Experiment No: 9a) **Date: 14/10/2020**

Study and Analysis of Hidden Terminal Problem in WLAN using Netsim

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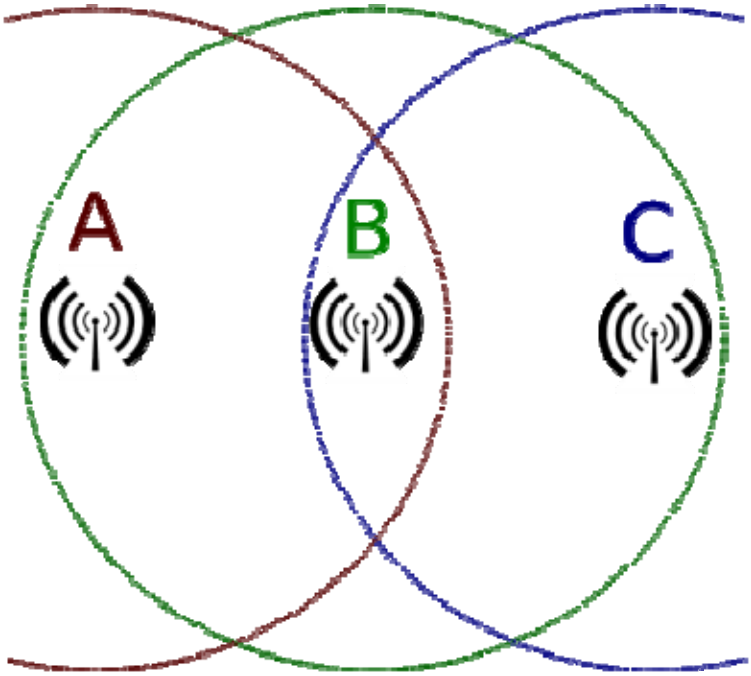
Theory:

Hidden nodes in a wireless network are nodes that are out of range of other nodes or a collection of nodes. In a wireless network, it is likely that the node at the far edge of the access point's range, which is known as **A**, can see the access point, but it is unlikely that the same node can see a node on the opposite end of the access point's range, **C**. These nodes are known as *hidden*.



The problem is when nodes A and C start to send packets simultaneously to the access point B. Because the nodes A and C are out of range of each other and so cannot detect a collision while transmitting, Carrier sense multiple access with collision detection (CSMA/CD) does not work, and collisions occur, which then corrupt the data received by the access point.

To overcome the hidden node problem, RTS/CTS handshaking (IEEE 802.11 RTS/CTS) is implemented in conjunction with the Carrier sense multiple access with collision avoidance (CSMA/CA) scheme. The same problem exists in a MANET.

Procedure:

Please navigate through the below given path to,

Go to, New -> Internetworks

Sample Inputs:

Follow the steps given in the different samples to arrive at the objective.

In Sample 1,

- Total no of APs (Access Points) used: 1
- Total no of Wireless Nodes used: 2
- Total no of Switch used: 1
- Total no of Wired Node used: 1

Also edit the following properties of AP A, Wireless Node D and E:

Wireless Node E Properties	
X/Lat	350
Y/Lon	150

Wireless Node D Properties	
X/Lat	150
Y/Lon	150

Edit Wireless link properties as shown:

Wireless Link Properties	
Channel Characteristics	PathLoss Only
PathLoss Model	LOG_DISTANCE
Path Loss Exponent(n)	4.5

Properties of Wired Links are default.

Disable TCP in both the Wireless Nodes and Wired Node:

Wireless Node D Properties	
TCP	Disabled

Wireless Node E Properties	
TCP	Disabled

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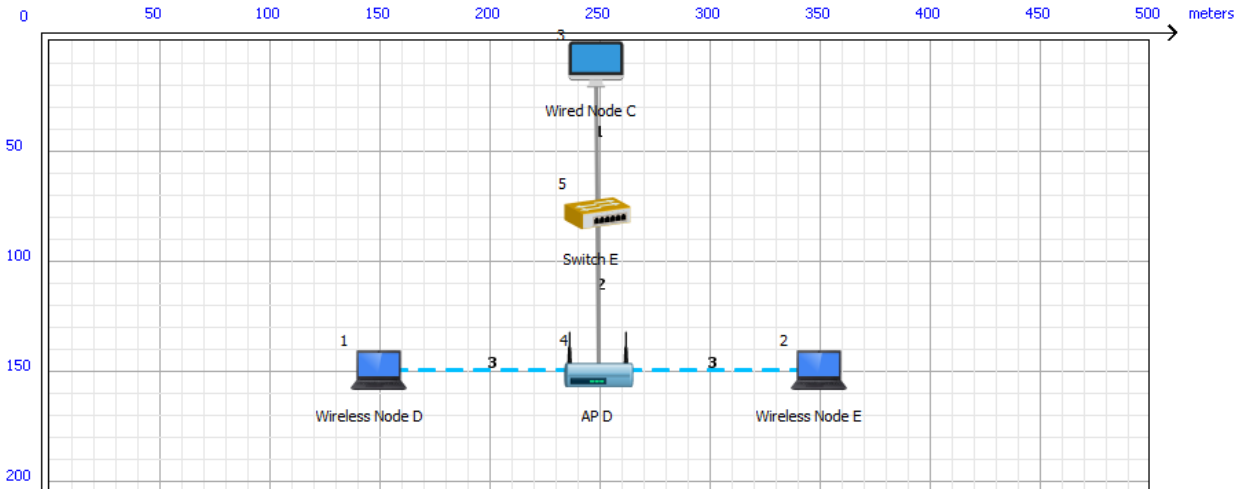
Wired Node C Properties	
TCP	Disabled

Set the properties of Access Point as follows:

Access Point Properties	
X/Lat	250
Y/Lon	100
Interface_Wireless properties	
RTS Threshold(bytes)	3000



Click and drop the Application, set properties and run the simulation.

Application Properties	Application 1	Application 2
Application Method	Unicast	
Application Type	CBR	
Source_Id	4 (Wireless Node 1)	5 (Wireless Node 2)
Destination_Id	3 (Wired Node)	3 (Wired Node)
Packet Size		
Distribution	Constant	Constant

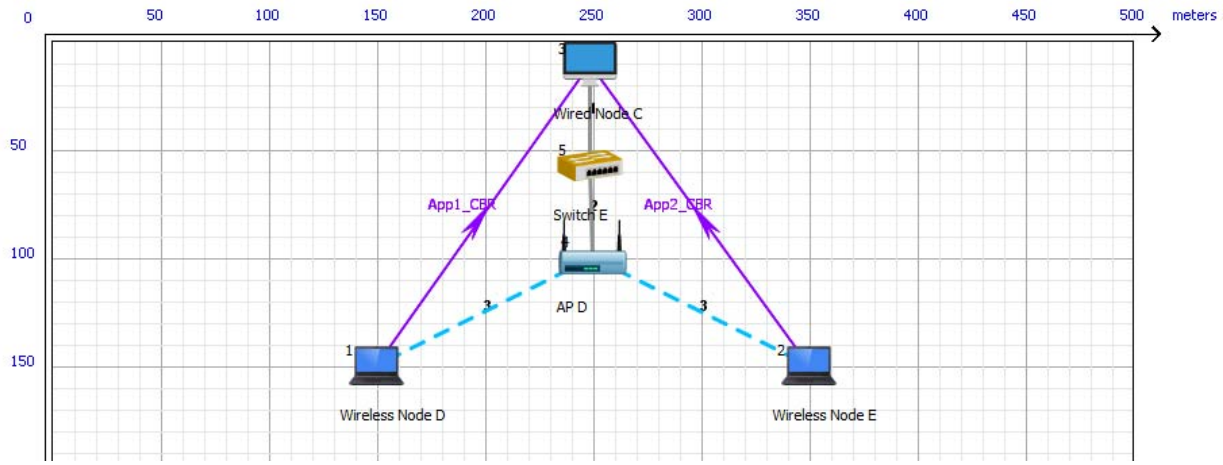
Value (bytes)	1460	1460
Inter Arrival Time		
Distribution	Constant	Constant
Value (micro sec)	20000	20000

Simulation Time - 10 Sec

(**Note:** *The Simulation Time can be selected only after the following two tasks,*

- *Set the properties for all the devices and links.*
- *Click on Run Simulation button***.**

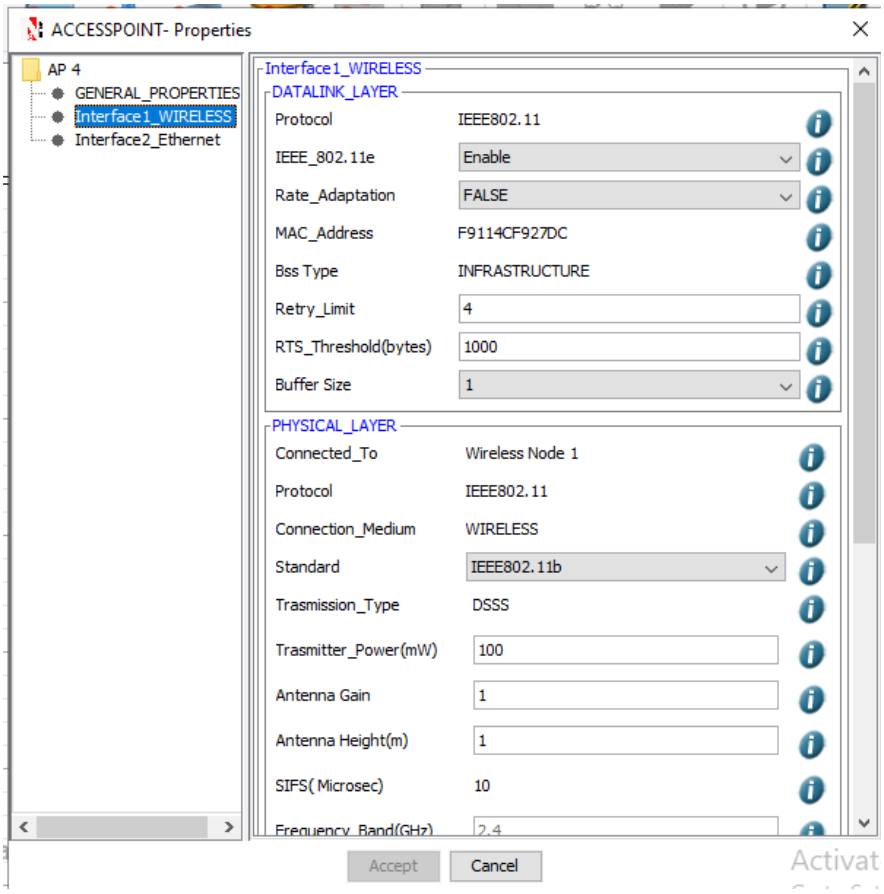
Upon completion of the experiment, Save it using the save button (or ctrl + s) in any user defined location.



In Sample 2,

Set the properties of Access Point as follows:

Access Point Properties	
X/Lat	250
Y/Lon	100
Interface_Wireless properties	
RTS Threshold(bytes)	1000



Simulation Time - 10 Sec

(**Note:** *The Simulation Time can be selected only after the following two tasks,*

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Upon completion of the experiment, Save it using the save button (or ctrl + s) in any user defined location.

Output:

Without RTS enabled

Network_Metrics_Table

Network_Metrics Detailed View

Link_id	Link_throughput_plot	Packet_transmi...		Packet_errored		Packet_collided	
		Data	Control	Data	Control	Data	Control
All	NA	1474	363	3	0	384	0
1	NA	362	0	0	0	0	0
2	NA	363	0	1	0	0	0
3	NA	749	363	2	0	384	0

Application_Metrics_Table

Application_metrics Detailed

Application Id	Application Name	Throughput (Mbps)
1	APP1_CBR	0.213744
2	APP2_CBR	0.209072

With RTS/CTS mechanism

Network_Metrics_Table

Network_Metrics Detailed View

Link_id	Link_throughput_plot	Packet_transmi...		Packet_errored		Packet_collided	
		Data	Control	Data	Control	Data	Control
All	NA	636	942	3	0	0	295
1	NA	211	0	1	0	0	0
2	NA	212	0	1	0	0	0
3	NA	213	942	1	0	0	295

Application_Metrics_Table

Application_metrics Detailed

Application Id	Application Name	Throughput (Mbps)
1	APP1_CBR	0.140160
2	APP2_CBR	0.105120

Comparison Table:

Collided Packets	Without RTS/CTS	With RTS/CTS
Data Packets	384	0
Control Packets	0	295

Metrics		Without RTS/CTS	With RTS/CTS
Throughput(Mbps)	**Application 1**	0.213744	0.140160
	Application 2	0.209072	0.105120

RESULT & INFERENCES:

The comparison with hidden stations shows that RTS/CTS mechanism reduce the data packet collision.

In sample 1 due to hidden node problem, packets collide continuously.

In sample 2 on enabling RTS/CTS, the source node will refrain from sending a data frame until it completes a RTS/CTS handshake with another station, such as an access point. A station initiates the process by sending a RTS frame. The access point receives the RTS and responds with a CTS frame. The station must receive a CTS frame before sending the data frame. The CTS also contains a time value that alerts other stations to hold off from accessing the medium while the station initiating the RTS transmits its data.

Hence in RTS/CTS mechanism throughput of the applications decreases than the other sample. Because data packets are transmitted after the successful RTS/CTS handshake happened.