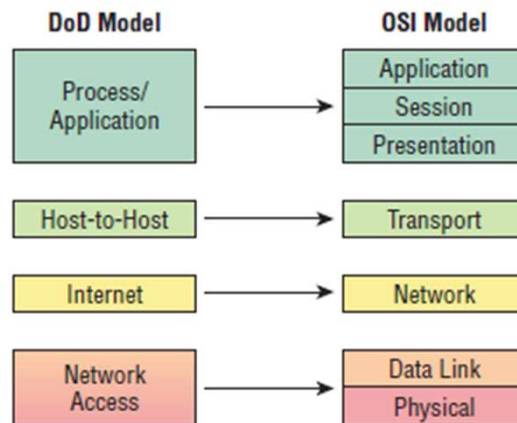# Redes y Comunicaciones
TCP/IP

Presentación elaborada por el profesor: Álvaro Pachón y fue adaptada para este curso.

Agenda

- Resumen TCP/IP
- Direccionamiento IPv4
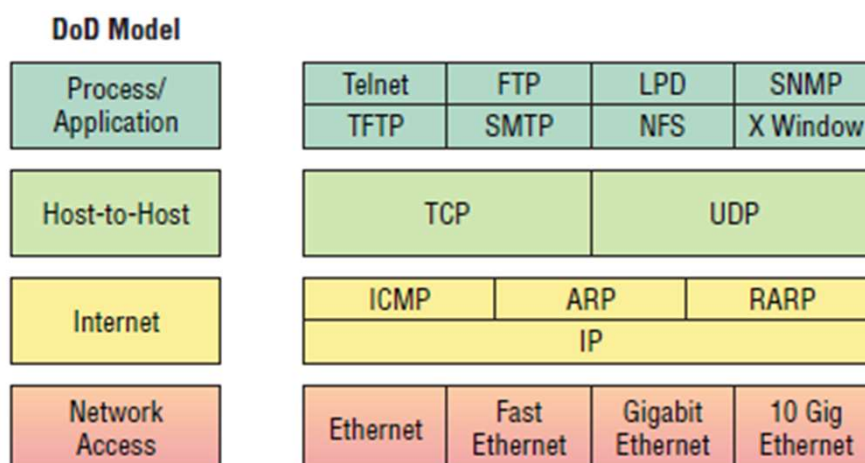- Ejercicio
- Preguntas próxima clase

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3- Modelo TCP/IP.

1- Pila ESTRATIFICADA y JERÁRQUICA de protocolos.

3- Modelo TCP/IP.

3- Modelo TCP/IP.

3.1. Nivel Físico

A- Transporta bits en una trama a través de un enlace.

B- Requerimiento: MEDIO DE TRANSMISIÓN.

C- Mensajero: SEÑAL.

D- Unidad lógica: **BIT**.

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3- Modelo TCP/IP.

3.2. Nivel de Enlace

A- Encapsula un datagrama en una **TRAMA**.

B- Envía tramas a través del enlace de datos.

C- NO se define protocolo específico= f(tecnología).

D- Protocolo = Diferentes servicios:

　　　　　a- Detección de Errores.

　　　　　b- Detección/Corrección de errores.
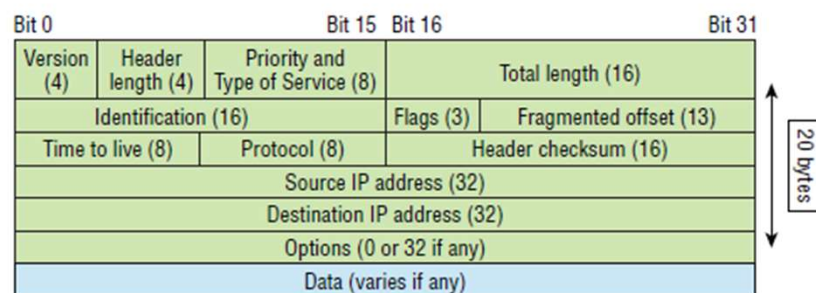
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3- Modelo TCP/IP.

3.3. Nivel de Red

A- Permite el intercambio entre FUENTE/DESTINO.

B- Comunicación: HOST-a-HOST

C- Aspecto clave: RUTA.

D- Protocolo: Internet Protocol (IP).

a- Define el formato del DATAGRAMA.

b- Define estructura de las direcciones.

c- Responsabilidad: Enrutamiento.

d- Protocolo NO orientado a conexión.

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3- Modelo TCP/IP.

Paquete IP:

IP header

Bit 0		Bit 15	Bit 16		Bit 31	
Version (4)	Header length (4)	Priority and Type of Service (8)	Total length (16)			
Identification (16)			Flags (3)	Fragmented offset (13)		20 bytes
Time to live (8)		Protocol (8)	Header checksum (16)			
Source IP address (32)						
Destination IP address (32)						
Options (0 or 32 if any)						
Data (varies if any)						

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3- Modelo TCP/IP.

H- Paquete IP:

Version   IP version number.

Header length   Header length (HLEN) in 32-bit words.

Priority and Type of Service   Type of Service tells how the datagram should be handled. The first 3 bits are the priority bits, now called the differentiated services bits.

Total length   Length of the packet, including header and data.

Identification   Unique IP-packet value used to differentiate fragmented packets from different datagrams.

Flags   Specifies whether fragmentation should occur.

Fragment offset   Provides fragmentation and reassembly if the packet is too large to put in a frame. It also allows different maximum transmission units (MTUs) on the Internet.

Time To Live   The time to live (TTL) is set into a packet when it is originally generated. If it doesn't get to where it's supposed to go before the TTL expires, boom—it's gone. This stops IP packets from continuously circling the network looking for a home.

Protocol   Port of upper-layer protocol; for example, TCP is port 6 or UDP is port 17. Also supports Network layer protocols, like ARP and ICMP, and can referred to as the Type field in some analyzers. We'll talk about this field more in a minute.

Header checksum   Cyclic redundancy check (CRC) on header only.

Source IP address   32-bit IP address of sending station.

Destination IP address   32-bit IP address of the station this packet is destined for.

Options   Used for network testing, debugging, security, and more.

Data   After the IP option field, will be the upper-layer data.

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3- Modelo TCP/IP.

3.3. Nivel de Red

D- Protocolos de enrutamiento Unicast y Multicast.

E- Protocolos auxiliares:

a- ICMP (*Internet Control Message Protocol*).

b- IGMP (*Internet Group Management Protocol*).

c- DHCP (*Dynamic Host Configuration Protocol*)

d- ARP (*Address Resolution Protocol*)

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3- Modelo TCP/IP.

3.4. Nivel de Transporte

A- Permite conexión lógica extremo-a-extremo.

B- Maneja SEGMENTO enviado a través de la conexión lógica.

C- Protocolos:

a- TCP (*Transport Control Protocol*).

b- UDP (*User Datagram Protocol*).

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3- Modelo TCP/IP.

D- Formato SEGMENTO TCP

TCP segment format

16-bit source port			16-bit destination port	
32-bit sequence number				
32-Bit Acknowledgment Number				
4-bit header length	Reserved	Flags	16-bit window size	
16-bit TCP checksum			16-bit urgent pointer	
Options				
Data				

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3- Modelo TCP/IP.

D- Formato SEGMENTO TCP

Source port This is the port number of the application on the host sending the data, which I'll talk about more thoroughly a little later in this chapter.

Destination port This is the port number of the application requested on the destination host.

Sequence number A number used by TCP that puts the data back in the correct order or retransmits missing or damaged data during a process called sequencing.

Acknowledgment number The value is the TCP octet that is expected next.

Header length The number of 32-bit words in the TCP header, which indicates where the data begins. The TCP header (even one including options) is an integral number of 32 bits in length.

Reserved Always set to zero.

Code bits/flags Controls functions used to set up and terminate a session.

Window The window size the sender is willing to accept, in octets.

Checksum The cyclic redundancy check (CRC), used because TCP doesn't trust the lower layers and checks everything. The CRC checks the header and data fields.

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3- Modelo TCP/IP.

E- Formato SEGMENTO UDP

UDP segment

Bit 0	Bit 15	Bit 16	Bit 31	
16-bit source port		16-bit destination port		8 bytes
16-bit length		16-bit checksum		
Data				
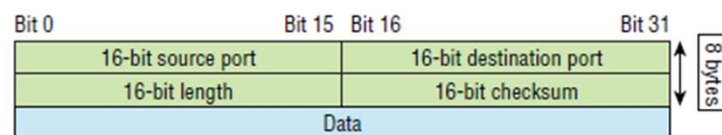
Source port Port number of the application on the host sending the data

Destination port Port number of the application requested on the destination host

Length Length of UDP header and UDP data

Checksum Checksum of both the UDP header and UDP data fields

Data Upper-layer data

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3- Modelo TCP/IP.

3.5. Nivel de Aplicación

A- Comunicación a nivel de PROCESOS.

B- Protocolos:

a- HTTP (*Hypertext Transfer Protocol*).

b- SMTP (*Simple Mail Transfer Protocol*).

c- FTP (*File Transfer Protocol*).

e- DNS (*Domain Name System*).

f- SSH (*Secure SHell*).

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3- Modelo TCP/IP.
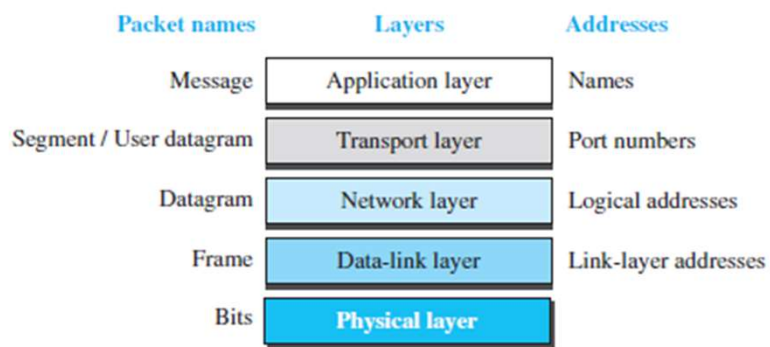
A- Encapsulamiento/Desencapsulamiento.
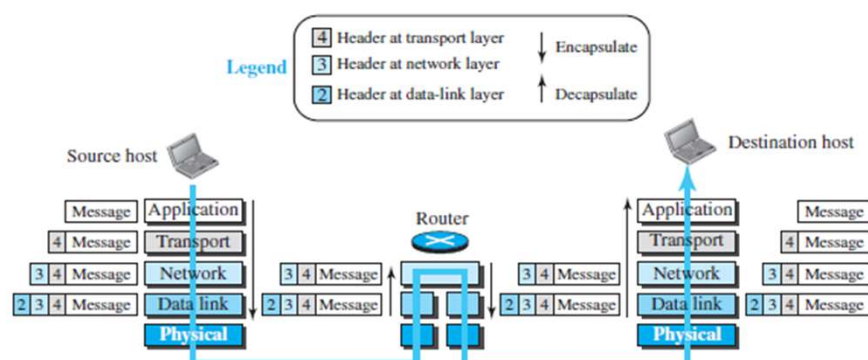

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3- Modelo TCP/IP.

B- Direccionamiento.

Packet names	Layers	Addresses
Message	Application layer	Names
Segment / User datagram	Transport layer	Port numbers
Datagram	Network layer	Logical addresses
Frame	Data-link layer	Link-layer addresses
Bits	Physical layer	

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3- Modelo TCP/IP.

F- TCP vs UDP

Key features of TCP and UDP

TCP	UDP
Sequenced	Unsequenced
Reliable	Unreliable
Connection-oriented	Connectionless
Virtual circuit	Low overhead
Acknowledgments	No acknowledgment
Windowing flow control	No windowing or flow control of any type

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3- Modelo TCP/IP.
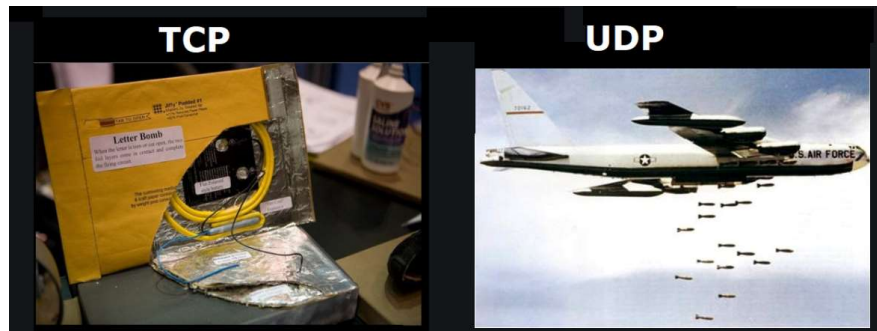
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3- Modelo TCP/IP.

G- Números de puertos (TCP,UDP):
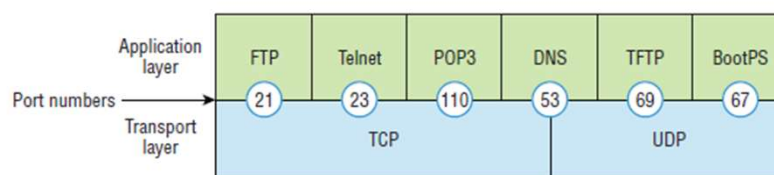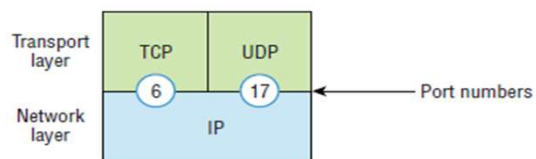
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3- Modelo TCP/IP.

Ejemplo:

3- Modelo TCP/IP.

3- Modelo TCP/IP.

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