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# DEVELOPING A NETWORK DESIGN FOR A SMART AIRPORT

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**GROUP 3**



## **GROUP MEMBERS**

|                          |                |
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## Introduction

These days the world needs fast and accurate internet, especially in airports. An airport is a sensitive place so, one error will cause many losses. Wherefore, the airport needs internet with high speed and errors are almost non-existent. In this report we will discuss the equipment we will use in each department and why we used these devices. Then we will list the configuration that we selected for each device. After that, we will discuss the design requirements coming from users, devices, applications, networks, and all the other things that are needed. Finally, we will describe the network topology that will be used to setup the various elements (links, nodes, etc.) In this project we will develop a network design for a smart airport using cisco packet tracer.













## Background about CISCO Packet Tracer

Cisco Packet Tracer is a very powerful software from Cisco. It is a network simulation software helping students to trace packets and test multiple test cases without using any external hardware. It is also helpful for network administrators. By downloading Cisco Packet Tracer, you can experiment with multiple test scenarios virtually without using real hardware. You need to continue as a guest user after downloading and installing Cisco Packet Tracer 7. You can easily visualize the configuration of your network with it. After preparing the positive and negative test cases of your network configuration, you can test them virtually with this software. By analyzing the test results you can edit the configuration to fix the problems you observed. Doing all these things with real hardware is quite expensive and time-consuming. Students preparing for Cisco certifications cannot afford the required hardware during their preparation. So, they need to virtually configure the network using switches, routers, and other networking devices to understand “why” and “what” they are doing. This is where Cisco Packet Tracer comes in handy.

## Design Requirements

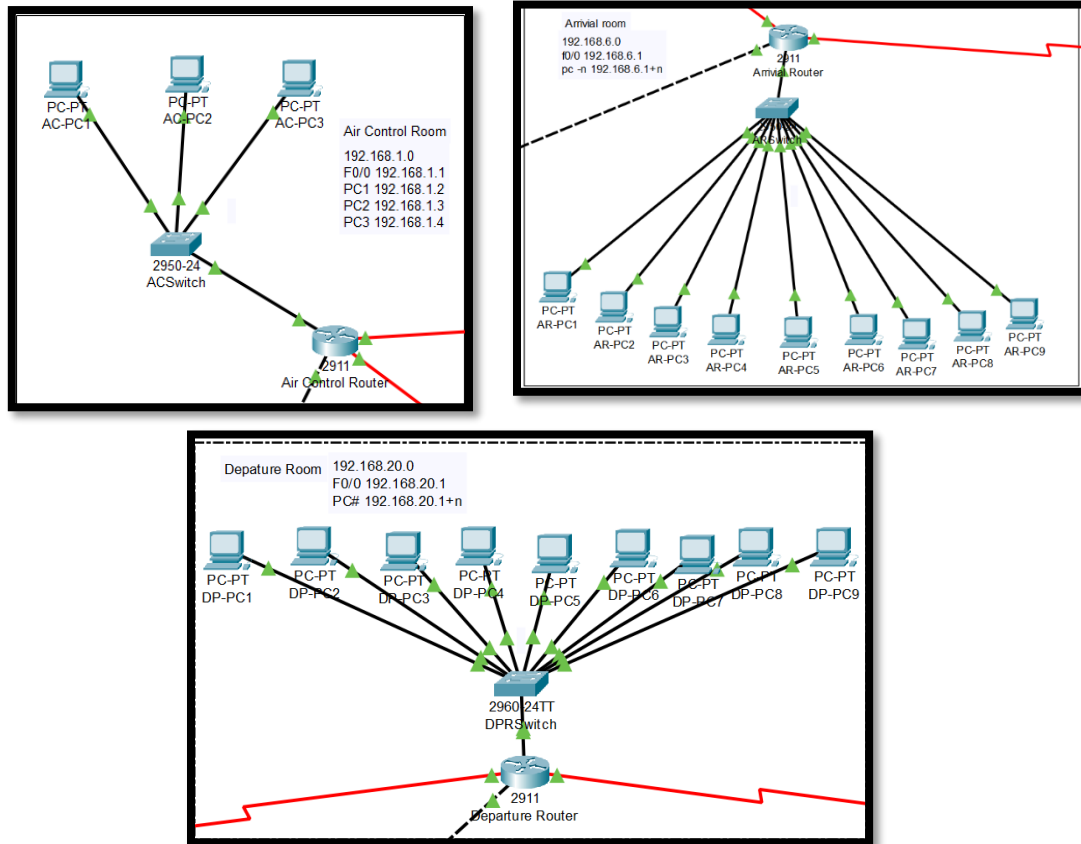
1. **Air control room:** will have three PCs connected to switch, and the switch connected to router.
2. **Departure room:** will have nine PCs for employees connected to switch, and the switch connected to router. Also, there is a webcam and monitor director connected to another switch and this switch will send data to server.
3. **Guest department (departure room):** will have a laptop, smart phone and tablet for guests connected to wireless router and the wireless router connected to router.
4. **Arrival room:** will have nine PCs connected to switch. And the switch connected to router. Also, there is a webcam and monitor director connected to another switch and this switch will send data to server.
5. **Guest department (arrival room):** will have a laptop, smart phone and tablet for guests connected to wireless router and the wireless router connected to router.
6. **Server room:** will have three servers and their names are AC Server (Air Control), DPR Server (Departure), and AR Server (Arrival). All these servers are carrying data from their corresponding room.
7. **Security room:** will have two servers. The names of servers are SecurityAR Server (Security of Air Control), and SecurityDPR Server (Security for Departure).
8. **Guest department of both arrival room and departure room should have** three end devices that are transmitting data to their employees part (arrival and departure) and they are connected through Wi-Fi. But they cannot transmit data to/from the Air Control Room.

## Equipment

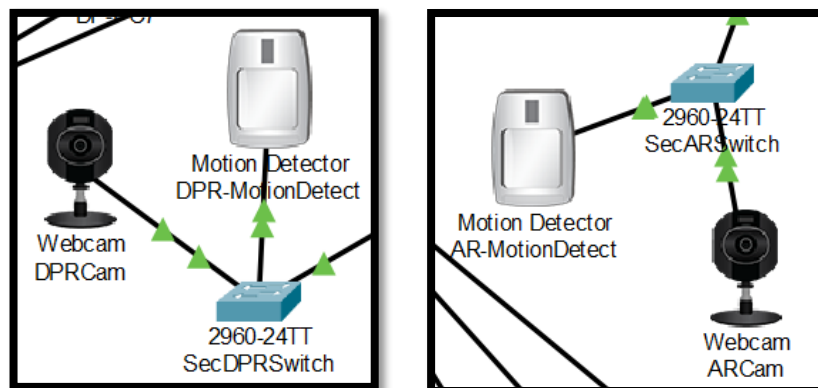
| Type                              |   | Justification   | Quantity |
|-----------------------------------|---|---|----------|
| PC                                |    | For the employees to contact using the software application.  | 21       |
| Switch<br>2960                    |    | 2960 Series Switches provide a range of security features to limit access to the network and mitigate threats.  | 5        |
| Router<br>2911                    |    | encryption acceleration is enhanced to provide higher scalability, enables WAN link security and VPN services.  | 5        |
| Wireless<br>RouterT300N           |    | wireless speed ideal for interruption sensitive applications like HD video streaming. provides separate access for guests while securing network.                 | 2        |
| Server                            |    | Provides central interface to manage users, implement security and other administrative processes Manages and monitors client computers and/or operating systems. | 5        |
| Laptop                            |    | Used by guest.  | 2        |
| Smart<br>phone                    |    | Used by guest.  | 2        |
| Tablet                            |    | Used by guest.  | 2        |
| Webcam                            |   | To identify persons.  | 2        |
| Motion<br>Detector                |  | An electrical device that utilizes a sensor to detect nearby motion. Form a vital component of security, automated lighting control.                              | 2        |
| Serial DTE Cable                  |  | to connect a Data Terminal Equipment (DTE) device (for example, a computer) to a Data Communications Equipment (DCE) device (for example, a modem).               | 4        |
| Copper Straight-<br>Through cable |  | a type of twisted pair copper wire cable for local area network (LAN) uses for which the RJ-45 connectors at each end have the same pinout.                       | 32       |

## Network topology

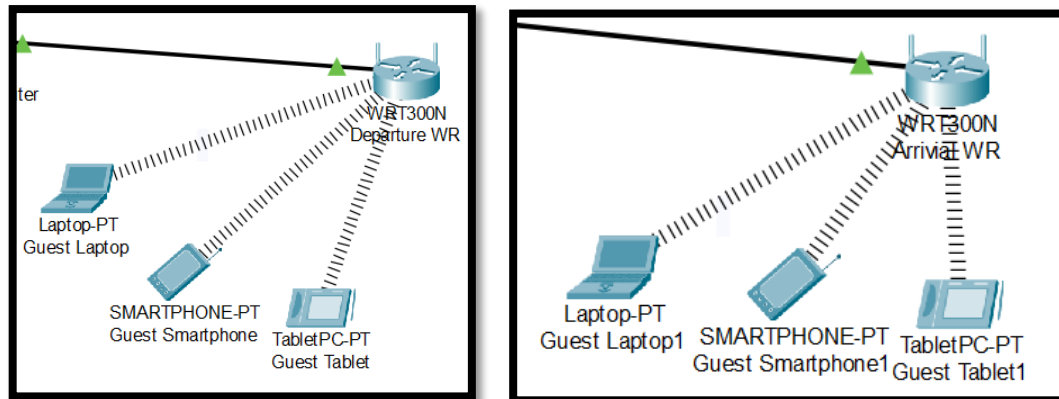
1. We have 3-star topologies for employees PCs at Air Control, Departure and arrival rooms (Copper Straight-Through cable).



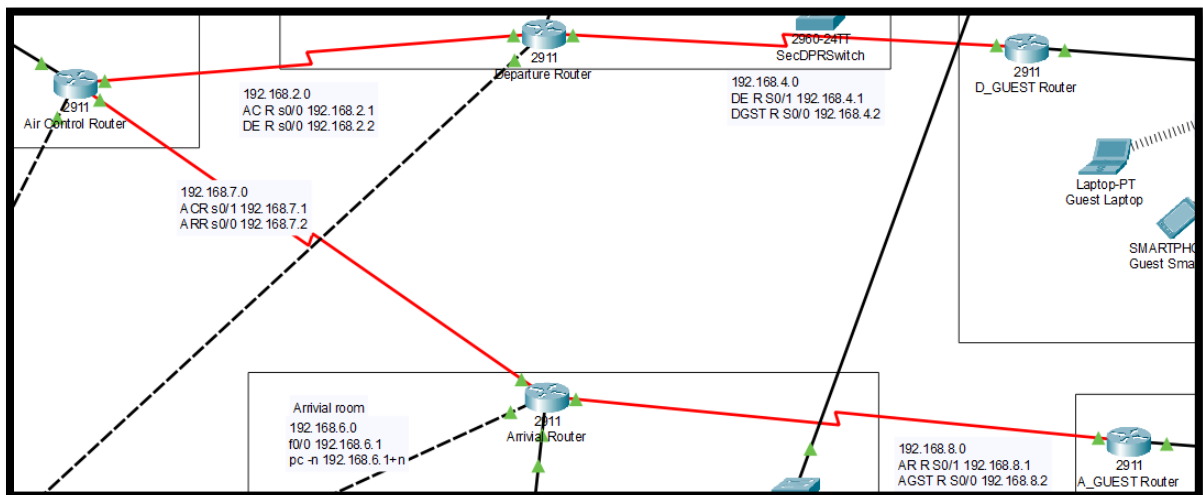
2. We have 2-star topologies for Webcam and Motion detector at Departure and Arrival rooms connected to servers from Security room (Copper Straight-Through cable).



3. We have 2-wireless star topologies for guest departments at Departure and Arrival rooms (WiFi).



4. We have 1-bus topology for routers (Serial DTE cable).



## Devices configuration

First, we must create the Addressing table with the following information (Device name, Interface, IP address, Default gateway) as follows:

**Note:** we decided to list one end system from each room since the rest will follow the pattern

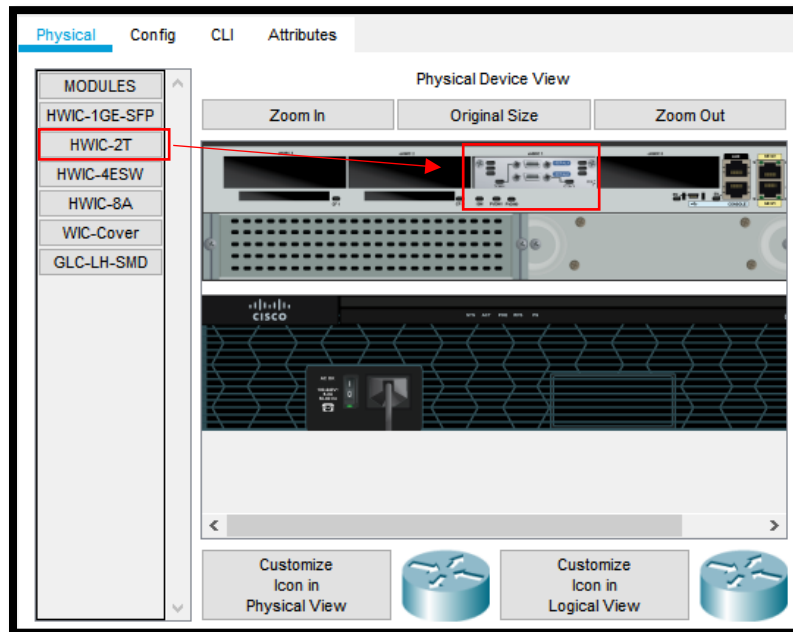
| Room               | Device                          | Interface     | IP address     | Gateway      |
|--------------------|---------------------------------|---------------|----------------|--------------|
| Air Control        | Air Control Router              | GbE 0/0       | 192.168.1.1    | N/A          |
|                    |                                 | GbE 0/1       | 192.168.25.1   | N/A          |
|                    |                                 | Serial 0/1/0  | 192.168.2.1    | N/A          |
|                    |                                 | Serial 0/1/1  | 192.168.7.1    | N/A          |
| Air Control        | AC-PC (n)                       | FastEthernet0 | 192.168.1.1+n  | 192.168.1.1  |
| Employee Departure | Departure Router                | GbE 0/0       | 192.168.20.1   | N/A          |
|                    |                                 | GbE 0/1       | 192.168.45.1   | N/A          |
|                    |                                 | Serial 0/1/0  | 192.168.2.2    | N/A          |
|                    |                                 | Serial 0/1/1  | 192.168.4.1    | N/A          |
| Employee Departure | DP-PC (n)                       | FastEthernet0 | 192.168.20.1+n | 192.168.20.1 |
| Guest Departure    | Departure Guest Router          | GbE 0/0       | 192.168.3.1    | N/A          |
|                    |                                 | Serial 0/1/0  | 192.168.4.2    | N/A          |
| Guest Departure    | Departure Guest Wireless Router | Ethernet 1    | 192.168.3.2    | 192.168.3.1  |
| Guest Departure    | Departure Guest Devices (n)     | Wireless 0    | 192.168.3.2+n  | 192.168.3.1  |
| Employee Arrival   | Arrival Router                  | GbE 0/0       | 192.168.6.1    | N/A          |
|                    |                                 | GbE 0/1       | 192.168.15.1   | N/A          |
|                    |                                 | Serial 0/1/0  | 192.168.7.2    | N/A          |
|                    |                                 | Serial 0/1/1  | 192.168.8.1    | N/A          |
| Employee Arrival   | AR-PC (n)                       | FastEthernet0 | 192.168.6.1+n  | 192.168.6.1  |
| Guest Arrival      | Arrival Guest Router            | GbE 0/0       | 192.168.5.1    | N/A          |
|                    |                                 | Serial 0/1/0  | 192.168.8.2    | N/A          |
| Guest Arrival      | Arrival Guest Wireless Router   | Ethernet 1    | 192.168.5.2    | 192.168.5.1  |
| Guest Arrival      | Departure Guest Devices (n)     | Wireless 0    | 192.168.5.2+n  | 192.168.5.1  |
| Security           | Security AR Server              | FastEthernet0 | 192.168.75.1   | N/A          |
| Security           | Security DP Server              | FastEthernet0 | 192.168.85.1   | N/A          |
| Server             | Air Control Server              | FastEthernet0 | 192.168.25.2   | 192.168.25.1 |
| Server             | Departure Server                | FastEthernet0 | 192.168.45.2   | 192.168.45.1 |
| Server             | Arrival Server                  | FastEthernet0 | 192.168.15.2   | 192.168.15.1 |



**We started configuring the devices in Air Control Room:**

### **Air Control Router:**

We First added a “HWIC-2T” module to gain access to Serial Ports



Then we started configuring the Interfaces as follows

**Note:** In interface Serial 0/1/0 we increased the Clock rate to achieve a faster Data transmission rates

GigabitEthernet0/0

Port Status ☒ On

Bandwidth ☐ 1000 Mbps ☒ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex ☐ Half Duplex ☒ Full Duplex ☒ Auto

MAC Address 0006.2A3A.1901

IP Configuration

IPv4 Address 192.168.1.1

Subnet Mask 255.255.255.0

Tx Ring Limit 10

GigabitEthernet0/1

Port Status ☒ On

Bandwidth ☐ 1000 Mbps ☒ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex ☐ Half Duplex ☒ Full Duplex ☒ Auto

MAC Address 0006.2A3A.1902

IP Configuration

IPv4 Address 192.168.25.1

Subnet Mask 255.255.255.0

Tx Ring Limit 10

Serial0/1/0

Port Status ☒ On

Duplex ☒ Full Duplex

Clock Rate 2000000

IP Configuration

IPv4 Address 192.168.2.1

Subnet Mask 255.255.255.0

Tx Ring Limit 10

Serial0/1/1

Port Status ☒ On

Duplex ☒ Full Duplex

Clock Rate 64000

IP Configuration

IPv4 Address 192.168.7.1

Subnet Mask 255.255.255.0

Tx Ring Limit 10

After configuring the Air control router, we moved to the departure room specifically the employee department

### Employee's Departure Router

We also added the same Module (HWIC-2T) to the departure router. We configured the interfaces for the departure router as follows:

| GigabitEthernet0/0 |  |
|--------------------|--|
| Port Status        | <input checked="" type="checkbox"/> On   |
| Bandwidth          | <input type="radio"/> 1000 Mbps <input checked="" type="radio"/> 100 Mbps <input type="radio"/> 10 Mbps <input checked="" type="checkbox"/> Auto |
| Duplex             | <input type="radio"/> Half Duplex <input checked="" type="radio"/> Full Duplex <input checked="" type="checkbox"/> Auto                          |
| MAC Address        | 0030.A3CC.9701   |
| IP Configuration   |  |
| IPv4 Address       | 192.168.20.1   |
| Subnet Mask        | 255.255.255.0  |
| Tx Ring Limit      | 10   |

| GigabitEthernet0/1 |  |
|--------------------|--|
| Port Status        | <input checked="" type="checkbox"/> On   |
| Bandwidth          | <input type="radio"/> 1000 Mbps <input checked="" type="radio"/> 100 Mbps <input type="radio"/> 10 Mbps <input checked="" type="checkbox"/> Auto |
| Duplex             | <input type="radio"/> Half Duplex <input checked="" type="radio"/> Full Duplex <input checked="" type="checkbox"/> Auto                          |
| MAC Address        | 0030.A3CC.9702   |
| IP Configuration   |  |
| IPv4 Address       | 192.168.45.1   |
| Subnet Mask        | 255.255.255.0  |
| Tx Ring Limit      | 10   |

| Serial0/1/0      |  |
|------------------|--|
| Port Status      | <input checked="" type="checkbox"/> On       |
| Duplex           | <input checked="" type="radio"/> Full Duplex |
| Clock Rate       | 64000  |
| IP Configuration |  |
| IPv4 Address     | 192.168.2.2                                  |
| Subnet Mask      | 255.255.255.0                                |
| Tx Ring Limit    | 10   |

| Serial0/1/1      |  |
|------------------|--|
| Port Status      | <input checked="" type="checkbox"/> On       |
| Duplex           | <input checked="" type="radio"/> Full Duplex |
| Clock Rate       | 64000  |
| IP Configuration |  |
| IPv4 Address     | 192.168.4.1                                  |
| Subnet Mask      | 255.255.255.0                                |
| Tx Ring Limit    | 10   |

Next, we configured the Guest department for Departure Room with two routers one of them is a wireless router, here is the configuration for the first router that links the guest with the employee's department

### Guest Departure Router

First, we added the (HWIC-2T) Module like the previous routers. Then we configured the interfaces as follows:

**Note:** In interface Serial 0/1/0 we increased the Clock rate to achieve a faster Data transmission rates

Configuration window for GigabitEthernet0/0 interface. The window includes sections for Port Status, Bandwidth, Duplex, MAC Address, IP Configuration, and Tx Ring Limit. The Port Status is set to On. Bandwidth is set to 100 Mbps and Auto. Duplex is set to Full Duplex and Auto. The MAC Address is 00E0.8FA9.3B01. The IP Configuration shows IPv4 Address 192.168.3.1 and Subnet Mask 255.255.255.0. The Tx Ring Limit is set to 10.

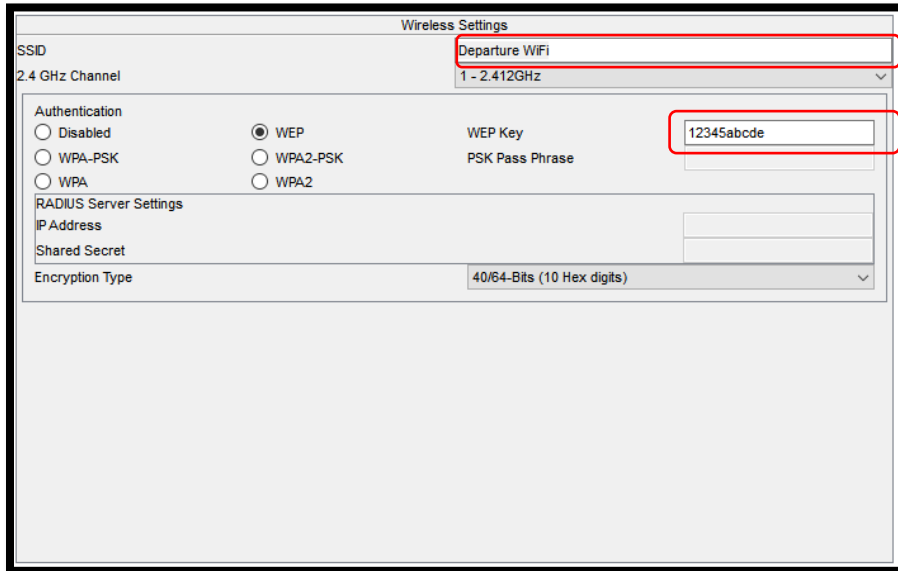
| GigabitEthernet0/0 |  |
|--------------------|--|
| Port Status        | <input checked="" type="checkbox"/> On   |
| Bandwidth          | <input type="radio"/> 1000 Mbps <input checked="" type="radio"/> 100 Mbps <input type="radio"/> 10 Mbps <input checked="" type="checkbox"/> Auto |
| Duplex             | <input type="radio"/> Half Duplex <input checked="" type="radio"/> Full Duplex <input checked="" type="checkbox"/> Auto                          |
| MAC Address        | 00E0.8FA9.3B01   |
| IP Configuration   |  |
| IPv4 Address       | 192.168.3.1  |
| Subnet Mask        | 255.255.255.0  |
| Tx Ring Limit      | 10   |

Configuration window for Serial0/1/0 interface. The window includes sections for Port Status, Duplex, Clock Rate, IP Configuration, and Tx Ring Limit. The Port Status is set to On. Duplex is set to Full Duplex. The Clock Rate is set to 2000000. The IP Configuration shows IPv4 Address 192.168.4.2 and Subnet Mask 255.255.255.0. The Tx Ring Limit is set to 10.

| Serial0/1/0      |  |
|------------------|--|
| Port Status      | <input checked="" type="checkbox"/> On       |
| Duplex           | <input checked="" type="radio"/> Full Duplex |
| Clock Rate       | 2000000                                      |
| IP Configuration |  |
| IPv4 Address     | 192.168.4.2                                  |
| Subnet Mask      | 255.255.255.0                                |
| Tx Ring Limit    | 10   |

## Guest wireless departure router

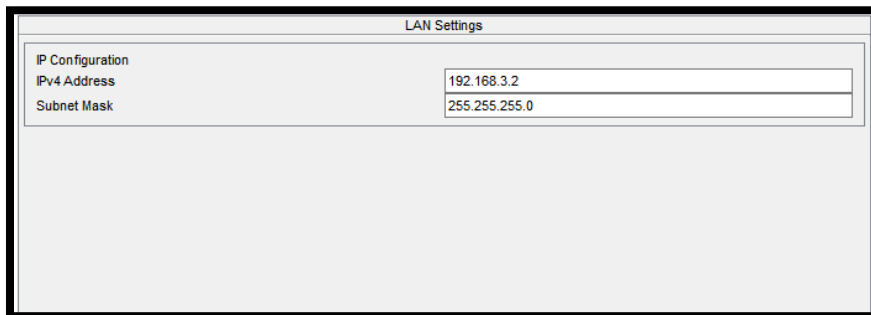
We decided to assign a SSID for the router (Departure WiFi) and a password (12345abcde) as you can see



The image shows a 'Wireless Settings' configuration window. The 'SSID' field is set to 'Departure WiFi'. The '2.4 GHz Channel' is set to '1 - 2.412GHz'. Under the 'Authentication' section, 'WEP' is selected. The 'WEP Key' field is set to '12345abcde'. The 'Encryption Type' is set to '40/64-Bits (10 Hex digits)'. Other options like 'WPA-PSK', 'WPA', and 'WPA2' are unselected. There are also fields for 'RADIUS Server Settings' (IP Address, Shared Secret) and a 'PSK Pass Phrase' field.

| Wireless Settings              |                                      |
|--------------------------------|--------------------------------------|
| SSID                           | Departure WiFi                       |
| 2.4 GHz Channel                | 1 - 2.412GHz                         |
| <b>Authentication</b>          |                                      |
| <input type="radio"/> Disabled | <input checked="" type="radio"/> WEP |
| <input type="radio"/> WPA-PSK  | <input type="radio"/> WPA2-PSK       |
| <input type="radio"/> WPA      | <input type="radio"/> WPA2           |
| WEP Key: 12345abcde            |                                      |
| PSK Pass Phrase:               |                                      |
| <b>RADIUS Server Settings</b>  |                                      |
| IP Address                     |                                      |
| Shared Secret                  |                                      |
| Encryption Type                | 40/64-Bits (10 Hex digits)           |

We configured the LAN as follows:



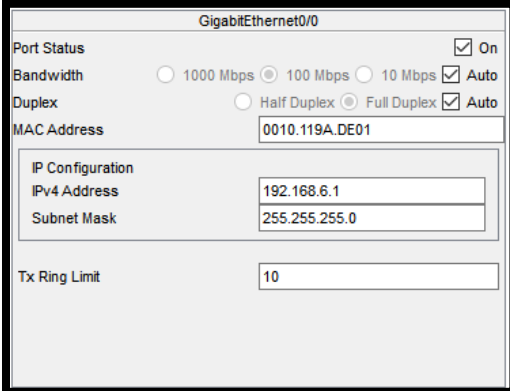
The image shows a 'LAN Settings' configuration window. The 'IP Configuration' section is expanded, showing 'IPv4 Address' set to '192.168.3.2' and 'Subnet Mask' set to '255.255.255.0'.

| LAN Settings            |               |
|-------------------------|---------------|
| <b>IP Configuration</b> |               |
| IPv4 Address            | 192.168.3.2   |
| Subnet Mask             | 255.255.255.0 |

## Employee's Arrival Router

We also added the same Module (HWIC-2T) to the Arrival router. We configured the interfaces for the arrival router as follows:

**Note:** In interface Serial 0/1/0 and 0/1/1 we increased the Clock rate to achieve a faster Data transmission rates



GigabitEthernet0/0

Port Status ☒ On

Bandwidth ☐ 1000 Mbps ☒ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex ☐ Half Duplex ☒ Full Duplex ☒ Auto

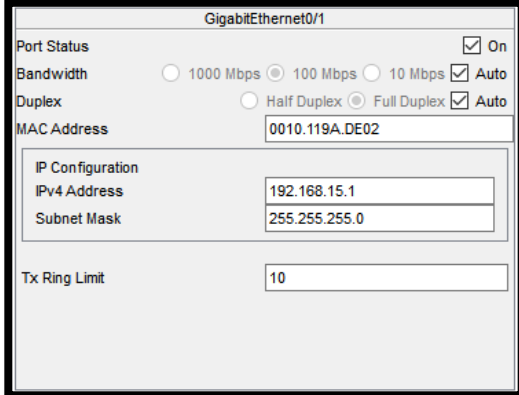
MAC Address 0010.119A.DE01

IP Configuration

IPv4 Address 192.168.6.1

Subnet Mask 255.255.255.0

Tx Ring Limit 10



GigabitEthernet0/1

Port Status ☒ On

Bandwidth ☐ 1000 Mbps ☒ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex ☐ Half Duplex ☒ Full Duplex ☒ Auto

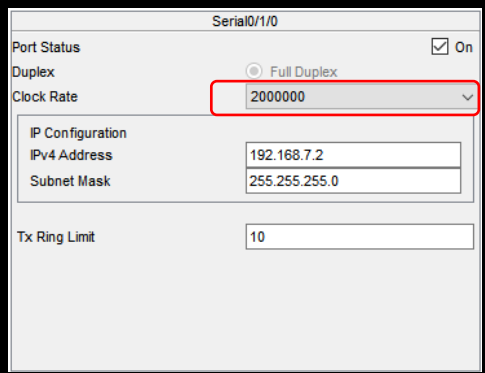
MAC Address 0010.119A.DE02

IP Configuration

IPv4 Address 192.168.15.1

Subnet Mask 255.255.255.0

Tx Ring Limit 10



Serial0/1/0

Port Status ☒ On

Duplex ☒ Full Duplex

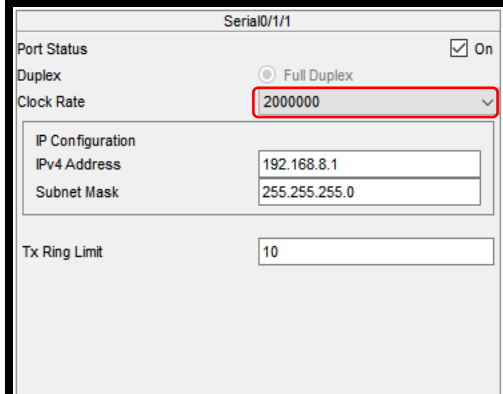
Clock Rate 2000000

IP Configuration

IPv4 Address 192.168.7.2

Subnet Mask 255.255.255.0

Tx Ring Limit 10



Serial0/1/1

Port Status ☒ On

Duplex ☒ Full Duplex

Clock Rate 2000000

IP Configuration

IPv4 Address 192.168.8.1

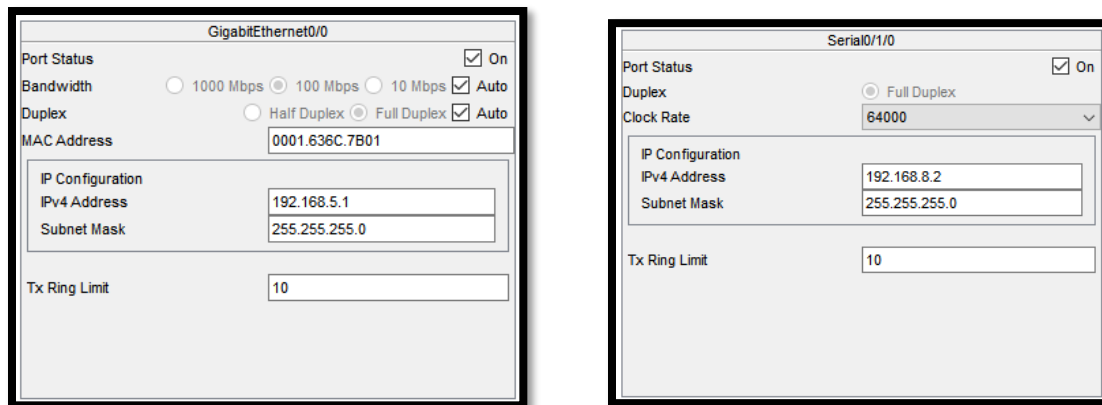
Subnet Mask 255.255.255.0

Tx Ring Limit 10

Similarly, to the guest departure room we have two router one of them is wireless, here is the configuration for the first router that links the guest with the employee's department

### Guest Arrival Router

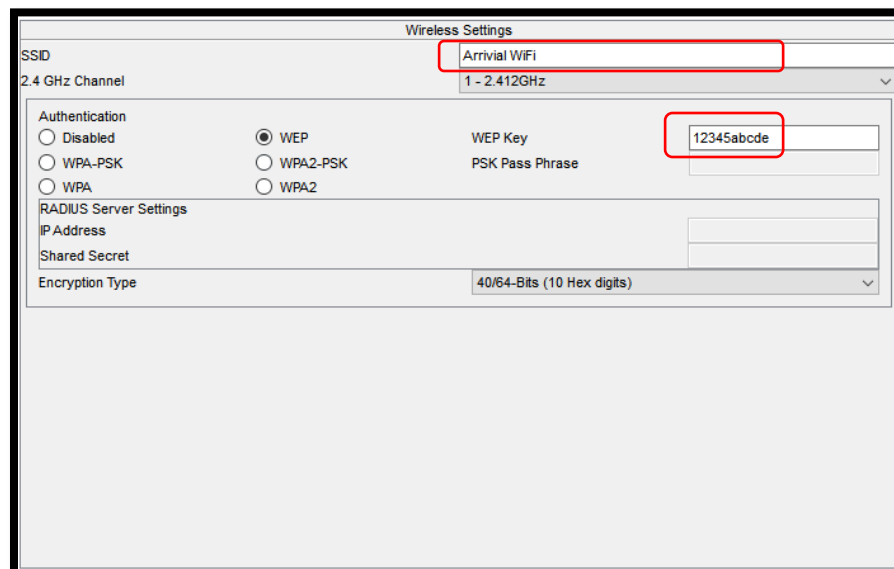
First, we also added the (HWIC-2T) Module like the previous routers. Then we configured the interfaces as follows:



The image displays two screenshots of router configuration interfaces. The left screenshot shows the configuration for the GigabitEthernet0/0 interface. It includes fields for Port Status (checked On), Bandwidth (100 Mbps selected), Duplex (Full Duplex selected), MAC Address (0001.636C.7B01), IP Configuration (IPv4 Address: 192.168.5.1, Subnet Mask: 255.255.255.0), and Tx Ring Limit (10). The right screenshot shows the configuration for the Serial0/1/0 interface. It includes fields for Port Status (checked On), Duplex (Full Duplex selected), Clock Rate (64000), IP Configuration (IPv4 Address: 192.168.8.2, Subnet Mask: 255.255.255.0), and Tx Ring Limit (10).

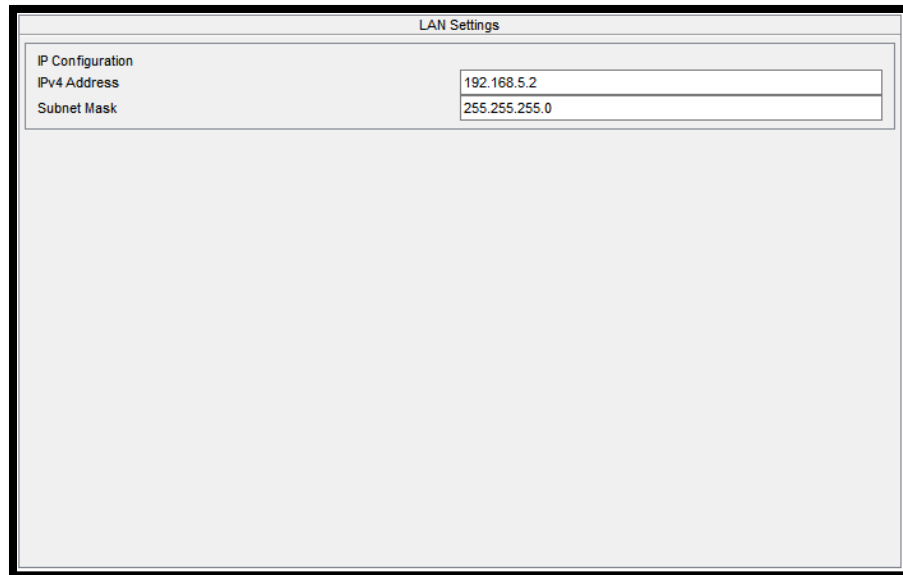
### Guest wireless arrival router

Similarly, to the departure Wi-Fi. We assigned a SSID for the router (Arrival Wi-Fi) and a password(12345abcde) as you can see



The image shows the Wireless Settings configuration page. The SSID is set to 'Arrival WiFi' and the 2.4 GHz Channel is set to '1 - 2.412GHz'. Under Authentication, WEP is selected, and the WEP Key is set to '12345abcde'. The PSK Pass Phrase field is empty. The RADIUS Server Settings section includes fields for IP Address and Shared Secret, both of which are empty. The Encryption Type is set to '40/64-Bits (10 Hex digits)'.

We configured the LAN as follows:



LAN Settings

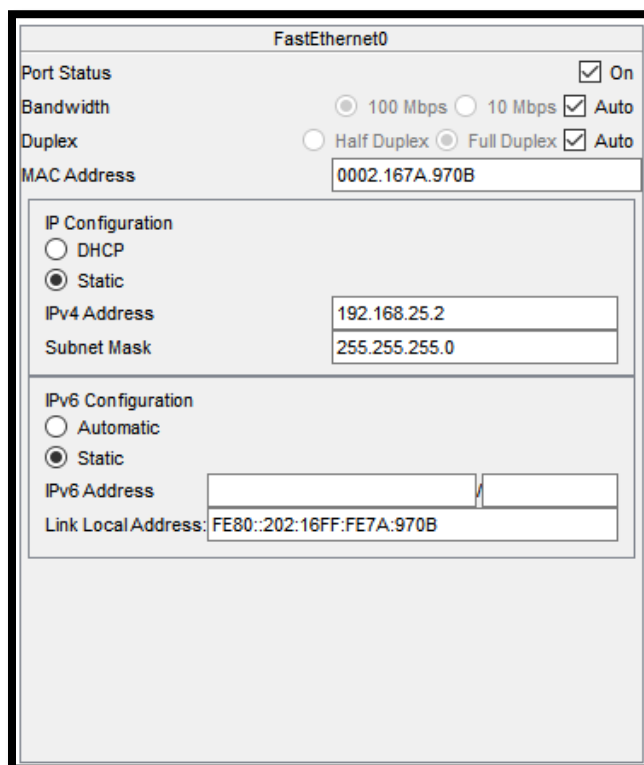
IP Configuration

IPv4 Address: 192.168.5.2

Subnet Mask: 255.255.255.0

### Air Control Server

Inside the server room we have three servers for each room the configuration for the air control server is as follows:



FastEthernet0

Port Status: ☒ On

Bandwidth: ☒ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex: ☐ Half Duplex ☒ Full Duplex ☒ Auto

MAC Address: 0002.167A.970B

IP Configuration

☐ DHCP

☒ Static

IPv4 Address: 192.168.25.2

Subnet Mask: 255.255.255.0

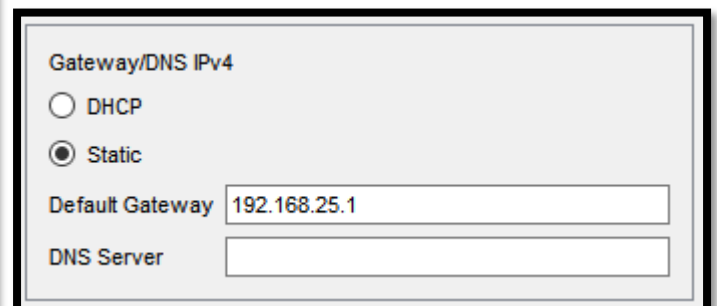
IPv6 Configuration

☐ Automatic

☒ Static

IPv6 Address: [Empty]

Link Local Address: FE80::202:16FF:FE7A:970B



Gateway/DNS IPv4

☐ DHCP

☒ Static

Default Gateway: 192.168.25.1

DNS Server: [Empty]



## Departure Room Server

Another server inside the server room is the departure server. The configuration is as follows:

FastEthernet0

Port Status

☒ On

Bandwidth

☒ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex

☐ Half Duplex ☒ Full Duplex ☒ Auto

MAC Address

0004.9A7E.102D

IP Configuration

☐ DHCP  
☒ Static

IPv4 Address

192.168.45.2

Subnet Mask

255.255.255.0

IPv6 Configuration

☐ Automatic  
☒ Static

IPv6 Address

Link Local Address

FE80::204:9AFF:FE7E:102D

Gateway/DNS IPv4

☐ DHCP  
☒ Static

Default Gateway

192.168.45.1

DNS Server

## Arrival Room Server

The last server inside the server room is the Arrival server. The configuration is as follows:

FastEthernet0

Port Status

☒ On

Bandwidth

☒ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex

☐ Half Duplex ☒ Full Duplex ☒ Auto

MAC Address

0001.64BA.EEC4

IP Configuration

☐ DHCP ☒ Static

IPv4 Address

192.168.15.2

Subnet Mask

255.255.255.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address

Link Local Address

FE80::201:64FF:FEBA:EEC4

Gateway/DNS IPv4

☐ DHCP ☒ Static

Default Gateway

192.168.15.1

DNS Server

## Security Arrival Room Server

FastEthernet0

Port Status ☒ On

Bandwidth ☒ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex ☐ Half Duplex ☒ Full Duplex ☒ Auto

MAC Address 0001.4236.184A

IP Configuration

☐ DHCP

☒ Static

IPv4 Address 192.168.75.1

Subnet Mask 255.255.255.0

IPv6 Configuration

☐ Automatic

☒ Static

IPv6 Address

Link Local Address: FE80::201:42FF:FE36:184A

## Security Departure Room Server

FastEthernet0

Port Status ☒ On

Bandwidth ☒ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex ☐ Half Duplex ☒ Full Duplex ☒ Auto

MAC Address 0002.16E8.9346

IP Configuration

☐ DHCP

☒ Static

IPv4 Address 192.168.85.1

Subnet Mask 255.255.255.0

IPv6 Configuration

☐ Automatic

☒ Static

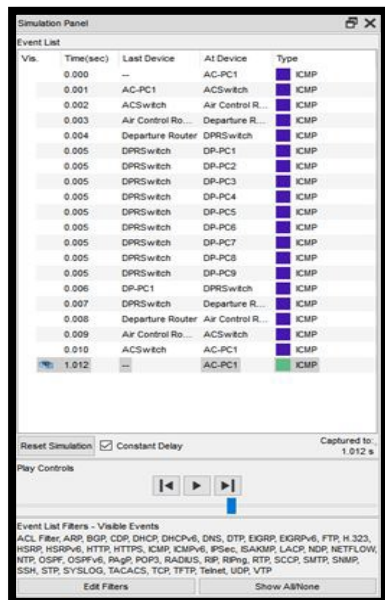
IPv6 Address

Link Local Address: FE80::202:16FF:FEE8:9346

## Simulation

To make sure our network will work properly as required we conducted a simulation. here is what we have found:

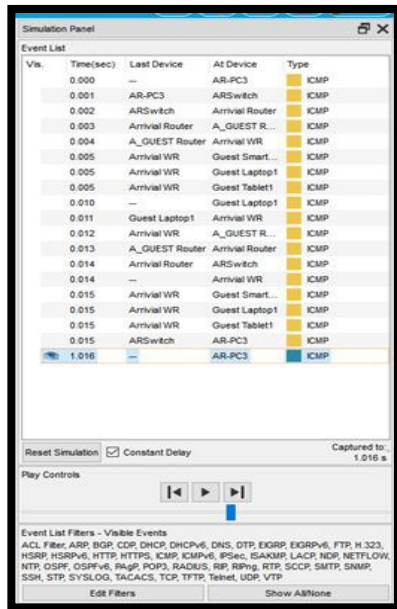
- Pinging from AC-PC1 to DP-PC1



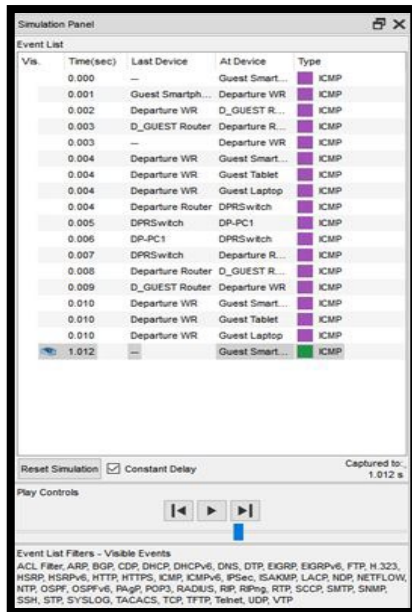
- Pinging from AR-PC2 to AC-PC3



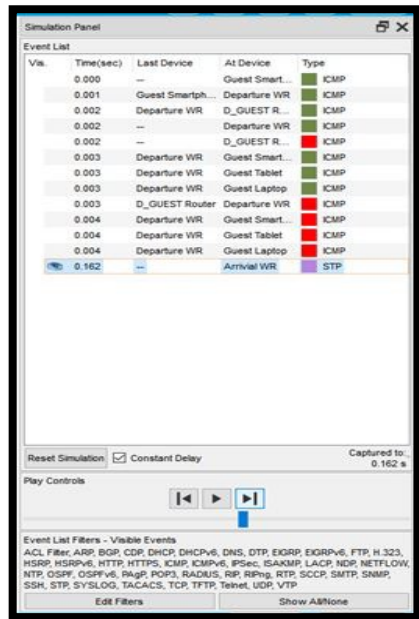
- Pinging from AR-PC3 to Guest Laptop1



- Pinging from guest smartphone to DP-PC1



- Pinging from guest smartphone to AC-PC1 (Should be Unreachable)



## Conclusion

To sum up, after checking the requirements we divided the airport into five rooms including the guest part (Air control room, Departure room, Arrival room, Server room, and Security room). Then we have set all the equipment that we need to run the airport. Furthermore, we designed the topology and then connect all the equipment. Finally, we configure all the devices we used and then tested them.