San Jose State University

Electrical Engineering

Project #2

EE289 Wireless and Mobile Networking

Under the Guidance of: Professor Pedro Santacruz

Tools Used: Network Simulator3, Wireshark, Eclipse, Ubuntu Terminal

Project 2 submitted by Group 4

Charanjeet Kaur
Kriti Walia
PrudhviRaj Tirumanisetti

1. Counting Received Packets

Q1. How many transmitters are there in the network?

S: There are 10 transmitters in the network because this is an ad-hoc network. Every node can send and receive from every node.

Q2. How many receivers are there in the network?

S: There are 2 receivers in the network.

Q3. Who is transmitting to who?

S: In ad-hoc network, node 1 and node 2 are receiving from everyone else.

Q4. How many total packets were successfully received during simulation?

S: Total number of packets received = 771

```
walia@walia-VirtualBox:~/Desktop$ python pythonparsing.py
['0', '0', '0', '0', '0', '0', '0', '18', '18', '18', '18', '18', '18', '18', '18', '18', '18', '18', '18', '18', '18', '18', '18', '18', '18', '18', '
18', '18', '18', '18', '18', '18', '18', '18', '18', '18', '18', '18', '18', '18', '18', '18', '18', '17', '18', '18', '18', '18', '17', '17']
Traceback (most recent call last):
  File "pythonparsing.py", line 12, in <module>
    print sum(buff)
TypeError: unsupported operand type(s) for +: 'int' and 'str'
walia@walia-VirtualBox:~/Desktop$ python pythonparsing.py
[0, 0, 0, 0, 0, 0, 0, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 1
8, 18, 18, 18, 17, 18, 18, 18, 18, 17, 17]
walia@walia-VirtualBox:~/Desktop$ python pythonparsing.py
[0, 0, 0, 0, 0, 0, 0, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 18, 1
8, 18, 18, 18, 17, 18, 18, 18, 18, 17, 17]
771
```

Figure 1: Simulation for packets received

Q5. Look at the .routes file. What is the route with the largest hop count?

S: Please look at the snapshot below.

```
Node: 2, Time: +15.000s, Local time: +15.000s, DSDV Routing table

DSDV Routing table
Destination      Gateway     Interface        HopCount        SeqNum     LifeTime             SettlingTime
10.1.1.1         10.1.1.1         10.1.1.3         1          2          14.975s    6.000s
10.1.1.2         10.1.1.2         10.1.1.3         1          2          14.985s    6.000s
10.1.1.4         10.1.1.4         10.1.1.3         1          2          14.974s    0.000s
10.1.1.5         10.1.1.1         10.1.1.3         2          2          14.991s    6.000s
10.1.1.6         10.1.1.6         10.1.1.3         1          2          14.977s    6.000s
10.1.1.7         10.1.1.7         10.1.1.3         1          2          14.978s    6.000s
10.1.1.8         10.1.1.8         10.1.1.3         1          2          14.977s    6.000s
10.1.1.9         10.1.1.9         10.1.1.3         1          2          14.981s    6.000s
```

Figure 2: Largest hop count screenshot

As shown above, the route with the largest hop count is 2 (two).

Q6. Look at the .pcap files. Describe the different types of packets that are being sent.

S: See the screenshot below for the packets information:

94	6.731359	00:00:00_00:00:07	Broadcast	ARP	64 Who has 10.1.1.1? Tell 10.1.1.7
95	6.731849	00:00:00_00:00:01	00:00:00_00:00:07	ARP	64 10.1.1.1 is at 00:00:00:00:00:01
96	6.732306		00:00:00_00:00:01 (…	802.11	14 Acknowledgement, Flags=o.....
97	6.733322	10.1.1.7	10.1.1.1	UDP	1064 49154 → 9 Len=1000
98	6.733332		00:00:00_00:00:07 (…	802.11	14 Acknowledgement, Flags=o.....
99	6.780386	00:00:00_00:00:05	Broadcast	ARP	64 Who has 10.1.1.2? Tell 10.1.1.5
100	6.781100	00:00:00_00:00:02	00:00:00_00:00:05	ARP	64 10.1.1.2 is at 00:00:00:00:00:02
101	6.781314		00:00:00_00:00:02 (…	802.11	14 Acknowledgement, Flags=o.....
102	6.782770	10.1.1.5	10.1.1.2	UDP	1064 49153 → 9 Len=1000

Figure 3: Wireshark screenshot

It is clear from the above picture that the different packets that being sent are: ARP, UDP, MANET, and ACK.

2. Transmission Range

Q1. What lines did you uncomment? What do they do?

S: We uncommented the following lines:

//wifiPhy.Set (EnergyDetectionThreshold",DoubleValue (-80));

//wifiPhy.Set ("CcaModelThreshold", DoubleValue(-81));

By uncommenting these lines, we reduced the range of nodes, so that few nodes will not be able to contact with each other.

Q2. How many total packets were successfully received during the simulation?

S: Total number of packets are 606.

Q3. Look at the .routes file. What is the route with the largest hop count?

S: The route with the largest hop count is 5 (Five).

3. DELAY

Q1. What is the average delay of packets for the DSDV routing protocol?

S: 0.00895 Seconds

Q2. What is the maximum delay of packets for DSDV routing protocol?

S: 3.0152 Seconds

Q3. How do you determined when a packet is successfully received from the .tr file?

S: According to us, we tried to match the sequence numbers of transmitters and

receivers. Once it is matched, we tried to compare the source and destinations ip addresses. If they match, that means the packet is successfully received.

4. OTHER ROUTING PROTOCOL

Q1. What is the average delay of packets for DSR routing protocol?

S: 0.10165 Seconds.

Q2. What is the maximum delay of packets for DSR routing protocol?

S: 27.651 Seconds.

Q3. What is the average delay of packets for AODV routing protocol?

S: Average Delay of AODV routing Protocol is 0.002529 Seconds.

Q4. What is the maximum delay of packets for AODV routing protocol?

S: Maximum Delay of AODV routing 0.043456 Seconds

Q5. Which routing protocol successfully transmits the most packets?

S: Using DSDV we are getting 771 Packets. Using DSR we are Receiving 779 Packets. Using AODV we are receiving 777 Packets. From this analysis, we can conclude that DSR protocol has more number of packets.

Q6. Which routing protocol has the largest average delay?

S: Since DSR has the maximum Delay compared to the other Protocols, DSR has the largest Average Delays

Q7. Which routing protocol has the largest maximum delay?

S: DSR has the maximum Delay when compared to DSDV and AODV.

Q8. Look at the.pcap files. Describe how different types of packets being sent are different than when using the DSDV routing protocol?

S: DSDV is a Proactive Protocol which means It's a table-driven routing protocol. Where as incase of the AODV and DSR the route is calculated when ever required. So AODV and DSR has route request and route reply mechanism while DSDV doesn't have.

5. NUMBER OF USERS:

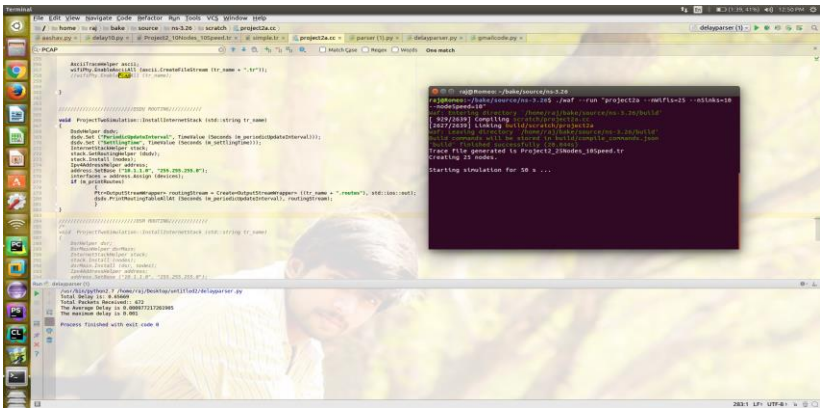


Figure 4: DSR

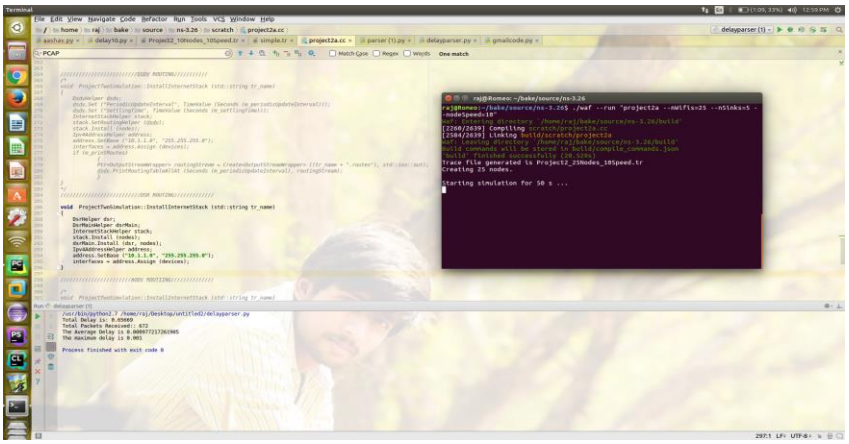
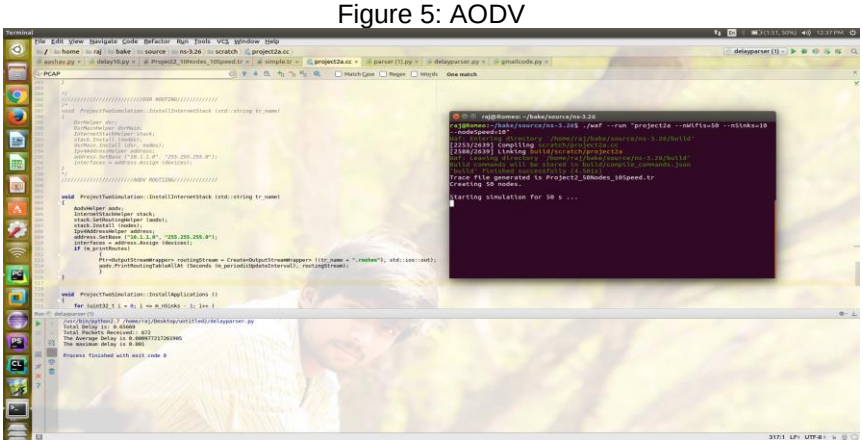


Figure 5: AODV



Number of Users	Routing Protocol	Total Packets Received	Average Delay	Maximum Delay
10	DSDV	716	0.0140	3.0068
	DSR	779	0.1009	27.651
	AODV	777	0.002529	0.0432
25	DSDV	3646	0.0197	3.0145
	DSR	2642	0.1059	27.762
	AODV	2432	0.00286	0.0467
50	DSDV	4110	0.0254	3.0120
	DSR	1610	0.1366	28.933
	AODV	2066	0.0279	0.0312

6. EFFECT OF SPEED:

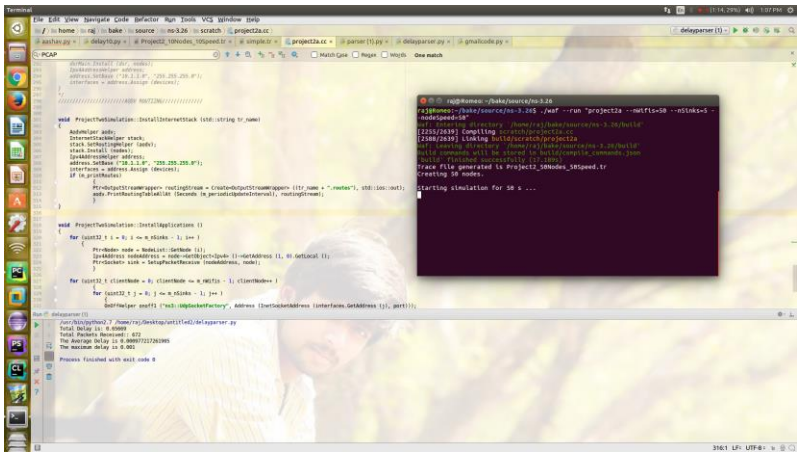


Figure 7

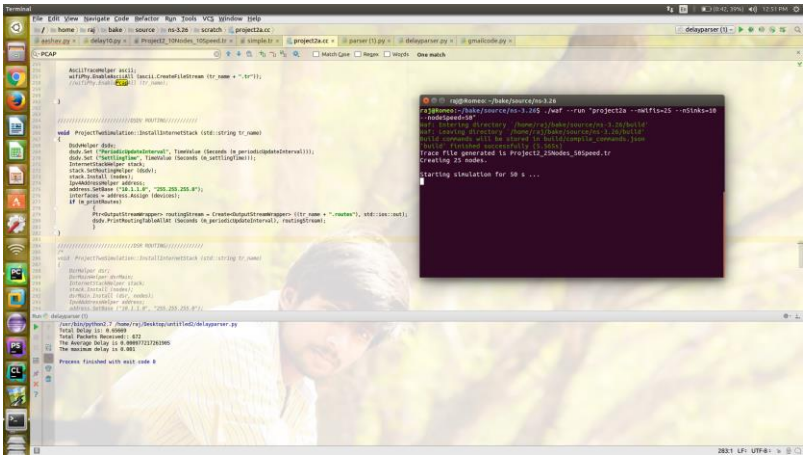


Figure 8

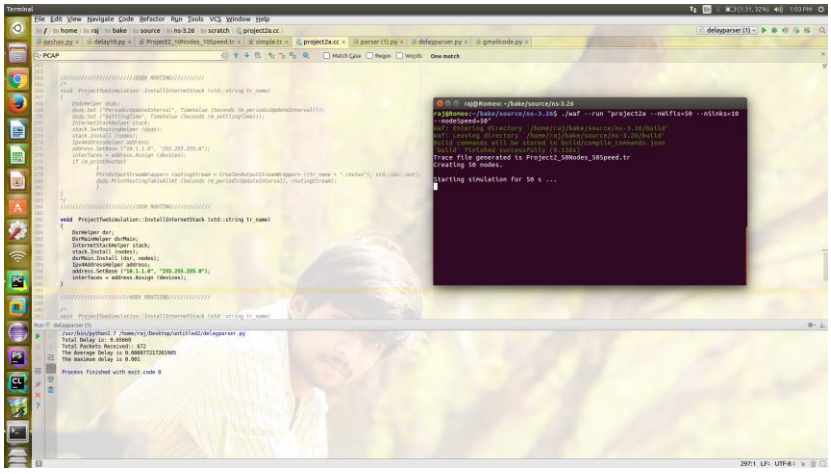


Figure 9:

Number of Users	Routing Protocol	Total Packets Received	Average Delay	Maximum Delay
10	DSDV	249	0.00171	0.0529
	DSR	599	0.3359	40.002
	AODV	646	0.00233	0.0351
25	DSDV	1597	0.00345	0.635
	DSR	1359	0.593	40.563
	AODV	1645	0.00321	0.0461
50	DSDV	2265	0.00544	0.905
	DSR	762	0.850	41.96
	AODV	1150	0.00442	0.749