

Sink Hole Attack in AODV

Software: NetSim Standard v13.2, Visual Studio 2022

Project Download Link:

https://github.com/NetSim-TETCOS/Sinkhole-Attack-in-AODV_v13.2/archive/refs/heads/main.zip

Follow the instructions specified in the following link to download and setup the Project in NetSim:

<https://support.tetcos.com/en/support/solutions/articles/14000128666-downloading-and-setting-up-netsim-file-exchange-projects>

Introduction:

Sinkhole attack is one of the severe attacks in wireless Ad hoc network. In sinkhole Attack, a compromised node or malicious node advertises wrong routing information to produce itself as a specific node and receives whole network traffic. After receiving whole network traffic, it can either modify the packet information or drop them to make the network complicated. Sinkhole attacks affect the performance of Ad hoc networks protocols such as DSR, AODV protocol.

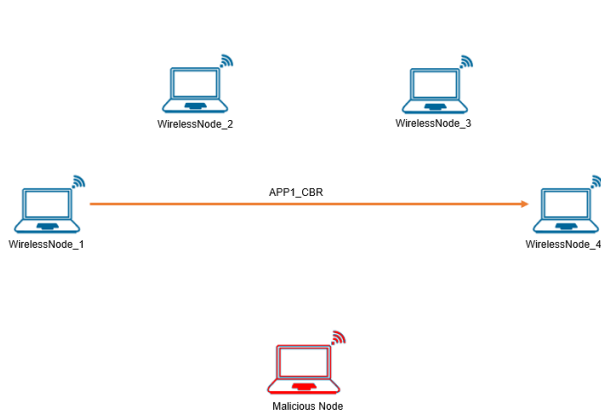


Figure 1: network configuration of how the traffic flow is configured

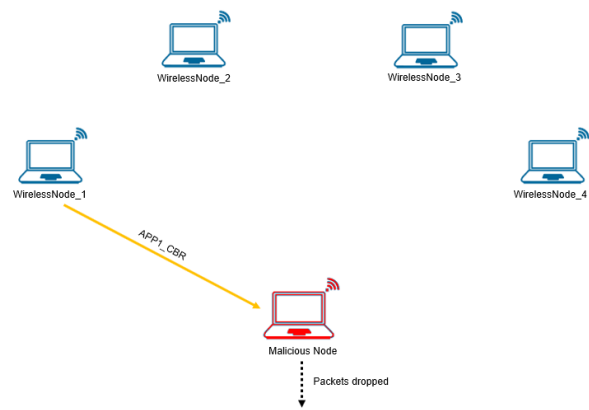


Figure 2: Network configuration of actual traffic flow along with the working of malicious node

Implementation in AODV

- In AODV the source broadcasts RREQ packet during Route Discovery.
- The destination on receiving the RREQ packet replies with a RREP packet containing the route to reach the destination.
- But Intermediate nodes can also send RREP packet to the source if they have a route to the destination in their route cache.
- Using this as an advantage the malicious node adds a fake route entry into its route cache with destination node as its next hop.
- On receiving the RREQ packet from the source the malicious node sends a fake RREP packet with the fake route.
- The source node on receiving this packet observes this as a better route to the destination.

- All the Network Traffic is attracted towards the Sinkhole (Malicious Node) and it can either modify the packet Information or simply drop the packet.

A file **malicious.c** is added to the AODV project which contains the following functions:

- **fn_NetSim_AODV_MaliciousNode();** //This function is used to identify whether a current device is malicious or not in-order to establish malicious behavior.
- **fn_NetSim_AODV_MaliciousRouteAddToCache();** //This function is used to add a fake route entry into the route cache of the malicious device with its next hop as the destination.
- **fn_NetSim_AODV_MaliciousProcessSourceRouteOption();** //This function is used to drop the received packets if the device is malicious, instead of forwarding the packet to the next hop.

You can set any device as malicious, and you can have more than one malicious node in a scenario.

Device ids of malicious nodes can be set inside the **fn_NetSim_AODV_MaliciousNode()** function.

Steps to simulate

1. Open the Source codes in Visual Studio by going to Your work -> Source Code and clicking on Open code button in NetSim Home Screen window
2. Expand AODV project and open Malicious.c file and set malicious node id.

```

30      /* Malicious Node */
31
32
33      #include "main.h"
34      #include "AODV.h"
35      #include "List.h"
36      #define MALICIOUS_NODE1 4
37
38      int fn_NetSim_AODV_MaliciousNode(NetSim_EVENTDETAILS*);
39      int fn_NetSim_AODV_MaliciousRouteAddToCache(NetSim_EVENTDETAILS*);
40      int fn_NetSim_AODV_MaliciousProcessSourceRouteOption(NetSim_EVENTDETAILS*);
41
42
43      int fn_NetSim_AODV_MaliciousNode(NetSim_EVENTDETAILS* pstruEventDetails)
44      {

```

Figure 3: Set Malicious Node in malicious.c file

3. Now right click on AODV project and rebuild it.

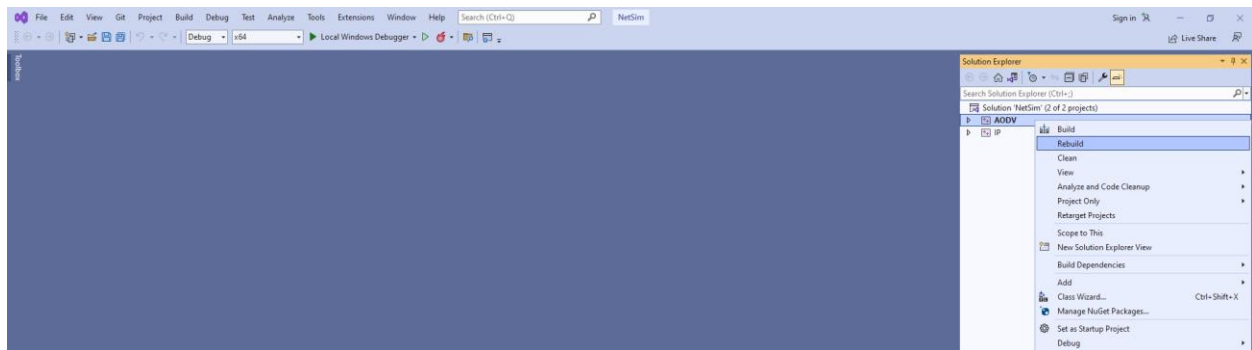


Figure 4: Screenshot of NetSim project source code in Visual Studio

4. Upon rebuilding, libAODV.dll will automatically get updated in the respective bin folder of the current workspace.

Example

1. The **Sink_Hole_Attack_AODV** comes with a sample network configuration that are already saved. To open this example, go to Your work in the Home screen of NetSim and click on the **SinkHole_Attack_AODV_Example** from the list of experiments.
2. The network consists of 6 wireless nodes with the properties configured as shown below:

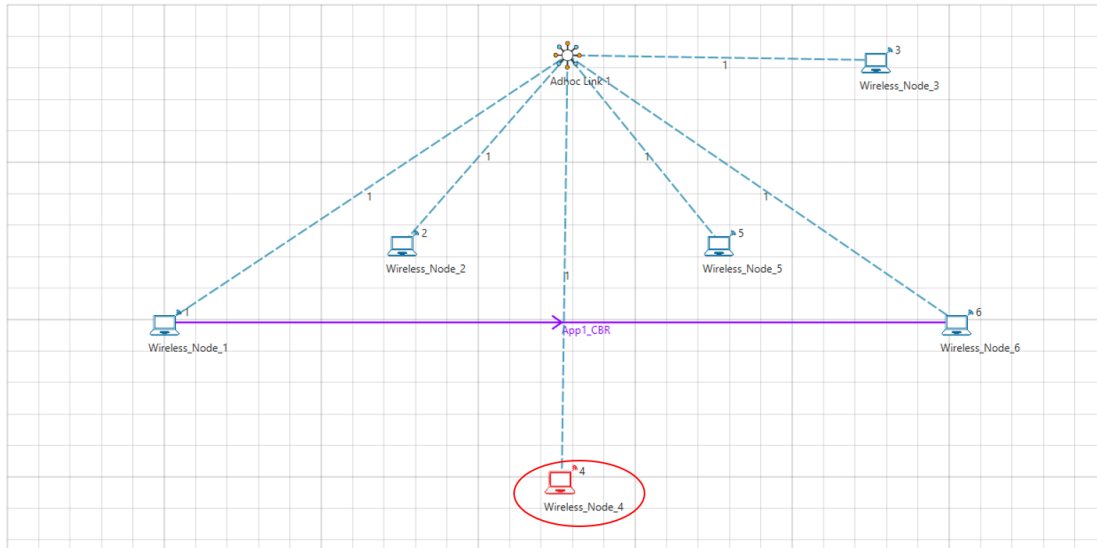


Figure 5: Network topology

3. Application Properties

Application Properties	
Source ID	1
Destination ID	6
Sinkhole(Malicious Node)	4

Table 1: Application properties

4. Channel Characteristics **pathloss only**, Path Loss Model: **Log Distance**, Path Loss Exponent: **3**
5. Run the Simulation for 100 seconds

Results and discussions

1. View the packet animation, You will find the malicious node (Device id 4) gives Route Reply on receiving Route Request and attracts packets towards it. You will also find that the malicious node does not forward the packets that it receives.

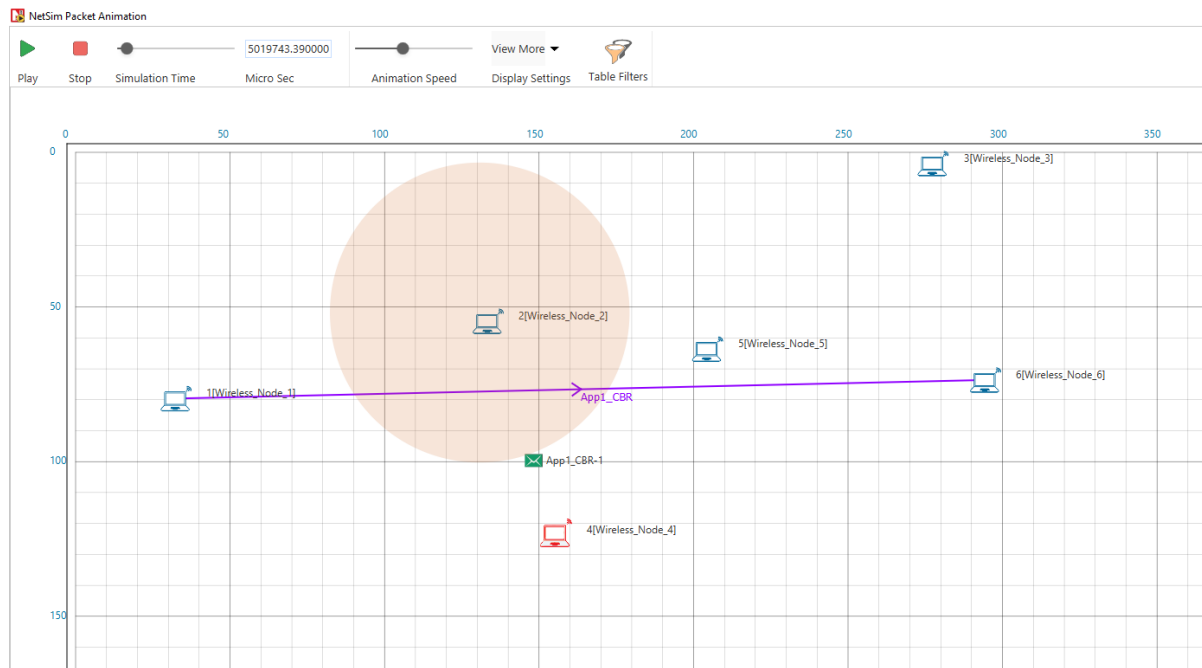


Figure 3: Animation window

2. This will have a direct impact on the Application Throughput which can be observed in the Application Metrics table present in NetSim Simulation Results window.

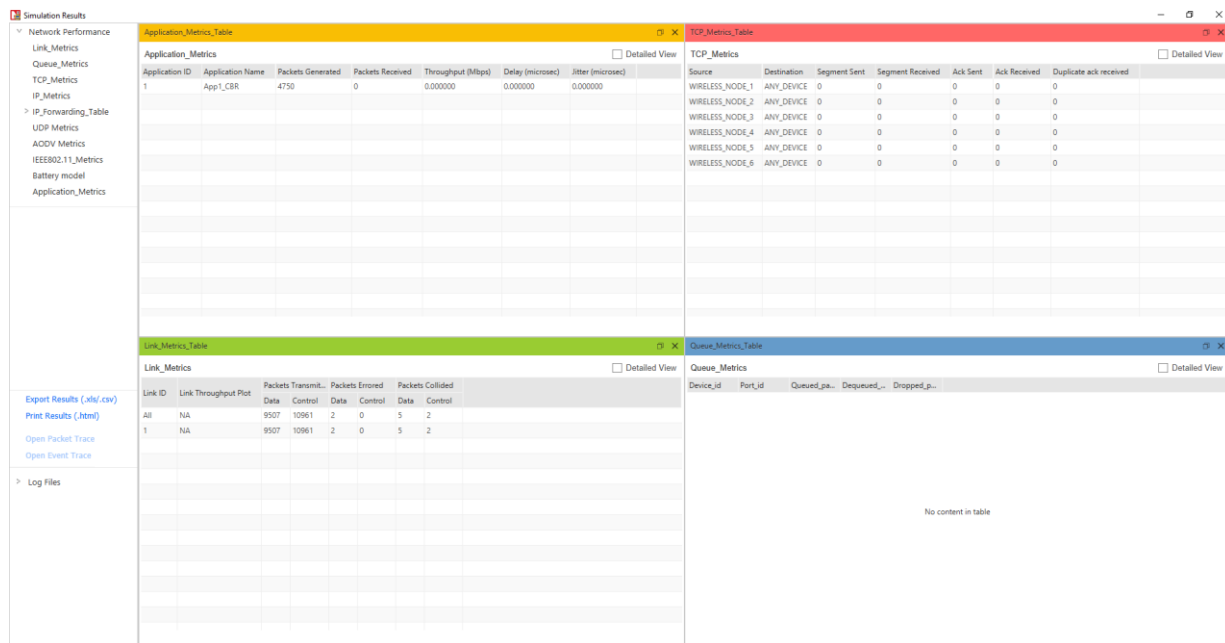


Figure 6: Result Dashboard