

Project Report

for

Smart Home Network Design



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Contents

1	Abstract	2
2	Network Requirements	2
3	Features And Services	3
4	Network Topology Diagram	3
5	Network Topology Explanation	3
6	IP Network Pool	5
7	Summary	5

1 Abstract

The problem is to design a network system for an IOT based smart home. The basic network infrastructure used in a smart home and the respective routing and switching mechanisms implemented therein have been laid out using Cisco Packet Tracer. The network design for the smart home consists of the following devices:

- Layer 3 Routers
- Layer 2 Switches
- Different IOT devices:
 1. Windows
 2. Door
 3. AC
 4. Light
 5. Fans
 6. Speaker
- A Server For DNS, DHCP, SMTP, FTP

The design includes a home having following areas:

- 4 Bed Rooms
- Lounge
- Garage

2 Network Requirements

The network has the following requirements:

1. Bed Rooms:

There are 4 bed rooms in the house, 2 on each floor. There is one connection per bed room where 8 IOT devices and 8 other devices are allowed to connect.
2. Lounge:

The lounge is the most important place in the house. It is the hub of activities and therefore, 32 devices can be connected at the same time. 16 IOT devices and 16 other devices.
3. Garage:

Garage has only 2 devices. One is the automatic door and the other one is a smoke detector.

3 Features And Services

According to the requirements explained in the previous section, the network design provides the following features and services:

1. VLSM (Variable Length Sub-net Masking):
There are 4 rooms, 1 lounge and 1 garage. Each of the different areas is a sub-network, having different host requirements.
2. VLAN (Virtual Local Area Network):
IOT devices and other devices are kept on different VLANs for security reasons.
3. DHCP (Dynamic Host Configuration Protocol) Servers:
DHCP is configured on each router for each sub-network.
4. FTP (File Transfer Protocol) Server:
There is a FTP server in the server room that allows file transfer between hosts inside the whole network.
5. IOT Registration Service:
There is a IOT registration server on which all the IOT devices are connected. This allows the owner to manage all the devices through one device, either a PC or a smart-phone.
6. RIP V2 (Routing Information Protocol) Routing Protocol:
All the routers are configured on RIP v2 because it supports VLSM.
7. Wifi Access Point: A wifi access point is set up in the lounge. Therefore, any device having wireless connectivity can connect to the access point from any room or garage.

4 Network Topology Diagram

The Figure 1 is the network design for a smart home made in Cisco Packet Tracer.

5 Network Topology Explanation

The Figure 1 shows the network design for a smart home made in Cisco Packet Tracer. The main network is "200.20.2.0/24 " which has been sub-netted into 10 sub-networks displayed in the table on page 5. The middle router placed in the lounge is the core router which interlinks all other routers and directs traffic across the entire network. It can be taken as the router that connects to the ISP (Internet Service Provider). There are 3 main areas:

1. Bed Rooms:
The bed rooms are represented by 4 squares on the corners of the lounge. The home is divided into floors with each floor having 2 rooms. Each floor is given a different sub-net allowing 32 devices, 16 per room. Each sub-net is further divided into 2 VLANs, one each for IOTs and other devices. Both the floors have DHCP configured on the router for that particular floor. All the routers support dynamic routing.

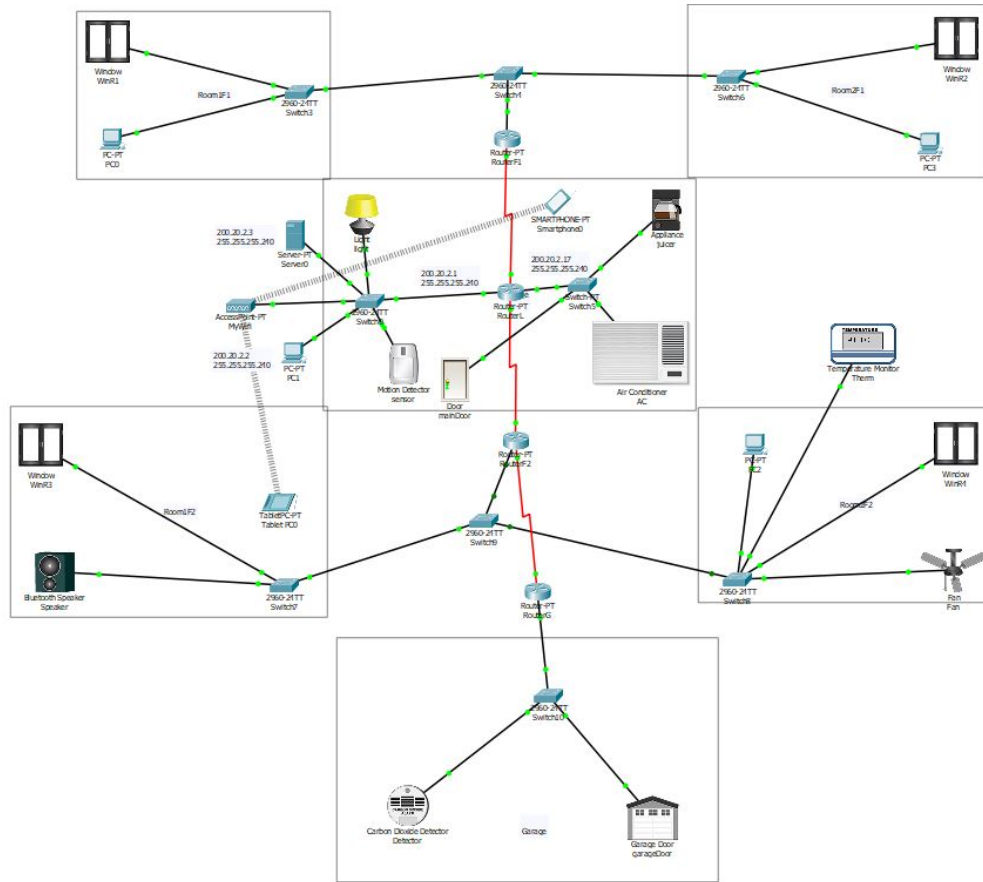


Figure 1: Smart Home Network Design

2. Lounge:

The Lounge is in the middle of the diagram. Two sub-nets namely, 200.20.2.0/28 and 200.20.2.16/28 given to the lounge. There are 4 IOT devices and 4 other devices including a PC, a Server, a smart-phone and a tablet PC. Other interfaces on the switches are left for new devices to connect to. There is only one server in the topology and that is placed in the lounge. The server provides all the services including, IOT, FTP, DNS, SMTP etc. The router in the lounge is at the centre of the whole network. Both the floors and the garage connect to the lounge router. It supports dynamic routing.

3. Garage:

The block at the bottom is the garage. The garage is assigned the sub-net of 200.20.2.96/28. There are only devices in the garage, smoke detector and the gate. DHCP is also configured here.

6 IP Network Pool

IP Network Pool		
Area	Network	Valid Hosts
Lounge sub-net1	200.20.2.0/28	14
Lounge sub-net2	200.20.2.16/28	14
Floor1Vlan10	200.20.2.32/28	14
Floor1Vlan20	200.20.2.48/28	14
Floor2Vlan10	200.20.2.64/28	14
Floor2Vlan20	200.20.2.80/28	14
Garage	200.20.2.96/29	6
RouterF1 to RouterL	200.20.2.252/30	2
RouterL to RouterF2	200.20.2.248/30	2
RouterF2 to RouterG	200.20.2.244/30	2

7 Summary

The network has been designed keeping in view the basic needs and requirements of a smart home. It has 3 separate areas including Bed-rooms, lounge and garage. It includes the basic networking concepts, like Sub-netting, VLSM, Routing Protocols (RIP v2), DHCP , DNS, FTP, and EMAIL.