

Ex No: 11

Date:

IMPLEMENT A HOME OR SMALL BUSINESS NETWORK USING WIRELESS TECHNOLOGY AND FACILITATE WITH INTERNET

Aim:

The aim of this experiment is to **design and configure a home or small business network** using **wireless technology** (Wi-Fi) and provide **Internet connectivity**. The network will include a router, wireless access points (WAPs), and client devices (laptops, smartphones, etc.), ensuring secure wireless access and proper Internet connection through the router.

Theory:

1. Wireless Network Basics:

- **Wi-Fi** (Wireless Fidelity) enables wireless communication between devices on a Local Area Network (LAN).

A **Router** connects the local network to the **Internet** via an ISP (Internet Service Provider), providing both wired and wireless connectivity.

- **Wireless Access Points (WAPs)** extend the range of the wireless network, enabling connectivity over a larger area.

Internet Connection:

- 2. The router's **WAN (Wide Area Network)** interface connects to the **modem**, which in turn connects to the ISP, granting Internet access.

DHCP (Dynamic Host Configuration Protocol) assigns dynamic IP addresses to all devices on the local network.

- **Network Security:**

WPA2 or **WPA3 encryption** secures the wireless network and prevents unauthorized access.

- 3. A **SSID (Service Set Identifier)** is used to identify the wireless network. It is important to use a unique SSID and a secure password to prevent unauthorized connections.

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Procedure:

1. Set up Devices in Cisco Packet Tracer:

- Open **Cisco Packet Tracer** and place the following devices in the workspace:

- **Router** (e.g., 2901 Router)

- **Wireless Access Point (WAP)**

- **Switch** (optional for wired devices)
- **Wireless Devices** (laptops, smartphones, etc.)
- **Modem** (connected to the router for Internet access)

2. Configure the Router:

- Select the router and enter **CLI (Command Line Interface)** mode to configure it.

LAN Configuration:

- Configure the **LAN interface** of the router to assign an IP range for the local network. Use the following commands in CLI:
 - Router(config)# interface gigabitethernet0/0
 - Router(config-if)# ip address 192.168.1.1 255.255.255.0
 - Router(config-if)# no shutdown
 - This assigns the IP address 192.168.1.1 to the LAN interface of the router.

WAN Configuration:

- Configure the **WAN interface** to connect the router to the Internet (via the modem):
- Router(config)# interface gigabitethernet0/1
- Router(config-if)# ip address <ISP_Provided_IP> 255.255.255.0
- Router(config-if)# no shutdown

(Replace <ISP_Provided_IP> with the actual IP provided by the ISP.)

NAT (Network Address Translation) :

- Enable **NAT** to allow devices on the local network to access the Internet.
- Router(config)# ip nat inside source list 1 interface gigabitethernet0/1 overload

3. Configure the Wireless Access Point (WAP):

- Place a **Wireless Access Point (WAP)** in the workspace, and connect it to the router or switch.
- Go to the **Config** tab of the WAP and set the following:
 - **SSID**: Choose a name for the wireless network, such as "Home_Network".
 - **Security Mode**: Enable WPA2 security and set a password (e.g., "secure123").

- o **Channel** : Select a channel for the wireless network (commonly 1, 6, or 11).

4. Configure DHCP on the Router:

- Configure the **router's DHCP server** to automatically assign IP addresses to devices on the local network.
- Router(config)# ip dhcp pool HOME
- Router(dhcp-config)# network 192.168.1.0 255.255.255.0
- Router(dhcp-config)# default-router 192.168.1.1
- Router(dhcp-config)# dns-server 8.8.8.8
- This configuration assigns IP addresses in the 192.168.1.0/24 range, with the router as the default gateway and Google DNS (8.8.8.8) as the DNS server.

5. Configure Wireless Devices:

- On each **wireless device** (laptop, smartphone), go to the **Desktop > PC Wireless** option.
- **Enable Wi-Fi** on the device, and it should automatically detect available wireless networks.
- Search for the **SSID** (e.g., "Home_Network") and select it.
- Enter the **security key (password)** set earlier (e.g., "secure123") to connect the device to the wireless network.

6. Test the Network:

- Use the **ping** command from a wireless device's **Command Prompt** to test connectivity to the router's LAN IP (192.168.1.1).
 - o Open the **Command Prompt** on a laptop or smartphone and type:
 - o ping 192.168.1.1
- If the ping is successful, the device is connected to the router.

Test Internet Connectivity:

- On a wireless device, open a web browser and try accessing a website, like **google.com**, or use **ping** to test connectivity to an external IP (e.g., **8.8.8.8**).
 - o If successful, Internet access is working.

7. Troubleshooting:

- If devices cannot connect to the Internet, check the following:
 - o Ensure that the router's **WAN interface** is configured correctly and has an active connection to the modem.

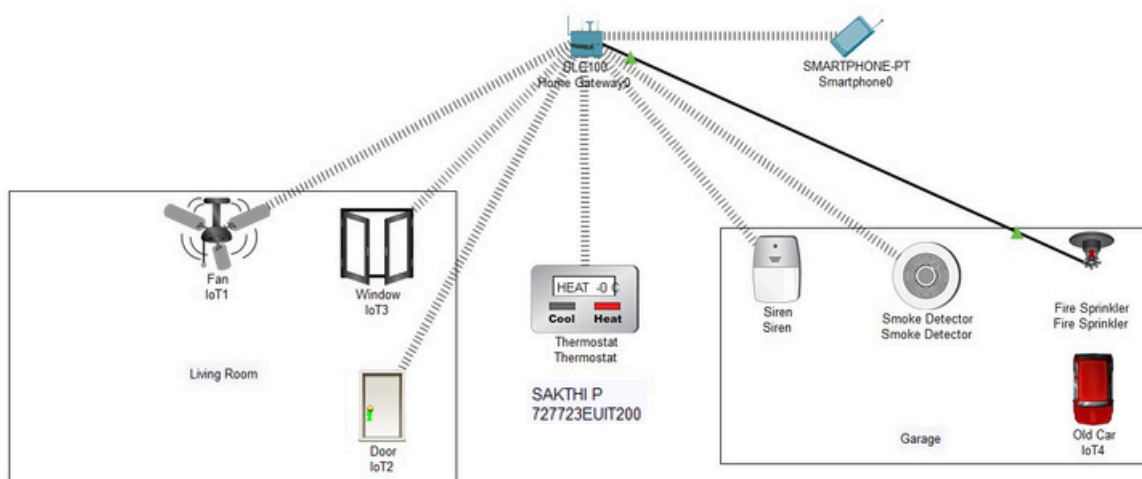
- Verify the **DHCP configuration** is correctly assigning IP addresses.
- Check that the wireless security settings (SSID and password) match on both the WAP and the client devices.

Steps – Input And Output :

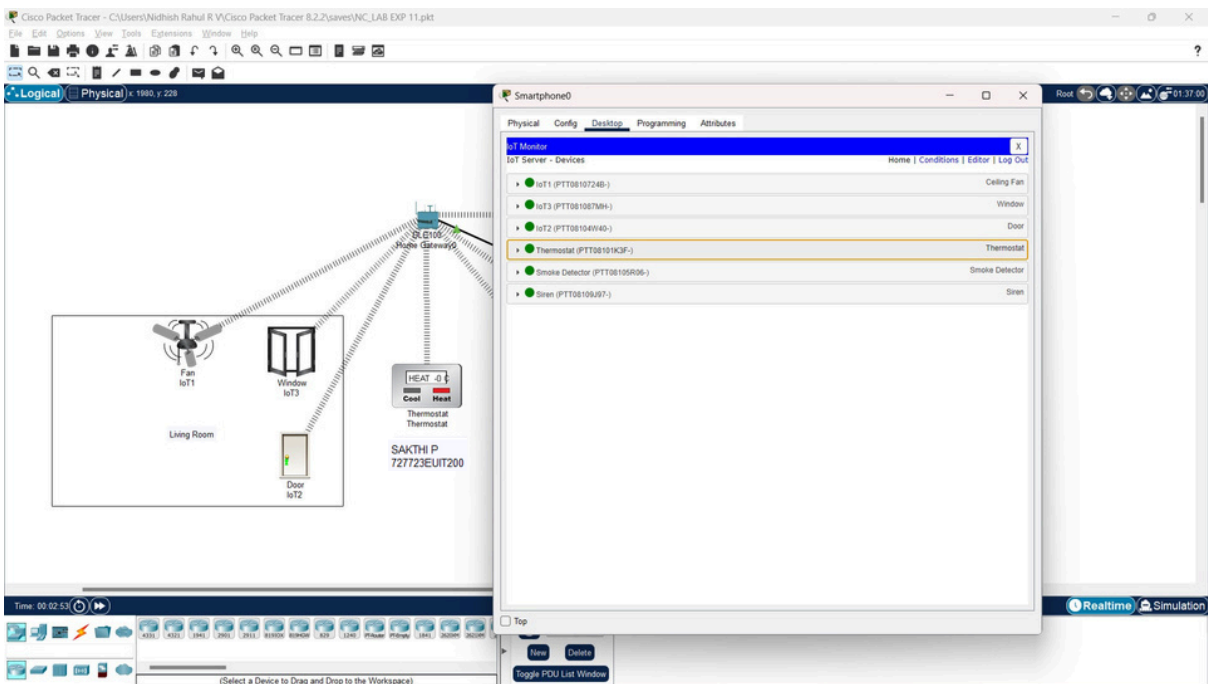
1. Open Cisco Packet Tracer in your system and login into your account.
2. Create a living room and garage
3. To create a Living room , Select a Ceiling fan and a Window.
4. Now choose the Home Gateway from the end devices.
5. To establish a wireless connection , click on the ceiling fan , and click on the advanced button on the bottom right corner and in network adaptor, choose PT-IOE-NM-1W and follow the same for the Window. Now the wireless connection has been made.
6. Now choose smartphone from the end device and connect it to the homgateway.
7. Copy the IP address of the homgateway and paste it in the IOT Monitor Application in the smart phone and login. This page shows the device connected to the homgateway.
8. To register the fan and the window in the IOT Monitor , Enable the Homgateway option in the IOE Server of both fan and the window.
9. Now these devices are seen on those IOT Monitor.
10. To make these devices automatically work based on the temperature of the environment , Thermostat device is used .
11. Select Thermostat from the end devices and provide the display name as Thermostat. Choose Homgateway in the IOE Server and DHCP in the IP configuration. Now the Thermostat is added in the Smart Phone.
12. In the Smart phone , IOT Monitor , Go to Conditions to add the respective conditions to monitor those devices.
13. Click Add , Name it as Turn the Ceiling fan Low and select any in match and Provide the condition as if Thermostat temperature ≥ 15 degree celcius , then set the ceiling fan status to low.
14. Again , Click Add , Name it as Turn the Ceiling fan Off and select any in match and Provide the condition as if Thermostat status is cooling , then set the ceiling fan status to Off.
15. Now check the Status of the ceiling fan according to the temperature changes shown in the Thermostat device.

16. In the garage , add the devices Siren , Smoke Detector and Fire sprinkler.
17. Now in all the devices , change the name of the devices and Choose Homegateway in the IOE Server and DHCP in the IP configuration. Now all these devices are added in the Smart Phone.
18. Now an old car is chosen to produce smoke effect.
19. Then the conditions are provided in the in IOT Monitor of the smartphone to monitor the devices.
20. Provide conditions like if the smoke detector detects the smoke level > 10 , then the siren alarm is on. Also the fire sprinkler is turned on.
21. Check those by creating smoke level according to the provided conditions.

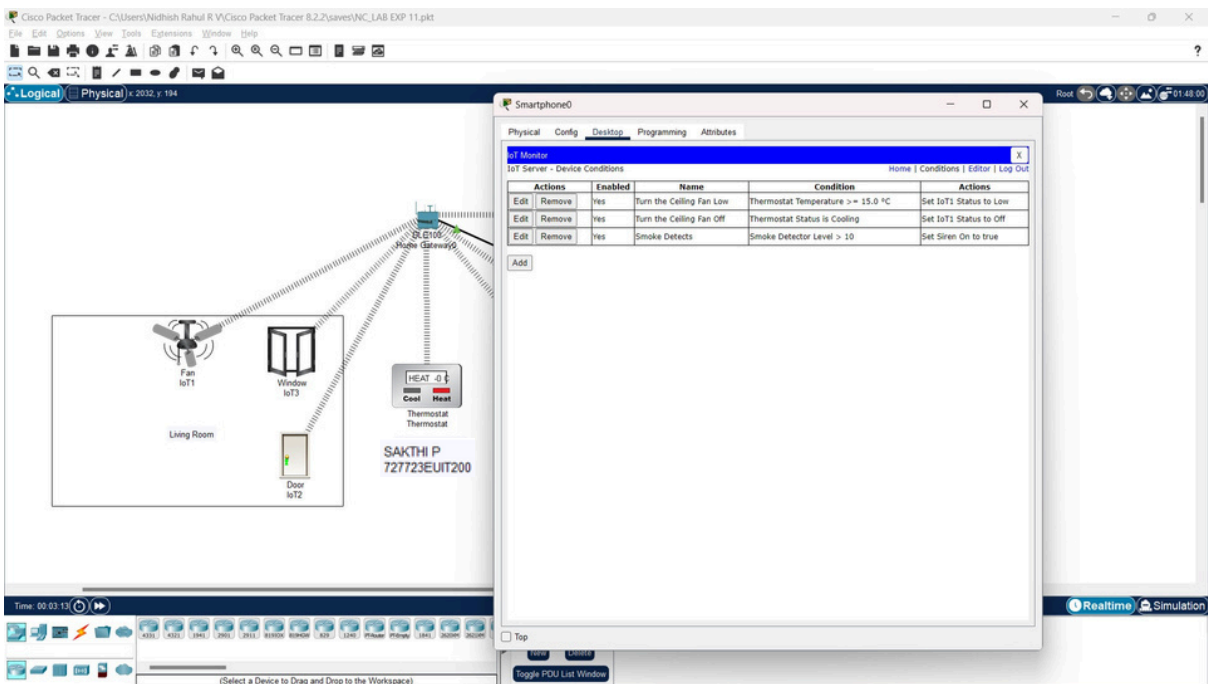
NETWORK DIAGRAM :

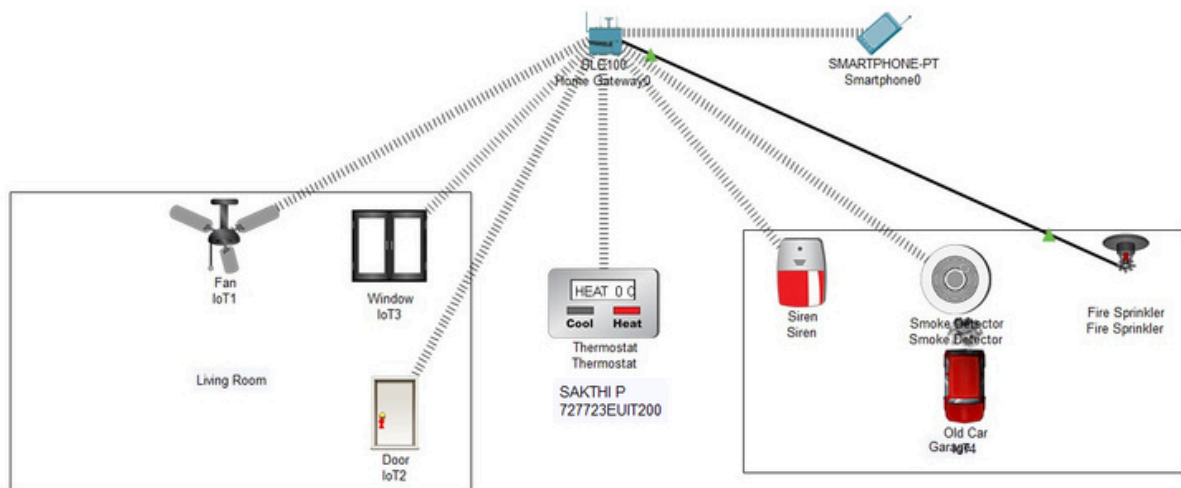


Devices connected :



Conditions provided :





RESULT :

Hence the IoT based Smart Home Network using packet tracer Tool has been studied and created successfully.