A COMPANY'S NETWORK (USING VLAN&DHCP)

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Project Description

In this project, I am going to set up the network of a company, using Cisco Packet Tracer.

With this work, I learned and understood the basic functionality of VLAN and AP.

Our LAN is made up from 3 subnetworks: IT, FINANCE and HR.

Starting Configurations

Our base network's IP is 192.168.1.0. In our company, we have 3 departments, each one corresponding to a subnetwork, so we need to have 3 subnets. Therefore, the subnet mask will be 255.255.255.192.
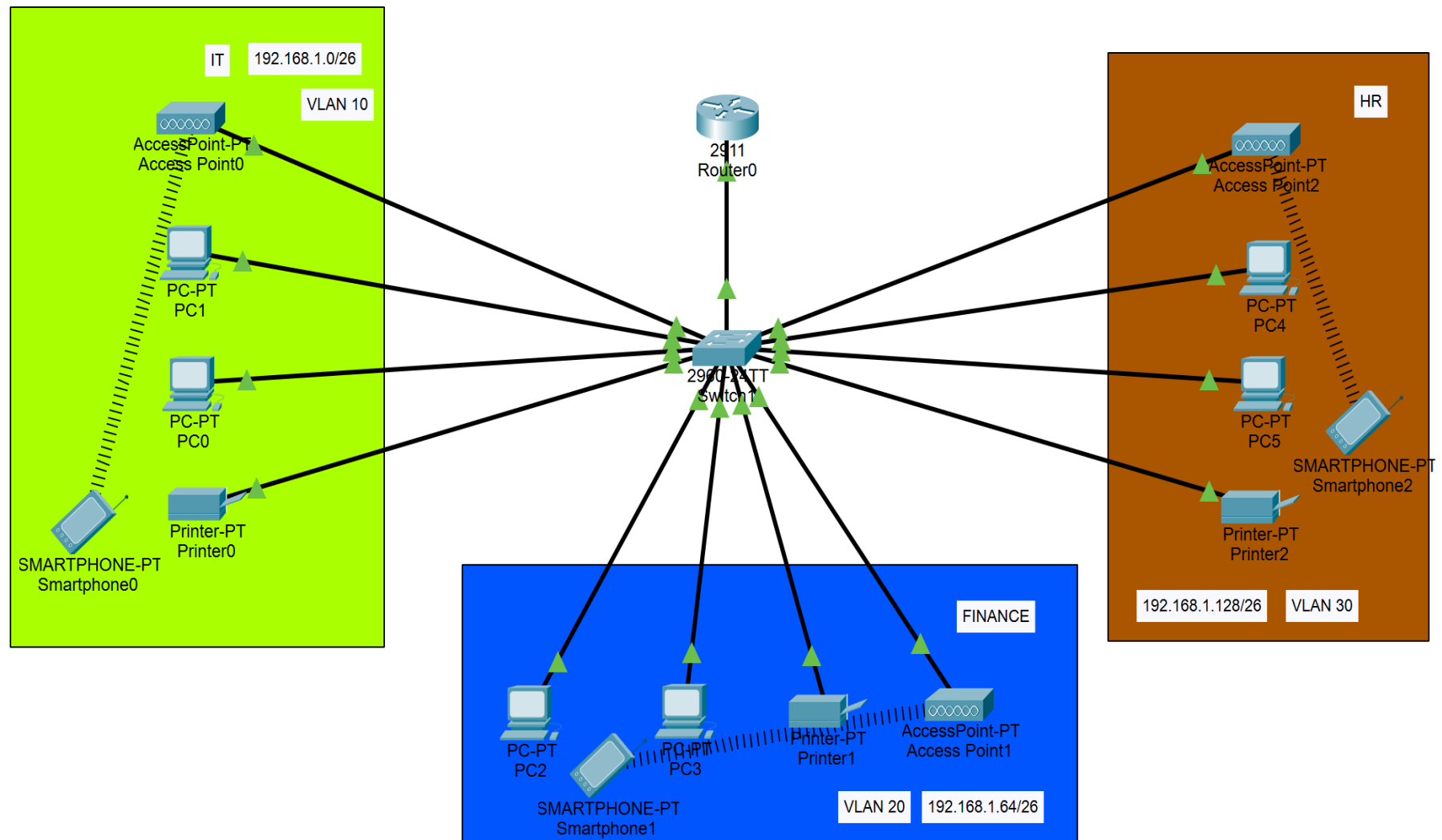
Before configuring the network, I set some „design" rules.

- we can only use one router and one switch
- each department is required to be in different VLANs
- each department is required to have wireless network for the users
- host devices in the network are required to obtain IPv4 address automatically.

Next, I will insert a table with each subnetwork's IP addresses.

IT	FINANCE	HR
Subnet mask: 255.255.255.192	Subnet mask: 255.255.255.192	Subnet mask: 255.255.255.192
Network address: 192.168.1.0/26	Network address: 192.168.1.64/26	Network address: 192.168.1.128/26
Range of valid hosts: 192.168.1.1-192.168.1.62	Range of valid hosts: 192.168.1.65-192.168.1.126	Range of valid hosts: 192.168.1.129-192.168.1.190
Broadcast address: 192.168.1.63	Broadcast address: 192.168.1.127	Broadcast address: 192.168.1.191

Network's structure

IT   192.168.1.0/26

VLAN 10

AccessPoint-PT
Access Point0

PC-PT
PC1

PC-PT
PC0

Printer-PT
Printer0

SMARTPHONE-PT
Smartphone0

2911
Router0

2960-24TT
Switch1

HR

AccessPoint-PT
Access Point2

PC-PT
PC4

PC-PT
PC5

SMARTPHONE-PT
Smartphone2

Printer-PT
Printer2

192.168.1.128/26   VLAN 30

FINANCE

PC-PT
PC2

SMARTPHONE-PT
Smartphone1

PC-PT
PC3

Printer-PT
Printer1

AccessPoint-PT
Access Point1

VLAN 20   192.168.1.64/26

A screenshot of the network's structure

Setting up the VLAN

To set up the VLAN, we have to configure the switch. The following are the commands that I have used to set it up.

Switch>enable

Switch#config t

Switch(config)#int range fa0/1-4

Switch(config-if-range)#switchport mode access

Switch(config-if-range)#switchport access vlan 1

Switch(config-if-range)#switchport access vlan 10

Switch(config-if-range)#int range fa0/6-9

Switch(config-if-range)#switchport mode access

Switch(config-if-range)#switchport access vlan 20

Switch(config-if-range)#int range fa0/10-13
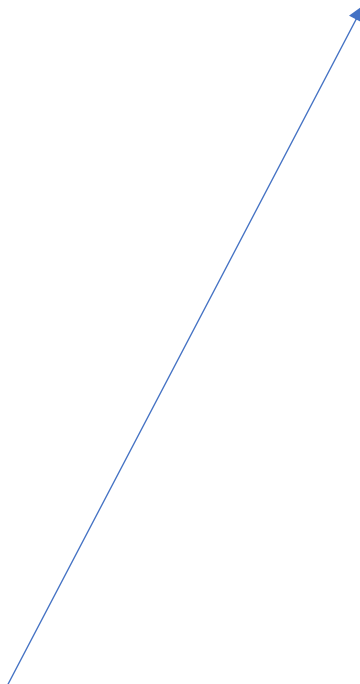
Switch(config-if-range)#switchport mode access

Switch(config-if-range)#switchport access vlan 30

Switch(config-if-range)#do wr

Switch(config)#int fa0/5

Switch(config-if)#switchport mode trunk

Switch(config-if)#do wr

Router configuration

First of all, we need to turn on the router's interface. All 3 subnets should be able to communicate with each other, so we have to create an **inter-VLAN communication,** which means to create multiple sub-interfaces from a single physical interface. Moreover, we'll assign a default gateway to every sub-interface corresponding to a VLAN. These are the commands that I have used in this process.

```
Router(config)#int gig 0/0.10

Router(config-subif)#encapsulation dot1Q 10

Router(config-subif)#ip address 192.168.1.1 255.255.255.192

Router(config-subif)#do wr

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Router(config)#int gig0/0.20

Router(config-subif)#encapsulation dot1Q 20

Router(config-subif)#ip address 192.168.1.65 255.255.255.192

Router(config-subif)#do wr

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Router(config)#int gig0/0.30

Router(config-subif)#encapsulation dot1Q 30

Router(config-subif)#ip address 192.168.1.129 255.255.255.192

Router(config-subif)#do wr
```

Now, the only thing left to do is to enable the DHCP server, so all devices can get an IP address automatically.

IT POOL	FINANCE	HR
Router(config)#service dhcp	Router(config)#ip dhcp pool FINANCE	Router(config)#ip dhcp pool HR
Router(config)#ip dhcp pool IT	Router(dhcp-config)#network 192.168.1.64	Router(dhcp-config)#network
Router(dhcp-config)#network 192.168.1.0	255.255.255.192	192.168.1.128 255.255.255.192
255.255.255.192	Router(dhcp-config)#default-router	Router(dhcp-config)#default-router
Router(dhcp-config)#default-router	192.168.1.65	192.168.1.129
192.168.1.1	Router(dhcp-config)#dns-server	Router(dhcp-config)#dns-server
Router(dhcp-config)#dns-server	192.168.1.65	192.168.1.129
192.168.1.1	Router(dhcp-config)#domain-name	Router(dhcp-config)#domain-name hr.com
Router(dhcp-config)#domain-name it.com	finance.com	Router(dhcp-config)#exit
Router(dhcp-config)#exit	Router(dhcp-config)#exit	Router(config)#do wr
Router(config)#do wr	Router(config)#do wr	

Working Test

In the end, we need verify our project's functionality. First of all, we have to see if the DHCP server works correctly.
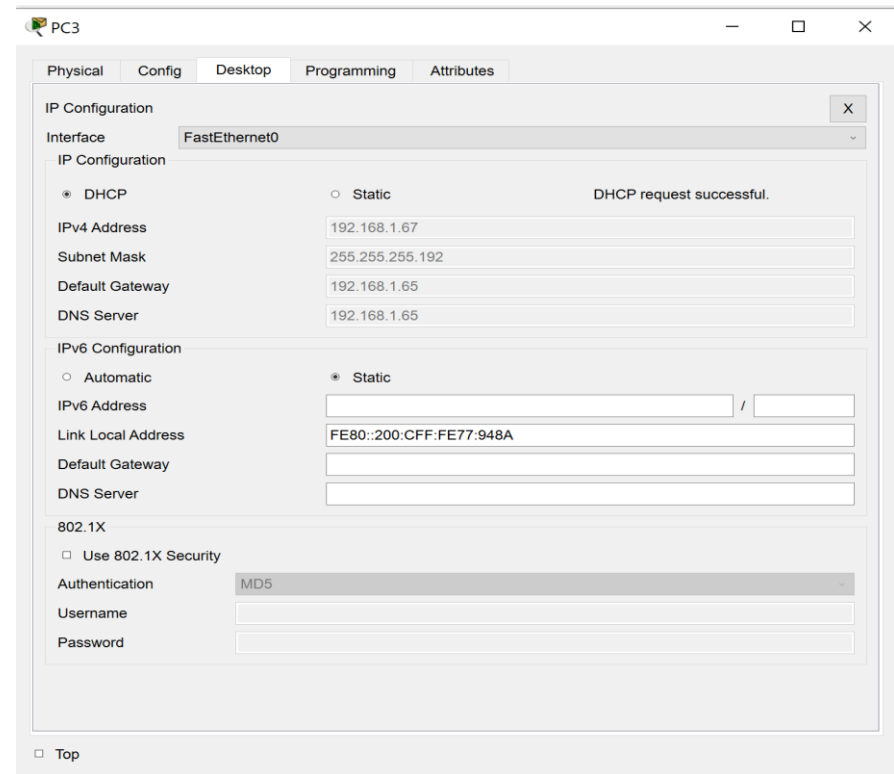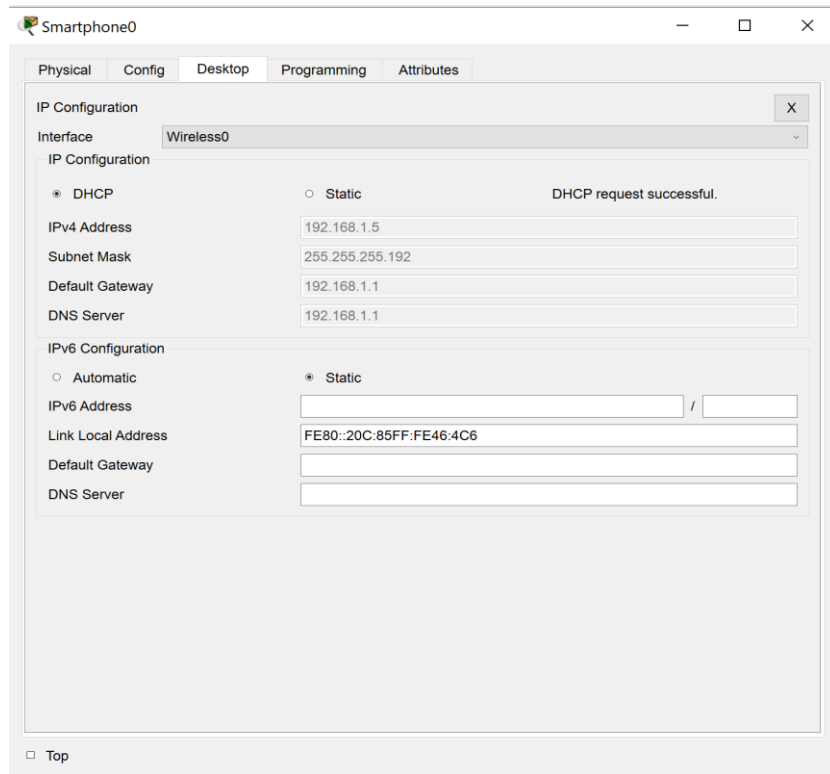
Both the wired and wireless devices (connected via an AP) in the network get an IP address automatically, so the DHCP server works.

To verify if the inter-VLAN connection is working, we need to see if all devices can communicate with others from other VLAN. To do so, we can use the „ping" command.

```
C:\>ping 192.168.1.131

Pinging 192.168.1.131 with 32 bytes of data:

Reply from 192.168.1.131: bytes=32 time=38ms TTL=127
Reply from 192.168.1.131: bytes=32 time=44ms TTL=127
Reply from 192.168.1.131: bytes=32 time=10ms TTL=127
Reply from 192.168.1.131: bytes=32 time=7ms TTL=127

Ping statistics for 192.168.1.131:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 7ms, Maximum = 44ms, Average = 24ms

C:\>
```

Smartphone0 from VLAN 10 can send/receive packets to/from PC3 in VLAN 30, so our network is working.