

Rebroadcasting packet in NetSim MANET/VANETs

Software Used: NetSim Standard v12.0 (32bit/ 64bit), Microsoft Visual Studio 2017/2019

Follow the instructions specified in the following link to clone/download the project folder from GitHub using Visual Studio:

<https://tetcos.freshdesk.com/support/solutions/articles/14000099351-how-to-clone-netsim-file-exchange-project-repositories-from-github->

Other tools such as GitHub Desktop, SVN Client, Sourcetree, Git from the command line, or any client you like to clone the Git repository.

Note: It is recommended not to download the project as an archive (compressed zip) to avoid incompatibility while importing workspaces into NetSim.

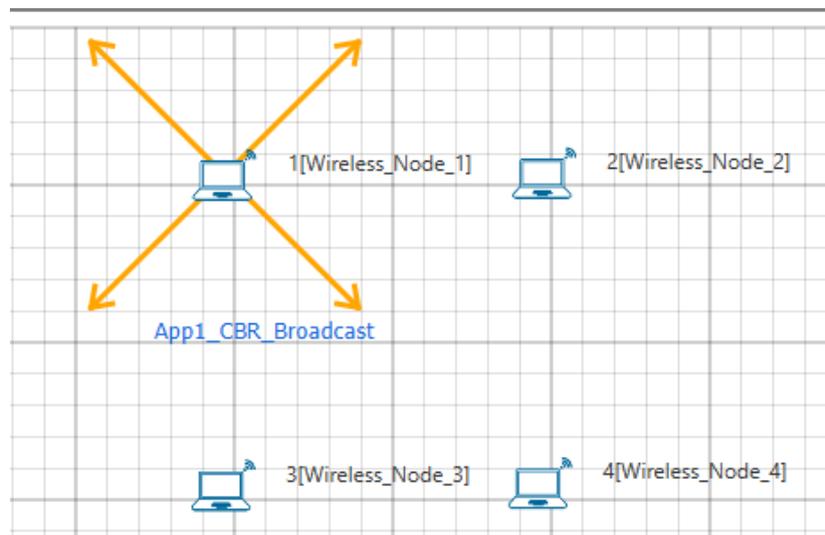
Secure URL for the GitHub repository:

https://github.com/NetSim-TETCOS/Rebroadcasting_in_NetSim_v12.0.git

Broadcasting:

Broadcasting is the process of sending a message from one node to all other nodes in an ad-hoc network. It is a fundamental operation for communication in ad-hoc networks as it allows for the update of network information and route discovery at every node.

Rebroadcasting:



Wireless Node 1 initiates a broadcast message and the message is received by nodes 2, 3 and 4. 2, 3 and 4 rebroadcast the message if they have not broadcasted that before. Furthermore, this implementation involves a `Rebroadcast_Probability` based on which the nodes resend the packets.

Probability-based rebroadcasting - The decision of rebroadcasting is based upon a random probability. This probability may be as simple as flipping a coin or it may be very complex involving probabilities which include parameters such as node density, duplicate packets received, battery power or a particular nodes participation within the network etc. Users can change the `Rebroadcast_Probability` macros present in `Rebroadcast.c` file as shown below:

```

ReBroadcast.c Application.c
Application (Global Scope)
12 *
13 *
14 #include "main.h"
15 #include "Application.h"
16
17 #define REBROADCAST_PROBABILITY 1.0
18 #define MAX_WAIT_FOR_REBROADCAST (100*SECOND)
19

```

Rebroadcasting in NetSim:

To implement this project in NetSim, we have created an additional Rebroadcast.c file inside Application project. The file contains the following functions:

- **void rebroadcast_packet();**
This function is used to rebroadcast the packet.
- **static bool isRebroadcastAllowed();**
This function is used to check whether rebroadcasting is allowed or not.
- **void rebroadcast_add_packet_to_info();**
This function is used to add the packet to rebroadcast list.
- **static void cleanup_broadcast_info();**
This function is used to clean the broadcast information.

Code modifications done in NetSim:

1. We have added the following lines of code in fn_NetSim_Application_Run() function in the APPLICATION_OUT_EVENT present in Application.c file inside Application project. This is used to generate next broadcast packet if the current device is present in the source list.

```

Application.c ReBroadcast.c
Application (Global Scope) fn_NetSim_Application_Run()
133 {
134     appInfo = fn_NetSim_Application_Email_GenerateNextPacket((DETAIL*)appInfo,
135     pstruPacket->nSc
136     get_first_dest_1
137     pstruEventDetail
138 }
139 else if(nappType==TRAFFIC_PEER_TO_PEER)
140 {
141     NetSim_PACKET* packet=pstruPacket;
142     while(packet->pstruNextPacket)
143     packet=packet->pstruNextPacket;
144     packet->pstruAppData->nAppEndFlag=1;
145 }
146 else if(nappType == TRAFFIC_EMULATION)
147 {
148     //do nothing
149 }
150 else
151 {
152 #ifdef REBROADCAST
153     if(appInfo->sourceList[0] == pstruEventDetails->nDeviceId)
154 #endif
155     fn_NetSim_Application_GenerateNextPacket(appInfo,
156     pstruPacket->nSourceId,
157     destCount,
158     dest,
159     pstruEventDetails->dEventTime);
160 }

```

2. The following lines of code are added in the same fn_NetSim_Application_Run() function in the APPLICATION_OUT_EVENT present in Application.c file inside Application project. The code checks if the destination is '0' i.e., Broadcast packet, then it adds the packet to rebroadcast list.

```

ReBroadcast.c  Application.c
Application (Global Scope) fn_NetSim_Application_Run()
160     }
161
162     //Add the dummy payload to packet
163     fn_NetSim_Add_DummyPayload(pstruPacket,appInfo);
164     //Place the packet to socket buffer
165     fn_NetSim_Socket_PassPacketToInterface(nDeviceId, pstruPacket, s);
166 #ifdef REBROADCAST
167     if (appInfo->sourceList[0] == pstruEventDetails->nDeviceId)
168 #endif
169     appmetrics_src_add(appInfo,pstruPacket);
170
171 #ifdef REBROADCAST
172     if(!dest[0])
173         rebroadcast_add_packet_to_info(pstruPacket, pstruEventDetails->dEventTime);
174 #endif // REBROADCAST
175
176     }
177 }
178 break;

```

- Now add the following code in fn_NetSim_Application_Run() function in APPLICATION_IN_EVENT present in Application.c file inside Application project. It checks whether the destination is '0' or not. If it is '0', then it rebroadcasts the packet or else deletes the packet.

```

ReBroadcast.c  Application.h  Application.c
Application (Global Scope)
200     (pstruappinfo->nAppType == NETSIM_SOURCE)
201     {
202         process_saej2735_packet(pstruPacket);
203     }
204 #ifdef REBROADCAST
205     UINT destCount;
206     NETSIM_ID* dest = get_dest_from_packet(pstruPacket, &destCount);
207     if (!dest[0])
208     {
209         rebroadcast_packet(pstruPacket,
210             pstruEventDetails->nDeviceId,
211             pstruEventDetails->dEventTime);
212     }
213     else
214     {
215 #elif
216         //Delete the packet
217         fn_NetSim_Packet_FreePacket(pstruPacket);
218     #endif // REBROADCAST
219 #ifdef REBROADCAST
220     }
221 #endif
222
223

```

```

ReBroadcast.c  Application.c
Application (Global Scope) fn_NetSim_Application_Run()
186     fnValidatePacket(pstruPacket);
187     pstruappinfo=appInfo[pstruPacket->pstruAppData->nApplicationId-1];
188     pstruPacket->pstruAppData->dEndTime = pstruEventDetails->dEventTime;
189     fn_NetSim_Application_Plot(pstruPacket);
190 #ifdef REBROADCAST
191     if (pstruappinfo->sourceList[0] == pstruPacket->nSourceId)
192 #endif
193     appmetrics_dest_add(pstruappinfo, pstruPacket, pstruEventDetails->nDeviceId);
194     if(pstruappinfo->nAppType==TRAFFIC_PEER_TO_PEER && pstruPacket->pstruAppData->nAppEndFlag==1)
195     {

```

- We have added the following function declarations in Application.h file.

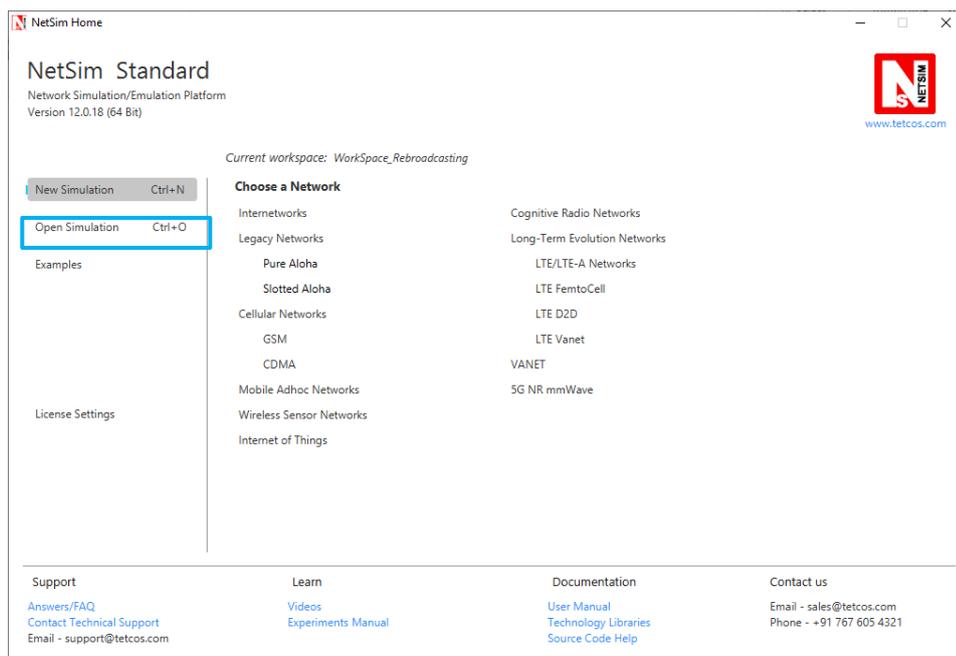
```

Application.h* -> X Application.c ReBroadcast.c
Application (Global Scope)
436 void appmetrics_dest_add(APP_INFO* appInfo, NetSim_PACKET* packet, NETSIM_ID dest);
437 int fn_NetSim_Application_Metrics_F(PMETRICSWRITER metricswriter);
438
439
440 //Application Interface function
441 void fnCreatePort(APP_INFO* info);
442 int fnCreateSocketBuffer(APP_INFO* appInfo);
443
444 int fn_NetSim_Add_DummyPayload(NetSim_PACKET* packet, APP_INFO*);
445
446 //Encryption
447 char xor_encrypt(char ch, long key);
448 int aes256(char* str, int* len);
449 int des(char* buf, int* len);
450
451
452 /*****REBROADCAST *****/
453 #define REBROADCAST
454 void rebroadcast_add_packet_to_info(NetSim_PACKET* packet,
455     double time);
456 void rebroadcast_packet(NetSim_PACKET* packet,
457     NETSIM_ID devId,
458     double time);
459 #endif

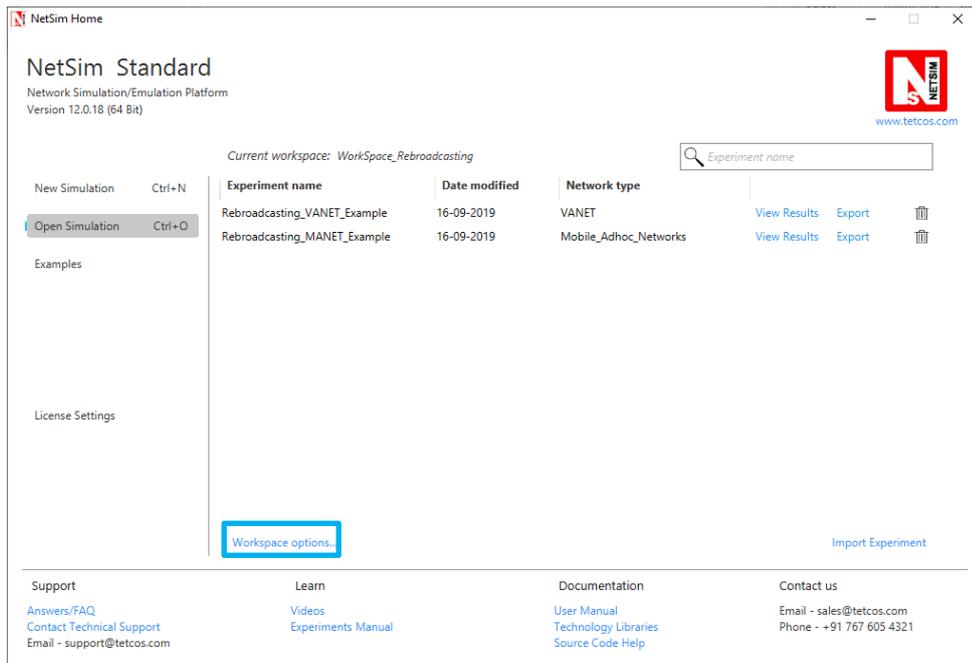
```

Steps:

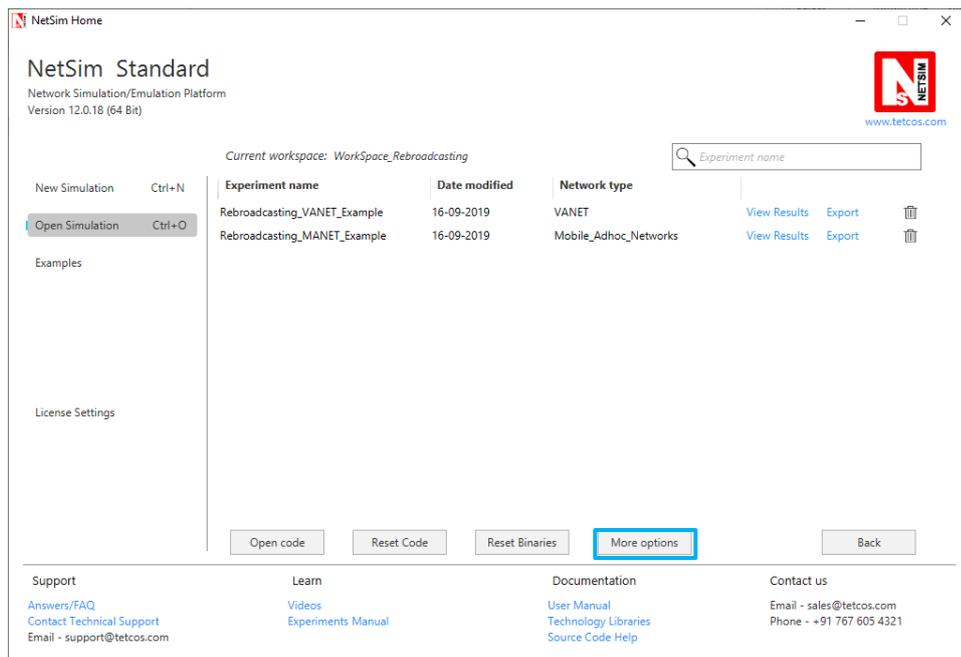
- After you unzip the downloaded project folder, Open NetSim Home Page click on **Open Simulation** option,



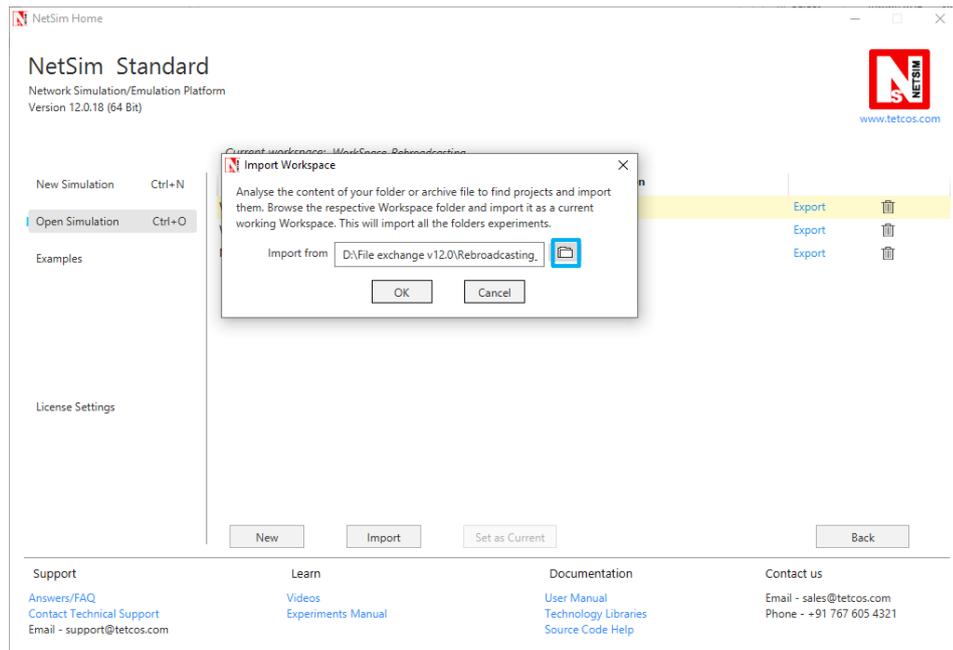
- Click on **Workspace options**



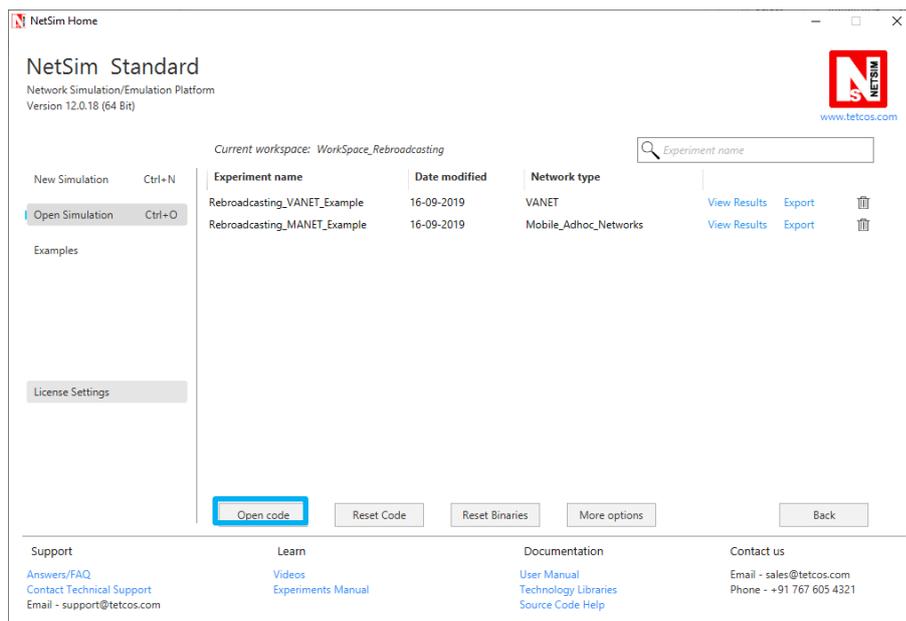
- Click on **More Options**,



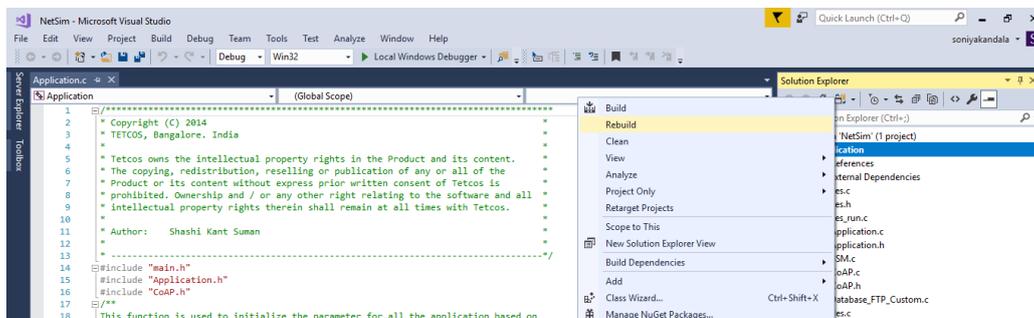
- Click on **Import**, browse the extracted folder path and go into the `Workspace_Rebroadcasting` directory. Click on the select folder button and then on **OK**.



- Go to home page, Click on **Open Simulation** → **Workspace options** → **Open code**



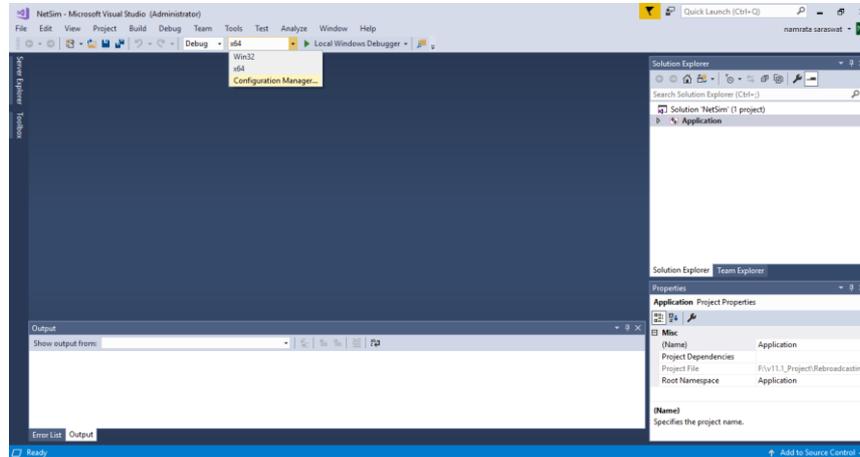
- Right click on Solution in Solution Explorer and select 'Rebuild solution'.



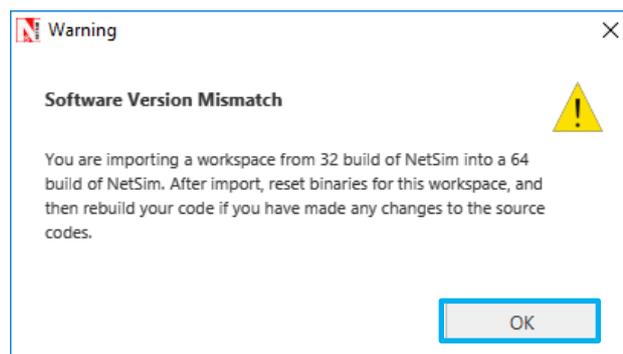
- Upon rebuilding, **libApplication.dll** will automatically get updated in the respective bin folder of the current workspace.

Note:

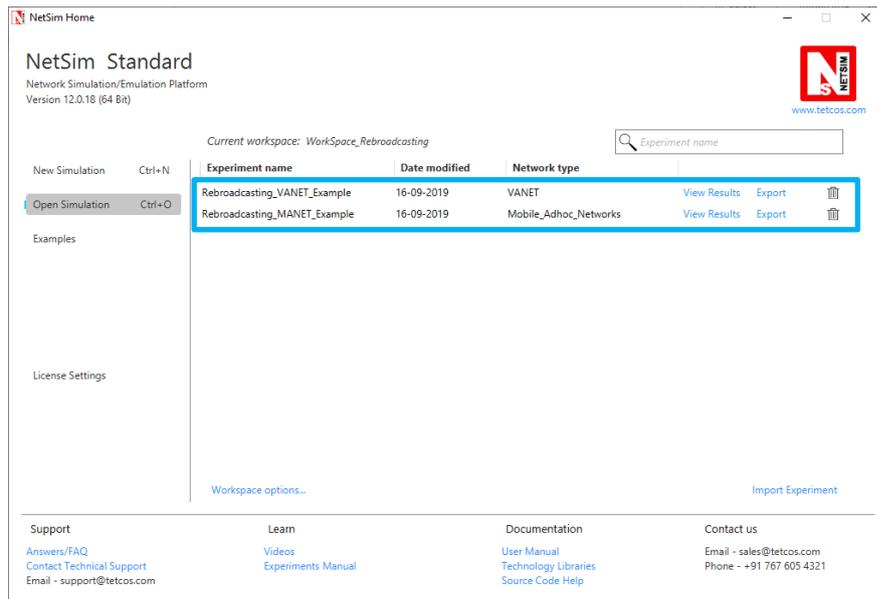
1. Based on whether you are using NetSim 32 bit or 64 bit setup you can configure Visual studio to build 32 bit or 64 bit DLL files respectively as shown below:



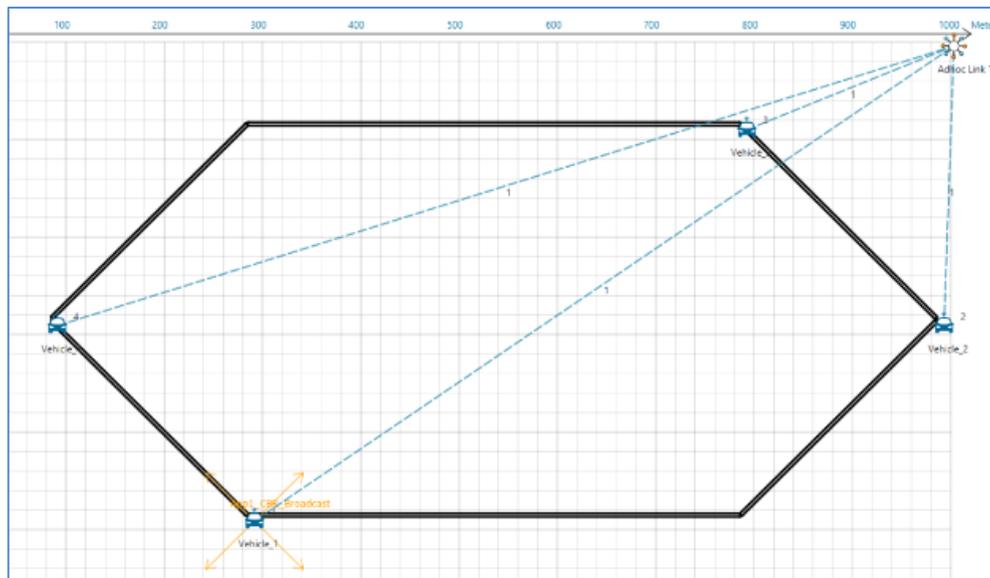
2. While importing the workspace, if the following warning message indicating Software Version Mismatch is displayed, you can ignore it and proceed.



- Go to NetSim home page, click on **Open Simulation**, Click on **Rebroadcasting_VANET_Example/ Rebroadcasting_MANET_Example** and run the simulation for 100 seconds.



VANET SCENARIO:



- In the above scenario, Vehicle-1 is broadcasting the packet and it is received by the Vehicles 2, 3 and 4. Then Vehicles 2, 3, and 4 will rebroadcast the same packet based on the probability value in Rebroadcast.c file.
- After simulation, open Packet Trace and filter Packet_Id to '1' or any other id and observe that the nodes other than source are rebroadcasting the same packet.

	A	B	C	D	E	F	G	H
1	PACKET_ID	SEGMENT_ID	PACKET_TYPE	CONTROL_PACKET_TYPE/APP_NAME	SOURCE_ID	DESTINATION_ID	TRANSMITTER_ID	RECEIVER_ID
2	1	0	CBR	App1_CBR	NODE-1	Broadcast-0	NODE-1	NODE-2
3	1	0	CBR	App1_CBR	NODE-1	Broadcast-0	NODE-1	NODE-3
4	1	0	CBR	App1_CBR	NODE-1	Broadcast-0	NODE-1	NODE-4
5	1	0	CBR	App1_CBR	NODE-2	Broadcast-0	NODE-2	NODE-1
6	1	0	CBR	App1_CBR	NODE-2	Broadcast-0	NODE-2	NODE-3
7	1	0	CBR	App1_CBR	NODE-2	Broadcast-0	NODE-2	NODE-4
8	1	0	CBR	App1_CBR	NODE-3	Broadcast-0	NODE-3	NODE-1
9	1	0	CBR	App1_CBR	NODE-3	Broadcast-0	NODE-3	NODE-2
10	1	0	CBR	App1_CBR	NODE-3	Broadcast-0	NODE-3	NODE-4
20	1	0	CBR	App1_CBR	NODE-4	Broadcast-0	NODE-4	NODE-1
21	1	0	CBR	App1_CBR	NODE-4	Broadcast-0	NODE-4	NODE-2
22	1	0	CBR	App1_CBR	NODE-4	Broadcast-0	NODE-4	NODE-3

- Note that Users SHOULD NOT use the performance metrics provided at the end of simulation but should rather calculate the network performance metrics from the packet trace.
- Users can also create their own network scenarios in **Single MANET/VANET** and run the simulation.