**Garance Nicole Loison, UCID 10083186 CPSC441 - Assignment 4**

Necessary tools to be installed:

- gcc for the appropriate OS of running computer to compile the C code.

Compiling the program:

Please compile the mac.c file with gcc on terminal such as :

gcc -o mac mac.c

Running the program:

Run the program with 3 arguments : the total number of levels in the tree (0<10), the start level of the protocol (1<start level <N), number of test scenarios (>0).

Example: ./mac 10 10 100

The program will ask for proper input values if the user enters invalid ones.

Results Display:

The results will be displayed on console as such:

Number of real nodes: Number of Scenarios: Starting Level:

1024  100  10

Avg number of ready stations: 487.500000

Avg total probes: 19288.350000

Avg collisions per test: 188008.500000

Failure rate: 9.747257 Avg Test Performance: 90.252743

Performance Analysis:

With N = 1, 2, 4, 8, 16, 32, 64, 128, 256, 512, and 1024 (tree level = 1, 2, 3, 4, 5 , 6, 7 ,8 ,9 , 10 ) and 100 scenarios we were able to get the following performance:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Start Level | N = 1 | N = 2 | N =  4 | N =  8 | N =  16 | N =  32 | N =  64 | N =  256 | N =  512 | N=  1024 |
| 0 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 2 |  |  | 99.097614 | 98.800347 | 98.533717 | 98.329209 | 98.165712 | 98.047968 | 98.026606 | 98.008824 |
| 4 |  |  |  |  | 97.964166 | 97.312187 | 96.729428 | 96.249692 | 96.100808 | 96.057197 |
| 6 |  |  |  |  |  |  | 95.454274 | 94.319748 | 94.13431 | 94.146415 |
| 8 |  |  |  |  |  |  |  | 92.372093 | 92.279289 | 92.119971 |
| 10 |  |  |  |  |  |  |  |  |  | 90.252743 |

We can see that not only the performance is a function of the tree size, but also at which level the MAC protocol starts. The performance from starting at level 0 is consistently 100%, consistent with the logic of the adaptive tree. The performance at N=1024, our largest dataset, decreases by 8.8% from the MAC protocols starting at level 0 to level 10, with a steady decrease of performance around 2% every time we start the protocol 2 levels lower in the tree.