Experiment 4

Wireless Sensor Networks & Wi-Max Networks

Objective:

A) To simulate a cluster based Wireless Sensor Network (WSN) with 18 nodes, two cluster heads and a base station (i.e., PAN coordinator) and analyse the performance.

B) To Simulate a Wi-Max network with two base stations and 10 nodes in each cell. Analyse the performance with multiple traffics.

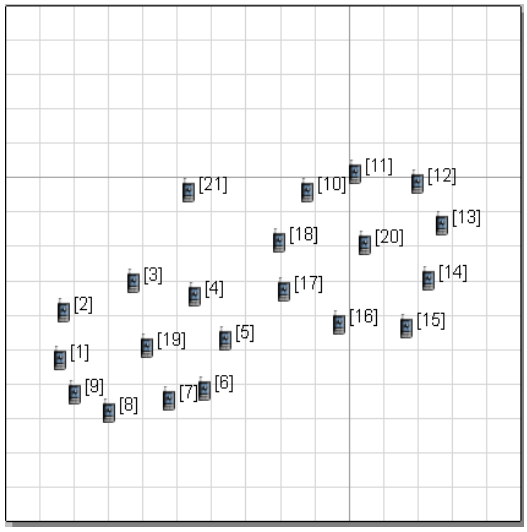
Procedure:

A) Go to File →new→save as→wsnnetworks

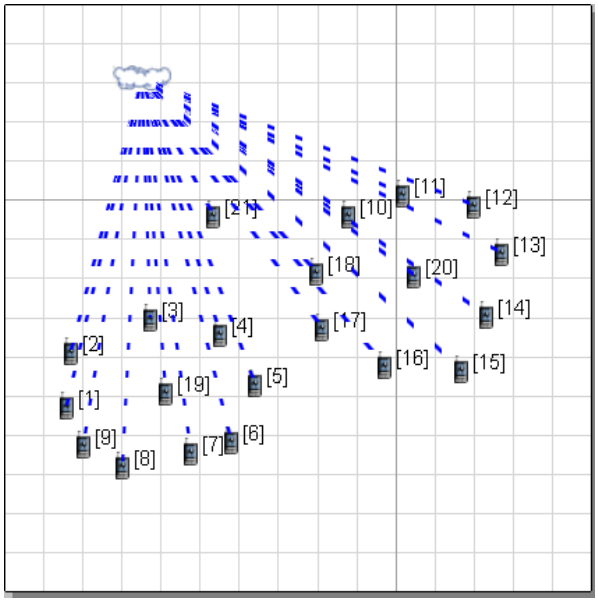
Select Scenario Properties → General Settings → Give Experiment Name, Simulation Time:300 Seconds

Terrain → Scenario Dimensions →1000 x 1000 meters

Step 1: Select "default" device (present under Standard Tool Set) and place the nodes on canvas as follows:

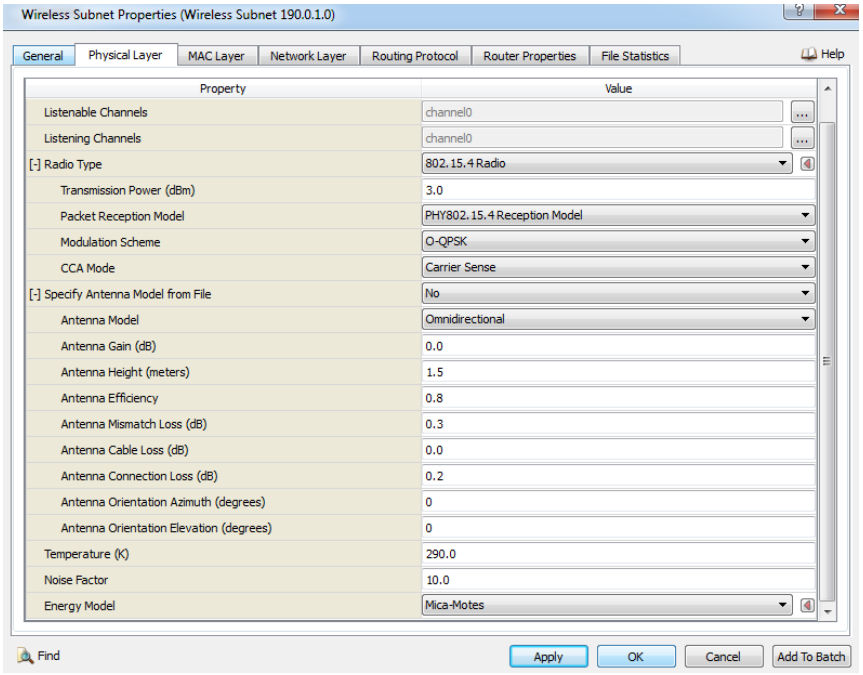


Select all the nodes in the Canvas, select Wireless Network (under Network Components) and place on the Canvas.

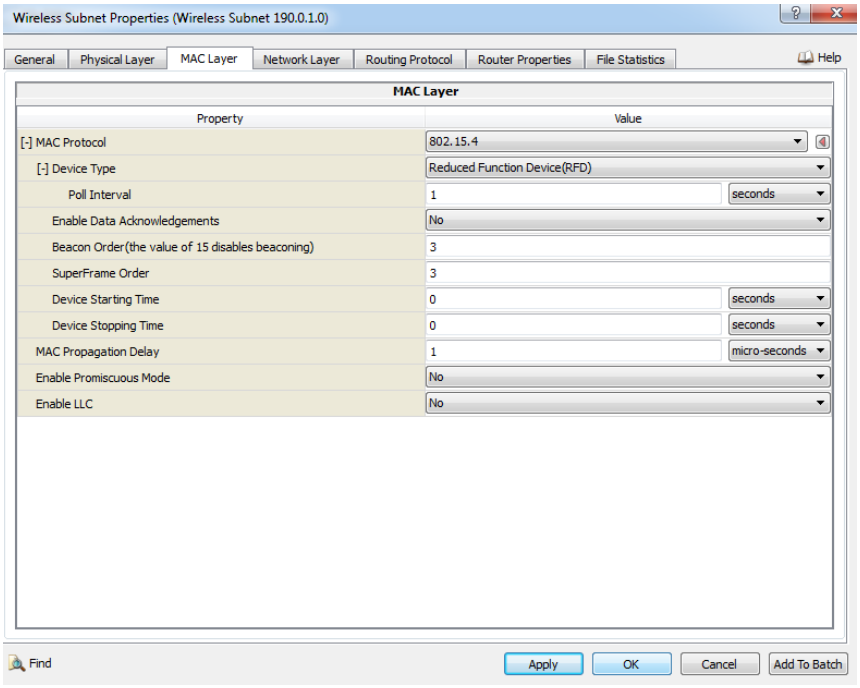


Step 2: Go to Table View → Networks → select subnet properties right click, properties

Under Physical Layer → Radio Type: 802.15.4 Radio, Energy Model: Mica-Motes



MAC Layer: change MAC Protocol: 802.15.4

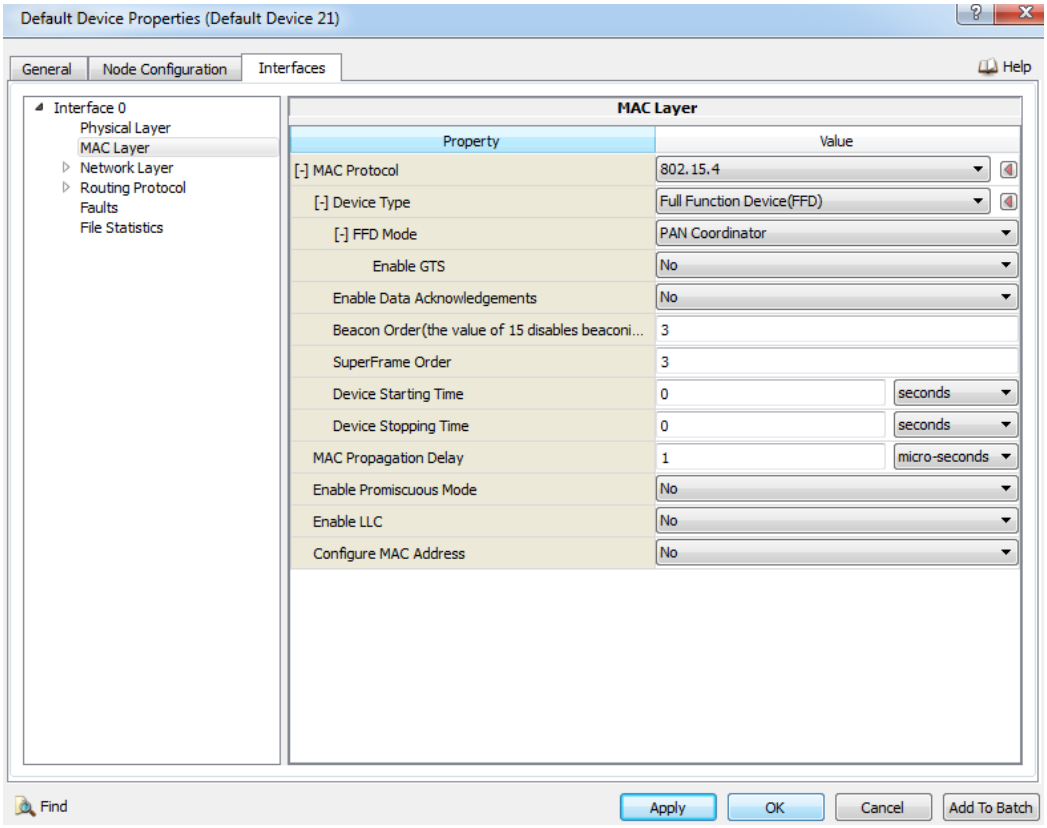


Step 3: To make node as Coordinator:

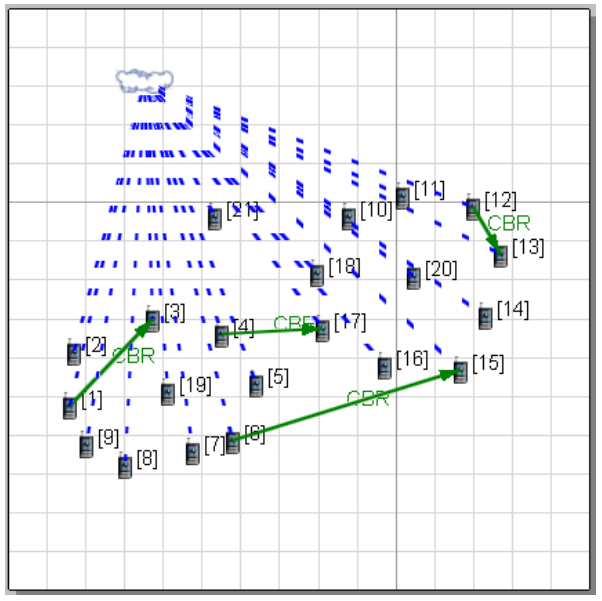
Select the two nodes on Canvas (which you want to make the coordinators), right click, properties, Node Configuration → Interfaces → MAC Layer → Device Type: Full Function Device (FFD), FFD Mode: coordinator.

Step 4: To make a Node as PAN Coordinator:

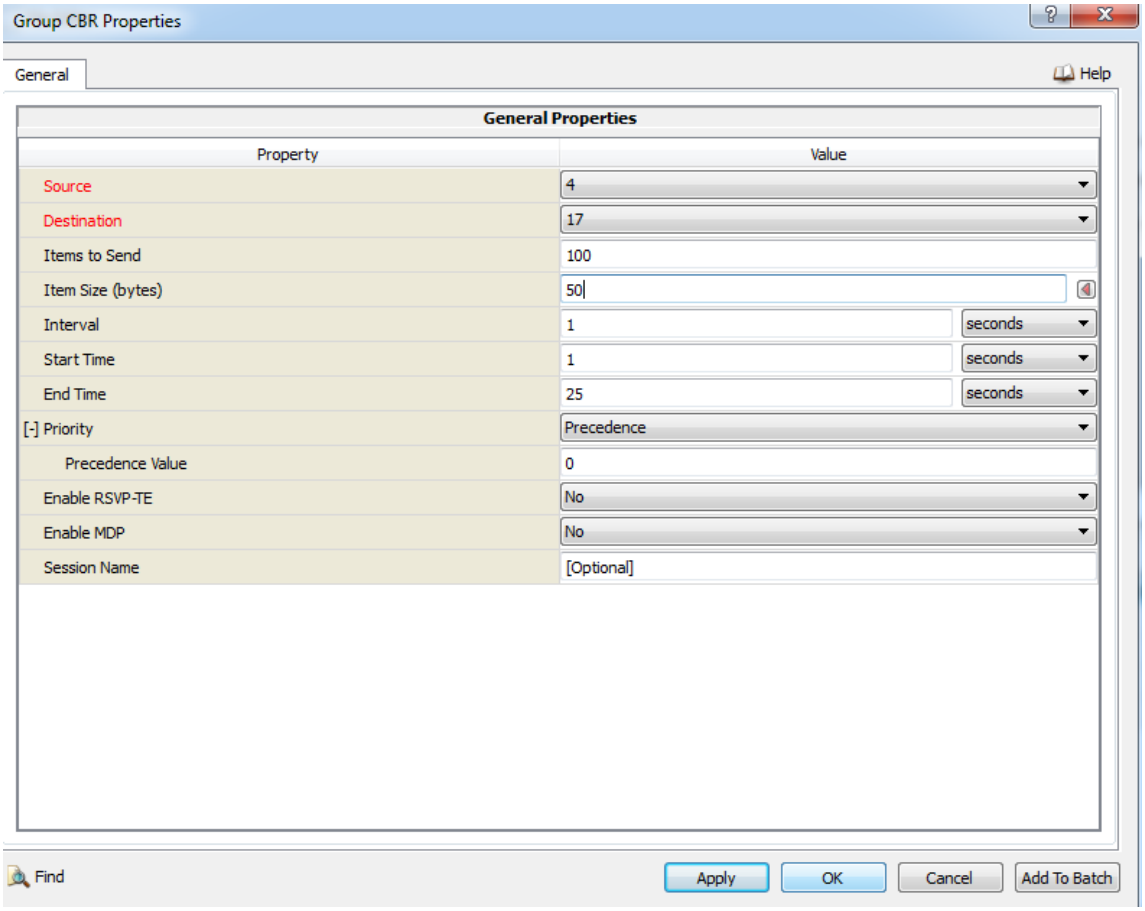
Select the node on Canvas (which you want to make the PAN coordinator), right click, properties, Node Configuration → Interfaces → MAC Layer → Device Type: Full Function Device (FFD), FFD Mode: PAN coordinator.



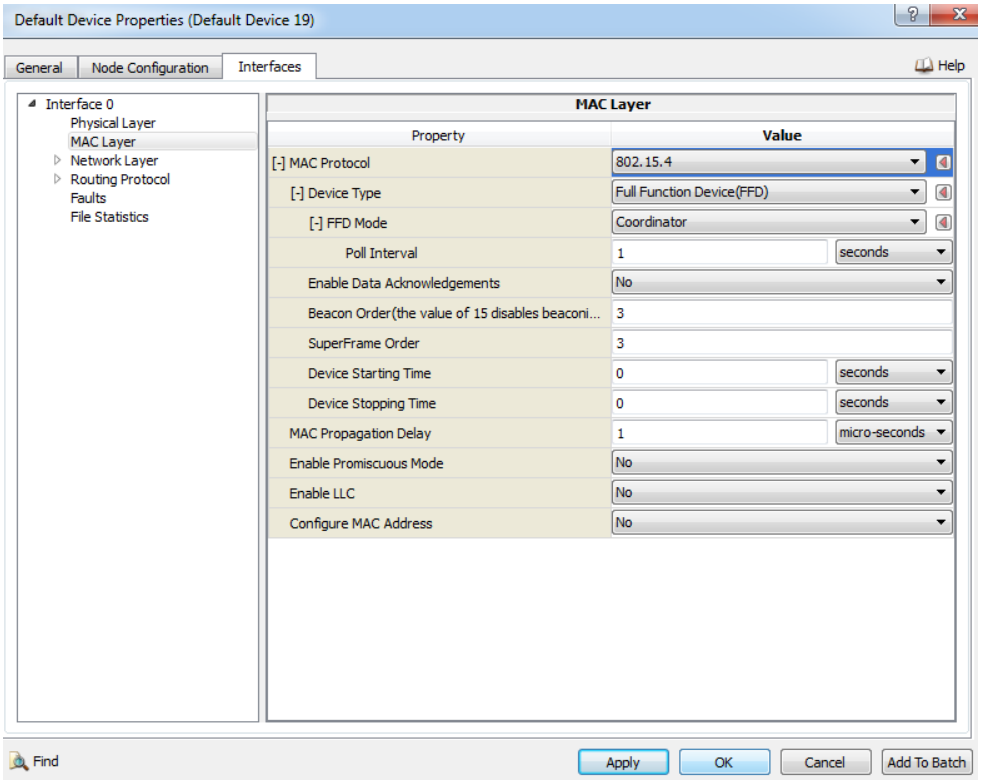
Step 5: Create CBR Traffic: Select few pairs of nodes and give CBR Traffic.



Step 6: Go to Table view → Applications → select all the CBR connections→ right click, properties → Item Size (bytes): 50 (it must be less than 70 bytes)



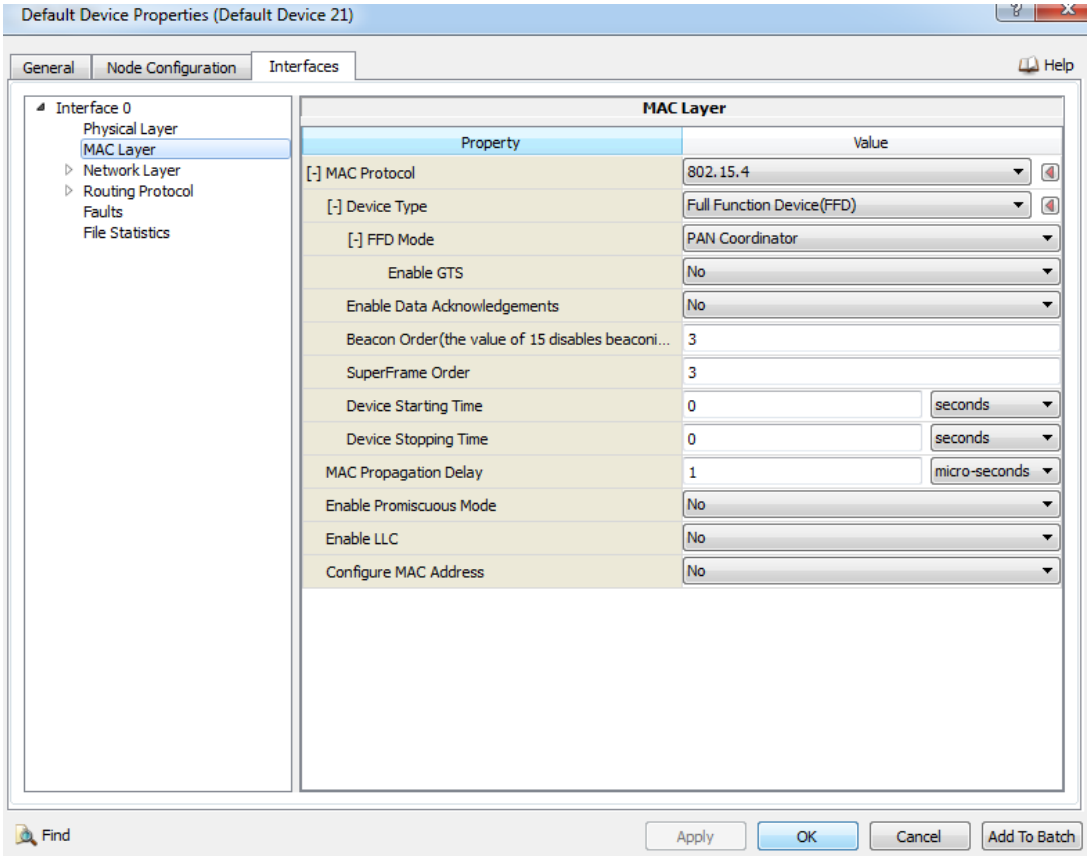
Step 7: Save the Scenario, Run Simulation, Play and Analyze Statistics of Current Scenario.



Step 8: To make a node as PAN Coordinator:

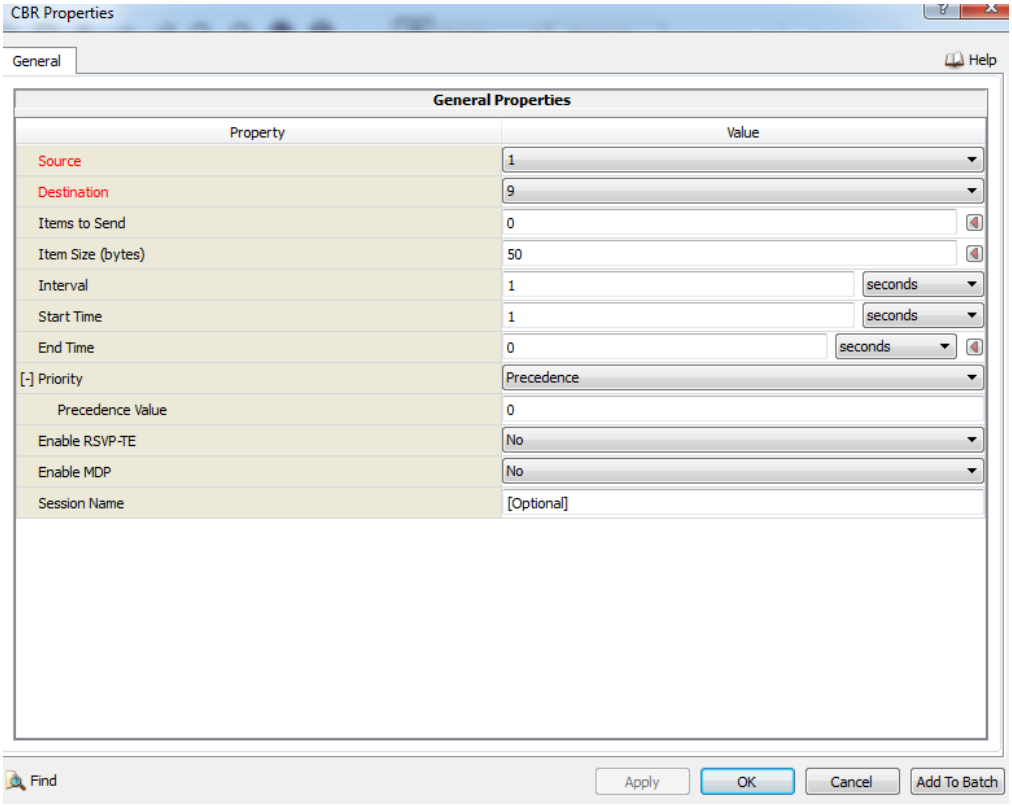
Select the node, right click, properties

Interfaces → MAC Layer → Device Type: Full Function Device (FFD), FFD Mode: PAN Coordinator

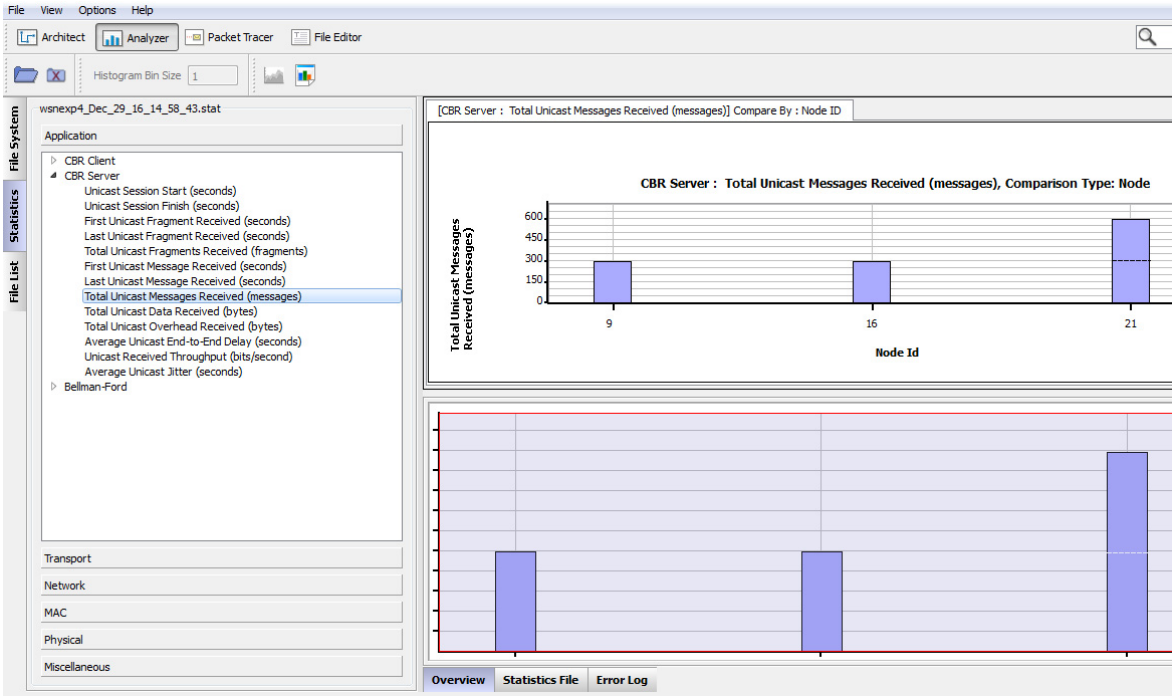


Step 9: Create CBR Traffic between some pairs of nodes.

Go to Table view →Applications → select all the CBR applications, right click, properties → Items to send: 0, Item size (bytes):50, End Time: 0



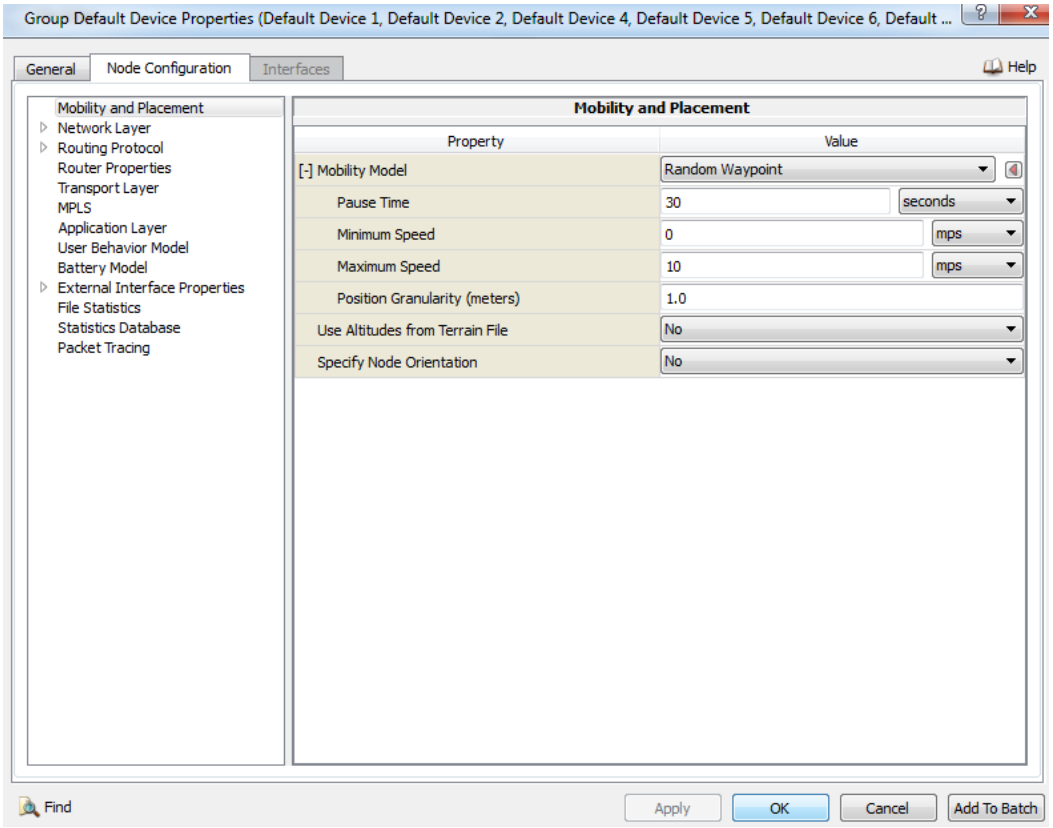
Step 10: Save the Scenario, Run Simulation, Play, and Analyze Statistics of Current Scenario. Verify the Total Unicast Messages received at server, End-to-End Delay, Throughput, and Jitter.



To create Mobility for Sensor Nodes:

Go to Table view → Nodes → select all the nodes, right click, properties → Node Configuration → Mobility and Placement

Mobility Model: Random Waypoint



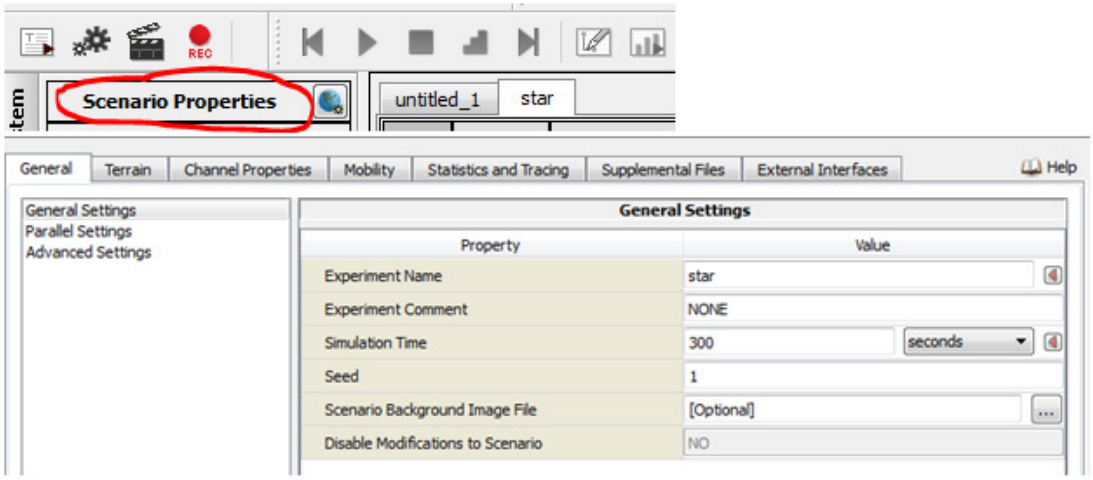
Save the Scenario, Run Simulation, Play and Analyze Statistics of Current Scenario.

Observe the Total Unicast Messages Received, End-to-End Delay, Throughput, and Jitter.

B) **Procedure:**Go to file → New → Save as →WiMax

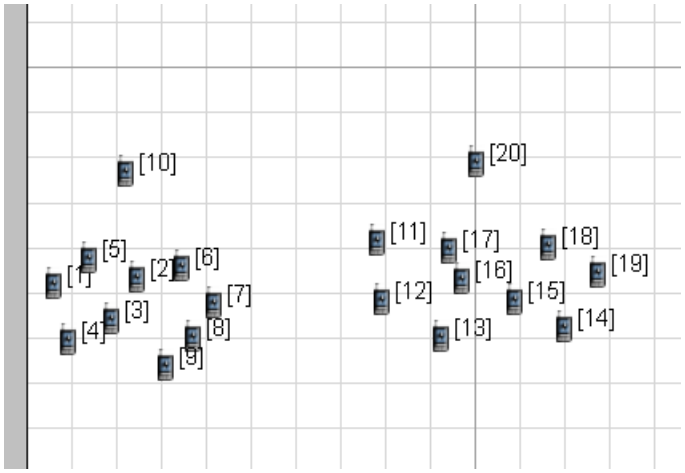
Go to scenario properties → General setting → Give experiment name and simulation time

Click Apply, Ok

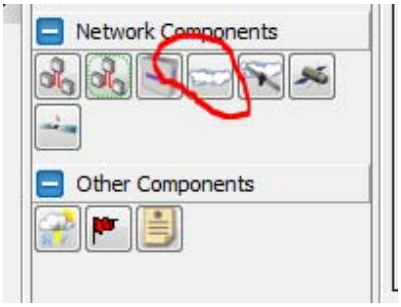


Keep the default value in other fields
Click Apply and Ok.

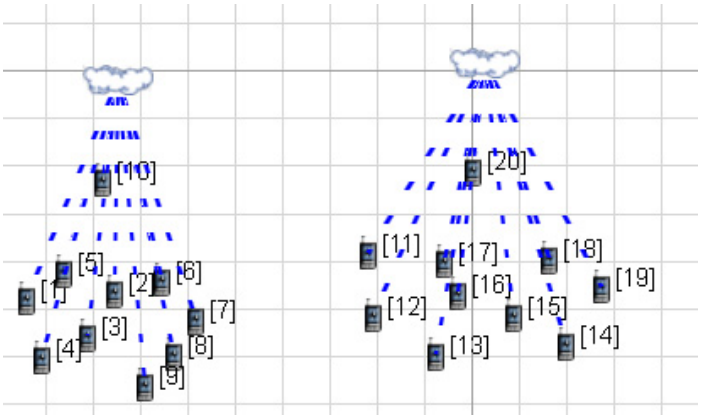
Step 1: Place nodes: in such way that one node in each as a base station (cluster head: in this 10th and 20th are the base)



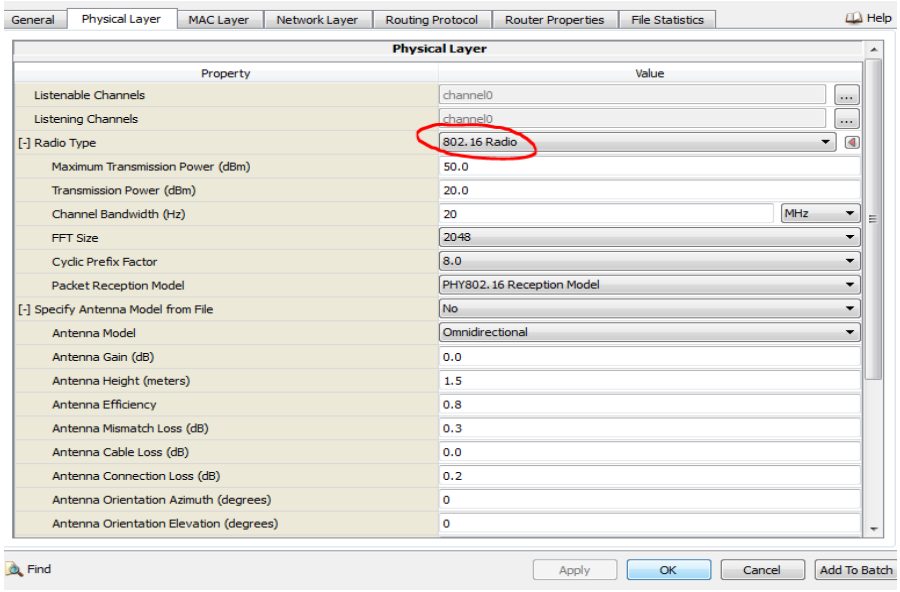
Select set of 10 nodes and place subnets for each set

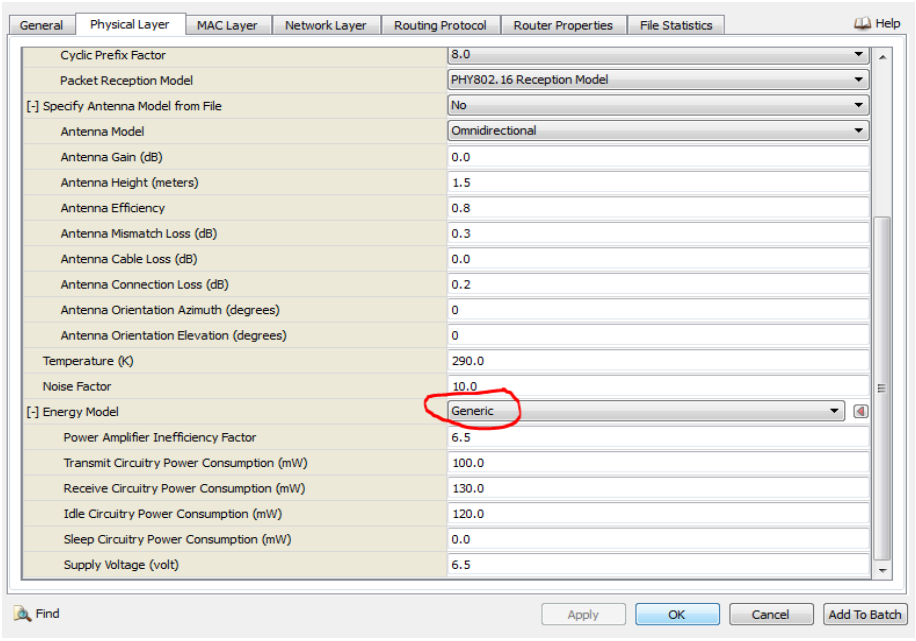


Right Click on subnet go to properties

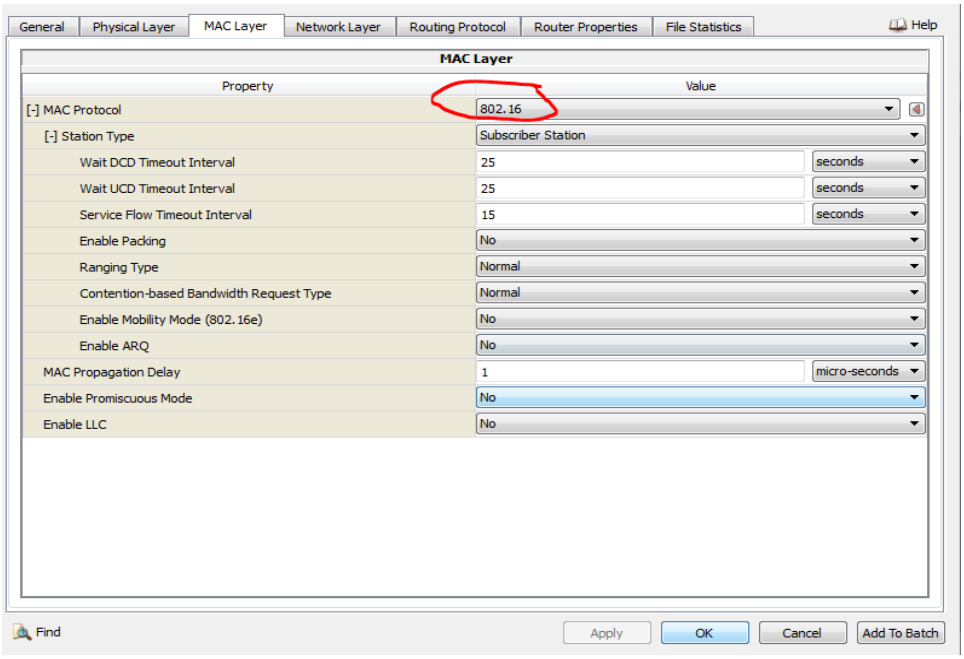


Step 2: Go to physical layer and set radio type: 802.16 radio (it's for Wimax) and energy model (optional)



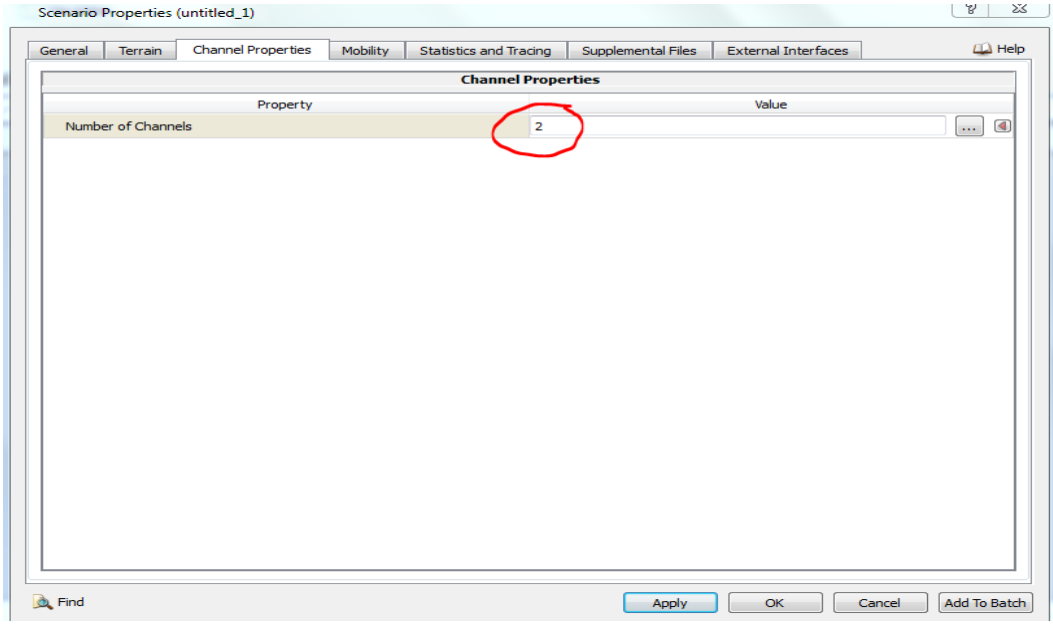


Go to MAC layer and set MAC protocol as (802.16)

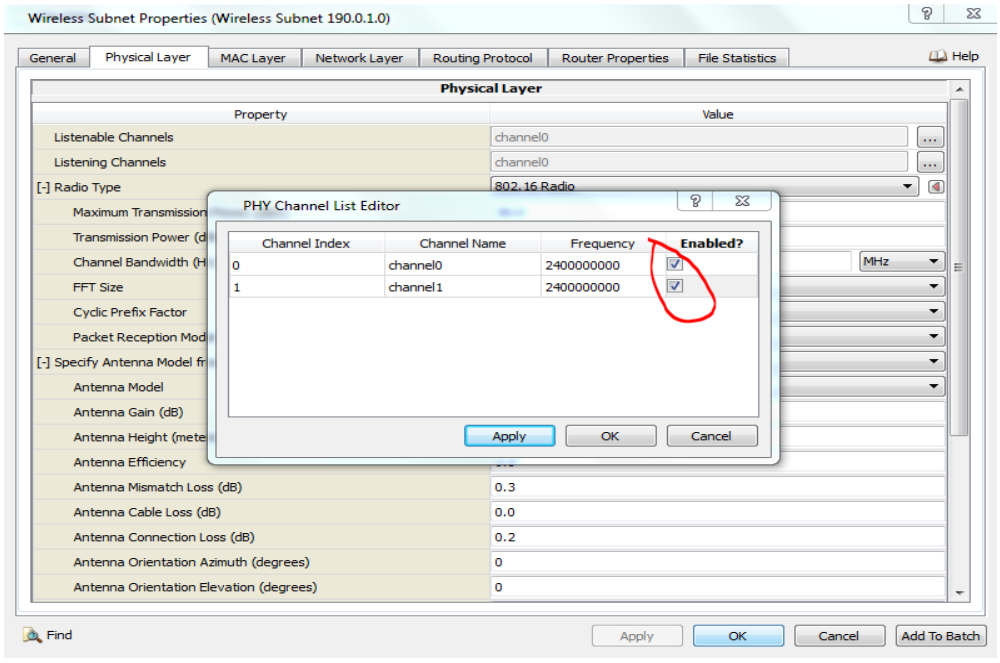


Similarly set all the parameters for other subnet

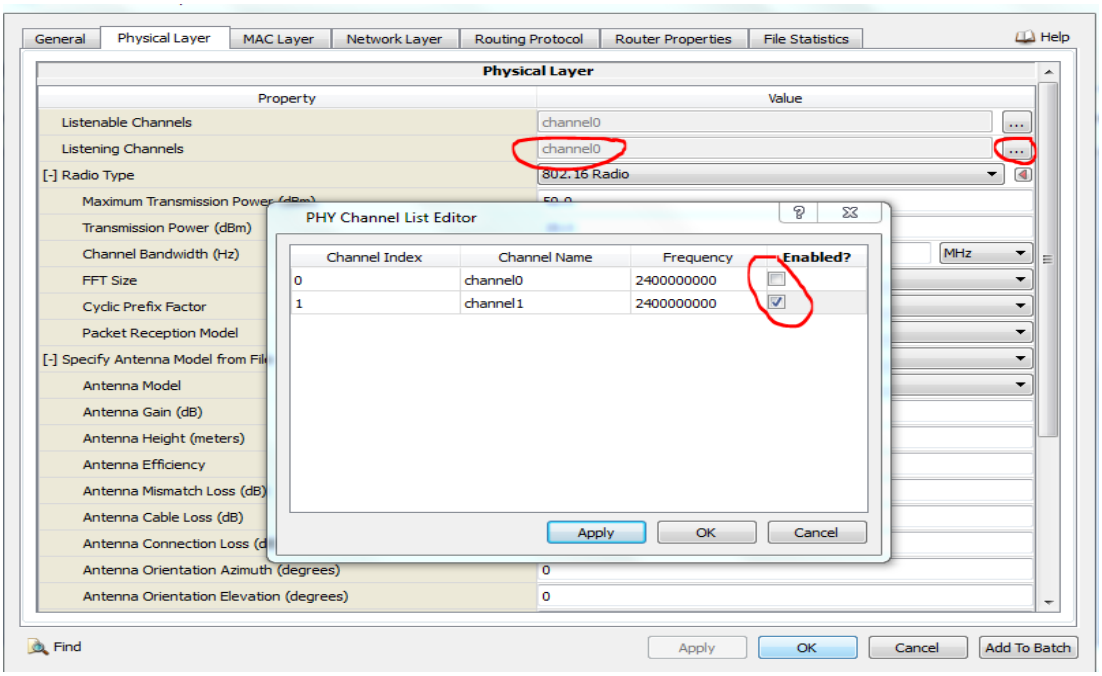
Step 3: Go to scenario properties to configure channels (Number of channel = 2, 1 channel is for one base hence for two base 2 channels are required). Apply and OK



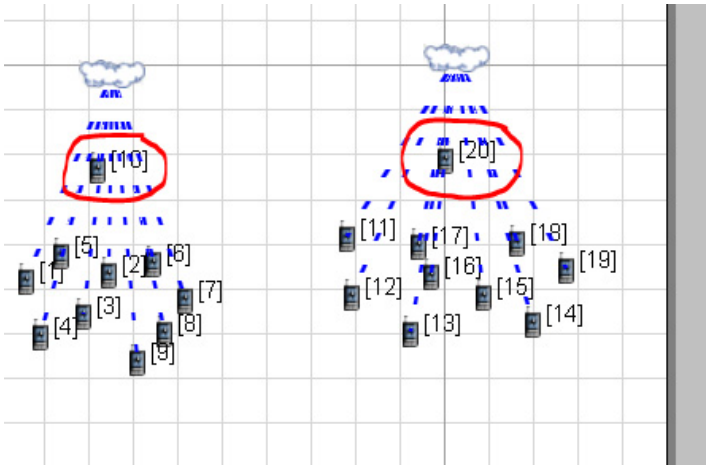
Step 4: Go to subnet properties: Click physical layer and go to Listenable channel activate both channels. Click Apply and Ok (This is for first subnet)

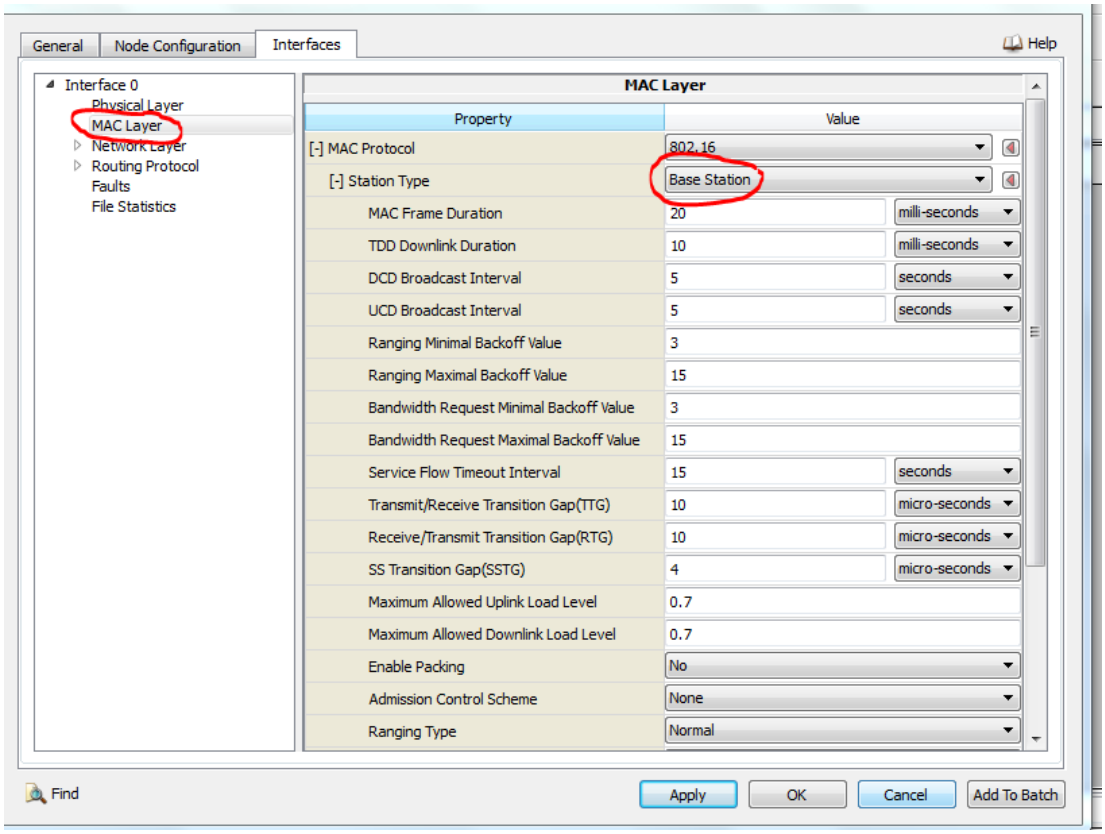


Go to subnet properties click physical layer and go to Listening channel activate channel 1. Click Apply and OK (This is for second subnet)

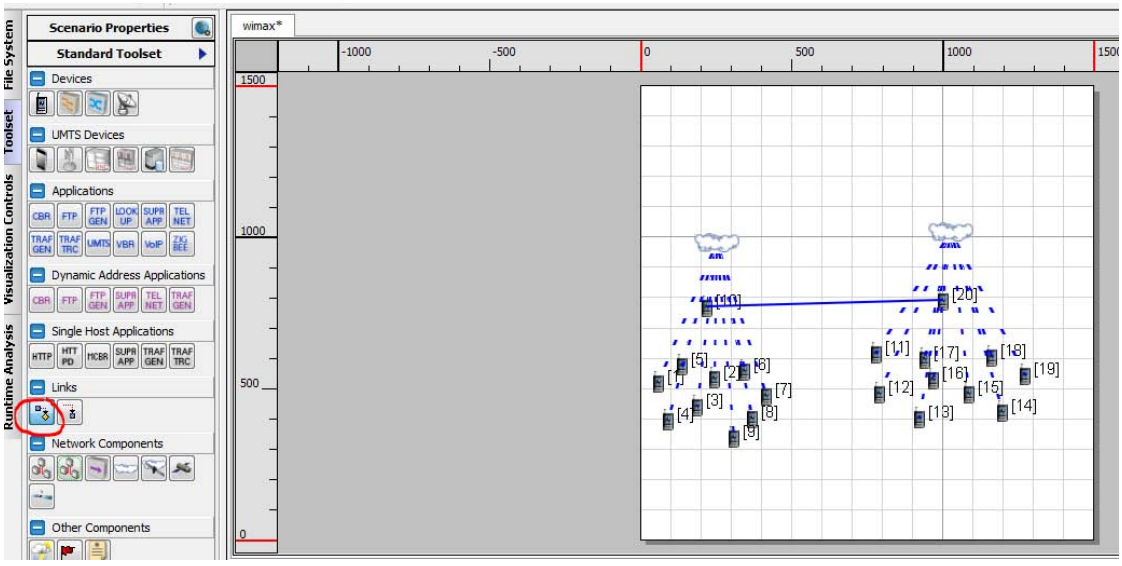


Step 5: Select 10th node properties to make 10th node as Base Station. Similarly for 20th node as Base station

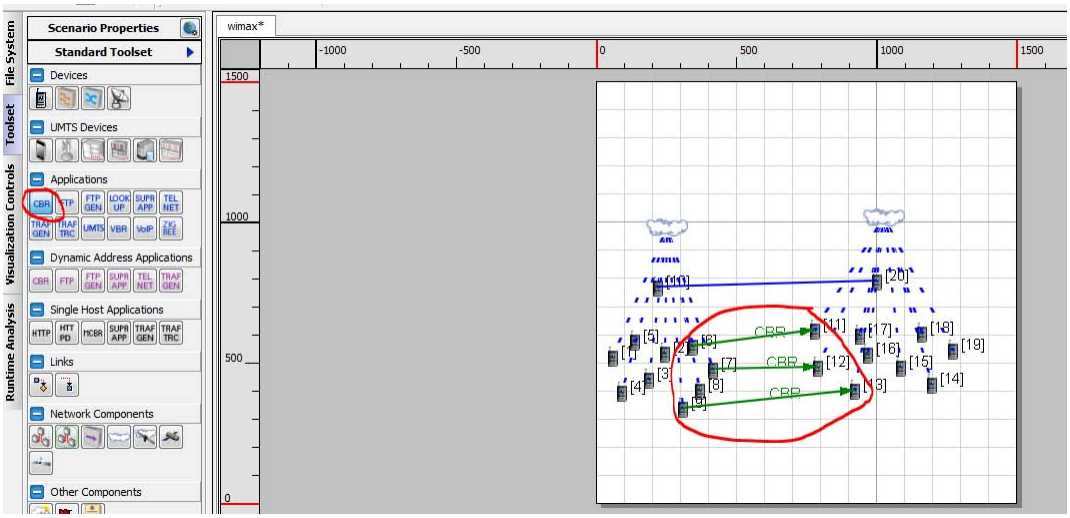




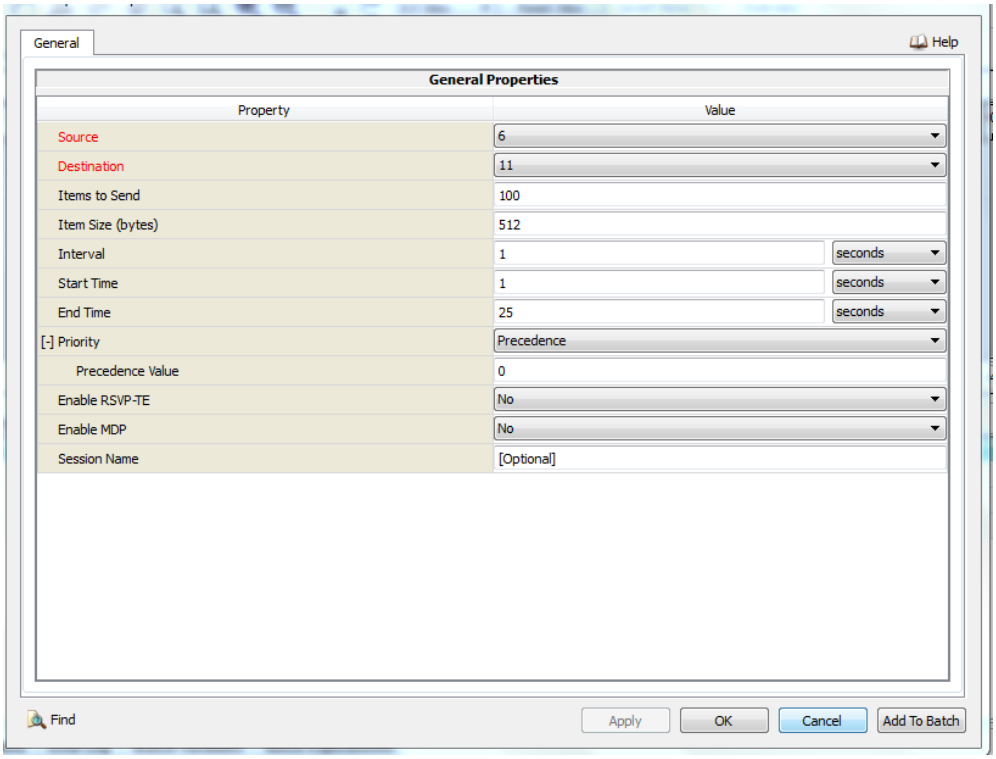
Link between two base stations: click on the link and connect two base stations



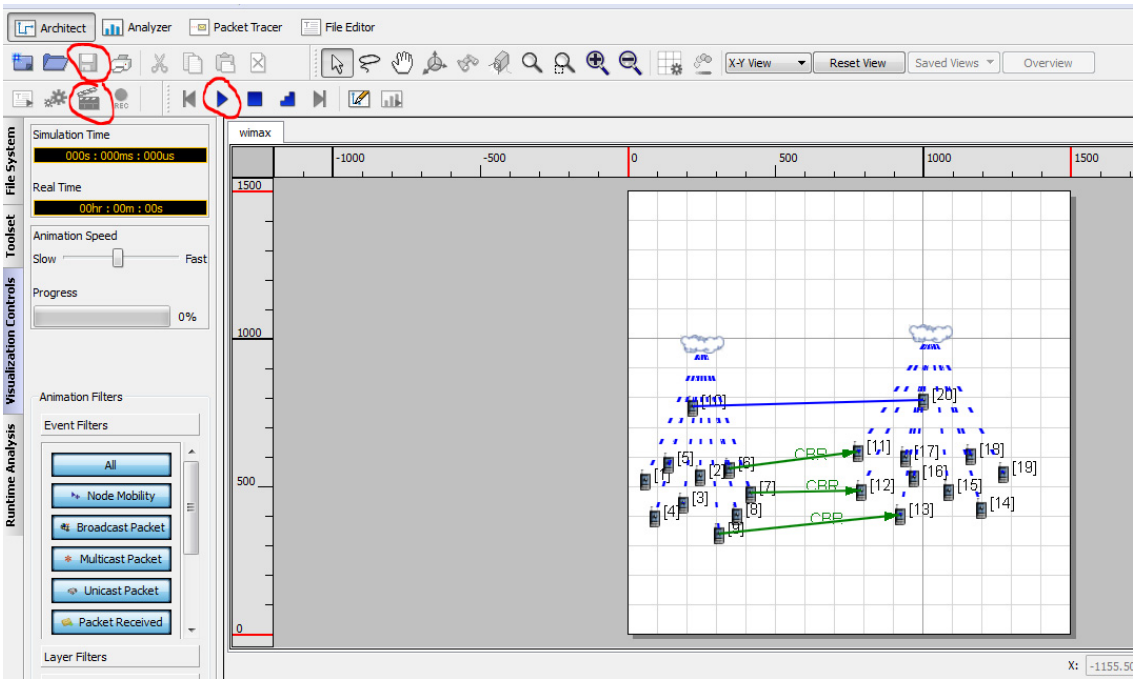
Step 6: Configure the traffic between the nodes: Click on the CBR and connect through the CBR to insert traffic using CBR.

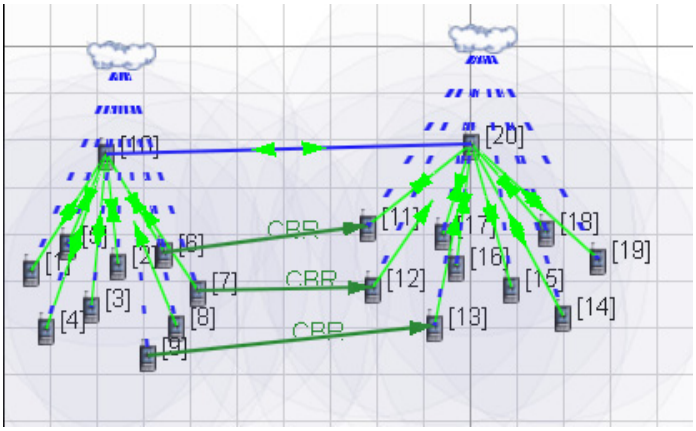


To configure CBR (constant bit rate): go to table view under applications select all by right clicking and again right click on properties

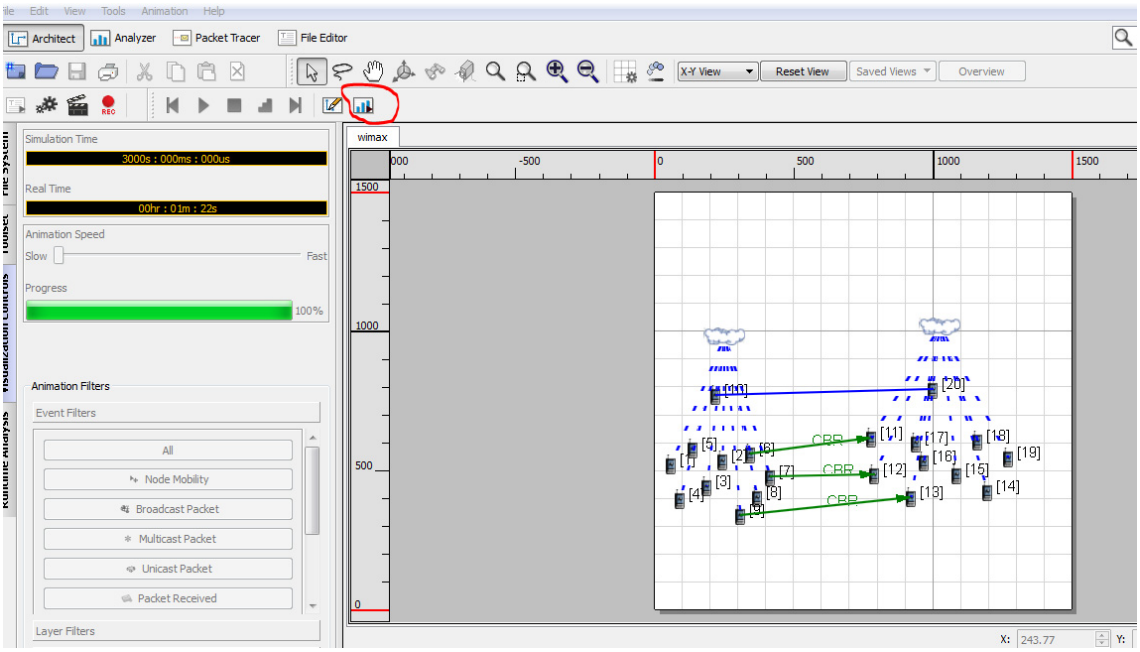


Step 7: Save the scenario, run and play

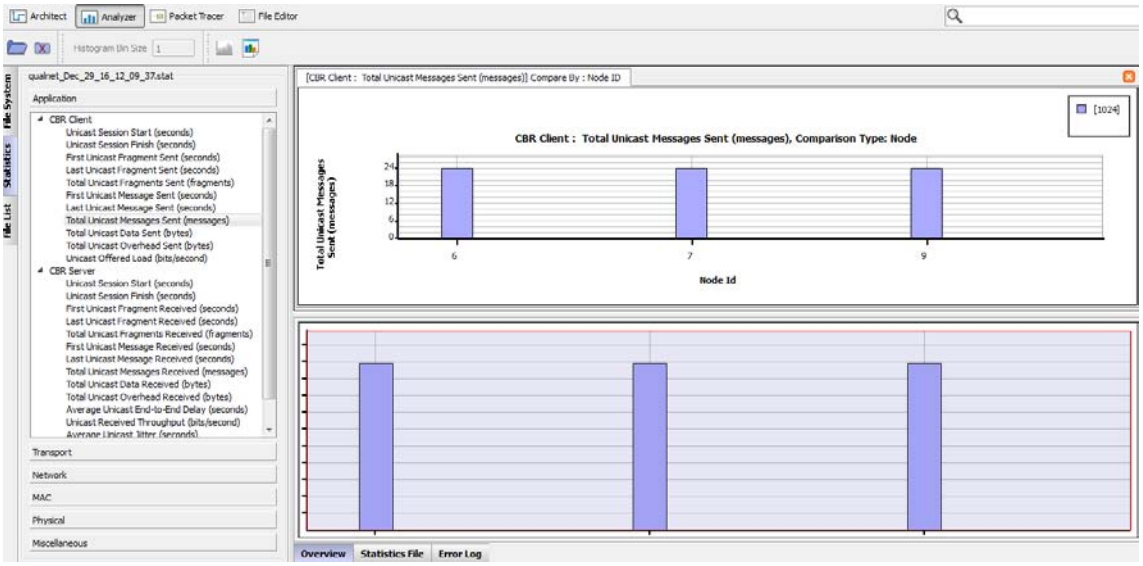




After simulation click analyse



Total unicast message sent



Total unicast message received