

# Lab1 WLAN OPNET introduction

## Objectives:

- Introduction to IT GURU and how can it model Wireless Networks.
- How to build and analyze wireless network models.
- How to collect Statistics about wireless network performance.

## Download OPNET IT

- 1- Go to [http://www.opnet.com/university\\_program/itguru\\_academic\\_edition/](http://www.opnet.com/university_program/itguru_academic_edition/)
- 2- Make an account as a student.
- 3- Through your email account you will have an access to download OPNET IT Guru Academic Addition.
- 4- After installation make sure to **run as administrator** and every time you launch the program as the student version have issues otherwise.
- 5- After installation follow the instructions to get your version licensed ( needs internet connection)

## Introduction

### Basic Definitions:

#### Stations:

- All components that can connect into a wireless medium in a network are referred to as stations.
- All stations are equipped with wireless network interface cards (WNICs).
- Wireless stations fall into one of two categories:
  1. Access points, and
  2. Clients.
- Access points (APs), normally routers, are base stations for the wireless network. They transmit and receive radio frequencies for wireless enabled devices to communicate with.
- Wireless clients can be mobile devices such as laptops, personal digital assistants, IP phones, or fixed devices such as desktops and workstations that are equipped with a wireless network interface.

#### Basic service set (BSS):

- The basic service set (BSS) is a set of all stations that can communicate with each other.

- There are two types of BSS:
  1. Independent BSS (also referred to as IBSS), and
  2. Infrastructure BSS.
- Every BSS has an identification (ID) called the BSSID, which is the MAC address of the access point servicing the BSS.
- An independent BSS (IBSS) is an ad-hoc network that contains no access points, which means they cannot connect to any other basic service set.
- An infrastructure can communicate with other stations not in the same basic service set by communicating through access points.

## Lab steps

### Building an Independent BSS Wireless Network

In this lab, you are going to plan for the expansion of a small wireless Independent BSS network.

#### *Simulation Steps:*

1. Run OPNET as administrator
2. Choose File->new project , new scenario
3. Click next till you reach "Model Family" then Select "wireless\_lan" and "wireless\_lan\_adv" and make them yes.
4. From Menu: Topology » Rapid Configuration » Select Configuration: Unconnected Net
  - » Select Node Model: wlan\_station\_adv
  - » Select Node Type: Fixed
  - » Set Number: 10
5. Traffic settings for stations
  - » Right-click on any station, and select similar nodes
  - » Select: "Edit Attributes" of any node.
  - » Expand the attribute: Traffic Generation Parameters setting the parameters as follow:
    - Start time » constant (5)
    - On state » exponential (100)
    - Off state » exp (1)
    - Interarrival time » exp (0.01)
    - Packet size » exp (1024)
  - » Setting the Wireless LAN parameters » Data Rate » 1 Mbps

- >> don't forget to check **Apply to all selected objects.**
6. Observe statistics
    - » Right-click on an empty space on the scenario
    - » Select: Choose Individual DES Statistics and select the follows:
      - » Traffic Sink (packets/ sec)
      - » Traffic Source (packets/ sec)
      - » Wireless LAN » Data dropped and Delay
  7. Run simulation
    - » from DES -> Click the configure/run simulation button
    - » Make sure that the simulation Duration is 3 minutes
    - » Click Run
  8. View results
    - From DES » Open Results » View Results
    - » Set the Graph view to "time average" instead of "AS IS"
    - » Click the hide or show all graphs button to hide the graphs
  9. Duplicate Scenario
    - » Menu: Scenarios » Duplicate Scenario
    - » Type: Data\_rate
  10. Follow step (2) to change the Data Rate of all 10 stations to be 9 Mbps
  11. Compare results: » Open Results » compare results.

Note: there are information about every statistic used in results, it appears if you just move the arrow on it, and you might find them very useful in answering these following questions.

## Requirements:

Deliver a report answering these points:

- 1- Compare between scenario 1 and scenario 2 in terms of data dropped due to buffer overflow, include the image in your report, and explain why these results appear.
- 2- Compare between scenario 1 and scenario 2 in terms of delay (sec), include the image in your report, and explain why these results appear.
- 3- Compare between scenario 1 and scenario 2 in terms of load (bit/sec) on the wireless layer by the upper layers, include the image in your report, and explain why these results appear.

- 4- Compare between scenario 1 and scenario 2 in terms of throughput (bit/sec), include the image in your report, and explain why these results appear.
- 5- Summarize the effect of changing the wireless LAN transmitting rate.