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Wireless Local Area Network (WLAN)

1. Introduction

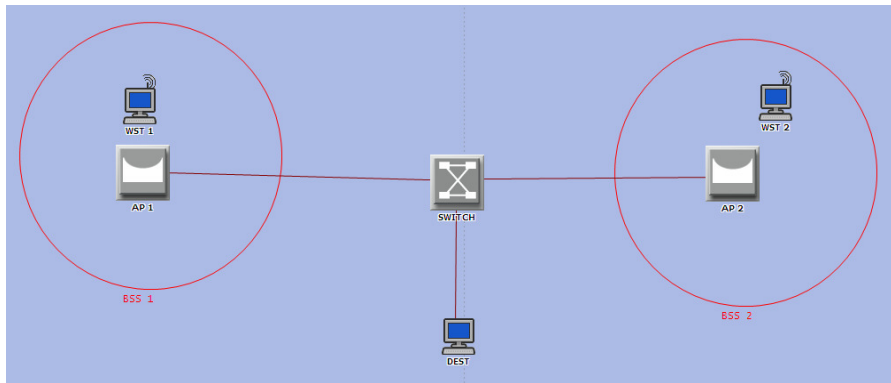
Infrastructure networks are distinguished from the ad hoc networks by the use of an access point. Access points are used for all communications in infrastructure networks, including communication between mobile nodes in the same service area. If one mobile station in an infrastructure BSS needs to communicate with a second mobile station, the communication must take two hops. First, the originating mobile station transfers the frame to the access point. Second, the access point transfers the frame to the destination station. With all communications relayed through an access point, the basic service area corresponding to an infrastructure BSS is defined by the points in which transmissions from the access point can be received. Although the multihop transmission takes more transmission capacity than a directed frame from the sender to the receiver, it has two major advantages:

- An infrastructure BSS is defined by the distance from the access point. All mobile stations are required to be within reach of the access point, but no restriction is placed on the distance between mobile stations themselves. Allowing direct communication between mobile stations would save transmission capacity but at the cost of increased physical layer complexity because mobile stations would need to maintain neighbor relationships with all other mobile stations within the service area.
- Access points in infrastructure networks are in a position to assist with stations attempting to save power. Access points can note when a station enters a power-saving mode and buffer frames for it. Battery-operated stations can turn the wireless transceiver off and power it up only to transmit and retrieve buffered frames from the access point.

In an infrastructure network, stations must associate with an access point to obtain network services. Association is the process by which a mobile station joins an 802.11 network; it is logically equivalent to plugging in the network cable on an Ethernet. It is not a symmetric process. Mobile stations always initiate the association process, and access points may choose to grant or deny access based on the contents of an association request. Associations are also exclusive on the part of the mobile station: a mobile station can be associated with only one access point. Considerations may, of course, limit the number of mobile stations an access point may serve. In practice, however, the relatively low throughput of wireless networks is far more likely to limit the number of stations placed on a wireless network.

2. Network scenario

The base network is composed by two BSSs (BSS 1 and BSS2) and an ethernet backbone. Each BSS is composed by one wireless mobile station and one Access Point. The backbone is composed by one switch (SWITCH) and a fixed station (DEST). The traffic flow is a unidirectional traffic between wireless mobile stations and fixed wired station.



3.Objectives

The objective of this lesson is to study the behaviour of the network when some important parameters are changed:

- Number of stations
- Traffic flows
- Mobility
- Transmitted Power from an AP.
- Roaming Capability of the mobile stations.

4.Getting Started

1.Create a project (see *Basics of OPNET* document)

1.1. A Campus scenario

2.Create an Object Palette (see *Basics of OPNET* document) with the following elements:

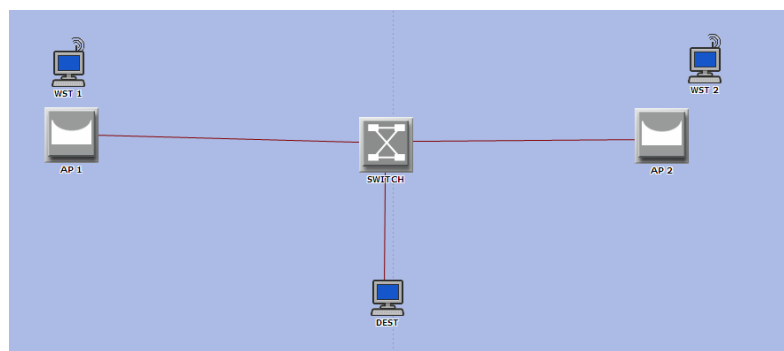
- Node models:
 - o ethernet16_switch
 - o Ethernet_station
 - o wlan_eth_bridge
 - o wlan_station_adv
- Link models:
 - o 100 Base T

3.Create a Network

3.1. Build a network

3.1.1. Drag the node models according to the network scenario presented in the following figure.

3.1.2. Name the objects with the names presented in the figure. Right-click on the object and select **Set Name**

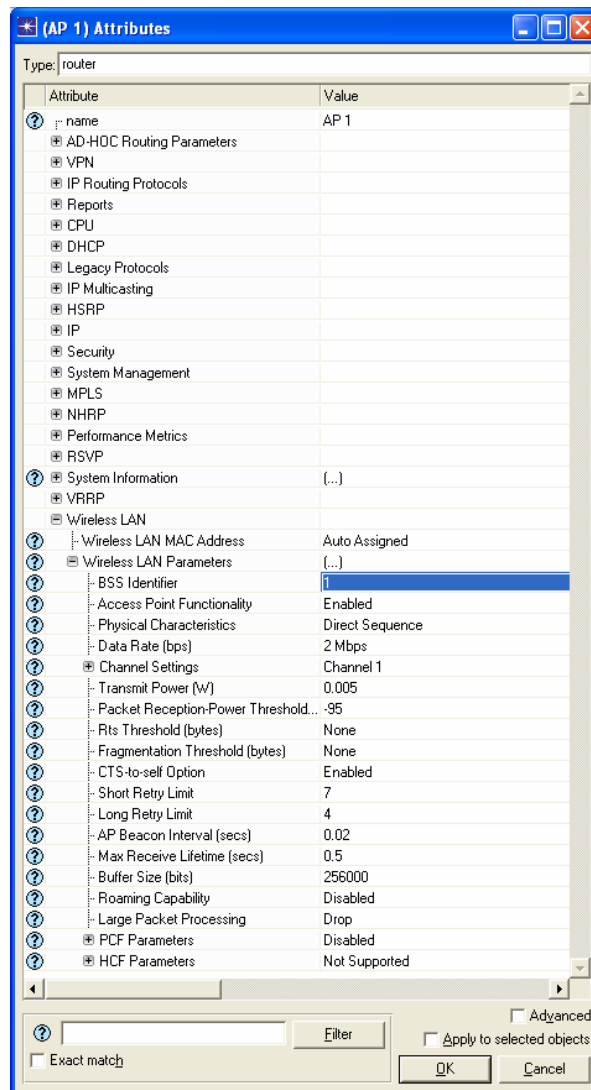


3.2. To Configure the network objects Follow these steps

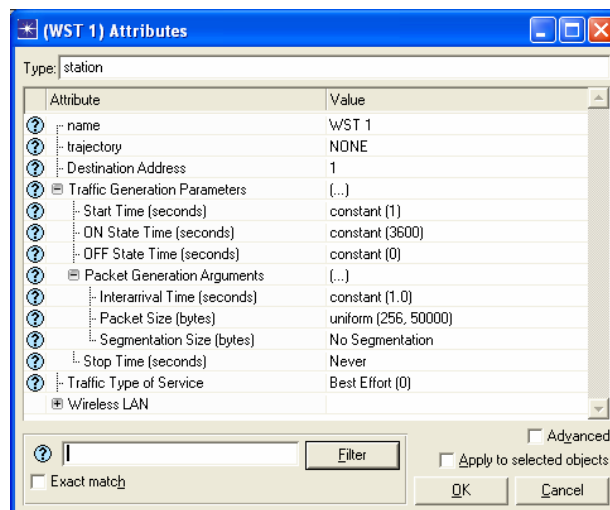
3.2.1. Configuring the BSS1.

Select the AP1, right-click on it and select **Edit Attributes**.

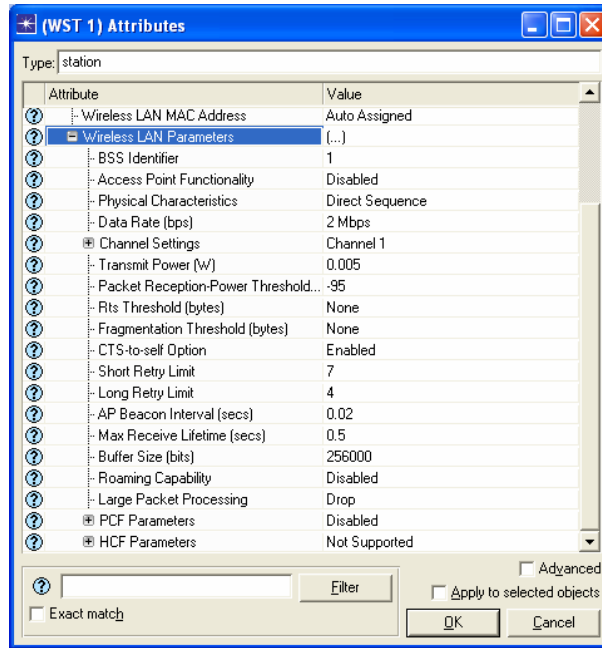
Set the BSS Identifier parameter equal to 1. Change the Data rate to 2 Mbps and choose channel 1.



Select the WST1, right-click on it and select **Edit Attributes**.
 Set the **Destination Address** parameter equal to 1.
 Set the **Traffic Generation Parameters** according to the following figure.



Set the BSS Identifier parameter equal to 1. Change the Data rate to 2 Mbps and choose channel 1.



3.2.2. Configuring the BSS2.

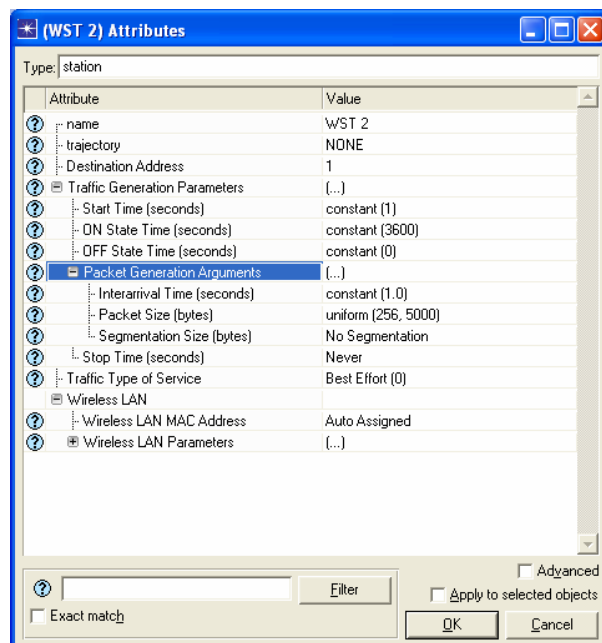
Select the AP2, right-click on it and select **Edit Attributes**.

Set the BSS Identifier parameter equal to 2. Change the Data rate to 2 Mbps and choose channel 2.

Select the WST2, right-click on it and select **Edit Attributes**.

Set the **Destination Address** parameter equal to 1.

Set the **Traffic generation Parameters** station parameters according to the following figure.

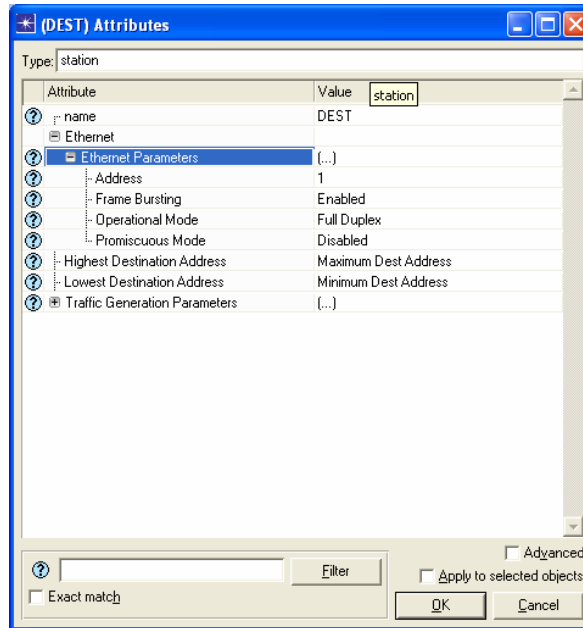


Set the BSS Identifier parameter equal to 2. Change the Data rate to 2 Mbps and choose channel 2.

3.2.3. Configuring the DEST station.

Select the DEST, right-click on it and select **Edit Attributes**.

Set the **Address** parameter equal to 1.

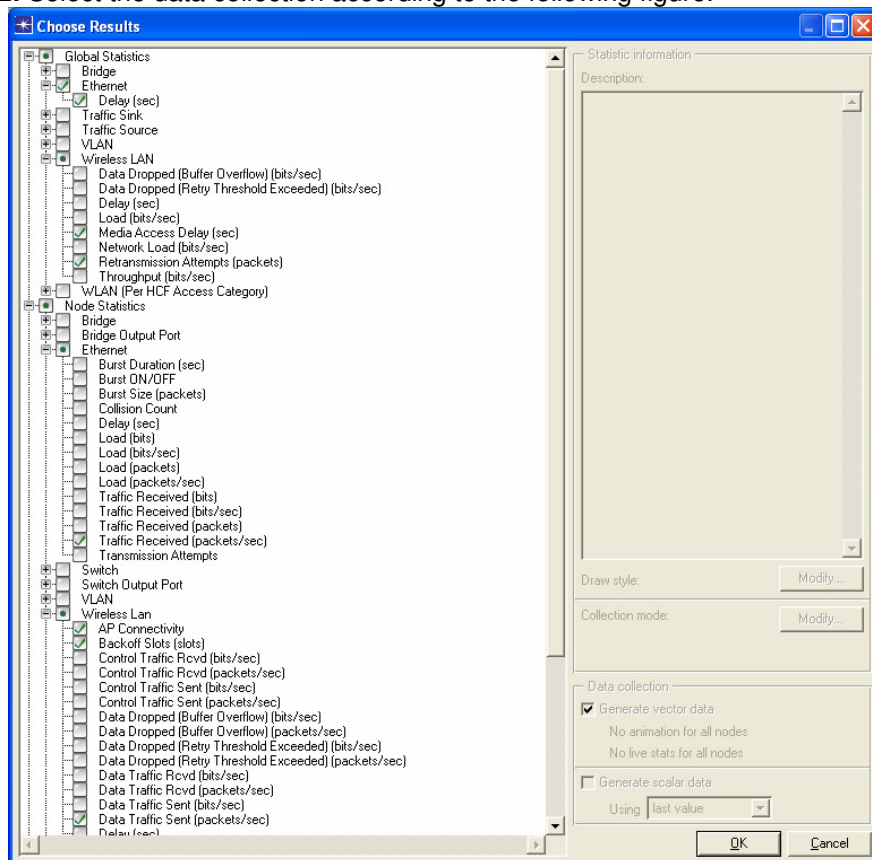


4. Collecting Statistics

4.1. Global Statistics

4.1.1. Right-click in the workspace (but not on an object) and select **Choose Individual DES Statistics** from the Workspace pop-up menu.

4.1.2. Select the data collection according to the following figure.

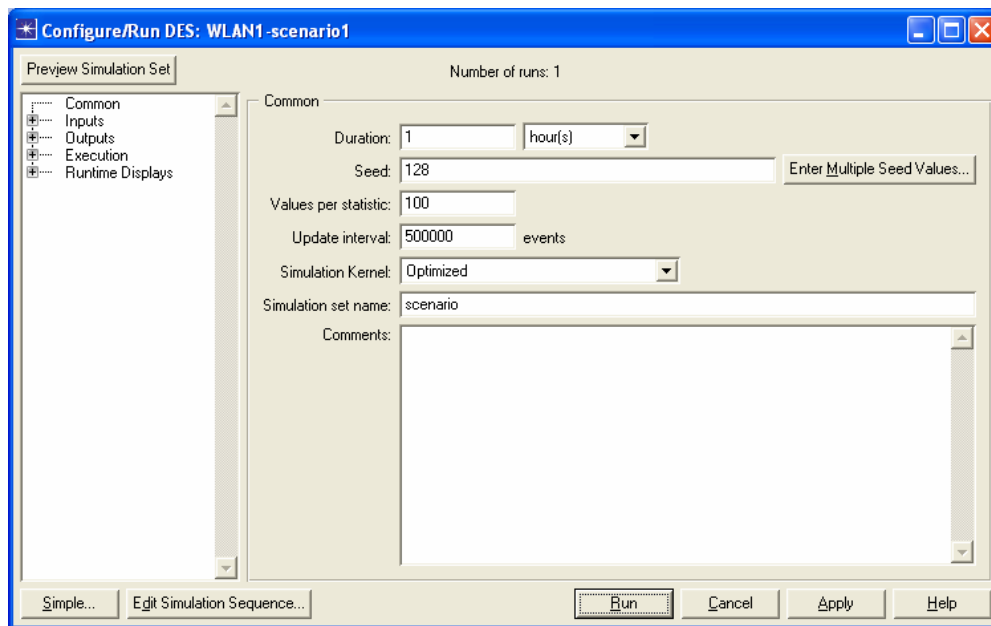


5. Run Simulation

1. Run a simulation

1.1. Select DES > Configure/Run Discrete Event Simulation....

- 1.2. Type **1** in the **Duration:** field to simulate 1 hour of network activity.
- 1.3. Type **10000** (events) in the **Update interval:** field to specify how often the simulation calculates events/second data. In this case, the simulation calculates and displays events/second data at 10,000-event intervals. The default setting for this is 500,000 for larger network simulations.
- 1.4. Set the Simulation Kernel to **Optimized**. You can use one of two types of kernels to run your simulation. The development kernel collects simulation data you can use to debug your models, but the optimized kernel runs faster.
- 1.5. Click the **Run** button to begin the simulation. While the simulation runs, a dialog box appears showing the simulation's progress.



6. Define a trajectory

1. Define a trajectory (see *Basics of OPNET* document)

