

WIFI BASED HOME AUTOMATION SYSTEM

A COURSE PROJECT REPORT

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SRM

INSTITUTE OF SCIENCE & TECHNOLOGY
Deemed to be University u/s 3 of UGC Act, 1956

**SCHOOL OF COMPUTING
COLLEGE OF ENGINEERING AND TECHNOLOGY
SRM INSTITUTE OF SCIENCE AND TECHNOLOGY**

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KATTANKULATHUR - 603 203

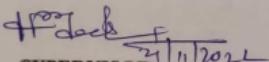
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BONAFIDE CERTIFICATE

Certified that this mini project titled "Wi-Fi based home automation system" is the bonafide work of K. Krishna Murthy(RA2011050010040), V. Pardhavan Reddy(RA2011050010007), P. Sai Vedhanth(RA2011050010031) who carried out the project work under my supervision.


21/11/2021

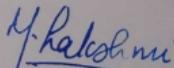
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ABSTRACT

Secure Wi-Fi technology is used by server, and hardware interface module to communicate with each other. User may use the same technology to log in to the server web-based application. If server is connected to the internet, so remote users can access server web-based application through the internet using a compatible web browser. For example, The home automation system can control the following appliances:

- 1) Lights on/off/dim
- 2) HVAC on/off
- 3) Door lock
- 4) Window shutdown
- 5) On/off different appliance and etc

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1. INTRODUCTION

In today's technologically growing world technological development without becoming a requirement that is frequently used in today's human life. Living home that includes smart objects with specific functions is called smart home. i.e aimed to improve safety, comfort and efficiency. Which can be used to automate home activities without users using various sensors (Temperature, Humidity, Smoke, Wind, Sound) to monitor the home environment. And there are usually monitoring tools, and the devices that are controllable and automatic this can be accessed via an internet-connected computer or smart mobile device. Instead of providing security that is safe, smart home can provide different features to provide automatic security using various alarm systems, as LCD display and siren sound and by sending email to valid users if sensor detects security issues. Home automation states handling and monitoring home items using microcontroller or computer technology. Automation is common because it makes the process simple, productive and secure. All smart devices are registered at the home gateway in this paper and operated by a legitimate person. By including different sensors in home automation, Smart Home eliminates user engagement in tracking home settings and operating home appliances. IOT (Internet of Things) is a system in which people, objects with a specific identity and moving capacity information without needing a dual human-tohuman origin, i.e destination or contact between people and computers IoT and IoE are a well versed technology which optimizes the life based on smart sensors and smart devices which operate together on the internet. All (IoE) web is a theory that extends machine-tomachine communication (M2M) emphasis of the Internet of Things (IoT) to describe a more complex system that also includes people and processes. IoE is a smart people, method, information and stuff relation. The Internet of All (IoE) describes a system inwhich billions of entities have sensors for measuring and determining their status; all linked by common or proprietary protocols over public or private networks. This paper describes the implementation of smart home with the use of latest version of cisco packet tracer as this version includes different sensors, actuators and smart devices used for home automation. Chic lights, chic windows, chic fans, chic doors with different detectors and sensors are some of the devices. Latest version the simulation program for cisco packet tracer odeling and configuration of IOE systems with conventional networking system to implement smart home.

2. LITERATURE SURVEY

Homes can be interfaced with sensors including motion sensors, light sensors and temperature sensors and provide automated toggling of devices based on conditions. More energy can be conserved by ensuring occupation of the house before turning on devices and checking brightness and turning off lights if not necessary. The system can be integrated closely with home security solutions to allow greater control and safety for home owners. The next step would be to extend this system to automate a large scale environment, such as offices and factories. Home Automation offers a global standard for interoperable products. Standardization enables smart homes that can control appliances, lighting, environment, energy management and security as well as the expandability to connect with other networks.

3. REQUIREMENTS

3.1 REQUIREMENT SPECIFICATION :-

Server
Router WRT-300N
Switch
Laptop
IOT Smart Fan,
windowAir
Conditioner
Siren
Web Cam
Motion Sensor
Smoke Detector
Humiture Monitor
Lawn Sprinkler

3.2 Software Requirements:-

Operating System: Windows

Platform: Cisco Packet

Tracer

Back end: IOT Server

Languages: HTML

Programming Language: Java

Script

4. ARCHITECTURE AND DESIGN

The below figure shows the overall design of our system. There is a server setup which is connected to a switch and router. The IoT devices are connected to the server and can be accessed from anywhere within range. The devices can be accessed using a laptop or mobile which is also connected to the network



The design shows how different devices can be connected inside a smart home through the internet of things. The different devices used for designare as follows -

1. IoT and Radius server - Remote Authentication Dial-In User Service is a networking protocol that provides centralized authentication, authorization, and accounting management for users who connect and use a network service. This server is to monitor intelligent things that are recorded on it and to have specific database features
2. Router(WRT300N) - Used to link different devices to the network of cellular.
3. Laptop - Link to your home destination to access intelligent objects.
4. Smartphone - To access the IoT devices from anywhere.
5. Fan - Used for ventilating the home environment on the basis of certain circumstances.

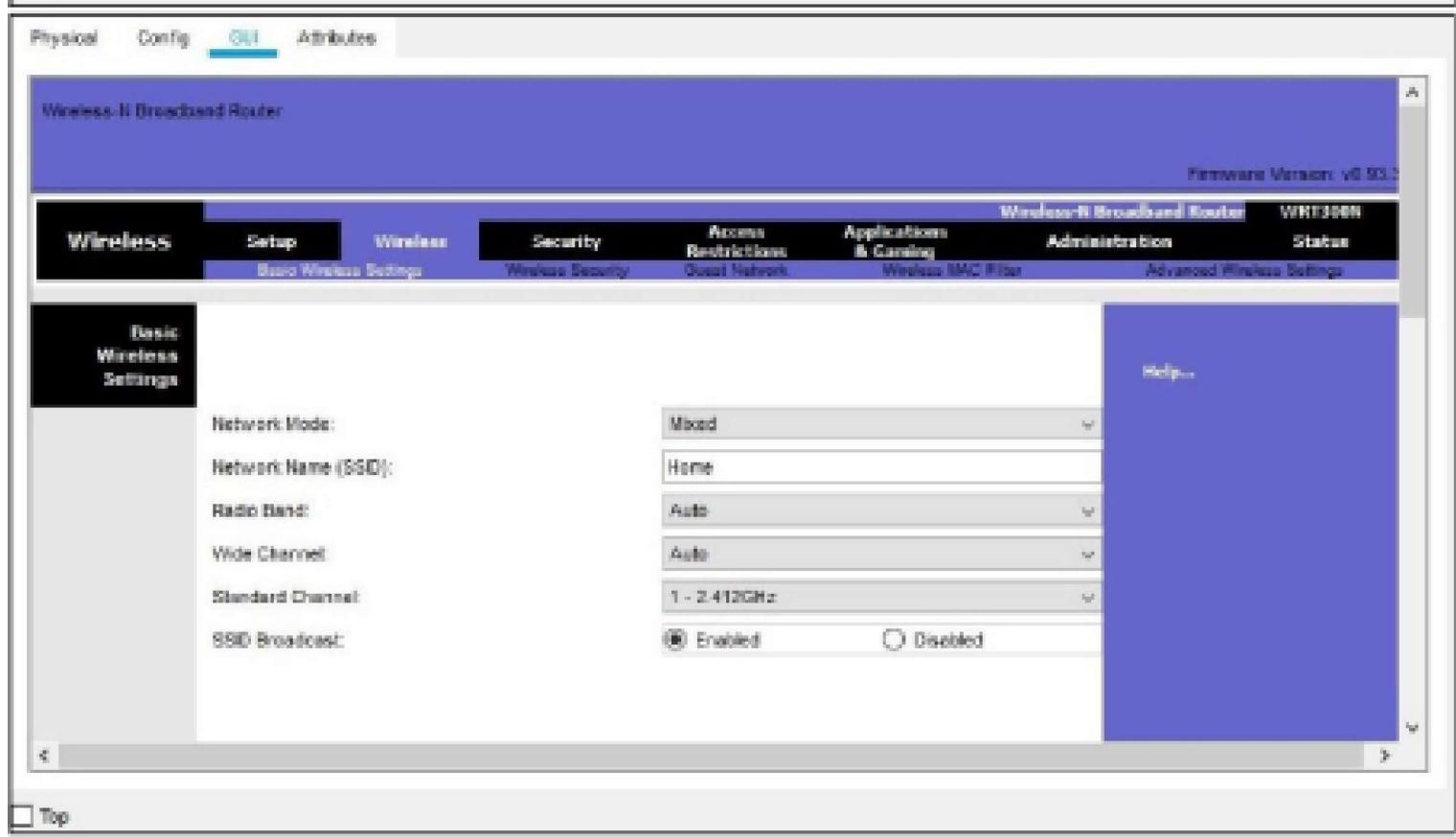
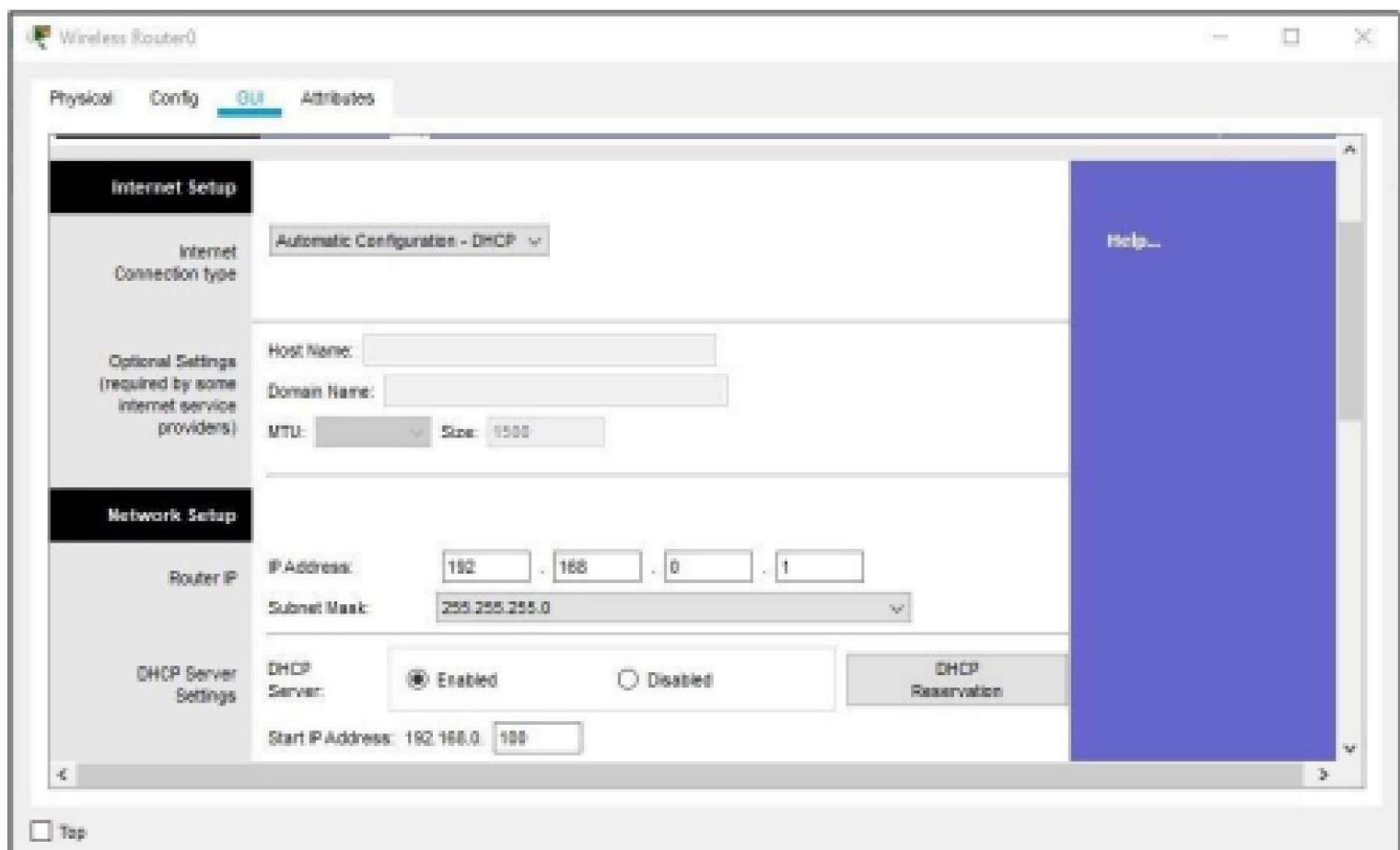
6. Webcam - For security to see who is coming in the house it gets activated only when the motion detector detects any movement and the webcam takes pictures and sends it to the server.
7. Siren - Provide sound at home for some cases for example if fire breaks out.
8. Motion detector - Link to your home getaway and detect motion.
9. Smart door - Link to your home getaway and detect motion to open or close automatically.
10. Lawn sprinkler - Used as a sprinkler based on environmental water level.
11. Smoke sensor - Used to sense the smoke level.
12. Older car - Used to model various home development scenarios as it affects the amount of oil, co2 and smoke. At a level of 1 percent an hour, this absorbs carbon monoxide. At a level of 2 percent an hour, this absorbs carbon dioxide. Affects Smoke at an hourly rate of 3%.
13. AC - Used at a level of -2 percent an hour to cool the home affects humidity.
14. Smart window - Used to remotely control the window impacts Argon, Carbon Monoxide, Carbon Dioxide, Hydrogen, Helium, Methane, Nitrogen, O₂, Propane, and Smoke.
15. Smart Light - Used to give light for home.
16. Humiture Meter - Displays current humiture, which is $(\text{temperature} + \text{humidity})/2$ to the closest integer

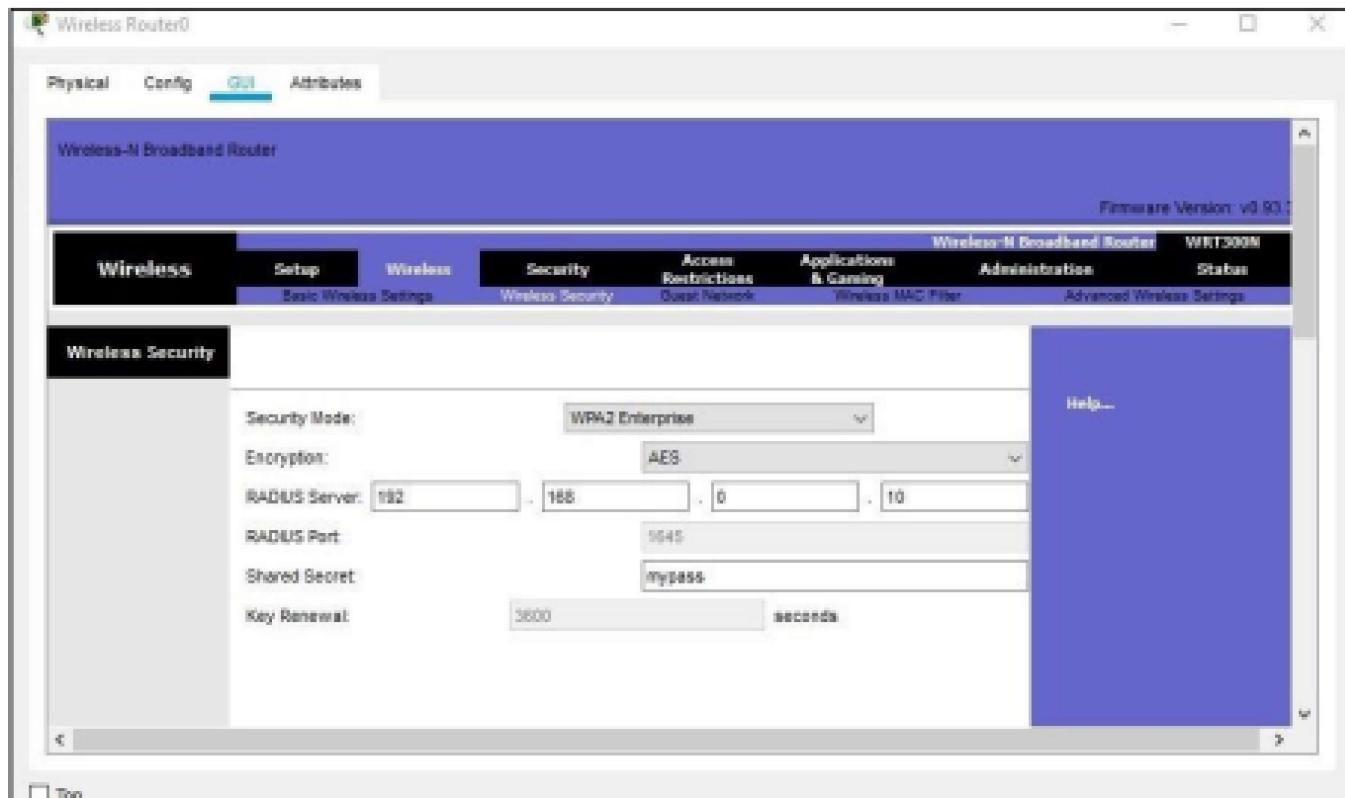
5. IMPLEMENTATION

Including various smart objects which are used for implementing home automation such as windows, fans, lights, doors, lawn sprinklers, webcams and various sensors. The router and server are used for controlling the objects and sensors, which provide a programming environment for controlling objects that are connected and provide control mechanisms through the registration of Home Gateway smart devices.

ROUTER(WRT300N)

The router is set up with an IP address and default gateway. Then we change the network SSID name to “Home”. In the wireless security section the network mode is selected to WPA2 Enterprise. Then the encryption is selected which we set to AES here. We set the radius server option here to what we registered our server with. Here we also provide the shared password for the router. The figure below show the different configurations of the router.

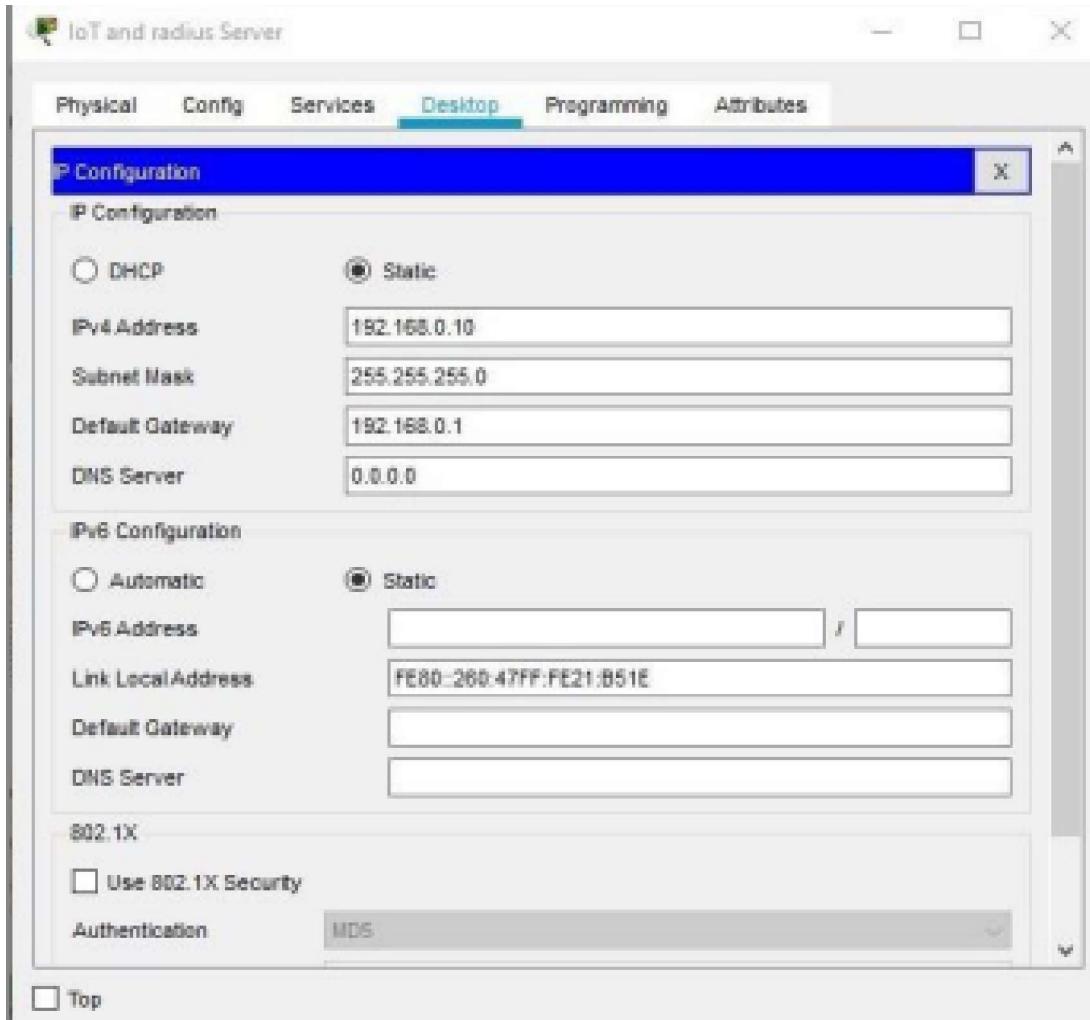




The router is connected to switch and different devices and the server.

IoT AND RADIUS SERVER

Remote Authentication Dial-In User Service is a networking protocol that provides centralized authentication, authorization, and accounting management for users who connect and use a network service. The device reads the username and password. The device creates a message called an Access-Request message and sends it to the RADIUS server. The device uses the RADIUS shared secret in the message. This server is used to monitor intelligent things that are recorded on it and to have specific database features .Firstly the IP configurations of the server is set up as shown below -



After that we use the AAA framework. AAA is a standard-based framework used to control who is permitted to use network resources (through authentication), what they are authorized to do (through authorization), and capture the actions performed while accessing the network (through accounting). Inside AAA service we set the client name, IP(IP address of the router) ,secret(which is the same as password set for router) and select the server type which is radius here.

IoT and radius Server

Physical Config Services Desktop Programming Attributes

SERVICES

- HTTP
- DHCP
- DHCPv6
- TFTP
- DNS
- SYSLOG
- AAA**
- NTP
- EMAIL
- FTP
- IoT
- VM Management
- Radius EAP

AAA

Service On Off Radius Port 1645

Network Configuration

Client Name	Client IP		
Secret	ServerType Radius		
Client Name	Client IP	Server Type	Key
1 Home	192.168....	Radius	mypass

Add Save Remove

User Setup

Username	Password
----------	----------

User Setup

Username	Password
1 AC	AC
2 Car	Car
3 Door_1	Door_1
4 Fan	Fan

Add Save Remove

IoT and radius Server

Physical Config Services Desktop Programming Attributes

Command Prompt

```
Packet Tracer SERVER Command Line 1.0
C:\>ping 192.168.0.1

Pinging 192.168.0.1 with 32 bytes of data:

Reply from 192.168.0.1: bytes=32 time<1ms TTL=255
Reply from 192.168.0.1: bytes=32 time=7ms TTL=255
Reply from 192.168.0.1: bytes=32 time=1ms TTL=255
Reply from 192.168.0.1: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 7ms, Average = 2ms

C:\>
```

Top

Laptop

Physical Config Desktop Programming Attributes

Web Browser

< > URL Go Stop

Registration Server Account Creation

Username:

Password:

```
C:\>ping 192.168.0.10  
Pinging 192.168.0.10 with 32 bytes of data:  
  
Reply from 192.168.0.1: Destination host unreachable.  
  
Ping statistics for 192.168.0.10:  
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),  
  
C:\>ping 192.168.0.10  
  
Pinging 192.168.0.10 with 32 bytes of data:  
  
Reply from 192.168.0.10: bytes=32 time=4ms TTL=128  
Reply from 192.168.0.10: bytes=32 time=16ms TTL=128  
Reply from 192.168.0.10: bytes=32 time=3ms TTL=128  
Reply from 192.168.0.10: bytes=32 time=16ms TTL=128  
  
Ping statistics for 192.168.0.10:  
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  
    Approximate round trip times in milli-seconds:  
        Minimum = 3ms, Maximum = 4ms, Average = 30ms  
  
C:\>
```

SETTING UP DEVICES

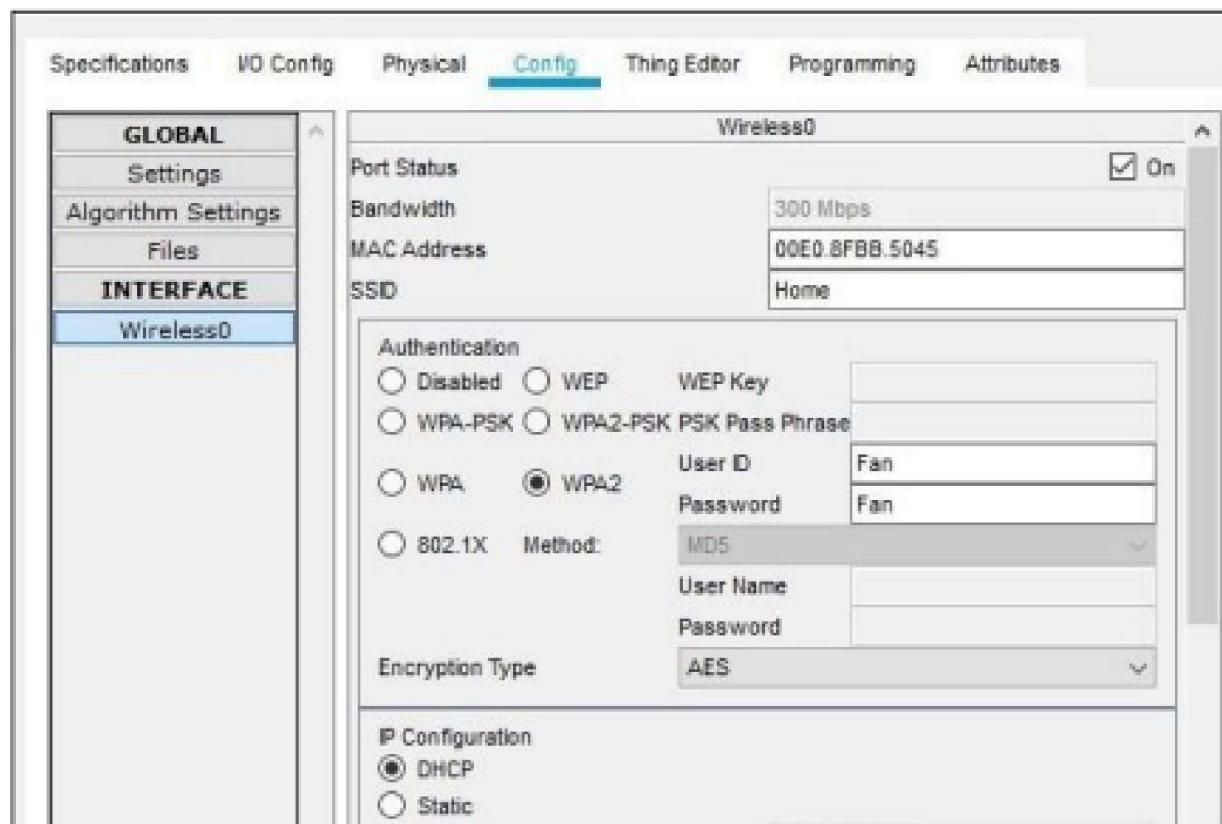
For every device the network adapter is set to PT-IOT-NM-1W-AC. After that IoT server is selected as remote server and we provide the IP address of the router along with the password that we registered on the server with. In the wireless configuration part we provide the SSID along with authentication type, encryption type and username, password of the device with which it has been registered on the server.

Fan

Specifications **IO Config** Physical Config Thing Editor Programming Attributes

Network Adapter	PT-IDT-NM-1W-AC
Network Adapter 2	None
Digital Slots	1
Analog Slots	0
USB Ports	0
Bluetooth	<input type="checkbox"/> Built-in
Desktop	<input type="checkbox"/> Show
Usage	<input checked="" type="radio"/> Smart Device <input type="radio"/> Component

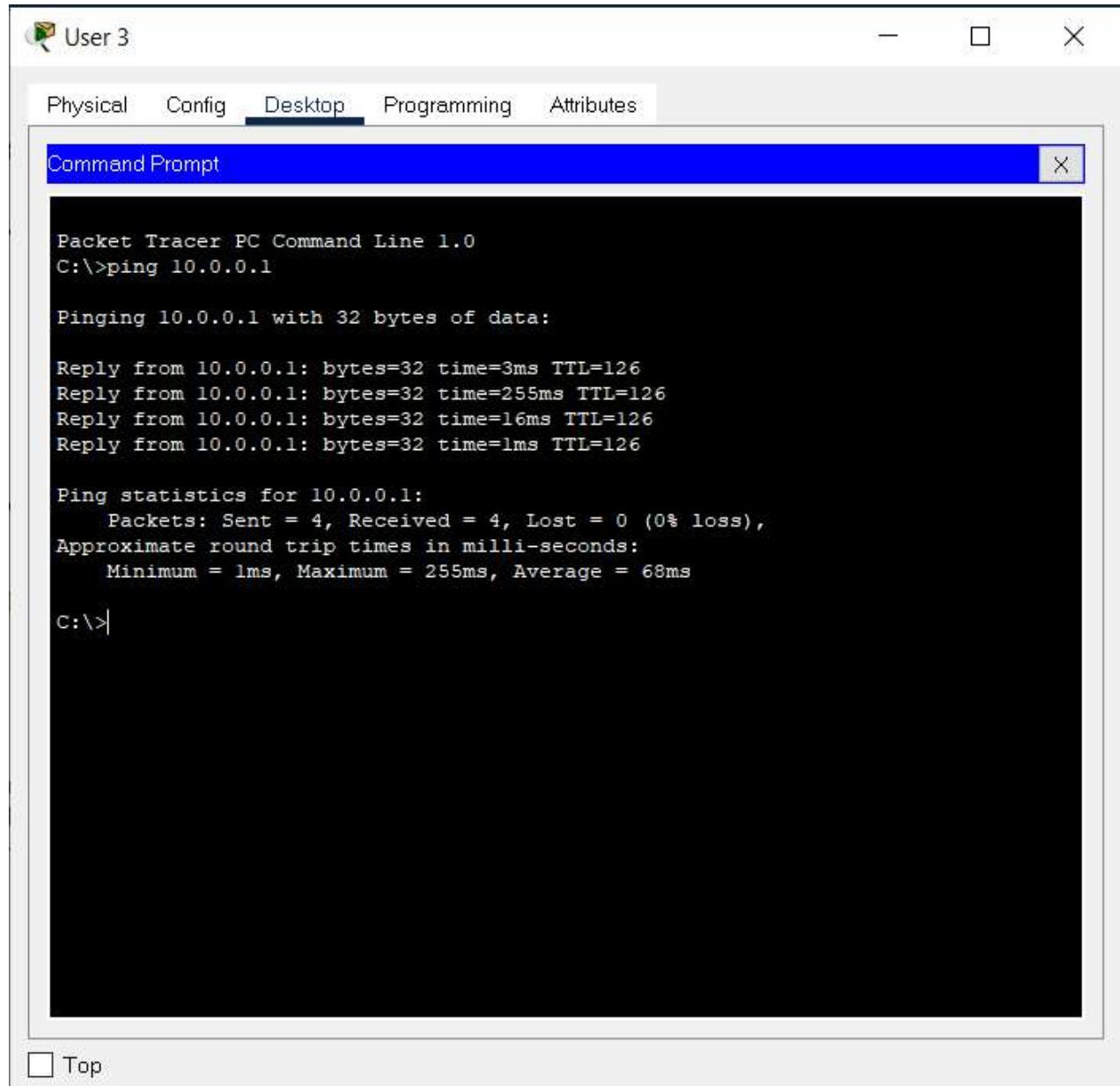
INTERFACE			
Wireless0	Default Gateway	<input type="text"/>	
	DNS Server	<input type="text"/>	
	IoT Server	 <input type="radio"/> None <input type="radio"/> Home Gateway <input checked="" type="radio"/> Remote Server	
	Server Address	<input type="text"/> 192.168.0.10	
	User Name	<input type="text"/> Home	
	Password	<input type="text"/> 123	
		<input type="button" value="Refresh"/>	



6. RESULTS AND DISCUSSION

6.1 Connection Check

The network connections were checked by ping requests:



A screenshot of a Windows desktop environment titled "User 3". The window title bar says "Command Prompt". The menu bar includes "Physical", "Config", "Desktop" (which is selected), "Programming", and "Attributes". The main window displays the output of a "ping" command:

```
Packet Tracer PC Command Line 1.0
C:\>ping 10.0.0.1

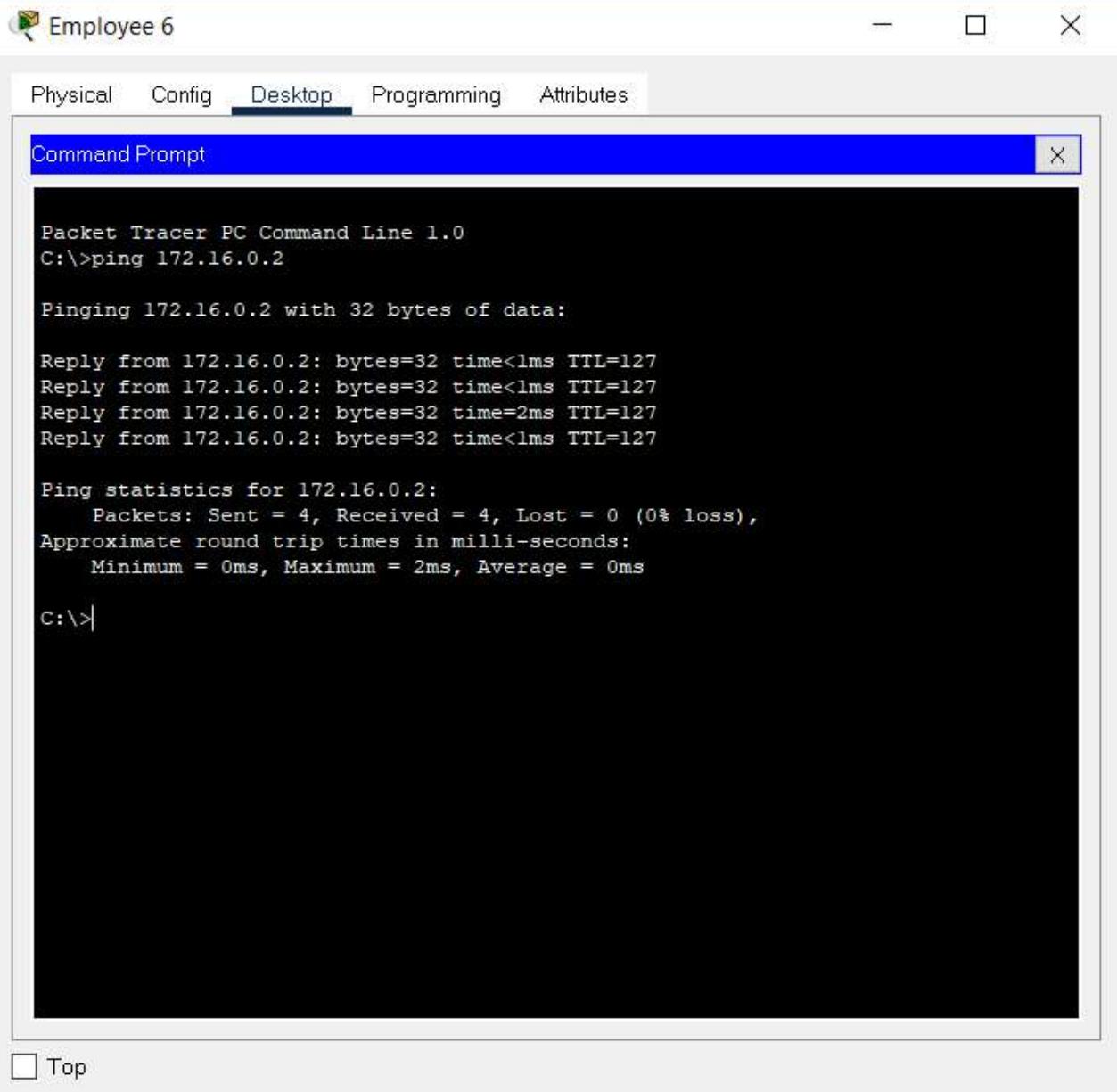
Pinging 10.0.0.1 with 32 bytes of data:

Reply from 10.0.0.1: bytes=32 time=3ms TTL=126
Reply from 10.0.0.1: bytes=32 time=255ms TTL=126
Reply from 10.0.0.1: bytes=32 time=16ms TTL=126
Reply from 10.0.0.1: bytes=32 time=1ms TTL=126

Ping statistics for 10.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 255ms, Average = 68ms

C:\>
```

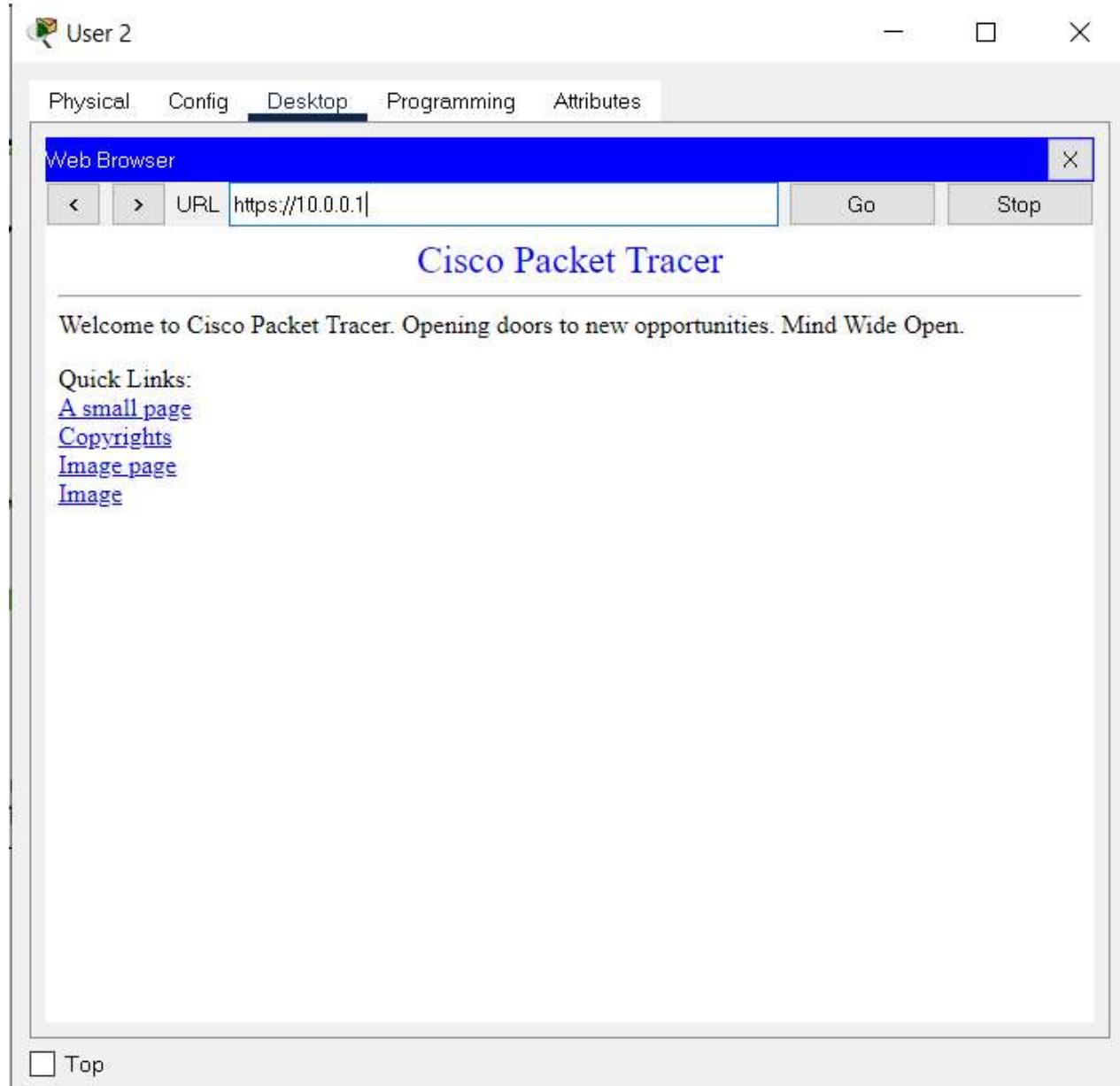
A public PC pinging the server via public IP



An employee PC pinging the server via private IP

6.2 HTTPS Check

The server access was checked with HTTPS by using a browser:



7. CONCLUSION AND FUTURE ENHANCEMENT

We used the latest cisco packet tracer version to introduce smart home, as this version includes numerous IOE devices. We used the home portal for home automation and record smart devices for monitoring them and microcontroller (MCU-PT) to connect various sensors as well as IOE devices. MCU moreover offers computing environment for different devices and different language of programming

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- 4) <https://www.iot-now.com/2020/06/10/98753-iot-home-automation-future-holds/>