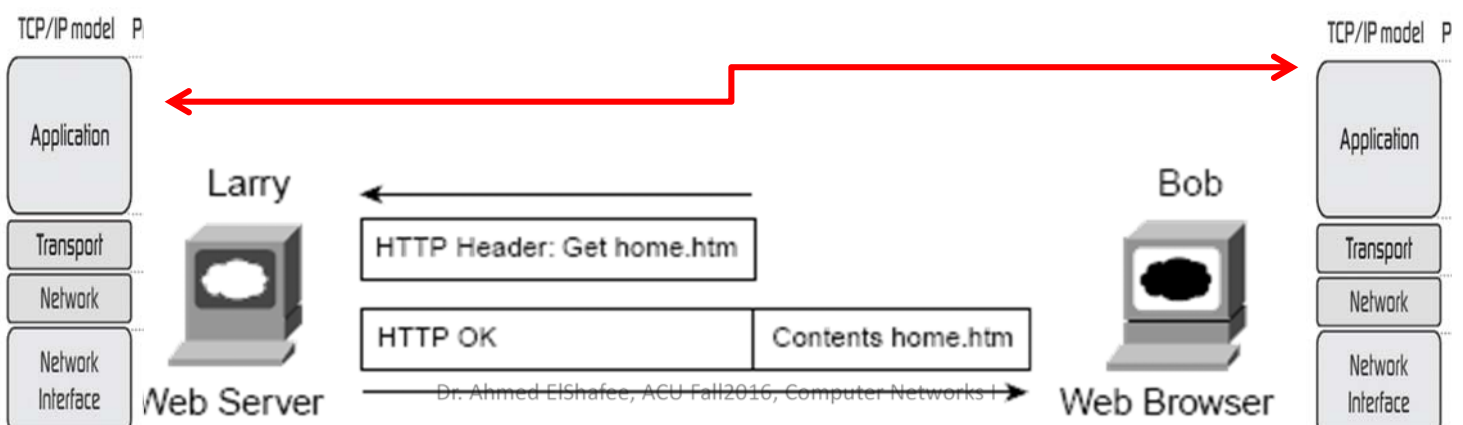
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- ***What really happens*** to allow that web page to appear on your web browser?
 - Imagine Bob opened his web browser, and wrote in address bar Larry Web Server address.
 - Bob's initial request actually asks Larry to send his home page back to Bob.



- Bob receives the file from Larry as HTML file.
- HTML defines how Bob's web browser should interpret the text inside the file he just received.
- For instance, the file might contain directions about making certain text be a certain size, color, and so on.
- In most cases, it also includes directions about other files that Bob's web browser should get— things such as graphics images and animation.
- HTTP would then be used to get those additional files from Larry, the web server.

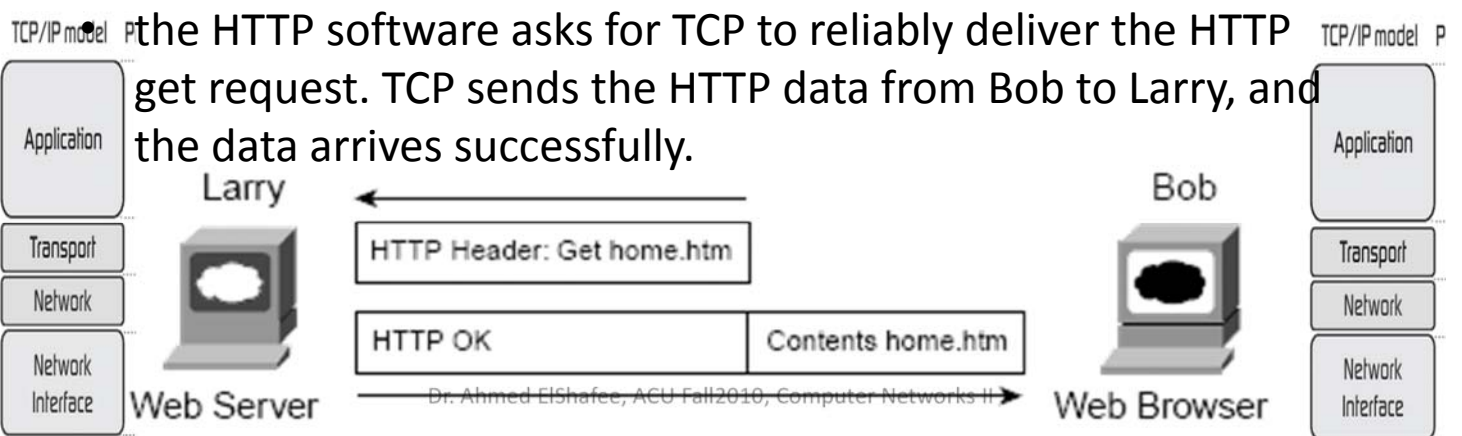
same-layer interaction concept;

- When a particular layer wants to communicate with the same layer on another computer, the two computers use headers to hold the information that they want to communicate.
- The headers are part of what is transmitted between the two computers. This process is called *same-layer interaction*.

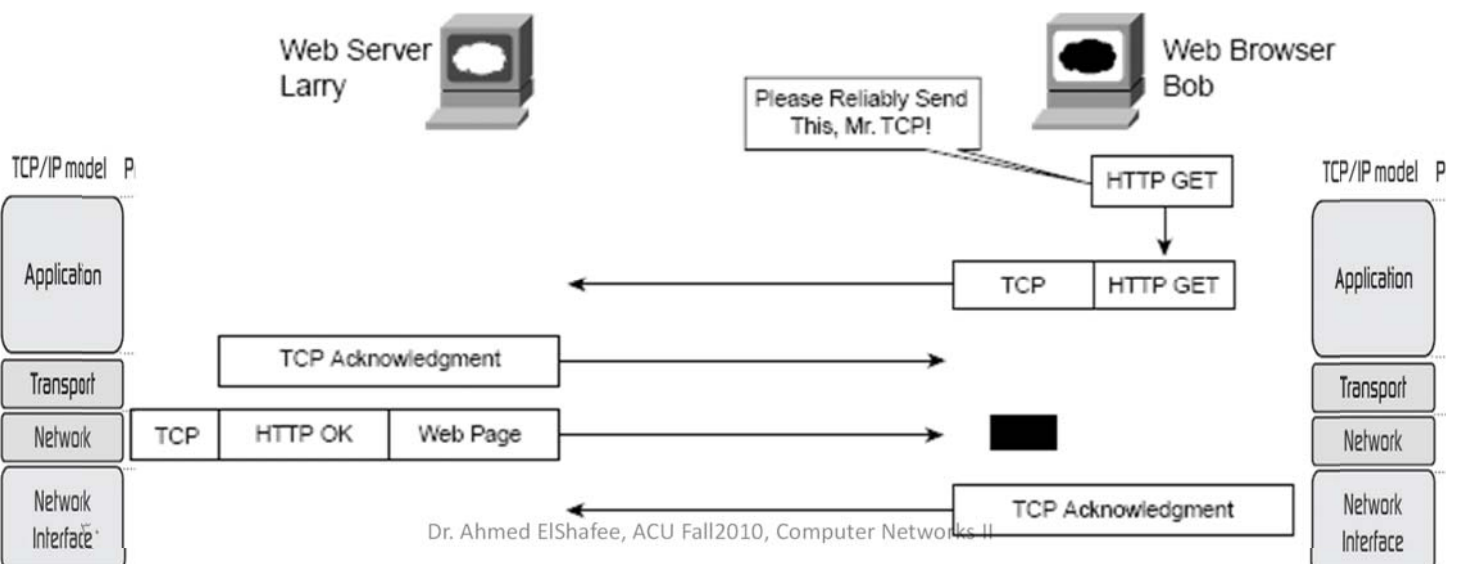


Transport Layer

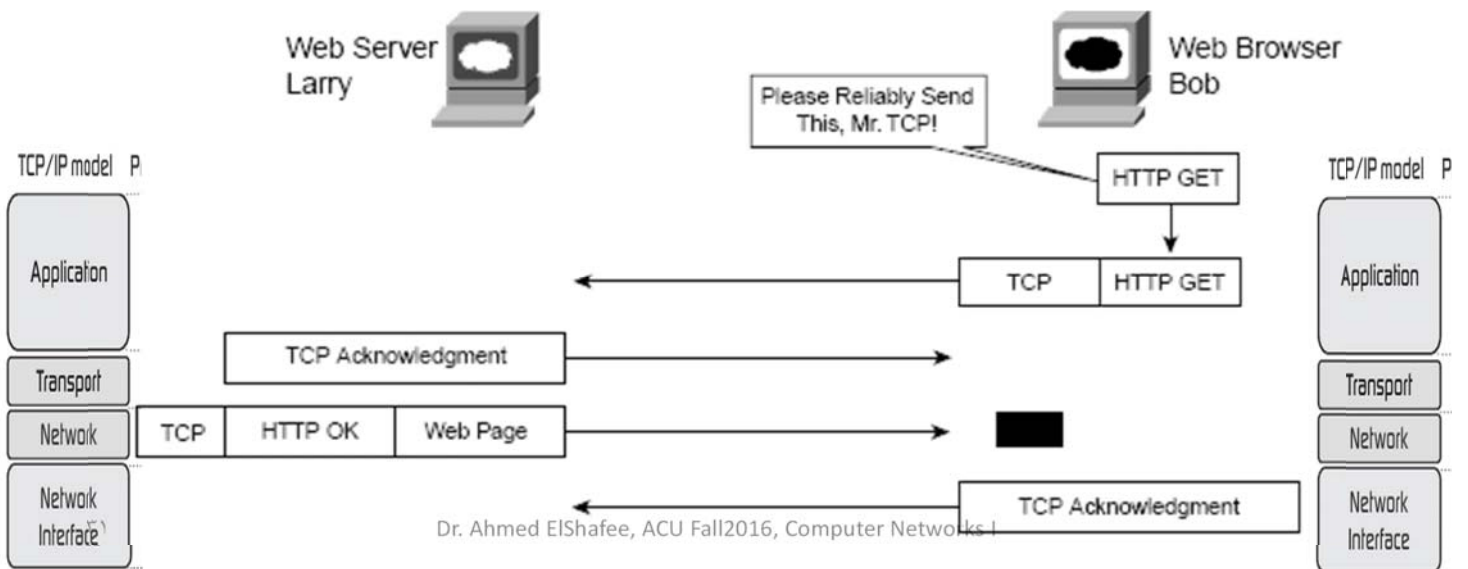
- Transport layer is responsible of identify and distinguishing packets of each software program running inside the same host (PC)
- Each software defines its default destination port (identifier) and random source port (identifier).
- both ports are included in TCP header.



- Larry's TCP software acknowledges receipt of the data and also gives the HTTP get request to the web server software.
- The reverse happens with Larry's response, which also arrives at Bob successfully

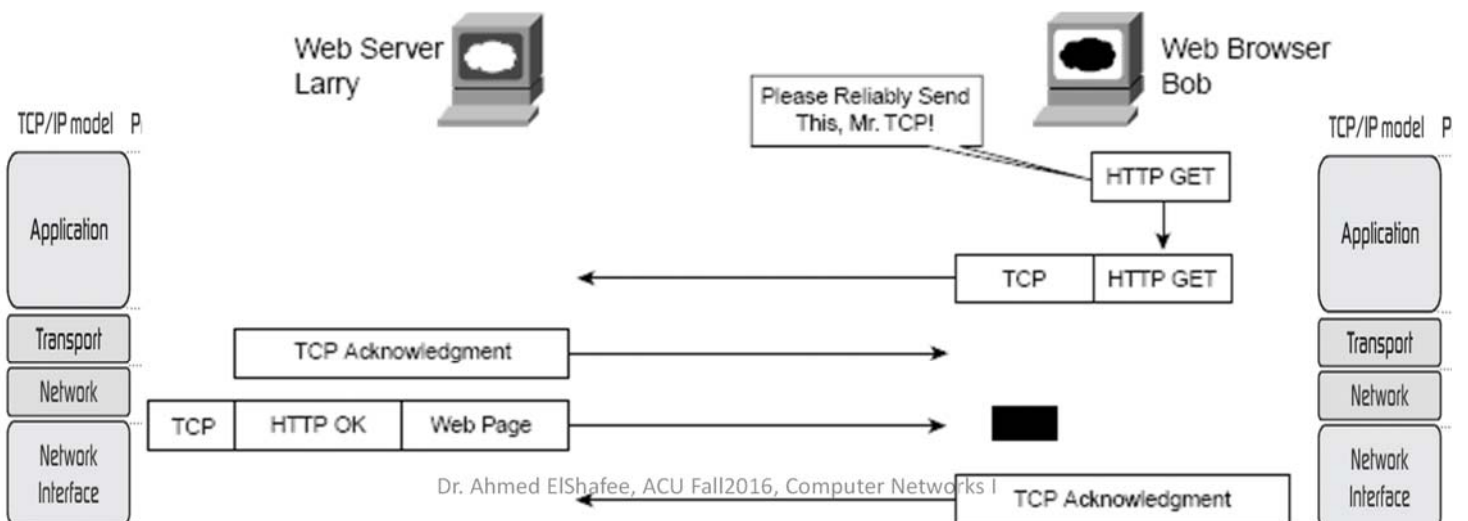


- assume that if either transmission had been lost, that HTTP would not be concerned, and that TCP would resend the data and ensure that it was received successfully.



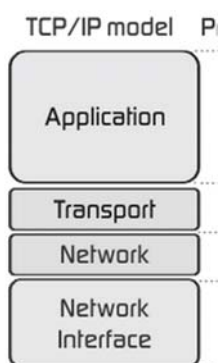
Adjacent layer interaction concept

So, the higher layer asks for the next lower-layer protocol (TCP) to perform the service, and the next lower layer performs the service. The lower layer provides a service to the layer above it.

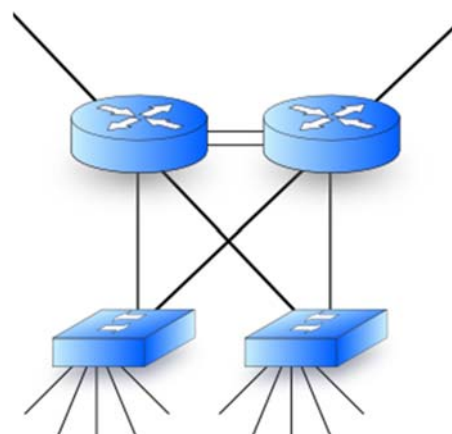


Internetwork Layer

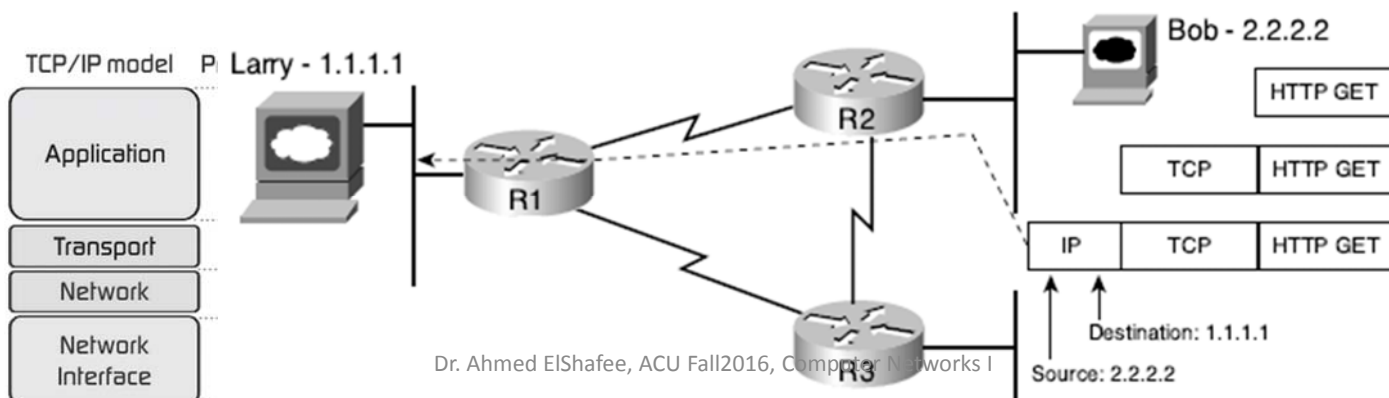
- the internetwork layer of the TCP/IP networking model, the Internet Protocol (IP), works much like the postal service.
- IP defines addresses so that each host computer can have a different IP address,
- IP defines the process of routing so that devices called routers can choose where to send packets of data so that they are delivered to the correct destination.



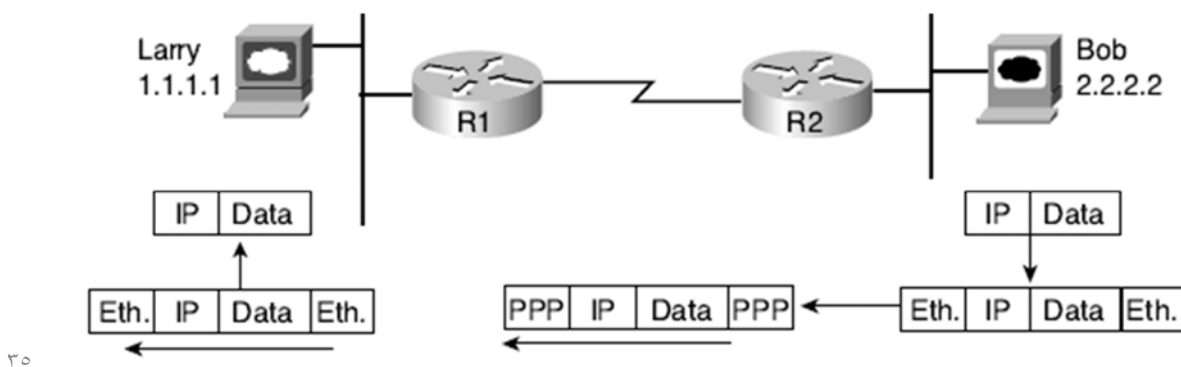
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- The IP header includes both a source and a destination IP address field, with Larry's IP address as the destination address and Bob's as the source.



- The network interface layer includes a large number of protocols like Ethernet protocols and other LAN standards.
- This layer also includes the popular WAN standards, such as the Point-to-Point Protocol (PPP) and Frame Relay.



- IP uses the network interface layer protocols to deliver the IP packet to the next router or host, with each router repeating the process until the packet arrives at the destination.
- Each network interface protocol uses headers to encode the information needed to successfully deliver the data across the physical network, much like other layers use headers to achieve their goals.
- In short, the TCP/IP Network Interface layer includes the protocols, cabling standards, headers and trailers that define how to send data across a wide variety of types of physical networks.

CAUTION Many people describe the network interface layer of the TCP/IP model as two layers,

- the data link layer and
- the physical layer.



Thanks,..
See you next week (ISA),...