# Assignment 3: Analyzing Network Layer Misbehavior using ns-2

## (SN 616 Wireless Security)

## [Due: May 5th, 11:59 pm]

**Problem**:

This assignment is broad which means that you are not given a specification of the network. You will be responsible for constructing a large network with randomly distributed nodes and modeling the impact of packet dropping attacks on performance.

**Simulation Setup**:

Create a useful representation of a mobile ad hoc network that includes enough nodes to be interesting (e.g., make sure routing isn't trivial or deterministic, allow the possibility of multiple routing paths, long paths, etc.) and has support for end-to-end services (e.g., TCP, UDP, etc.) Identify at least two interesting metrics at each of the physical, MAC, network, and transport layer and create some plots using these statistics to demonstrate that your network functions end-to-end under normal working conditions.

a) Implement the Packet Dropping Attack for AODV routing protocol and analyze the impact of the attack on overall performance for varying percentage of malicious nodes. Run the simulation for varying number of seeds (typically 1-100) and average the results obtained from simulations.

b) Introduce a parameter that specifies the probability with which the node will drop each packet, a parameter to specify the attack type, and statistics to measure the received and dropped packets. By setting the configuration for attack type and drop probability from TCL scripts and studying the generated trace files, you can see the impact of packet dropping; you can observe the number of dropped packets and the total packets seen by the malicious code, the ratio of which should be close to the drop probability. Run this configuration for several values of the drop probability, varying from 0 to 1, and create a nice figure that shows the results of the simulation study.

c) Introduce another attack type with two new parameters, changing from probabilistic packet dropping (i.e., drop every packet with probability p) to periodic probabilistic packet dropping as follows. One parameter will be the period, let's call it T, and the other will be the duty cycle, let's call it d, where 0<d<1. In the periodic probabilistic packet dropping attack, the node will drop packets with probability p for dT seconds, then drop no packets for (1-d)T seconds, and continue forever. Once you make the necessary changes to all of the relevant files, run the configuration for a few values of p, T, and d and tabulate the resulting statistics. How does the ratio of dropped packets to total packets seen now compare to these parameters? As in the previous task, create a few interesting figures to demonstrate how this forwarding misbehavior affects performance statistics at various layers.

**Deliverables**:

(i) A project report containing the plots of the various metrics obtained from your simulation and your observations and analysis. This report must be submitted in hardcopy form in class on the due date. No late submissions will be accepted.

(ii) Zip of your simulation source files along with the report should be submitted via AUMS.