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Implementing Smart College Using CISCO Packet Tracer7.2 Simulator

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ABSTRACT
Aims of this paper implement Smart College; the Internet of Things (IOT) is the new technological paradigm is conquering the entire world by connecting various objects around us. IOT make people's lives easy and comfortable and IOT use in different applications one of them is education, the smart college (a college that uses IOT) use smart devices used in a campus utilize WiFi network for receiving instructions and sending data. A computational IOT nervous system for colleges to keep track of major resources, create smarter lesson plans, design secure campuses, enhance information access, and much more with its set of advanced tools, IOT can be regarded as a new method of implementing smart college using the same infrastructure of data communication. to provide implementation of smart college.
Keywords - IOT (Internet of Things); Gateway, Server; Microcontroller; Router ; RIP(Routing Information Protocol).

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I. INTRODUCTION

The IOT was started in the year 1998 and the term internet of Things was first coined by Kevin Ashton in 1999 [1]. Internet of Things (IOT) refers to the use of intelligent devices to take advantage of data. The rapid spread of Internet over the years and the coming years has led to the convergence of a new dimension of services that improve the quality of consumers' lives and the productivity of enterprises. Internet of Things (IOT) is a new Internet revolution. It makes the objects themselves identifiable, obtain intelligence, convey information about them and can access information gathered by other things. Internet of Things lets you connect with people and things anytime, anywhere [2].The focus on IOT is in the configuration, control and networking via the Internet of devices or "Things" that are traditionally not associated with the internet [3].

II. IOT APPLICATION:

2.1 Smart cities

Internet Objects plays an impotent role to improve urban intelligence and includes many applications to monitor the availability of parking spaces in the city. The availability of parking spaces and street lighting is monitored, urban bridges are monitored and monitored, street lighting is adapted to the weather, Garbage, and smart roads, with warning messages and conversions according to climate conditions and unexpected events such as accidents or traffic jams [2].

2.2 Manufacturing

Intranet of things role became more important in enabling access to hardware and machines, which were hidden in manufacturing systems. This development will allow IT to bypass digital manufacturing systems. IOT Industrial will connect the plant to many applications, which work around production. The factory is connected to the smart grid, thus leading to more intelligent and efficient production.

2.3 Health

There are many benefits that Internet technologies offer to the healthcare field in tracking things, employees and patients, identifying and documenting people, automatically collecting data, monitoring patient flow status to improve hospital work. Identification and documentation to reduce harmful accidents of patients, comprehensive electronic medical record, maintenance, and identification of infants in hospitals to prevent match [4].

2.4 Agriculture

Information such as current temperature, soil moisture conditions, leaf wetness, and solar radiation is collected and analyzed by the sensors [4].

III. IOT ADVANTAGES AND DISADVANTAGE:

3.1 IOT advantages

Data – The more information, the easier it is to make the right decision. Find out what to buy from the grocery store while away from home, saving time and comfort.

- Technology Optimization – Technologies and data improve customer service and help make technology more efficient.
- Reduced Waste – Internet things make areas of improvement clear. Where the Internet provides information objects in the real world leading to more efficient management of resources.

3.2. IOT disadvantages:

- Security – IOT creates an ecosystem of constantly connected devices communicating over networks. The system offers little control despite any security measures. This leaves users exposed to various kinds of attackers.
- Privacy / /Security – IOT is involved in many devices and technologies and will be monitored by multiple companies. Because smart sensors will transmit a lot of relevant data, there is a high risk of losing private data.
- Complexity – Some find that Internet systems are complex in terms of design, deployment and maintenance because they use multiple technologies and a wide range of new technologies.
- Flexibility – Many are concerned about the flexibility of an IOT system to integrate easily with another. They worry about finding themselves with several conflicting or locked systems.
- Compliance – Internet, like any other business technology, should be in line with regulations, making compatibility very difficult when many consider standard programs.[7]

IV. HOME GATEWAY:

4.1 Home gateway and IOE devise

By using Home Gateway a wireless access point as the figure 1 shows internet of Things devices (Lamp, Door, Window, and Fan) connected to it by using wireless. The IOE devices can be connected wireless to Home Gateway remotely by changed the Network adapter as shown in figure 2. IOE Device after changed the Network Adapter and IOE Server from None to Home Gateway figure3. The Home Gateway default internal IP address is 192.168.25.1 and the IOE devices dynamically (DHCP) addressing.

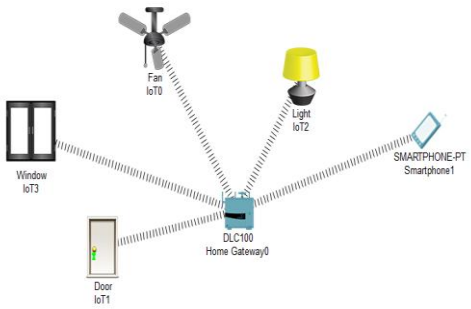

Fig1: IOT devices connected to Home Gateway

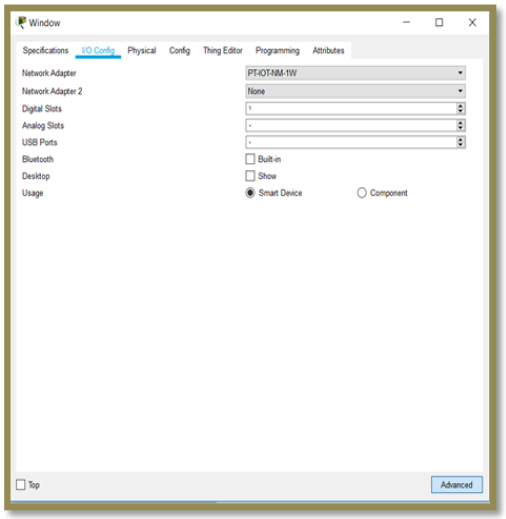

Fig 2: Changed Network Adapter in IOT device

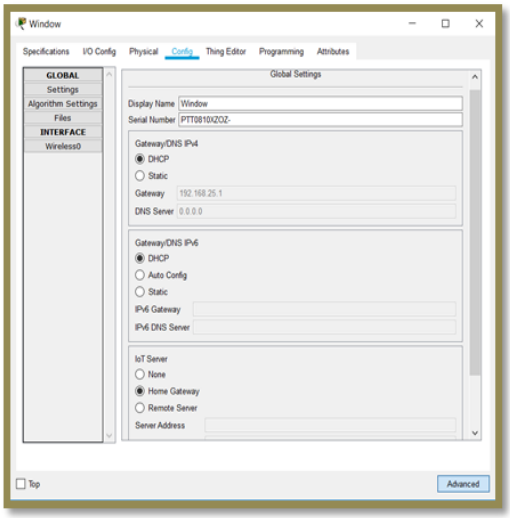

Fig 3: Example of IOT Device after changed the IOT Server to home gateway

4.2 Smart Phone:

In The Smartphone desktop we can found IOT Monitor icon figure 4. The IOT monitor displayed all IOT devices as we see in figure 5. Smart phone connected to home gateway to change IOT devices status as we see in fig 6 and we can edit IOT device condition for example if Lamp is on close the window figure 7.

Fig4: Smartphone desktop

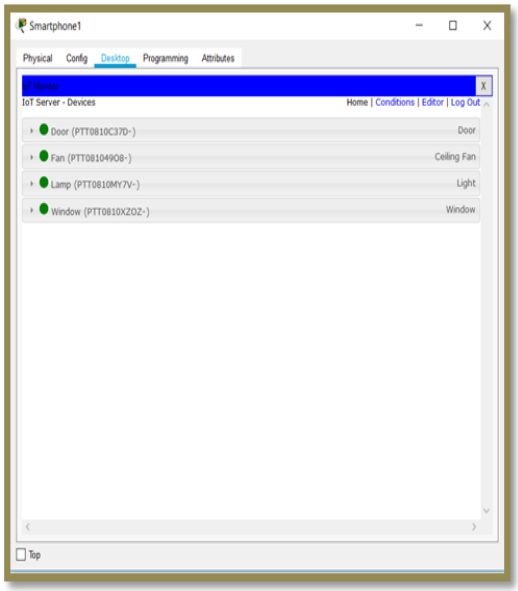

Fig 5: Smartphone IOT monitor

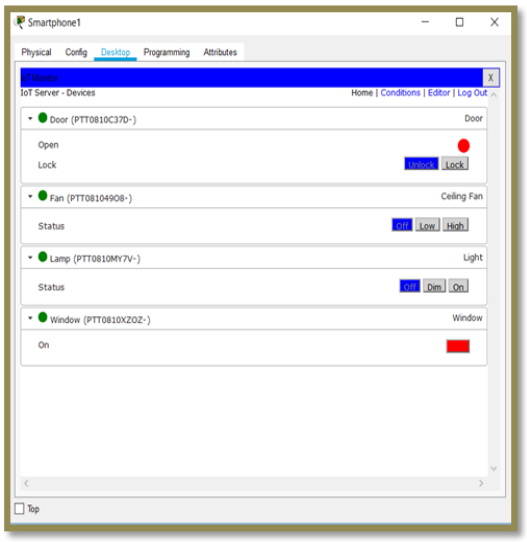

Fig 6: Smartphone IOT devices status

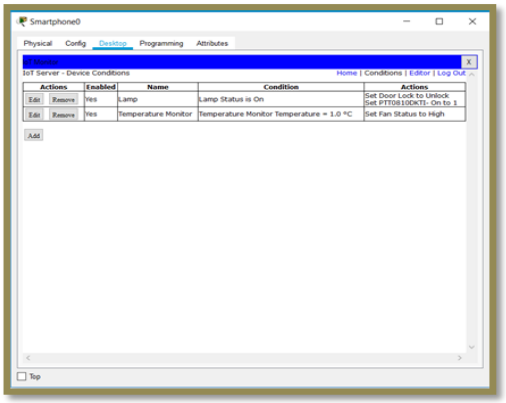

Fig7: Conditions edit by using Smart phone

4.4 IOT server registration

To logon in to server we can create username and password figure9, and we can display the username and password in Services – IOT.

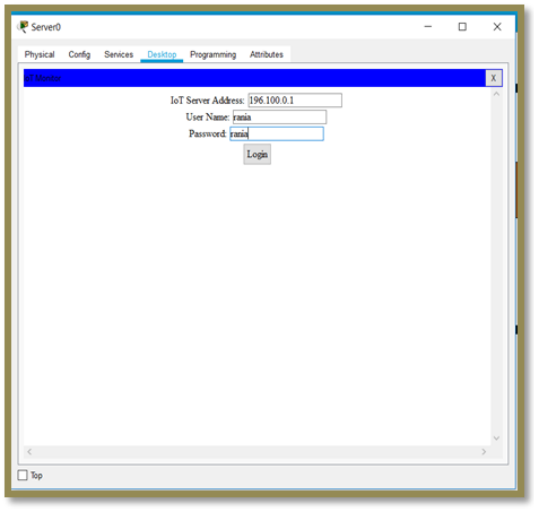

Fig 9: IOT server logon

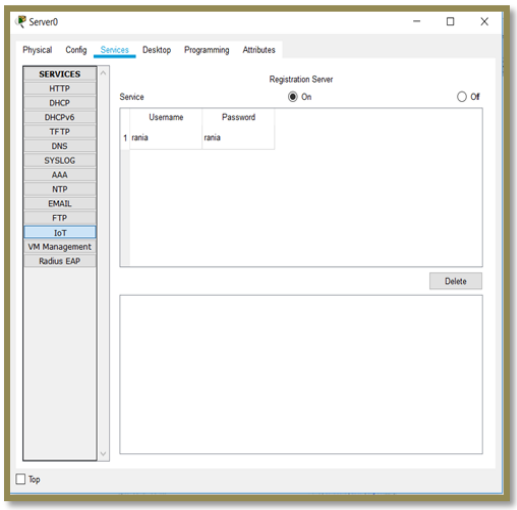

Fig 10: Registration Server for IOT services

4.5 IOT device registration:

The smart devices were remotely connected to the IOT server sharing the same username and password credentials. Connection also was established by using the static IP of the IOT server hosted in the same IOT network as shown in figure 11 and figure 12.

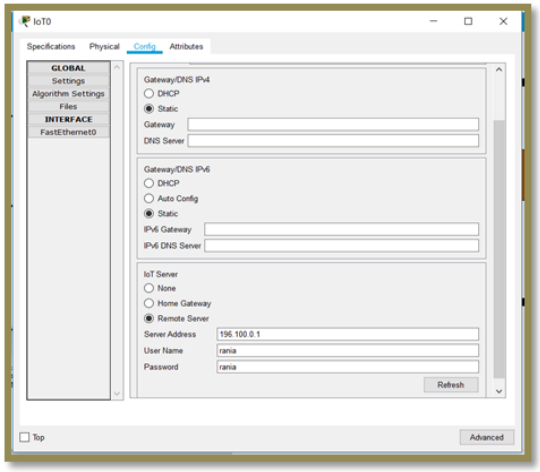

Fig 11: Registration Device in Remote server

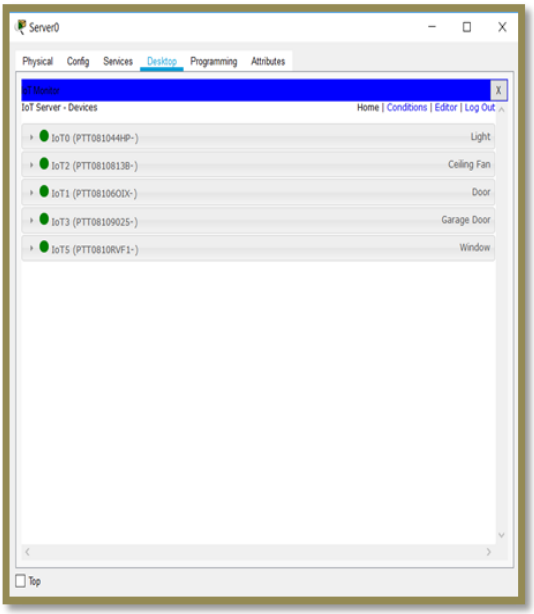

Fig12: IOT monitors in server

V. IOT MICROCONTROLLER (MUC)

IOT microcontrollers are referred to as the heart of any wireless node or electronic device located in the IOT network. These microcontrollers are designed to seamlessly process the data and enable interaction with the network as shown in figure 13.

VI. CONNECTING LANS:

6.1 Connecting Routers

The backbone network was created utilizing three interconnected routers. Every router had a connection to the other two in order to build a redundant infrastructure that could withstand failures of trunks between the routers figure 13.

6.2 A backbone routers network

A backbone routers network connected a traditional switch based classroom wired network, a wireless LAN for the department buildings and a dedicated IOT network based also on switch figure 13. Along with the backbone connection each router was also connected to one of the three sub-networks: Computer lab building network, department building network and staff building network. All the three networks were physically separated by placing them in an own dedicated physical container.

6.2.1 The first network

A simple network for emulate a PC laboratory room where, nine PCs, connected by Ethernet cables to the classroom switch. Switch was then connected to one of the Ethernet port of the router.

6.2.2 The second network

The department building network was also a simple WLAN network that simulated a wireless connectivity in the computer's department buildings using home gateway and also connected IOT devices by using MUC. In this case a WLAN router was utilized in order to create the local wireless network; router was then connected with one of the backbone routers. DHCP functions in this network were also carried on by the WLAN router. One a smartphone was connected to the wireless network.

6.2.3 The third network:

The office building (IOT network), this was a switch-based network connected to the third backbone router. IOT devices and IOT server were all connected to the same switch. In the original specification of the IOT simulation a WLAN router was supposed to be utilized to connect the entire IOT device.

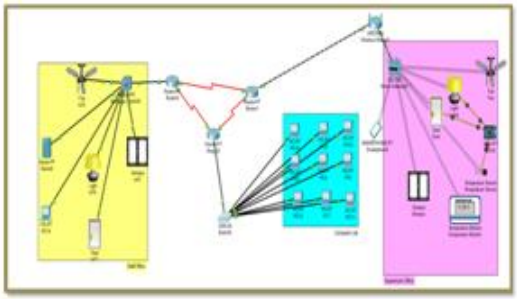

Fig13: Cisco Packet Tracer layout of Smart-College simulation

VII. RIP ROUTING

For keeping the routing between the backbone devices simple yet, to allow full connectivity between the three networks, a basic Routing Information Protocol (RIP) was used in the router configuration. RIP is a very simple, and old, routing protocol that periodically shares routing table between devices. [8]

7.1 RIP routing in Router0

Configure routing by using RIP routing protocol in Router0 by adding the directly connected networks IP addresses as shown in the figure 14.

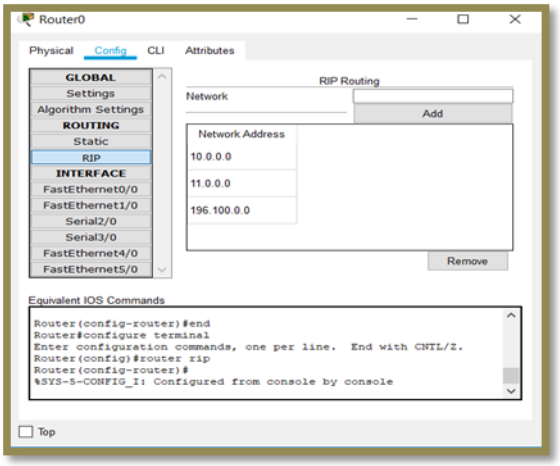

Fig 14: RIP Routing in Router0

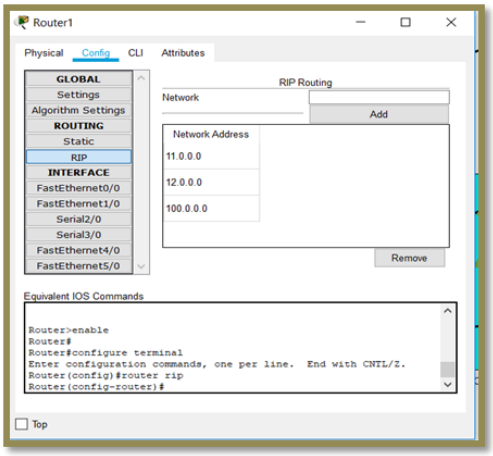

Fig 15: RIP Routing in Router1

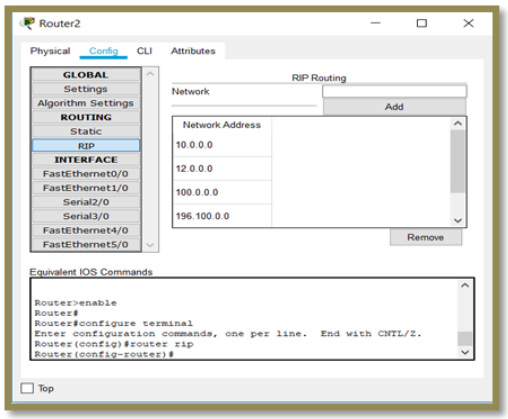

Fig 16: RIP Routing in Router2

7.2 RIP routing in Router1

` Configure routing by using RIP routing protocol in Router1 by adding the directly connected networks IP addresses as shown in the figure 15.

7.3 RIP routing in Router2

Configure routing by using RIP routing protocol in Router2 by adding the directly connected networks IP addresses as shown in the figure 16.

VIII. COLLEGE BUILDINGS

Connection between the College buildings . The last step test the Connection between College buildings and the figure 17 show the connection was successful.

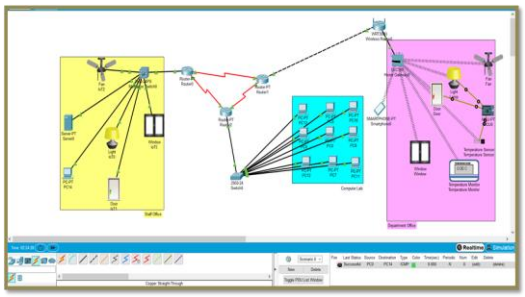

Fig17: Connection successful between College buildings

IX. CONCLUSION

Smart college network can be implemented through the simulation concept designed on cisco packet tracer 7.2, because this version included different IOE device used for home automation. I used home Gateway that function as transmission media paths and provide automatic addressing to multiple devices connected via wireless networks, IOT server and smartphone that serve as interfaces in controlling and monitoring electronic devices and Microcontroller (MCU) to register IOT device on it to control them.

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