Lab 4: Wireless Topology

The ns-3 is a discrete-event network simulator, widely used in academia and industry. In this lab, you will be simulating a combined network topology that includes a point to point link, an Ethernet link as well as Wireless links using NS3.

Objectives

1. You will learn to work with a Wireless System in NS3.
2. You will learn about how a Wireless Device connects to an Access Point.

Description:

In this lab experiment, the first thing you will do is to go through the code **examples/tutorial/third.cc** and try to see how much you can understand without any help.

Next, go through the following link to understand what each line of the code means: https://www.nsnam.org/docs/release/3.24/tutorial/singlehtml/index.html#building-a-wireless-network-topology

Once you understand the code, run the program as follows.

```
$ cp examples/tutorial/third.cc scratch/mythird.cc
$ ./waf
$ ./waf --run scratch/mythird
```

You should see an output similar to.

```
Waf: Entering directory `/home/craigdo/repos/ns-3-allinone/ns-3-dev/build'
Waf: Leaving directory `/home/craigdo/repos/ns-3-allinone/ns-3-dev/build'
'build' finished successfully (0.407s)
At time 2s client sent 1024 bytes to 10.1.2.4 port 9
At time 2.01796s server received 1024 bytes from 10.1.3.3 port 49153
At time 2.01796s server sent 1024 bytes to 10.1.3.3 port 49153
At time 2.03364s client received 1024 bytes from 10.1.2.4 port 9
```

But this will not create the trace files for individual nodes. In order to generate the trace files you need to run the following command.

```
./waf --run "scratch/mythird --tracing=true"
```

Print the Output of each trace files.

Then, Answer the following questions with necessary snapshots.
- Total how many times ARP requests are issued (add up for all the segments of the Network)? Why?
- What are the steps of a connection establishment to a Wireless Access Point? (Hint. Check the trace third-0-1.pcap)

Now By default, the program assigns some standard IP address to the network.
Change the Base network addresses. (Hint: Look at the lines **"address.SetBase ("10.1.1.0", "255.255.255.0");"**) Be careful in assigning the IP addresses. They must be non-overlapping.

Furthermore, the original code creates 3 WIFI devices , by default.
Change the number of devices to 10 by using the following command:

```
./waf --run "scratch/mythird --tracing=true --nWifi=10"
```

Print out the Outputs as well as the trace file contents. Then Answer the following questions.

- From the trace files, how would you calculate the number of wifi devices connected to the AP? (Hint. Check the trace third-0-1.pcap)
- What is the maximum number of Wifi devices that can be created with this program?

Next, Change the Probing mechanism in WIFI devices to Active probing by changing the following line in the code

```
mac.SetType ("ns3::StaWifiMac",
        "Ssid", SsidValue (ssid),
        "ActiveProbing", BooleanValue (false));
```

to
```
mac.SetType ("ns3::StaWifiMac",
        "Ssid", SsidValue (ssid),
        "ActiveProbing", BooleanValue (true));
```

- Run the program again (With 10 WIFI nodes) and then, based on the trace **third-0-1.pcap** point out the differences between the active probing and non-active (passive) probing.
- Write a summary of what did you learn by doing this lab exercise

[N.B. Supporting screenshots must be provided with all the answers expect the summary question]