LAB 4 – Compare the performance of PCF and DCF

Objective: To familiarize you with Riverbed Modeler and to learn how Riverbed Modeler can be used to model and evaluate the performance of a small internetwork. The scenario in this lab has nine wireless LAN-based station nodes in a simple network configuration (infrastructured BSS) which demonstrates the PCF access method used by the Wireless LAN.

Along the way, you will learn to
- Build a network quickly
- Collect statistics about network performance
- Analyze these results

Instructions

Open Project

1. Download the project WLAN_KTH from the Social and extract it.
2. Start **Riverbed Modeler Academic Edition 17.5,** if it is not already open.
3. Select **File/Open.**
4. Select **WLAN_KTH** and click Open.
   a. The project will open with the scenario named **PCF_vs_DCF**.
5. Maximize the project by clicking on the **Maximize** button on the top right corner of the project editor. The workspace should be like the figure below.
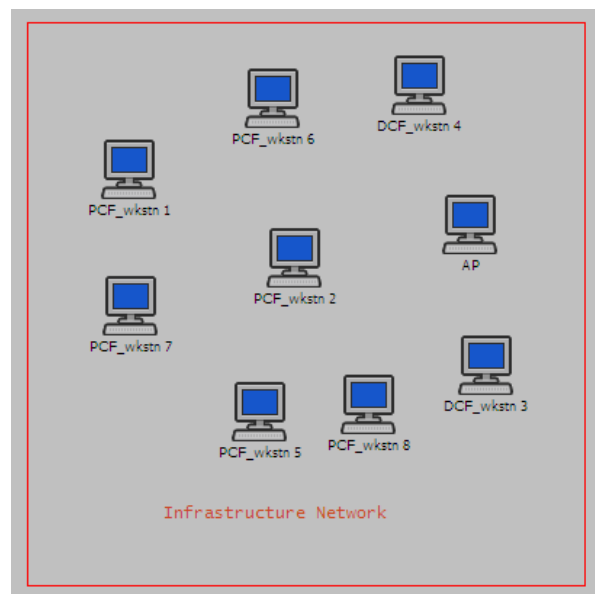
The figure shows eight workstations and an access point. PCF provides a contention-free (CF) frame transfer. The medium access during the CF is regulated by the Point Coordinator (PC) which resides in the access point (AP). Workstation 1,2,5,6,7 and 8 will use PCF and workstation 3 and 4 will use DCF. The workstation 3-8 and the Access point are already preconfigured. You will configure the workstation 1 and 2.

The traffic flows between the stations have been configured as,

          PCF_wkstn   1 <--------> PCF_wkstn   2
          DCF_wkstn   3 <--------> DCF_wkstn   4
          PCF_wkstn   5 <--------> PCF_wkstn   6
          PCF_wkstn   7 <--------> PCF_wkstn   8

Configure the wireless nodes

1. Right-click on the **PCF_wkstn 1** => **Edit Attributes** => Assign to the **Destination Address** attribute the number **2** (e.g. address of the PCF_wkstn 2).
   The following figure shows the values assigned to the **Destination Address** attributes for PCF_wkstn 1.
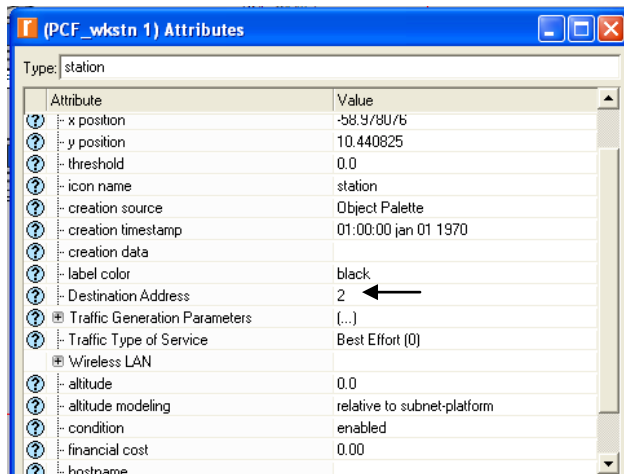
Traffic Generation Parameters

2. Double click on the **Value** of **Traffic Generation Arguments.**
3. Edit the attributes to match the values shown in the following figure

4. Expand the hierarchies of the **Packet Generation Arguments** attributes
5. Edit the attributes to match the values shown in the following figure and click **OK** twice.

Enabling PCF

6. Expand the hierarchy of the **Wireless LAN Parameters** attribute => Expand the hierarchy of the **PCF Parameters** attribute => **Enable** the **PCF Functionality** attribute => click **Ok**
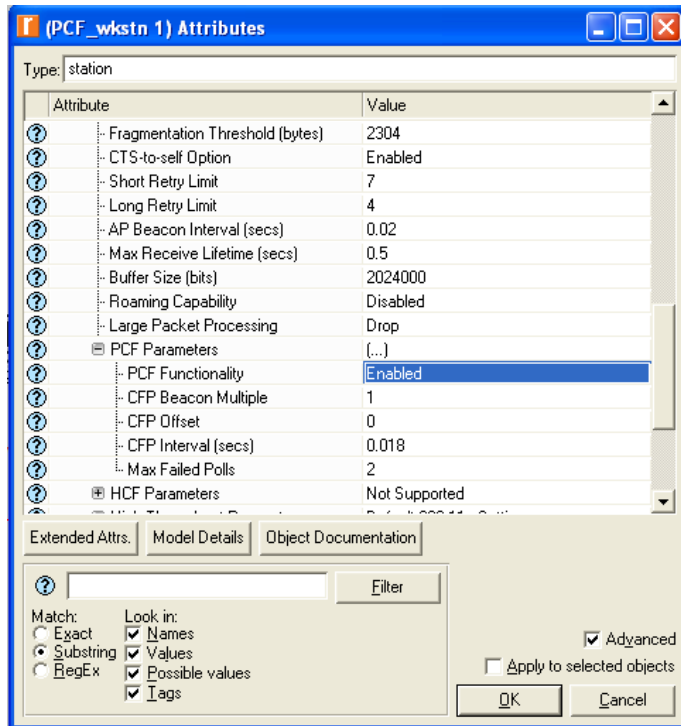

Configure PCF workstation 2

7. Make the above changes in step 1 to 6 on the PCF workstation 2. Notice that the destination address for PCF_wkstn2 is **1**.

Verify the access point configuration

8. The function as an access point must be enabled on the access point. Verify the function by Right-click on the **AP** => **Edit Attributes**.
9. Expand the **Wireless Lan/Wireless LAN Parameters** attribute and verify that the **Access Point Functionality** is **Enabled.** See the figure on the next page.
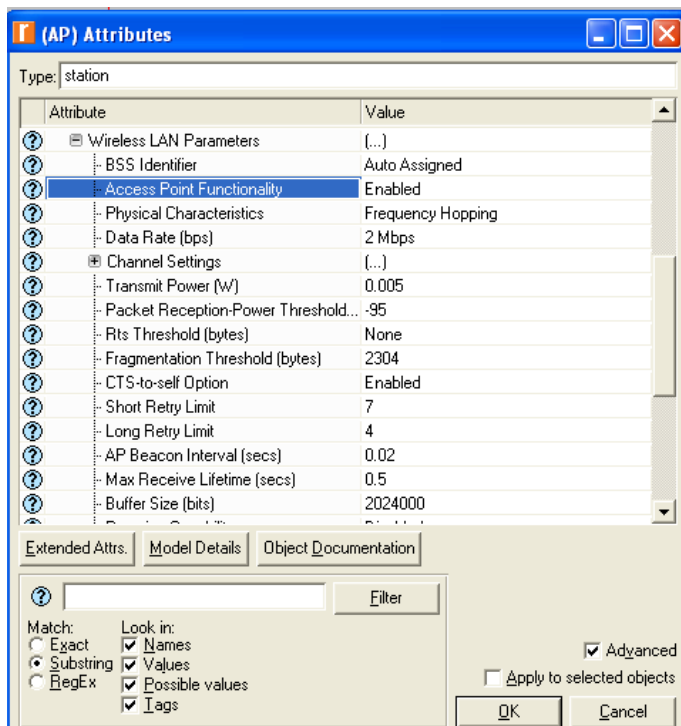
10. Click **Ok** to close the window.

Choose the Statistics

To test the performance of the network in our DCF and PCF scenario, we will collect some of the available statistics as follows:

11. Right-click anywhere in the project workspace and select **Choose Individual DES Statistics** from the pop-up menu.
12. In the **Choose Results** dialog box, Expand the **Global Statistics** and **Node Statistics** hierarchies => choose the following statistics as shown in the figures below.
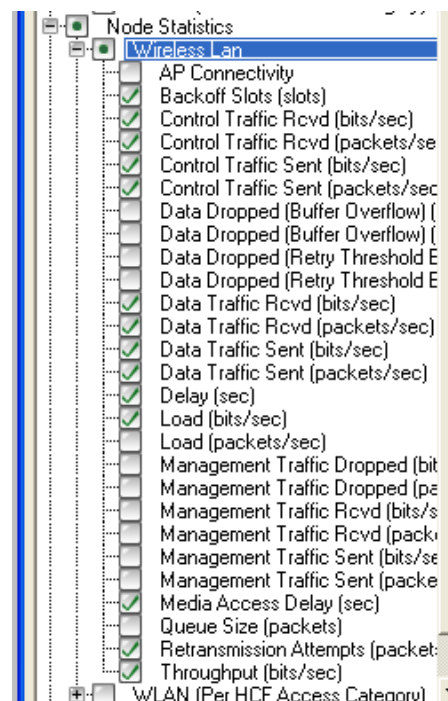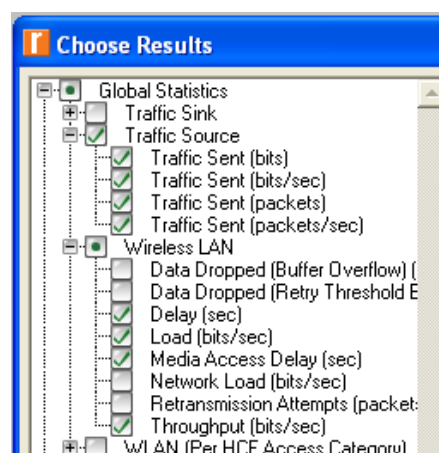

13. Click **OK** and then save you project

Run simulation

14. Click on the **Configure/Run Discrete Event Simulation(DES)** button.
15. Verify that the **Simulation Duration** is set to **1 minute** and then click the **Run** button.
16. When the simulation completes click on the **Close** button.

View Results

17. Click on the Hide/Show Graph Panels icon to open the Saved Template.
18. Click on **DES/Panel Operations/Panel Templates/Load with Latest Results**
19. The resulting graphs should resemble the following ones.
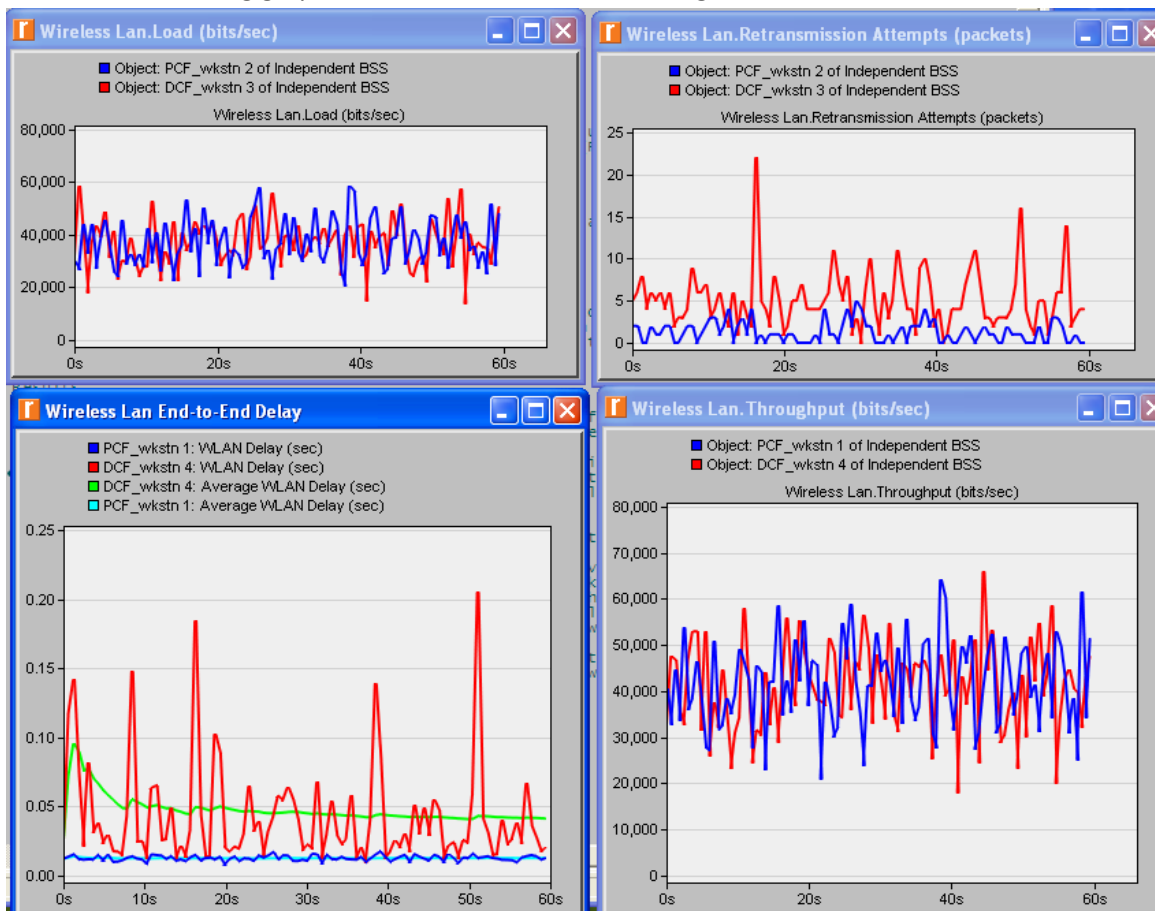
Exercises

While studying the results, we focus on the traffic flowing from PCF-2 to PCF-1 and from DCF-3 to DCF-4

- Analyze the Load and Retransmission graph. Can you make some conclusion of why where is much less number of retransmission from one of the workstation?
- Third graph compares the end-to-end WLAN delays measured at the stations PCF-1 and DCF-4.Can you explain why there is a difference between the workstations? The workstation which has a less variation in the delay values of the received packets, what kind of benefits could this lead to?
- At the final graph, we can see that the throughputs measured at both destinations are quite same. The third graph show different delays but we still have almost the same throughput, how can this be?
- Analyze the Delay and throughput. What is the effect of utilizing PCF?