### Network\_week4\_lec4-1-20240926

说话人1 00:00  
Our last lecture, we already talked about the temple here, basically in the world and the services were provided in this layer. With specifically mentioned one important, the broken particle is how to make a ten gct the party parties, right? In that case, is the how unreliable channel provide reliable service. So we talk about the book again. So now this have review what's each layer was a purpose in a very top layer. We call the occupation layer, right? Another layer as a medical engineer, you can write in the end system. That means we can triple calling the host, means you are a mobile phone, your ipad, et cetera.

In the transport they are in the application. There you have application can push down and participate in many different messages. Right? The message you pick out from the socket. After pick up the socket, that's what we talk about. Access level. The first group, once your message passed through the group, you cannot conquer anymore. That's temple. There. They are into their system. They are often is prepared by your local operating system running in your home. So basically transfer the communication is process to process that, for example, this post you have maybe millions, even billions of different kind of process. So in the application, in the other end, you may look like this flight, or this is is in the peer to peer relations. So each time you say you have a hand shaking, so both sides, the process, the transport, they are basically the process to process communication, then how this message goes through from this side, to this side, through the internet, from this host, to this host.

So that's why once you wanna collect your devices to the internet, you must have ip address. The ip address, in some degree, is represent the host ok so in this case, what's your message from this side to this side? Which process there are too many process? How do you do? First, i'll call the ip address to find the whole is right. Then according your the messaging, the camera part always contain the port number as the nation. This process support the number that go to that process to processing. So when you send from your south side, you're doing more effective, right? From the application, they are going to transform. They are important. Transport they are handle is right. Then from the transport they are go down to, there will be they are you add the there will be a handle and so on.

When you got the destination, you from the bottom, the physical layer and go to legally or network, they are transporter in the end and you go to application layer. In each of these layer, you remove the header part, sometimes we call the d multiplexity. In the ad original message from here. Each time you add more and more after this, you could hear you just remove in the end application. They are you get the original data you expected? We talking about how to do in this. There are two important point. Why is the gcd why is in? Deg is right. Gdp basically, the electricity basically is the connection oriented. 45. That means 1 ~ 1. That means the problem left side, this process. And to write process 11 ~ 11. Here you cannot. Here that. But for utt like, you go to the same http website, the product number is any, in that case, you can multiple process from different a client can share on the same process.

We already mentioned that in our last lecture about the why important, how to do go back in, we will start with very simple example for stop and wait. You send a message for other side. You just take away is right. Give us a reply. If after a certain amount of time, you didn't get a reply. So then you resend the message. In that case, we use the utilization. This metric is a major during this period, how much time proportions are used for your data transmission. So if just a single package, so that's utilization really is quite low. Instead, you can maybe each time you have up to a for example, in that example, will give any importance for you send for packet at the same time. So do not expect the within the the previous packet reply rather than internet you use so called review, then send up to any act package in power line, same time, not the same time in power line first to finish, followed by second and third and 4th.

Okay? So there is several only sense punitive act that means from the very beginning is too far. This all successful is in this moment, you just send this the so called community means to from the very beginning so far, all successful. You send this one. Otherwise, if you have a gift, for example, we will give you an example. So if you have a gap, you always send the community was successful in that circumstance. After a certain ., if particular the packet you set up, you didn't receive the act, maybe your packet on the way to the destination loss, maybe that the nation already, they would send you act acknowledgement, but acknowledge even the loss. In that case, you have time out, maybe reset from there.

Again. In this case, in the outside, as I mentioned, you only did one time off, always recalled the oldest. And the package is, right? So we use one specific example. For example, this each time you have four package, you send out, for example, this package three of this. It's a little bit different. Usually the packet number is the window. You have one and four. So actually, usually we call use k peter to represent our window heavy.

If a equals four, that means 22, that means k equals two. For the very simple example, I gave to you in the very first stop and wait that beta actually is k equals one, the only zero ones, the packet number. But the in practice in here, suppose the original the entire package, entire application, you have many different. A message set up. That's number is a special number increase from 012456, 0 k so in this case, you can obviously say this is not. So this reserve so far, the number is 80.

You get 80, this one, ok one. Now you say this loss, but this bunch, you send four packets. This one received. So if you discard it, because otherwise, the timer always here. So otherwise, you send a take one, you maybe got aa power. This is the 4th target. Why do you put the second one? Because from a very beginning to here, in the receiver side of this, like a point of just here, so far, this is successful. Because from here to here, you have aa gap is right, always use the last successful one. This is what happened. We said if in the course, you have many different kinds of failure. I can give you one specific case, this one, or maybe we have five.

Okay? In this circumstance, this one failure is right. You have two failures. In terms of time, always is here the oldest one. This one is despite the failure. So you just waiting to certain actual time up, time up, ok for example, if this is pk three, that means from pk four at this time, this is pk four, this is pk five. I just use seven, the number on the window ok so in this case, pick a file despite successful the receiver side. So you always want to visit failure. You start from here, this pk four, you need a transform, pk four. You need a descent, pk five. Also, after this, you you can't descend again. That's you be careful about this big transmitter or unpaid a package, whether this sensible or not after this failure, all the risks that you've got to be sent.

That's the go back in. Now we talk about another particle called selective, repeat, some shortcut, the sr using the first character, ok so still why we put together because they are of similarity. So you also use the pipeline way each time you can send up to any package to with receiver receivers and individual act for each package be careful. So in this case, how many timer will require? How many for for is we are assuming is the winner is for. If you have anything. That's right. You have any right. Instead in that time, you always just one, right? Ok so that means you need individual. You have up to any 5 ok for each individual package, sender antenna time for each on an active package. When time expire, we transmit only on his pattern just for each of these type of you, correspondence, one, and anchor packing. So in that case, after this time, after you only to send this unpacking, unhappy the package only.

So in this case, compare is good idea. What's the advantage? You don't have to resent the message successfully. Yeah, you are right. For example, in this case, people take a bug already successful is right. After this failure, no matter, you risk, for example, the very first failure, the risk, a - 1, all n minus one packet successful. You still resent all these in packets that's go back in. But for this 10 ki have to send the first failure. Then I can do that. There is some degree select to repeat the get out of energy, compare output back in. What's the disadvantage? Compare? Go back in. What did you say? March 20. So much power. So you have up to end power, you need a manage. That's absolutely right. This one just one simple. What the orders, what do you say? Orders means the package order. A packet, also another issue you can look at go back in if failure is the receiver side, you do not about the risk, whether successful or not.

But in here, you need a bottle is right. For each of the successful packet, you should put on a bottle, right? Once this bunch everybody finished, collected, then you put next one. So you need extra having. Management are organized in the timer, up to any a timer. You have a platform in the receiver side. You need a man in this, but you go back in, you, you don't need to worry about this at.

So we have this one, then we go to selected one. Okay? Firstly, we can already know receiver individually acknowledgment all correctly received a packet. If the pattern out of order, for example, but this one failure, but this was successful. In that case, the remaining, every successful you should put in aa buffer that everybody collected that would be over in eventually. However, delivery. So up there to the application there, all right. Several times after you transmitted individually and actually active set of mechanics, time for each and the active package. So that's you. Then you can say you have up to any time off, okay? Nearly the sentence of seven. Now we can look at the selective from the center, receiver side. Both sides look at the window. This one, I think, is original. This is supposed for the green already so far in the left hand side already success across that. The second base, the very first one, the start of this currently window after any package, right?

The yellow means you already set up, but you haven't got reply from receiver. So maybe is in the center path is lost. Maybe receiver he developed this package, but the acknowledgment either on the way or acknowledge and message loss. Ok in this window, you can see some is the green means receiver received. And for the acknowledgement center of already received, the blue means in this window. So far, you said to this point of this number of packets. So the here you have six low. That means you can continue online and set the risk the six package. For the receiver ok this is so called base. This next second number means you can send the next packet in current time window. Receiver side is different, is right.

For example, this two yellow means doesn't, you haven't got the acknowledgment yet, but again, from the reserve side, you can say is become green. The reserve will be received these two packets, ok so for here, the yellow set out, but here means the silver base. You can see also, this center base means the very first. You haven't got acknowledgment. The inner receiver side of the base means from their very beginning to so far, the very first packet hasn't received, because the packet number, as I mentioned, in its order, this is the silver side, right?

So that doesn't matter because you can see here this every side depends so far successful. Then you move, I call the sliding window into the window side is in. Right? So here you use sliding window starting point here, and at the point here, but in the reserves, are they already got this? So the study window start from this, where first one the haven't got it up to here. So not necessary is in the same second number, is you you need to be aware of that. Now we can see in terms this particular particle, you need to know what's the law or what's the instruction they should follow ok in terms of center. If this is the available surplus number reserve, that you maybe is affected in the last round, they still on the run away. Haven't the target yet?

So actually that's already passed, actually already received. You may be recent. You do not care. You just say if this segment show number in the target time window, the sliding window, you just set the package. If above or after this one, you do not care. Coming. Up means this particular package you have a potential members, right? So this package you send up waiting a certain amount of time. You didn't got a reply. In that case, you can't be, we send this package again. You you miss that time are always. You send something out. You start talking from that point if that's correct, right? So then we talk about acknowledgment. You got at any from the other side. Right? You need to change this supplier number. We don't need your current time window, as we mentioned, saturdays, the very first package you send up, you still get a reply. So the windows is the end.

So if the end is in this range, means during this time, this slide window, you send a packet, you haven't got to buy it down, but we buy, please be careful in terms of interval which the second number in which if any smallest at target advanced window is to the next one, this is like here.

This is certainly this is right if you interact because this one, so the window of who would rather have a one position and you point into here and this point into here, ok so that in terms, receiver side, receiver side, you got a package that's also receiver base, as I mentioned, in the several base, the previous all of the package has been successfully received.

This very first one you haven't got. So that means from the receiver base, but this slides window, if you here you send ok not human, that's okay. That means you may be up all of a buffer that firstly, you can go to the second environment so that it doesn't matter.

But once the bubble all connect currently the alien character, the successfully that you can go to move be careful.

Sometimes this means, you said, apparently you said is this interval is right. This one is in the previous interval currently in that interval. If you got this kind of a you got acknowledging you also acknowledgment, but this one means the previous time window already gone. So you just reply to center. Other matter, you come to this side, and they do not take any further action. We look at here. So, for example, in this starting point here is right. 1 days you got to go to 1 the rather direction from one position here. For example, if this is the best one, right? You got it. Okay. In this case, you become free, then you move to here. So any of these the package arrived, for example, in here. Rather you can do that, but sometimes currently, for example, you already in this position, someone will send you this package information after the package is already got. It may be repeated the center of time after actually received.

So that's you already in this for time in the window, this slide from this is the previous one. So all you already got in the law that you can acknowledge, he says, I got it is right. So that's about ok so this is the law you should keep. Now is here is the same example. If I go back in now, we use selecting the team. What's the difference? So you can see the very first one. You send out successfully, you send it back. A lot are totally different. Having this kind of two, you got your knowledge. Now, as you can see, the third packet you didn't got, it doesn't matter. The force you got is right. You send the economy and this is specifically. Package is right, ok after you can see this was successful, then you click it the next one.

So now you set the panic at four, because after three, you send this successfully. So you remove the window, go to one position after, right? So now you start from one to four. So the one, so after this audience so that you said the packet of five, so packet five, then because after these two, you suppose you expect the reason finish, you got a certain package, eight, but unfortunately, this didn't okay at this time, because this lost this already. So this packed three around. So this you will have to suppose time out here already. So then you send the package to ok so pack it to pack it too successful. So you already in your buffer, x 345, and two, this form four is right after this ok so chemical to arrive, what's the latest action? Can anyone tell me? Once all of this bunch before the package, because original this loss is right, you hold ak three, ak four, ak five.

Now is ak two. You in the buffer, you reorder ak two, ak three, ak four, ak five, exactly equal n what's the next step in doing this particle? Anyone know? I move the window to which the location six. You were supposed six, the antibody is where? Nine, right? So this is two very important basic particles. One is go back to ny is selective. Ok the next thing we're talking about so called the connection oriented transform. Polygraph means is tcp transfer connection polymer. Okay? First of all, this particular started, actually, internet started from 1968 by american startup from cra and sri basically triangle and los angeles and san francisco. The contact area. The first started with nineteen 1970 ~ 1972. That are the first 40 rtcpudp basically, from that, as I say, that the particle initially, they do some export you, the standard and rfc investor for comments, my topic.

During the course, you can see many different number to become the multiple motivation multiplication.

So exactly from the so far, you already have five different one. So this is updated 100 to 80s. So if you're interested, you maybe have look at that. That's maybe more than in this textbook. It will stop for you. Why you should know this apartment part communication in terms of network communication. Do you know what's the point to .? What's have any other kind of communication in the internet? Do anyone know about that? Also, 1 to 1 was another game for this particular communication. It is from one point to another point, 1 to 1. What was another name? Stick out to the long term I can hear you. What was the name? This is typical. We call the unicast. Do you hear about this?

Time passed, the unit pass was another things. These are more cast. So that means 1 to many. Other one is too many. This one, what is that? We call the boss p so called cost, it means you have any table. You tell the risk that any table in this kind of good. The other guy also tell us that any people, you everyone that this is called the cost.

So one means in terms of entire network from this mode, you took our host to that. The host, you have communication. ~ 11 to many means you have one source. You have an explanation in this network. You want to do. You doing this, you certainly can implement with 1 to 1, do that from sources sent to each individual once for one receiver. But if you can do one source, you have this guy and this guy. So then this is not. If everybody included, we call the broadcasting. If a certain number of customers include this part of the body cost. For example, if you satisfy a particular the movie and final physics is right, you the lost provider said looking up and everybody, you have a few talk about the color. You have the same basis that you have watching. If you don't, you want to work. This is monica, if you just use the 1 to 70 years repeated, so that's waste a lot of resource.

But unfortunately, traditional tcp only provide a quality ., not to want to more cast this actually in the modern is more important. For example, we broadcast our news on the to doing in a system of the complication, just inform everyone rather than 1 . 1. Why is reliable? Tcd is reliable in order byte screen. Each time the packet size is a byte and fish. In this case, in order means due during the course, maybe after order, for example, you use select, selective, repeat is right. So you may be second packet or rather the first scale of loss you need to be transmitted.

But in the end, it will be similar side. You can be all of this on out of order, becoming in order ok this this issue for complex data, 40 clips, you don't give it. That means give a table from a to b from b to a at the same time. You can work in this report for duplicate. If this cable chooses each time you're on the one direction from a to b that means you cannot from b to a at the same time that we call the simple duplicates. This is is sometime with by a direction of get off load. One issue we use data, cut a lot mss called the maximum segment, the next side or next.

The segment, as we mentioned, in a very popular in the very beginning, we have talked about These have different kind of name sometimes is abuse the terminology, but informally just use package, but actually, the different name in the application they are. We say that we put something at the post socket. What's the basic unit we call? We already say that one process in this side, another process in other side, these two process communication through which you guys have forgotten is the message is right. Okay. The message after take out the socket to to the application to the transporter is right. So after transport layer, what was the name of the car? What do you do? The original message and so called t he sorry, called hth means ahead of rt is transportation.

So now you have a little database, we call the multiplexy. You got forgot last time I already mentioned what's this one, this we call the second. Okay. From the transport layer, you go down to which layer never work there. That's right. So there, as I said, this, just you also will give an example like 1/2 half. The problem is, is our hope how the hope that you have many kegk is our process. Ok so that looking at is from this house and that house that you need a communication for the background. So the here you need so called network. They are head of heart and hte and m this one we call the diagram.

Okay, and so on. So if you ignore the header part, why you say we we have so many header part, because the header part is added. For example, you communicate the transformation from this process to that process. So how to the message goes through the internet? You have no idea. It's right. So that means by the routing article determine which role is the goal so that they put the head of heart trying this message goes through ok so in this case, each of these the lens, how maximum one you have, since the location, typically, if my memory is correct, I want to be sure is a 40, 96 bias. This old one. So if you are sometimes during the course, you add more into larger than you can further on partition, currently, ms into several mm mmss okay?

In here, be careful, tcp do not use selective repeat particle rather than use the cumulative x that means similar like go back in they are on the top line, so far the top line. Instead, you transfer single message and waiting the way to receive the rather than each time you send multiple messages and in top line, right? You have a so called atcd contestant. And through control this, we will talk about the later. So called full control. For example, sender sent to receiver is right. I could maximum students on the receiver side. You finished, you then you into the socket and application. But in terms of the socket, your buffer is small. You cannot handle. You are processing speaker so slow. In that case, you if the sender can sending you, the message lost. So what do you do each time? You need to reply to send us here whether I got it is right. If you're kind of a hanger, you can in your knowledge different indicated to the center.

I'm too busy, I couldn't handle you. The center can reduce center speed ok this we call the flow control. To buy individual is right. The receiver can control the center. The so called congestion means, for example, this link so that how many this is not a bridge from there, the side of the north side and the south side. And you like yellow river. This is the bridge is right. So the north side, people will go to south side, go to the north side. If too busy, everybody busy in terms of individual are from this to a lot of wealth that so this is the rotor of make a decision, but the individual this is decentralized.

Nobody really you over our government entire procedure just through you receive the slow or faster, got 1/2 day. I haven't got my stuff and say, okay, maybe something wrong. You can slow down your sending, doing something that's called tcp congestion. Come from. We will talk about the in our later part. What's the mechanism adopted in these things? Full camera, as we see the center, we are not overwhelming receiver. The receiver can come from.

Now, we look at, we already see the segment. So what's, as I said, in the computer, they just understand the 01, a big, the different things of this is typical structure. This is a source part, is destination part. So some students ask me, what's you see the segment? You didn't talk about the ip actually, ip already look in some other without ip you cannot believe your message to other processes. Process is located in the host. The host has ip address. This is serving the tcd we already said for easy socket, you need to identify. You have four components, source ip address this information, ip address, source, portal number, estimation number, right?

This is 32 bigger. Each of them is 16 bit for that. This second number, because you're a big document application. You partition many different, the the segment, each segment, you start from 0123 increase order. And this for specific segment, each package of a second number, okay? Also serve as the sender and receiver should be sending you acknowledgement in a telephone. There also is a segment is right. So there are just a single bit indicated this received our law ok this is so called payload, your application data, as I said, the ms typical 4,096, but if you just 200, for example, each of your email, maybe that's the figure.

Ok is individual difference. This is jackson, jackson. I already told you guys last time is right. Suppose you send to number a and b and put together, you proceed. So you send a and b and the submission. But the receiver, when you receive the a prime and c and original summation, a prime plus c is not equal original, a plus c the checks and indicated not equal. That means something wrong. If a single bit flipping error, one becomes 00 becomes one. You have a magnet and you can make a direction.

This is the transmission corrupted. I can correct. But if you have two more bits, for example, original 22, number one is 011 is 10. The first is 01. The second is 10, but you are transmission. The first become 10, the second becomes 01. But in terms of addition, is the same, but actually not every the correction is. If is really, you can do that. Another, say, if you more be the get error, you may not able to detect ok so you detect just a part of a kind of area, some area. You are not able to detect at all. Gcp option. This is kind of lens. This is the header part put on. Actually, not just this four layer one.

Therefore, you can find it for spn some will be violent. Or in fact, the last 20 years, actually from the last parliament is major trend, is software department of the functions to sell gas. Much more in the function. In that part we will talk about in the a little bit. They are a little arrive. The receiver window, as I mentioned, the receiver window you already saw for put back in or selective, you have several windows, you have received a window. Coming will also see the end is right. But in practice, as I said, if you wanna flow control and you the receiver window down between the center window, ce is c is congestion. Each of this is just a single reader. This is just you are already in the memory of this. I told you basically, this is a human make a decision, the divide in this, since the first point on the head of the entire this one, maybe for the head of area, he should be the occupy how many pieces?

And each of these specifically, the 01 is that which means you just then, for example, rpssysy sy it means is the civilization be fi means finished it, so we will talk about later.

So this seems you're going to be the memorize or something. It doesn't know it is so called the basic format was started to recover.

So where is the number? As we say, that this each second we count the unit is bike, is right. You can see that this is a typical sense. The green on the other side means this is entire. The second, for example, you have 200. The left hand side already in terms of bite already finished, the current yellow one. This is center side, this is center on the variable. Is a lot of economic yellow, means you send out, you have a lot of economy yet. Then the the blue one means you still ever send the rest of the packets in this one. You can look at here. What is this yellow? On green to move to the right hand side? One position? If the two of them finished, then you move to position. Because at that ., how you can do that, that means each of these are part these things associated package. You have these things with that in terms of knowledge and the format, because with our central and receiver, both in the transport, there is a segment, the basic communication unit.

So you also have the similar things be careful. The acknowledgement, as I said, more or less like, go back in you. You need a community of economic knowledge, individual and selection will repeat one issue. How is several hundreds out of all of the segment? Do anyone have any idea? If, for example, you send to in here is 555, right? So that is easy. You can feel like a package and package. If it's out of order, what do you do? These are on the segments. You have multiple segments. You should segment the compact, many, five. For example, I have this part. I send two segments, one, segments, two. But if, for example, signals one, the silver didn't want about the signals two, they were already received. This is out of order, right? So what this is supposed to do, so what go back again that you guys did see, refusing the.

Okay, that means after a certain point, you send the segment to one again, whether you need. We send the signal to. After ii heard the same one x that means despite you already send the sigma two, and the same was successfully received the sigma two.

But in this case, if the sigma one failure, you receive the sigma one as well and sigma two as well. Because they are talking one only one time, ok two o'clock one, ok let's have a look. This very special case, this cabinet, i'm not sure you guys just tell me the previously. How many of you guys use leaves or even previously? Okay, just you. What would I ask? So the fgb cabinet is now is more committed in the past. You. If you have access to the motor fire system or doing something before the work, you are use parametric or ftb to get up into the fire other. The civil side. Here you can see this host, a host, the b you send a segment. The second that each segment started should be our second number. This is an entire file. This is not from so far. This is one example. Sentence number is 42.

Currently, you're sitting on only one single element c so that means you said This message invested in things, acknowledgment that 79, that means a former receiver side. The reserve side processing so far is 79 ok so once you send it to here, the receiver b got your stuff. So you are 72, because your one is actually the current message. The second advance. This is just single is . 5. So that means is 42 + 5 is not 27. Because this is the only one. So your knowledge and 43 already know 79 is right. So you will see that this, this is our 79. You reply to here. But if you are allowed in the further, you can say this is receivers and policy. You are seven number, currently 79, you send one, so you got 80. So that means this one successful increase by the second and less.

Similarly, here, originally you get this value. You increase the author by how the current statement. And that's how long you add over there. Okay? How to this is another issue we will deal for. Sure. This is about, maybe I think the rest is 90 point two, 9:22, right? We taking time is everything is a risk. We come back - 30.