

Overview of Term Paper

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I planned on adding the gray hole attack but could not get it to function properly in time to add it in this paper. The way I calculated some of the performance metrics in the .awk file may not have worked for the gray hole attack anyway. I can reuse the code I made in this project to test the effects of the gray hole for the summer. So instead I focused on the Black hole attack for this paper.

This paper test the effects of the black hole attack on ad hoc networks using the AODV protocol. There were three different created scenarios with three different cbr files for each of the scenarios. The networks tested had 0, 1, and 5 malicious nodes present respectively in different test I called "environments." The .awk file I created includes both the pulling of data off the traces for each simulation and the calculation. I put these numbers in tables in word and took screenshots of them to place into Latex because the tables were giving me errors. The metrics I took from the trace are the following:

Start time
End Time
Sent Packets
Received packets
Dropped packets
Packet Size

With this information I was able to get the following:

$$\text{Net dropped packets} = ((\text{received packets}) - (\text{dropped packets}))$$

With this information I could calculate:

$$\text{PDR} = (\text{net packets}) / (\text{sent packets})$$

$$\text{Average Throughput} = (\text{received packet size}) / (\text{end time} - \text{start time}) * \frac{8}{1000}$$

Simulation Documentation

Followed the following bits of documentation from your github:

1. Add the blackholeaodv folder to your network simulator folder under

```
~/ns-allinone-2.35/ns-2.35/
```

2. Update the `\tcVib\ns-lib.tcl` as the following:

Under the switch **-exact \$routingAgent_** add the following code to define the new agent:

```
blackholeAODV {  
    set ragent [$self create-blackholeaodv-agent $node]  
}
```

Since this is a modified version of the AODV protocol, add the following code after the **Simulator instproc create-aodv-agent { node }** block:

```
Simulator instproc create-blackholeaodv-agent { node } {  
# Create BlackholeAODV routing agent  
    set ragent [new Agent/blackholeAODV [$node node-addr]]  
    $self at 0.0 "$ragment start"      ;# start BEACON/HELLO Messages  
    $node set ragent_ $ragment  
    return $ragment  
}
```

3. Update the `Makefile.in` as the following:

Under the **OBJ_CC = ** and after the **aodv** output files add the following two lines of code to generate the output files for the updated agents:

```
blackholeaodv/blackholeaodv_logs.o blackholeaodv/blackholeaodv.o \  
blackholeaodv/blackholeaodv_rtable.o blackholeaodv/blackholeaodv_rqueue.o \  

```

4. After you are done with all the files update, you need to recompile the network simulator to reflect the changes and generate all the necessary output files. To recompile do the following:

```
sudo ./configure  
sudo make clean  
sudo make
```

Running the simulation:

```
ns your_tcl_file_name
```

Next I created three different scenarios with the following lines:

```
netdest -n 10 -p 2.0 -M 20.0 -t 1000 -x 750 -y 750 > scen1
netdest -n 50 -p 2.0 -M 20.0 -t 1000 -x 750 -y 750 > scen2
netdest -n 50 -p 2.0 -M 20.0 -t 1000 -x 750 -y 750 > scen3
```

Next I created three different CBR simulations with the following lines:

```
ns cbrgen.tcl -type cbr -nn 10 -seed 1.0 -mc 8 -rate 4.0 > cbr-10-test
ns cbrgen.tcl -type cbr -nn 20 -seed 1.0 -mc 9 -rate 4.0 > cbr-20-test
ns cbrgen.tcl -type cbr -nn 50 -seed 1.0 -mc 35 -rate 4.0 > cbr-50-test
```

After this I had to make several copies of the tcl file and put paths to previous files I created and specific the correct number of nodes. Here is an example of scenario 1 with 1 black hole node.

```
set val(nn) 10;# total number of mobilenodes
set val(nnaodv) 9;# number of AODV mobilenodes
set val(rp) AODV;# routing protocol
set val(bp) blackholeAODV;#blackholeAODV protocol
set val(x) 750;# X dimension of topography
set val(y) 750;# Y dimension of topography
set val(cstop) 951;# time of connections end
set val(stop) 1000;# time of simulation end
set val(cp) "scenarios/scen1";#Connection Pattern
set val(cc) "scenarios/cbr-10-test";#CBR Connections
```

To set the number of black hole nodes, you change the val(nnaodv) variable. The smaller its value, to more nodes there will be. In this case if the values was set to 9, there will be 1 black hole node. If it was set to 8, there would be two, etc...

Next, I changed the names of the output files to reflect the simulation I was running.

```
$ns_ use-newtrace
set tracefd [open sim1forBlackHole.tr w]
$ns_ trace-all $tracefd

set namtrace [open sim1forBlackHole.nam w]
$ns_ namtrace-all-wireless $namtrace $val(x) $val(y)
```

Used the following command to run the tcl file afterwards:

```
ns sim1forBlackHole.tcl
```

This will create the .tr which can be analyzed with the .awk file I created:

```
Awk -f Results.awk sim1forBlackHole.tr > BHSim1Results
```

Next I opened the file and created the tables and charts for the results I got from each of the simulations.