

ENSC 835: COMMUNICATION NETWORKS

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DEMO OF PROJECT PERFORMANCE EVALUATION OF KEY 802.11 MAC PROTOCOLS

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Evaluation of Three Key Features of MAC Layer

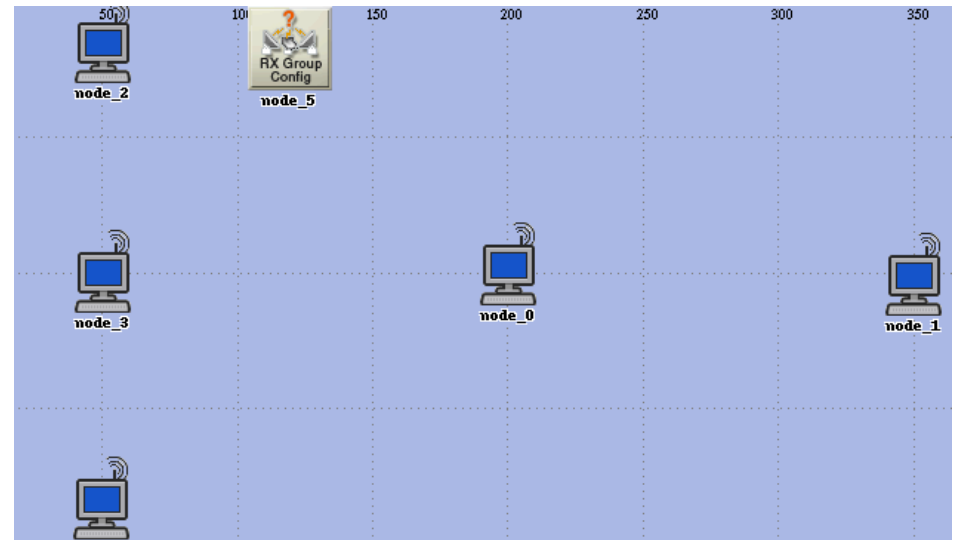
- RTS/CTS (Request to Send/Clear to Send)
 - RTS/CTS handshake before sending packets, similar to TCP connection
 - To solve the problem of Hidden Node
- Fragmentation
 - To divide the large packets smaller to avoid retransmitting large packets in the presence of RF interference.
- Back-off Algorithm
 - A algorithm to let node wait for a while before delivery when collision occurs in busy time.
 - 802.11 mainly use DCF. There is no arbiter.
 - Each node have to cooperate with each other to use the channel fairly

Implementation – RTS/CTS Evaluation

- **Network topology** - A small and simple 5 nodes wireless LAN network is simulated. The Node 0 in the center acts as AP, receiving data from the Nodes 1-4. Nodes 1 acts as Hidden Node to the node 2-4.
- **Hidden Node** - The tool “Rx Group Config” is introduced to hide the Node 1 from node 2-4.
- **Network configuration** - Distance Threshold of “Rx Group Config” was defined to group receiver of nodes 0-4. Node 0-1 belong one group, node 0, 2-4 is in another group

Parameters of the network

Params	Scenarios				
	1	2	3	4	5
Dest Address	0	0	0	0	0
Start Time	exp(15)	exp(15)	exp(15)	exp(15)	exp(15)
ON State Time	exp(10)	exp(10)	exp(10)	exp(10)	exp(10)
OFF State Time	Off	Off	Off	Off	Off
Pack Interarrival	exp(0.02)	exp(0.02)	exp(0.02)	exp(0.02)	exp(0.02)
Packet Size	exp(2048)	exp(2048)	exp(2048)	exp(2048)	exp(2048)
Data Rate	1 Mbps	1 Mbps	1 Mbps	1 Mbps	1 Mbps
Rts Threshold	None	1024	None	1024	256
RX Group - Distance	N/A	N/A	220 m	220 m	220 m



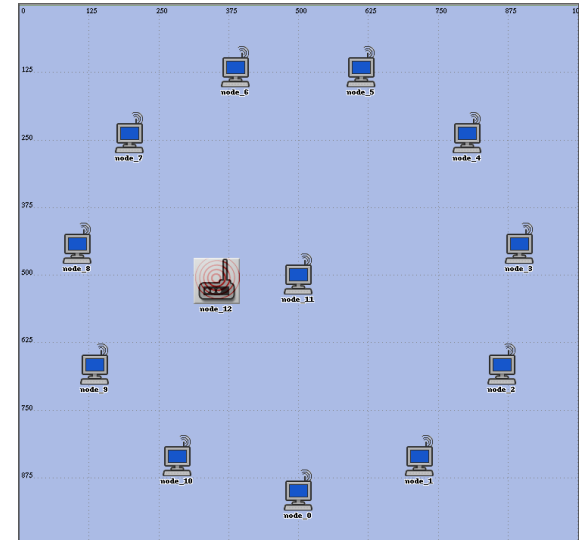
Implementation – Fragmentation Evaluation

- **Network topology** – 11 nodes network. Node 11 act as receiving only AP. Nodes 1-10 work as sending only nodes.
- **Jammer Node** – Jammer Node is introduced in the network to simulate the interference.
- **Scenarios** – 8 scenarios have been studied in this project.

Scenarios:

1. No Fragmentation without interference.
2. No Fragmentation with interference.
3. Default threshold 1024 bytes without interference.
4. Default threshold 1024 bytes with interference.
5. Threshold 512 bytes without interference.
6. Threshold 512 bytes with interference.
7. Threshold 256 bytes without interference.
8. Threshold 256 bytes with interference.

Fragmentation



Parameters	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8
Data Source								
Interarrival Time(second)	exp(0.035)	exp(0.035)	exp(0.035)	exp(0.035)	exp(0.035)	exp(0.035)	exp(0.035)	exp(0.035)
Packet Size(Byte)	4000	4000	4000	4000	4000	4000	4000	4000
Wireless Lan								
Data Rate	1Mbps	1Mbps	1Mbps	1Mbps	1Mbps	1Mbps	1Mbps	1Mbps
RTS Threshold	None	None	None	None	None	None	None	None
Fragmentation Threshold	None	None	1024	1024	512	512	256	256
Buffer Size	256000	256000	256000	256000	256000	256000	256000	256000
Large Packet Processing	Drop	Drop	Drop	Drop	Drop	Drop	Drop	Drop
Interference	No	Yes	No	Yes	No	Yes	No	Yes

Implementation – Backoff Algorithm

- **Comparison of two back-off Algorithms: BEB vs. DIDD**
- **20, 40 and 60 wireless nodes build ad hoc network.**
 - Packets' interarrival time: $\exp(0.2)$
 - Packet size: $\exp(1500)$
- **New node parameter “Backoff Method”**
 - Control back-off algorithm used by node
- **DIDD Algorithm replaces BEB at state “BKOFF_NEED”**

?	Roaming Capability	Disabled
?	Large Packet Processing	Drop
	Backoff Method	MIND
	Min CW	0
?	⊕ PCF Parameters	Disabled

Implementation – Backoff Algorithm

