Practical No-1

Aim :- Understanding the Sensor Node Hardware. (For Eg. Sensors, Nodes(Sensor mote),Base Station, Graphical User Interface.

Components

A wireless sensor network (WSN) is a hardware and software package that typicallyconsists of four parts (see Figure 1):

1. *'Sensors'* connected to each node by a wired connection. In our case, we use sensors that can measure soil moisture, electrical conductivity, soil temperature, water pressure, flow rate, or a range of weather variables (light,air temperature, wind, humidity, etc.).

Figure 2. One of many sensors that can be connected to a node, this EC--5 sensor (Decagon Devices, Inc. Pullman, WA) measures volumetric water content(soil moisture).

2. 'Nodes' collect the data from sensors and transmit that to a 'base station'
   computer using a one-way (in the case of monitoring) or two--way (in the case of monitoring and control) radio. Nodes can simply monitor environmental andsoil conditions or can be used to make control decisions. For example, some nodes have the capability to control an electric valve, such as an irrigation valve.

Relay switch, used to control irrigation valve(s), is located here.

Figure 3. This nR5 (Decagon Devices, Inc. Pullman, WA) node is powered off of 5- AA batteries and is connected to 5 soil moisture sensors via stereo ports. The nR5node is also capable of controlling irrigation valve(s), based on user--defined settings.

3. 'Base Station' computer connects the system to the internet, so that data collected by the nodes, then transmitted to the base station computer, can beviewed anywhere an internet connection is available.

4. *'Graphical User Interface'* is the web--based software package, that allows the data collected by sensors to be viewed. The software is also used to set irrigation parameters.

Figure 4. The graphical user interface above depicts the volumetric water content (soilmoisture) as horizontal lines and irrigation events and amounts as bars. Notice the increase in soil moisture after each irrigation event.

Not every WSN will have all four components, but to get optimal functionality thesystems developed as part of this project do.

A very simple WSN example that many can relate to is that of the wireless environmental monitoring system used by the National Weather Service (NWS). You have probably seen these at a local airport or school. In this case, sensors measure environmental conditions and send this data to a node that wirelessly transmits the datausing a cell signal or wireless signal to a base--station computer where NWS employees(and you) can view the current temperature (or rainfall/dew point, wind, etc.) via awebsite or application (‘app’).

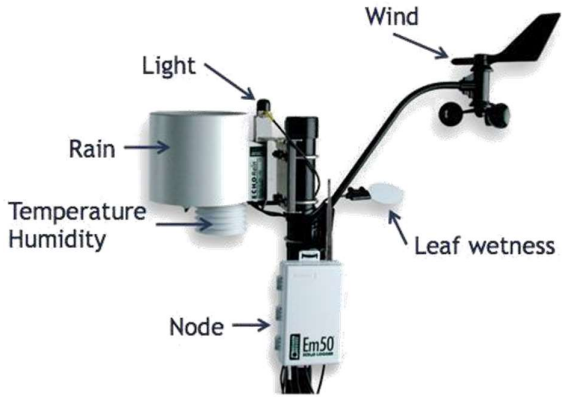


Figure 5. Typical environmental monitoring sensors that you would see at a NationalWeather Service (NWS) monitoring station. These same components can be used ina wireless sensor network by a specialty crop producer.

Practical No – 2

Aim:- Using Packet Tracer, create a wireless network of multiple PCs using appropriate accesspoint.

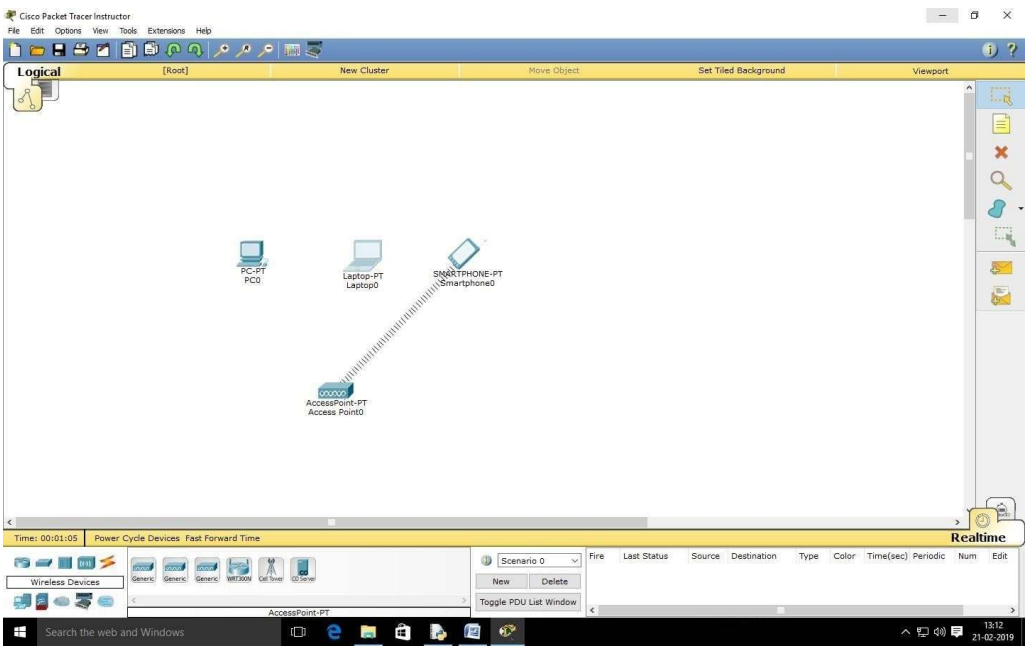
Steps:

Step 1: From the left corner of bottom toolbar select **'Selection On Left Most Panel in Bottom Toolbar'** and then from the right hand side panel select **'Selection On Adjacent Panel'** drag and drop devices on Canvas. Refer table below

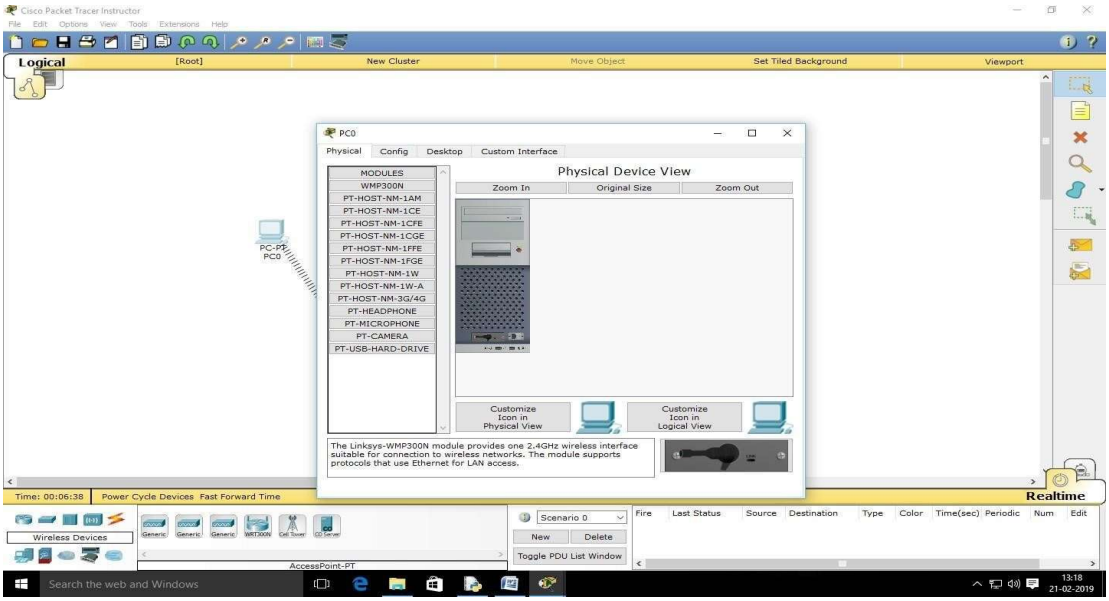
Selection On Left MostPanel in Bottom Toolbar	Selection On Adjacent Panel	Device ID
End Devices	PC-PT	PC0
End Devices	Laptop-PT	Laptop0
End Devices	SmartPhone-PT	SmartPhone0
Wireless Devices	AccessPoint-PT	AccessPoint0

Your Canvas should look as shown in figure below

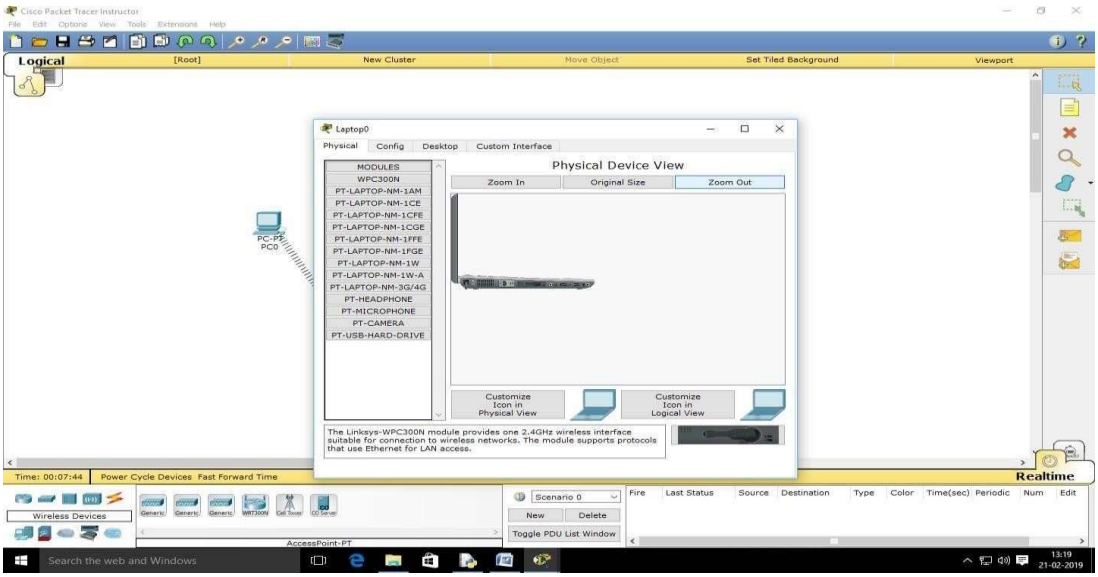
.



Step 2: Click on **PC0** in **Physical** tab view Physical view of CPU is shown. **Switch OFF** the CPU and then remove the **PT-HEADPHONE** module from CPU and then add **WMP300N** module to CPU and**Switch ON** the CPU.

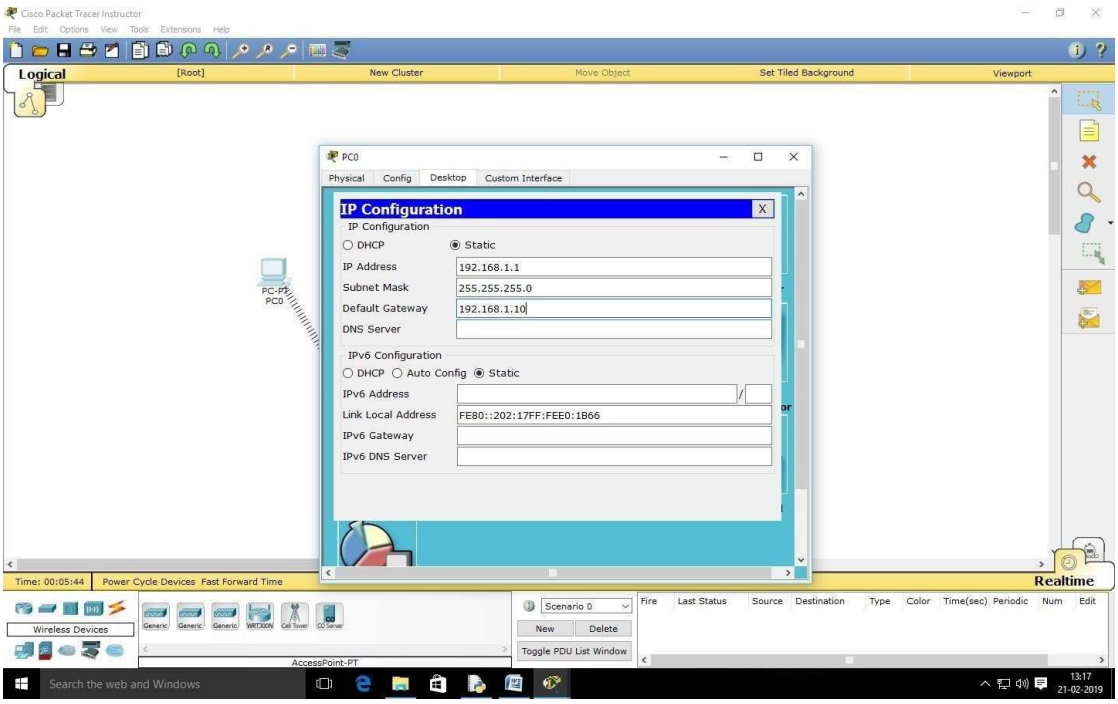


Step 3: Click on **Laptop0** in **Physical** tab view Physical view of Laptop is shown. **Switch OFF** theLaptop and then remove the **PT-HEADPHONE** module from Laptop and then add **WMP300N** module to Laptop and **Switch ON** the Laptop.

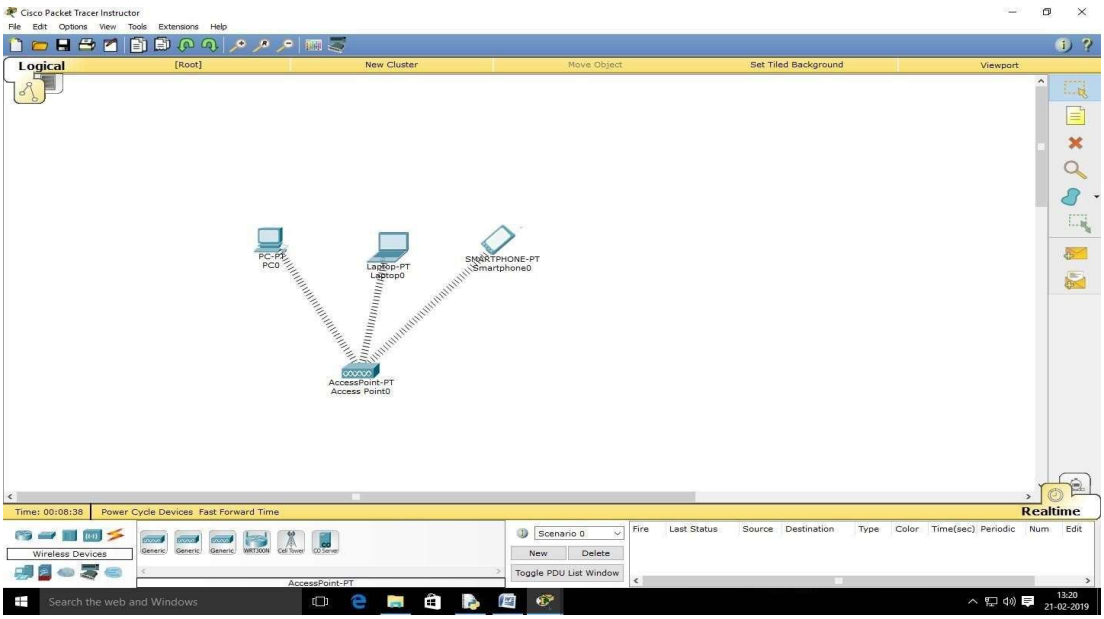


Step 4: Click on **PC0>>Desktop>>IP Configuration** a window as shown in figure should appear onyour screen. Assign IP Address, Subnet Mask, Default Gateway to PC0 and similarly for **Laptop0**.

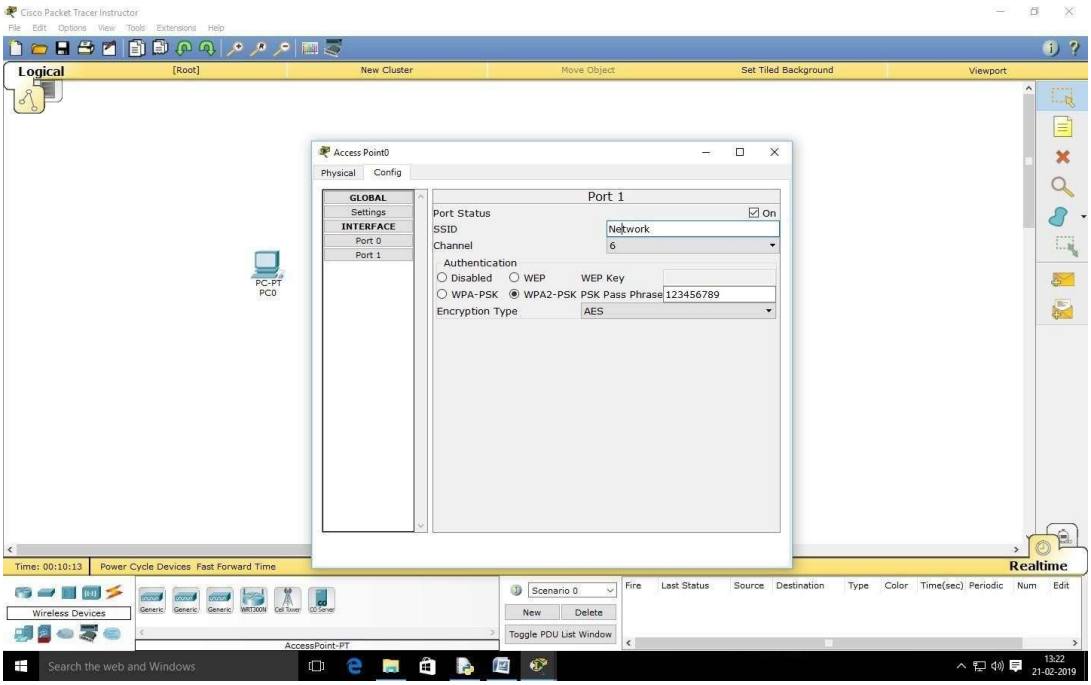
Device ID	IP Address	Subnet mask	Default Gateway
PC0	192.168.1.1	255.255.255.0	192.168.1.10
Laptop0	192.168.1.2	255.255.255.0	192.168.1.10



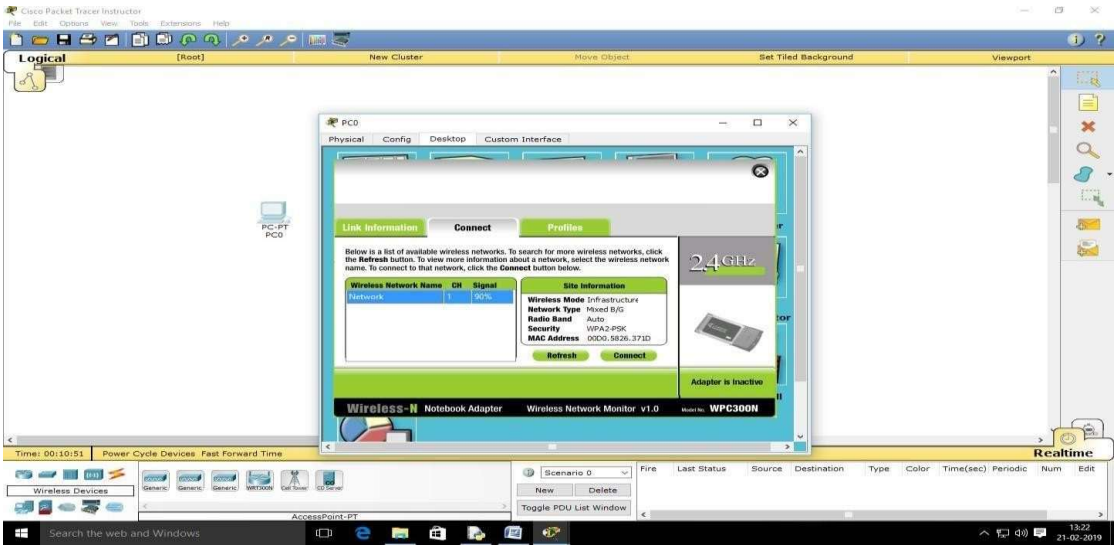
Step 5: After adding hardware module and setting IP Address **PC0** and **Laptop0** must have beenconnect to **AccessPoint0**. Your Canvas should be as shown in figure below



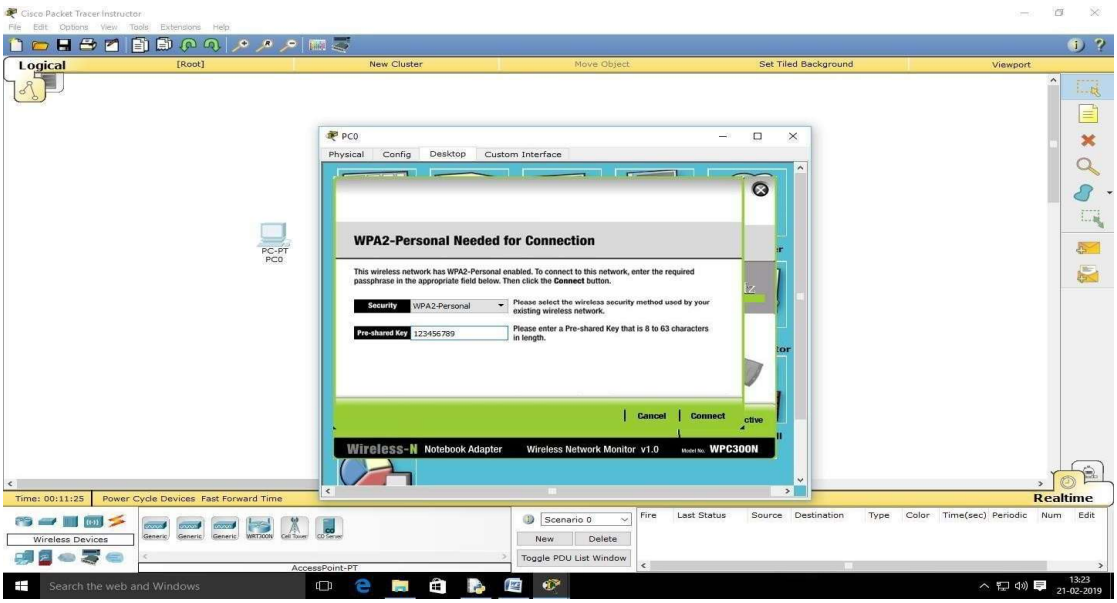
Step 6: Click On **AccessPoint0>>Config>>Port 1**. Assign **SSID=Network**, and in frame Authenticationselect **WPA2-PSK** assign **Pass Phrase** of your choice(e.g.123456789) to **AccessPoint0**.



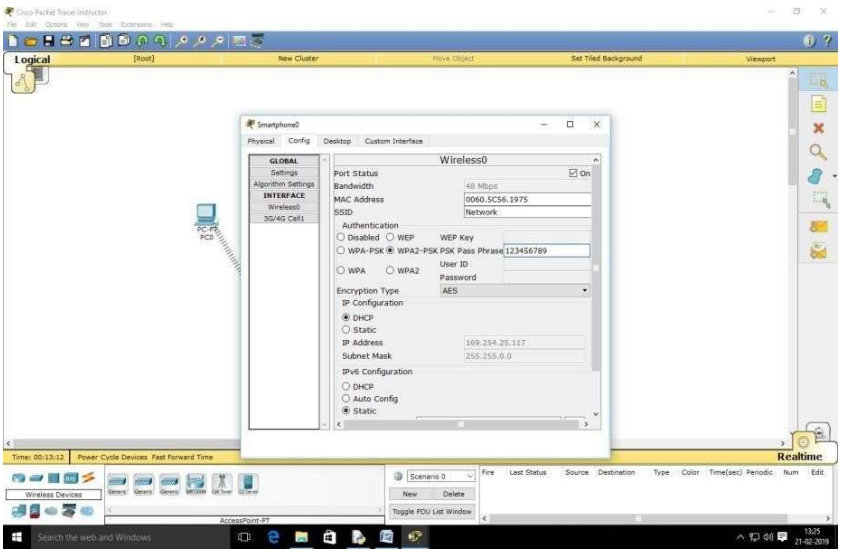
Step 7: Click On **PC0>>Desktop>>Wireless Connections** a window as shown in figure should appearon your screen. Click On **Connect>>Refresh. SSID** of **AccessPoint0** should appear in list of available connections. Click On **SSID** of **AccessPoint0** and then Click on **Connect.**



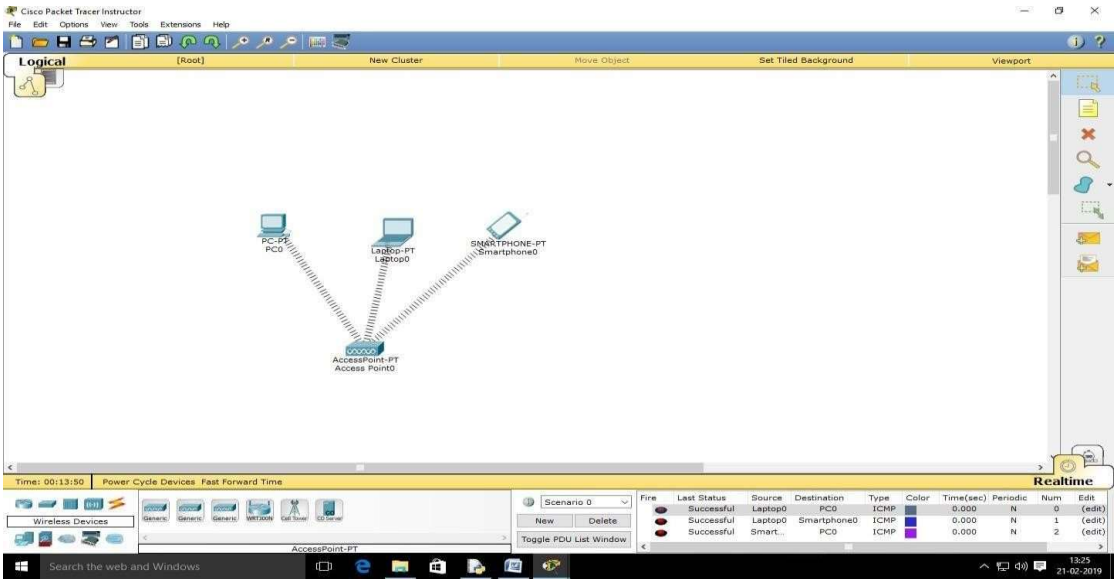
Step 8: After clicking on **Connect** a dialog box as shown in figure below will appear asking for **PassPhrase.** Enter the **Pass Phrase**(e.g. 123456789)and then Click On **Connect**. Similarly Connect **Laptop0** to **AccessPoint0**



Step 9: Click On **Smartphone0>>Config>>Wireless0** a window as shown in figure should appear onyour screen. Enter **SSID** of **AccessPoint0**(e.g. Network) and then in Authentication frame select **WPA2-PSK** and enter **Pass Phrase**(e.g. 123456789).



Step 10: Verify your network by sending messages from one PC to another. From Right hand side toolbar select **"Simple Empty PDU".** Drop PDU on one End Device and then on another End Device on Canvas. In PDU list window, if Last Status is shown as "**Successful**" then consider that your network is working properly.



Practical No – 3

Aim:- Create and simulate a simple ad hoc network

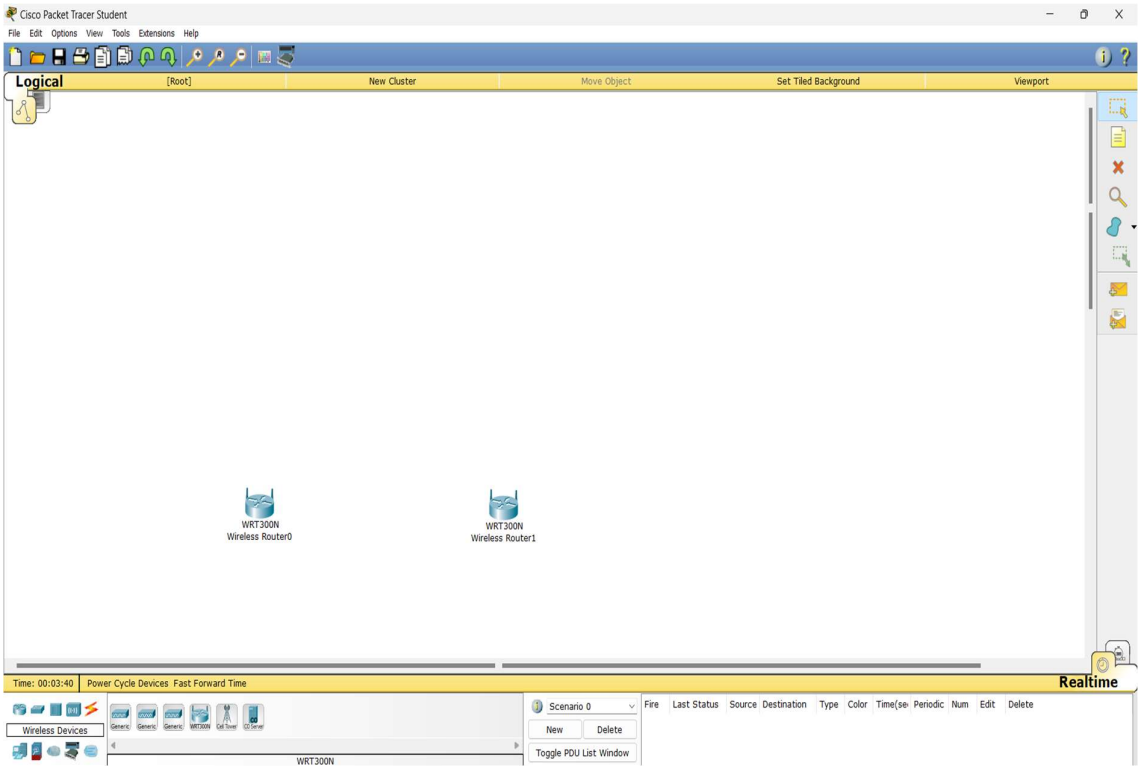
Modules: 1) 2 PC

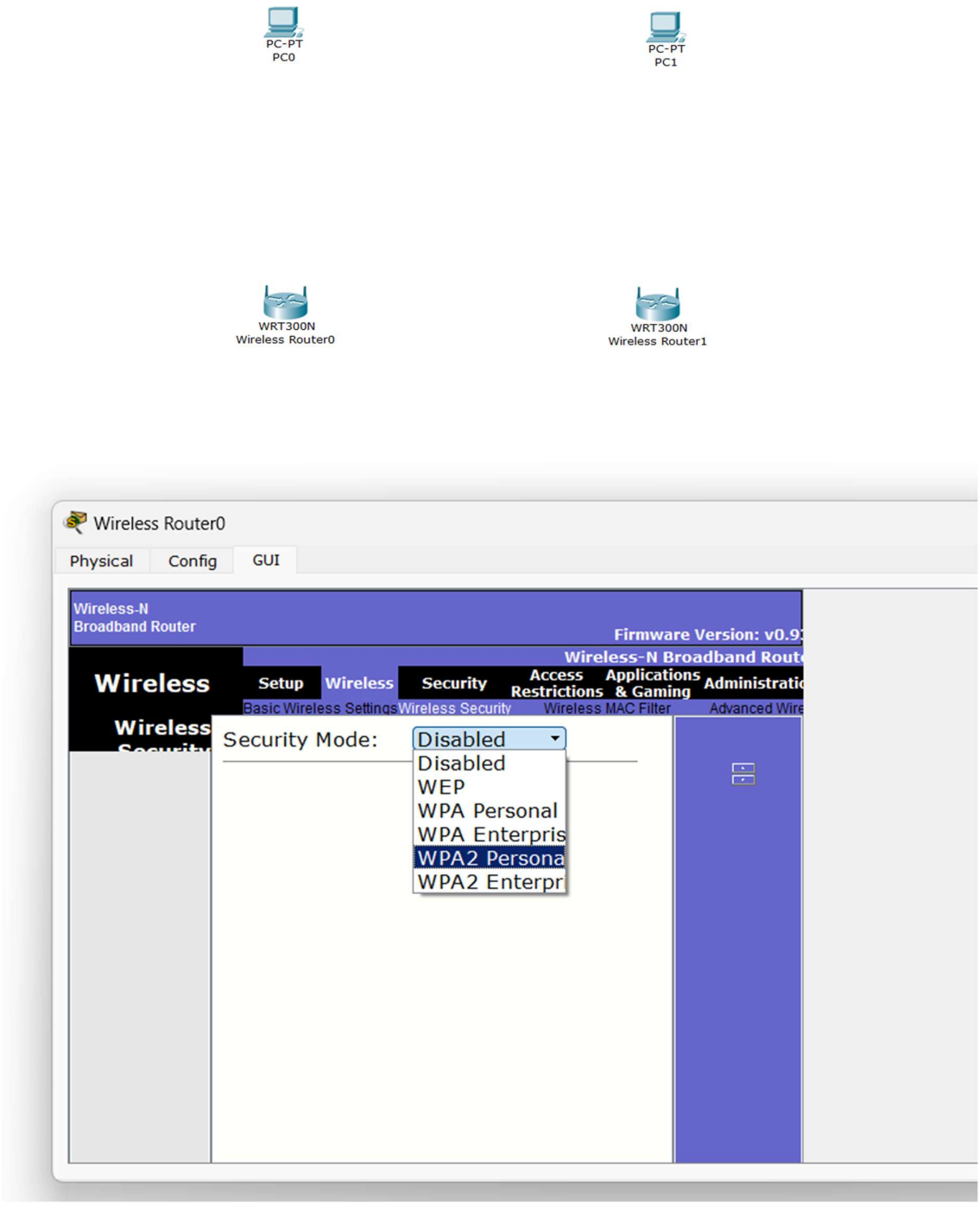
2) 2 Router

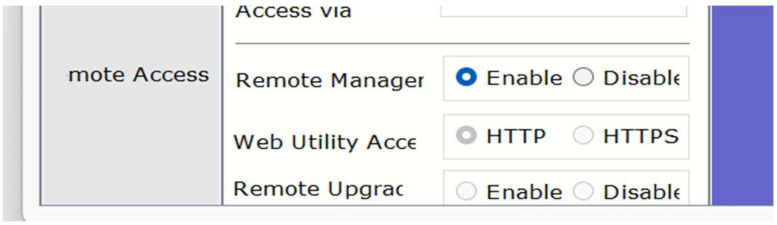
Background:

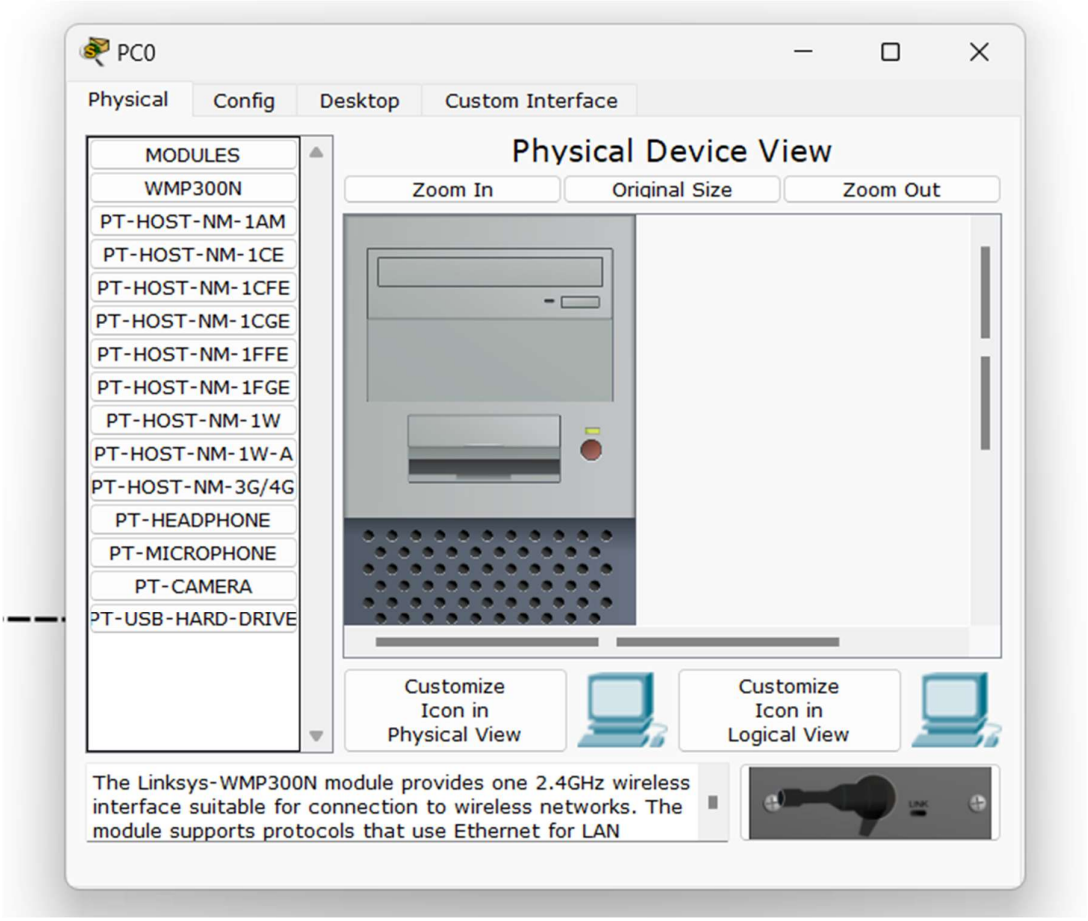
1. An ad hoc network is one that is spontaneously formed when devices connect and communicatewith each other. The term ad hoc is a Latin word that literally means "for this," implying improvised orimpromptu.

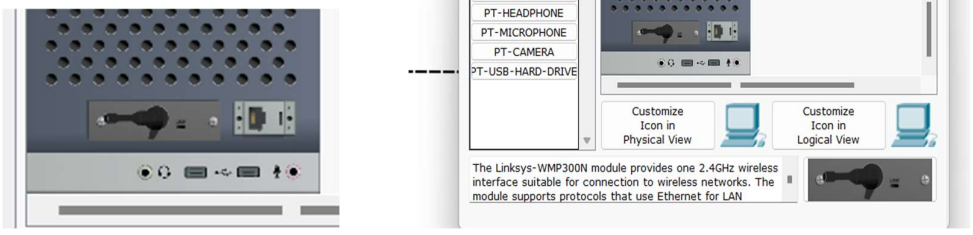
2. Ad hoc networks are mostly wireless local area networks (LANs). The devices communicate witheach other directly instead of relying on a base station or access points as in wireless LANs for data transfer co-ordination. Each device participates in routing activity, by determining the route using therouting algorithm and forwarding data to other devices via this route

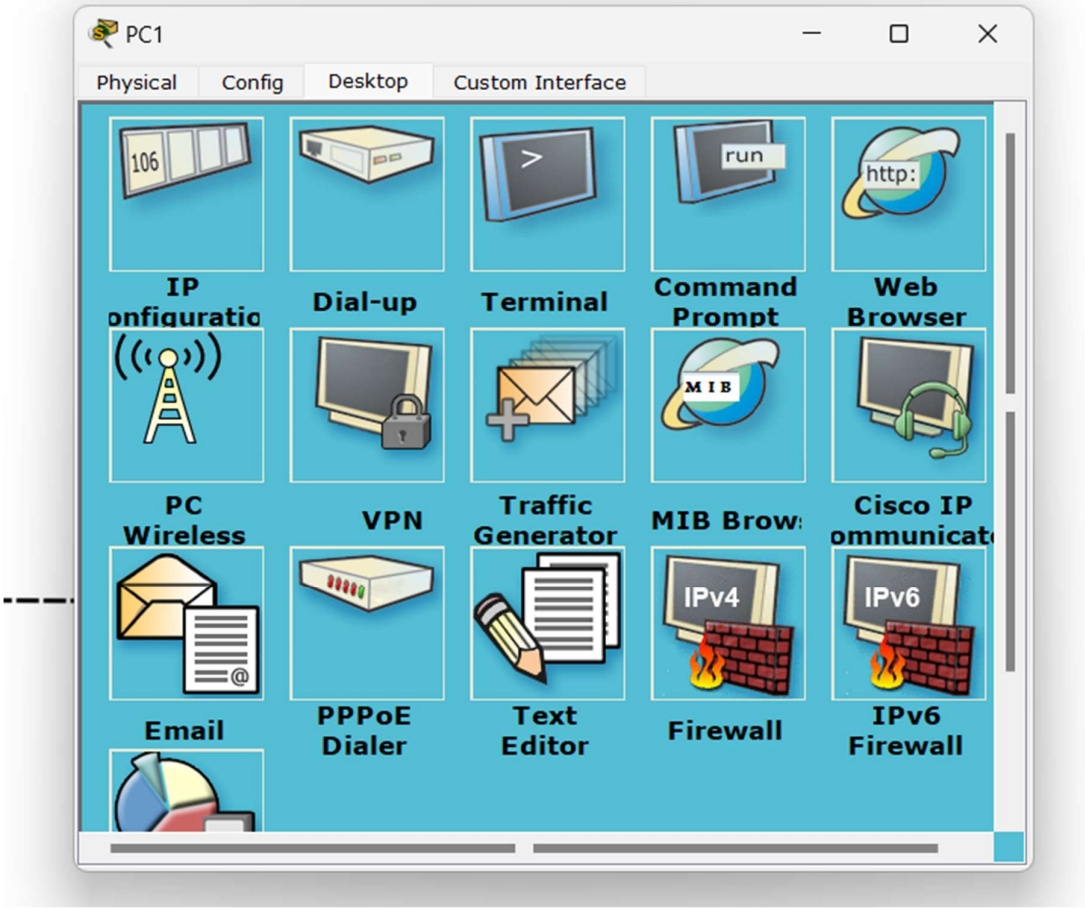


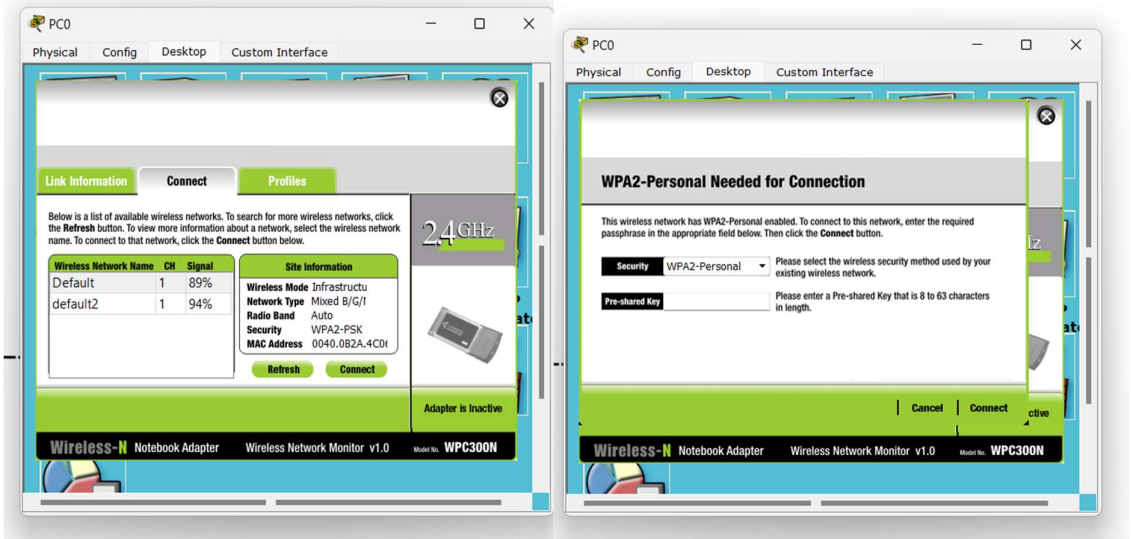

PC-PT
PC0
PC-PT
PC1
WRT300N
Wireless Router0
WRT300N
Wireless Router1
Wireless Router0
Physical
Config
GUI
Wireless-N
Broadband Router
Firmware Version: v0.9
Wireless-N Broadband Rout
Wireless
Setup
Wireless
Security
Access Restrictions
Applications & Gaming
Administrati
Basic Wireless Settings
Wireless Security
Wireless MAC Filter
Advanced Wire
Security Mode:
Disabled
Disabled
WEP
WPA Personal
WPA Enterpris
WPA2 Persona
WPA2 Enterpr

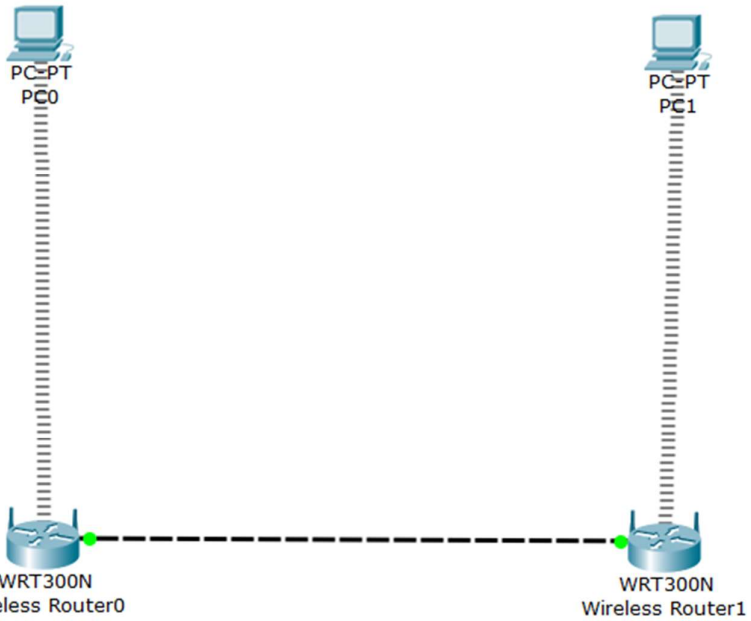

Access via
mote Access
Remote Manager
Enable
Disable
Web Utility Acce
HTTP
HTTPS
Remote Upgrac
Enable
Disable

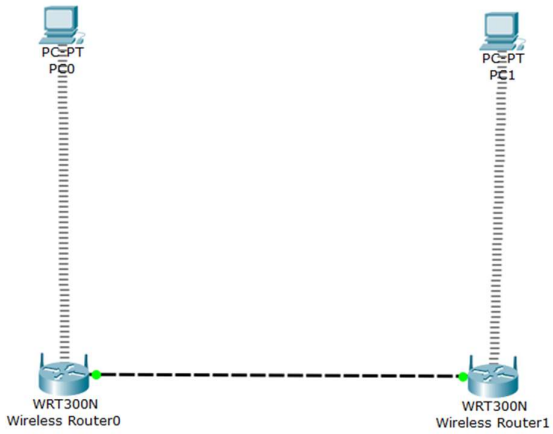

PC0
Physical
Config
Desktop
Custom Interface
MODULES
WMP300N
PT-HOST-NM-1AM
PT-HOST-NM-1CE
PT-HOST-NM-1CFE
PT-HOST-NM-1CGE
PT-HOST-NM-1FFE
PT-HOST-NM-1FGE
PT-HOST-NM-1W
PT-HOST-NM-1W-A
PT-HOST-NM-3G/4G
PT-HEADPHONE
PT-MICROPHONE
PT-CAMERA
PT-USB-HARD-DRIVE
Physical Device View
Zoom In
Original Size
Zoom Out
Customize Icon in Physical View
Customize Icon in Logical View
The Linksys-WMP300N module provides one 2.4GHz wireless interface suitable for connection to wireless networks. The module supports protocols that use Ethernet for LAN

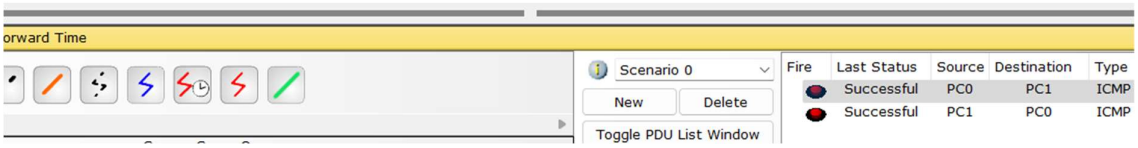

PC0
Physical
Config
Desktop
Custom Interface
MODULES
WMP300N
PT-HOST-NM-1AM
PT-HOST-NM-1CE
PT-HOST-NM-1CFE
PT-HOST-NM-1CGE
PT-HOST-NM-1FFE
PT-HOST-NM-1FGE
PT-HOST-NM-1W
PT-HOST-NM-1W-A
PT-HOST-NM-3G/4G
PT-HEADPHONE
PT-MICROPHONE
PT-CAMERA
PT-USB-HARD-DRIVE
Physical Device View
Zoom In
Original Size
Zoom Out
Customize Icon in Physical View
Customize Icon in Logical View
The Linksys-WMP300N module provides one 2.4GHz wireless interface suitable for connection to wireless networks. The module supports protocols that use Ethernet for LAN


PC1
Physical
Config
Desktop
Custom Interface
IP onfiguratio
Dial-up
Terminal
Command Prompt
Web Browser
PC Wireless
VPN
Traffic Generator
MIB Brow
Cisco IP ommunicat
Email
PPPoE Dialer
Text Editor
Firewall
IPv6 Firewall


PC0
Physical
Config
Desktop
Custom Interface
Link Information
Connect
Profiles
Below is a list of available wireless networks. To search for more wireless networks, click the Refresh button. To view more information about a network, select the wireless network name. To connect to that network, click the Connect button below.
Wireless Network Name
CH
Signal
Default
1
89%
default2
1
94%
Site Information
Wireless Mode Infrastructu
Network Type Mixed B/G/I
Radio Band Auto
Security WPA2-PSK
MAC Address 0040.0B2A.4C0(
Refresh
Connect
2.4GHz
Adapter is Inactive
Wireless-N Notebook Adapter
Wireless Network Monitor v1.0
Model No. WPC300N
PC0
Physical
Config
Desktop
Custom Interface
WPA2-Personal Needed for Connection
This wireless network has WPA2-Personal enabled. To connect to this network, enter the required passphrase in the appropriate field below. Then click the Connect button.
Security
WPA2-Personal
Please select the wireless security method used by your existing wireless network.
Pre-shared Key
Please enter a Pre-shared Key that is 8 to 63 characters in length.
Cancel
Connect
Wireless-N Notebook Adapter
Wireless Network Monitor v1.0
Model No. WPC300N


PC-PT
PC0
PC-PT
PC1
WRT300N
Wireless Router0
WRT300N
Wireless Router1


PC-PT
PC0
PC-PT
PC1
WRT300N
Wireless Router0
WRT300N
Wireless Router1


orward Time
Scenario 0
New
Delete
Toggle PDU List Window
Fire
Last Status
Source
Destination
Type
Successful
PC0
PC1
ICMP
Successful
PC1
PC0
ICMP