SEER AKADEMI
Linux Networking- Lecture 1

Hi everyone, welcome to the Linux and the programming basics class today we will continue to the next section this is the Linux networking calling it lecture one but recall this is lecture number five we just finished the Linux basics ,where we introduced the concept of Linux how Linux developed over time ,we also talked about the various parts of the Linux kernel shell in the file system.

And then when we went through several commands for starting some basic commands like Ls,ce and a thing that when we moved on to more esoteric commands and we also like had some fun exercises to see how these commands can work together, so today again.

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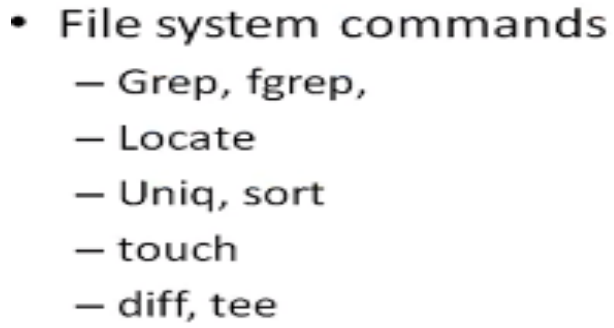

We continue finish off that section with a couple of things that are remaining so these are the things that is already like the PI system commands Grep ,fgrep, locate uniq ,sort touch etc so today we will finish up this section there were few commands that when we just talk about those events and then we will start the Linux networking piece of the lecture, so without wasting much time.

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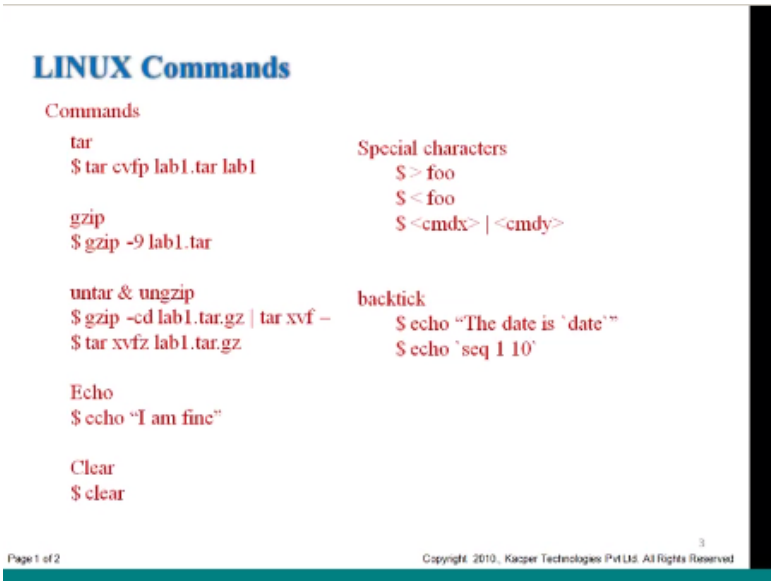

Let us begin so some more commands so these are some of the key commands to slightly advanced commands than what we saw before the first command is tar it is the short form or to archive so essentially tar is used to archive a directory structure so assume that you have a directory a under that there are some files B and C and then another direction D and then the D contains C and F and then maybe like G as an under the directory structure this entire directory structure is there and then the archive et1 archive flat 5.

So the tar command actually combines all these it goes down the parenting collect all these files and put them all together in a single file so that way it is the easy to actually transfer this file and then once, we extract this archive then we can get back the all the file itself and usually this tar archives all the files in the archive format actually like.

I mean the it is a glyph format independent so whatever the format is there underneath thing it puts them in that order so here is one example this is essentially let are CB FP and then in turn multiple files and then we do not put together in one and here the destination is given first in the argument.

So a lab on Hr. is the distinction and then the lab one can be the entire directory or just can be a single file which one that you want to and then we want to actually extract this file we just replace the C with X here the this command you can actually go to man pages and man tar and then look at what these options are but it is a two day straight covered. I think we will stand or verbose ,I think again I will ,I would like you to actually explore this a little bit more.

So again the command is tar it stands for to archive and then you basically give the destination first and then you specify which files or which folders that you want to okay again here you can actually do multiple files and then if you want all of them to I want to explore this I want you to

focus this particular the other command that we will use this the grip, this is actually for compressing a file so typically a file as it could be some of these files can run into multiple gigabytes of information.
But sometimes these files will have more form empty holes or it could be encrypted and made it much tinier ,so these are this compressing utility which compresses the file and again. I want you to do a man to find out what man entry is therefore grip or gzip so one thing is this -9 what is - 9 stand for you can find it out when you do them and easy here we do the man I mean when you because it is it - 9 the lab 1 from this command chart it generates another file called lab 1 of tar that and DV.
The subscript stands for cities with 5 and gzip is definitely a binary file and also you will be able to read it and there are utilities that you can use to open the gzip and read it nowadays like a lot of these utilities are becoming more commonplace to get back this I told you liked Tar - xvf which is shown here you can also do the first thing is what you do is like you do a gzip - CD to get the untoward.
You can also do the there are other commands like done zip D unzip which is essentially unzip the file which is from the compressed file it brings like the larger file and there is nowadays like a shorter route it gzip Z, Z stands for unzip and then entire v so this is another handy command that you can use it or doing your operations then there are few other commands. I am fine essentially echo whatever you put in it just displays back.
So like I mean typical first command that you write in Linux will be echo and then you get in the ports you say hello world and then it echo back that hello world and then the other one is clear which is also an important command which is basically clears the , so that whatever you typed in it goes up and then I am basically this in a blank screen is left point to begin your wall then there are some special characters you already saw this greater than sign and then followed by the filename.
Essentially like when we do the any command and then pipe and rather than a file name in the output of that command, we will go into that file again there are special ways to actually distinguish what is the standard out and what is a standard error you can look it up when you do the math pages for that and then you should be able to see a lot of entry for that and then there is also like a less than that you can use it is essentially the contents of the file now goes into the command and then the pipe one.
That we already saw this agreement that is so in pipe the output of one command into another form using the pipe comment there is also another nifty operator which is the back ticks also

called back tick here you can see that there is this date has a back tick in front of it and then also like and it is a single quote that is or actually it is called a back tick and so then we do this I want to see like what you get as an output this is backtick did you know that echo command actually echoes what always in type of code if you use the back pick what will be the output and then also like.

I mean there is a small programming person for you seek one to ten what do we do on this one essentially like the backtick is used as a command expander essentially what it does is exactly execute whatever following the back take a second, and so since the date is a command will execute the data and mostly produces for goal value of the beta's same thing for sequence one to ten prints the sequence above the number one ten integers, so it is fun to actually do the programming okay.

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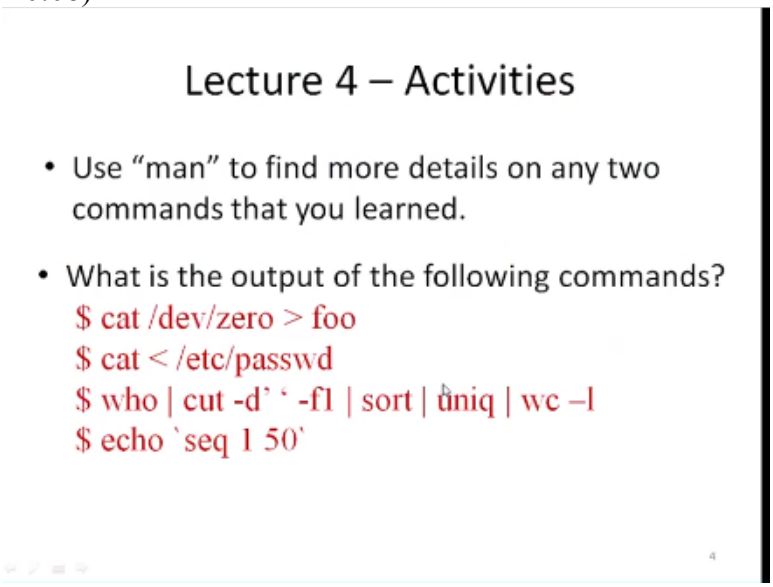

So now let us look at just what the activities are for or this week so again, I want you to use math to find the details on the comment that we mentioned we saw earlier and then I want you to actually explore the mall in the Linux command structure with these following commands I have given this as an example for you can use this and then see what all things that you can get this will also become your lab ,once you start doing this okay so now we start our today's lecture which is essentially the lecture on the next networking.

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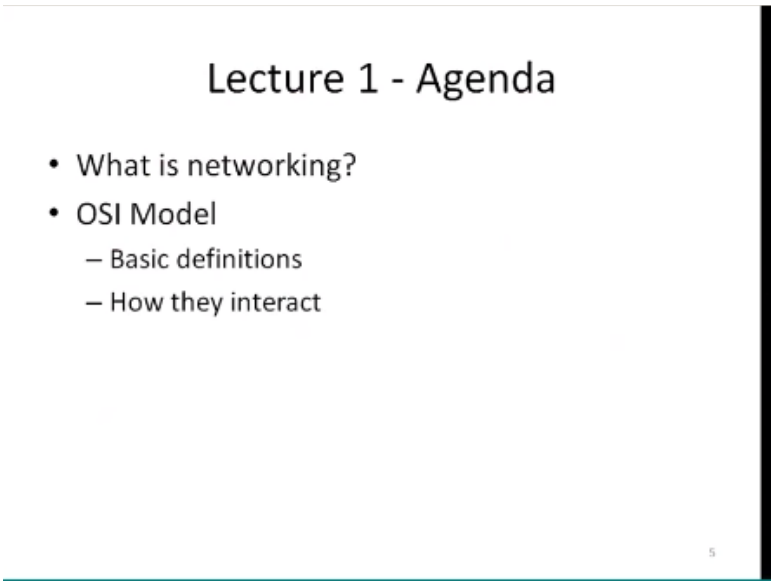

So in today's lecture we will be covering the main ideas what is really networking what does networking mean you saw that Linux is a multitasking multi-user multi CPU system, so the multi CPU and multi-user are key aspects of what networking then we will talk about the OSI model which is one of the key concepts that was developed or networking and in fact there are graduate courses on OSI models so we would not go into like gory details as to like what all the things. You will at least look at the basics as to what exactly it stands for and why is it important in our complex and then we will move to the various other things in the Linux networking area so today we will be mostly like dealing with the OSI model and why is it important for us so how does it make the machines interact that is the one of the key things that we in today let us look at what is networking.

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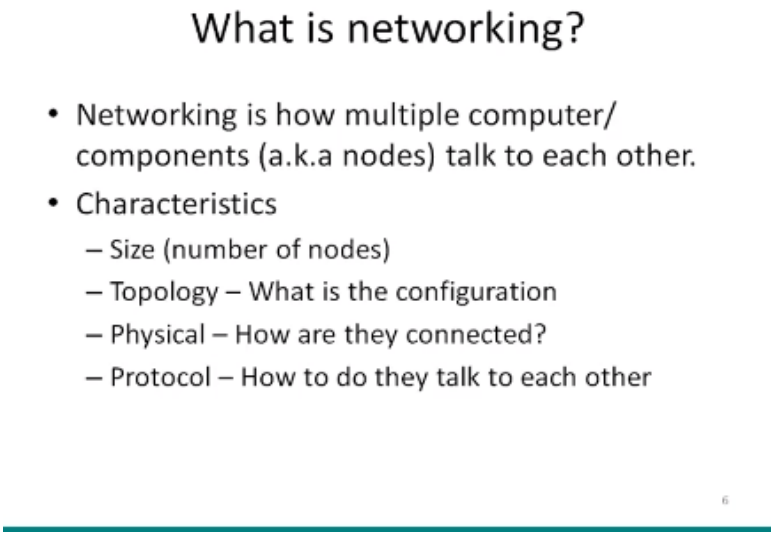

So the classical definition or networking is how computer or components in our now the terminology we will move to this call that moves how they talk to each other that is the key aspects of people, so that is what networking is all about so the so far we saw how a single window single you go out interacts with the next system which is good in the sense that you can still one program, but you cannot interact with other machines other users using Linux so far so today we will break that barrier and actually start talking about.
How we can communicate with other users how other in Newer system how they can communicate your session or you can also see how we can ask every mode machines perform a graph for us which is again crucial for LSF for the load balancer type of application in fact that the entire computer industry built on this networking basis and the basics as you know the today like .I mean most of the browsing that you do makes when you do the various interaction with the various websites.
They are all using the networking principle and these are we will see how we can do that using so before we talk about networking and network itself which is a passive entity there turtle computers are there and they are all interacting that network has two characteristics the few characteristics are number one input time which is essentially you can define it as the number of modes or network so for example, if there are five computers connected or in your university.
You have a you have many computers connected to the central server or any coming computers connected to each other the number of computers becomes the size of the network the second characteristic of a network is a topology here essentially we talk about what is the configuration okay, we know that there are five computers, that are interacting with each other how are they connected are they connected one is this connected to one or one is going to all of them those kind of what kind of configuration.
That is the main aspects that we will talk about the third item in a network is physical which is how are they connected are they connected using copper wires are connected using fiber channel here we will go a little bit deeper not just consider the physical medium but also like what is the speed are they connected on a table so many megahertz or how they are connected so we will talk about that and then finally the protocol is how do they talk to each other so then one wants to talk what does it do or if somebody is talking and how do you import that person.
So again this is you have the rules of conversation very similar to how humans interact with each other so we will see some of these concepts in books like.
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Characteristics

- Size – WAN, LAN
- Topology – Star, ring, point to point, etc
- Physical – Ethernet, Gigabit Ethernet, Fiber Channel, etc
- Protocol – Round robin, token ring, 100BaseT, 10BaseT, HyperTransport

So the characteristics the size is determined by the number of nodes as I mentioned earlier and there are many systems that are prevalent today the LAN or the wide area network LAN or locally are two examples, but there are many such networks are they already available in use today so that is where the size comes into picture what is the topology as I mentioned before one computer is connected to all of them or to the next-door neighbor how do they can go do they connect that is the one are they connected in a hierarchy.

So based on that you can have like a tar connection or ring banishing a point-to-point connection things like that and then hierarchy can see those are all like point to be used upon physical as I mentioned it is the medium by which the computers are connected to each other and today we have several such medium one is the internet the other one is a gigabit internet fiber channel these are all like characterized as various speeds so that you have you can establish the connectivity in fact.

I should add here that even Wi-Fi also can be considered as a physical connection which is what is the characteristic of connecting wirelessly and though there is more the medium is actually there this enables ,you to phone and finally, the protocol there are many types of protocol the earliest one is the round robin then you can bring the round robin is essentially every computer is connected in the big circle and each one gets specified time for communicating.

So essentially I communicate or by 100 milliseconds and then pass the command to the next forum or the next one implicitly it will take over so every say like ten computers are planted in this form of work every computer gets just 100 milliseconds so by one second you cover all the , so every second the computers get to connect get to talk you can see like how inefficient system

can be because if somebody does not want to talk still he will hold up for 100 milliseconds before he pass it on.
I mean before the temple goes in person then they were token ring that was developed which is mostly there is a token that gets fast if you want to talk so if I want to talk I because the token from whoever has it open if I get the token then .I can talk and then I have when I finish talking I still hold on to the token until the another person asks for it and then in that case I can just posit talking to a person again you did not see that and how inefficient this kind of system could mean so there are the in real terms actually like them.
In 100 days t 10 base T things like that are more propping protocol and then finally the hyper transport this is another protocol there is one point two point six so let us some move on so the next one so now that we understand what the network is now how do we make them so one of the significant achievement.
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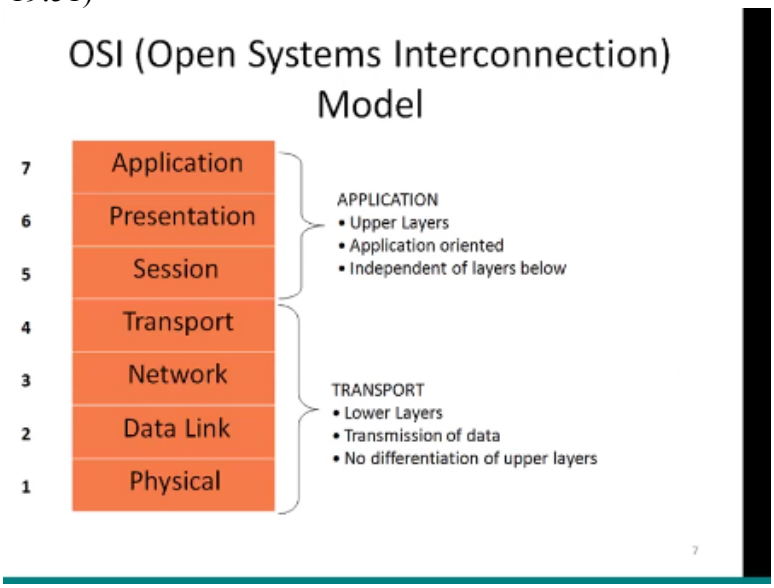

In the 18th is the development of this open systems interconnection model to enable how computers can talk to each other until this time like. I mean all the communication used to be very every company had its own rules and every computer use community in its own base but this open systems interconnection model pretty much standardized how the computers need to connect and this helped develop the whole internet itself which is now as you know we cannot live without geometric.
So the open systems interconnection model divided the whole communication framework into seven layers ,so the first layer here is the lowest layer which is physical then there is a layer called data link layer then there is another layer called the network layer and then the transport

layer so these four layers are the lower layers lower layer these are the ones by which the data actually gets transmitted okay, so now the next three layers the session layer presentation layer and the application layer are at the top of the pyramid.
They are more concerned with the semantics of the message which is okay, I am sending a message so the lower four layers are just concerned about how can I get it to another person but the top layer is the one that gives the intelligence to that message, so that it is routed in the proper way so again so if you think about like an human the brains are all in the top the application presentation position layer and then these are all the other sense organs make them make us warm.
So if you just left it to these layers this whole layer will be just walking around aimlessly because we know how to walk but in order to reach a destination we need these three layers so let us look at how these layers are position again as I mentioned the OSI is a big topic there are graduate courses on just this just one aspect of it just explaining all these layers and how they communicate how to build those waves so we would not t go into that gory details we only will limit ourselves to why this is important and how can we use them use it in our networking case and then give this move on.
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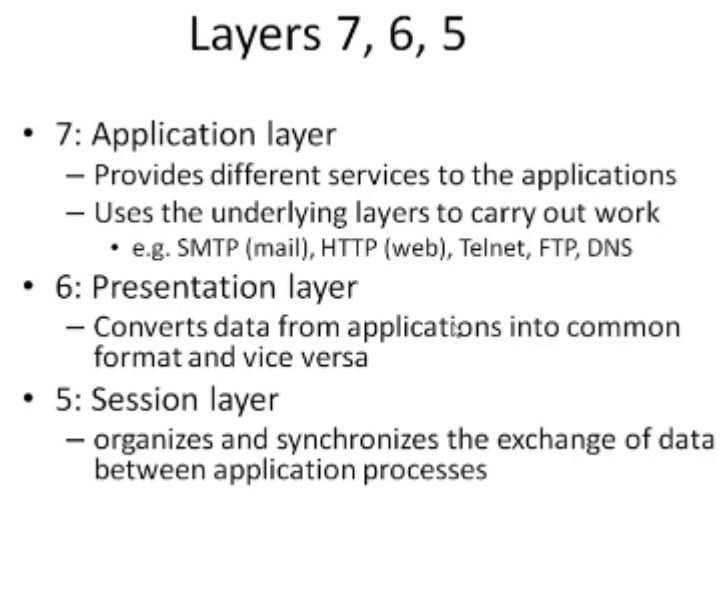

So we look at from now the talk down is we look at the brains and then we are going to more details the lower physical age, so the lay layer seventh and fifth and file then the reason why we combine these three things that I will explain now between later but the application layer provides four different services to publications so this is where that the topmost the all the gory

details are shown. I mean or the gory details are hidden but the actual semantics is shown so it uses the underlying layers to do the work and here the application layer can list.
Your mail program the HTTP which is the website or the telnet and we will study in more details regarding the next two which is the FTP or File Transfer Protocol and then the DNS so this next layer is the presentation layer this converts, the data from application into a common format and vice versa here is when gets the common format data from the down below it converts that into the application.
So that applications can be directly the session layer essentially is the layer that organizes synchronize change of data between application processes again we combine this because one of the team protocol that we will learn which is the IP the internet protocol combines BP these three layers in this one okay
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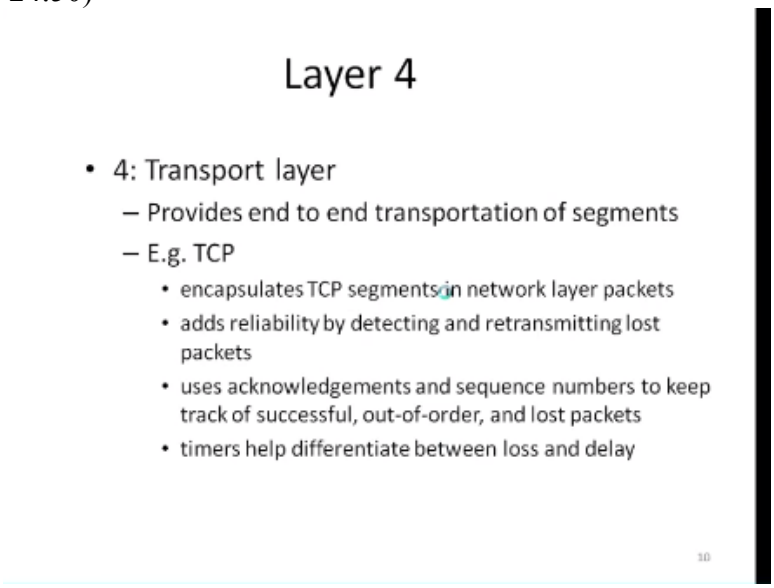

So now let us look at the next layer which is the transport layer this is where the messages are actually being transported and it provides into in transportation of segments, so example here is the TCP which we will browse through now in the next section again this actually this layer encapsulate the TCP segment with what we are the one things to be done in two layer packets and it also adds reliability by detecting and transmitting the last packet so here so whenever a packet gets lost this is the layer that sweetens.
Which that until it gets a message saying that that packet was received by well there was the receiver and then it is use of these acknowledgments and sequence of number and sequence numbers to keep track of successful out of order and lost packets there are timers that are also included in this layer that help differentiate between the log and the delay, so if the timer is

waiting indefinitely you know that actually there is a loss and go there are fixed number of time fixed amount of time of it is how much it will wait before it.
Can declare that something is a lost packet so we have seen like I mean from this one it is more like the real program or command or something that you want service over and now.
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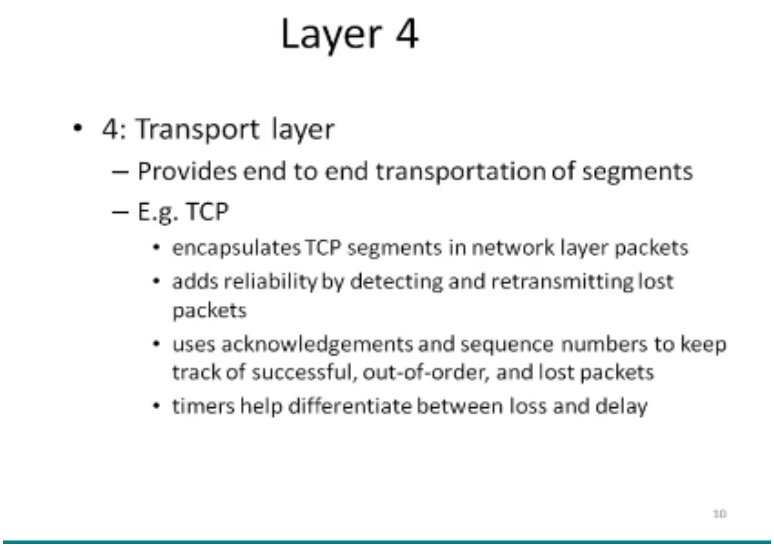

We talked about packets in this slide well we now take that thing take the program from this slide break that into small pieces and then we try to send it to whoever wants to service that particular program or so this request so now when we go into the next layer they are much more granular so we will go into that.
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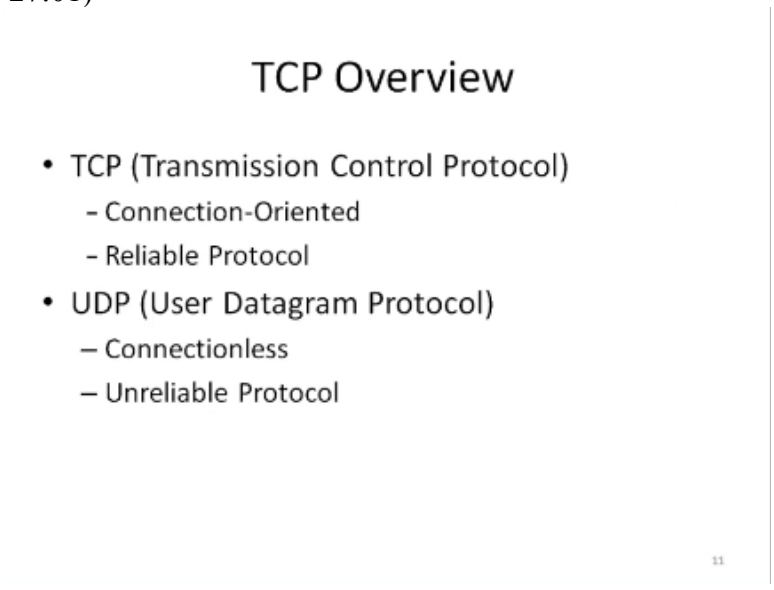

So before that ,I would just wanted to say couple of words so I gave you the example in layer four that it is TCP and the example which is it stand for transmission control protocol this is a

connection-oriented protocol there is also another one that is prevalent which is the user Datagram protocol which is more like connectionless protocol and but this is little bit unreliable so I just wanted to want you to know these terminologies because in future you will be using these terminologies or somebody mean of devotees.

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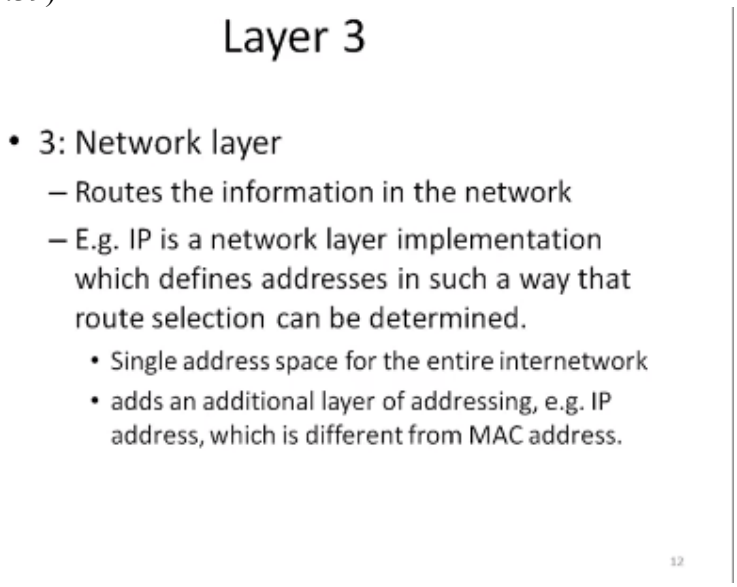

So now let us go to the next layer up to the layer 3 layer 3 is essentially it is the network layer this is the layer that route the information within the network so this mainly deals with all the address places addresses so essentially IP is an input layer implementation and it defines the addresses in such a way that the route selection can be determined so we will look at what is an IP address and how to do how to actually assign an echo or how the IP addresses are today.

And then again the it uses a single address space for the entire internet work it adds an additional layer of struggling so this is different from the MAC address that we know.

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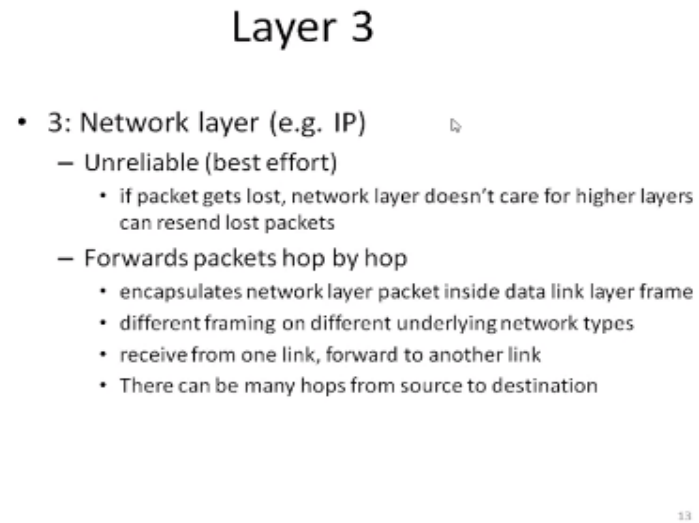

So here essentially like I mean or unreliable networks essentially like I mean if the packet gets lost the network layer that will care for Iolaus and since the higher layers actually can recent back so this layer is not really that the intelligence is already lost when you come home and then basically like it powers rackets up by hop so again as we know that if you want if you have like many computers connected and from one computer you can actually walk through multiple computers then reach the final destination we will see like how this is done in mobile charge in L.

And apply but I just wanted to give you the introduction on this and also it makes the routing decision as to how can a packet be sent closer to its destination, so all the time it is looking at the above and comparing the verities and where is the destination and see what will be the next hop point that is needs throughout and then if it floats at that point that is that will make it closer to the destination or it is going to be far away from based on that it transmits that pocket and so essentially like.

I mean you have these four since I talked about all these things like I mean so there are forwarding tables and the routing table and that kind of knows that space its nearest neighbors wants to look cool they are what is their address things like that so based on that it can actually like now send these packets all out again, the routers can talk to each other they exchange information about the network topology.

So if the another router which is having this table routing table it can actually share the table with this computer so the 32 know what is the surrounding natural of that particular.

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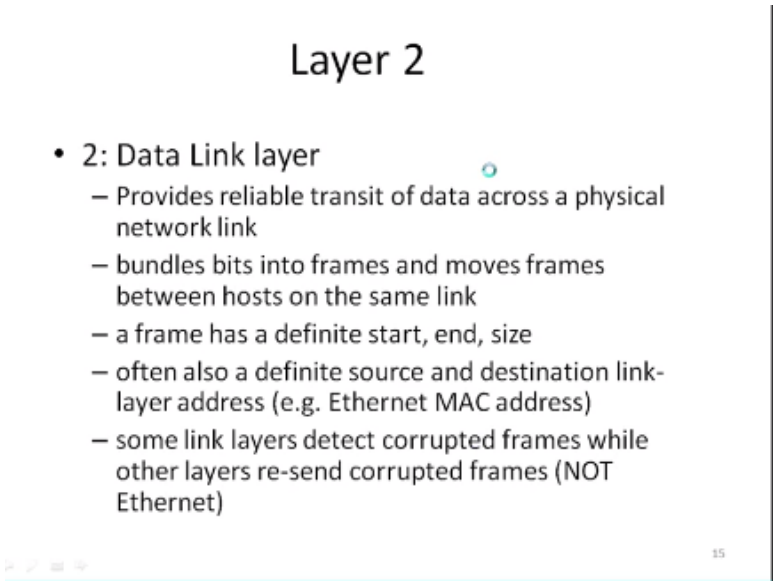

So now let us look at the data link layer here the intelligence is completely lost so we started with the packet information our actually the actual message then we split into packets then the previous layer the network layer was only concerned with where to set it now when we go into data link layer even like we are losing that intelligence also here the data link layer is only responsible to provide reliable transmit of data across.

The physical network it bundles bits into frames and moves frames between the holes on the same thing and the key characteristic of the frame is it has a business start and end and the size, so the receiving computer can determine from the looking at the header of the frame it can determine when the message will end and it also has a definite source and the destination link layer addresses so this is the Internet MAC address of the computers simply.

So again once the network layer decides of this is where I am going to go so then it knows that exactly okay .I am receiving it from this computer things like that so it is it is a care addressing is already specified and then the link layers detect corrected frames and some of them also can resend so some of the upper level tasks can be done at the lower level also this is the things are evolving so you will see more of that and finally the physical layer.

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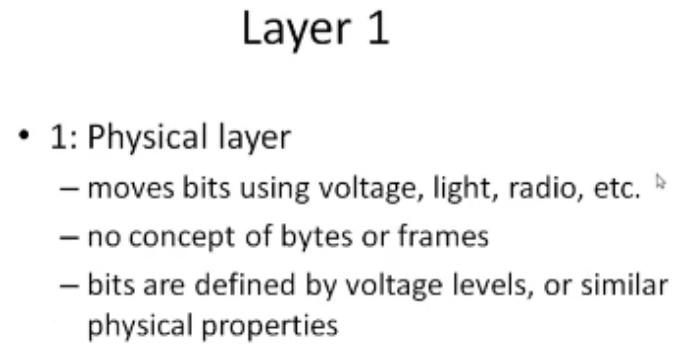

Which is essentially the actual connection info and here it moves the bits using voltages so we do not even talk about the bits and the bikes these are all like just the real communication channels , so one of the examples modern-day example is service of the sterilizer be single sterilizer essentially like. I mean there we do not worry about okay what is the address that it is going is it going in the right direction things like that here we just move one bit from one point to new to the other and that uses just the voltage.

So here we look at the eye opening baby's other characteristics so that the RF interference is there or not things like that that is all we worried at this level, so again there is no concept of bytes or frames the bits are defined by this voltage level very similar to so this is their the VLSI designers really contribute in the sense of our knowledge about how things transmit through a copper or any other wheel or fiber.

So again so now we understood the various layers now let us put together and see like I mean how we can make you both this as I mentioned the distinction between.

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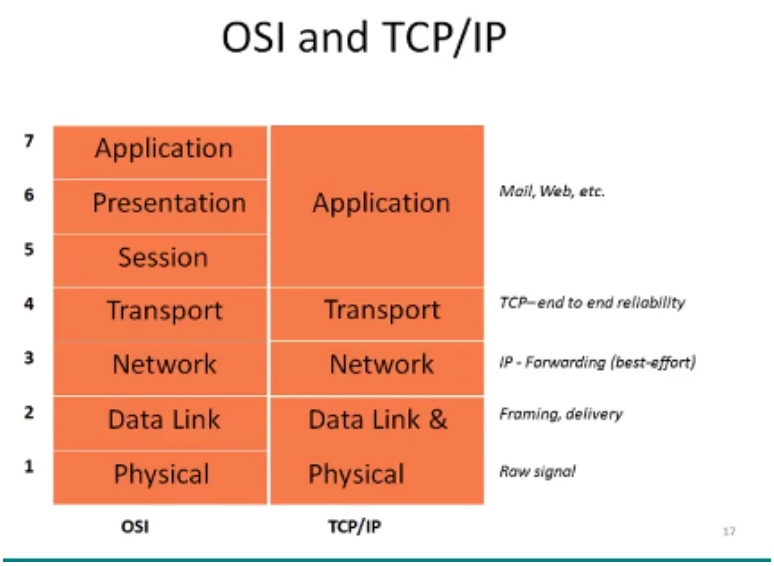

The tcp/ip and OSI protocol is the top three layers are combined or the tcp/ip which is essentially like what we will be dealing with Linux Network inside the OSI is more like a generalized for policy specifying it is distribution so the tcp/ip is pretty much the implementation for Linux and then again just a recap is the application layer provides for the main application support the applications can be like main the web or HTTP etc, transport layer this is basically the TCP end-to-end reliability that is the main reason or main use of this layer.

The network is essentially like it is basically like the IP forwarding essentially it looks at the particular packet and its address and it forwards to the neighbor using a best-effort algorithm so you can think of this as what is there working people and what is the forward table elf it and then based on that it to the forward ,and then once that it decides like that put it in the data link layer takes over and that helps in framing the message and then the delivery of the movie itself to the distribution and it uses the physical layer or actually the wires.

To send it and again here there will be like other protocols that will take over as to whether how to clock the system, let us just send the clock along with the data or separately or is it a serial data first type of communication there are several things expose II and well nowadays it call like the studies basically it is ethereal data more goes on so those are the things that that are done in the digital.

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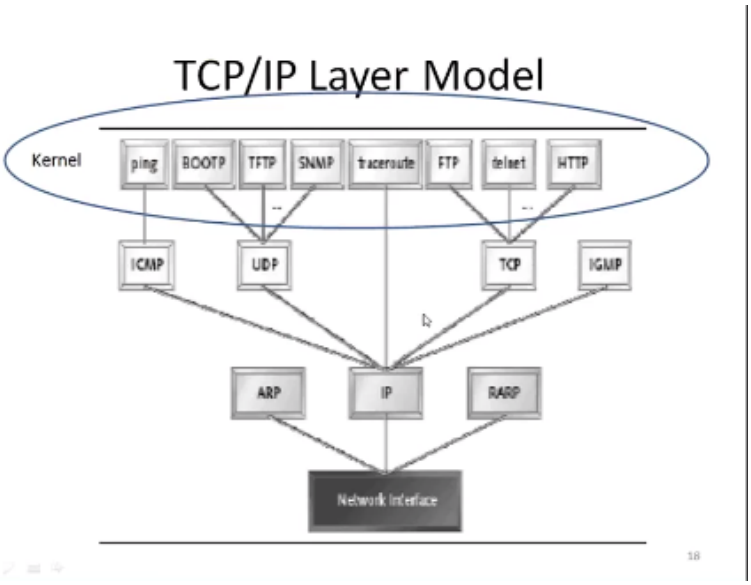

So here is how it is important for our Linux application ,so the application layer is where the kernel resides in and kernel also uses some of these concepts basically making them because all the wind cortical and that is actually sent to the network interface, which is then is a physical interface to the subsequent and if you look at it this kind of this model helps us to isolate some of the various areas for example, if the we are using Wi-Fi or our fiber channel or any other the wire line communication those are all like isolated from the top.

Because only the network interface is going to change, so this helps us to actually reuse all the programs that we are writing all the protocols all the intelligence building up front - still reuse and gain benefits even then the lower level lower layers changes to some other things again same thing like. I mean if you consider any layer that those layers can be changed independently of the other layers and that is one of the key benefits of this model.

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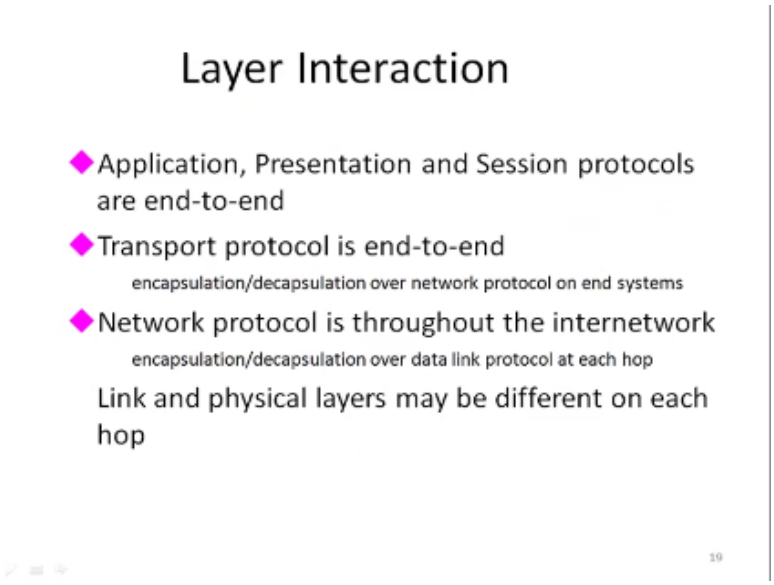

So let us look at the layer interaction. Because this is one of the things that we want to just browse through it and then we can move on again then when we start doing the communication the topmost layer essentially or essentially like .I mean those are valid end-to-end what that means is when we start a communication we start at this layers and then the receiver wherever this application gets executed they also see all the way up to stop this the transport protocol could be n 2 n.

The network protocol is throughout the internet work itself and then basically like having the link and the physical layer will be different on the top so you can on one table you can use Wi-Fi wire line things like that so this can be so now.

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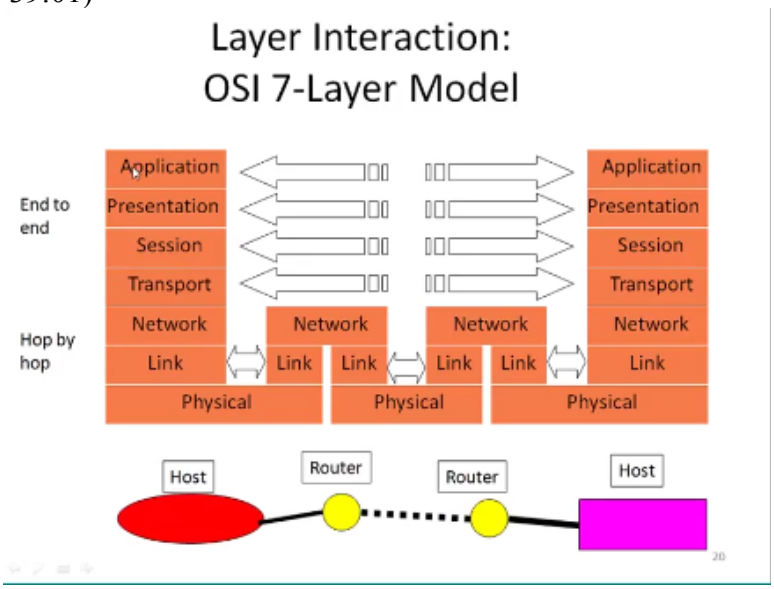

Let us see all this is done so here is an OSI interaction which is essentially with the top layer so and the application starts that the Co-essentially for process the various translations happen throughout the as the message goes down before layers then finally the physical layer transmission to the next one, and in the next one the message is put together all, the up the network layer there it is seeing that okay this is not my destination something else is the destination.

So again this particular router transmit that message to the next one and in the next router again like a minute it tries to identify whether it needs to provide the service it is not so the message stops at the network view and then it gets routed back and then it goes to the physical layer and finally agree to co-host there now it goes back all the way and then oh it is at service so we can see that actually like this come four layers and n2m and the message the network layer is throughout the internet working.

Whereas this physical layer could be different or different messages and different distinctions so similarly on a PCB essentially like we do not have the session in the presentation layer but working wise it is very much similar to the earlier model where it goes through the physical layer goes up and then the IP layer essentially disciples and says that okay , hey this is not the destination so go to the next hop.

So the next half point of the next clock pixel and this could be like meaning actually of stated in bottom diagram there could be one draw a couple of rotors or many routers are if the host is directly connected to the other hole then you can directly go up also, so it all depends on how your network configuration is we already saw that the characteristics of the network so that is what determines how these communication can happen.

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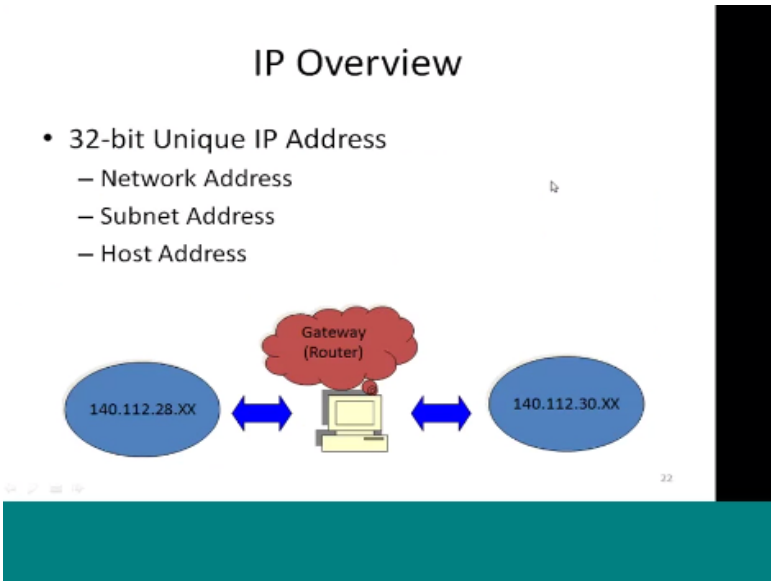

So now we will be going into the IP overview. I just wanted to give some basic overview of the IP addresses so here there are three different things basically make them network address subnet address and the host address then basically read up the numbers that normally encounter like one party dot told 112 dot 28 dot something and then how would that connects to the other ones and then we the Gateway.

Which is essentially what is the router and that translates into or sends it to another one here this host is a 30.8 sec so you can see that the router is kind of anarchical between sitting between these two and how this is done.

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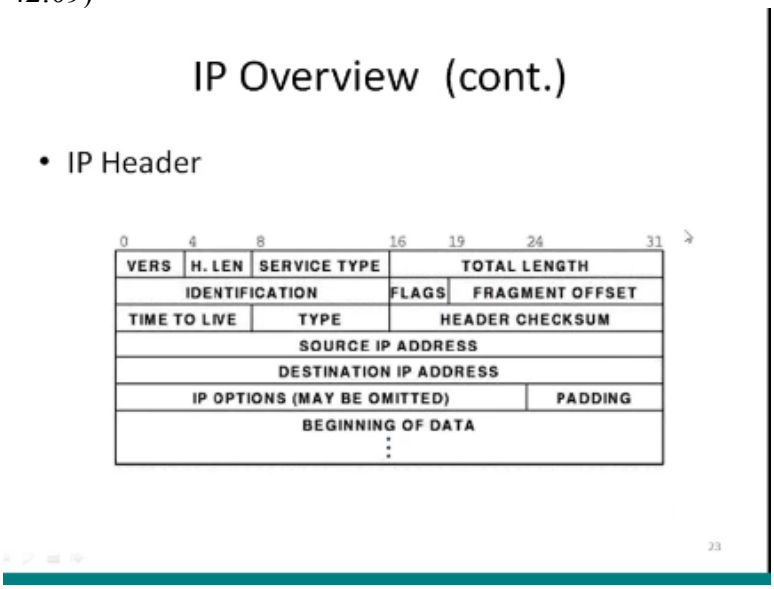

So in the IP header essentially like I mean you have so this is what the consisting of this is what is in the message you have various fields if I then again I do not require you to understand all of

these and in this course the main things that I want you to know or basically the length of them the message because is also encoded and then what is the source IP address and the destination of the edges here we also talked about a time to live essentially like.
I mean this feel make sure that after that particular time it is declared I said last packet basically can be retransmitted so this time is used for to set the timer to enable the timer so that it can see like then it should be transmitted and then there are some identification this and then there is a header section, so you can see that one two three four five six this six 32-bit words are essentially just to set up the communication then after that the data will begin.
So and you can also feel like context ends essentially for the reliable transmission so then the destination encounters this and then basically detection and then it is streams go match then you can discard that and then it waits for the packet and the pocket to be below so there definitely is how to communicate and achieve through these protocols and you can also see that actually like the overhead is this two three four five six times.
32 bits or overhead of this protocol because for every packet that you send you need to send these bits and columns.
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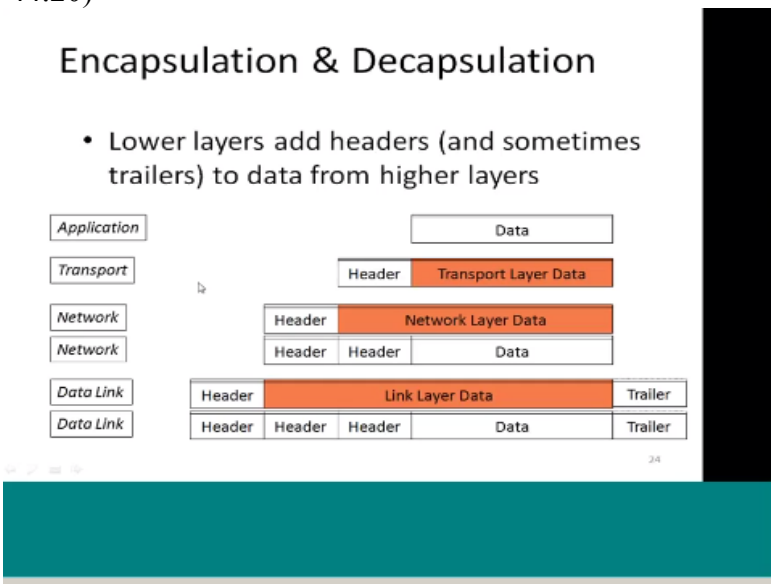

And this actually explains how the communication theory happened so the data the transport layer attaches the better and it converts the data into a transport layer data and then when it goes to the network layer Network layer adds more headers it takes the whole thing the network layer data and then if you look at it actually, it is it has this the transport layer header and then the pita and then the data link layer.
Now as it puts its own header and it also puts a trailer blocks and suddenly you can see that actually like the data is only like so much and all these are overheads for the communication.

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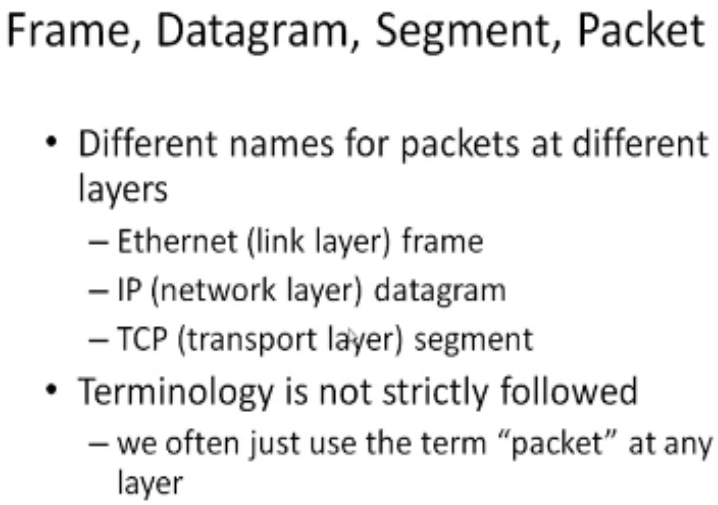

So the I introduce the several terminologies in this lecture the packets essentially are like it is a encapsulated or it is a capsule and message capsule, so let us go back to this picture so the message capsule contains the data and then it contains a little bit more, so you can think of this as a medicine say for example where the main ingredient main active ingredient is with the data and then you put a coating a sugar coating name or using the header and then you have you are actually putting multiple coatings.

Because it is going to go through multiple systems and finally like a top cover to cover the medicine and which is the actual the capsule which oh and that is how you can picture this and then that that is how it goes from these form faces, so in this lecture we use like I mean different name form so if the Internet or the link layer we call it as a frame at the IP layer we can call it as a Datagram and at the TCP layer.

We call it a success so we look at this so here is the link layer the link layer is essentially it now we call it as a frame and then we go into the network layer the IP here and now this is a Datagram which is very similar to a telegram, or something mobile and then at the transport layer it is still called as a segment, so they all refer to the data with various pieces added to it and we will briefly look at how these things are added and then sometimes we just use packet for all these things.

So in the documentation and things like that all these different terminologies we may just use packet so now we go into more details is here.

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Layer 2 - Ethernet frame

Preamble	Dest	Source	Length	Type	Data	CRC
	6 bytes	6 bytes	2 bytes	2 bytes	46 to 1500 bytes	4 bytes

- Destination and source are 48-bit MAC addresses
- Type 0x0800 means that the data portion of the Ethernet frame contains an IP datagram. Type 0x0806 for ARP.

26

So we start with the lowest level which is the Internet or the transport the link layer so in link layer we have a preamble we order in the destination with using a six bytes and then source is also six by the length of the data is given as 2 bytes and then what kind of what is the type of that message which is another 2 bytes and then we transmit, the data the data can vary in size from 46 to 1500 bytes and then there is a NPS which is like a CRC also likely more like an encryption that constitutive of 4 bytes.

So the destination and source are the 48-bit MAC addresses and then the type is essentially given as before numbers so basically like zero 800 means the data portion of the internet frame contains the IP Datagram and then the 806 is for ARP type of so this is that the Internet.

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Layer 3 - IP datagram

Version	IHL	Type of Service	Total Length	
Identification			Flags	Fragment Offset
Time to Live		Protocol	Header Checksum	
Source Address				
Destination Address				
Options				Padding
Data				

- Version = 4
- If no options, IHL = 5
- Source and Destination are 32-bit IP addresses
- Protocol = 6 means data portion contains a TCP segment. Protocol = 17 means UDP.

27

Now when we go into the next higher level, we saw the IP in IP essentially like, I mean now bits are organizing this fashion again you see that actually like I mean this is the things may be small but the data is broken into multiple pieces there here once those the data gets added then it is compiled into this form there we have a version I HL the type of service the total length and then basically some identification.
There are some flags we saw this one the time-to-live protocol header section the source address this museum approve and then some options and padding and finally with that down the six 32-bit or 8 or 4 byte in so far, this is like 24 bytes of get scan it is insane so here the addresses are now different here they are more like the MAC addresses then so here they are like the IP address is small.
So again the MAC addresses just provide a point to point or one hops whereas now the IP addresses will provide us to go from one computer to another computer power then.
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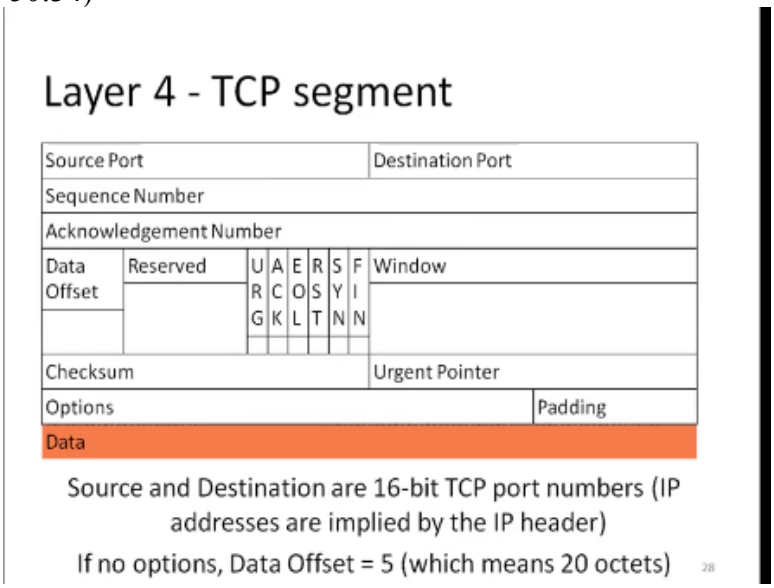

When we go to the next higher layer the TCP there it is even so the way it is here now we are defining what is called ports there is a source port and the destination port and the sequence number and then an acknowledgement number then it has several long flags and then finally like I mean there's a checksum and then finally the data is also sent as with this song in this segment so here the source and the destination are no longer.
The IP addresses now they are the ports so once you know the IP addresses this IP addresses that are already implied by for IP header and we know which for to open on goes like this so we will we will go into more details when we talk about directory services which will be coming in the next term next sections and then the data offset is five which means like there are twenty octet

after that the data. So again there are predefined rules as to how to get the data into the data and things like that.

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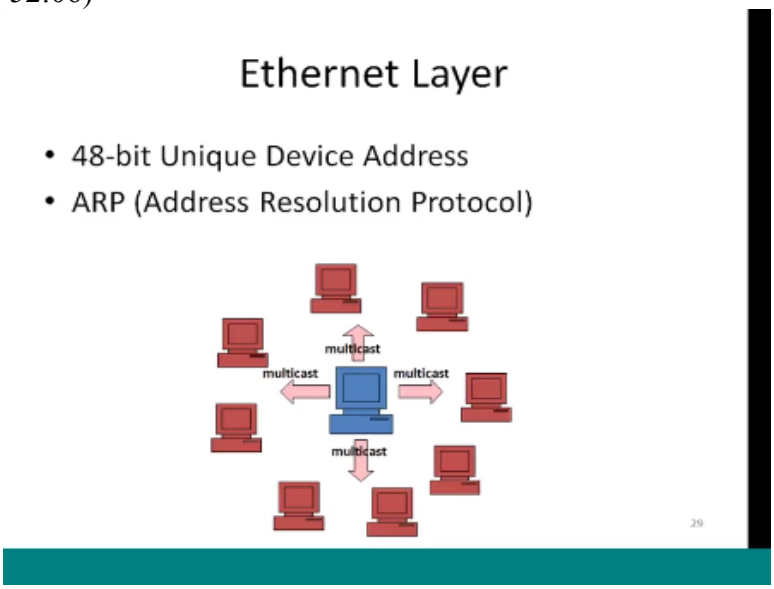

So on the internet layer again basically they are 48 bit unique device addresses are provided for each of them. I encourage you to find the MAC addresses for your own machines and try to find like more kind of command is needed to get to the MAC addresses and basically reduces this we are protocol with a new protocol in order to communicate channel information.

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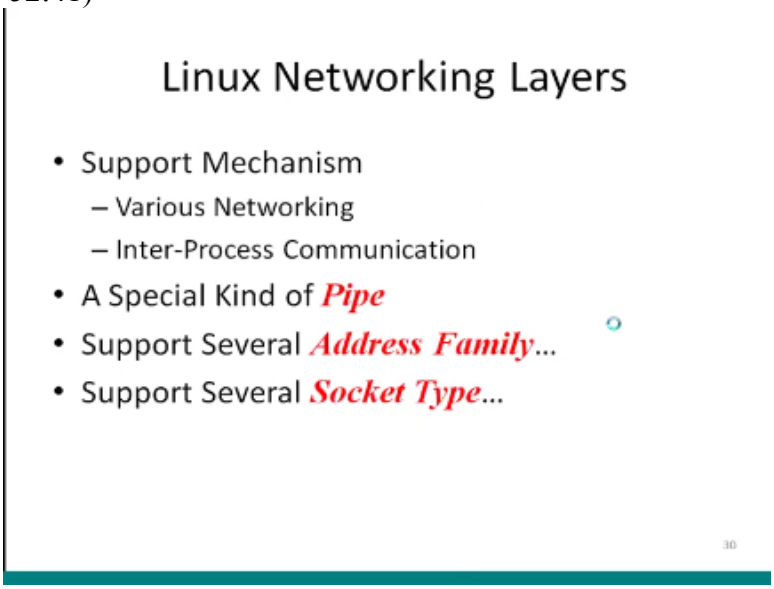

So in the Linux world essentially like. I mean so we saw all these things essentially the networking inter-process communication they kind of they are called the it uses a special kind of pipe on support several address families and support several socket types so the socket is what we will see.

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Addr Family	Description
UNIX	Unix domain sockets
INET	Internet address family support TCP(UDP)/IP
AX25	Amateur radio X25
IPX	Novell IPX
APPLETALK	Appletalk DDP
X25	X25

So here is the basically like the various families that it supports in fact, you can also see that that you go amateur radio for protocol for there with the in the Linux itself but we will limit ourselves. To mostly mobile unit for the main pockets and then.

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Socket Type	Description
Stream	Reliable, Sequenced, Like TCP
Datagram	Unreliable, Not sequenced, Like UDP
Reliable Delivered Messages	Like datagram but reliable
Sequenced Packet	Like Stream but fixed size packet

The sockets are essentially whether it is a screen Datagram and then basically can be a reliable delivered messages or a sequence packet we will just touch upon these things we won't be going more people.

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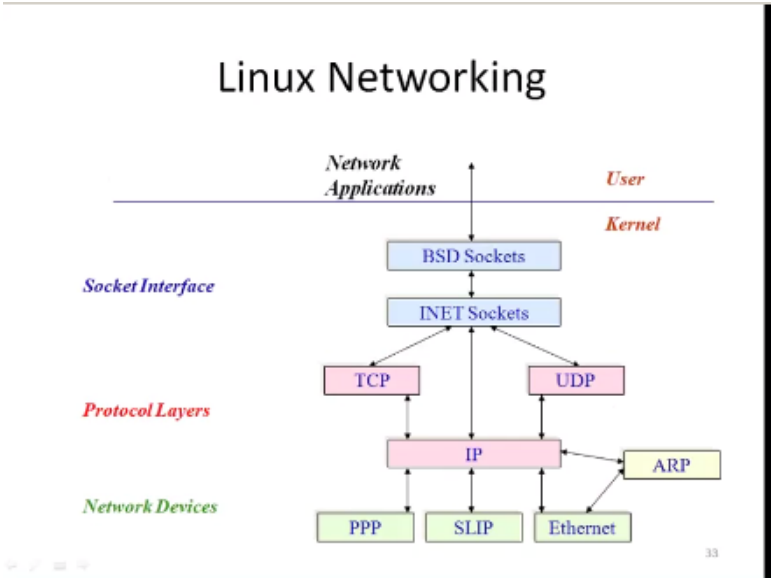

So I just wanted to give you an idea about so we saw from the tcp/ip and the Internet layers below. So they communicate through these sockets to the Linux so then we learnt about this essentially like I mean the these are the next higher layers or which are we have which are on top of the TCP layer itself and which provides the network capability so essentially like I mean the TCP and they open water called the sockets, which are essentially mentioned below and then these sockets are the ones that communicates to the network application from the user side so here also like.

When you can see that the kernel is all the things below and then if they transform to interpretation from power.

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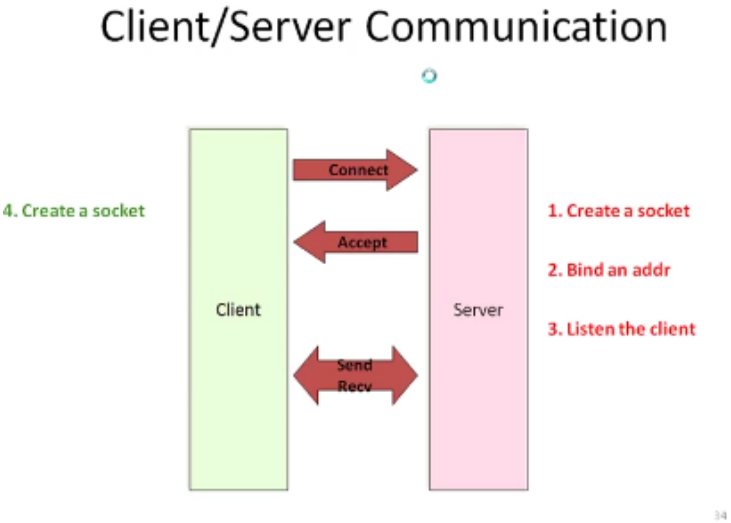

So a simple client-server mechanism is what we will talk about so in a server actually there is a socket that is created we bind an address to the socket and then the server destined for the client also creates a socket and then it connects that socket into to the server and once that connection is to see you then if the server is okay, with the tension then it sends an except signal back to the client and then the client starts sending whatever the message that it would not system.
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So this is a simple Centerville protocol an example of this is the HTTP so again when we make do a Google search essentially like to search something actually the client is making all these some kind of connections to the server and then getting the data out of it and all the things so like now we saw this much essentially, like there it creates a socket and starts communicating that star is starting to communicate here represents all the things that we saw in this diagram below. This portion and also all the things that we learn in all these this tag.
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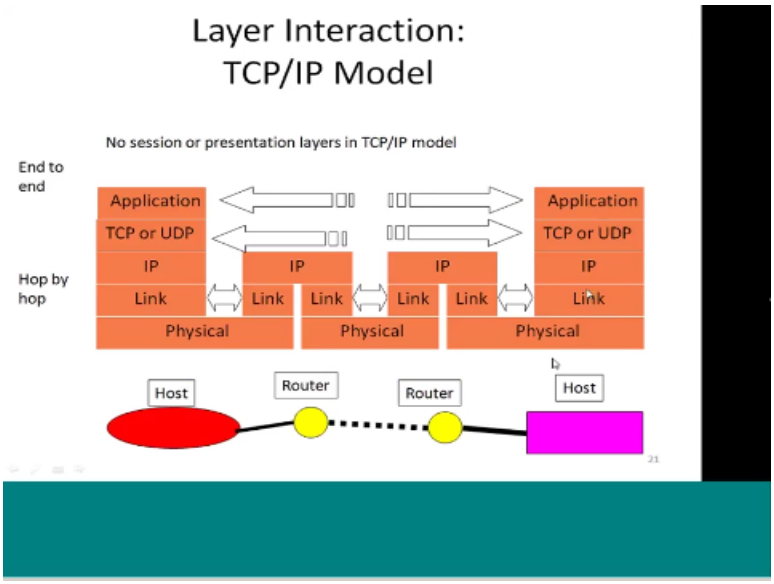

So I hope like I mean now we have a good understanding of what happens when we send a request and how that gets into the Machine and how its communicated so this all goes back to that OSI layer the technician mobile PC TM to protocol let me talk about so there is a lot of things that goes.

In the background we we do not we do not really understand or we do not really want to understand what the fine again it is important from the VLSI designers perspective because all these things ultimately end up in the designers hands and we let designers want to improve these designs and make sure that the communication form always reliable and powerful.

So with that we conclude today's lecture and we will pick up some more of this IP addressing.

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IP Addressing

In the next session and then we will continue other the advanced Linux networking topics demo session thanks.