LEACH in NetSim

Low-energy adaptive clustering hierarchy ("LEACH") is a MAC protocol which is integrated with clustering and a simple routing protocol in wireless sensor networks (WSNs). The goal of LEACH is to lower the energy consumption required to create and maintain clusters in order to improve the life time of a wireless sensor network.

This Cross Layer Protocol is implemented in NetSim in MAC layer which involves ZigBee Protocol and Network layer which involves DSR protocol. The clustering of sensors happens in the Network layer and the Cluster head election involves interacting with the MAC layer to obtain the remaining power of the sensors.

A **LEACH.c** file is added to the DSR project.

1. For this implementation of LEACH, the number of Clusters is fixed as 4 and all the 4 clusters are equal. If the user wants to change it, then he/she must also change the static routing for the Cluster Heads and the ClusterElement array accordingly.

2. To make 4 equal clusters the number of sensors must be 4,16,36,64,100. Depending on the number of sensors, the ClusterElements array must be defined. Here, it has been defined and commented for 4,16,36,64,100 sensors. Uncomment the one you want to use.

The file contains the following funcitons:

fn_NetSim_LEACH_CheckDestination()
        This function is used to check whether the current device is the destination (i.e) the sinknode or not. Else the packet will be forwarded to the next hop.

fn_NetSim_LEACH_GetNextHop()
        This function is used to identify the next hop in cases where the current device is either a sensor within the cluster or the cluster head. Static routes are defined in this function. It returns the Device id of the next hop.

fn_NetSim_LEACH_AssignClusterHead ()
        This function is used to dynamically assign cluster heads within a cluster based on the residual energy. The sensor with higher remaining power in comparison to other sensors within the same cluster will be elected as the cluster head.

fn_NetSim_LEACH_IdentifyCluster()
        This function is used to determine the cluster to which a sensor belongs. It returns the cluster id of the cluster.
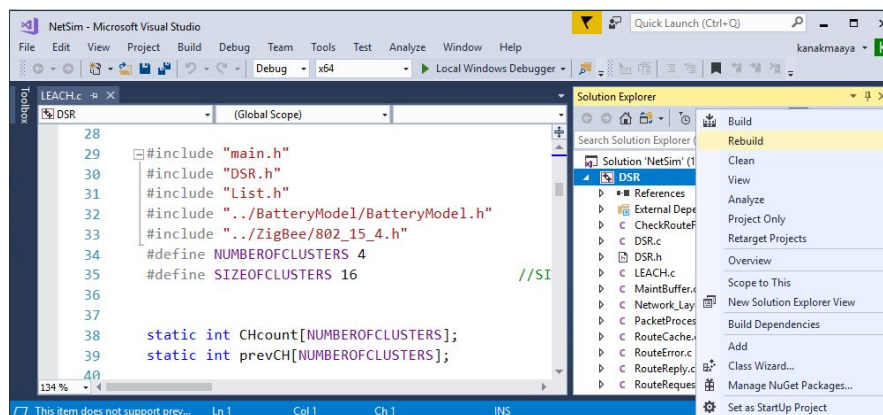
Steps:

1. Open the Code folder and double click on the NetSim.sln file to open the project in visual studio.

2. Right click on the DSR Project and select rebuild.

3. Now copy the libDSR.dll from the DLL folder.

Name	Date modified	Type
.vs	26-09-2018 15:05	File folder
BatteryModel	26-09-2018 12:27	File folder
Dll	26-09-2018 15:06	File folder
DSR	26-09-2018 14:26	File folder
Include	26-09-2018 12:27	File folder
lib	26-09-2018 12:27	File folder
ZigBee	26-09-2018 12:42	File folder
NetSim.sln	26-09-2018 12:46	Visual Studio Solu.

4. Replace these DLL's in NetSim bin folder in the NetSim installation directory (Eg: **C:\Program Files\NetSim Standard\bin**) after renaming the original libDSR.dll file.

This PC > Local Disk (C:) > Program Files > NetSim Standard > bin

Name	Type	Size
libARP.dll	Application extens...	29 KB
libCellular.dll	Application extens...	39 KB
libCognitiveRadio.dll	Application extens...	72 KB
libCSMACD.dll	Application extens...	19 KB
libDevicePlacement.dll	Application extens...	51 KB
libDSR.dll	Application extens...	216 KB
libDSR_Original.dll	Application extens...	38 KB
libDTDMA.dll	Application extens...	32 KB
libEthernet.dll	Application extens...	39 KB
libiconv-2.dll	Application extens...	1,496 KB
libIEEE802.11.dll	Application extens...	125 KB
libIEEE1609.dll	Application extens...	18 KB
libIP.dll	Application extens...	86 KB

5. Now create a Network Scenario in NetSim WSN Network as per the Number of clusters and size of clusters that are set in the LEACH code. By default the code runs for a scenario with 64 sensors uniformly placed, with the SINKNODE placed as per the screenshot below.
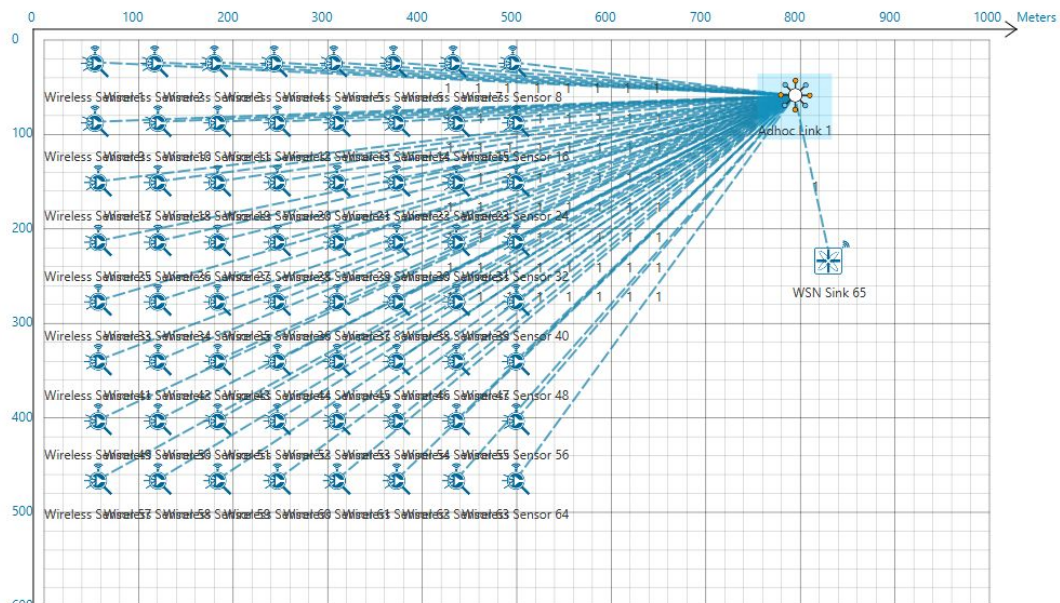
A sample Configuration.netsim file is also provided in the Config_File folder along with this project which can be opened in NetSim directly.

6. Run the simulation.

7. View the packet animation. You will note that the sensors directly start transmitting packets without route establishment since the routes are statically defined in LEACH. You will also note that the cluster heads keep changing dynamically.