

Experiment #	<TO BE FILLED BY STUDENT>	Student ID	<TO BE FILLED BY STUDENT>
Date	<TO BE FILLED BY STUDENT>	Student Name	[@KLWKS_BOT] THANOS

## Lab 6: Implementation of Smart home using Cisco packet tracer and verify the configuration

Date of the Session: \_\_\_\_/\_\_\_\_/\_\_\_\_

Session Time: \_\_\_\_to\_\_\_\_

### Learning outcome:

- Understanding IoT Concepts and Gain a solid understanding of IoT and its applications in smart homes
- Configure Cisco routers and switches to create a functional network for the smart home.
- Learners will gain a comprehensive understanding of Smart Home technology and its applications.
- Learners will develop skills in designing network infrastructures that support Smart Home implementations

### Pre-Lab Task:

1. Mention the concept of a smart home and its benefits.

A smart home uses internet-connected devices to automate and control household functions like lighting, security, and appliances.

#### Benefits:

- **Convenience** (Remote control, automation)
- **Energy Efficiency** (Smart thermostats, lighting)
- **Security** (Cameras, locks, alarms)
- **Accessibility** (Assists elderly/disabled)
- **Cost Savings** (Reduces utility bills)

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2. Give some examples of devices or systems that can be incorporated into a smart home setup?

- Smart Lighting (Automated LED bulbs)
- Smart Security (Cameras, locks, sensors)
- Smart Thermostats (Nest, Ecobee)
- Smart Speakers (Alexa, Google Home)
- Smart Appliances (Fridge, oven, washing machine)

3. Discuss the importance of network infrastructure in enabling a smart home environment.

A strong network ensures seamless communication, security, and efficiency in a smart home. Wi-Fi coverage, encryption, and scalability are key for reliability and protection against cyber threats.

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## Home Automation Basics – Beginners Guide

Although not many people can see the need for having their smart fridge connected to the Internet, most people will find the ability to remotely control lights, security cameras and other home appliances very useful. If you are thinking about adding smart devices to your home then this guide to smart homes and home automation will give you a good basic understanding of how smart devices are connected and how they are controlled.

What is Home Automation?

**Home automation** or **domestics** is building automation for a home, called a **smart home** or **smart house**. It involves the control and automation of lighting. Home automation is one of several areas of the IOT (internet of things), and is often called **Home IOT**.

There are three distinct levels of home automation.

1. Monitoring
2. Control
3. Automation

### Monitoring

The ability to view status of systems i.e

- What is the temperature?
- Is the door locked?
- Is The Light on or off

### Control

The ability to change the state of a systems i.e

- Turn up the heating.
- Lock the Door
- Turning the light on or off

### Automation

The ability to change the state of a system automatically in response to an event. i.e.

- Turn on the heating if the outside temperature falls below a certain temperature.
- Turn the lights off when no one is a home.

Currently most smart home systems are at the **control level**.

## Smart Home – Automation System Components

A home automation system will consist of

- End Devices like switches, sensors ,lights, locks etc
- Connection devices like hubs and Gateways.
- A Network or networks e.g. Wi-Fi, Zigbee etc
- Internet connection – maybe optional

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### Local Control and Cloud Control

All homes should be able to be controlled locally from within the home. This doesn't mean that they should have manual switches, but that they should be controllable across a local network. They should also **IMO** be controllable and **fully functional** without an Internet connection. In other words if you loose the Internet connection you should still be able to turn your lights on and off. Unfortunately not all systems will operate without an Internet connection. This article is worth reading.

As a General rule of thumb **Zwave** and **Zigbee** networks and devices will operate without an Internet connection. **Wi-Fi devices** will generally **require** an Internet connection. If the device is controllable directly using a smart phone then it requires an Internet connection. This reddit discussion is worth reading.

### The Role of the Cloud In Smart Homes

Many Internet devices especially **Wi-Fi devices** are dependent on an Internet connection, and cloud services to function. Generally when you set up these devices you **register them** with the manufacturer on a cloud service. They can then be controlled via an App on a smart phone, Alexa etc but will require an Internet connection to function correctly. Although these devices are easy to setup and operate they are useless without an Internet connection. IMO the Internet should represent an alternative way of controlling devices, and not the only way.

### In Lab Task: Implementation of Smart home using Cisco packet tracer

Writing space for the Problem: (For Student's use only)

#### Step 1: Open Cisco Packet Tracer

- Launch Cisco Packet Tracer and create a new project.

#### Step 2: Add a Home Gateway

1. Go to Network Devices > Wireless Devices.
2. Drag and drop a Home Gateway onto the workspace.
3. Click on the Home Gateway, go to the Config tab, and select Wireless0.
4. Set the following details:
  - SSID: HomeGateway
  - Security Mode: WPA2-PSK
  - Password: k1u12345678

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### Step 3: Add IoT Devices

1. Go to End Devices > Smart City.
2. Drag and drop the following IoT devices onto the workspace:
  - Ceiling Fan (IoT0)
  - Door (IoT1)
  - Light (IoT2)
  - Motion Detector (IoT3)
  - Window (IoT4)

### Step 4: Connect IoT Devices to the Home Gateway

1. Click on each IoT Device, go to the Config tab, and select Wireless.
2. Set the following details:
  - SSID: HomeGateway
  - Password: k1u12345678
3. Ensure each device successfully connects to the Home Gateway.

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### Step 5: Add a Smartphone

1. Go to End Devices and place a Smartphone on the workspace.
2. Click on the Smartphone, go to the Config tab, and select Wireless.
3. Set the following details:
  - SSID: HomeGateway
  - Password: k1u12345678

### Step 6: Control IoT Devices from the Smartphone

1. Click on the Smartphone, go to Desktop, and open the IoT Monitor App.
2. The app will display a list of connected devices.
3. You can now remotely control the smart home devices:
  - Turn ON/OFF the Ceiling Fan (IoT0)
  - Lock/Unlock the Door (IoT1)
  - Dim/Turn ON the Light (IoT2)
  - Activate the Motion Detector (IoT3)
  - Open/Close the Window (IoT4)

### Step 7: Set Up Automation Rules

#### Example 1: Motion Detection Turns ON Light

1. Click on the Motion Detector (IoT3).
2. Go to the Programming tab and set a rule:
  - If motion is detected → Turn ON the Light (IoT2).

#### Example 2: Auto-Lock Door After No Motion

1. Click on the Door (IoT1).
2. In the Programming tab, set a rule:
  - If no motion detected for 5 minutes → Lock the Door.

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## Step 8: Test the Smart Home Setup

Once all devices are configured, it's time to **test the simulation** to ensure everything works as expected.

### 1. Control Devices Using the Smartphone

1. Click on the **Smartphone** in Cisco Packet Tracer.
2. Go to **Desktop > IoT Monitor App**.
3. Manually test each device by turning it ON/OFF:
  - Turn ON/OFF the Fan (IoT0).
  - Lock/Unlock the Door (IoT1).
  - Dim/Turn ON the Light (IoT2).
  - Enable/Disable the Motion Detector (IoT3).
  - Open/Close the Window (IoT4).

### 2. Test Automation Rules

- Click the **Motion Detector (IoT3)**.
- Press **Ctrl + Alt** to simulate motion detection.
- Check if the **Light (IoT2)** automatically turns ON.
- After a few seconds, verify that the **Door (IoT1)** auto-locks when no motion is detected.
- Simulate high wind speeds and check if the **Window (IoT4)** automatically closes.

### 3. Verify Complete Functionality

- Ensure all devices respond correctly through the **Smartphone IoT Monitor App**.
- Make adjustments if necessary in the **Programming tab** of each IoT device.

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## Final Output: Smart Home System in Action!

- ✓

The Smartphone successfully controls all IoT devices.
- ✓

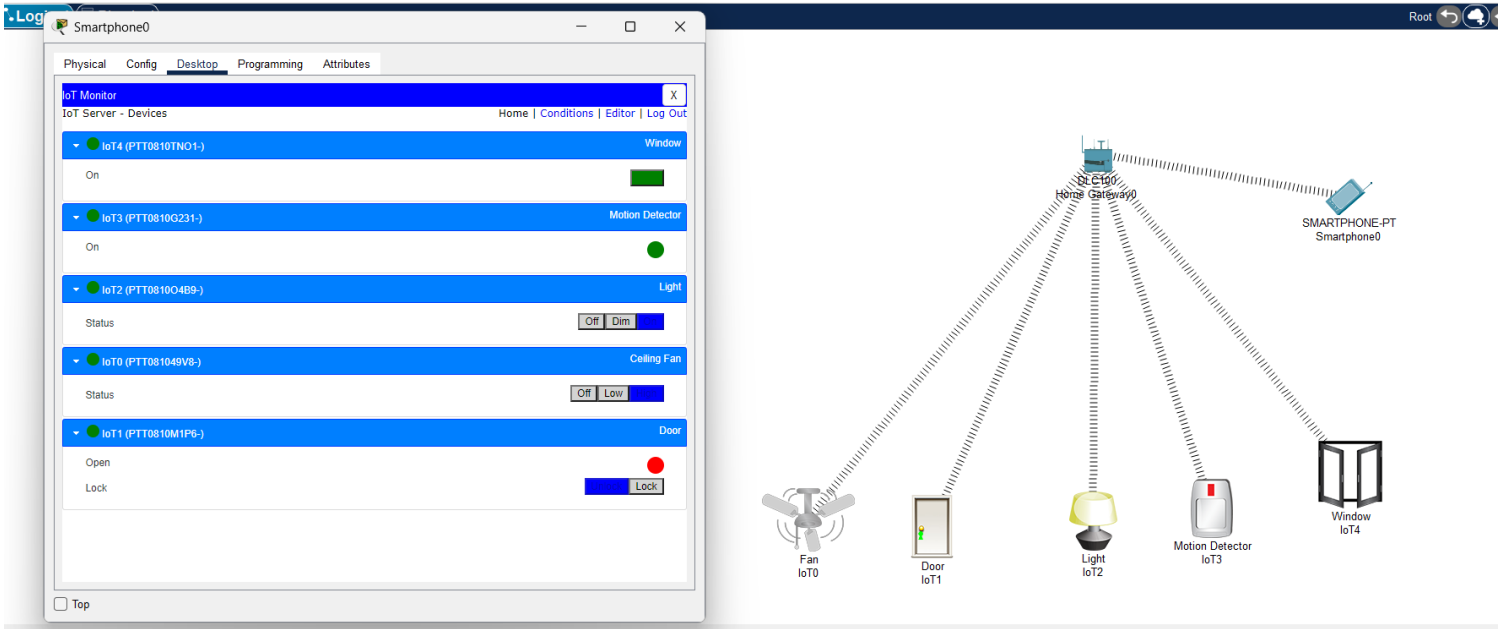
The Motion Detector triggers automation for lights.
- ✓

The Door auto-locks after inactivity.
- ✓

The Fan and Light respond as expected.
- ✓

The Window closes automatically in high wind conditions.

DIAGRAM



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### VIVA-VOCE Questions (In-Lab):

1. What is a smart home, and how does it differ from a traditional home setup?

A smart home uses IoT devices for automation, remote control, and energy efficiency, while a traditional home relies on manual operation.

2. Explain the concept of the Internet of Things (IoT) and its role in smart home technology.

IoT connects devices to the internet for automation and remote control, enhancing convenience, security, and energy efficiency.

3. What communication protocols are commonly used in smart home devices, and how do they function?

- **Wi-Fi:** High-speed internet connection.
- **Zigbee/Z-Wave:** Low-power, short-range automation.
- **Bluetooth:** Short-range device communication.
- **MQTT:** Lightweight IoT messaging.
- **Thread:** Secure, low-power mesh networking.

4. What security considerations should be taken into account when configuring a smart home network in Packet Tracer?

- **Use WPA2/WPA3 encryption** for Wi-Fi.
- **Set up firewalls and VLANs** for isolation.
- **Change default credentials** and enable **MAC filtering**.
- **Update firmware** regularly.
- **Use VPNs** for secure remote access.

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### Post Lab Task:

1. Describe the network topology you used for implementing the smart home in Cisco Packet Tracer. What devices were involved, and how were they interconnected?

- Star topology with a home router connecting smart devices.
- Devices: Router, smart lights, smart plugs, motion sensors, security cameras, PC/smartphone.
- Connectivity: Wi-Fi & Ethernet for communication.

2. Explain the concept of a smart home and its benefits.

- A smart home allows remote control of devices, enhancing automation, security, and energy efficiency.
- Benefits: Convenience, energy savings, better security, remote access, and AI integration.

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3. Discuss the protocols or technologies you implemented to enable communication and control within the smart home environment.

- **Wi-Fi (802.11), Zigbee, MQTT, HTTP/HTTPS, DHCP, IoT Cloud.**
- **Enables efficient communication, remote access, and automation.**

<b>Evaluator Remark (if Any):</b>	<b>Marks Secured _____ out of 50</b>
	<b>Signature of the Evaluator with Date</b>

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