IoT MINI PROJECT

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CO2 LEVEL MONITOR

1.1 Introduction:

The IOT(internet of things) is a system which is equipped for interfacing everything to the web through remote sensor networks.CO2 is very harmful in large amounts and is also responsible for climate change and many other environmental issues. Leaving this aside, controlling and monitoring indoor levels of carbon dioxide inside buildings is important for everyone to be safe, healthy and even maintain energy efficiency. High amounts of CO2 inhalation often leads to a silent death. 1.6 million deaths occur every year due to CO2 leakages indoors.

1.2 Hardware/software requirement:

S.NO	DESCRIPTION	QTY
1.	CO2 detector	1
2.	Server	1
3.	Old car	1

4.	Garage door	1
5.	Window	1
6.	Switch	1
7.	PC	1

1.3 Background:

Theory

A carbon dioxide sensor or CO_2 sensor is an instrument for the measurement of carbon dioxide gas. The most common principles for CO_2 sensors are infrared gas sensors (NDIR) and chemical gas sensors. Measuring carbon dioxide is important in monitoring indoor air quality.

Although CO2 is produced both naturally and through human activities, it is not classified as an air pollutant. However, it is treated as a pollutant because the amount of oxygen required for breathing becomes insufficient at high concentrations of CO2 in an indoor space. CO2 is a representative greenhouse gas that causes global warming. Thus, the CO2 gas sensor module CM1103 is installed to detect and monitor CO2 concentrations. The sensor uses nondispersive infrared technology (NDIR) that has advantages of high precision, fast response, and factory calibration. Also, it features excellent long-term stability with low power consumption

4.3 Components description:

4.3.1
Old Car
A car having lots of problems.

Features:

- **Off**
- **On**
- **Increases Carbon Dioxide**
- **Increases Carbon Monoxide**
- **Increases Smoke**

Usage:

- **N/A**

Direct Control:

- **ALT-click to interact**

Local Control:

- **N/A**

Remote Control:

- **N/A**

Data Specifications:

- **N/A**

Example:

- **Place a CO detector and a CO2 detector within the same container as the car.Turn on the car and notice the alarm indicators go off on the detectors.**

4.3.2

Garage Door

A garage door opener.

Features:

- **Registration Server Compatible**
- **Ability to vent Carbon Dioxide and Carbon Monoxide**

Usage:

- **N/A**

Direct Control:

- **ALT-click to interact**

Local Control:

- **Connect device to MCU/SBC/Thing. Use the customWrite API per Data Specifications**

Remote Control:

- **Connect device to Registration Server using Config Tab**

Data Specifications:

- **Input Slot: D0**
- **Message Format: [state]**
- **state: 0 = closed, 1 = open**

Example:

- **Look for an IoT sample file named garage_door.pkt.**

4.3.3

Window

A window that can open or close

Features:

- **Registration Server Compatible**
- **Ability to vent Carbon Dioxide and Carbon Monoxide**

Usage:

- **Windows works with Environment objects. It reads CARBON_DIOXIDE and CARBON_MONOXIDE variables set in the Environment object and change these variables when users activate window opening/closing**

Direct Control:

- **ALT-click to open and close**

Local Control:

- **Connect device to MCU/SBC/Thing. Use the "customWrite" API per data Specifications**

Remote Control:

- **Connect device to Registration Server using Config Tab**

Data Specifications:

- **Message Format: [state]**
- **state: 0 = closed, 1 = open**

Example:

- **N/A**

4.3.4

Carbon Dioxide Detector

Detects the level of the carbon dioxide

Features:

- **Registration Server Compatible**
- **Alarm will go off when it detects a Carbon Dioxide level of 60%**
- **Usage:**
- **Use an Old Car to change the Carbon Dioxide level**

Direct Control:

- **N/A**

Local Control:

- **N/A**

Remote Control:

- **N/A**

Data Specifications:

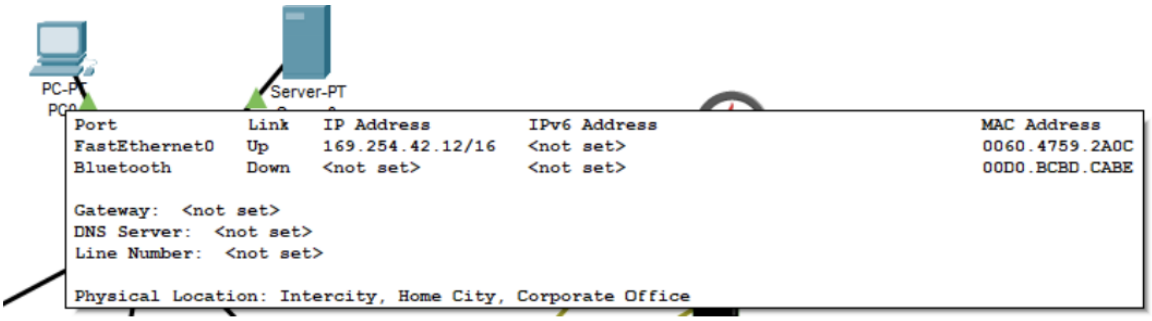
- **Message Format: [state],[level]**
- **state: 0 = alarm off, 1 = alarm on**
- **level: a positive number**

Example:

- **Start an Old Car to increase the Carbon Dioxide level, alarm will turn on when the level > 60%**

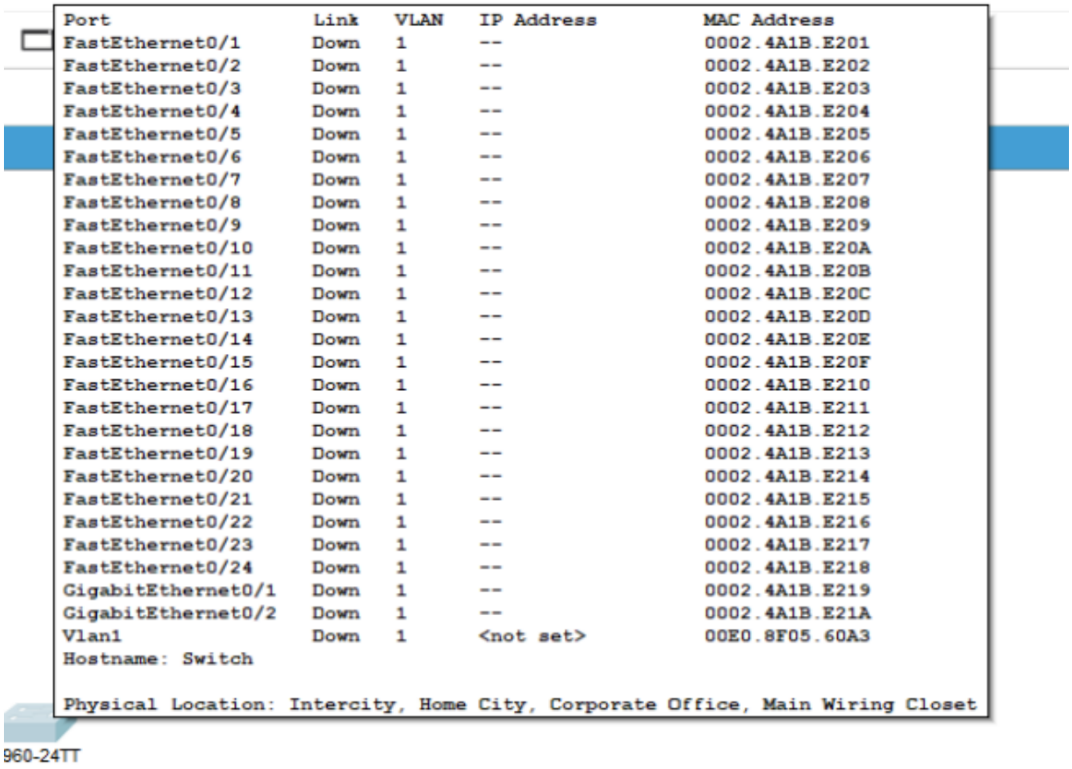
4.3.5

Desktop computer



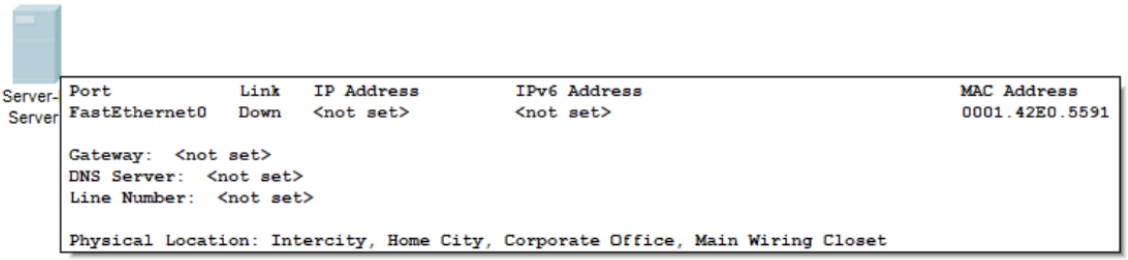
4.3.6

Switch



4.3.7

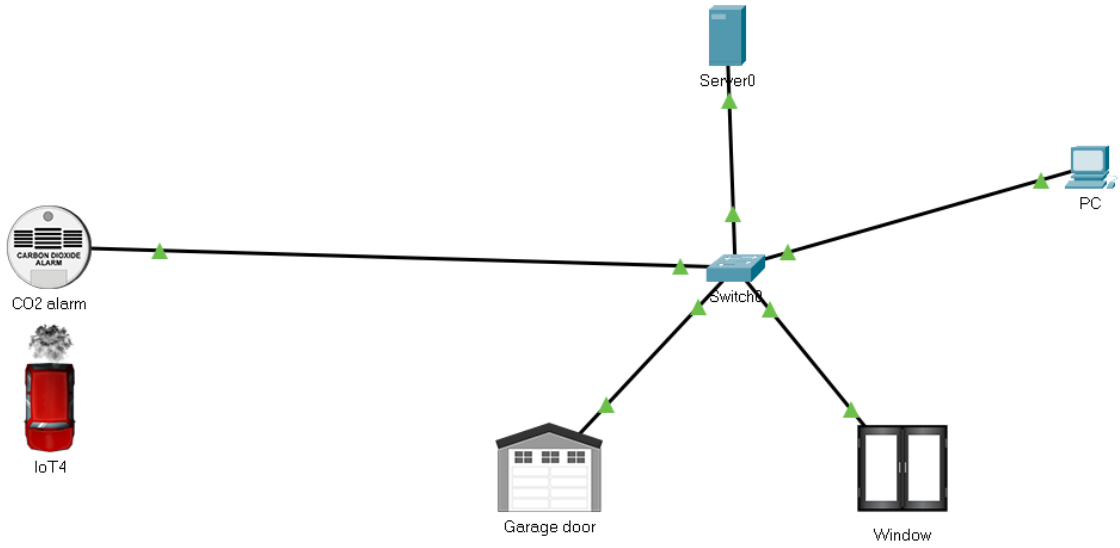
Server

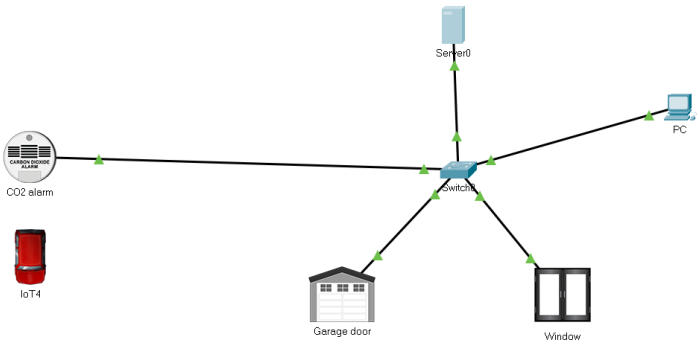


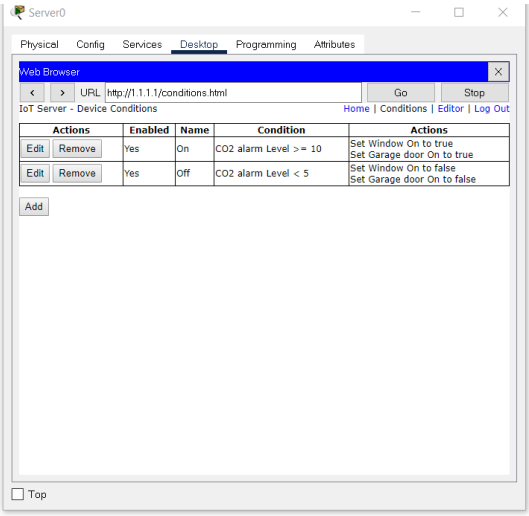
4.4 Procedure:

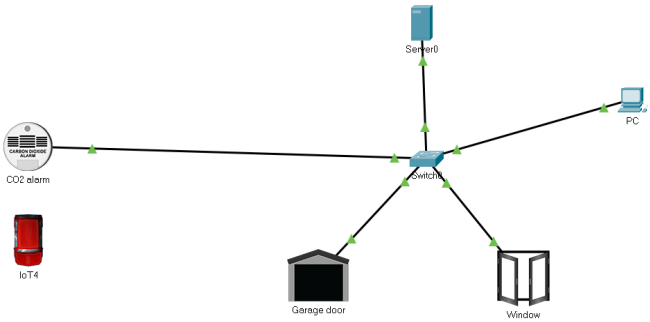
a. **Launch cisco packet tracer in desktop.**
b. **From the file menu select New File.**
c. **Work in the logical window.**

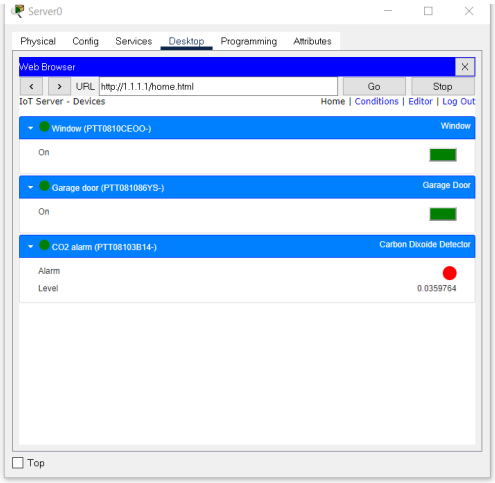
d. Add the required devices from the network components space, and select the components for building the logical network.
e. Connect all the network components using Copper Straight- Through cable.
f. Configure the Server-PT, using the tab Settings and Fast Ethernet
g. Configure the PC-PT, using the tab Settings and Fast Ethernet
h. Configure the CO2 detector, using the tab Settings and Fast Ethernet
i. Configure the Garage door, using the tab Settings and Fast Ethernet
j. Configure the Window, using the tab Settings and Fast Ethernet
k. Configure the server using DHCP IP address




Server0
PC
CO2 alarm
Switch0
IoT4
Garage door
Window


Server0
Physical
Config
Services
Desktop
Programming
Attributes
Web Browser
URL
http://1.1.1.1/conditions.html
Go
Stop
IoT Server - Device Conditions
Home | Conditions | Editor | Log Out
Actions
Enabled
Name
Condition
Actions
Edit
Remove
Yes
On
CO2 alarm Level >= 10
Set Window On to true
Set Garage door On to true
Edit
Remove
Yes
Off
CO2 alarm Level < 5
Set Window On to false
Set Garage door On to false
Add
Top


Server0
PC
CO2 alarm
Switch0
IoT4
Garage door
Window


Server0
Physical
Config
Services
Desktop
Programming
Attributes
Web Browser
URL
http://1.1.1.1/home.html
Go
Stop
IoT Server - Devices
Home | Conditions | Editor | Log Out
Window (PTT0810CEOO-)
Window
On
Garage door (PTT081086YS-)
Garage Door
On
CO2 alarm (PTT08103B14-)
Carbon Dioxide Detector
Alarm
Level
0.0359764
Top


Caution
CO_2 alarm
vacate immediately

4.5 Observations:

Server

Port ID	**FastEthernet0**
Link (UP/DOWN)	**UP**
IPv4 Address	**1.1.1.1**
IPv4 Subnet Mask Address	**255.0.0.0**
IPv6 Address	**<not set>**
MAC Address	**0004.9A8E.85AC**

PC

Port ID	**FastEthernet0**
MAC Address	**0001.9672.15AA**
IPv4 Address	**1.1.1.2**
IPv4 Subnet Mask Address	**255.0.0.0**

Switch

Port ID	**FastEthernet 0/0**
MAC Address	**NA**
IPv4 Address	**NA**
Ipv4 Subnet mask address	**NA**
VLAN	**1**

Link (UP/DOWN)	**UP**

Garage door

Port ID	**FastEthernet0**
MAC Address	**00D0.BA43.4D02**
IPv4 Address	**1.1.1.4**
IPv4 Subnet Mask Address	**255.0.0.0**
Link (UP/DOWN)	**UP**

Window

Port ID	**FastEthernet0**
MAC Address	**00E0.8FB5.4482**
IPv4 Address	**1.1.1.3**
IPv4 Subnet Mask Address	**255.0.0.0**
Link (UP/DOWN)	**UP**

Co2 Detector

Port ID	**FastEthernet0**
MAC Address	**0005.5EA0.3401**
IPv4 Address	**1.1.1.5**
IPv4 Subnet Mask Address	**255.0.0.0**
Link (UP/DOWN)	**UP**

4.6 Result:

Window and garage door have been activated successfully whenever the Co2 level goes above 20% and closes when the CO2 level goes

below 5% which is the percentage at which it is breathable. The experiment has successfully been conducted using Cisco Packet Tracer.