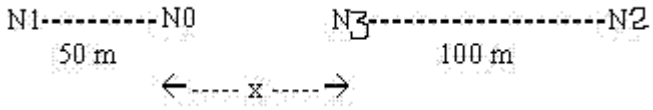
Wireless Networking Lab 104: 802.11 Fairness

Introduction

The goal of this exercise is to understand the concept of starvation and unfairness in IEEE 802.11 standard.

We consider the following topology:



There are 2 CBR flows: f1 (N0->N1) and f2 (N2->N3) that start at the same time.

NS2 Instructions

- 1. Get the tcl script from here.
- 2. A script "fairsim.tcl" is provided. This script takes a single command-line argument "**dist**" and creates a toplogy like that shown in the figure with x varying as the argument. Script usage is :

```
ns fairsim.tcl -dist {x}
```

- 3. There are 2 CBR flows: f1 (N0->N1) and f2 (N2->N3) that start at the same time.
- 4. Run simulations for x=100m, 200m, 300m, 450m, 500m, 600m.
- 5.Determine the throughput of flows f1 and f2. Plot the throughput of f0 and f1 on the same graph with the distance x on the x-axis. To calculate throughput, you need to calculate [num of received packets]. Following command will give the number of received packets where {num} is 1 for flow f1 and 3 for flow f2.

```
grep "AGT" fairsim.tr | grep "^r" | grep "Ni {num}" | wc -l
```

To understand more about the trace file and what it contains, refer to sections 16.1.6 and 16.1.7 of the ns2 manual.

Turn In

Electronically turn in **compressed** plots from the previous section. Expected plots are the per flow throughput vs distance x for different x values. Please be considerate and make sure the plot files are not too large. For the analysis section questions, please type your answers in a document (plain text is fine), and email it along with the plot files.

Analysis

This assignment lets you understand how unfairness can play its role in 802.11. Looking at the results, you will realize that there is lot happening behind this simple looking topology. First try to recall the following about 802.11 and ns2 , then try to answer latter questions with respect to the graph obtained above-

1. If a node correctly decoded the last packet detected, it must sense the channel to be idle for DIFS prior to resuming backoff. If it detected a packet but couldn't correctly decode it, it must backoff for EIFS. EIFS > DIFS.

2. If a node sends an RTS and does not receive a CTS, it doubles its contention window and then retries.

3. As per default ns2 settings, TX Range is approx. 250m and CS Range approx. 550m. This simply means that nodes within TX Range can detect as well as decode the packet correctly but nodes outside TX Range but within CS Range are only able to detect the packet. This further implies that such nodes(outside TX Range) would back off for EIFS and not DIFS.

Keep these in mind and answer the following:

Question-

1.What do you observe from the graph obtained? Can you explain the observations on the basis of the 802.11 contention resolution/backoff mechanism?

References

1. Overview of IEEE 802.11
2. Know ns2