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## Design and Implementation of Smart Home System using Packet Tracer



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### ABSTRACT

Smart home automation is a technology to make things happen at home automatically. When we say home automation, the first thing that comes to mind is robots, lighting, complex electronics, and a general feeling that it is a controlled warm, or cold condition of the home. However, some simple forms of automation such as Garage door opener, Remote controls, Irrigation/sprinkler control systems, Motion-activated lights, security systems. The home automation will have become important roles t in the human's environment because it provides the users with comfortable and calm for applying the home automation device. The design and implementation of smart home automation control uses three methods; Power Electrical system, fire alarm system, and home automation system to control of selective and security of the home device that protects the home. All of the systems are controlled by a server that also called a registration server. Some devices are used WIFI or WLAN and some of the devices that were used are wired (RJ45) or fiber optic.

**Key words:** RFID, Motion detector, Fire alarm, Sprinkler control systems.

## 1. INTRODUCTION

The home automation is controlled the home appliance by using a central control point or registration servers. All devices are completed automatically every day that can use on or off definitely devices and control remotely. The concept of the communication cable system is to use the wire IEEE 802.3, Wifi IEEE802.11 b/g/n [1,2]. The celebrity of wireless networks has expanded day by day and advanced computer technology has the facility to connect via the wireless network [3]. But, Wifi or RF has limited that it is avoided or not penetrated ceiling, concrete, steel frame, and wood. However, the RF device in a home environment is transmitted with high data rate transmission and to avoid cable complexity.

Home automation is used to imagine equipped CCTV (Close Circuit TV) with motion, streetlight with motion, Aircon with control room temperature, fire alarm and actuators for opening the door in the home automation. The automation is

means 'intelligent' that can support a secure, more appropriate, and more security. Soon, most electronic appliances will include network card and home automation in as PCs, mobile, IoT, refrigerator, electrical generator, heating, and air condition and controlled PC, tablet by using web-based user interface by using http (hypertext transport protocol). In this paper has been designed a smart home automation control system by using four rooms of fire alarm control that it is control fire alarm using a server-based system, air condition system, and lighting system [4].

# 2. METHODOLOGY AND INFRASTRUCTURE OF SMART HOME AUTOMATION

This paper is divided in three sections. They are electricity sources, fire alarm, and home security automation. In the first section, the electricity sources that they are AC source (LV power line 220V 60Hz), electrical generator source, solar, and wind turbine are automatically selected [5,6]. A second section, fire alarm system that it is used smoking detectors. And then, in the third section, home security automation is controlled by the garage door, home door, and motion detector. Figure 1 shows the Network Infrastructure of Smart Home Automation.



Figure 1: Network Infrastructure of Smart Home Automation

#### 2.1. Automation System of Electricity Sources

There are four sources of electricity for smart home automation. They are AC source (LV power line 220V 60Hz), electrical generator source, solar, and wind turbineare automatically selected by using the registration server. The home that it is used four sources are used hybrid electricity smart electricity system. There is no problem with electrical power interrupting. Figure 2 shows the AC power on of home automation network.



Figure 2: AC power on of home automation network

This system is four sources of the electrical system. The AC power is sensed by the blower fan [7,8]. The electricity of the AC power line is on the electrical generator off. However, solar and wind turbine is charging. The electricity power off, electrical generator on. In this situation, the solar and wind turbine sense. Solar power is an irradiation sensor that it is a sense of environment weather of packet tracer [9,10,11]. Figure 3 shows the Generator on while AC power supplies off.



Figure 3: Generator on while AC power supply off

The registration server is setting in the condition of the home automation network. All of the devices are remote to the registration server. Figure 4 shows the Registration server at conditions.

< > [	IRL http://192.	168.1.1/conditions.	ntmi	10	Go	Stop
T Server - D	evice Condi	tions		Home   Conditio	ns   Editor	Log O
Actions	Enabled	Name	Condition	Acti	ons	
Edit Remove	Yes	generator off	Match any: WT Power Output > 10 kWh solar Status = 1000 Wh Battery Bank Available power = 60 % AC Power sensor Status is High	Set Generator Curve Shape to Min		
Edit Remove	Yes	generator on	Match all: • WT Power Output < 10 kWh • solar Status < 100 Wh • AC Power sensor Status is Off • Battery Bank Available power < 40 %	Set Generator Curve	Shape to	CosInv

Figure 4: Registration server at conditions

This research a streetlamp that is controlled motion detect. The motion detector is sensed the objects that there is object, the streetlamp is on. There is no object, the streetlamp off. The object moves behind streetlamps, the street lamps off. Figure 5 and 6 shows the streetlamp of detect motion object and streetlamp off condition of detect motion object



Figure 5: The streetlamp of detect motion object



Figure 6: The streetlamp off condition of detect motion object

#### 2.2. Fire Alarm and Sprinkler System

The fire alarm is very important at home automation stations [12,13]. This system is controlled by the smoking detector of CO2. The kitchen, living room, and bedrooms are used in the fire alarm system. If the CO2 of smoking from the kitchen or other rooms is detected, the smoking alarm and sprinkler will

be opened. Figures 7,8,9,10,11 show the fire alarm network infrastructure design, registration server setting by using DNS, registration server condition setting, registration server CO2 condition setting of alarm, and Operation of CO2 or fire detection respectively.



Figure 7: The fire alarm network infrastructure design

a 1171 Aller Manager and			^
<ul> <li>our upbawww.myn</li> </ul>	rome.com	Go	Stop
	Registration Server Login		
	Username:		
	Password:		
	Sign In		
Don't have an IoE account? Si	gn up now		
Don't have an IoE account? <u>Si</u>	ign up now		
Don't have an IoE account? <u>Si</u>	ign up now.		
Don't have an IoE account? <u>Si</u>	ign up now		
Don't have an IoE account? Si	ign.up.nov		

Figure 8: The registration server setting by using DNS

The registration server is used dns, webserver and registration server that it is used IoT (Internet of Thing).

Physical Config Servic	ces Desitop Programming	Attributes				
Web Browser						х
< > URL http://w	ww.myhome.com/conditions.html				Go	Stop
IoT Server - Device Con	ditions			Home   Condi	dons   Editor	Log Out 🗸
Actions	Enabled	Name	Condition	Actions		
Edit Remove	Yes	fire alarm on	SD1 Level > 3	Set Fire 1 Status to true Set Fire 2 Status to true Set Fire 3 Status to true Set Fire 3 Status to true Set Fire 5 Status to true Set Fire 5 Status to true Set Fire status to true Set Fire status on true		
Edit Remove	Yes	kit chen off	SD1 Level < 0.5	et Fire 1 Status to false Set Fire 2 Status to false Set Fire 3 Status to false Set Fire 3 Status to false Set Fire 4 Status to false Set Fire 5 Status to false Set Kitchen Alam On to false Set Kitchen Mam On to false		
Edit Remove	Yes	living room on	LR od1 Level > 2.5	Set IR 1 Status to true Set IR 2 Status to true Set IR 3 Status to true Set Living Room Alarm On to true Set Fire stabion On to true		
Edit Remove	Yes	lving room off	LR sd1 Level < 0.5	Set Living Room Alarm On to false Set LR 1 Status to false Set LR 2 Status to false Set LR 3 Status to false Set Fire station On to false		
Add						

Figure 9: The registration server condition setting

Fire 3 (PTT08106N690H8-)	Fire Sprinkler
Fire 4 (PTT08106A0690H088LH3-)	Fire Sprinkler
Fire station (PTT081075AZ-)	Siren
Living Room Alarm (PTT0810AN0Q-)	Siren
LR sd1 (PTT0810/5D1-)	Smoke Detector
Alarm .evel	3.6073
LR 1 (PTT08107WIF-)	Fire Sprinkler
LR 2 (PTT0810U08D-)	Fire Sprinkler





Figure 11: The Operation of CO2 or fire detection

This paper is used as a fire alarm system that it is detected CO2 or fire. If the fire or CO2 is detected, the fire alarm or sprinkle will be operated. This system is connected to the fired station via the network by using a fiber optic. If the fire or CO2 is not detected, the fire alarm or sprinkle will be stopped.

When the smoking detector in the kitchen is detected CO2 from extremely above of the cooking smoke, the fire alarm and water sprinkler is operated and then fire alarm at the fire station is alert that the fireman will know where the fire is burned. Moreover, the Living room is the same process as the kitchen.

## 2.3. Security System of Smart Home Automation

Figure 12 shows the smart automation systems.



Figure 12: The smart home automation systems

There are five separates operations in smart home automation. Firstly, Gate door that it is the main gate of the home is controlled by the RFID card and motion sensor. The motion sensor that is connected to CCTV has detected motion activities. If the moving objects are be detected from the motion sensor, CCTV camera would be taken a photo of moving objects which it is captured the video another time. RFID (Radio Frequency ID) card is shown the match ID or not and then this card is identified from the storage ID system. If the corrected valid ID card detected, the gate would be open. If no valid ID card detected, the gate is never open the gate. The second operation is the door of a home that is the same operation as the main gate system. The third operation is the money vault room. This room is prevented from thieves and other unnecessary issues. This room is installed on the motion sensor and camera. Moving everybody or every object in this room would take the photo by the system. Forth operation is the kitchen room. This room is sensed the CO2 from the cooking and another smoke. When either over the normal cook smoking or below firing smoking was detected, the fan and air blower fan are operated to release internal smoke to the outside. The fifth operation is the AirCon, Heat, and Water sprinkler of grasses field. The temperature sensor is sensing the outside weather heat. If the temperature is above 23, the water sprinkler of grasses field will be a spray of water, and all AC open. If the temperature is below 20, all AirCon is close and the water sprinkler is stopped.

The Cisco router is used with a remote server and is connected to the cloud. The office and mobile phone can be an interface to the home network or home automation service via the cloud. Figures 13,14,15,16 shows the registration sever condition of home automation, RFID controlled garage door, camera operation, and system diagram.

Actions         Enabled         Name         Condition         Actions           Ed         Rever         Fes         Kitchen CO2 detection         spoke sensor Level > 0.9         Set Fin1 Status High           Ed         Rever         Fes         Kitchen CO2         spoke sensor Level > 0.9         Set wind Status to UF           Ed         Rever         Fes         Kitchen CO2         spoke sensor Level > 0.5         Set wind Status to UF           Ed         Rever         Fes         Notion detect ramera         Motion detector 1 On is fuse         Set camera 1 On to true           Ed         Rever         Fes         Set comr off         Motion detector 1 On is false         Set camera 1 On to true           Ed         Rever         Fes         Set comr open         Card Reader1 Card D = 1001         Set courd to the false           Ed         Rever         Fes         Jam spikler on         Respectater montion Temperature > 23.0 °C         Set water 1 Status to the Set water 2 Status to the Set water	× Iot S	ver - Device Cr	onditions	com condeors nem		Go Home   Conditions   Editor	Stop Log Out
Edit         Ramm         Res         Kitchen CO2 didection         spoke sensor Level > 0.9         Set find Status to High Set wind Status to High           Edit         Ramm         Veis         Kitchen CO2         spoke sensor Level > 0.5         Set int Status to Off           Edit         Ramm         Veis         Kitchen CO2         spoke sensor Level < 0.5         Set int Status to Off           Edit         Ramm         Veis         motion detect rune and         Motion detect run is true         Set camera 1 On to true           Edit         Ramm         Veis         pate camera 0         Motion detect run is false         Set camera 1 On to true           Edit         Ramm         Veis         Sate door open         Card Reader 1 Cin 1 Status         Set water 1 Status to true           Edit         Ramm         Veis         Jann spikler on         temperature nontror Temperature > 2.0 °C         Set water 1 Status to Take           Edit         Ramm         Veis         Jann spikler on         temperature nontror Temperature < 1.20 °C         Set water 1 Status to Take           Edit         Ramm         Veis         Jann spikler on         card Reader2 Status to Veis         Set water 1 Status to Take           Edit         Ramm         Veis         Jann spikler on         temperature nontror Temperature < 1.20 °C		Actions	Enabled	Name	Condition	Actions	
Edit         Name         Net         Athree CO2         spoke sersor Level < 0.5	Edit	Remove	Yes	Kitchen CO2 detection	spoke sensor Level > 0.9	Set fan 1 Status to High Set wind Status to High	
Edit         Paraw         Nes         motion detect carera         Notion detect or 1 On is true         Set carera 1 On to true           Edit         Paraw         Nes         pate carer off         Notion detect or 1 On is false         Set carera 1 On to true           Edit         Paraw         Nes         pate carer off         Notion detect or 1 On is false         Set carera 1 On to false           Edit         Paraw         Nes         Set door open         Card Reader 1 Card 1 D= 1001         Set Door 1 On to true           Edit         Paraw         Nes         Jam spinkler on         temperature monitor Temperature > 22.0 °C         Set water 1 Status to true           Edit         Paraw         Nes         nam spinkler on         temperature monitor Temperature < 12.0 °C	Edit	Remove	Yes	Kitchen CO2	spoke sensor Level < 0.5	Set fan1 Status to Off Set wind Status to Off	
Edit         Parame         Nes         pate came off         Motion detector 1 On is False         Set cames 1 On to False           Edit         Parame         Nes         Gate door open         Card Reader 1 Card ID = 1001         Set Door 1 On to the           Edit         Parame         Nes         Sam spinkler on         temperature monitor Temperature > 22.0 °C         Set water 1 Status to the           Edit         Parame         Nes         Jam spinkler on         temperature monitor Temperature > 22.0 °C         Set water 1 Status to Table           Edit         Parame         Nes         Ann spinkler on         temperature monitor Temperature < 12.0 °C	Edit	Remove	Yes	motion detect camera	Motion detector 1 On is true	Set camera 1 On to true	
East         Name         Name         Name         Sate door open         Card Reader 1 Card ID = 1001         Set Door 1 On to true           Edit         Rame         Name         Name         Name         Sate door open         Emperature montor Temperature > 22.0 °C         Sate water 1 Status to Take           Edit         Rame         Name	Edit	Remove	Yes	gate camer off	Motion detector 1 On is false	Set camera 1 On to false	
Eff         Ream         less         Jam spikler on         temperature monitor Temperature > 22.0 °C         Eff water 1 Status to the Eff Water         Status to Status         Status to Status           Eff         Ream         Ves         Jam smikler         temperature monitor Temperature < 12.0 °C	Edît	Renove	Yes	Gate door open	Card Reader1 Card ID = 1001	Set Door1 On to true	
Eff         Ream         les         Junn sinkler         temperature montor Temperature < 1.0 °C         Set water 1 Status to Table           Eff         Ream         Veis         None door camera         Notion detector 2 On is true         Set water 2 Status to Table           Eff         Ream         Veis         door camera         Notion detector 2 On is true         Set camera 2 On to true           Eff         Ream         Veis         door camera         Notion detector 2 On is true         Set Core 2 unk to Unicok           Eff         Ream         Veis         bank rault         Notion detector 3 On is true         Set Core 2 unk to Tube           Eff         Ream         Veis         bank rault         Notion detector 3 On is true         Set Act 0 To to true           Eff         Ream         Veis         air con off         temperature monitor Temperature > 22.0 °C         Set Act 0 To to Tube           Eff         Ream         Veis         air con off         temperature monitor Temperature < 10.0 °C	Edit	Remove	Yes	Lawn spinkler on	temperatiure monitor Temperature > 23.0 °C	Set water 1 Status to true Set water 2 Status to true	
Edit         Parame         Nome door camera         Motion detector 2 On is true         Set camera 2 On to true           Edit         Rame         Net         door open         Card Reade/2 Status is tail         Set Door 2 Lock to Uniock           Edit         Rame         Net         bank vaait         Motion detector 3 On is true         Set Camera 3 On to true           Edit         Rame         Net         bank vaait         Motion detector 3 On is true         Set Camera 3 On to true           Edit         Rame         Net         Arr con on         temperature nonitor Temperature > 22.0 °C         Set AC1 On to true           Edit         Rame         Net         arr con off         temperature c 10.0 °C         Set AC1 On to To Bate           Edit         Rame         Net         semostative         semostative c 30.°C         Set Hormostate Auto Con Temperature to 16.0 °C           Edit         Rame         Net         semostative         temperature nonitor Temperature > 22.0 °C         Set Hormostate Auto Con Temperature to 16.0 °C           Edit         Rame         Net         semostatire         temperature nonitor Temperature > 22.0 °C         Set Hormostate Auto Con Temperature to 16.0 °C           Edit         Rame         Net         temperature nonitor Temperature > 22.0 °C         Set Hormostate Auto Con Temperat	Edît	Renove	Yes	Lawn srinkler	temperatiure monitor Temperature < 12.0 °C	Set water 1 Status to false Set water 2 Status to false	
Edit         Ramm         Nes         door open         Card Reader 2 Status is Valid         Set Door 2 Look to Unlock           Edit         Ramm         Nes         Aark vault         Motion detector 3 On is true         Set Careera 3 On to true           Edit         Ramm         Nes         Aar con on         Respectative monitor Temperature > 22.0 °C         Set AC 1 On to true Set AC 2 On to true           Edit         Ramm         Nes         air con off         Respectative monitor Temperature < 10.0 °C	Edit	Remove	Yes	home door camera	Motion detector 2 On is true	Set camera 2 On to true	
Edit         Ream         les         bank rault         Motion detector 3 On is true         Set camera 3 On to true           Edit         Ream         les         Arron on         temperature monitor Temperature > 22.0 °C         Set AC1 On to true Set AC2 On to true           Edit         Ream         les         air con off         temperature monitor Temperature < 10.0 °C	Edit	Remove	Yes	door open	Card Reader2 Status is Valid	Set Door2 Lock to Unlock	
Earl         Ream         Ves         Ar con on         temperature monitor Temperature > 22.0 °C         Set ACI On to the Set ACI On to the Set ACI On to Set           Earl         Ream         Ves         ar con off         Respectative monitor Temperature < 10.0 °C	Edit	Remove	Yes	bank vault	Motion detector 3 On is true	Set camera 3 On to true	
Edit         Ranne         Ves         air con off         temperature monitor Temperature < 10.0 °C         Set AC1 On to take set AC2 On to fake           Edit         Ranne         Ves         temostate         temperature monitor Temperature < 9.0 °C	Edit	Remove	Yes	Air con on	temperatiure monitor Temperature > 22.0 °C	Set AC1 On to true Set AC2 On to true	
Edit         Name         Nes         temostate         comportance monitor Temperature = 0.0 °C         Set thermostate Auto Heat Temperature to 16.0 °C           Edit         Name         Hes         temostata acto         temperature monitor Temperature = 22.0 °C         Set thermostate Auto Cod Temperature to 20.0 °C	Edit	Remove	Yes	air con off	temperatiure monitor Temperature < 10.0 °C	Set AC1 On to false Set AC2 On to false	
Edit Resove Vies termostart ac temperature monitor Temperature > 22.0 °C Set thermostate Auto Cool Temperature to 20.0 °C	Edit	Remove	Yes	temostate	temperatiure monitor Temperature < 9.0 °C	Set thermostate Auto Heat Temperature to 16.0 °C	
	Edit	Renove	Yes	termostart ac	temperatiure monitor Temperature > 22.0 °C	Set thermostate Auto Cool Temperature to 20.0 °C	
	144						

Figure 13: The registration severe condition of home automation



Figure 14: The RFID controlled garage door

< > URL http://www.myhome.com/home.html	Go Stop
<ul> <li>Camera 1 (PTT0810ILFV-)</li> </ul>	Webcam
On Image	
	<b>k 1</b>
<ul> <li>Camera 2 (PTT081024YX-)</li> </ul>	Webcam
The second se	

Figure 15: camera operation



Figure 16: System diagram

The following command is the cisco command that it is DHCP (Dynamic Host Configuration Protocol) and routing Protocols. Figure 17 shows the screenshot of the code.

Ev

v

Router>en Router#conf t Enter configuration commands, one per line. End with CNTL/Z. Router(config)#int gigabitEthernet 0/1 Router(config)#no shut Router(config-if)#ip address 192.168.1.1 255.255.255.0 Router(config)#ip dhcp pool home Router(dhcp-config)#default-router 192.168.1.1 Router(dhcp-config)#network 192.168.1.0 255.255.255.0 Router(dhcp-config)#exit Router(config)#ip dhcp excluded-address 192.168.1.1 192.168.1.20 Router(dhcp-config)#ip dhcp pool home Router(dhcp-config)#dns-server 192.168.1.2 Router(dhcp-config)#exit Router(config)#exit

Router>en Router#config Router(config)#interface gigabitEthernet 0/0 Router(config-if)#no shut Router(config-if)#ip address 10.10.0.1 255.0.0.0 Router(config-if)#exit Router(config)#router rip

Router(config-router)#version 2 <u>Router(config</u>-router)#network 10.0.0.0 <u>Router(config</u>-router)#network 192.168.0.0 <u>Router(config</u>-router)#exit <u>Router(config</u>)#exit <u>Router#</u>

Figure 17: Screenshot of the code

## 3. DATA AND SIMULATION RESULT

The Data flow is set up the system of the network infrastructure of smart home automation. Firstly, the IoT devices that they are connected to the system are inquired Arp (Address Resolution Protocols) of layer 2 data links because IoT devices or network devices have differences MAC addresses. The whole over the world of network devices is not the same difference companies. Figures 18, 19,20,21,22 shows the various system setup output of this research.

Simul	ation Panel					
Event L	.ist					
Vis.	Time(sec)	Last Device	At Device	Тур	)e	^
	0.206		Door2		IOT TCP	
	0.496		Wireless Ro		ICMP	
	0.496		Wireless Ro		ARP	
	0.500		Motion detec		TCP	
	0.509		Door2		TCP	
	0.614		Door1		IoT TCP	
	0.851		Motion detec		DHCP	
	0.852	Motion detector 2	Access Point0		DHCP	
	0.853	Access Point0	Switch0		DHCP	
	0.854	Switch0	Router0		DHCP	
	0.854		Access Point0		DHCP	
	0.854		Router0		ICMP	
	0.854	Switch0	Server0		DHCP	
	0.854		Router0		ARP	
	0.855	Access Point0	Weather stat		DHCP	
	0.855	Access Point0	Laptop0		DHCP	
	0.855	Access Point0	temperatiure		DHCP	
	0.855	Access Point0	Motion detec		DHCP	
	0.855	Access Point0	thermostate		DHCP	
	0.855	Access Point0	camera 1		DHCP	
	0.855	Access Point0	camera 2		DHCP	~

Figure 18: The Data flow of Setup systems

mulati	on Panel					
ent List						
s.	Time(sec)	Last Device	At Device	Тур	e	^
	0.855	Access Point0	Motion detec		DHCP	
	0.855	Access Point0	camera 3		DHCP	
	0.855	Access Point0	Card Reader2		DHCP	
	0.855	Access Point0	Motion detec		DHCP	
	0.855	Access Point0	Card Reader1		DHCP	
	0.855	Access Point0	Door1		DHCP	
	0.855	Access Point0	water 1		DHCP	
	0.855	Access Point0	AC1		DHCP	
	0.855	Access Point0	Door2		DHCP	
	0.855	Access Point0	wind		DHCP	
	0.855	Access Point0	irradiation se		DHCP	
	0.855	Access Point0	water 2		DHCP	
	0.855	Access Point0	spoke sensor		DHCP	
	0.855	Access Point0	irradiation se		DHCP	
	0.855	Access Point0	irradiation se		DHCP	
	0.855	Access Point0	Wireless Ro		DHCP	
	0.855	Access Point0	AC2		DHCP	
	0.855		Wireless Ro		ICMP	
	0.855		Wireless Ro		ARP	
	0.855	Router0	Switch0		ARP	
	0.855	Wireless Router0	Laptop1		ARP	~
	-		- 01 - 0	_		

Figure 19: The ARP flow of setup systems

Simulat	ion Panel					
Event Lis	t					
Vis.	Time(sec)	Last Device	At Device	Тур	e	^
	0.856	Switch0	Access Point0		ARP	
	0.856	Switch0	Server0		ARP	
	0.857	Access Point0	Weather stat		ARP	
	0.857	Access Point0	Laptop0		ARP	
	0.857	Access Point0	temperatiure		ARP	
	0.857	Access Point0	Motion detec		ARP	
	0.857	Access Point0	thermostate		ARP	_
	0.857	Access Point0	camera 1		ARP	
	0.857	Access Point0	camera 2		ARP	
	0.857	Access Point0	Motion detec		ARP	
	0.857	Access Point0	camera 3		ARP	
	0.857	Access Point0	Card Reader2		ARP	
	0.857	Access Point0	Motion detec		ARP	
	0.857	Access Point0	Card Reader1		ARP	
	0.857	Access Point0	Door1		ARP	
	0.857	Access Point0	water 1		ARP	
	0.857	Access Point0	AC1		ARP	
	0.857	Access Point0	Door2		ARP	
	0.857	Access Point0	wind		ARP	
	0.857	Access Point0	irradiation se		ARP	
	0.857	Access Point0	water 2		ARP	~

Figure 20: The ARP flows of setup systems

vent L	ist				
Vis.	Time(sec)	Last Device	At Device	Туре	^
	0.857	Access Point0	spoke sensor	ARP	
	0.857	Access Point0	irradiation se	ARP	
	0.857	Access Point0	irradiation se	ARP	
	0.857	Access Point0	Wireless Ro	ARP	
	0.857	Access Point0	AC2	ARP	
	0.858	-	Wireless Ro	ARP	
	0.859		Wireless Ro	ARP	
	0.860	-	Wireless Ro	ARP	
	0.860	-	Wireless Ro	ARP	
	0.861	2 <b>2</b>	Wireless Ro	ARP	
	0.861		Wireless Ro	DHCP	
	0.861	Wireless Router0	Laptop1	DHCP	
	0.862		Wireless Ro	ARP	
	0.863		Wireless Ro	DHCP	
	0.863	-	Wireless Ro	DHCP	
	0.864	-	Wireless Ro	DHCP	
	0.864	-	Wireless Ro	DHCP	
	0.867	12	Wireless Ro	ARP	
	0.868	Wireless Router0	Laptop1	ARP	
	0.869	9 <del></del>	Wireless Ro	ARP	
	0.869		Wireless Ro	ARP	

Figure 21: The ARP flows of setup systems

vent Li	ist				
Vis.	Time(sec)	Last Device	At Device	Туре	^
	1.012		Wireless Ro	DHCP	
	1.013	Wireless Router0	Laptop1	DHCP	
	1.014		Wireless Ro	DHCP	
	1.015	8 <u>2</u> 9	Wireless Ro	DHCP	
	1.015		Wireless Ro	DHCP	
	1.015	-	Wireless Ro	DHCP	
	1.015		Wireless Ro	DHCP	
	1.017	925 (	Wireless Ro	DHCP	
	1.018	Wireless Router0	Laptop1	DHCP	
	1.018		Laptop1	ARP	
	1.018		Wireless Ro	DHCP	
	1.020	<u></u>	Laptop1	ARP	
	1.021	Laptop1	Wireless Ro	ARP	
	1.022	-	Wireless Ro	ARP	
	1.023		Wireless Ro	DHCP	
	1.023	02	Wireless Ro	ARP	
	1.024	-	Wireless Ro	ARP	
	1.024	Wireless Router0	Laptop1	ARP	
	1.025		Wireless Ro	ARP	
	1.025	122 I	Wireless Ro	ARP	
19	1.026		Wireless Ro	ARP	

Figure 22: The ARP and DHCP of setup systems

## 4. CONCLUSION

This paper is used Cisco routing and switching technology. And then, the system can be controlled from the owner's office or any mobile network via mobile network or fiber optic communication.

The author's design tested with a real connection to install smart home devices and the registration that can get security and authentication process was including. The author's design can exam the wired and wireless network. When the wireless connection, the costs of wire will reduce, and some devices will obtain flexible by moving one place to another easily.

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