Abstract:

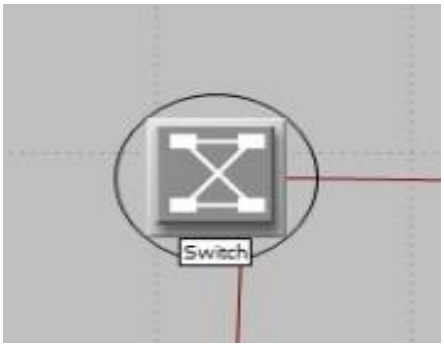
A Wireless Local Area Network gives a flexible data communication system rather than using a wired LAN within a building. It uses radio frequency to transmit and receive data which minimizes the need for wired connections. The intention of this project is to evaluate the performance of WLAN when the workstation connected to the WLAN Network get increased or when the background load is added to the network. To achieve the performance of the network we are going to use optimized network simulating tool (RIVERBED modeler 17.5.). The performance of the network were measured by setting up four main functions. Delay, Load, Retransmission Attempts and Throughput .

Components used: -

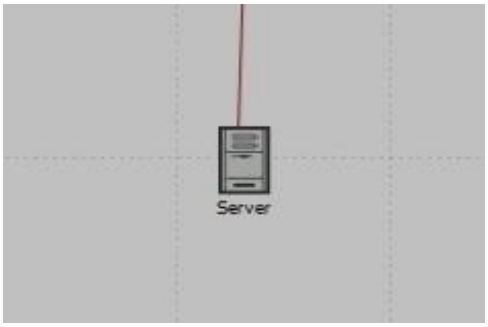
• **Application Config:** It is used to specify applications that will be used to configure users profiles.

• **Profile Config:** It is used to describes the activity patterns of a user or group of users in terms of the applications used over a period of time. You must define the applications using the application config object before using this object.

• **ethernet16_switch:** The ethernet16_switch node model is used to represent a switch that is supporting up to 16 Ethernet interfaces.



• **ethernet_server:** The ethernet_server model represents a server mode with server applications running over TCP/IP and UDP/IP. This node supports one underlying Ethernet connection at 10Mbps or 1Gbps.

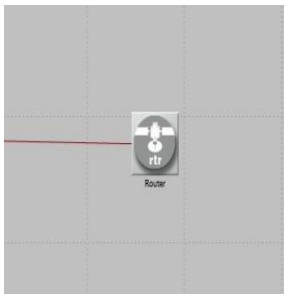


• **100BaseT link:** The 100BaseT duplex link represents an Ethernet connecting operating at 100 Mbps. It can connect any combination of the following nodes (except Hub-to-Hub which can't be connected).

• **Subnet :** A subnet is a logical partition of an IP network into multiple smaller network segments . It is typically used to subdivide large networks into smaller , more efficient subnetworks.

• **wlan_wkstn_adv** :- wlan_wkstn_adv represents a workstation with client-server application running over TCP/IP and UDP/IP . The workstation supports one underlying Wlan connection at 1 Mbps, 2 Mbps , 5.5 Mbps and 11 Mbps.

• **wlan_ethernet _router_adv** :- This is a wireless lan based router with one ethernet interface.



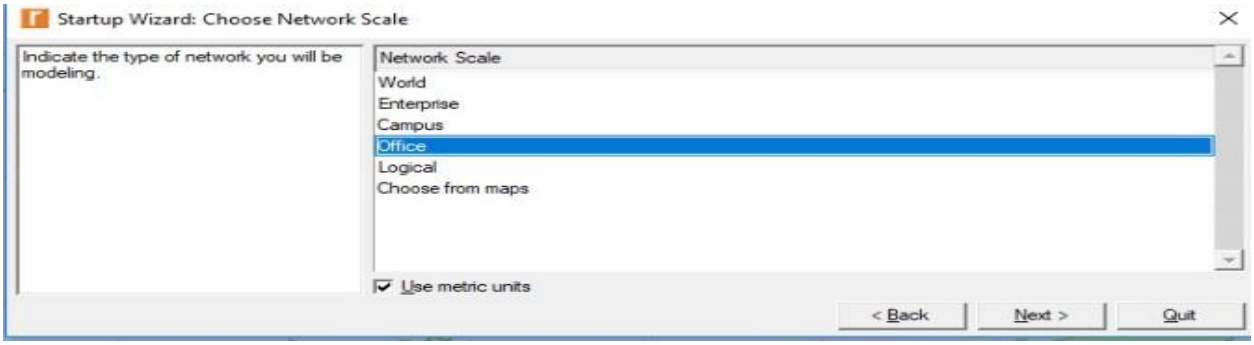
Methodology :-

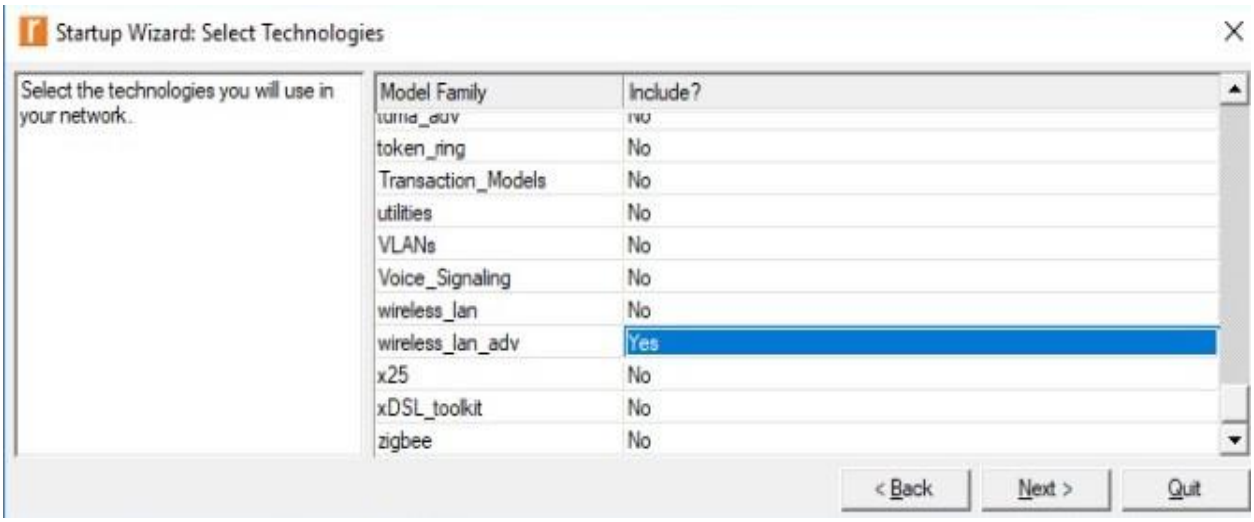
• Start Riverbed Modeler Academic Edition.

• Choose ***New*** from the ***File*** **menu.**

• Select **Project -**–click **ok** name the project **<your intials >_ WLAN** and the scenario as **Scenario1.** Check that use Startup Wizard is checked –Click **OK**.

• In the Startup Wizard: Initial Topology dialog box, make sure that **Create Empty Scenario** is selected –Click **Next –**Choose **Office** from the network scale list –Click **Next --**Choose **wireless_lan_adv** from the select technologies and click **Yes** –Click **Next –**Click **Finish.**



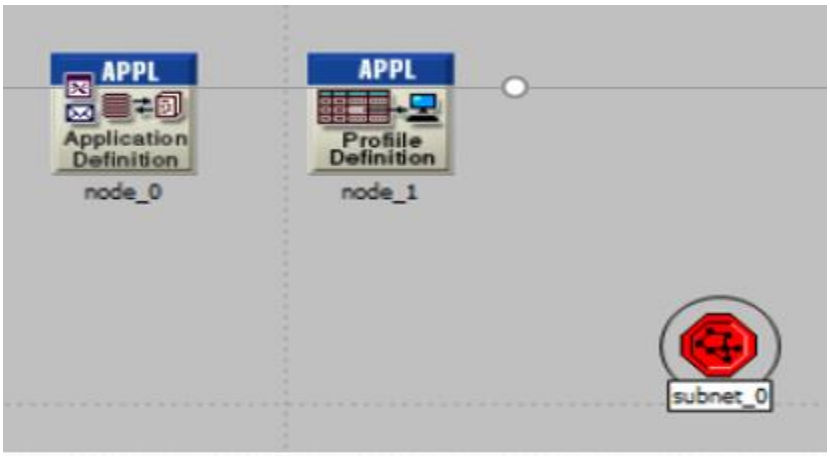


Intialize the Network :-

• Open palette dialog box should be now on the top of project space. If it is not there ,open it by click on **Topology** and select **Open Object Palette**.

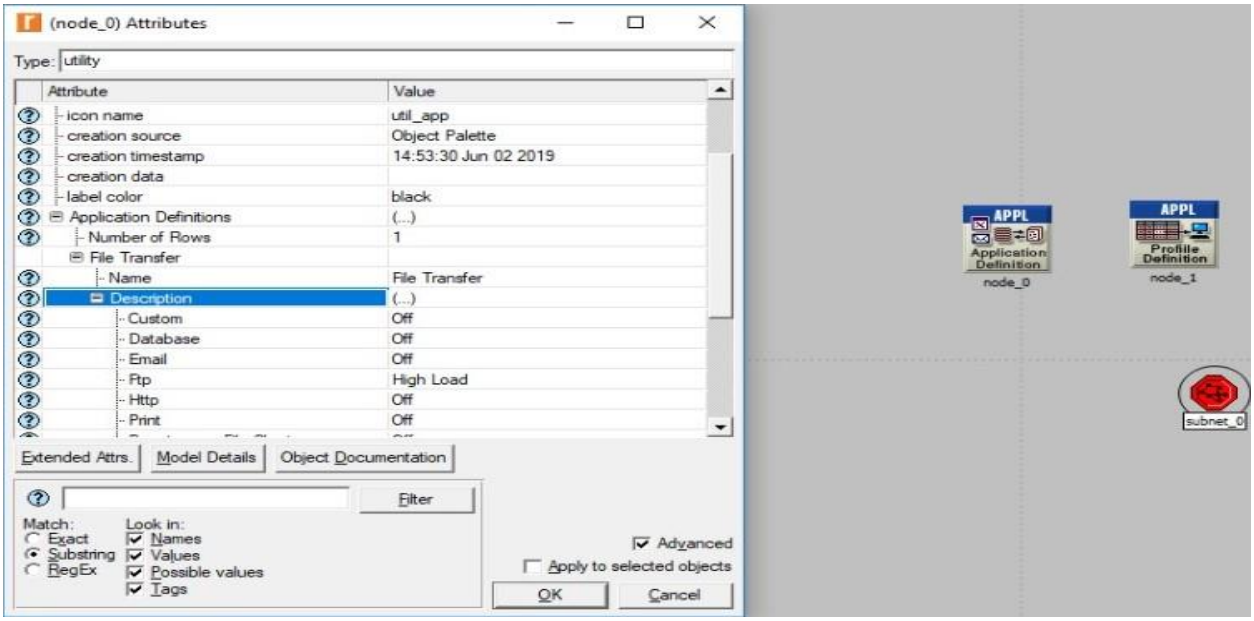
• Add to the project workspace the following objects from the palette: **Application Config** , **Profile Config** , and **Subnet .**

To add an object from a palette, click its icon in the object palette – move mouse to the workspace –Left click to place the object. Right click when finished . The workspace should contain the following three objects.

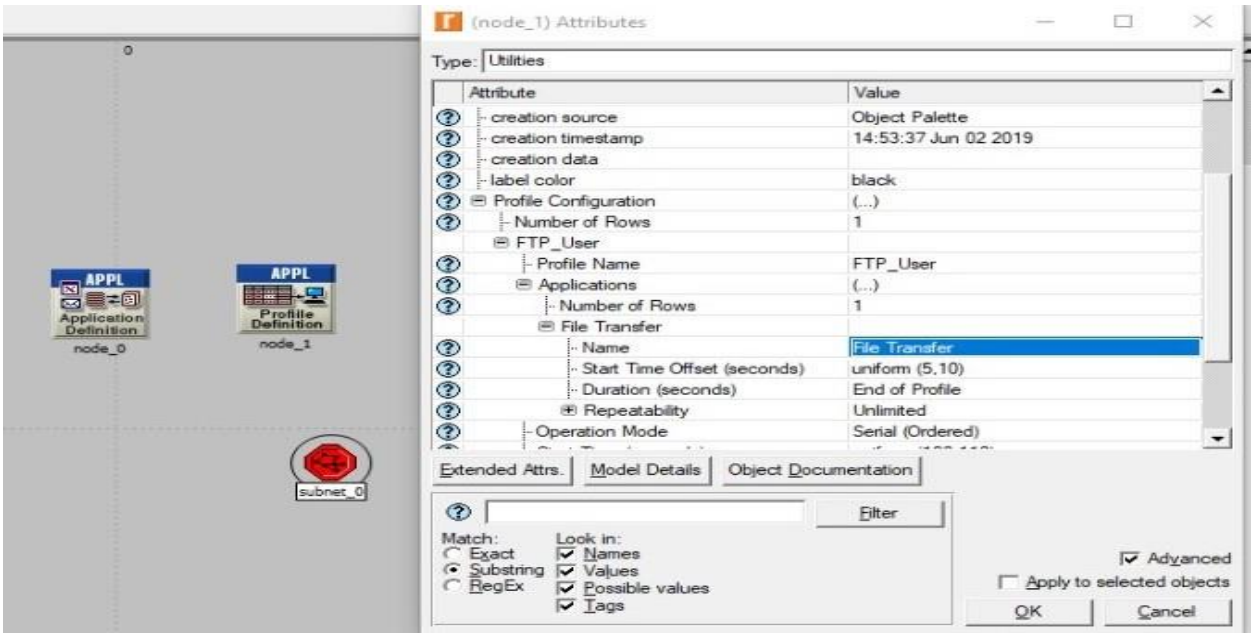


Configure the services:-

Right click on the **Application config** node –**Edit attributes** –Change the name attribute to Application_config --Click on the **Application Definitions** attribute --change the **Number of Rows to 1** --Enter application name as **File Transfer –** Click on the **Description --**Select **Ftp** –Apply **High load.** Click **OK.**



Right click on the **Profile config** node –**Edit attributes** –Change the name attribute to Profile_config --Click on the **Application Configuration** expand it --change the **Number of Rows to 1** --Enter profile name as **FTP_User –** Click on the **Application** expand it --change the **Number of Rows to 1** --expand **Enter Application name** –change **Name** to **File Transfer – Click OK.**



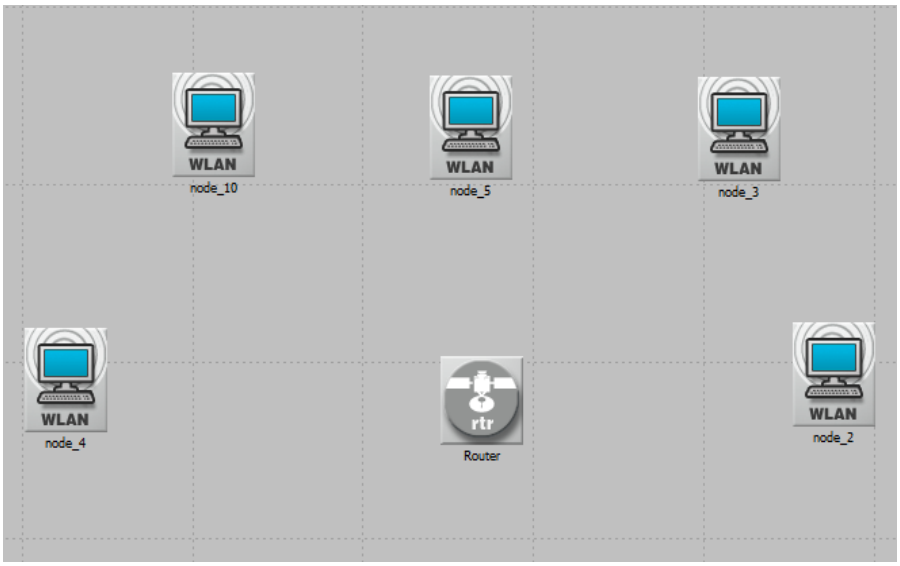
Cofigure a subnet:-

Right click on the **subnet** node –**Set Name** –change the name attribute to **Department** and click **OK.**

Double –Click on the **Department** node. You get an empty

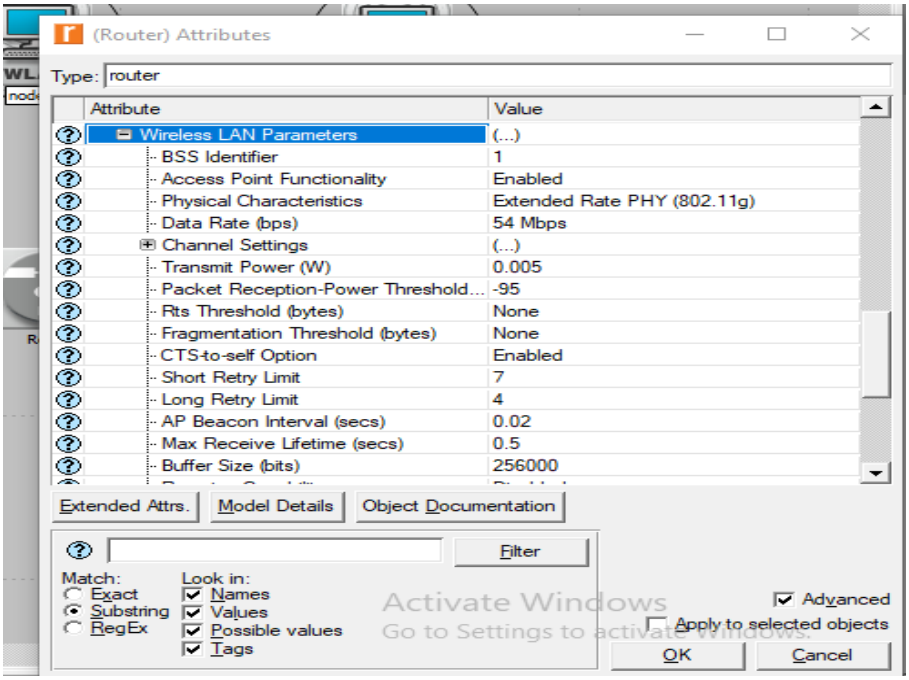
workspace , indicating that the subnet contains no objects.

From Object Palette Add the following items to the subnet workspace : **wlan_ethernet _router_adv(Fixed Node)** and take **5 wlan_wkstn_adv(Fixed Node) –** close the palette.



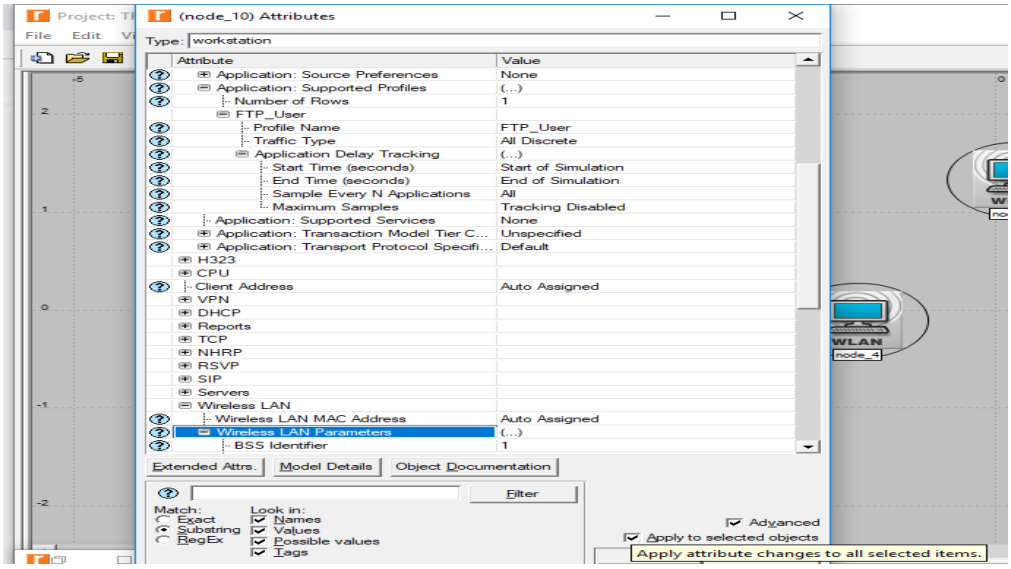
Right click on **wlan_ethernet _router_adv** the node –**Set Name** –change the name attribute to **Router** and click **OK.**

Right click on **Router** select **Edit Attribute –** expand **Wireless Lan –** expand **Wireless Lan Parameter –**set **BSS to 1 –**click **OK**.



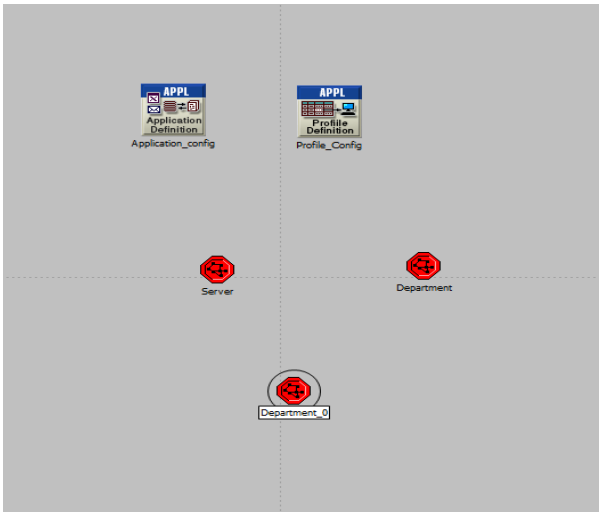
Right click on **wlan_wkstn_adv** –Click on **Select Similar Node .**

Again Right click on **wlan_wkstn_adv**(any node) **–** check **Apply to select objects** –then expand **Application—**change Application Support Profile from None to Edit(it will show another option table) –Selecr **1 Row –** click **none** change it to **FTP_User** –click **OK** –expand **Wireless_LAN** –expand **Wireless_LAN_Parameter** -- change **BSS** from **auto assigned to 1** –Click **OK**--Click **yes.**



Now select the **Department** presss **Ctrl+V** press **Ctrl+C –**Left Click (this will create a similar copy of the Department).Make /Change the **BSS**

identifier of **wlan_wkstn_adv** and **wlan_ethernet _router_adv** of every subnet.



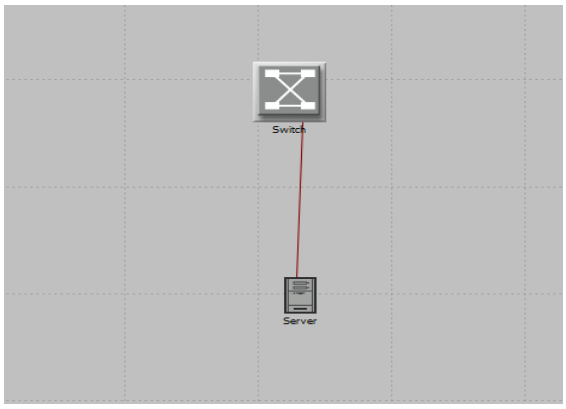
Save your Project.

Cofigure the Servers:-

Now we need to implement a subnet that contains the server . The server have to support the application defined in the profile we deployed. We can double-click those applications by editing the attributes of our **Profile** node. Inspect each row under the **Application** hierarchy, which in turn, is under the **Profile Configuration** hierarchy. You will see that we need a server that support the following application: File Transfer.

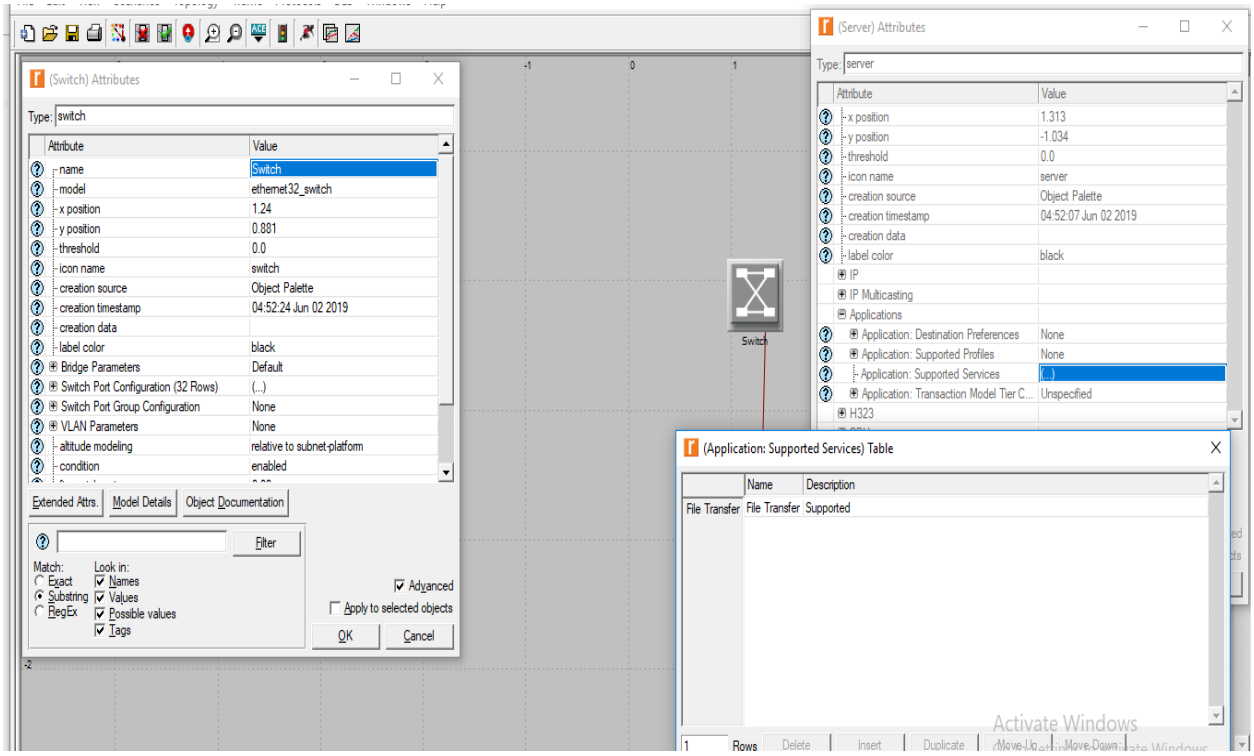
Open the **Object Palette** and add a new **subnet** –Rename the new **subnet** as **Server** –Double click the **Servers** node to enter its workspace.

From the **Object Palette** add **Ethernet_servers,** one **ethernet32_switch,** and one **10BaseT links** to connect the servers with the switch.



Close the **Object Palette.**

Rename the servers and the switch as follows:



Right –click on server and **Edit** the value of the **Application : Supported Services** attribute under **Application.**

For the Server add 1row to support the following services:
File_Transfer(Heavy Load).

Go back to the project space by clicking the **Go to the Parent Subnet** button.

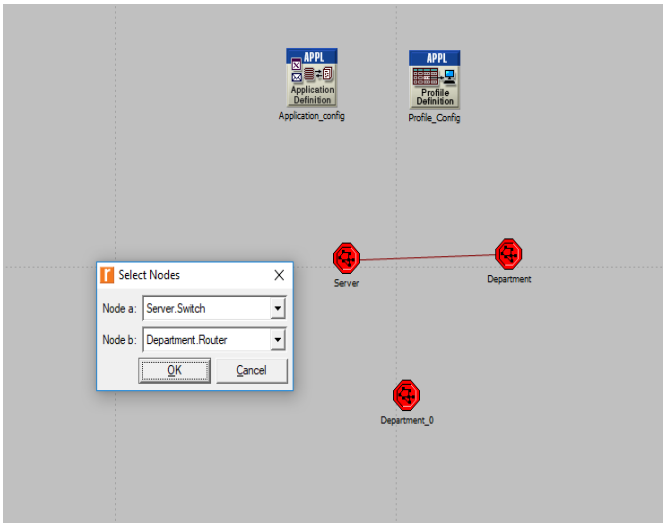
Save your Project.

Connect the Subnets:

Now all subnet are ready to be connected together.

Open the **Object Palette** and add two **100BaseT** links to connect the subnets of the different departments to the **Server** subnet.

During connection make sure that it is configured to connect the “Switch” to “Router” in both subnets to each other. Do this by choosing them from the drop-down menus as follows :



Close the Object Palette.

Save your Project.

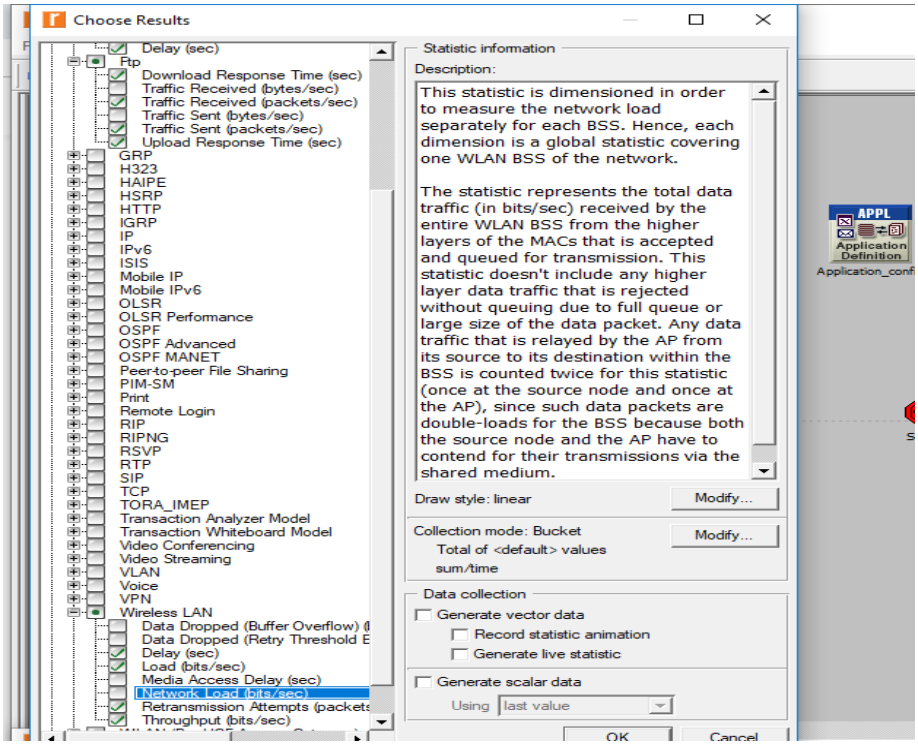
Choose the Statistics:-

To test the performance of the network collect one of the many available statistic as follows:

Right –Click anywhere in the project workspace and select **Choose Individual Statistics** from the pop-up menu.

In the **Choosen Result dialog** box, choose the following statistic:

Click Ok.

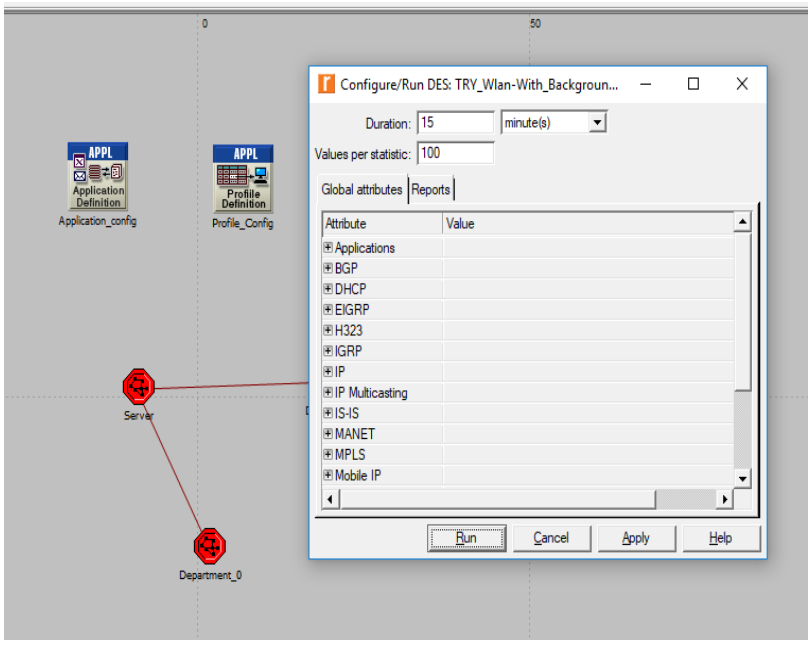


Configure the Simulation :-

Click on the **Configure/Run Simulation .**

Set the duration to be **15.0 minutes.**

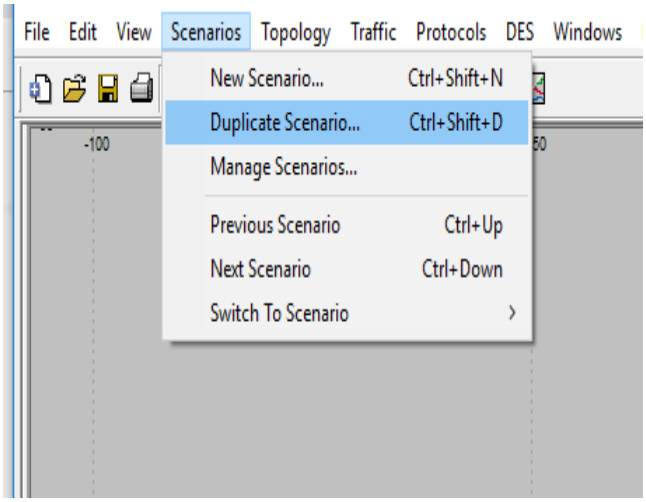
Press **Run** Repeat for all the Simulations.



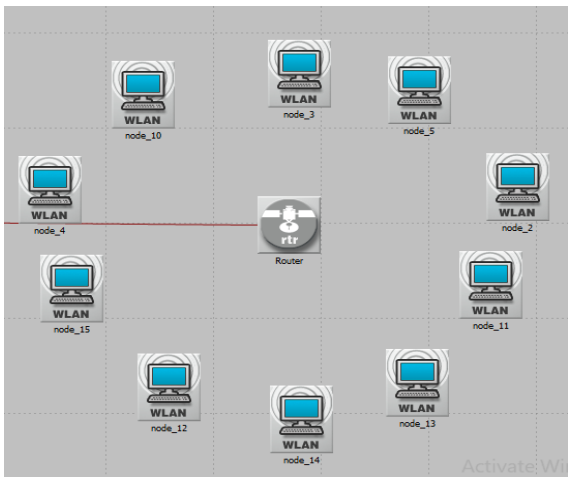
Dublicate the Scenario:-

Till now we just created a two department with 5 workstation in it. Now we will add 5 more workstation to every department in scenario2, add 10 to every department in scenario3 and in start we assumed that there is no background traffic in the on link. So in scenario4 we add background traffic to it as well. Because in real life usually the amount of workstation connect to a Wi-Fi is not fixed and the link also have usually some existing Background traffic on them .

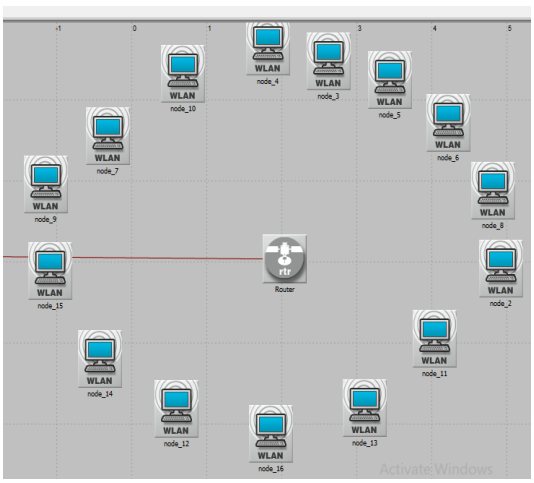
Select **Duplicate Scenario from the Scenarios menu and give it the name scenario1** –Click **OK.**



Double –Click on the **Department Subnet** node and then select any workstation and make 5 more of it for scenario2 and 10 more copy in scenario3. Similarly perform it for Department1 in both the scenario.



Scenario 2



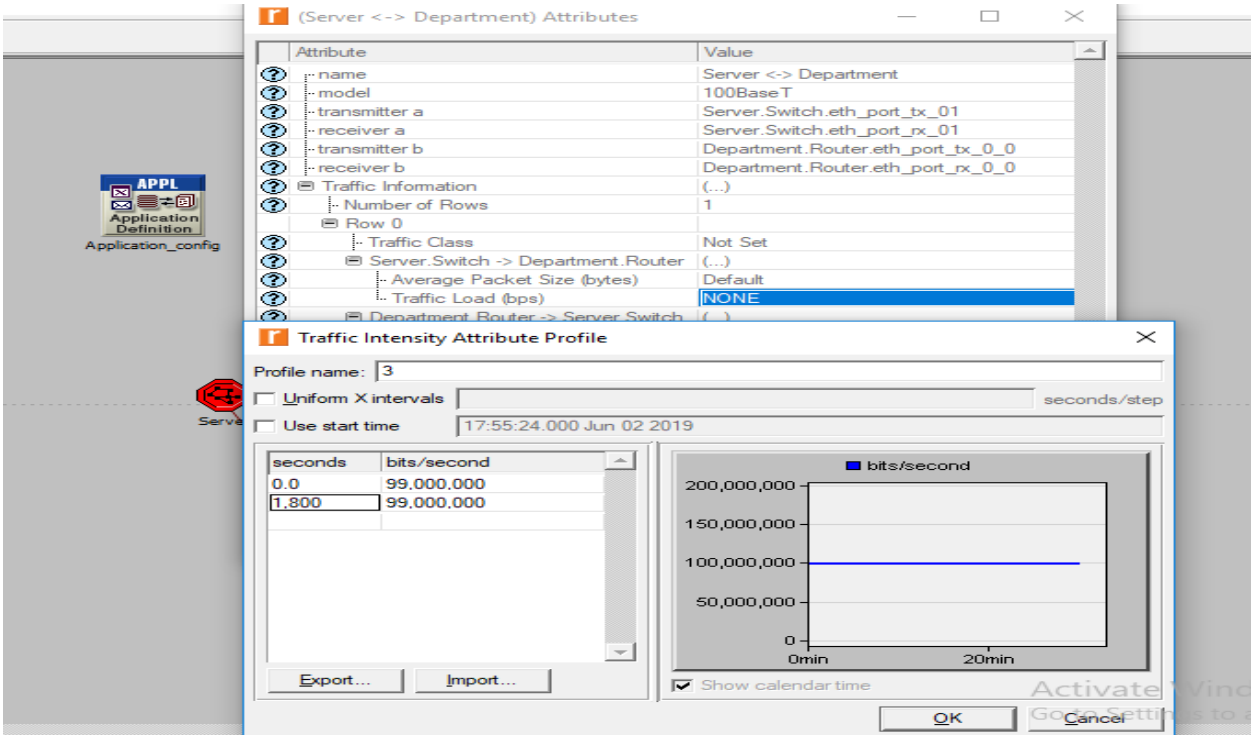
Scenario3

Create one more duplicate scenario of scenario1.

Select all the 100BaseT links simultaneously (click on all of them while holding the **shift) –**Right click any one of them **–Edit Attribute –Check the apply changes to Selected Objects check box.**

Expand the hierarchy of the **Traffic Information Attribute –**Click on the value of **number of row assign 1 –Click enter.**

Expand the hierarchy of the **Row 0 attribute –Expand the hierarchy of the 2 Campus Network. –**Click on the value of **traffic Load of the first and choose 1 –**click **Enter.**

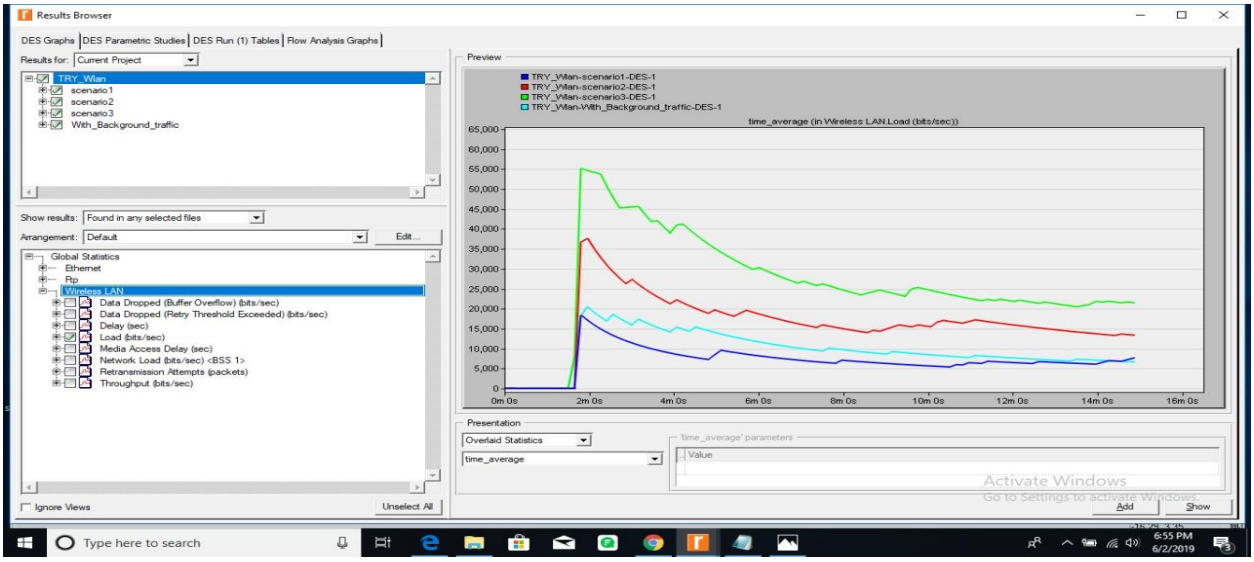


Result and Analysis :-

LOAD:-

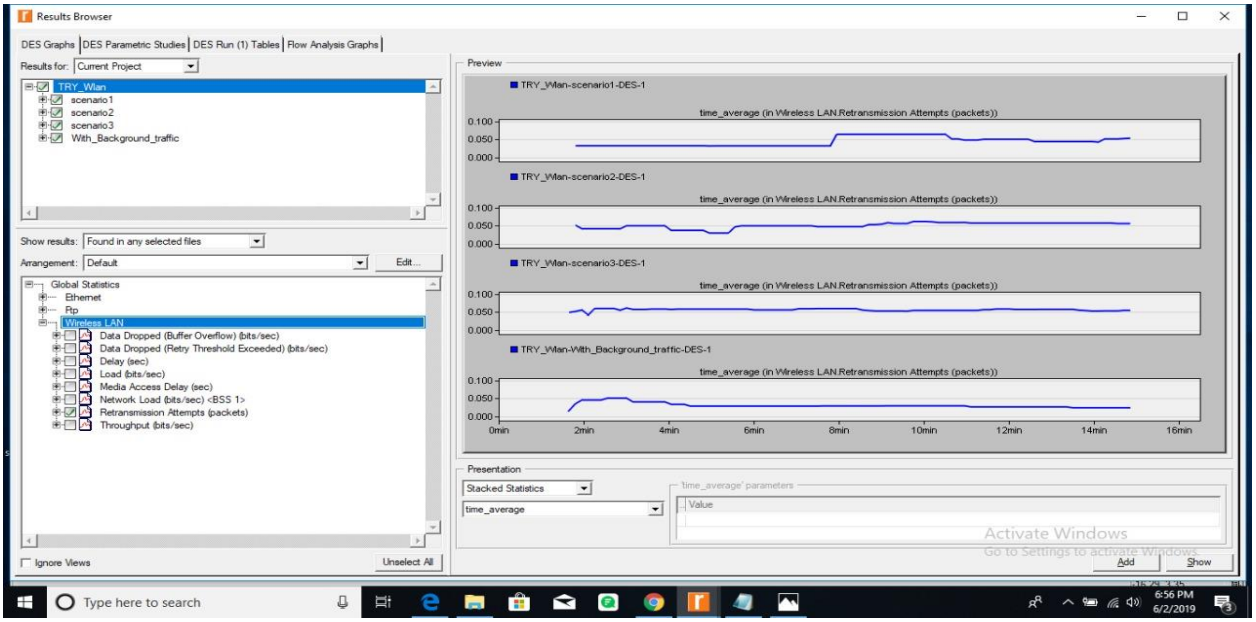
Represents the total load (in bits/sec) submitted to wireless LAN layers by all higher layers in all WLAN nodes of the network.

As the number of the station connected to the network get increased the load on the network automatically get increased. . Thus the Load for scenario3 which has 15 stations is maximum. Followed by the node with 10 and the scenario4 has maximum load than scenario1 because the link in scenario4 has extra background traffic on it .



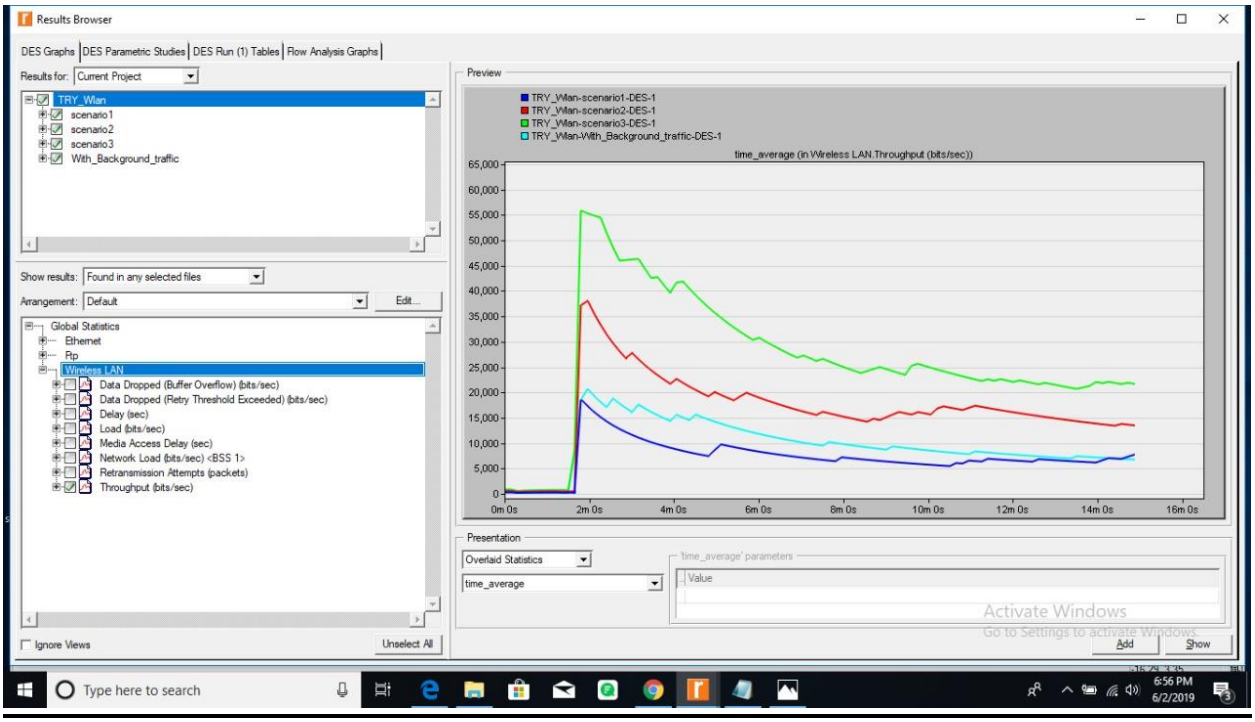
Retransmission Attempts:-

Total number of retransmission attempts by all WLAN MACs in the network until either packet is successfully transmitted or it is discarded as a result of reaching short or long retry limit.



Throughput:-

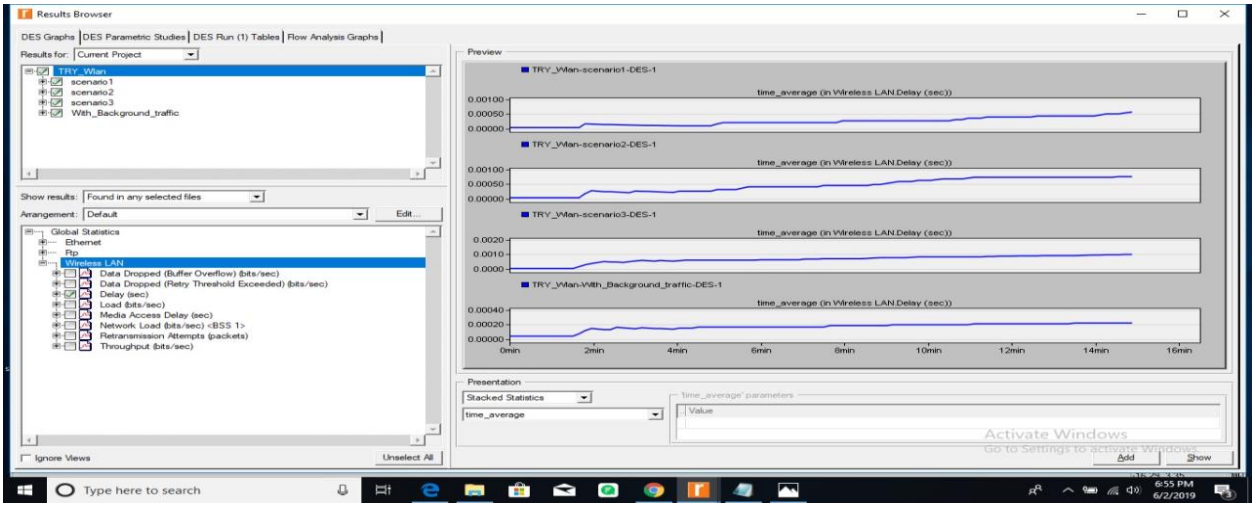
Represents the total number of bits (in bits/sec) forwarded from wireless LAN layers to higher layers in all WLAN nodes of the network.

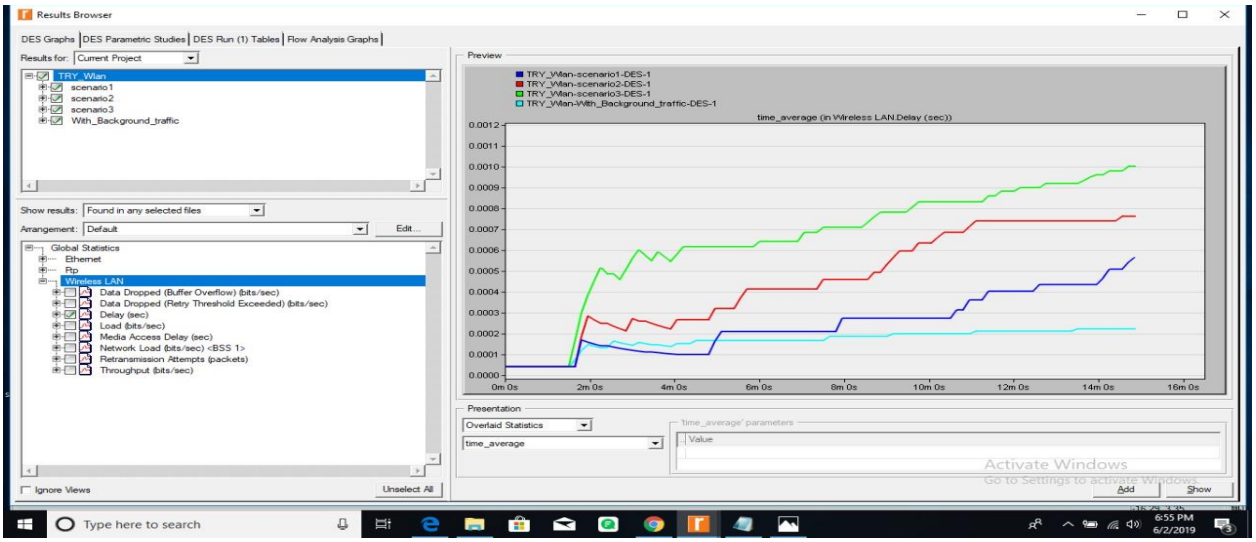


Delay:-

Represents the end to end delay of all the packets received by the wireless LAN MACs of all WLAN nodes in the network and forwarded to the higher layer.

This delay includes medium access delay at the source MAC, reception of all the fragments individually, and transfer of the frames via AP, if access point functionality is enabled.





If the number of stations connected to an access point increases then the channel acceptance decreases and hence the delay increases. The Simulation using riverbed clearly indicates the above phenomenon. Thus the delay for 15 stations with an access point was much observed than 10 and 5 stations.

Refrences:-

- V. Samuthira Pandi , G keerthana Manohari , S Indhu : Performance evaluation of WLAN :-Performance evaluation of WLAN -IEEE Conference Publication
- Junaid Anjum :- ***Lab 9: Wireless Local Area Networks - YouTube***