

# IMPLEMENTING SMART HOME USING CISCO PACKET TRACER SIMULATOR

Isa Shemsi

CSE Department, SIT, Symbiosis International University, Pune, India  
isa.beriso@sitpune.edu.in /isashemsi@gmail.com

**Abstract:** Smart home is a house that uses currently released IOT technology to automate different activities of home. IOE devices connected to the internet, to allow the distant monitoring and controlling of different home appliances such as lighting, heating, cooling and alarming. In this paper, I implemented smart home using new released cisco packet tracer simulation software, since different IOT device used for home automation is included in this new version simulator. The previous software has only networking device, but in new released simulator IOT device is included those are sensor, board, IOE device and Programming Languages with classically networking device. To design smart home I used different device used for home security, safety and home environment prosperity.

**Keyword:** IOE, Smart home, packer tracer, sensor

## 1. INTRODUCTION

Smart home is a living home that include smart object to improve home activities in advance, that can be automating activities of home without users involvement such monitoring home environment condition by various sensor (Temperature, Humidity, smoke, wind, sound) then ventilate the environment based on sensor information. Smart home can provide different function rather than providing safety that is security by providing more automate security using different alarm system such siren sound, LCD display and sending email to legitimate user if security issue is detected by sensor. Home automation states managing and controlling home objects by using micro-controller or computer technology [1].Automation is popular because it provides ease, efficiency and secure environment. In this paper all smart appliance is registered to home gateway and controlled by legitimate person. Smart Home reduces user's involvement in monitoring home settings and controlling home appliances by including different sensor in home automation [2]. This paper presents if smoke is detected the fire sprinkler automatically on to ventilate the environment and window is open.

While the term "Internet of Things" (IoT) was first announced, the primary question might be what

is considered as "Things". Till current years, groups of scholars and organizations tried to make clear the definition of Io T. Haller et al. [3] proposed a definition of IoT with "A world where physical objects are seamlessly integrated into the information network, and where the physical objects can become active participants in business process." IOT is an abbreviation of Internet of Things which refers to uniquely identifiable objects (things) and their virtual representations in an Internet-like structure [4].Internet of Things (IoT) is currently released technology to automate communication by connecting different objects around us as part of internet. IoT objects integrated with networking technology to control from remote and local.

This paper deals about implementing smart home using new released cisco packet tracer because this feature include different sensor , actuator and different smart device used for home automation [5][8]. Some of the device are smart window, smart light, smart door, smart fan with different detector and sensor. To implement smart home I used new released cisco packet tracer simulation software to design and configure IOE device with classically networking device.

## 2. MOTIVATION

Currently cisco released new version of packet tracer that include IOE device withclassically networking device [6][7]. Boards is also added to this version those are microcontrollers (MCU-PT), single boarded computers (SBC-PT) that provide programming environment to control connected object.

**Benefits of new released Packet Tracer are:**

- ✓ Offers a realistic simulation and visualization of IOT device

- ✓ Permits users to design, build, configure smart home, smart city by providing different smart object used for them.
- ✓ Provide board to control smart object
- ✓ Allows students to explore concepts IOE
- ✓ Provide detector for sensor

### 3. METHODOLOGY

In order to implement smart home I used new released cisco packet tracer, which included different smart object used for home automation such as smart fan, smart window, smart door, smart light, smart garbage door, fire sprinkler, lawn sprinkler and different sensor is included.

To control this smart object and sensor, microcontroller (MCU-PT) and Home Gateway used, since it provide programming environment for controlling smart object connected to it and provide controlling mechanisms by registering smart device to Home Gateway respectively.

#### 3.1 HOME GATEWAY

Home Gateway have 4 Ethernet ports in addition to a wireless access point configured with the "Home Gateway" SSID (see fig 2). To secure wireless connection WEP / WPA-PSK / WPA2 enterprise can be configured on home gateway. The figure 2 shows seven internet of Things device connected to a Home Gateway by using Ethernet cable and wireless. To connect the Home Gateway to the Internet its Internet WAN Ethernet port available on home gateway. The IoE device can be remotely managed through a web interface hosted by the Home Gateway. The Home Gateway internal (LAN) IP address is 192.168.25.1 but it can also be accessed through its Internet facing IP address.

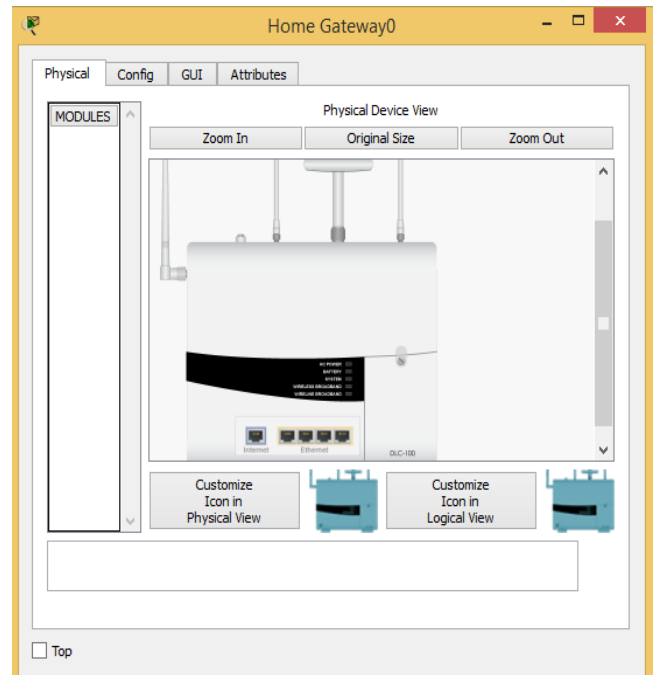


Fig 1: home gateway Ethernet and internet port

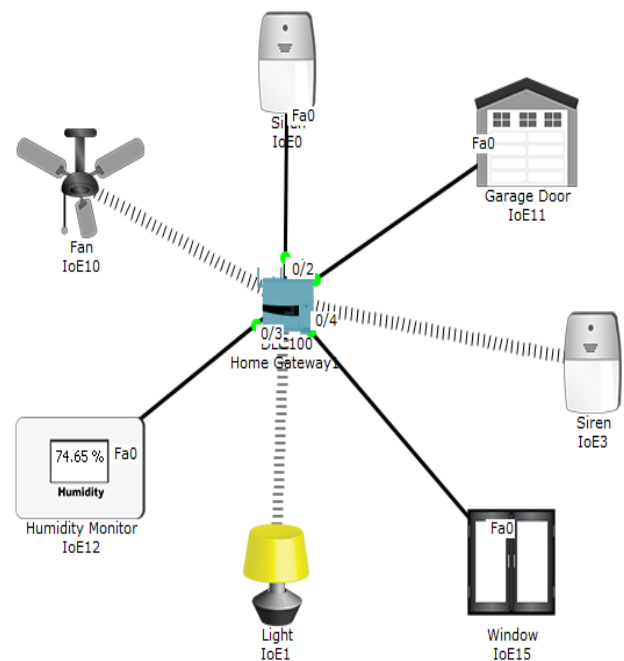


Fig 2: Home gateway with seven smart thing connected to Home gateway

The above figure shows the smart object is connected to the home Gateway using Ethernet cable and wireless medium to manage smart device local and remotely. Home gateway also works as DHCP server by assigning IP address to each smart device that connected to it.

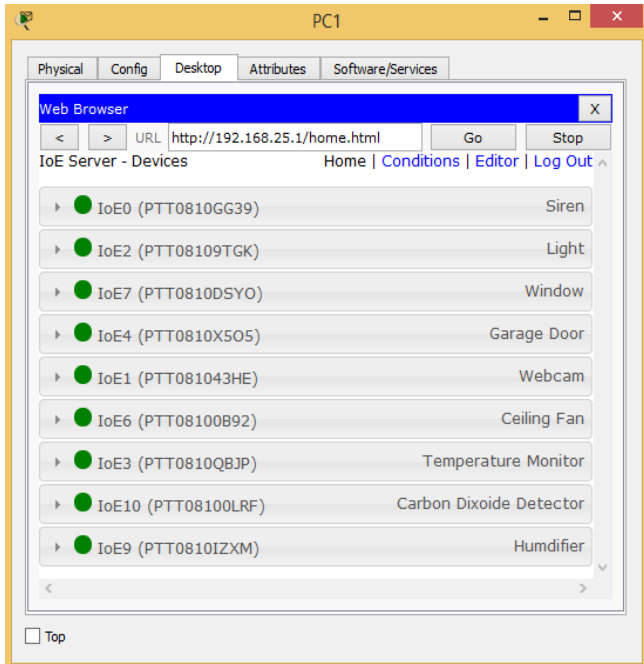


Fig 3: registered IOE device on home Gateway

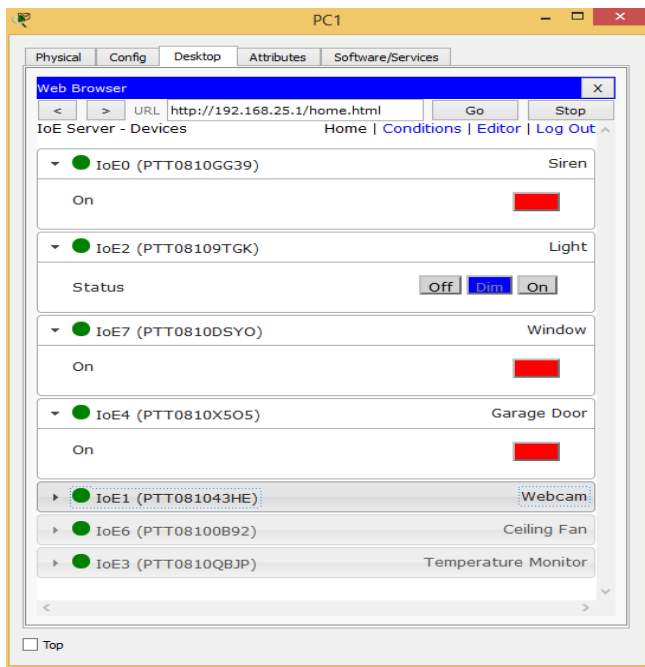


Fig 4: registered IOE device with their status

The above figure shows after registering smart device to home gateway all device are accessed through web by legitimate user. Figure 4 shows there are seven IOE device registered to Home gateway those all are controlled through web by legitimate person.

### 3.2 MICROCONTROLLER (MCU-PT) BOARD

Microcontroller board is used to interconnect different smart object and provide programming environment with different language those are JavaScript, python and visual basic, to control the connected smart object (see fig below)

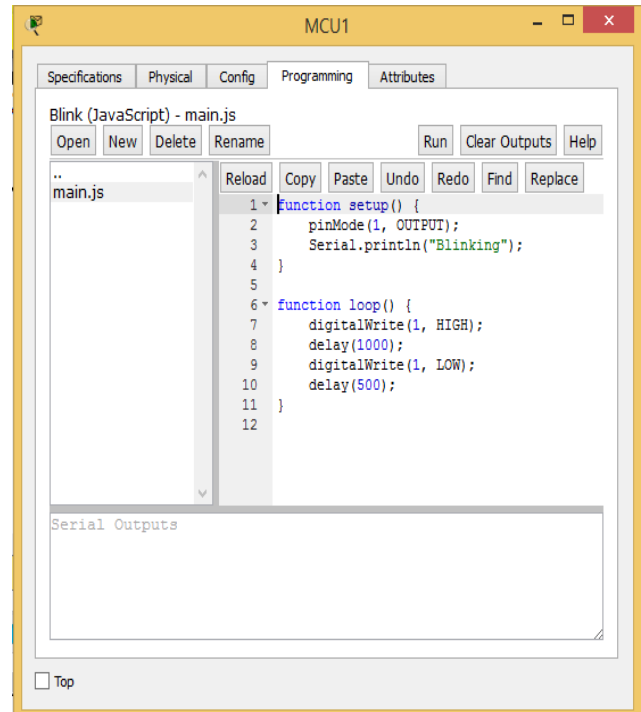


Fig 5: MCU programming environment

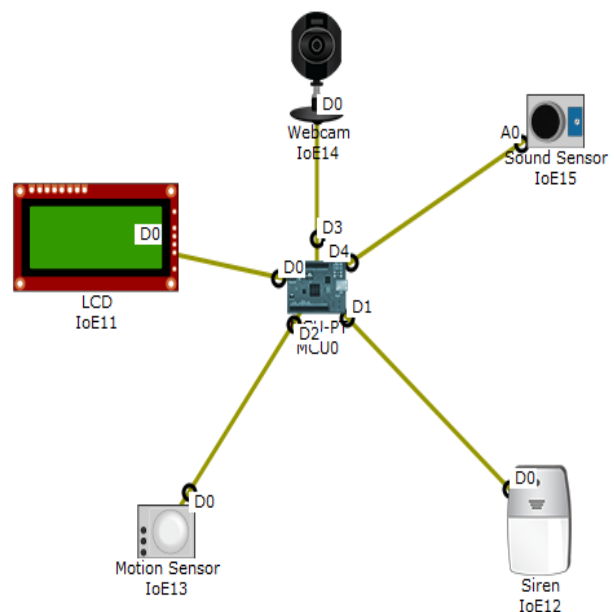


Fig 6: IOE device connected to MCU board

#### 4. IMPLEMENTATION

To implement smart home using cisco packet tracer I used different sensor, smart device and detector to make smarter. The following figure

represent the home architecture that connected each other using wireless and wired medium.

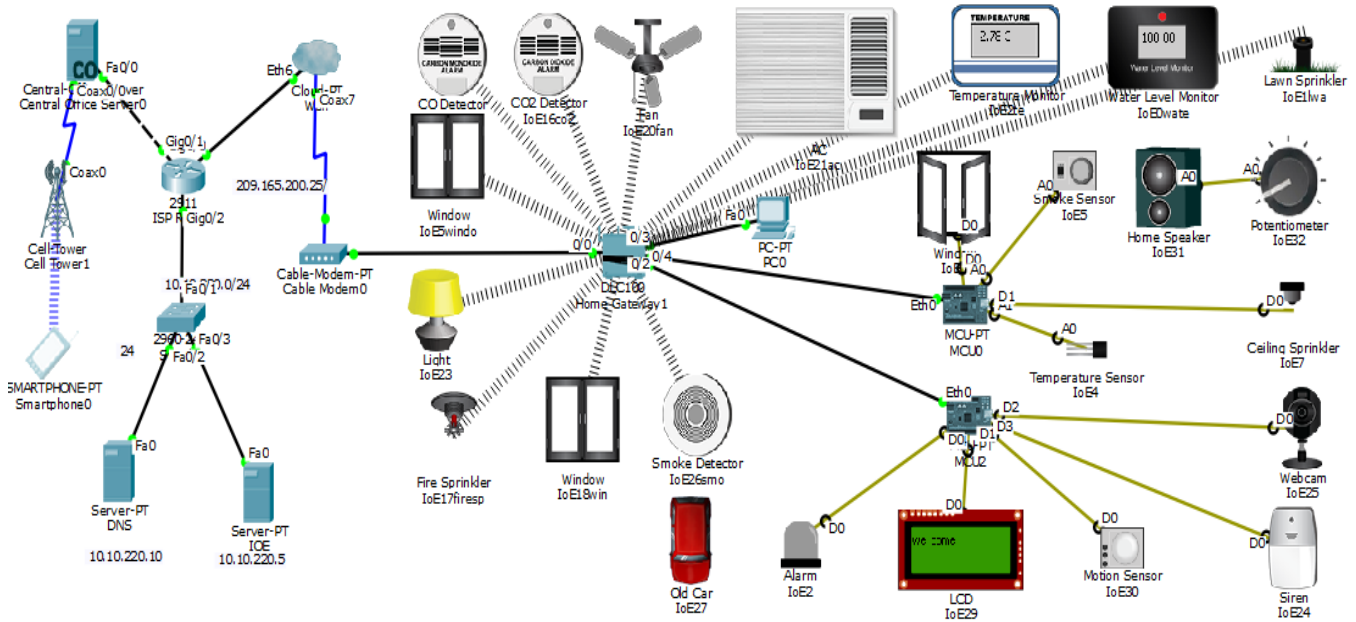


Fig 7: smart home architecture

#### 4.1 DEVICE CONFIGURATION AND SETUP

ISP router configuration

**Assigning hostname and Ip address for ISP router**

```
Router>
Router>enable
Router#conf terminal
Router(config)#hostname ISP
ISP(config)#int gigabitEthernet 0/2
ISP(config-if)#ip address 10.10.220.1
255.255.255.0
ISP(config-if)#no shutdown
ISP(config)#int gigabitEthernet 0/0
ISP(config-if)#ip address 209.165.200.225
255.255.255.224
ISP(config-if)#no shutdown
```

```
ISP(config)#int gigabitEthernet 0/1
ISP(config-if)#ip address 209.165.201.225
255.255.255.224
ISP(config-if)#no shutdown
```

#### Configuring dhcp server for cell and IOE device

```
ISP(config)#ip dhcp excluded-address
209.165.201.225 209.165.201.230
ISP(config)#ip dhcp pool cell
ISP(dhcp-config)#network 209.165.201.225
255.255.255.224
ISP(dhcp-config)#default-router 209.165.201.225
ISP(dhcp-config)#dns-server 10.10.220.10
ISP(config)#ip dhcp excluded-address
209.165.200.225 209.165.200.230
ISP(config)#ip dhcp pool ioe
ISP(dhcp-config)#network 209.165.200.224
255.255.255.224
ISP(dhcp-config)#default-router 209.165.200.225
ISP(dhcp-config)#dns-server 10.10.220.10
```

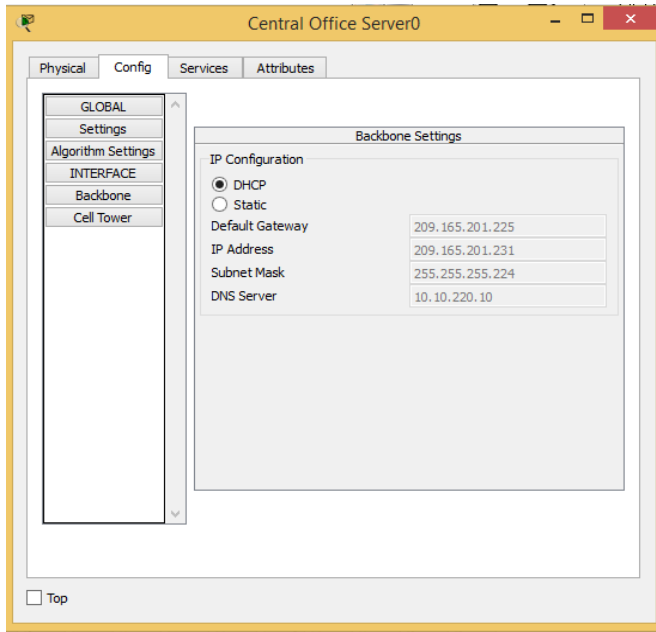


Fig 8: central office server obtain IP address from ISP server

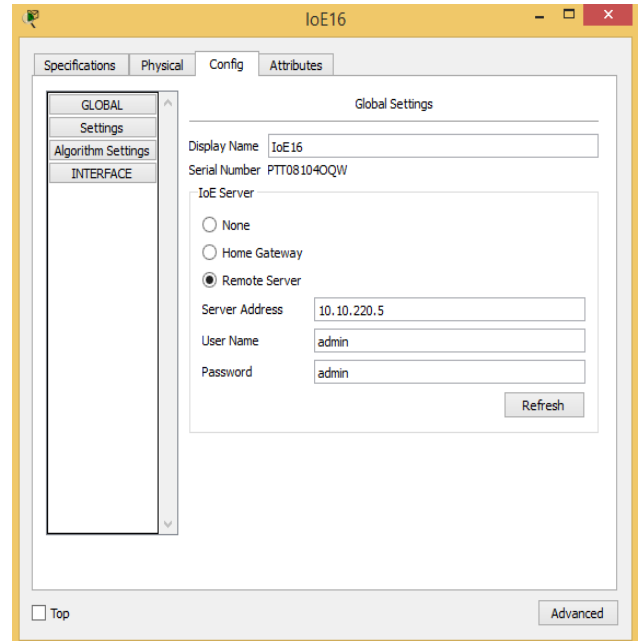


Fig 10: registering IO device to IOE server

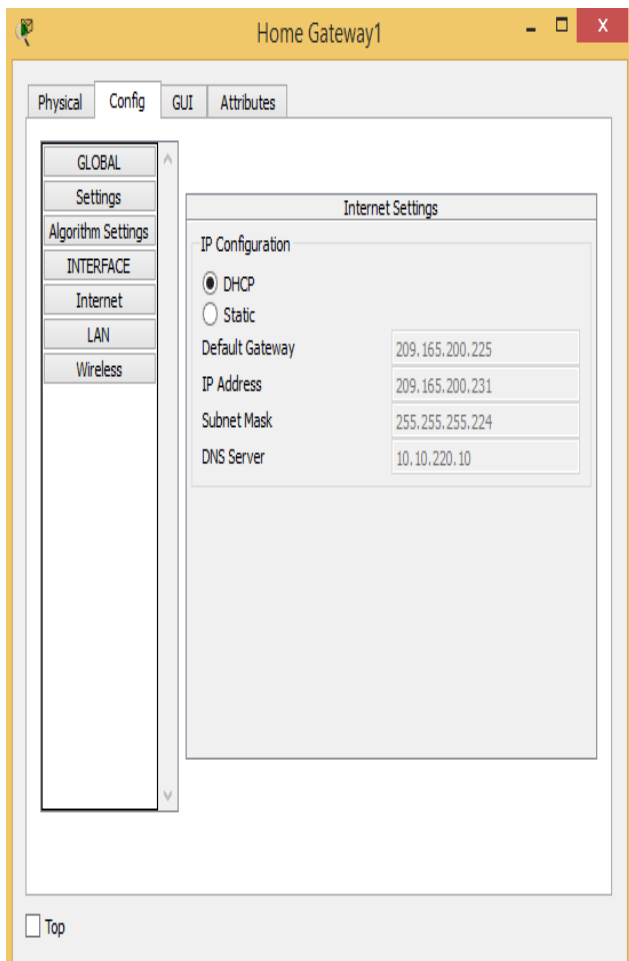


Fig 9: Home Gateway obtain IP address from ISP server

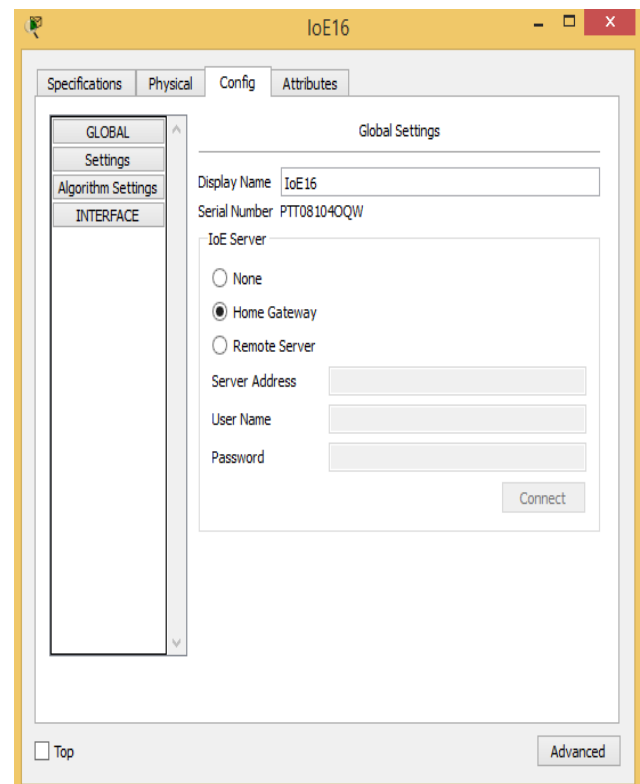


Fig 11: registering IO device to Home Gateway

The figure 11 shows how to register IOE device to home Gateway. The home Gateway have default username and password to access the registered IOE device through the web.

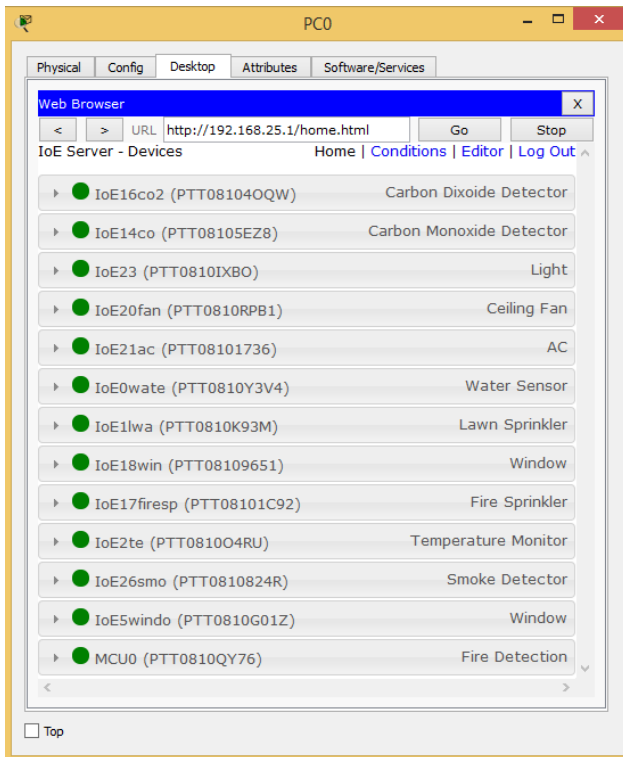


Fig 12: registering IO device to Home Gateway

The figure 12 shows the registered IOE device on home Gateway.

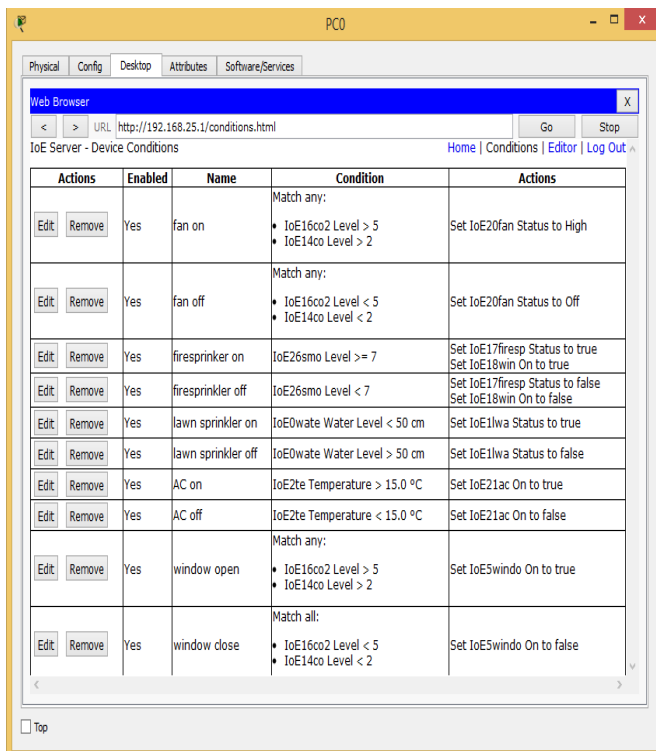


Fig 13: condition made on home Gateway to control IOE device.

## 4.2 DEVICE USED FOR DESIGN

Table 1. Device used for implementation

No	Device	Function
1	Router(1941)	Used to interconnect home to cellular network.
2	Cable modem	Used to connect home to the internet
3	Home gateway	Used to register smart object and give IP address to smart object
4	IOE Server	To control smart thing registered on it and provide difference server functionalities
5	Central office server	Used to connect cellular system to the router
6	MCU	Used to interconnect different smart thing
7	Pc	Connect to home gateway to access smart object
8	Fan	Used to ventilate the home environment based on some condition
9	Webcam	Control the home
10	Siren	Provide sound for some event in the home
11	Light	Provide light
12	Motion detector	Connect to home gateway and provide Detection of motion
13	Smart door	Connect to home gateway and provide Function based event
14	Cell tower	Provide cellular system coverage for home user to control the home appliance form remote.
15	Tablet	Used to control the home from outside
16	Co detector	Used to detect co of home
17	Co2	Used to detect co2 of the home
18	Water level monitor	Used to detect water level of home environment
19	Lawn sprinkler	Used to sprinkler based on water level of the environment
20	Smoke sensor	Used to sense the smoke level
21	Sound sensor	Used to sense the sound
22	Home speaker	Used to simulate the sound sensor Affects Sound Volume at 65 dB.
23	Temperature sensor	Used to sense the temperature of the home
24	Ceiling sprinkler	Used to ventilate home environment Affects Water Level at a rate of 0.1 cm per second.
25	Old car	Used to simulate different scenario in home design since it affect, co, co2 and smoke level. Affects Carbon Monoxide at a rate of 1%

		per hour. Affects Carbon Dioxide at a rate of 2% per hour. Affects Smoke at a rate of 3% per hour.
26	AC	Used to cool the home Affects Humidity at a rate of -2% per hour.
27	Smart window	Used to control the window remotely Affects Argon, Carbon Monoxide, Carbon Dioxide, Hydrogen, Helium, Methane, Nitrogen, O <sub>2</sub> , Ozone, Propane, and Smoke. When the door is opened, those gases will decrease to a maximum of 1% in total change.
28	Smart Light	Used give light for home

### 5. RESULT



Fig 14: lawn sprinkler is on to watering the plant

The figure 14 shows the lawn sprinkler is on, this can be based on the condition made on home Gateway that is if water level is more than 10 cm the lawn sprinkler on else off.

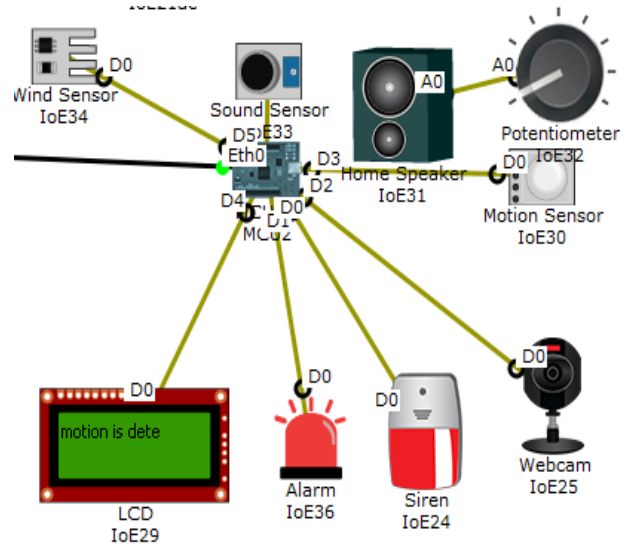


Fig 15: alarming the respective person when motion is detected

The figure 15 shows alarming the respective person when the motion is detected, those alarming system are siren, alarm and LCD by providing sound, red light and text message respectively. This is done by programming on Microcontroller (MCU) to control the device.

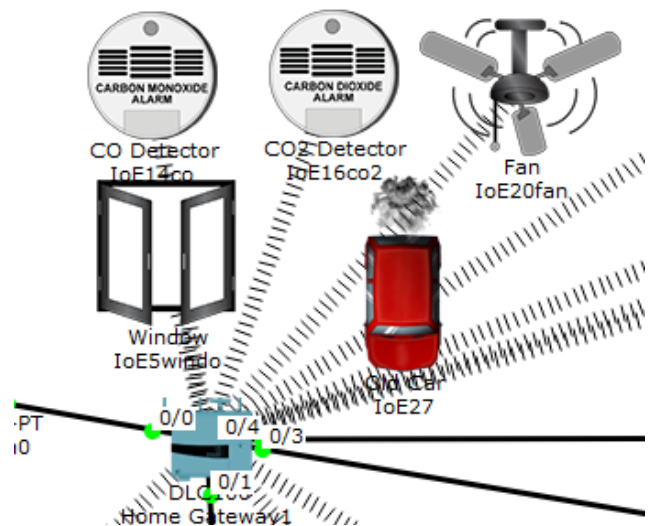


Fig 16: window and fan is open when co and co2 is detected to ventilate the place.

The figure 16 shows the window and fan is opened when the carbon dioxide and carbon monoxide is detected. To detect carbon dioxide and carbon monoxide I used carbon dioxide and monoxide detector. To simulate the scenario old car is used because old car is a lot of problem by increasing the co and co<sub>2</sub>.

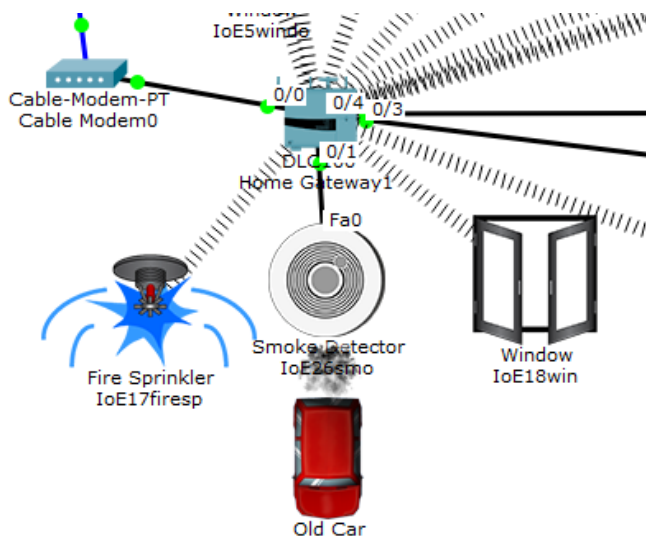


Fig 17: fire sprinkler and window is opened when smoke detected

The figure 17 shows the fire sprinkler and window is opened this can be based on the condition made on home Gateway that is if smoke level is more than 10 the fire sprinkler and window is open to ventilate the place. To simulate the scenario I used old car as old car increases the smoke level.

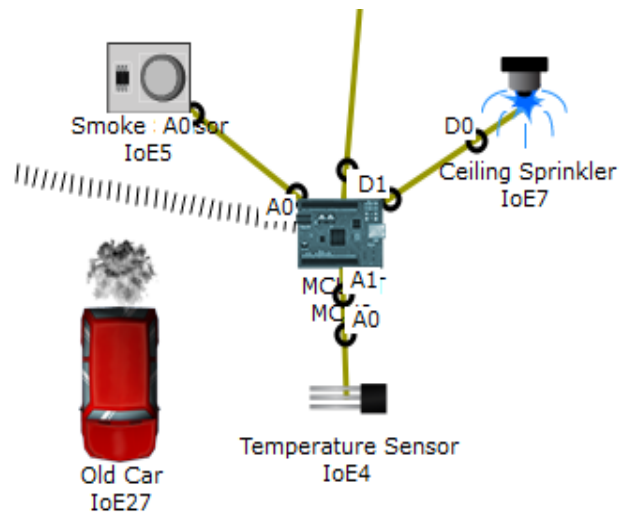


Fig 19: ceiling sprinkler is on when the temperature and smoke level increase to ventilate the environment.

The figure 19 shows the ceiling sprinkler is on this can be when the temperature and smoke level increase. To detect the temperature and smoke I used temperature sensor and smoke sensor. The status of temperature and smoke are controlled by legitimate person by registering MCU on home Gateway.

## 6. CONCLUSION

In this paper, I implemented smart home using new released cisco packet, because this version included different IOE device used for home automation. I used home Gateway to register smart device on it to control them and Microcontroller (MCU) to interconnect different sensor and IOE device. Also MCU provide programming environment to manage different device, different programming language available on MCU but I used JavaScript and python to control the device

## REFERENCE

- [1] Chattoraj, Subhankar. "Smart Home Automation based on different sensors and Arduino as the master controller." International Journal of Scientific and Research Publications 5.10 (2015): 1-4.
- [2] Soliman, Moataz, et al. "Smart home: Integrating internet of things with web services and cloud computing." Cloud Computing Technology and Science (CloudCom), 2013 IEEE 5th International Conference on. Vol. 2. IEEE, 2013.
- [3] S. Haller S. Karnouskos and C. Schroth "The Internet of Things in an Enterprise Context " in Future Internet-FIS

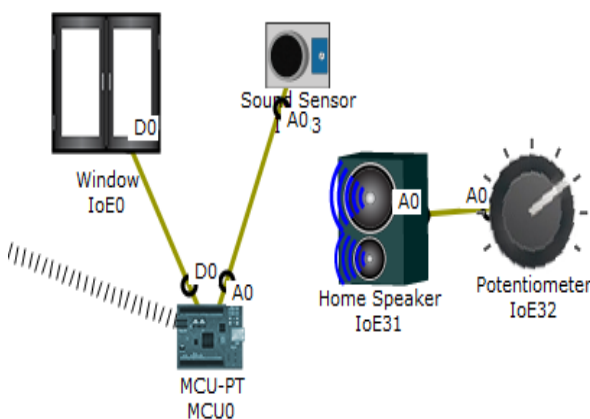


Fig 18: windows is close when sound is detected

The figure 18 shows the window is close due to sound is detected by sound sensor. To simulate sound sensor I used speaker, when speaker on sound sensor detect the sound then window close.



2008 Lecture Notes in Computer Science Vol. 5468 2009  
pp 14-28.

- [4] Jie, Yin, et al. "*Smart home system based on iot technologies.*" Computational and Information Sciences (ICCIS), 2013 Fifth International Conference on. IEEE, 2013
- [5] <http://www.packettracernetwork.com/>
- [6] Qin, X. U. E. "*Simulation Experimental Teaching of Computer Network Based on Packet Tracer [J].*" Research and Exploration in Laboratory 2 (2010): 57-59.
- [7] <http://www.packettracernetwork.com/internet-of-things/pt7-iot-devicesconfiguration.htm>
- [8] Sun, Liangxu, et al. "*Comparison between physical devices and simulator software for Cisco network technology teaching.*" Computer Science & Education (ICCSE), 2013 8th International Conference on. IEEE, 2013.