WIRELESS COMMUNICATION AND NETWORK LABORATORY

LAB INSTRUCTIONS

ON

SIMULATION AND INVESTIGATION OF THE IMPACT OF CONTENTION WINDOW SIZE ON THE PERFORMANCE OF IEEE 802.11 MAC PROTOCOL (NS2 SIMULATOR)

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3.1: OBJECTIVE:

To investigate the impact of contention window size on the performance of the IEEE 802.11 MAC protocol.

3.2: SOFTWARE REQUIRED:

NS2 SIMULATOR (NS2.29/2.30/2.33) under Linux

3.3: THEORY:

Students are advised to go through the available literature and describe in brief the following.

- Overview of IEEE 802.11
- DCF protocol
- Binary Exponential Backoff
- Contention Window

(Refer any text on Computer Network)

3.4: PROCEDURE:

In the working Desktop, Create a folder named with your Roll No .

1. Get the tcl script cwsim.tcl.

2. In the script you will find the following lines that set the values of CWMin and CWMax to the desired value:

```
$val(mac) set CWMin_ 31
$val(mac) set CWMax_ 31
```

In the lines above, CWMin and CWMax have been set to 31. You will manually change these values when asked to do so, using a text editor of your choice.

3. The script you have, takes a single command-line argument "rlen" and creates a topology of rlen^2 nodes arranged in a regular grid (Figure-3.1(a)). For example, if you were to run the experiment with 2x2 = 4 nodes in the 150m x 150m grid area, you will be required to run the following command.

```
ns cwsim.tcl -rlen 2
```

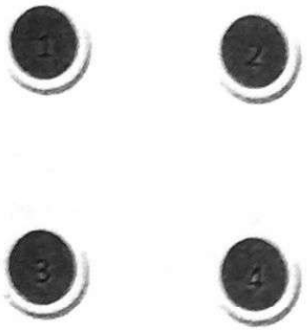

Figure-3.1 (a): 2x2 grid topology

Figure-3.1 (b): 3x3 grid topology

4. Run the script for rlen=3, 4 and 5 (i.e. number of nodes=9, 16, 25), and vary CWMin=CWMax to take the following set of values: 2, 7, 15, 31, 63, 127 (A total of 18 combinations). (use "-rts on -ps 512")
5. Obtain and plot the aggregate CBR throughput and Packet Delivery Ratio (PDR) vs CW size for different rlen values.

- To calculate PDR, you will need to know the number of packets sent and number of packets received. In this example, to get the number of packets sent, you can use the following command:

```
grep AGT cwsim.tr |grep ^s |grep cbr|wc -l
```

- The number reported **above** is the number of packets **sent** by all nodes. To get the number of packets received, you can use a similar command:

```
grep AGT cwsim.tr |grep ^r |grep cbr|wc -l
```

- The reported number **above** is the number of packets received (should be less than equal to the number of packets sent). The ratio of **[Packets Received] / [Packets Sent]** is the PDR.
- To get the throughput, since all flows are a CBR, with a constant packet size of 512 bytes, just multiply number of packets received with 512 x 8 and divide by total simulation time (25 seconds for this example), i.e, Throughput in bits/second = **512 x 8 x [Packets Received] / 25 .**

3.5: OBSERVATION

Contention Window Size	(3x3=9) nodes			(4x4=16) nodes			(5x5=25) nodes		
	Packet Sent(S)	Packet Recvd (R)	PDR (R/S)	Packet Sent(S)	Packet Recvd (R)	PDR (R/S)	Packet Sent(S)	Packet Recvd (R)	PDR (R/S)
2									
7									
15									
31									
63									
127									

3.6: ANALYSIS:

Try to answer following questions with respect to the graph obtained above-

1. What trends do you observe? Do you observe any optimal CW size for each network population?
2. If yes, does the optimal window size exhibit any particular relationship with the network population?
3. Can you predict what would happen if you try to run this script for rlen = 6? Explain.
4. Could you explain what the grep command does to extract information from the trace file?

(N.B: Answer the above questions and include in the conclusion/analysis part of your lab record.)