Information Security 3
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Module 48
Network access & physical media

In this module we will basically discuss about the different types of network access that are typically possible as well as very briefly talked about there are different typed of physical media that we would be encountering in a network topology.

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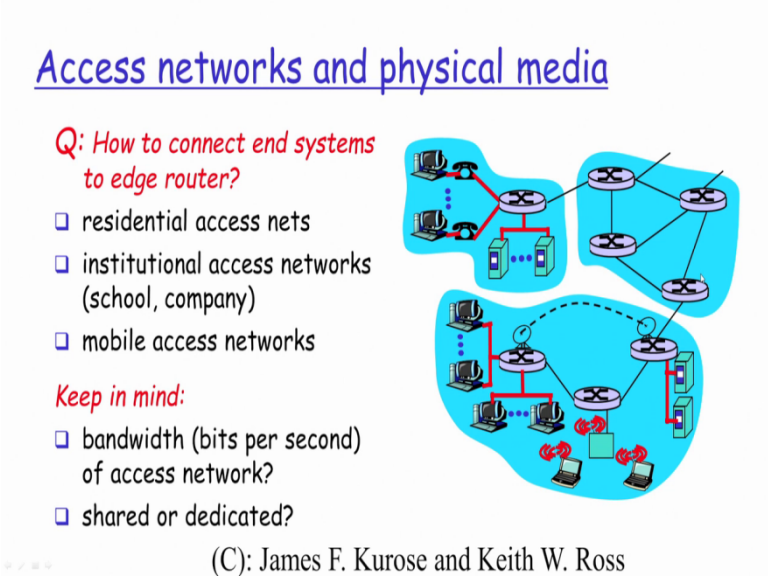

So when it comes to access networks, how do we really connect the different end systems to the router, you have different types of mechanisms that is typically followed so it could be a residential access network if you are trying to have a network in our residences, it could be an institutional access network if it is basically organization or a institute or alternatively it could also be a mobile access network that is typically being looked at so irrespective of whatever type of network that we are really looking at we just need to keep in mind a couple of actors with by which we decide what is the type of a network, access network that we are going to really have finally setup and configured.

So the two factors are one the bandwidth so as we already discussed in the previous module bandwidth is basically the speed that is the number of bits that I am able to transfer per second so

that is the reason why you are typical isp provider asks you what is the capacity of the bandwidth transfer that you really require based on which he will give you appropriate pLAN and the second parameter is whether it could be shared or dedicated so when we say shared we essentially mean that on that same link there will be multiple users whereas when we say dedicated the be typically here about something called that is least line right, so depending on whether we are ok for a 10mpbs shared line or a 10mbps least line is something that we require appropriately we will have to decide what will be the most appropriate network connectivity that will be going towards right.

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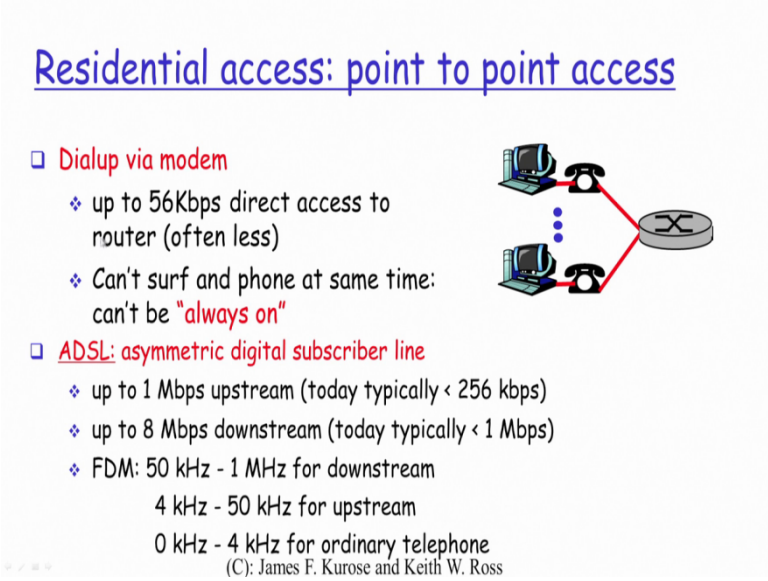

So there are different possibilities that is there so historically if you look at it the residential access which is basically a point to point access, it all started off with a dialup modem which theoretically had a maximum capability of 56kbps this is this is just a theoretical limit but practically it used to be much lesser and this was the oldest technology that is actually available which which has been put to use for network connectivity in the residences long time back so the main problem with this was we couldn't use the link at the same time for both surfing the internet as well as making a voice call as a phone right, so it could it could be actually used only for one of the two methods at any point in time so either I could actually use it for data that is basically for surfing the internet or I can actually make a voice call at the phone, but I will never be able to do both of them at the same time.

So the main problem that actually happened with the modem dialup was that it something which was expected to be always on and if you had basically used to used the the dialup for your data surfing part of it, you will not be able to use the phone in the same time for making a voice call so that turned out to be a very big handicap but predominantly nowadays what we actually end up using is what is called as an ADSL, so ADSL stands for an asymmetric digital subscriber line where I will be able to make use of both voice as well as data at the same time as long as I have this ADSL splitter with me and so if we actually basically approach a I'll ask my isp vendor today and if he tells that he is going to install an ADSL modem in your residence premises it basically will have the capability to allow both voice and data traffic to be going through it at the same time so typical speeds that I will be able to get is 1 mbps upstream and 8 mbps downstream so 1 mbps upstream is typically the traffic speed that will that will be able to get out from the residence towards the public network and the downstream traffic is basically what I will be able to get from the public network into my residential device, so whatever device I am using for connecting to the internet in the residence right.

So the the basic reason why the downstream as actually got more bandwidth here is that typically we will be able to understand that we would want to download more amount of data as compare to how much we would want to typically upload by default, so very rarely we upload files or upload content but we will be predominantly downloading the data across so because of which you have typically a higher downstream capability available in the ADSL connectivity.

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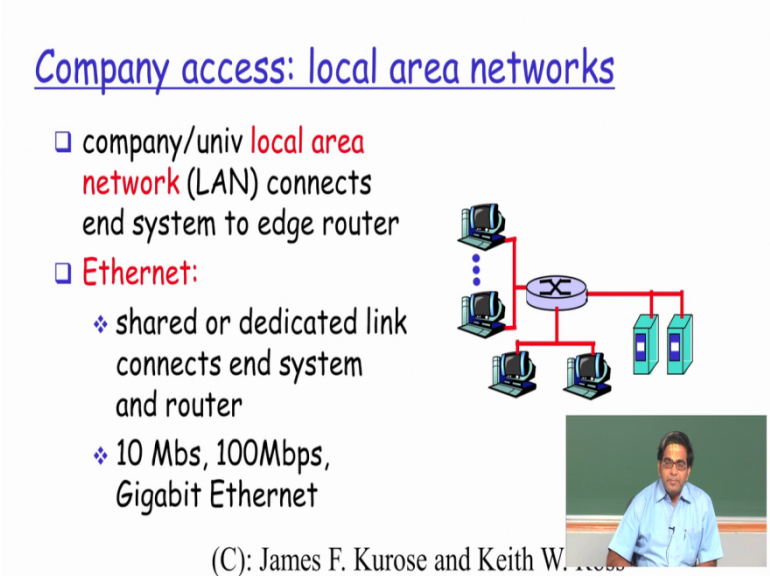

So coming down to a non residential type of network access you typically have a LAN network which we all would have heard of so that is typically based on Ethernet, so when it is Ethernet it is basically a shared or a dedicated link which is connecting the end system and my router device on that particular LAN network so it could be either 10 mbps, 100 mbps gigi and today it is also becoming pretty common to actually have 10 gigabit Ethernet LAN backbones as well.

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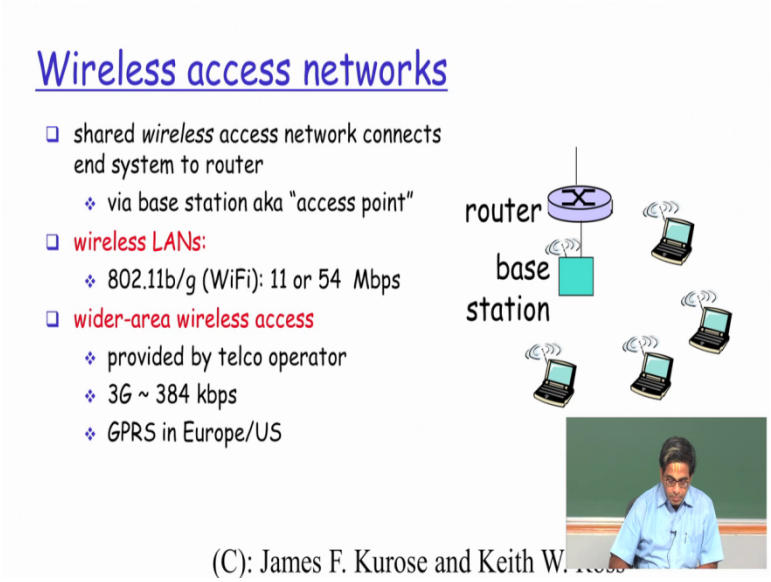

So other possibility other than wired network is to actually have a wireless access networks so this again is becoming very very common in today's world where we have lot of WiFi enabled devices that we want to connect to the network so I could really have a shared wireless access network connecting my end system to the router and what is actually used for this connection I something called as a base station or an access point so in short you will hear something called as an ap so ap actually means access point, so what is the purpose behind this access point so this access point can be sort of understood as a bridge device that is connecting my wireless devices right so my maybe my mobile phones, my laptops or any other kind of mobile devices from the Wi-Fi from the wireless medium into the wired medium so that from the WiFi device I will be able to actually access the internet so the base station or the access point is going to be the sort of a bridge connectivity between the individual WiFi enabled host on my network to my public internet which will be actually connected over a router device.

So I could really actually go upto 54mbps theoretically when I use a a wireless LAN network and when it is a wider area wireless depending on whether I go for a 2g or 3g or 4g, I will have vary in bandwidths that is actually possible to be achievable at my end in my end device right, in my mobile in my mobile device.

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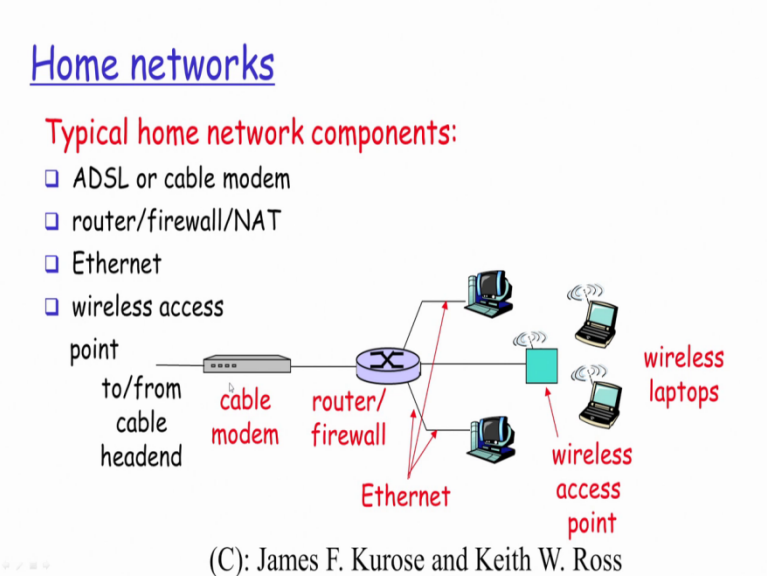

So in home network if you see I could actually have a cable modem as one possible device or an ADSL modem depending on what kind of connectivity the physical connectivity that I have gone in for my internet connection so I will have my modem connected with the router or the firewall so I will typically have today's world a device which will actually has a capability to run as a router device within in build firewall device right, so what is this firewall device we would all have already got use to running some sort of a firewall software it could be either the software level or it could be the hardware level so if I really want protection against certain types of inbound traffic from my public network into my network, into my home network as well as a protection for the outgoing traffic from my home network into my public network all those things are actually capable of being implemented with the help of a a firewall,

so in today's world I typically have a consolidated device which really runs the routing functionality and also has the firewall functionality that I can enable depending on what kind of policy I want to set for the traffic to be allot from the ingo incoming network to the outgoing network and vice versa back right, so I will have the router and the firewall functionality in build into a single device to which I could actually have various devices that is connected over the wired Ethernet like you see here and I could also have the various kinds of wireless devices connected over the wireless access points so this wireless access point you see here is the the

device that is going to connect this kind of a wireless device with my wired Ethernet and possibly even to my internet outside right, nowadays we find that lot of vendors actually have got an integrated product which has the inbuilt functionality of being working as an access point, it could act as a router and also has the functionality of it working as a firewall so I have one simple small size device which which could potentially fit in one small corner of my table at home which has all these functionalities inbuilt into it and depending on my specific home network connectivity requirement I could either enable or disable any of these functionalities that is there inside this device.

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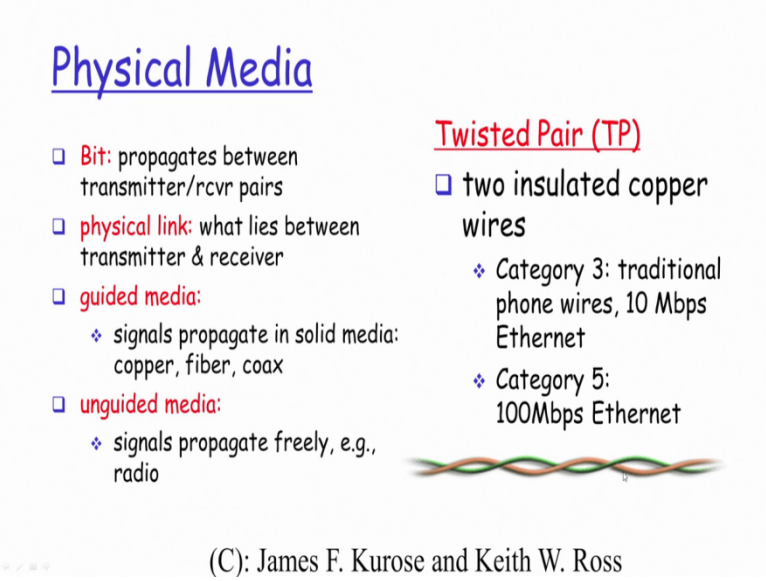

So in the physical media we will actually have different terminologies that are used so one which is the bit as we had already seen bit is the smallest amount of data that will be referred to in the networking world which typically denotes what is it that is getting propagated from my transmitting and transmitter to my receiver right, so physical link is basically the media, the physical link media at the bottom most layer which is going to be connecting my transmitter and the receiver and then we are going to have something called as an Guided media and a unguided media so now what is a Guided media is basically a wired media where if you really look at a copper cable or a fiber cable or a quack seal cable whatever signal is actually getting transmitted at one end to the cable is guaranteed to come out to the other end of the cable as long as I maintained by distance limitations as appropriate for that particular solid media right, whereas in

a wireless medium that we are referring to as an unguided media since the signals are propagating freely in a wireless medium you you cannot really guarantee that when it is getting transmitted from the the source host when it when the when the signals are going to go over a wireless medium like an un unguided medium the the signals will be reaching successfully to the desired strength at the receiver end right.

So in a guided media essentially all kinds of cabled wired medium is refer to as a Guided medium whereas in an unguided media you will typically refer to the wireless medium when the source and the destination are not really physically connected by a wire or a cable but expect the that signal transmissions to be happen on my wireless medium right, so you also have something called as a twisted cable which is nothing but two insulated copper wires which are just twisted so as to have the least amount of interference so what you typically find as an Ethernet cable is basically a twisted pair cable internally which has been actually insulated for you with an external cover right, so the reason for it being called as a twisted pair cable is because of the fact that internally you have two different cables which have been just actually twisted together to have as little interference as possible when the data is really getting transmitted across that particular physical cable.

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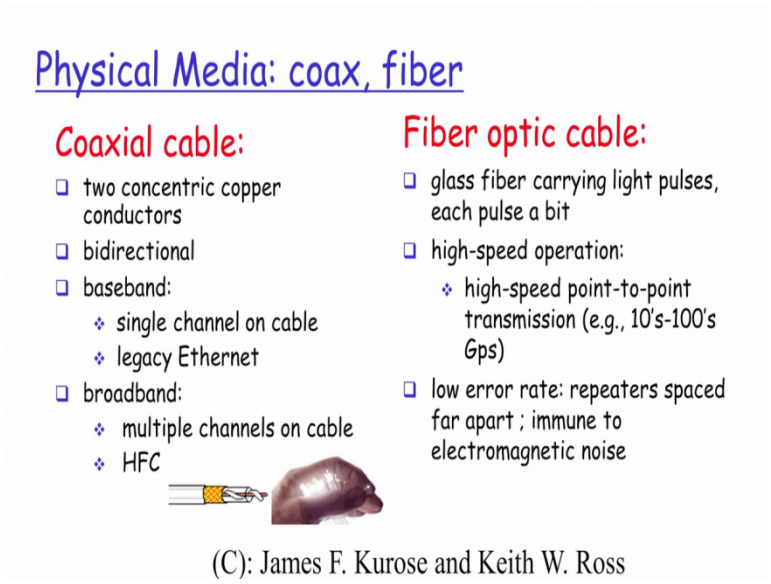

So you have something also called as a coaxial cable or a fiber optic cable so the physical characteristics are different in both of them as well as the amount of bandwidth that I could possibly get is different so when I use a fiber optic cable I have typically a very high speed possibility on that with the least amount of latency and the error rates that is possible to happen on a fiber optic cable as compared to a normal coaxial cable.

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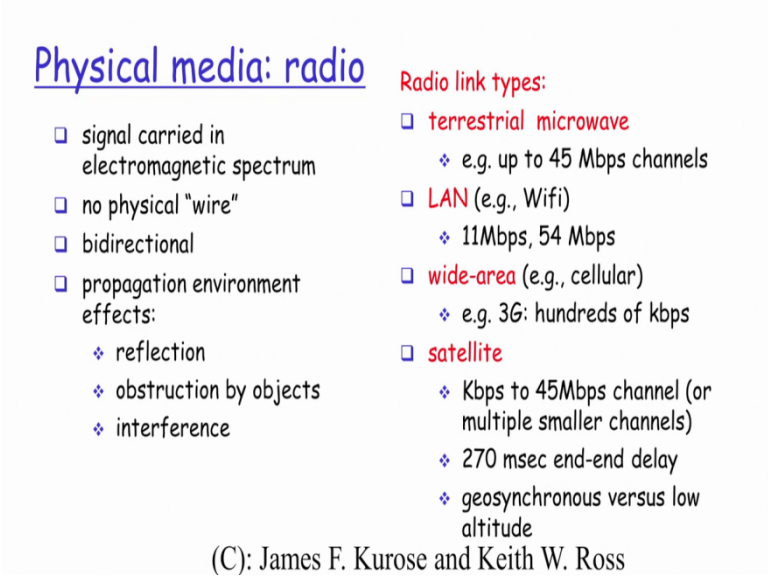

So coming down to the radio as a physical media as we were just discussing it's basically a signal that is going to be carried in in a electromagnetic spectrum, there is no physical wire or a cable connected and I could really have that by bidirectional transfer possible over a radio as a physical medium but the the flip side to this advantage that we get so here I don't need to really lay any wire or a cable across which is basically a very huge exercise in terms of the logistical part of it, so that's a big advantage that I have here but that it also has a side effects in the sense that I could have a huge loss of bandwidth because of reflection, my signals could get reflected before it reaches the target receiver or the my signals could get obstructed by the objects in the middle so this is basically where we call something called as a line of side so we essentially say that if there is a line of side between the transmitter and the receiver.

I will tend to have a higher bandwidth that is possible but if I am going to have obstruction by the objects in the middle bit the path between my transmitter and the receiver then my bandwidth

is going to be getting that much reduced because of the fact that my signal strength is going to be very weak when it goes and reaches the receiver right and then I could also have interference with multiple people trying to transfer the same time and thereby not being able to get a proper a strength for the signals to reach the the the receiver successfully right so there are different types of radio link types I could have a terrestrial microwave link, I could have a WiFi link, I could have a wider area, I got 3g or whatever or I could have a a satellite radio link also, so the different types of bandwidth are possible in various the radio link types and also different kind of physical requirements are there for each of those links and depending on where I am trying to actually set up this network with the basically media to be used as a radio link depending on the physical characteristics of that place a appropriate type would actually be made use of.

Thank you.