# Wireless Communications and Networks
# CS6120 Assignment 3

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## Executive summary

The primary purpose of this assignment is to understand the code and observe the pattern and time change on changing different variables.

Thus, We have seen through changing the state as an abstracted and full model of MAC and PHY and compared them through graphs of transition and throughput, which consists of different performance metrics such as latency, packet loss, etc in the statistics file.

The time difference between different configurations is observed.

## Steps Taken

1. Random Speed: Changed the random number generation speed to roll Number.

```
rng(51,'combRecursive');             % Seed for random number generator
simulationTime = 1000;              % Simulation time in milliseconds
showLiveStateTransitionPlot = true; % Enable live state transition plot for all nodes
displayStatistics = true;           % Display statistics at the end of the simulation
```

2. Execution Time: added execution time calculator to the code.

```
tt1=datetime;
run(networkSimulator,simulationTime);
tt2=datetime;
fprintf('Time taken for simulation = %f seconds',diff(datenum([tt1;tt2]))*24*3600);
```

3. Abstract MAC and Abstract PHY:

```
MACFrameAbstraction = true;
PHYAbstractionType  = "TGax Evaluation Methodology Appendix 1";
```

4. Full MAC and Abstract PHY:

```
MACFrameAbstraction = false;
PHYAbstractionType  = "TGax Evaluation Methodology Appendix 1";
```

5. Full MAC and Full PHY:

```
MACFrameAbstraction = false;
PHYAbstractionType  = "None";
```

6. more downlink: downlink is 10 times of uplink

```
% Configure downlink application traffic
trafficConfig(1).SourceNode = 1;        % AP node ID
trafficConfig(1).DestinationNode = 2;   % STA node ID
trafficConfig(1).DataRateKbps = 1000000;
trafficConfig(1).PacketSize = 1500;     % In bytes
trafficConfig(1).AccessCategory = 0;    % Best Effort (0), Background (1), Video
(2), and Voice (3)
```

7. more uplink: uplink is 10 times of downlink

```
% Configure uplink application traffic
trafficConfig(2).SourceNode = 2;        % STA node ID
trafficConfig(2).DestinationNode = 1;   % AP node ID
trafficConfig(2).DataRateKbps = 1000000;
trafficConfig(2).PacketSize = 1500;     % In bytes
trafficConfig(2).AccessCategory = 0;    % Best Effort (0), Background (1), Video
(2), and Voice (3)
```

8. Node3: Add a new node. i.e. make it a 3-node setup. i.e. one AP and two Stations.
    a. Added a new node with location as STA node and two more traffic configs.

# Observation:

1. Through every step the time taken has increased with few exceptions as the time taken for increased downlink or uplink is equal.
2. The random speed generator affects packet loss.
3. The node positions don't affect the performance unless the difference is made incredibly large.
4. The throughput depends on the ration between uplink and downlink data rates.