

EE450: LAB 4

SESSION 4

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Aim: To simulate a combined network topology that includes a point to point link, an Ethernet link as well as Wireless links using ns-3.

Trace file for Wi-Fi:

```
[L$ tcpdump -nn -tt -r third-0-1.pcap
reading from file third-0-1.pcap, link-type IEEE802_11 (802.11)
0.000025 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
0.000308 Assoc Request (ns-3-ssid) [6.0 9.0 12.0 18.0 24.0 36.0 48.0 54.0 Mbit]
0.000324 Acknowledgment RA:00:00:00:00:00:08
0.000402 Assoc Response AID(0) :: Successful
0.000546 Acknowledgment RA:00:00:00:00:00:0a
0.000721 Assoc Request (ns-3-ssid) [6.0 9.0 12.0 18.0 24.0 36.0 48.0 54.0 Mbit]
0.000737 Acknowledgment RA:00:00:00:00:00:07
0.000824 Assoc Response AID(0) :: Successful
0.000968 Acknowledgment RA:00:00:00:00:00:0a
0.001134 Assoc Request (ns-3-ssid) [6.0 9.0 12.0 18.0 24.0 36.0 48.0 54.0 Mbit]
0.001150 Acknowledgment RA:00:00:00:00:00:09
0.001273 Assoc Response AID(0) :: Successful
0.001417 Acknowledgment RA:00:00:00:00:00:0a
0.102400 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
0.204800 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
0.307200 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
0.409600 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
0.512000 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
0.614400 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
0.716800 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
0.819200 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
0.921600 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
1.024000 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
1.126400 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
1.228800 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
1.331200 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
1.433600 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
1.536000 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
1.638400 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
1.740800 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
1.843200 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
1.945600 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
2.006112 ARP, Request who-has 10.1.3.4 (ff:ff:ff:ff:ff:ff) tell 10.1.3.3, length 32
2.006128 Acknowledgment RA:00:00:00:00:00:09
2.006206 ARP, Request who-has 10.1.3.4 (ff:ff:ff:ff:ff:ff) tell 10.1.3.3, length 32
2.006352 ARP, Reply 10.1.3.4 is-at 00:00:00:00:00:0a, length 32
2.006524 Acknowledgment RA:00:00:00:00:00:0a
2.008151 IP 10.1.3.3.49153 > 10.1.2.4.9: UDP, length 1024
2.008167 Acknowledgment RA:00:00:00:00:00:09
2.031758 ARP, Request who-has 10.1.3.3 (ff:ff:ff:ff:ff:ff) tell 10.1.3.4, length 32
2.032017 ARP, Reply 10.1.3.3 is-at 00:00:00:00:00:09, length 32
2.032033 Acknowledgment RA:00:00:00:00:00:09
2.032165 IP 10.1.2.4.9 > 10.1.3.3.49153: UDP, length 1024
2.033701 Acknowledgment RA:00:00:00:00:00:0a
2.048000 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
2.150400 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
2.252800 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
2.355200 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
2.457600 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
2.560000 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
2.662400 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
2.764800 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
2.867200 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
```

The above beacon is transmitted for the remainder time.

Trace file for left side of Point to Point link:

```
[L$ tcpdump -nn -tt -r third-0-0.pcap
reading from file third-0-0.pcap, link-type PPP (PPP)
2.008151 IP 10.1.3.3.49153 > 10.1.2.4.9: UDP, length 1024
2.026758 IP 10.1.2.4.9 > 10.1.3.3.49153: UDP, length 1024
```

Trace file for right side of point to point link:

```
[L$ tcpdump -nn -tt -r third-1-0.pcap
reading from file third-1-0.pcap, link-type PPP (PPP)
2.011837 IP 10.1.3.3.49153 > 10.1.2.4.9: UDP, length 1024
2.023072 IP 10.1.2.4.9 > 10.1.3.3.49153: UDP, length 1024
```

Trace file for CSMA network:

```
[L$ tcpdump -nn -tt -r third-1-1.pcap
reading from file third-1-1.pcap, link-type EN10MB (Ethernet)
2.017837 ARP, Request who-has 10.1.2.4 (ff:ff:ff:ff:ff:ff) tell 10.1.2.1, length 50
2.017861 ARP, Reply 10.1.2.4 is-at 00:00:00:00:00:06, length 50
2.017861 IP 10.1.3.3.49153 > 10.1.2.4.9: UDP, length 1024
2.022966 ARP, Request who-has 10.1.2.1 (ff:ff:ff:ff:ff:ff) tell 10.1.2.4, length 50
2.022966 ARP, Reply 10.1.2.1 is-at 00:00:00:00:00:03, length 50
2.023072 IP 10.1.2.4.9 > 10.1.3.3.49153: UDP, length 1024
```

Q1.1

There are three ARP requests made in the Wi-Fi trace and two are made in the CSMA network. Total 5. The first two requests are made when the client (10.1.3.3) is trying to send its echo to the server and in order to do so must determine the mac address of the next hop which is the access point (10.1.3.4). The next ARP request is made by node 1 on the CSMA bus to determine the mac address of the server with IP address 10.1.2.4 so it can pass the message from the client. The next one is again made on the CSMA network when the server (10.1.2.4) receives the echo request and turns the packet around trying to send it back to the source. The server knows that this address is on another network that it reaches via IP address 10.1.2.1. This is because global routing is initialized and it has figured all of this out for us. But, the echo server node doesn't know the MAC address of the first CSMA node, so it has to ARP for it just like the first CSMA node had to do. Finally, the last ARP request is made by the Access Point (10.1.3.4) to pass over the echo from the server to the client and in order to do so needs to determine the mac address of the client (10.1.3.3).

Q1.2

There are total 4 steps to establish connection with a wireless access point:

Initially the wireless access point (AP) is transmitting a beacon containing the SSID and supported rates.

1. This beacon is picked up by the wireless device which then sends an association request.
2. The AP provides an acknowledgement that it has received the request.
3. If the association is successful, then the AP sends a Successful Association Response, else Failure Association Response.
4. Finally, the wireless device acknowledges the Association Response.

IP address changes:

```
address.SetBase ("10.1.1.0", "255.255.255.0");
Ipv4InterfaceContainer p2pInterfaces;
p2pInterfaces = address.Assign (p2pDevices);

address.SetBase ("192.168.1.0", "255.255.255.0");
Ipv4InterfaceContainer csmaInterfaces;
csmaInterfaces = address.Assign (csmaDevices);

address.SetBase ("172.1.1.0", "255.255.255.0");
address.Assign (staDevices);
address.Assign (apDevices);
```

Output:

```
[L$ ./waf --run "scratch/mythird --tracing=true --nWifi=10"
Waf: Entering directory `/Users/therelaxist/ns3-workspace/ns-allinone-3.24/ns-3.24/build'
[ 882/2274] Compiling scratch/mythird.cc
[2274/2274] Linking build/scratch/mythird
Waf: Leaving directory `/Users/therelaxist/ns3-workspace/ns-allinone-3.24/ns-3.24/build'
Build commands will be stored in build/compile_commands.json
'build' finished successfully (5.309s)
At time 2s client sent 1024 bytes to 192.168.1.4 port 9
At time 2.01887s server received 1024 bytes from 172.1.1.10 port 49153
At time 2.01887s server sent 1024 bytes to 172.1.1.10 port 49153
At time 2.03559s client received 1024 bytes from 192.168.1.4 port 9
```

Trace Files:

Trace file for CSMA network:

```
[L$ tcpdump -nn -tt -r third-1-1.pcap
reading from file third-1-1.pcap, link-type EN10MB (Ethernet)
2.018756 ARP, Request who-has 192.168.1.4 (ff:ff:ff:ff:ff:ff) tell 192.168.1.1, length 50
2.018780 ARP, Reply 192.168.1.4 is-at 00:00:00:00:00:06, length 50
2.018780 IP 172.1.1.10.49153 > 192.168.1.4.9: UDP, length 1024
2.024885 ARP, Request who-has 192.168.1.1 (ff:ff:ff:ff:ff:ff) tell 192.168.1.4, length 50
2.024885 ARP, Reply 192.168.1.1 is-at 00:00:00:00:00:03, length 50
2.024991 IP 192.168.1.4.9 > 172.1.1.10.49153: UDP, length 1024
```

Trace file for left side of Point to Point link:

```
[L$ tcpdump -nn -tt -r third-0-0.pcap
reading from file third-0-0.pcap, link-type PPP (PPP)
2.009070 IP 172.1.1.10.49153 > 192.168.1.4.9: UDP, length 1024
2.028677 IP 192.168.1.4.9 > 172.1.1.10.49153: UDP, length 1024
```

Trace file for right side of point to point link:

```
[L$ tcpdump -nn -tt -r third-1-0.pcap
reading from file third-1-0.pcap, link-type PPP (PPP)
2.012756 IP 172.1.1.10.49153 > 192.168.1.4.9: UDP, length 1024
2.024991 IP 192.168.1.4.9 > 172.1.1.10.49153: UDP, length 1024
```

Trace file for Wi-Fi:

```
[L$ tcpdump -nn -tt -r third-0-1.pcap
reading from file third-0-1.pcap, link-type IEEE802_11 (802.11)
0.000025 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
0.000281 Assoc Request (ns-3-ssid) [6.0 9.0 12.0 18.0 24.0 36.0 48.0 54.0 Mbit]
0.000297 Acknowledgment RA:00:00:00:00:00:0a
0.000498 Assoc Request (ns-3-ssid) [6.0 9.0 12.0 18.0 24.0 36.0 48.0 54.0 Mbit]
0.000514 Acknowledgment RA:00:00:00:00:00:0b
0.000697 Assoc Request (ns-3-ssid) [6.0 9.0 12.0 18.0 24.0 36.0 48.0 54.0 Mbit]
0.000713 Acknowledgment RA:00:00:00:00:00:08
0.000818 Assoc Response AID(0) :: Successful
0.001101 Assoc Request (ns-3-ssid) [6.0 9.0 12.0 18.0 24.0 36.0 48.0 54.0 Mbit]
0.001117 Acknowledgment RA:00:00:00:00:00:0c
0.001300 Assoc Request (ns-3-ssid) [6.0 9.0 12.0 18.0 24.0 36.0 48.0 54.0 Mbit]
0.001316 Acknowledgment RA:00:00:00:00:00:0f
0.001526 Assoc Request (ns-3-ssid) [6.0 9.0 12.0 18.0 24.0 36.0 48.0 54.0 Mbit]
0.001542 Acknowledgment RA:00:00:00:00:00:10
0.001776 Assoc Request (ns-3-ssid) [6.0 9.0 12.0 18.0 24.0 36.0 48.0 54.0 Mbit]
0.001792 Acknowledgment RA:00:00:00:00:00:09
0.002029 Assoc Request (ns-3-ssid) [6.0 9.0 12.0 18.0 24.0 36.0 48.0 54.0 Mbit]
0.002045 Acknowledgment RA:00:00:00:00:00:0e
0.002274 Assoc Request (ns-3-ssid) [6.0 9.0 12.0 18.0 24.0 36.0 48.0 54.0 Mbit]
0.002290 Acknowledgment RA:00:00:00:00:00:07
0.002473 Assoc Request (ns-3-ssid) [6.0 9.0 12.0 18.0 24.0 36.0 48.0 54.0 Mbit]
0.002489 Acknowledgment RA:00:00:00:00:00:0d
0.002594 Assoc Response AID(0) :: Successful
0.002738 Acknowledgment RA:00:00:00:00:00:11
0.002844 Assoc Response AID(0) :: Successful
0.002988 Acknowledgment RA:00:00:00:00:00:11
0.003085 Assoc Response AID(0) :: Successful
0.003229 Acknowledgment RA:00:00:00:00:00:11
0.003362 Assoc Response AID(0) :: Successful
0.003506 Acknowledgment RA:00:00:00:00:00:11
0.003630 Assoc Response AID(0) :: Successful
0.003774 Acknowledgment RA:00:00:00:00:00:11
0.003880 Assoc Response AID(0) :: Successful
0.004024 Acknowledgment RA:00:00:00:00:00:11
0.004076 Assoc Response AID(0) :: Successful
0.004221 Acknowledgment RA:00:00:00:00:00:11
0.004318 Assoc Response AID(0) :: Successful
0.004462 Acknowledgment RA:00:00:00:00:00:11
0.004523 Assoc Response AID(0) :: Successful
0.004667 Acknowledgment RA:00:00:00:00:00:11
0.004827 Assoc Response AID(0) :: Successful
0.004971 Acknowledgment RA:00:00:00:00:00:11
0.102400 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
0.204800 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
0.307200 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
0.409600 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
0.512000 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
0.614400 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
0.716800 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
0.819200 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
0.921600 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
1.024000 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
1.126400 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
1.228800 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
```



```

1.331200 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
1.433600 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
1.536000 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
1.638400 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
1.740800 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
1.843200 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
1.945600 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
2.007112 ARP, Request who-has 172.1.1.11 (ff:ff:ff:ff:ff:ff) tell 172.1.1.10, length 32
2.007128 Acknowledgment RA:00:00:00:00:00:10
2.007206 ARP, Request who-has 172.1.1.11 (ff:ff:ff:ff:ff:ff) tell 172.1.1.10, length 32
2.007388 ARP, Reply 172.1.1.11 is-at 00:00:00:00:00:11, length 32
2.007560 Acknowledgment RA:00:00:00:00:00:11
2.009070 IP 172.1.1.10.49153 > 192.168.1.4.9: UDP, length 1024
2.009086 Acknowledgment RA:00:00:00:00:00:10
2.033677 ARP, Request who-has 172.1.1.10 (ff:ff:ff:ff:ff:ff) tell 172.1.1.11, length 32
2.033935 ARP, Reply 172.1.1.10 is-at 00:00:00:00:00:10, length 32
2.033951 Acknowledgment RA:00:00:00:00:00:10
2.034110 IP 192.168.1.4.9 > 172.1.1.10.49153: UDP, length 1024
2.035646 Acknowledgment RA:00:00:00:00:00:11
2.048000 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
2.150400 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
2.252800 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS

```

The above beacon is transmitted for the remainder time.

Q2.1 Count number of Association Responses that have status code successful and have unique destination mac addresses.

Q2.2 250 due to programming constraints. Although this number depends on the subnet mask. Technically with subnet mask of 255.255.255.0 we could support 256 devices including AP.

```

if (nWifi > 250 || nCsma > 250)
{
    std::cout << "Too many wifi or csma nodes, no more than 250 each." << std::endl;
    return 1;
}

```

Q3.1

In Passive mode that we have seen in the earlier problems the wireless device listens for beacons that are sent out by the AP. The disadvantage of this maybe that devices may have to wait for long periods for a valid beacon. However, an advantage in this method could be that the network traffic will be less.

Active probing is the process where in the wireless device (trying to connect) sends out a broadcast probe request to solicit a probe response from the AP. This probe response is picked up by the device and then followed up by the association steps which are similar to the passive mode. The major difference from passive mode is that the device does not have to wait for the beacon but causes lot of traffic on the network.

Q3.2 This lab was by far the best. I had never envisioned such sophistication in a network simulator. This lab showed me how easy it can be to simulate complex networks with simple code and also makes me wonder of its applications in the industry when making a choice in network topology.

Conclusion: The ns-3 tool is a fantastic tool that can simulate complex network configurations with verbose logging and packet trace. Using this tool in this lab, I learnt how to create a basic network containing a wireless device, a CSMA network and a point to point network. I also learnt the differences in the probing techniques in wireless scanning.

```
[L$ tcpdump -nn -tt -r third-0-1.pcap
reading from file third-0-1.pcap, link-type IEEE802_11 (802.11)
0.000025 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
0.000277 Probe Request (ns-3-ssid) [6.0 9.0 12.0 18.0 24.0 36.0 48.0 54.0 Mbit]
0.000430 Probe Request (ns-3-ssid) [6.0 9.0 12.0 18.0 24.0 36.0 48.0 54.0 Mbit]
0.000736 Probe Request (ns-3-ssid) [6.0 9.0 12.0 18.0 24.0 36.0 48.0 54.0 Mbit]
0.000779 Probe Response (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit]
0.000947 Acknowledgment RA:00:00:00:00:00:11
0.001077 Assoc Request (ns-3-ssid) [6.0 9.0 12.0 18.0 24.0 36.0 48.0 54.0 Mbit]
0.001093 Acknowledgment RA:00:00:00:00:00:0a
0.001299 Probe Request (ns-3-ssid) [6.0 9.0 12.0 18.0 24.0 36.0 48.0 54.0 Mbit]
0.001434 Probe Request (ns-3-ssid) [6.0 9.0 12.0 18.0 24.0 36.0 48.0 54.0 Mbit]
0.001596 Probe Request (ns-3-ssid) [6.0 9.0 12.0 18.0 24.0 36.0 48.0 54.0 Mbit]
0.001675 Probe Response (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit]
0.001843 Acknowledgment RA:00:00:00:00:00:11
0.001973 Assoc Request (ns-3-ssid) [6.0 9.0 12.0 18.0 24.0 36.0 48.0 54.0 Mbit]
0.001989 Acknowledgment RA:00:00:00:00:00:0b
0.002139 Probe Response (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit]
0.002308 Acknowledgment RA:00:00:00:00:00:11
0.002438 Assoc Request (ns-3-ssid) [6.0 9.0 12.0 18.0 24.0 36.0 48.0 54.0 Mbit]
0.002454 Acknowledgment RA:00:00:00:00:00:0f
0.002595 Assoc Response AID(0) :: Successful
0.002739 Acknowledgment RA:00:00:00:00:00:11
0.002872 Probe Response (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit]
0.003040 Acknowledgment RA:00:00:00:00:00:11
0.003170 Assoc Request (ns-3-ssid) [6.0 9.0 12.0 18.0 24.0 36.0 48.0 54.0 Mbit]
0.003186 Acknowledgment RA:00:00:00:00:00:07
0.003354 Probe Response (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit]
0.003522 Acknowledgment RA:00:00:00:00:00:11
0.003652 Assoc Request (ns-3-ssid) [6.0 9.0 12.0 18.0 24.0 36.0 48.0 54.0 Mbit]
0.003668 Acknowledgment RA:00:00:00:00:00:10
0.003818 Probe Response (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit]
0.003986 Acknowledgment RA:00:00:00:00:00:11
0.004116 Assoc Request (ns-3-ssid) [6.0 9.0 12.0 18.0 24.0 36.0 48.0 54.0 Mbit]
0.004132 Acknowledgment RA:00:00:00:00:00:09
0.004228 Assoc Response AID(0) :: Successful
0.004372 Acknowledgment RA:00:00:00:00:00:11
0.004469 Assoc Response AID(0) :: Successful
0.004613 Acknowledgment RA:00:00:00:00:00:11
0.004674 Assoc Response AID(0) :: Successful
0.004819 Acknowledgment RA:00:00:00:00:00:11
0.004979 Assoc Response AID(0) :: Successful
0.005123 Acknowledgment RA:00:00:00:00:00:11
0.005157 Assoc Response AID(0) :: Successful
0.005301 Acknowledgment RA:00:00:00:00:00:11
0.102400 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
0.204800 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
0.307200 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
0.409600 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
0.512000 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
0.614400 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
0.716800 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
0.819200 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
0.921600 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
1.024000 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
1.126400 Beacon (ns-3-ssid) [6.0* 9.0 12.0* 18.0 24.0* 36.0 48.0 54.0 Mbit] IBSS
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