### Network\_week8\_lec02-20241031

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May be able to have a safety net that our company. So sometimes you will become the company on the exactly the same time. Sometimes people in your practice you didn't know about someone else then. Then you said, actually, some are also different. Either you have to yourself some degree. You both said, then collide with each other. We say one particle is better than other. We supposed to use the quantity magic ok we still are now calculated, was one simple packet or a friend successful rate, but still everybody is. P the one successful rate is p times one minus p eighty to one. Compare that one is you get better. Because you only part because the love is already centralized, right?

In each time slot, you only one guy allowed to do that. All right? That means this the time slot ok for example, in the beginning here, without any people, right? One of you is successful, same, right? That means at the same time, the risk model said the probability of 100 p you have n minus one person. This is the probability be careful in the pure one means this you said area is right. So the premium is one.

For example, if you look like this, the next one look like this. There have no coordination. So that means your successful probability is p previous one. The x minus one person do not understand. And the next is the one. What it said in terms of compare this pr one, this is new one. So this is power part is n minus one. The pure one is equal to p one minus p to n minus one, a is worse than this one.

Okay? Then with a packet probability, is you have any this pity is, right? Lots of. No, this is simple. This is single one. You have n that means n is for the success of probability. Then you get this one in the end. The maximum efficiency is 1 point 0 . 36. That is a double original 0 . 167. That means some successful arrayed is twice as pure a lot. So that's why the slaughter a lot of paper. This is . 8. How do you write? Similarly like the previous one, the invasion, right? Then you get this one, then you use that value to for the derivation. You divide this one of the e that's we put the progress is a lower, smaller, a lower performance available. Right?

Now. We talk about the cgna this is aa single in the second generation, third generation. Ge two d three d is quite a lot carry your sense of multiplexing. So that means listen before talk, that means you send your friend before that you need. You change the channel whether someone already doing that. How do you sense? The character without there? Anybody transition activity in the channel? Ok so this is a different sensor devices. And I can check it whether the channel and be going up or the body or the current. So that's the physical they are another explore. So there have further divide as the following three different model, no consist persistent, one persistent p persistent. So called p is also probability right?

Now we talk about your first case, no persistent. Csma oscillation sensor. The particle basically is looking like this for the sense of the checkup to see whether anybody you somebody use you. You didn't use it right? If the summer is busy, it will not continue. Sensing the channel. You should be stopped for a while. Then you may listen to instead, tv on around the time period, this period we call it back out in the communication sense, and come back and listen again, you would like this market, you is china city, you just figure out less, you got a long time then take it with a still busy is right, moving the nobody there, then you trust me. If china is idle, you just trust me.

Then you can do it, as I say, that someone else may be also trying to be there. You don't know where your existence. In that case, if you climb, now, this is, then you back off again. That's not on this on and on. Until you transmit or you give up, that's the so called no persistent csma now, we talk about what's called one persistent csma okay? So the only difference of state or use of the leader sense of china, if china busy, we just wait until it is become idol. Okay? Whenever it says channel is idle, it will transmit. If a pollution occurs, it will delay or random period and start again. That means you're doing this. Just you busy or politely just with a wire that going on.

Again. This is persistent. P persistent means ok that's what look at with. First of all, you apply slot in the channel, station sense in the channel. Okay? If the sense either channel is transmitted, even this empty, nobody use, you will send your message. You have a probability, not just the original is 100 %. So one, I think that I I just said that's the probability is one. I use a certain probability, the p to defer whether I should send at this moment. If you do not send them to one minus p right? If the sensor busy, you did it around the time, a number of london time. I start again. Now we look at the curves, the different algorithm, look at the pure aloha. So that means you successfully typically about the 3 times you were success. But the probability we know, because 0 . 18 is right, less than 20 %.

Then if I use slot a lower average about 7 times, I can successfully that, but the probability almost zero one thirty 36, right? In the middle in here. So then you use one persistent one, this once you have nobody use you, you just said this is one persistent. One is it probably seems like a smaller aloha, but in terms of the probability, much higher is nearly 50 % ok so if you get a chance to depend is out of whether I did that is 50 % probability you get.

But this time you get longer everything about 9 times, you said the probability almost got 70 %. Certainly, in practice, for example, 0 . 1, you usually either you send the probability very small, 0 . 1, 00 . 1. In this case, you made it up to several hundreds of time, because then you certainly able to send a probability. Successful reading is one. So from these curves, you can see some kind of turn off like this one, very simple. These are a little bit of civilization. This one, you need to try many times. You get a successful. In practice, that's also you can see from here. This is early, very back to 70 is right. There are few people. The video and major military group now is from clear, is basically is commercial is not you guys is more communication. So that is you need very high, high successful rate so that why we got the csnap persistent one.

Okay, so now that carry your sense of multiplexy multi access. But in commercial, we also have so called collision detection. Okay? What's conclusion detection? That means, you mean, you send the cause you able to detect with a solution happens. Ok collision detectives in a shorter time collision turn. Once you detect, you collided, you with someone, you transmitted during the middle, you find someone also transmission at this moment. Once you are aware now. Another person transition you just about means you completely just waste of time, because then there the receiver or wouldn't give it also this sometimes for coming is come coming there polluted, so that's not good.

Similarly, the other person want to detect a busy, they also afford that is unsuccessful. This is called the pollution detection. This actually is a commercial standard. I could be it due to others. Three in the early days. We will give you a very specific example. This is supposed one. The yellow one is one guy is send your why you or why is video, right? As you have a provocation today. So we're beginning, this comes from the zero you send, you detect, and nobody send. In terms of similar. You send it, you just review. But in terms of q one, this have propagation delay. In this point, you back to here. You here. This is detected, because they didn't sense it. Any other transmission, actually, these are already transmitted, but in this side, because single propagation delay, we didn't aware, means I can start trust me.

So after a certain point, and in this time, the point, so they are actually similar, have already interference with each other. So in this case, you can see here the packet, this area means you have climbed with each other. That's right. Then do you able to take that? Not even immediately, you maybe have aa bigger delay. You aware of each other? In this case, both commission, this guy and the yellow and red is about current condition, because you are collected with each other in the areas.

So look at the success. That's cool. That's called the cd pollution detection algorithm. What's the specific estimate arguing this for a while as well? Received a gram from them working there? You you are talking about the current is linked layer, right? Pray, the prep ok if nica little bit card, a sensor channel, if I will start transmission is busy, just waiting, then trust me where we are doubt if we as a transmit the entire time without collusion, this is done, okay, successful. If you detect the other submission. So the current one aboard is you're not successful. You need to turn. So then you are waiting time. The waiting time basically, is we call the back of what's the next time you want. That's what they gave us so far on the call. That means. But before any not, that means of wedding is you have a period of ok that means m means you have zero is 1202122, the qm that means 01248, 16, usually is the power of two.

So this is supposed, you choose one of k from here, for example, next time. If I choose just a 2224, 16, that means I have waited basically unit come to 512, then 16,000, 1 5,512. The the bigger time, then I believe the transition in this range, you rather choose one value after $500. You get your waiting period. This is how you want to transform. Okay? You see the new friend basically is that, so in practice, what's the overall the throughput that means individual and decent probability on the number of users? Okay? This is just the two nodes. The network is one pass on the denominal pass, but ttp is propagation time. This a single from the transmit asian car. One is physical, very the similar, nothing to do this package, these others. So you can see here, even the worst case is paper. There are a a lot of time is very early one, and also we're in the worst world. Ii I know there are one. Okay. Even the city collision, texas and the world we are invited to china, first of all, is very how to attack with all these areas.

In some of practice, People got controlled by this in china hated, and it's also about so called a hidden problem, at least I can show you. Right? Suppose this is a this is, say, a and communication. B is right. The c actually, you are transmission c in your range, ok and bok transmission. B is also with c in the range. So then this case actually interference. They both come here. So also, this transmission, for example, to be, you can pick up parents a and b because a and b didn't know where it is done in this case. That's the ca is avoidance. What's cacd means.

So before first of the session, that's the same. Figure x is the right times missing and a computation, a signal like aloha, this is for values. One values actually is very popular offer is part 8080 2011. This is like aabg and xab so many of them is for while in the internet. And I get that's a little you need to check out that many values. And why is it? Particle. Okay, so we are talking about so far china partition were invention. So london one is, as we mentioned, is aloha and never talk about the esma cdcs and all of this one.

The last one we were, one of the talking about is closing basic technic terms is more like a real world things. Okay? Suppose like here we have four holes, ok you transmission data. In this case, you have a master master. Take care of you. The master, this running with the run means this time your turn, if you do not have anything, you just give up. Right? So if you are going to have something to transmit, you can everybody should wait that the time of bringing the next one. So that is everybody take turns. It tells me, and so that's better.

Access in the struggle is wrong. You should know the game is turned, you really are wrong, must know the why to transmit the killing by master people using simple devices. You have, in this case, for master to call, there's someone here, for example, the how do you solve this diagram?

The first ascend to you, this part delay, then you send the data back, right? If this is sometimes is unnecessary, because this is overhead, the next one will report to this guy.

So that's the one issue is the master broken down. So the system is becoming chaos because who were there for the coordinated your eyes transmission data? So this is the weakness. Also, you need somehow calling it. So the core time is some degrees of delay, so it's not good. That so called take turns ok this means ok everybody, this we put a circle ok the circle is just a virtual expression. Everybody takes turns you'll have a tokyo. This is like a what was it here? You get this, someone who you are for me in all the group. We only one the time of one person get. This topic is for me, if you this is for me, you can do submission. If you do a lot of this commit, you can do anything. Like, if you take a trip, you must bring your I ds, right? Without the id and id is not good because this is means you'll get us specific information. Only one person can get it. So once you get it, you can do it. Transmission. Once you without, you wouldn't do that.

So at any time on, you, only one person can get transmitted for the control of protein passed from one mode to the next sequentially protein. This will show method, take about controversy. You can see here, for example, this guy, the second guy not copy, he doesn't have anything to send, then told you to serve the guy, you have a paper to transmit. Okay? Then this one is also of sentencing if the talking, you all the talking. Now you lost the turkey, so the rest of the world wouldn't do any further. They don't become you. Nobody can talking in the end. So this is not good. Also, the tendency, both cases like the previous one master, a slave and turkey, for where small side the networks are not enough. Dozens, hundreds is okay. If a millions of this is the delay is unbearable too much.

Ok so we already mentioned mac layer. We specifically topic the different kind of multimedia and the common channel. And media will do several three different ways to do that, kind of partition. The cdna how do we support galaxy, pregnancy, multi galaxy and code or second code is right. Then we talk about access, random access, aloha slaughtered, aloha carry a sense of make access and content, pollution, detection, collision of bodies. It says, finally, we talk about the twins. So this from that, bluetooth is actually about the tdma we have 20 minutes, and then we continue to talk about this part of the city today.

Now we will be doing the next one today. And I guess a lot of smaller, a lot of these are some of the theory work is important. Certainly for your exam, in waiting for such questions, every protection, as we mentioned, you to the sender to receive zero. This is just the liberal knows if you the receiver found area some degree, the receiver at the area and the direction the model asking the centers.

In some cases, you have the area you are not able to correct, but you can make your center of the center again. All right. Every protection means and correctly, you make it use the refund, redundant redundancy, ok so for example, we have this one. This is the initial diagram is right. Suppose, as I mentioned, table there is b edc means you'll be careful every detective and control it. This is extra bit not customer pay, rather, you want make sure the panic, corrective delivery to the receiver.

So this is the channel is right, like one is video, maybe get an area you received it. D prime ok this is edc another extra bit ok then this detection condition, whether d prime it's okay equals d original one. If you, if means you detect everything, even as I said, not all the areas from their society, are you behave? Maybe you scared, but still that is you pass. So that's the possibility, but chance is more.

Okay? As you mentioned, area depends about 100 % reliable. That means even someone you can pass through, but maybe still get the area. If you do it, error detection, that's 100 % is an error. So do you understand this sentence? All right. Ok particle, maybe some areas you pass on this, but actually, it's an area over there. Now there are etct or the data detection at the director, but more overhead turn off. This is very important. For example, you have 100 b before the 50 be the epc that means 2 ~ 1, then you can make a correction, at least the 50 to get errors. If you just use the single bit, that means 1 % is right. So you only correct 1 bit.

In these ways is because you transmit this part is redundant. You cost the energy consumption. You can't occupy the benefit. In practice, there are some kind of turn off. All right? Link, channel, condition is not ideal transmission errors that occur. It leads to detail right or wrong. Okay? Prime is so constructive that compare relationships of all. These is a friend invalid. If the same friend doesn't have a relationship, something may be wrong, is resistant redundancy, be actually for correction purpose.

All right.

Now we will have a look very early. Today. We are already informal mentioned about this one. This is real data for give. It. You only use a single bit to this. We call the parity checking ok so you put a life for me. In this case, you can count the number of ones. The of the here, if is old, you add is one. If is even 1 equal to 0, you can get 31, 456789 is / 1. So you have one. Okay? We call the module two. It would be several sides or is one. That means you are correct. If it's the service that contains zero, that means your detection data ever similar is that you get a graph. If you have two more pieces created, then you maybe get a lot that's you want to call it one dimension. The two dimensions is means every role you make is single way, every column make a single way. Like here, 1231 equal to one, this 41 equal to zero, this 31 equal to one, this column 21, room 210311 with this, or even one, this, 2120, 0 k this is initial into it.

Parity. Now, for example, you get something wrong in here. So then you're doing, you receive the entirety. You got something wrong. Okay? You can see here are original. Suppose is one, you get out zero, this get a zero, you ever detect ever. Ok so the law basically says, has content of udp segments is 16, is the integer. We use jackson previously already. Does that this sense? Chance of value put in? The udp friend checks and failed is bbc okay? Receiver calculate the checks and receive and checking the checks on whether it was originally transmitted data checks in because they are identical. That means actually no error effective. Maybe an error, you don't know. You do not definitely have area, so you really make a direction.

Now, we talk about very important technique, make a correction. This is called a syndicate dependency chip, but somehow we call the crc that means g is database, means you can know you how much data you want to transfer. G is the pattern generator. People are inside r plus one bit. So the generator, as I mentioned, you use the modern edible called the circular group. I'm not sure you haven't known the more than anyone so called the group feel. And red do any of you got done previously?

If you don't know that's you are a certain of a group, you make every things is, suppose, is a problem number. Then you follow things. You may do not even know that, but this is could be acr the basic knowledge, if you are clear, included, all right? That means the g is generator is the certain group. The basic unit generate all the other elements in this group.

If r plus one, did you actually this edc area on the we is a regular data. This is the math behind. Usually xor the goal, if you put these are that xor you pick up within a bit, right? This is typical, is modular to we use is boundary to express that. This is not really as they have. I mentioned that attitude to 11, there have ad e adad the target about the 11 more than this behind some of many of different particle about the values of communication. Since in the past, 15 years, no wrong and shit. Do not understand that.

So now we look at here because the risk is rb this area, so these be part two are because you are the rest is still on rb X Orr is, as we mentioned, is the radar of this generator ok so you can feel that your xor pok so then this kind of right? Because here, then they decide to get the xrr on the right in the end. What's the remaining bit? Is here. Remember, this is integer part. This is a reminder of it. For example, x g is equal 1001. What mathematically that means? That means that you have an x like this 11234, 31, and plus x two quantum s zero and plus zero x the last one is the one time. It's 00 k that means you have one. If you mass, that means x three plus one, this is the generation beta.

Okay? We tried to say, as we give more detail how we calculate this is real data, you want to transform 10, triple 10. You use this g generator. You are the are the EEC are the r was looking at, because you can see here, we will give more detail.

Here is the diagram. This is your center part. This is your original data. The rest are is because r depends on the g what we which you use the generator ok if g is r plus one bit, here, you have r zeros, ok eraser is five, the g so in the end is you get a reminder, okay?

This, in the end, only arbok so then you send your data to. Your neighbor is original data plus crc is your division part. If the receiver in the end, you get your original data plus crc they still are using the same g doing division, then checking the reminder. If all the reminder is zero, that means no errors. That's correct. If not zero, they are. Compare. Number one means the rejection is detector error, either your local interaction or send back to the center you send again. Okay? Now we will talk about how to calculate this one, the crc that's how I look. Suppose we have a b 1001.

Now we look at the g the g is 1234, gr plus one. That means remaining only of three triple zero, because these r plus one is RB then you do integration. Because each time this 4 bit, you start from here, because it's one, you just copy the eraser, 1011, this this usually is xor operation. 11 becomes zero, right? 01 become 100 become zero, and one, one becomes zero ok so then you can see you move this card. This market integration is right. The significant bigger is become a zero. You do not use visa rather than all zeros ok then usually xor zero, 000, and 10. You got one.

Then you use this one doing here, 1000. This is the most significant opinion is one. You use the divisor, 1011 is xor 011011000, 110.

Now you've got three. You put this one down. Now. The significant is zero. You use equal four zeros. Then the 00. You got 010. You got one, xy 104, ROK once this is finished, this is reliable. So you send it to your destination or label. Original data is 1001. Right? Now, crc you got it is 110. Have you got it? This calculation very important. Once you send this to the other side, as we mentioned, crc already calculated is right. If the receiver, simply your data is looking like a maze, then still is the original divisional 1011. You can go home to practice. Then the remaining part should be triple 00 k if not triple zero. That means you get an error. You need, make a corrective. If less than RB you can correct the local.

All right? Two cases at the receiver side. One is we just calculate, it's not a case. It's right. Okay? If in the reserves are because this one, you still are using the divisor to do that. First of all, the Top is one. We use divisor becoming 0011, 0, ok then the Top is zero. You put the zeros, 1010, 101. Then you add this one, become one. This is one, become one, 1011. Then you triple zero. Then you put this one, you put zero, all zero. So that means you get on reading about it. So that means this competition is correct, no errors. But if you in the receiver side, for example, this one, they changed a bit as zero. What do you do? You? Still? Is divisor. We're beginning is 10, become 101 become one. This becomes zero, ok 011, because you the receiver side, this is one going down.

This is zero, check the zero, 111, then you put this. One is the one, is 1011 become zero, become one, becomes zero, ok then you got here. The last is zero, because this one, you use 1011, one, and one. And this becomes 00 k this is not on the left hand side. Okay, is your contact one? That means this package example you get ever, actually you have already found on reading the supposed one now become zero.

This one, basically, we already talked about the crc area protection, usually on normal. For example, this is division, 101110. The triple one is look like this, as I just mentioned to you guys, how will you can see this one, as I see it behind its mathematics? Is the group zero. It's actually circular group. This is a commercial use on you, crc eight. These are only the it's 18 machine. You got still use, you go to bank, you borrow money, use your ATM car actually using this crc and data intense one extend to this one.

Ipu is international Telegraph. Union. Early days you use paragraph to send on. This is very far for union. There's that this for higher definition, TV transmission, This local level is so detailed, basically. And you can say so complicated. Actually, this is go to crv behind. I think this is just repeat the previous why we go home to practice. Today we just finished here. Despite that, you shouldn't want to basically several molecule like a lower PR lower. The conclusion with avoiding this as a way of the crc how to make a correction. Okay? That's about to be a lecture. We go to the next one to the following session. All right.