

Wireless LAN Networks :

Example of Channel Selection using Packet Tracer

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I am going to talk about what are some wireless planning and how do you use Packet Tracer, especially the wireless part; because not many people are clear about the wireless configuration on Packet Tracer. In fact, you can do a lot of things with the Packet Tracer when you work with wireless.

Every time we talk about wireless, we always think about security so how can I enable the encryption and authentication and makes sure my wireless is secure?

Before we talk about the security level, we also need to think about the most fundamental, the most basic stuff, which is the wireless signal coverage. There are two things about wireless signal coverage we need to consider, one is the wireless channel selection, and the other one is the wireless Access Point placement.

(Irrelevant texts omitted)

There are, actually, from 1 to 14 channels that are available in this 2.4Ghz frequency band. But in fact, there are frequency channels from 1 to 14, or 1 to 11 depending on the country. Some countries are available for 11 channels and some are 14 channels. All these channels actually are not completely non-overlap. We have many channels here, but many of them are overlapping each other.

For example, you see that we have the Channel 1. (Let me put a pointer here) Here is Channel 1 and this is Channel 2, and this is Channel 3. Channel 1 is a channel itself, but 80% of the channel actually overlapped with Channel 2. And Channel 3 also overlapped 50% of the channel bandwidth. We can see that we have to select the wireless channel very carefully. And is really depends on location, where you have the single Access Point or you have multiple Access Points, or you have other people deploying wireless LAN which may use the same frequency channel that interfere your wireless network deployment.

This is one example in the curriculum. Channel 1, Channel 6 and Channel 11 are the non-overlapping channels, which means that we have 3 non-overlapping channels in 2.4 GHz ISM band. When you configure your wireless router, you need to choose the right channel, probably the clearest channel that you would like to use because it's less interference.

So, now I am going to switch to my Packet Tracer and show you how we can change the channel for a Wireless Access Point, and how we can observe the difference when you choose different wireless channels for your wireless network.


In Packet Tracer, there is one interesting feature. (Let me go to my application sharing. So this is Packet Tracer screen.) In this Packet Tracer file, I put a background image to show you, when one device is using Channel 1, and the other device is using other channels, what will be the effect. Right now, I have one Access Point here. I simply put a Linksys Access Point here for my demo. Let me open this Access Point and show you. I didn't do any configuration except the SSID. And I leave the wireless channel to be default - Channel 1.

I can use my computer, the laptop here. You open up a laptop if you want to do this exercise, you have to make sure your laptop has the Linksys WPC-300N wireless Network Interface Card. You must have this network interface card in order to use this PC wireless feature, if not then you cannot see the Linksys card client interface. Make sure you have this card installed on the computer, and have your computer turned on. So go to desktop, PC wireless. You see now the wireless is not connected. This is our wireless client screen, and I click 'connect'. So in a connect screen, I can do a channel scan. I can scan all the available wireless networks in the area. So don't forget that we are now working in a logical workspace. So in a physical workspace this laptop and the Wireless Access Point are actually placed in the same location on a same rack. When I turned on this computer, the wireless screen, I can see that this computer can receive one wireless network signal. This is the network A. I purposely set the SSID to A for us to observe the effect when we choose different wireless channels. So we have the wireless network A and current signal coverage is 100%.

What happened if I have another Wireless Access Point here? Okay, let's say I put another Access Point here, and I change the Wireless Access Point's SSID to B. Again with the same channel. It's just for us to observe the effect. I change the SSID. We can see the difference here. So now we have the network A, the SSID A, and B. The signal coverage is now dropping from 100% to 79%. So, what that means is, when you have more than one device using the same channel, actually you are getting interference from each other, from other Access Points.

The same practice you can do, is add more Access Points. For example, again, I do not want them to be associated and I want to show, so I change the SSID. So this one to C and this one I change the SSID to D. Now, I opened my laptop. Let me do a refresh. Now I can see that my laptop is getting four wireless networks, and this four wireless networks, their signal coverage is actually even lower than the last, before I add these two Access Points. If without any interference, only a single Access Point, I got 100%. When I add a second one, I got like 79%. I add two more, now I get 29%. So you can see that when we have more devices, using the same channel, actually I get weaker signal because of the interference.

The things we need to do is we should use different channels. So let me delete these two devices. Now I have two wireless Access Points here, and I do a show again. So, now the wireless, take note is 79%. So, what we demo here is that we can change the wireless Access Points' channel setting. The default channel is Channel 1. So I can change to, let's say, Channel 2. Okay, before I go to the next non-overlapping channel. So I choose Channel 2. I go to a computer and do a refresh. Now, this time you see that although I have two wireless Access Points here, but I change one wireless channel on one of the Access Point. And we see that the signal is now actually stronger because it's higher than the previous scenario. Now we got



83%. One AP is using Channel 1, and the other one is using Channel 2. They are not 100%, it's because quite a large part of this wireless channels are overlapped with each other.

Let's do another setting. We change it to Channel 3. Channel 3 has less wireless channel overlapping, and we should expect a better signal. So this time we get 87%. See, when we change from both Channel 1 and in this scenario, one is Channel 1 and the other is Channel 3, we get a better signal. And then, we can further move this channel for one of the Access Point, let's say, to Channel 5. (With) Channel 5, I got 95%. You may be wondering why there is not 100%? Channel 1 and Channel 5 looks like non-overlapping channels. (So this is curve is Channel 1 and this curve is Channel 5.) In fact, these two frequency channels are too close to each other. There is still some overlapping and it will produce interference to each other. So Channel 1 and Channel 5 - they are still slightly overlapped and there is interference occurred.

The best option is we choose one in Channel 1 and the other one in Channel 6. So let me go to this AP and change to Channel 6. What would you expect is that Channel 1 and Channel 6, they are completely non-overlap. And there are channel gap to make sure there are no interference; there are no overlapping. So let me open my laptop now and do a refresh and this time, we get much better network signal coverage. A is using Channel 1, signal is 99% and B is using Channel 6, and also 99%. Although Packet Tracer currently does not support showing the channel number in this Linksys client, it is enough for you to observe using the different wireless channels and the effect on the signal coverage, the signal strength and signal coverage for this device. This is my first demo about the wireless channel.