a mini session on

DATA TRANSMISSION

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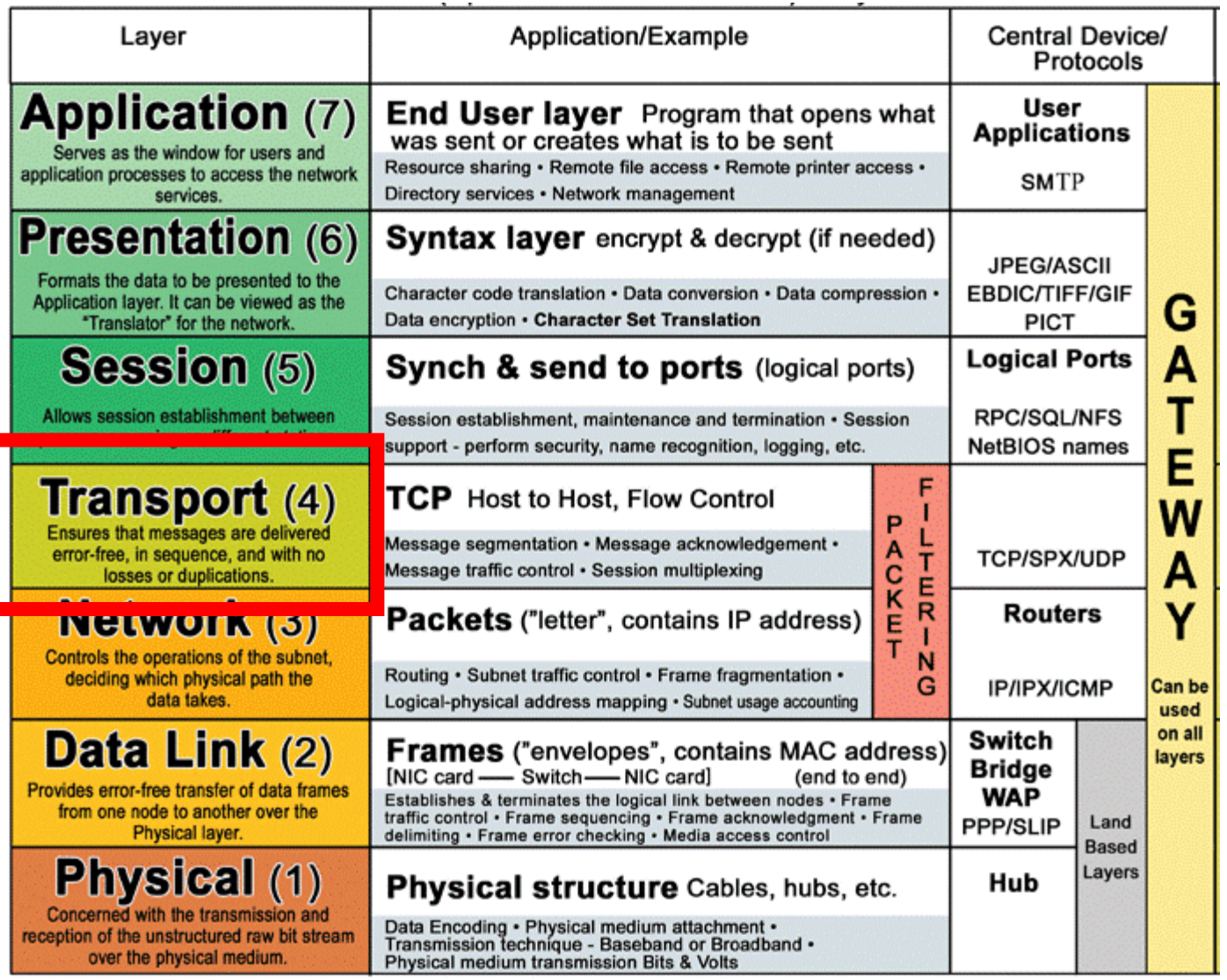

Layer	Application/Example		Central Device/ Protocols	
Application (7) Serves as the window for users and application processes to access the network services.	**End User layer** Program that opens what was sent or creates what is to be sent Resource sharing • Remote file access • Remote printer access • Directory services • Network management		**User Applications** SMTP	**GATEWAY** Can be used on all layers
Presentation (6) Formats the data to be presented to the Application layer. It can be viewed as the "Translator" for the network.	**Syntax layer** encrypt & decrypt (if needed) Character code translation • Data conversion • Data compression • Data encryption • **Character Set Translation**		JPEG/ASCII EBDIC/TIFF/GIF PICT	
Session (5) Allows session establishment between	**Synch & send to ports** (logical ports) Session establishment, maintenance and termination • Session support - perform security, name recognition, logging, etc.		**Logical Ports** RPC/SQL/NFS NetBIOS names	
Transport (4) Ensures that messages are delivered error-free, in sequence, and with no losses or duplications.	**TCP** Host to Host, Flow Control Message segmentation • Message acknowledgement • Message traffic control • Session multiplexing	PACKET FILTERING	TCP/SPX/UDP	
Network (3) Controls the operations of the subnet, deciding which physical path the data takes.	**Packets** ("letter", contains IP address) Routing • Subnet traffic control • Frame fragmentation • Logical-physical address mapping • Subnet usage accounting		**Routers** IP/IPX/ICMP	
Data Link (2) Provides error-free transfer of data frames from one node to another over the Physical layer.	**Frames** ("envelopes", contains MAC address) [NIC card — Switch — NIC card] (end to end) Establishes & terminates the logical link between nodes • Frame traffic control • Frame sequencing • Frame acknowledgment • Frame delimiting • Frame error checking • Media access control		**Switch** **Bridge** **WAP** PPP/SLIP	Land Based Layers
Physical (1) Concerned with the transmission and reception of the unstructured raw bit stream over the physical medium.	**Physical structure** Cables, hubs, etc. Data Encoding • Physical medium attachment • Transmission technique - Baseband or Broadband • Physical medium transmission Bits & Volts		**Hub**	

Error Detection

- 1-D Parity Check
- 2-D Parity Check
- Checksum Scheme

1-D Parity Check

- A parity bit is added to the data to detect for error.
- We can either implement Odd-Parity or Even-Parity Check

Consider a 7 bit data : 1110 011

If we want to implement Odd-Parity Check, then a '**0**' will be added as the Parity bit, so that the data transmitted will be 1110 011**0**

If we want to implement Even-Parity Check, then a '**1**' will be added as the Parity bit, so that the data transmitted will be 1110 011**1**

Do you know which of the following data(s) contain error?

(A) 1010 1100

(B) 0110 1110

(C) 1011 0011

(D) 1001 0101

2-D Parity Check

- A parity bit is added to each data to detect for error.
- A byte is added to a group of data to help ‘locate’ the error.
- Consider we have a Odd-Parity Check :

```
(data 1) : 1010 1101
(data 2) : 0110 1110
(data 3) : 1011 0011
(data 4) : 1001 0100
           0001 1011
```

2-D (Odd) Parity Check

- Can you locate a 1 bit error?

```
(data 1) : 1010 1101
(data 2) : 0100 1110
(data 3) : 1011 0011
(data 4) : 1001 0100
           0001 1011
```

2-D (Odd) Parity Check

- Can you locate a 2 bit error?

```
(data 1) : 1010 1101
(data 2) : 0100 1110
(data 3) : 1011 0111
(data 4) : 1001 0100
           0001 1011
```

Checksum Scheme

a) Assign a weightage to each digit :

_x3 + _x5 + _x7 + _x9 + _x11 = Sum

b) Apply mod to the Sum :

Sum % 10 = n

c) Transmitted data : _ _ _ _ _ n

Checksum Scheme

Example : Let the data be 12345

Compute for the Checksum :

a) Assign a weightage to each digit :

$$1x3 + 2x5 + 3x7 + 4x9 + 5x11 = 125$$

b) Apply mod to the sum :

$$125 \% 10 = 5$$

c) Transmitted data : 123455

Can you tell whether is there any error?

Transmitted Data : 739428

Compute for the Checksum :

a) Assign a weightage to each digit :

$$7x3 + 3x5 + 9x7 + 4x9 + 2x11 = 157$$

b) Apply mod to the sum :

$$157 \% 10 = 7$$

Hence, the transmitted data contains error !

Examples of Checksum :

- NRIC number
- Car Plate number
- Credit Card number