Department of ICT

Faculty of Technology

University of Ruhuna

Computer Networks – ICT1253 **Level 1 - Semester - 2**

Lab Sheet 04

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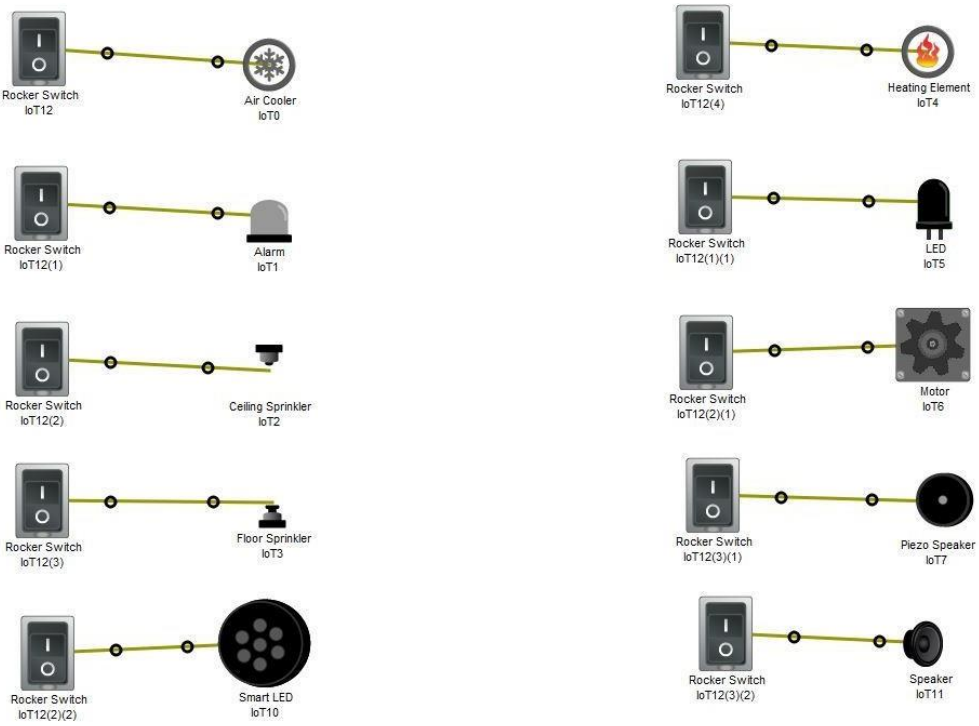
Goals:

Understand IoT using Cisco Packet Tracer.

DEFINITION: IoT means Internet of Things. These devices are used to automate our daily needs.

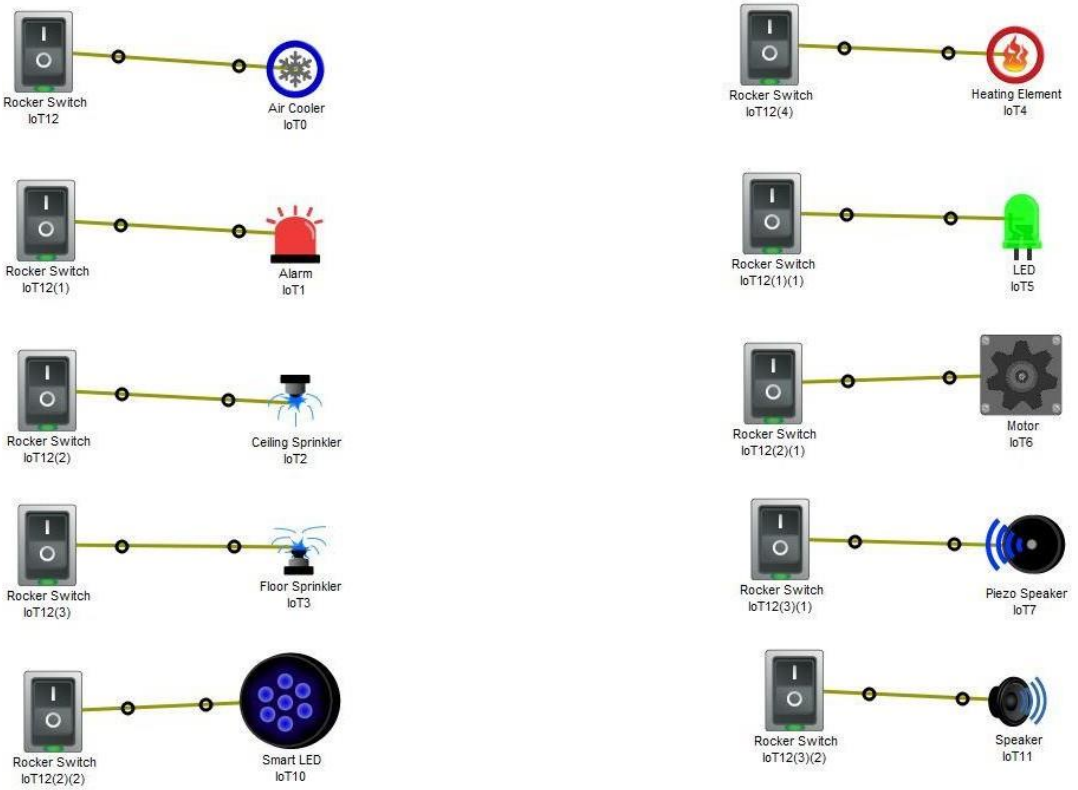
Exercise 1:

1. Open Cisco Packet Tracer software.
2. Go to components then select actuators.
3. Drag the following items.
    - Air cooler
    - Alarm
    - Celling Sprinkler
    - Floor Sprinkler
    - Smart LED
    - Heating element
    - LED
    - Motor
    - Piezo speaker
    - Speaker
4. Go to the sensors and add 10 Rocker switches
5. Connect each item using IoT custom cable to a rocker switch



6. Click on rocker switch while holding left Alt key. The devices will be turned on.

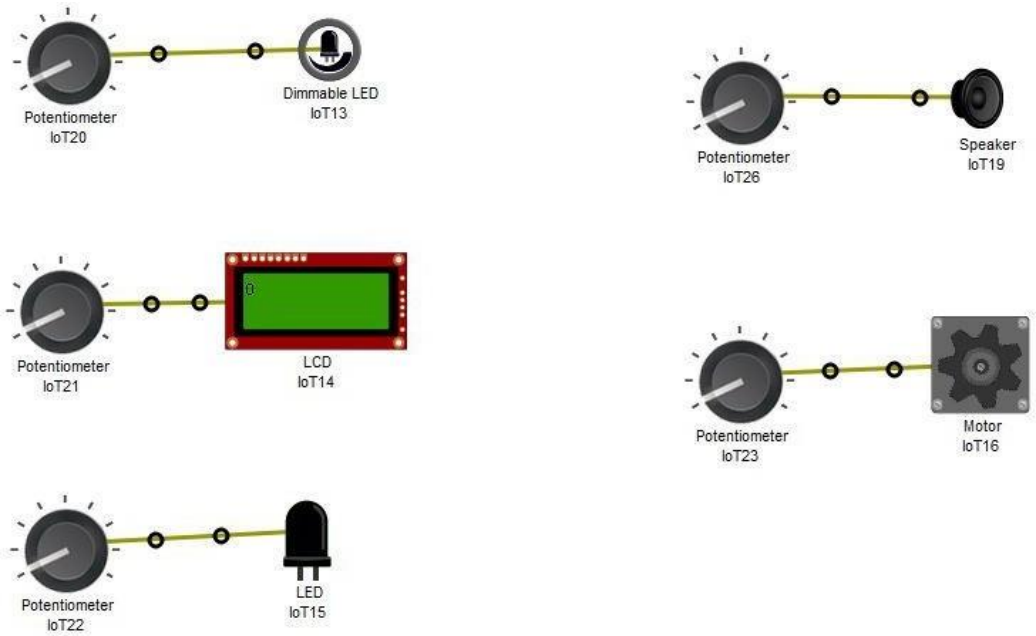
7. Try using all the items.



8. Save the workspace.

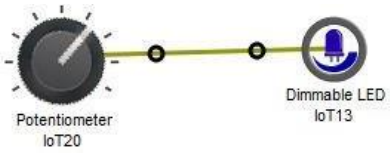
Exercise 2:

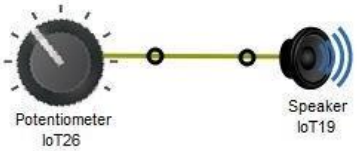
1. Open a new workspace.
2. Go to components then select actuators.
3. Drag the following items.
    - Dimmable LED
    - LCD
    - LED
    - Motor
    - Speaker
4. Go to the sensors and add 5 potentiometers.
5. Connect each item using IoT custom cable to a potentiometer.

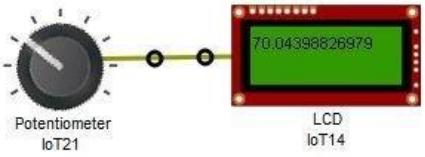


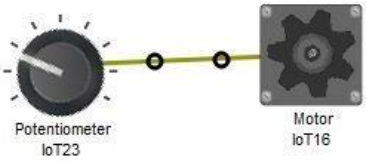
6. Change the angle on rocker potentiometer while holding left Alt key. The devices will be changed their status.

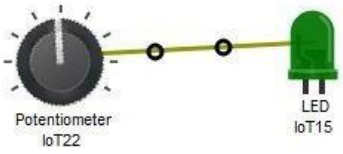
7. Try using all the items.







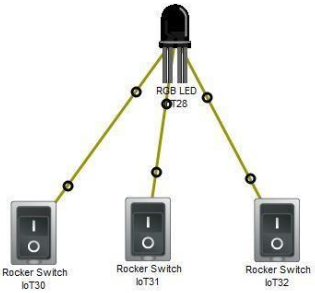


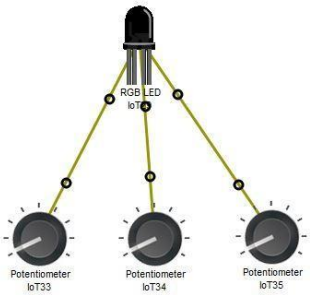


8. Save the workspace.

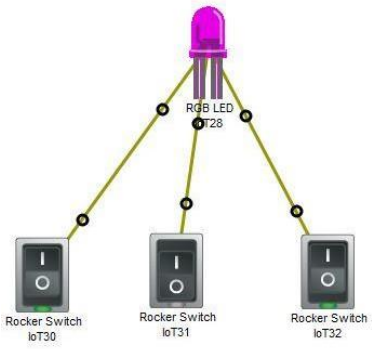
Exercise 3:

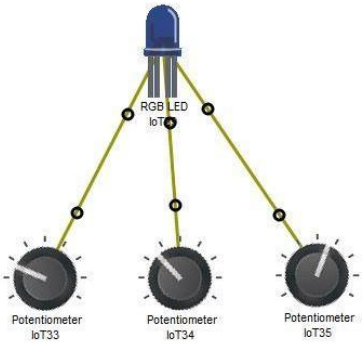
1. Open a new workspace.
2. Add two RGB LEDs, three rocker switches and three potentiometers.
3. Connect one RGB LED to three rocker switches using IoT custom cables.
4. Connect the other RGB LED to three potentiometers using IoT custom cables.





5. Try turning on the rocker switches and changing potentiometer values.





6. Save the workspace.

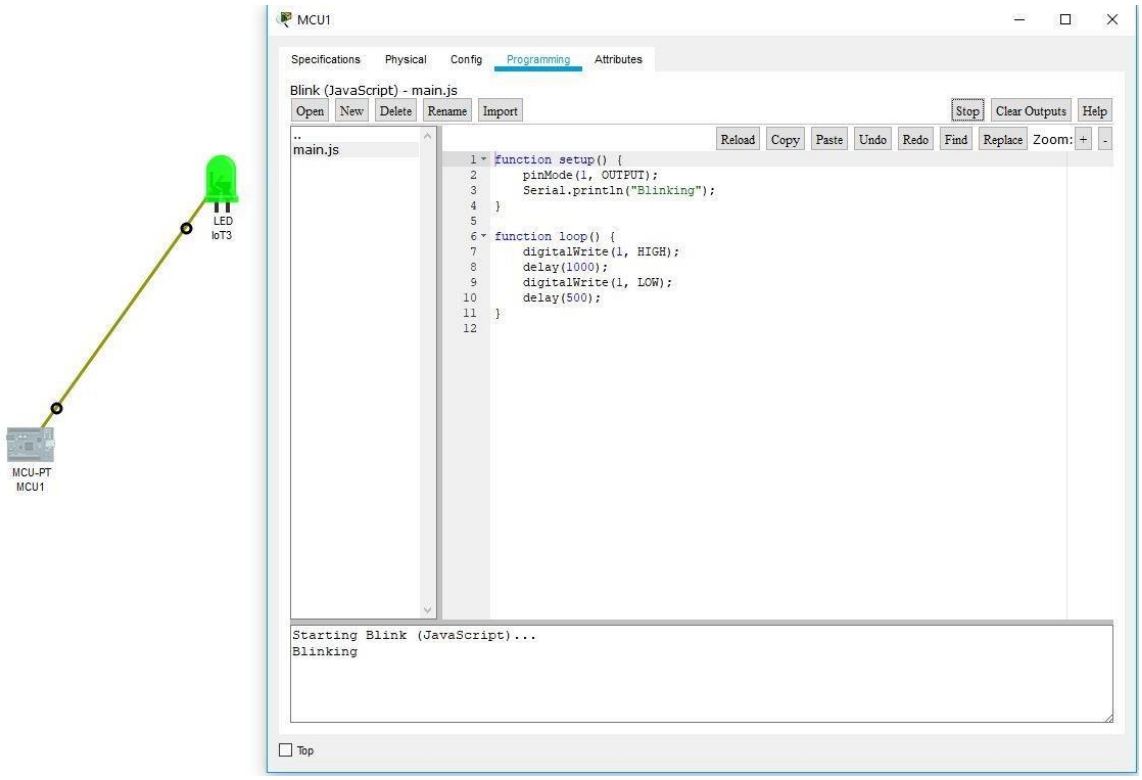
Exercise 4:

1. Open a new workspace.
2. Insert a MCU board and a LED.
3. Connect MCU's D1 port to LED using IoT custom cable.

4. Double click on the MCU and go to the programming tab.

5. Double click on Blink (JavaScript) and then double click on main.js

6. A JS program will be shown. Click on Run button to start the script.



7. Change the value 1 to 3 in all the lines and connect the LED to port D3.

8. Try changing delay values.

9. Save the workspace.

NOTE:-

- For a MCU there are two types of data communication.
  1. Input mode
  2. Output mode
- There are two types of data communicating methods.
  1. Digital data
  2. Analog data
- MCU pins are Digital Input pins by default.
- If we need to change the type we can use **pinMode (pin number, INPUT/OUTPUT);**
- If we need to output a digital data we can use **digitalWrite (pin number, HIGH/LOW);**

- We can use **digitalRead (pin number);** to get a digital input.
- Also there are commands **analogRead (pin number);** and **analogWrite (pin number, value);** for analog input and output.
- We can print on serial interface using **Serial.println ("string");**
- MCUs are high speed devices. So we use **delay (miliseconds);** to wait some time.
- Setup function will be run once. But loop function runs continuously.

Exercise 5:

1. Open a new workspace
2. Add a MCU, LED and push button. Then connect those using IoT cables.
3. You have to connect push button to D0 and LED to D1.
4. Change the script on MCU to the below code

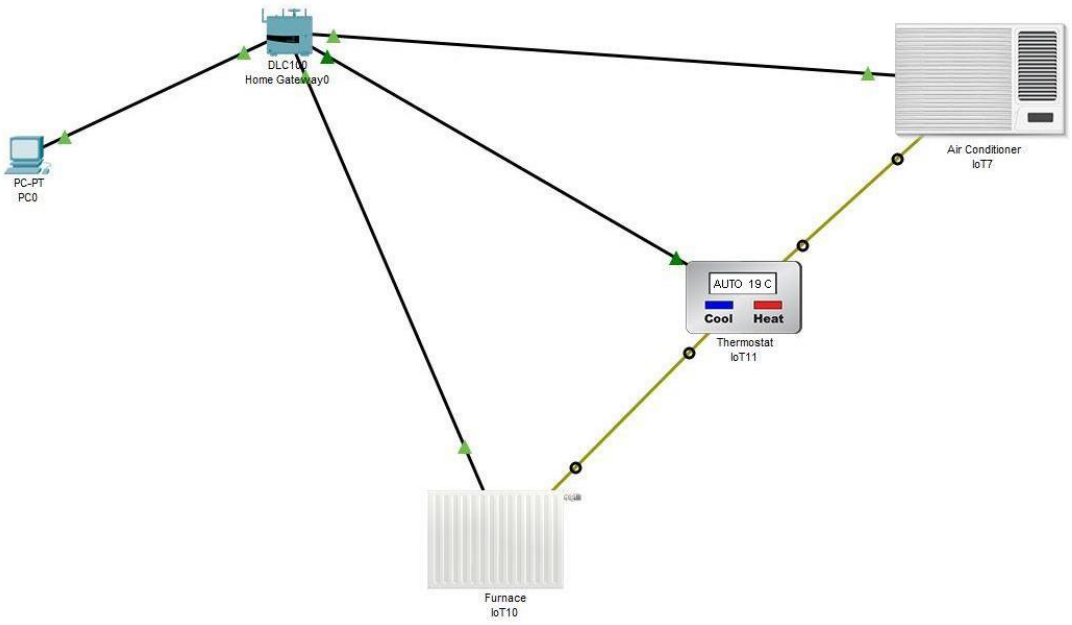
```
function setup() {
	pinMode(0, INPUT);
	pinMode(1, OUTPUT);
	Serial.println("Blinking");
}

function loop() {
	if(digitalRead(0)==1023){
		digitalWrite(1,  HIGH);
	}else{
		digitalWrite(1,  LOW);
	}
}
```

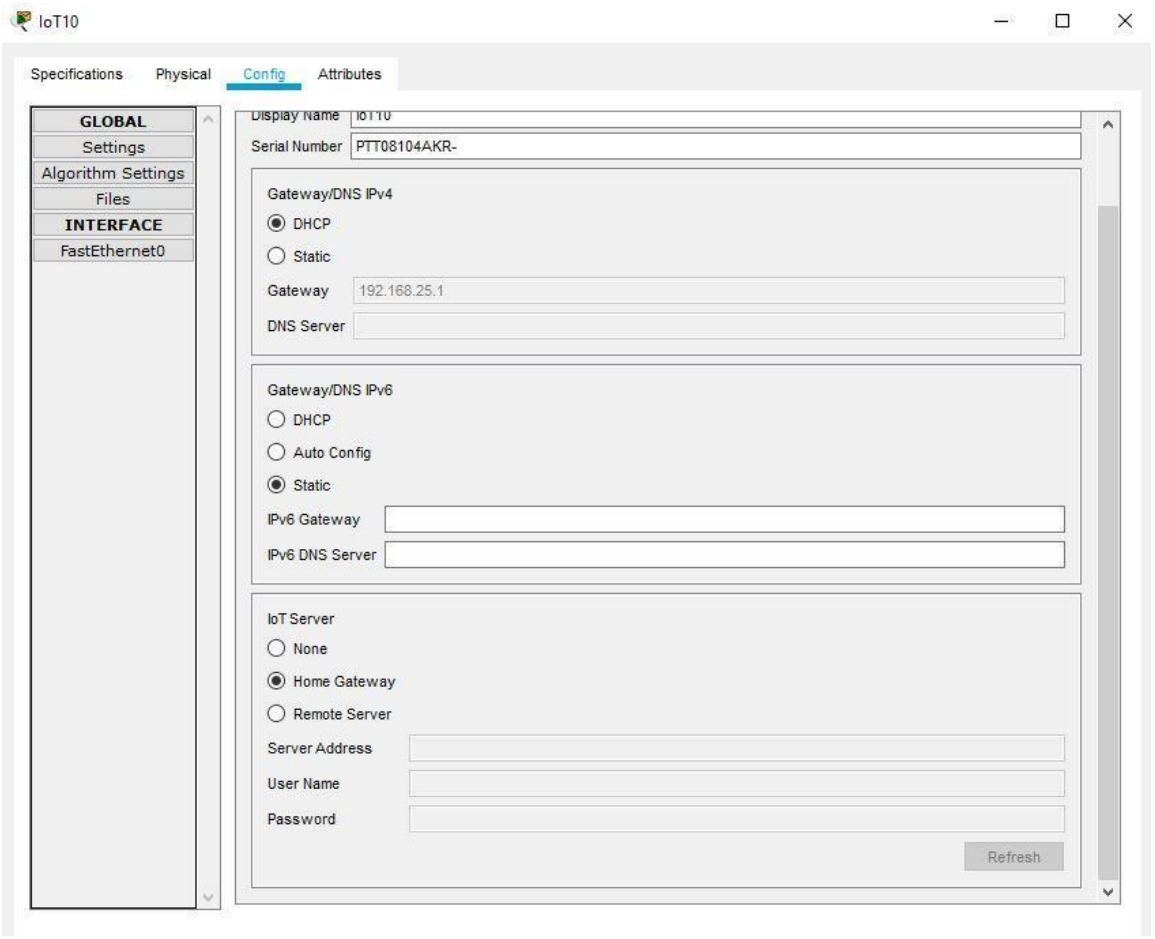
5. Run the code and alt+click on the push putton.
6. Try analog inputs and outputs using a potentiometer and LED. (Analog input value 0-1023, analog output value 0-255)
7. Use other sensors and actuators to practice.
8. Save the workspace.

Exercise 5:

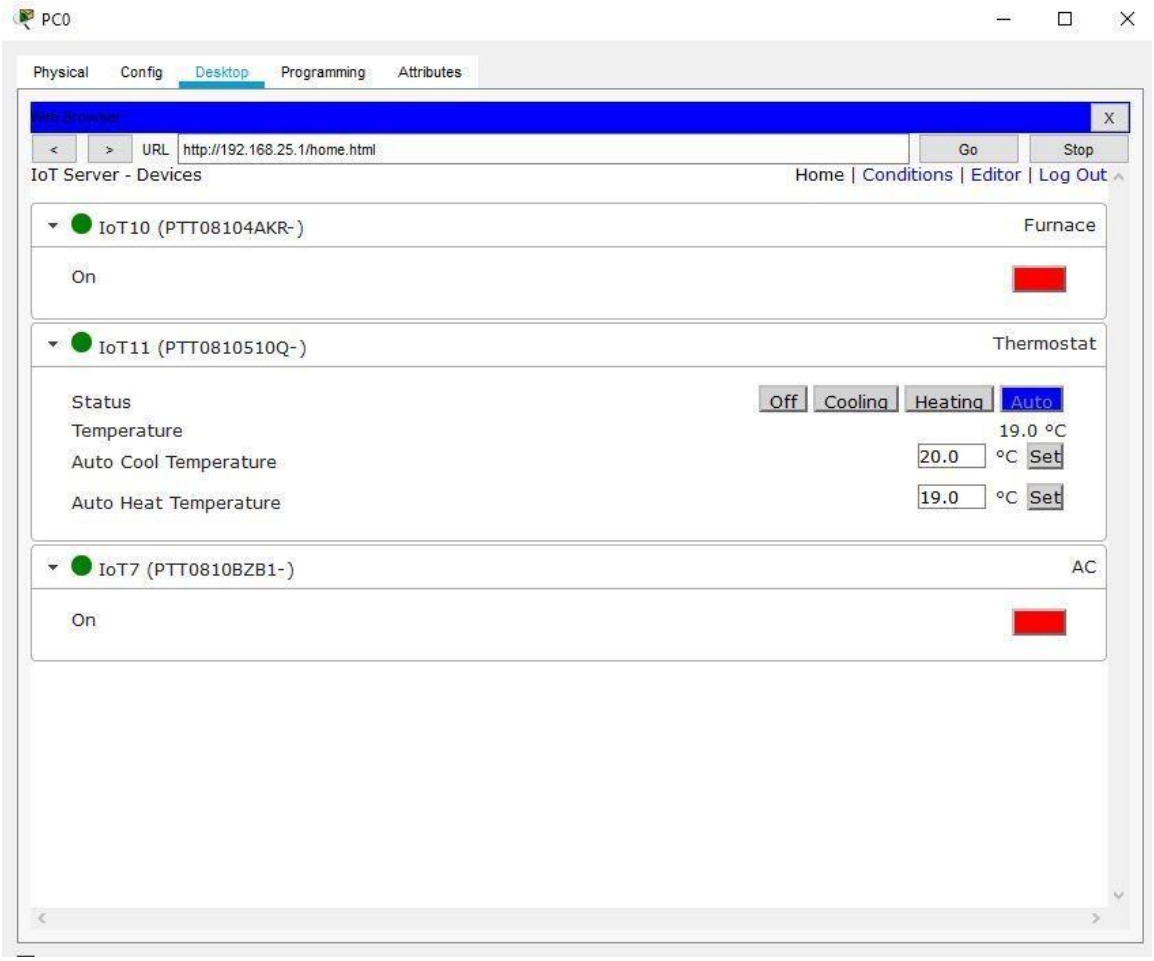
1. Open a new workspace
2. Add a Furnace, Air conditioner and a thermostat using home submenu in end devices component box.
3. Add a PC and Home Gateway device (wireless submenu).
4. Connect Furnace to thermostat's D1 pin and connect AC to D2 pin.
5. Connect all the devices to Home gateway. **Do not use auto cabling.**
6. All the devices must be connected to the Ethernet ports on the home gateway device. Do not use the Internet port.



7. All devices will get DHCP IPs from home gateway. On each of the devices select DHCP and change IoT server as Home gateway.



8. Go to web browser from PC. Enter the URL 192.168.25.1.
9. You will get a login page. The username and password both are **admin.**
10. A page will be shown with three IoT devices. Click on each device and look at the settings.
11. Change thermostat's status to Auto and set the cool and heat temperatures.



12. Close the window and see what happens in the workspace.

13. Save the workspace.

Exercise 6:

Try the other devices in Home, Smart city, Industrial and Power grid sub component boxes. Understand how we can automate our environment using IoTs.

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