Network Models Part-1

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Layer Approach :- In layered approach the networking concepts are divided into different layers and each layer has a dedicated task.
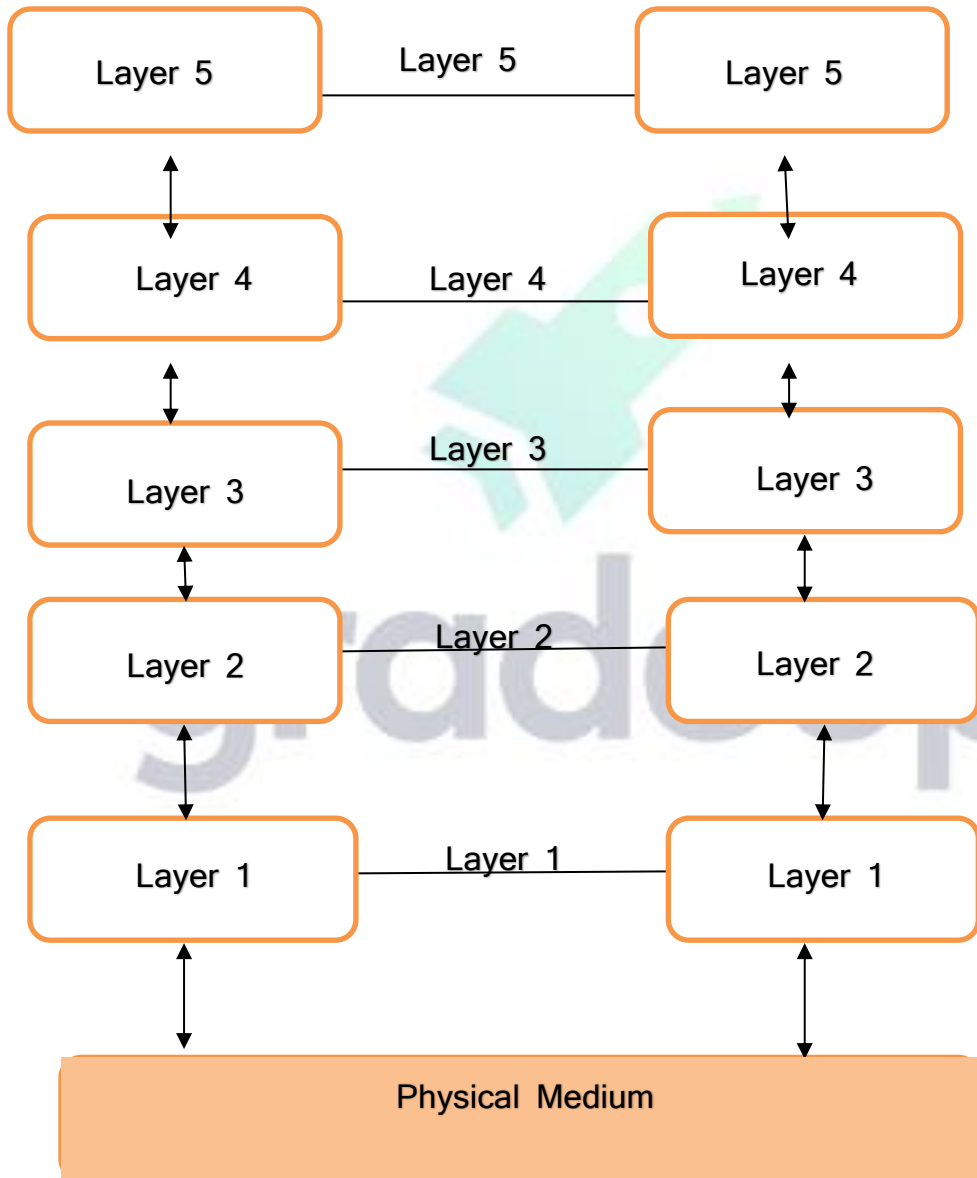
Layer Architecture :-

- The main aim this architecture is to divide the design into small pieces.
- Each of the lower level layer add its services to the higher level layer to provide a full set of service to manage the communication and run application.
- It provide clear interface and modularity i.e. provide the interaction between the subsystems.
- It ensures the independence between layers by providing the services from lower level to higher level layer without defining how the services are implemented. Therefore, any modification in a layer will not affect other layers.
- The number of functions, layers, contents of each layer will vary from network to network. However, the purpose of each layer is to provide the service from lower level to a higher level layer and hiding the details from the layers of how the services are implemented.
- The basic elements of layered architecture are protocols, services and interfaces
  a. **Service:** It is a set of actions that a layer provides to the higher level layer.
  b. **Protocol:** Protocol defines the set of rules that a layer uses to exchange the information with the peer entity. These rules are mainly concern about both the order and contents of the messages used.
  c. **Interface:** It is a way through which a message is transferred from one layer to another.

- In a layer N architecture, layer N on one machine will have a communication with the layer N on another machine and the rules used in a conversation are known as a layer-N protocol.

Let's take the five layered architecture :

- case of the layered architecture, no data is transferred from layer n of one machine to the layer n of another machine. Instead, each layer passes data to the layer immediately just below it, until the lowest layer reached.
- Below layer 1 their is the physical medium through which the actual communication takes place.
- In the layer architecture , the unmanageable task are divided into several manageable and small tasks.
- A set of protocols and layers is known as network architecture.

Need of layered architectur :-

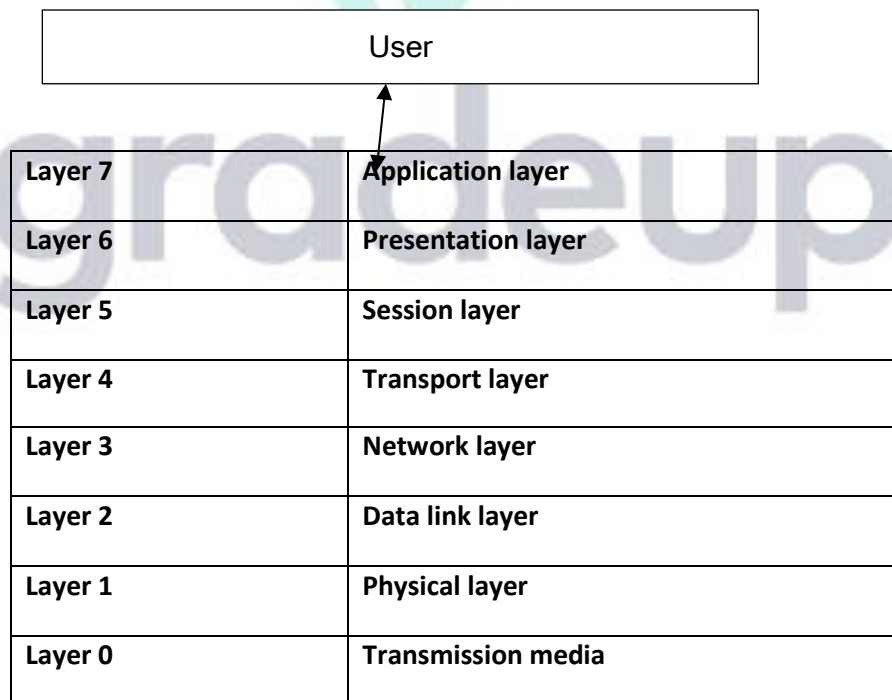1. Divide- and- conquer approach
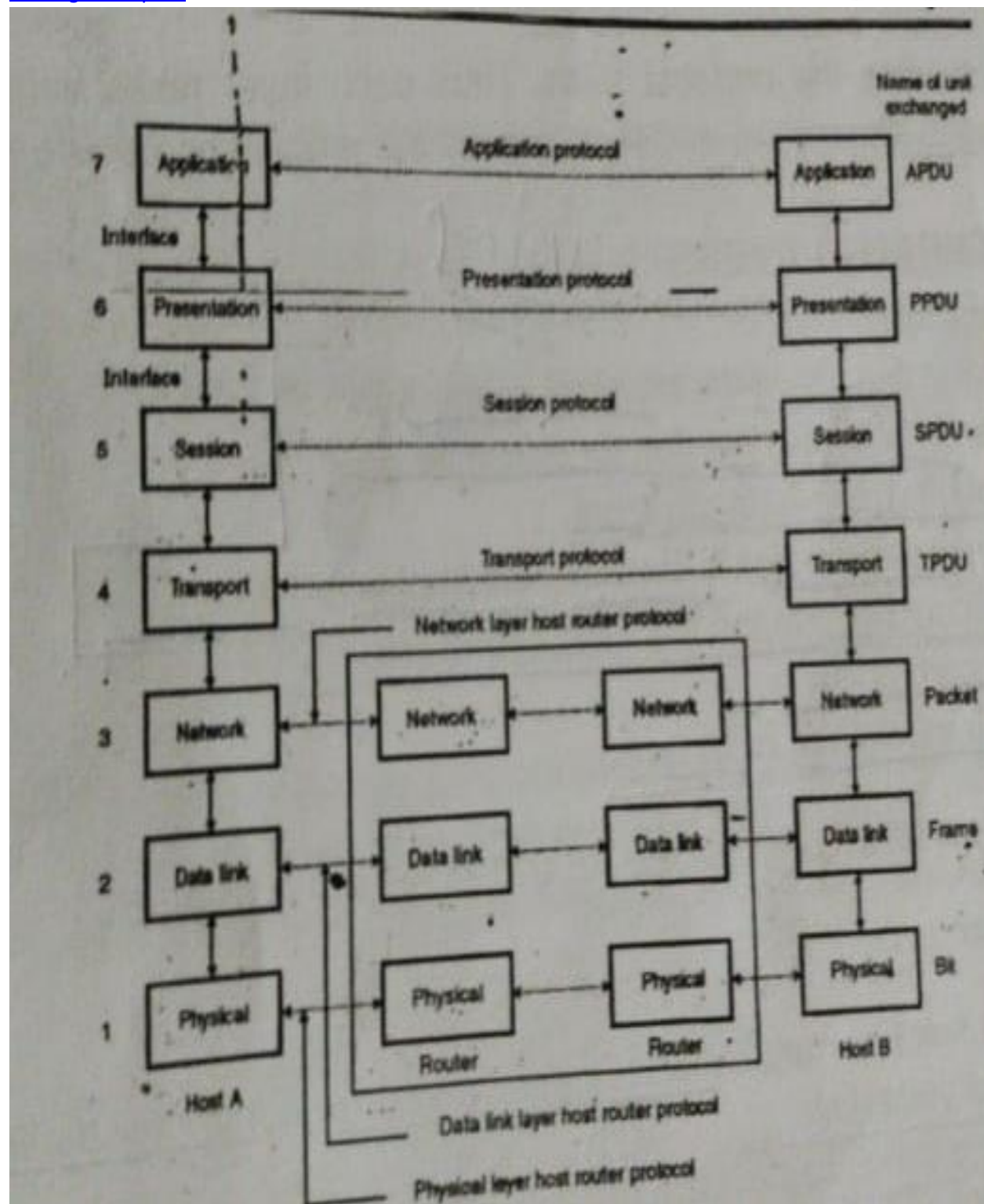2. Modularity
3. Easy to modify
4. Easy to test

After the layered network now discus the two architecture or reference model. The most important reference models are:

1. The OSI reference model
2. The TCP/IP reference model

- The international Standards Organization(ISO) covers all aspects of network communication in the Open System Interconnection(OSI) model.
- An OSI model is the layered framework for the design of network systems that allows for communication across all the types of computer systems.
- The purpose of each layer is to offer certain services to the higher layers

OSI Model :-

- The use of a computer network are located over a wide physical rang i.e. all over the world.
- Therefore a ensure that nationwide and worldwide data communication systems can be developed and are compatible to each other , an international group of standards have been developed
- These standards will fit into a framework which has been developed by the "international organization of standardization (ISO)
- This framework is called as "Model for open system interconnection (OSI)" and it is normally referred to as "OSI referred model "
- It defines the seven level or layers in a complete communication system. The lower layer is known as physical layer and the higher layer is known as application layer

User

Layer 7	Application layer
Layer 6	Presentation layer
Layer 5	Session layer
Layer 4	Transport layer
Layer 3	Network layer
Layer 2	Data link layer
Layer 1	Physical layer
Layer 0	Transmission media

Below table shows various layers and its functions

Level	Name of Layer	Functions
1	Physical Layer	Make and break connections , define voltages and data rates , converts data bits into electrical signal .Decide whether transmission in simplex , half duplex or full duplex
2	Data Link Layer	Synchronization , error detection and correction . To assemble outgoing message into frames
3	Network Layer	Routing of the signals , divide the outgoing message into packets, to act as network controller for routing data
4	Transport Layer	Decides whether transmission should be parallel or single path , multiplexing ,splitting or segmenting the data , to break data into smaller units for efficient handling
5	Session Layer	To manage and synchronize conversation between two systems. It controls logging on and off user identification , billing and session management
6	Presentation Layer	It works as a translating layer
7	Application Layer	Retransferring files of information ,LOGIN, password checking etc.

- All the applications need not use all the seven layers as shown in the diagram.
- The lower three are enough for the most of the application. Each layer is built from electronics circuit and/or software and has separate existence from the remaining layers.
- Each layer support to handle message or data from the layers which is immediately above or below it.
- This is done by following the protocol rules. Thus each layer takes data from the adjacent layer , handles it according to these rules and then passes the processed data to the next layer on the other side.

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Functions of Different Layers:

Layer 1: The physical layer

- To active , maintain and deactivate the physical connection
- To define voltages and data rates needed for transmission
- To convert the digit **bits** into electrical signal
- To decide whether the transmission in simplex, half duplex or full duplex
- A physical layer dose not perform following operation
  a. It dose not detect or correct errors.
  b. It does not decide the medium or modulation

Note :- Thee example of physical layer protocols are RS-232 or RS-449 standards.

Layer 2 : Data Link Layer:

- Functions of the DLL are synchronization and error control for the information which is to be transmitted over the physical layer.
- To enable the error detection , it adds error detection bits to the data which is to be transmitted.
- The encoded data is then passed to the physical layer.
- These error detection bits are used by the DLL on the other side to detect and correct the error.
- At this level the outgoing message are assembled into the frames, and the system waits for the acknowledgements to be received after every frame transmitted
- Correct operation of the DLL ensures reliable transmission of each message. Example of DLL protocols are HDLC,SDLC or X25 protocols

Layer 3: The network Layer

- To route the signals through various channels to other end
- To act a the network controller by deciding which route data should take

- To divide the outgoing message into packets and to assemble incoming packets into message for the higher levels .

In short the network layer acts as a network controller for routing data.

Layer 4: The Transport Layer

- It decides if the data transmission should take place on the parallel path or single path .
- If does the function such as multiplexing splitting or segmentation on the data
- Transport layer guarantees transmission of data from one end to the other end.
- It breaks the data group into the smaller units so that they are handled more efficiently by the networks layer

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