

2-05-2020

Mar'18

08

WK 10 (067-299)

OSI Model - TCP/IP Model

Thursday

Feb 2018

12	13	14	15	16	17	18	19	20	21	22	23	24
26	27	28										

OSI Model or TCP/IP model is nothing but a set of rules. It is a set of standards. Now, why we need to follow a set of rules or set of standards in the computer industry!

To understand that we need to learn a little bit about the history of the computer industry. Not long ago, there was a battle between IBM and Digital Equipment Corporation (DEC) for being the leading computer manufacturer. But there was a problem. Both these manufacturers manufactured devices which were not compatible with each other. So, if you have a computer of IBM, then you have to own every device from IBM (Printer, Monitor etc). Similarly if you bought a device from DEC then you had to buy all the accessories and other devices from the same company so that you can actually use it.

Notes

There were many companies which bought equipments from both equipment manufacturers such that the accounts department had IBM computers and

8 devices and the marketing department
 9 had Digital Equipment Corporation computer.
 10 But the problem is they could not
 11 communicate with each other or they
 12 could not even share information with
 13 each other. Now that was not the right way
 14 forward. That was about the time when
 15 international organization for standards
 16 known as ISO ~~is required~~ developed
 17 OSI (Open System ~~Integration~~ Interconnect)
 18 which is more commonly known as
 19 OSI Reference Model. At about the same
 20 time, a competing standard known as
 21 TCP/IP model which was promoted by the
 22 department of defence came into being.

16 The TCP/IP model is more
 17 like a stripped down version of the
 18 OSI Model and because it was
 19 more relevant and become the
 20 industry standard.

Notes
 21 Every office has different
 22 employees and employee levels. So you
 might have a CEO, you might have a
 Senior office staff, you might have a
 payroll manager, an account manager,

Mar'18

10

WK 10 (069-296)

Saturday

	M	T	W	T	F	S	S	M	T	W	T	F	S
							1	2	3	4	5	6	7
							8	9	10	11	12	13	14
Feb 2018							15	16	17	18	19	20	21
							22	23	24	25	26	27	28

Apr 2018

8 maintenance manager, you have
9 maintenance staff, you have junior
10 office staff, and you have different
11 staffs. The reason every companies
12 have different employees with different
13 designations, is because all those people
14 have different roles and responsibilities
15 so, when you know that something is
16 not done, or some task is not
17 accomplished, you know who is responsible.
18 For instance if salary is not credited,
19 then you know the responsibility has to
20 be with the payroll manager, whether
21 the bank is involved or not... that is

Mar'18

11

WK 10 (070-295)

Sunday

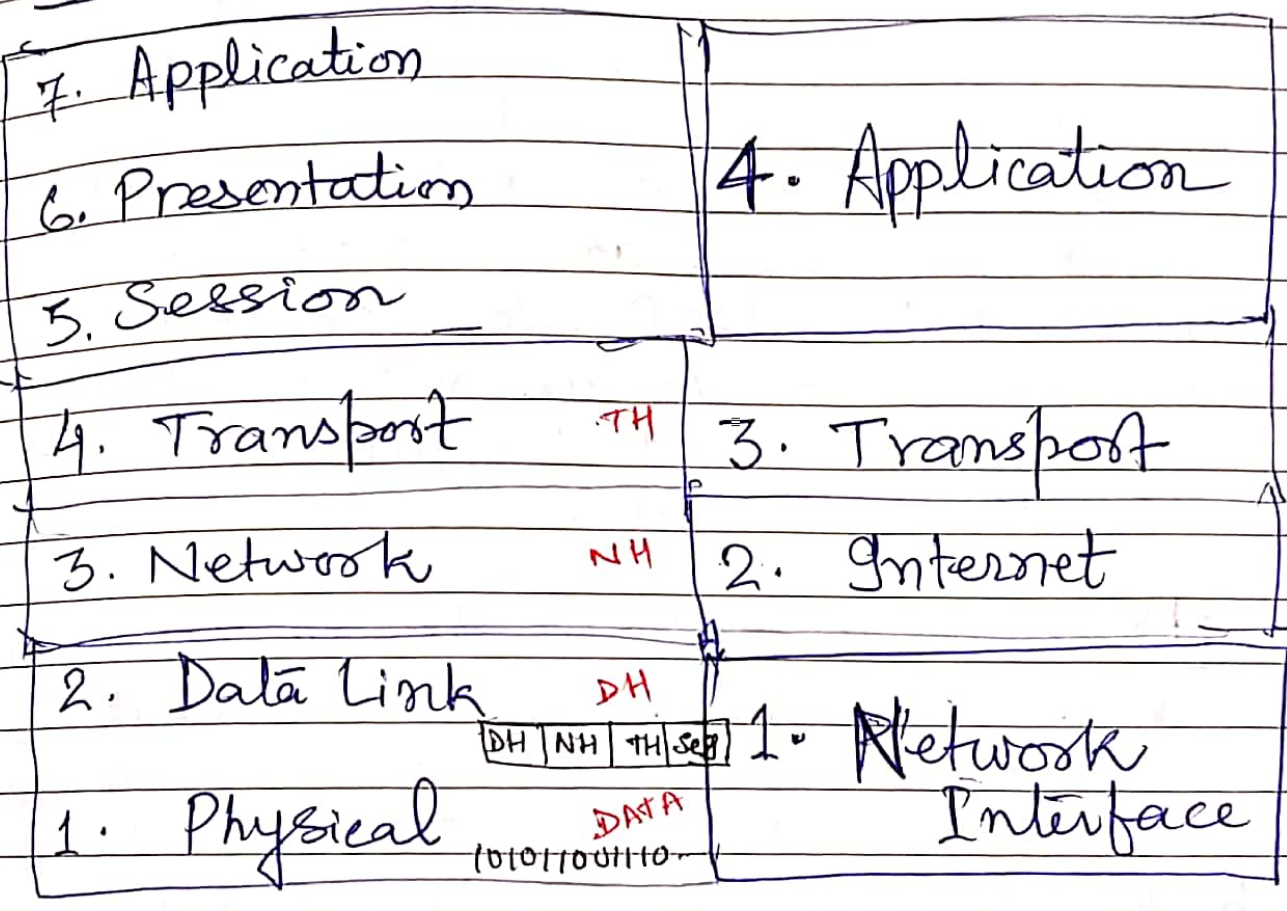
Secondary, but the payroll manager
is your first point of contact.

Similarly, we learn about
the OSI Model and the TCP/IP model
because in learning about computer
network, or tomorrow when we will
trouble in computer networks, we
need to know what works at
Notes What layer. So if something is
not working, instead of troubleshoot-
ing all the equipments, we know
exactly where the problem is!

That is why we have a layer approach.

OSI Model

TCP/IP Model



→ Application layer is point of contact for all Network Aware applications. All the applications on your computer resides on this application layer, which is not true. Application layer firstly deals with only application that is network aware and secondly

Mar'18

13

WK 11 (072-293)

Tuesday

M	T	W	T	F	S	S	M	T	W	T	F	S	S
			1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22	23	24	25
26	27	28											

all the applications on your computer has nothing do with the application layer if they do not communicate on the network. So, if an application communicates with the networks, that is the only time the application layer is invoked. Some of the protocols that work at this layer are - FTP, TFTP, SNMP, DNS, HTTP etc. So you can just visit google and get the entire list of all the protocols that work at this layer.

→ Presentation Layer: It is the layer which generalizes data. That means, it is the layer which takes the data coming out of sessions layer on the way back, converts it into presentable form and gives it to the application layer.

So, if you have raw data coming from sessions layer, to the presentation layer, this is where data is converted. So, if it is an image, it creates an image. If it's a word document, it creates a document. So, presentation layer is where all data conversion happens.

Also all encryption services like TLS, SSL all that are taken care of at this layer.

Session Layer :- Sessions layer is the layer which creates and maintains session. When I say that, let's assume your computer has two applications. You have your telnet program and you have your web browsing application, maybe internet explorer. Now both of these applications are accessing the network. So, this layer is the layer that create two different sessions and maintains them. So, when your web browser session is terminated, your telnet session will also not get terminated because they are separate sessions. So it maintains different sessions.

Layers NO 5, 6, 7 are taken care of by the Operating System.

But layer 4, 3, 2, 1 is where as a network engineer, you have to know exactly how they work.

Mar'18

Transport Layer

15

WK 11 (074-291)

Thursday

M	T	W	T	F	S	S	M	T	W	T	F	S	S
			1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22	23	24	25
26	27	28											

Transport layer is also one of the critical layers for a network engineer. When the information coming from the upper layers comes to the transport layers, transport layer breaks them into manageable segments. Each segment, the transport layer adds its own header to create encapsulation.

Two critical decision taken by Transport layer is -

- 1) Whether to use Reliable Communication or Unreliable Communication.
- 2) Create Port Numbers.

When applications need reliable communication, they use TCP which is nothing but Transmission Control Protocol. If it wants unreliable communication, it uses UDP, which is User Datagram Protocol.

Reliable communication has an acknowledgement on completion whereas unreliable communication has no acknowledgement for any segment transmission.

So, unreliable is actually faster because of the less overhead. So if the application is real-time, they will use UDP, because it is faster. ~~and it is~~.

So, most of the time, if you have tried watching an online transmission or a live feed, these are times when we see those green pixels on the screen. This is nothing but the information for that pixel has not been received and the receiving device has no way of telling the sending device that did not receive that pixel. Similarly another function that is taken care by the transport layer is to create port numbers. Port Number is a number that is attached with the IP Address, to identify which application from

Notes Where this information is coming from. The transport layer creates a random port source port number and attaches the port number for the destination.

Mar'18

17

WK 11 (076-289)

Saturday

Feb' 2018

M T W T F S S M T W T F S
1 2 3 4 5 6 7 8 9
12 13 14 15 16 17 18 19 20 21 22 23 24
26 27 28

8 So, if your traffic is going to
9 a web server, the web server has a
10 standard port number of 80. So,
11 if you are going to an IP Address
12 of 10.10.10.10 for instance as
13 an example, it takes 10.10.10.10
14 and adds a port number 80. So, it
15 creates a socket. Socket is
16 nothing but an IP Address and
17 port number. It creates a socket
18 and sends down to the network
19 layer. It also adds a source
20 port number. Why does it require
21 source port number?

Mar'18

18

WK 11 (077-288)

Sunday

22 the reason is because
23 if there are 2 applications running
24 on your computer and it is going
25 to the same IP address, when the
26 reply comes back, the transport
27 layer ~~comes~~ needs to know
28 which data goes to which application
29 And it will identify that by

Notes

Apr 2018
8 actually having our source port number. Next we have

9 Network Layer → When the network layer gets a segment from the transport layer, it adds a network layer header. When a network layer header is added, that information is called as a Packet. So one of the critical functions of the network layer is of IP Addressing or also called logical addressing. We will learn IP addressing in next unit.

14 → Data Link Layer → When the packet comes from the Network Layer to the data link layer, the data link layer will add data link header to it. And that information is called a Frame. The data link layer is responsible for MAC Addressing. MAC represents Media Access Control and it is a hardware address. Every network interface card of your computer has its own MAC address. MAC address is also known as Burn-In-Address and it is a address that cannot be changed. There are ways of spoofing the address, but it cannot be changed physically. This is also a layer

Mar'18

20

WK 12 (079-286)

Tuesday

Feb' 2018
M T W T F S S M T W T F S
1 2 3 4 5 6 7 8
12 13 14 15 16 17 18 19 20 21 22 23 24
26 27 28

where Error checking happens.

8 So, when information coming from
9 the physical layer to the data link
10 layer, the data link layer has the
11 ability to check if there were
12 errors that were induced during
13 transmission. So, it could use
14 Cyclic Redundancy Check (CRC) or
15 it could use Parity Check or
16 any other error checking mechanism
17 that Data Link Layer uses to
18 check for errors.

→ Physical Layer:— Physical layer is
14 where the actually data transfer
15 happens. This is the layer that deals
16 with wires, cables and hardware
17 ports/connectors and all similar
18 things that happen at this layer.