Internet of Things Simulation Performance using Cisco Packet Tracer Platform

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ABSTRACT
Recently, many companies have produced programs, applications, and platforms in various fields, including in architectural design, network design, electronic circuit designs, and many other engineering and medical fields. These programs act to represent and simulate projects in a way that facilitates workers in various fields to visualize their projects accurately and obtain results before proceeding to apply it on the ground. Cisco is one of the leading companies in this field, as the company provides an integrated platform called Packet Tracer. This platform is used to simulate connecting devices, creating small and large networks, using protocols to send and receive data, etc., and also supports the environment to simulate Internet of Things (IoT) technology, where a house can be designed Or a building and placing different devices in it, and then connecting these devices together, programming them, and controlling them through the web application inside the platform.This paper presents a simulated business model for the Internet of Things, where some devices are connected with the controller, then connected to the router in order to data transmission and also computer used to control the devices through the application.

Keywords
Packet tracer, IoT, Platform.

1. INTRODUCTION
The Internet of Things (IoT) is one of the modern technologies that are witnessing a great development in all fields of information technology. This is due to the expansion of different types of devices in all areas of life and the ability of these devices to connect to the world of the Internet and share data between them, so they are called smart devices(fig.1). With the growth of this technology, the challenges and risks increased to devices and data, so it must work on designing networks of this technology with a high level of accuracy and security to provide the necessary protection for it, and for this reason it should resort to using a platform to simulate our project before applying it in order to avoid all mistakes and make an integrated project in all respects [1].

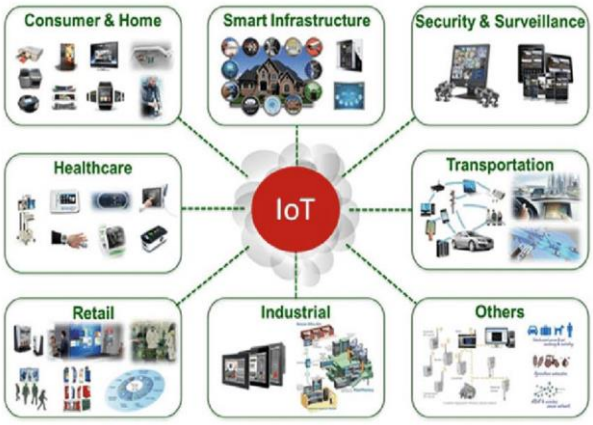

Fig 1: Applications of internet of things [2].

2. INTERNET OF THINGS WITH CISCO
Cisco devices has been used for many years to instruct engineers on Cisco networking, was selected as the technology for the simulations. The tool's main advantage is that it provides a choice of network components that replicate those found in a real network. Devices would then need to be linked and set up in order to form a network. The Internet of Things (IoT) functions were added to the tool by Cisco in a previous edition, and now smart devices, components, sensors, actuators, as well as devices that mimic microcontrollers like the Arduino or Raspberry Pi, can be added to the network. All IoT devices can run on pre-written software or be customized using Java, Python, or Blockly programming. As a result, Cisco Packet Tracer is the perfect. In this study, the work of this platform will be evaluated and how it can be used in the laboratory to facilitate researcher's projects[3].

Cisco has worked on modernizing its devices to be able to support the Internet of Things systems, and has made great progress in this field at various levels, and has established a complete academy to teach the Internet of Things and how to use its devices in this field.

3. PCKET TRACER
Packet Tracer created by Cisco and made available to consumers without cost. Users can design, construct, and resolve network issues using the potent visualization and simulation tool Packet Tracer in a secure setting. With its simple drag-and-drop interface, you can easily construct your topology. (fig.2) display packet tracer UI.[4].

The device's interfaces can be easily added and removed, and you may choose the interfaces by choosing the devices. To check if the devices are UP & Running (i.e., running), you don't even need to create a ping command; all you need to do is click on an envelope and ping it. It supports practically all testing-required networking hardware and connections.[5].

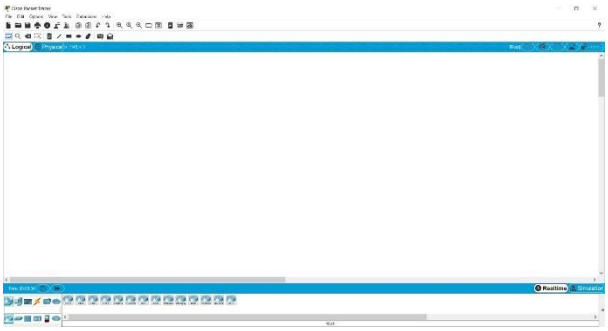

Fig 2: The project device.

This paper introduces some components used to build our IoT network design:

3.1End Devices

Packet Tracer is available in this field on peripheral devices that are used as sensors to sense different types of conditions such as movement, heat, light, etc.[6].

There are devices that work to display data as well as other devices that work to enter data into the system.(See fig.3).

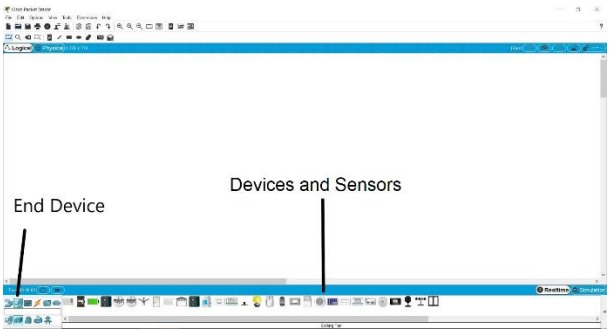

Fig 3: Packet Tracer End Devices.

3.2 Devices features

Each of these devices consist of features it can be set appropriate properties by double click to devices. (See fig.4).

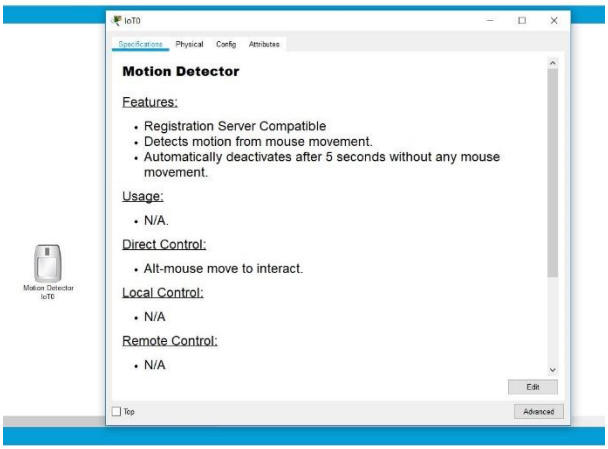

Fig 4: motion detector properties.

There are set of properties above, including:

Specification / which are the characteristics of the device or sensor and its advantages as well as its software status, where some features appear if the bar drop to the bottom the following:

Data Specifications:

Message Format: [state]

state: HIGH=activated, LOW=inactive

As in the case of HIGH the device is effective and in the case of LOW it is ineffective. Also, there is an onfig for the settings of the device, its IP status, and determining the method of connecting it, whether via cable or wireless. Also, the Attribute shows the specifications of a device, and finally there is programming. This section appears in the microcontrollers, through which it can be program the microcontroller and control the devices and sensors.

4. PROPOSED SYSTEM

This paper introduces a design of system to demonstrate and evaluate the functioning of this environment (See fig 5), this system consists of:

- Laptop
- Home Gateway
- Microcontroller (Arduino)
- LED
- Motion Sensor.

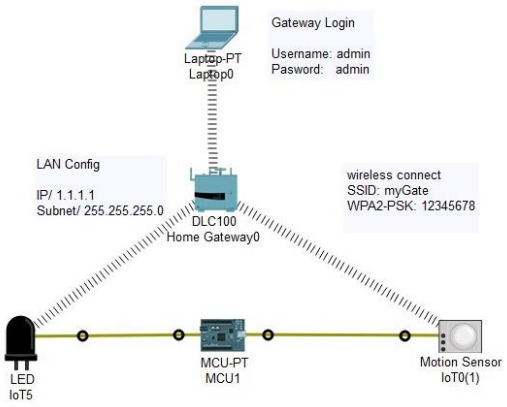

Fig 5: Implementation of the Proposed System.

4.1 The Procedure

The aim of system security, which the LED turns on when the sensor movement around, also the sensor and the LED can be controlled through the laptop via the Gateway.

By inserting the elements mentioned and shown in the (fig.5), through the sources that were mentioned previously, and also the sensor and the LED are connected to the controller using the special IoT cable (See fig.6).

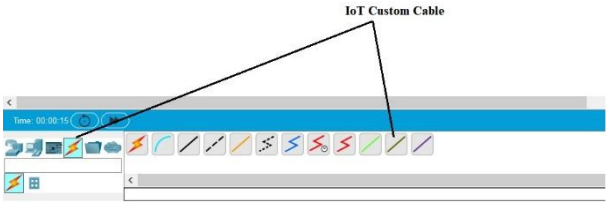

Fig 6: IoT custom cable

At connected the elements, its require to specify the input and output (GPIO) of the sensor, which is: (A3, A2, A1, A0, D1, D2, D3, D4, D5) This is what benefit from in programming the sensor, as it is known.

In addition, connect the sensor, the LED, and the laptop with the Gateway via wireless for the purpose of accessing the sensor and the LED via the laptop using the browser, Choose the component and apply the steps (See fig.7).

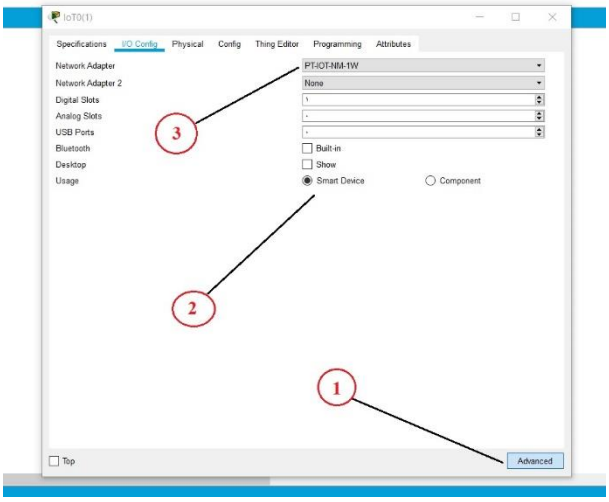

Fig 7: Component properties

In the Configuration section, notes that the wireless connection has appeared, by select it and enter the SSID and WPA2 / PSK, which are like : SSID= myGate and WPA2/PSK= 12345678(fig,8).

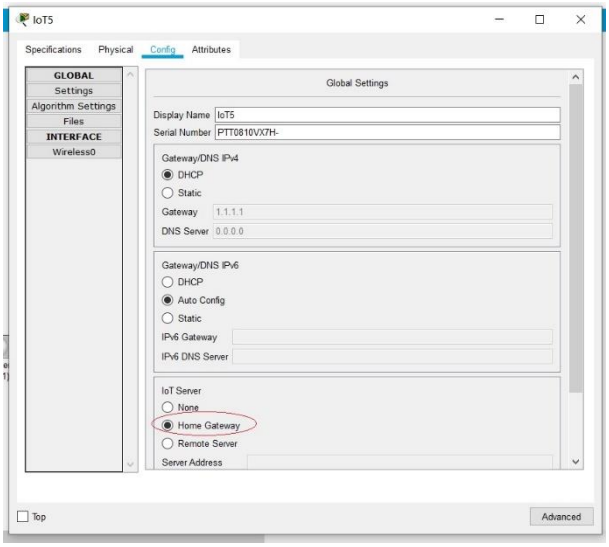

Fig 8: SSID and WPA2/PSK configuration

This process repeated for the LED and the laptop. Also, its should be set a private IP for the Gateway, through the Configuration in the LAN part, as show in (fig.9).

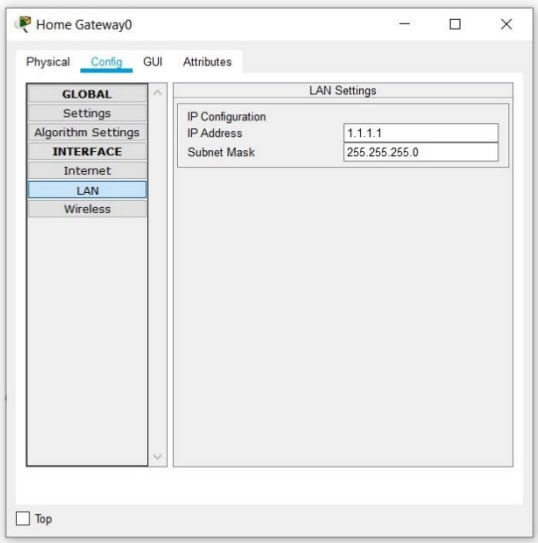

Fig 9: Gateway IP setting

4.2 Microcontroller Unit

The important part of the system is the microcontroller, where this component programmed to control all the components associated with the system, Packet Tracer supports the microcontroller with features through which the real microcontroller can be simulated and programmed on the same mechanism. By clicking on the controller, Packet Tracer provides an integrated IDE for programming microcontrollers and connected components through the JavaScript and Python programming languages, and there is documentation for using of these two languages within the Packet Tracer package., the settings for this microcontroller show the Programming part(See fig.10,11,12).

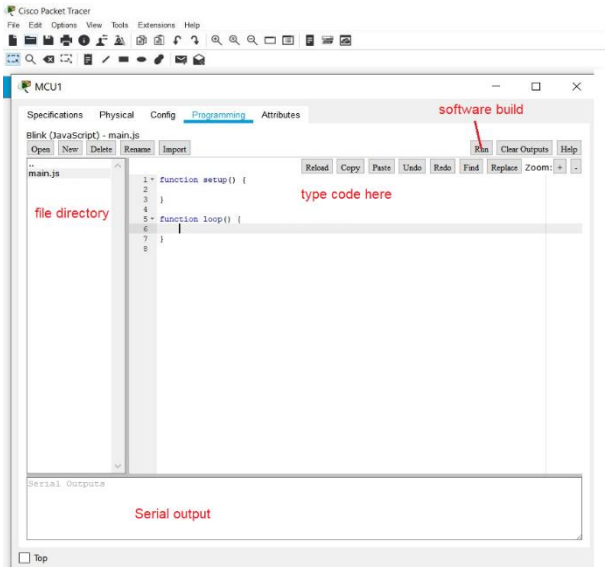

Fig 10: Microcontroller IDE

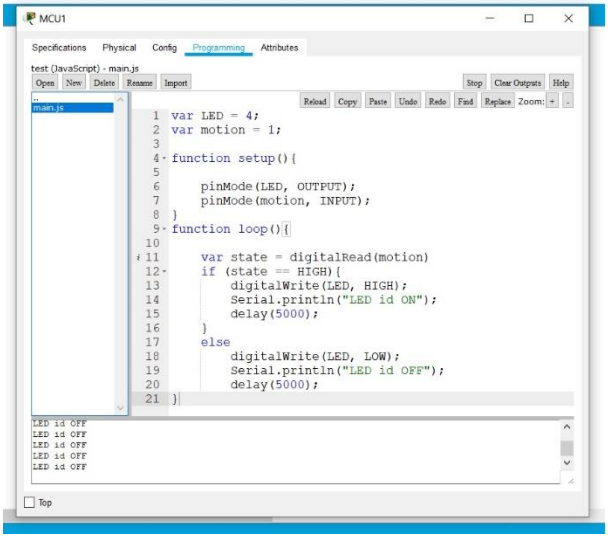

Fig 11: Programming by JavaScript.

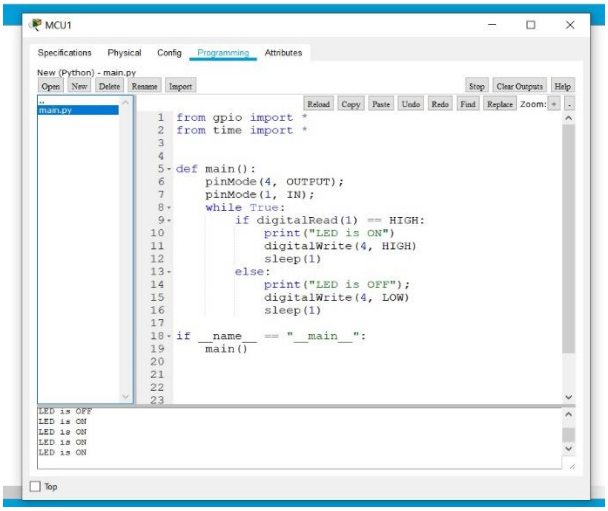

Fig 12: Programming by JavaScript

The elements are accessed through the laptop by clicking on the laptop icon and going to the desktop and selecting the web browser as shown in (fig.13).

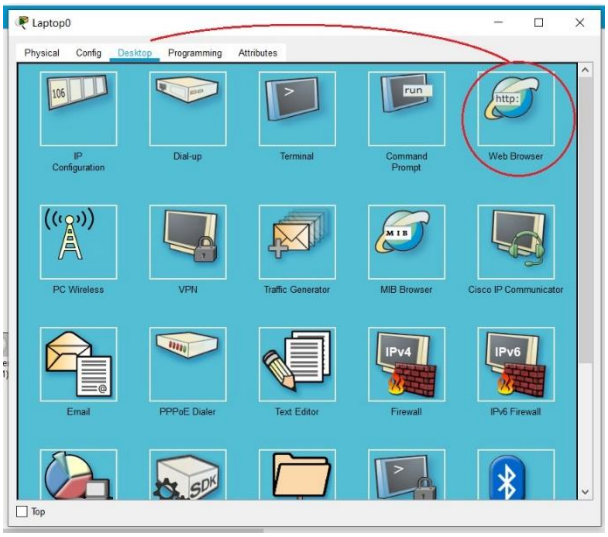

Fig 13: Laptop Desktop Apps in packet Tracer

In the field of URL insert http://1.1.1.1 and type admin as a username and password and then click submit, it moves to home page(fig.14)

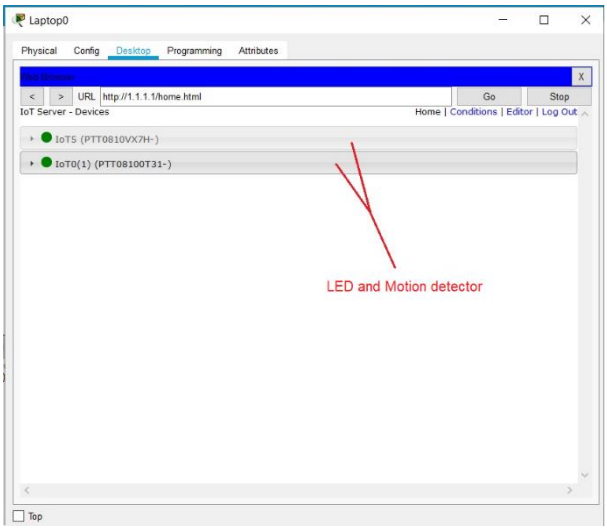

Fig 14: Web home page

Now the status of the sensor or the LED cn be seen by clicking on any of item, and it can be control them as well.

5. CONCLUSION

The use of integrated platforms saves researchers and engineers a lot of time in simulating and representing their projects before starting to implement it realistically, and also reduces the financial cost due to avoiding errors that may occur during the implementation of the project. This research presented a model for using one of those platforms, which is Packet Tracer and explain how it works and evaluate its performance in the Internet of Things networks, and the result was easily dealing with tools and programming the controllers within this platform.

6. REFERENCES

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