What are design issues of layers?

There are some key design issues occur in computer networks are present in several layers

- Addressing: Every layer needs a mechanism to identify senders and receivers.
- Error control: Its an important issue because physical communication circuits are not perfect. Many error detecting and error correcting codes are available. Both sending and receiving ends are must agree to use any one code.
- Flow control: This property leads to mechanisms for disassembling, transmitting and then reassembling messages.
- Multiplexing & Demultiplexing: These two are must for improving the n/w system.
- Routing: When there are multiple paths between source and destination, a route must be chosen

Comparison of OSI and TCP/IP Reference Model

Now it's time to compare both the reference model that we have learned till now. Let's start by addressing the similarities that both of these models have.

Following are some **similarities** between OSI Reference Model and TCP/IP Reference Model.

- Both have layered architecture.
- Layers provide similar functionalities.
- Both are protocol stack.
- Both are reference models.

Difference between OSI and TCP/IP Reference Model

Following are some major differences between OSI Reference Model and TCP/IP Reference Model, with diagrammatic comparison below.

OSI(Open System Interconnection)	TCP/IP(Transmission Control Protocol / Internet Protocol)
1. OSI is a generic, protocol independent standard, acting as a communication gateway between the network and end user.	1. TCP/IP model is based on standard protocols around which the Internet has developed. It is a communication protocol, which allows connection of hosts over a network.
2. In OSI model the transport layer guarantees the delivery of packets.	2. In TCP/IP model the transport layer does not guarantees delivery of packets. Still the TCP/IP model is more reliable.
3. Follows horizontal approach.	3. Follows vertical approach.
4. OSI model has a separate Presentation layer and Session layer.	4. TCP/IP does not have a separate Presentation layer or Session layer.
5. Transport Layer is Connection Oriented.	5. Transport Layer is both Connection Oriented and Connection less.
6. Network Layer is both Connection Oriented and Connection less.	6. Network Layer is Connection less.
7. OSI is a reference model around which the networks are built. Generally it is used as a guidance tool.	7. TCP/IP model is, in a way implementation of the OSI model.

8. Network layer of OSI model provides both connection oriented and connectionless service.	8. The Network layer in TCP/IP model provides connectionless service.
9. OSI model has a problem of fitting the protocols into the model.	9. TCP/IP model does not fit any protocol
10. Protocols are hidden in OSI model and are easily replaced as the technology changes.	10. In TCP/IP replacing protocol is not easy.
11. OSI model defines services, interfaces and protocols very clearly and makes clear distinction between them. It is protocol independent.	11. In TCP/IP, services, interfaces and protocols are not clearly separated. It is also protocol dependent.
12. It has 7 layers	12. It has 4 layers

Key Differences between TCP/IP and OSI Model

1. TCP/IP is a client-server model, i.e. when the client requests for service it is provided by the server. Whereas, OSI is a conceptual model.
2. TCP/IP is a standard protocol used for every network including the Internet, whereas, OSI is not a protocol but a reference model used for understanding and designing the system architecture.
3. TCP/IP is a four layered model, whereas, OSI has seven layers.
4. TCP/IP follows Vertical approach. On the other hand, OSI Model supports Horizontal approach.
5. TCP/IP is Tangible, whereas, OSI is not.
6. TCP/IP follows top to bottom approach, whereas, OSI Model follows a bottom-up approach.

Connection Oriented and Connectionless Services

These are the two services given by the layers to layers above them. These services are:

1. Connection Oriented Service
2. Connectionless Services

Connection Oriented Services

There is a sequence of operation to be followed by the users of connection oriented service. These are:

1. Connection is established.
2. Information is sent.
3. Connection is released.

In connection oriented service we have to establish a connection before starting the communication. When connection is established, we send the message or the information and then we release the connection.

Connection oriented service is more reliable than connectionless service. We can send the message in connection oriented service if there is an error at the receivers end. Example of connection oriented is TCP (Transmission Control Protocol) protocol.

Connection Less Services

It is similar to the postal services, as it carries the full address where the message (letter) is to be carried. Each message is routed independently from source to destination. The order of message sent can be different from the order received.

In connectionless the data is transferred in one direction from source to destination without checking that destination is still there or not or if it prepared to accept the message. Authentication is not needed in this. Example of Connectionless service is UDP (User Datagram Protocol) protocol.

Difference: Connection oriented and Connectionless service

1. In connection oriented service authentication is needed, while connectionless service does not need any authentication.
2. Connection oriented protocol makes a connection and checks whether message is received or not and sends again if an error occurs, while connectionless service protocol does not guarantees a message delivery.
3. Connection oriented service is more reliable than connectionless service.
4. Connection oriented service interface is stream based and connectionless is message based.

Key Differences Between Connection-oriented and Connection-less Services

The points given below explains the difference between connection-oriented and connection-less services:

1. There is a requirement for prior connection for communication in connection-oriented services, in contrast, it is not needed in connection-less services.
2. Reliability is more in connection-oriented as compared to connection-less services.
3. Traffic congestion is greater in connection-less services whereas its occurrence is rare in connection-oriented services.
4. In connection-oriented services order of packets received at the destination is same as sent from the source. On the contrary, the order might change in connection-less services.
5. All packets follow the same path in connection-oriented services while packets follow a random path to reach the destination in connection-less services.
6. Connection-oriented service is appropriate for long and steady communication whereas connection-less service is fit for bursty transmission.
7. In connection-oriented services, sender and receiver are synchronized with each other while it is not the case of connection-less services.
8. Connection-oriented services use circuit switching on the other hand packet switching is used in connection-less services.
9. Bandwidth requirement is higher in Connection-oriented services whereas its low in connection-less services.