

## Design and Implementation of an IoT-Based Smart Supermartes Using Packet Tracer Simulation

Name	Student ID
Batool Al Salim	2210003514
BATOUL ALJARUDI	2220004519
DANA ALI ALSHEHRI	2210003622
ZAINAB ALKDHEM	2220001189

instructores :

Ashwaq Al Atlantic – Maha AlGhamdi – Sara AlQarni –  
Huda AlThamali

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## Abstraction :

The Internet of Things (IoT) has made a revolution in enhancing the services provided to many sectors. offering a path to enhance the quality of life and security. This paper introduces a smart supermarket model empowered by IoT principles and simulated using Cisco Packet Tracer software.

## Introduction:

IoT is a structure in which objects and people are provided with an exclusive identity and the ability to move data through a network without requiring two way inter-human to human source. Accordingly, the objects and devices that support the IoT have significant importance in life in general and in work fields in particular, such as smart supermarkets. Smart supermarkets are a combination of devices and office environment services that applying both the IoT and network techniques to improve efficiency, security, and safety. We implemented smart supermarket network that is efficient and detect threaten that can happened inside the super market by using smart cameras and motions sensors and siren to make more safe and secure for customers and employees .In this paper we designed a smart supermarket model is proposed and done by simulating using Cisco Packet Tracer tool.

## Devices Table:

Device Name:	Quantity:
PC's	13
Laptop	2
Switch	8
Router	6
Wireless Roter	1
IP phone	4
Server	6
Home Getaway	3
AC	2
Camera	2
Smoke Detector	1
Motion Detector	1
Siren	1
Printer	2
Smart Phone	1
Products Garage door	1
Window	3
Access Pointer	2
Wireless	17
Straight Wire	33
Cross Wire	5
Console Cable	1
Serial Wire	3

## methodology

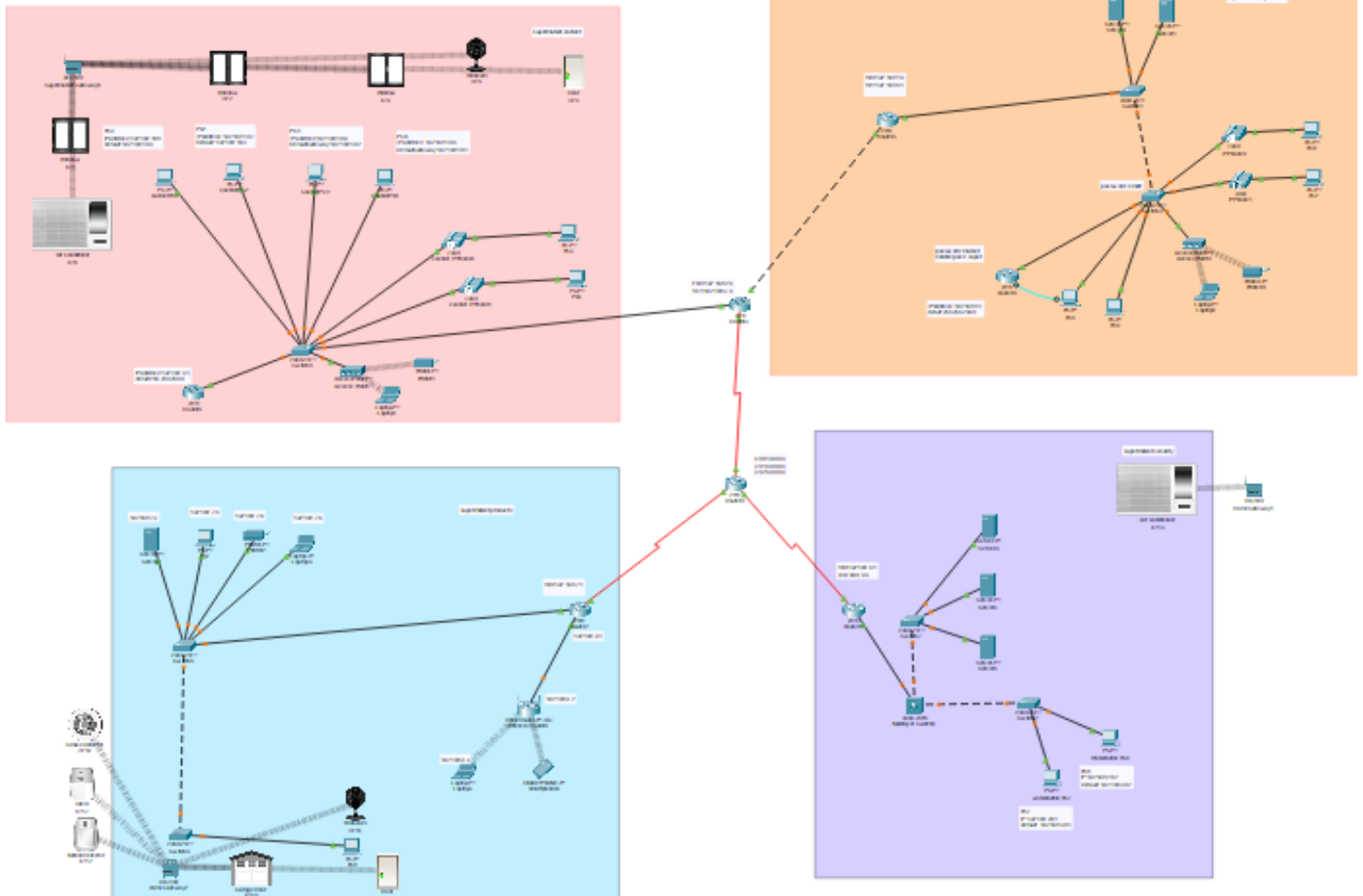
### Setting Up Topologies:

The Smart supermarket Networks:

For our Smart supermarket model we used Cisco Packet Tracer version 7.3. Cisco Packet Tracer is a simulator software to design, configure, and troubleshoot the devices. we created a secure, functional, and integrated Smart Supermarket network for our project. We were able to simulate the network design by using the features of the application. Using the appropriate tools and protocols in the right devices for the needed purposes for more security and smart supermarket environment that meets user's needs.

# Star Topology:

Star topology is mostly used in our network to reduce the costs and highly efficient.



## Addressing Table:

Device	Interface	IP Address	Subnet Mask	Default Gateway
<b>Router0</b>	s1/0 s1/1 s1/2	10.0.0.4 40.0.0.4 50.0.0.4	255.255.0.0	NA
<b>Router2</b>	S1/0 F0/0	70.0.0.4 192.168.7.1	255.255.0.0 255.255.255.0	NA
<b>Security Router1</b>	S1/0 F0/0	60.0.0.4 192.168.6.1	255.255.0.0 255.255.255.0	NA
<b>Wireless Router0</b>	Gig1	192.168.9.2	255.255.255.0	NA
<b>Laptop3</b>	F0/0	192.168.9.3	255.255.255.0	NA
<b>Cashier IP phone0</b>	Vlan1	192.168.4.2	255.255.255.0	192.268.4.1
<b>Cashier PC0</b>	F0	192.168.10.5	255.255.255.0	192.168.10.1
<b>Server2</b>	F0	192.168.7.3	255.255.255.0	NA
<b>Cashier PC1</b>	F0	192.168.10.6	255.255.255.0	192.168.10.2
<b>Cashier PC2</b>	F0	192.168.10.7	255.255.255.0	192.168.10.3
<b>Cashier PC3</b>	F0	192.168.10.8	255.255.255.0	192.168.10.4
<b>Printer2</b>	F0	192.168.7.5	255.255.255.0	NA
<b>Laptop4</b>	F0	192.168.7.6	255.255.255.0	NA
<b>Cashier IP phone 1</b>	Vlan1	192.168.4.4	255.255.255.0	192.168.4.1
<b>Laptop 3</b>	NIC	192.168.9.3	255.255.255.0	NA

# Router Configuration:

In router 0 and 1,2,3 we configured the interface CLI

```
Router0
Physical Config CLI Attributes
Router(config)#interface Serial1/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial1/1
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial1/0
Router(config-if)#ip address 10.0.0.4 255.255.0.0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial1/1
Router(config-if)#no ip address
Router(config-if)#ip address 20.0.0.4 255.0.0.0
Router(config-if)#ip address 20.0.0.4 255.255.0.0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial1/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial1/1
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial1/2
Router(config-if)#ip address 30.0.0.4 255.0.0.0
Router(config-if)#ip address 30.0.0.4 255.255.0.0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial1/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial1/1
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial1/2
Router(config-if)#
Router(config-if)#exit
Router(config-if)#clear
Router(config-if)#
% Invalid input detected at '^' marker.
Router(config-if)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int s1/0
Router(config-if)#ip address 10.0.0.4 255.255.0.0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface Serial1/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1/0, changed state to up

Router#
Router con0 is now available

Press RETURN to get started.
```

```
Router1
Physical Config CLI Attributes
Router>enable
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int f0/0
Router(config-if)#ip address 192.168.6.1 255.255.255.0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

Router con0 is now available

Press RETURN to get started.

Press RETURN to get started!

Router>enable
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int s1/0
Router(config-if)#ip address 60.0.0.4 255.255.0.0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface Serial1/0, changed state to up
```

```
Router2
Physical Config CLI Attributes

Press RETURN to get started!

Router>enable
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int f0/0
Router(config-if)#ip address 192.168.7.1 255.255.255.0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

Router con0 is now available

Press RETURN to get started.

Router>enable
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int s1/0
Router(config-if)#ip address 70.0.0.4 255.255.0.0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface Serial1/0, changed state to up
```

```
Router3
Physical Config CLI Attributes
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface FastEthernet0/1
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet0/0
Router(config-if)#ip address 192.168.2.4 255.255.255.0
Router(config-if)#ip address 192.168.2.4 255.255.255.0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet0/1
Router(config-if)#ip address 192.168.3.4 255.255.255.0
Router(config-if)#ip address 192.168.3.4 255.255.255.0
Router(config-if)#exit
Router(config)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int f0/1
/
Router(config)#int f0/0
Router(config-if)#ip address 192.168.2.4 255.255.255.0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

Router(config-if)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

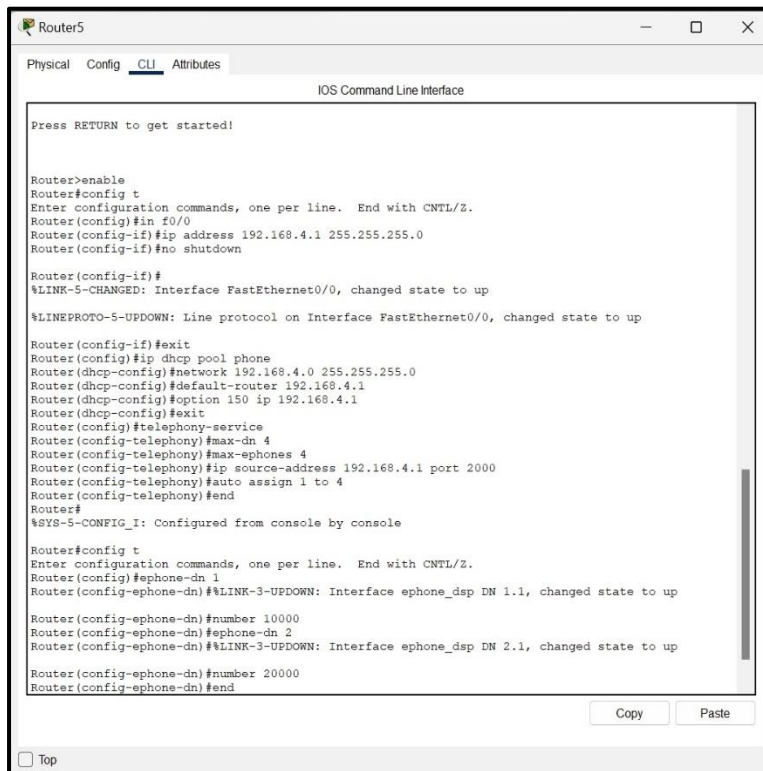
Router#wr
Building configuration...
[OK]
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int f0/1
Router(config-if)#ip address 192.168.3.4 255.255.255.0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
```



## IP phone Configuration:

We used 4 IP phones , 2 of them are in the super market cashier to announce important things and the other two in the super market department if they need to call someone in the same department.

A screenshot of a Cisco IOS Command Line Interface window titled 'Router5'. The window has tabs for 'Physical', 'Config', 'CLI', and 'Attributes', with 'CLI' selected. The terminal text shows the configuration of a router interface and a DHCP pool for IP phones. The configuration includes enabling the router, entering configuration mode, setting the interface FastEthernet0/0 to 'no shutdown', and configuring a DHCP pool named 'phone' with network 192.168.4.0/24 and a default gateway of 192.168.4.1. It also sets up telephony services with 4 ephones, each with a source address of 192.168.4.1 and a port of 2000. The configuration is saved to the startup configuration.

```
Router5
Physical Config CLI Attributes
IOS Command Line Interface

Press RETURN to get started!

Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#in f0/0
Router(config-if)#ip address 192.168.4.1 255.255.255.0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

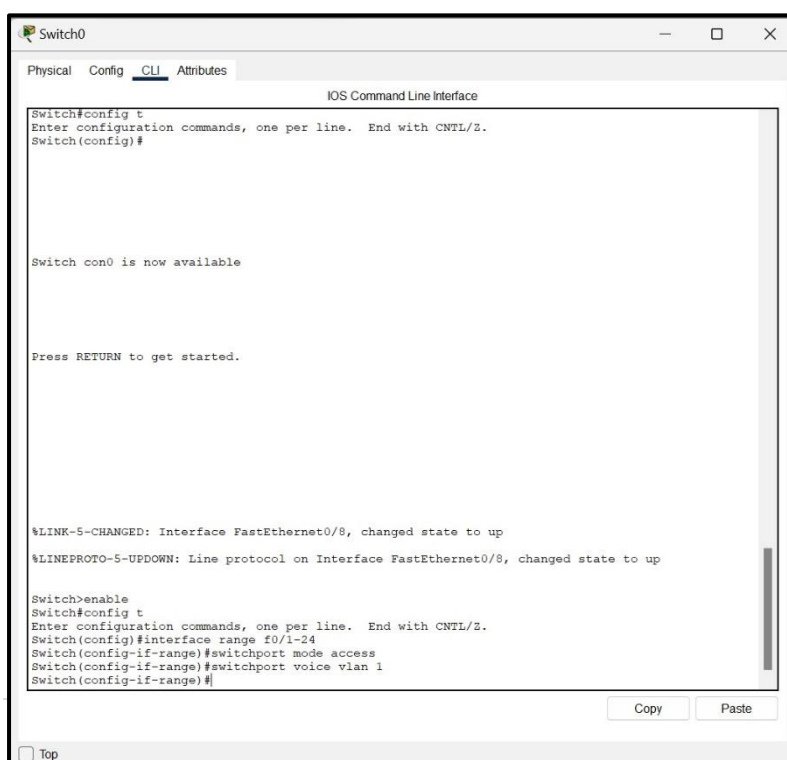
Router(config-if)#exit
Router(config)#ip dhcp pool phone
Router(dhcp-config)#network 192.168.4.0 255.255.255.0
Router(dhcp-config)#default-router 192.168.4.1
Router(dhcp-config)#option 150 ip 192.168.4.1
Router(dhcp-config)#exit
Router(config)#telephony-service
Router(config-telephony)#max-dn 4
Router(config-telephony)#max-ephones 4
Router(config-telephony)#ip source-address 192.168.4.1 port 2000
Router(config-telephony)#auto assign 1 to 4
Router(config-telephony)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ephone-dn 1
Router(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 1.1, changed state to up

Router(config-ephone-dn)#number 10000
Router(config-ephone-dn)#ephone-dn 2
Router(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 2.1, changed state to up

Router(config-ephone-dn)#number 20000
Router(config-ephone-dn)#end

Copy Paste
Top
```

A screenshot of a Cisco IOS Command Line Interface window titled 'Switch0'. The window has tabs for 'Physical', 'Config', 'CLI', and 'Attributes', with 'CLI' selected. The terminal text shows the configuration of a switch interface range for IP phones. The configuration includes enabling the switch, entering configuration mode, and setting the interface range FastEthernet0/1-24 to 'switchport mode access' and 'switchport voice vlan 1'. The configuration is saved to the startup configuration.

```
Switch0
Physical Config CLI Attributes
IOS Command Line Interface

Switch#config t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#

Switch con0 is now available

Press RETURN to get started.

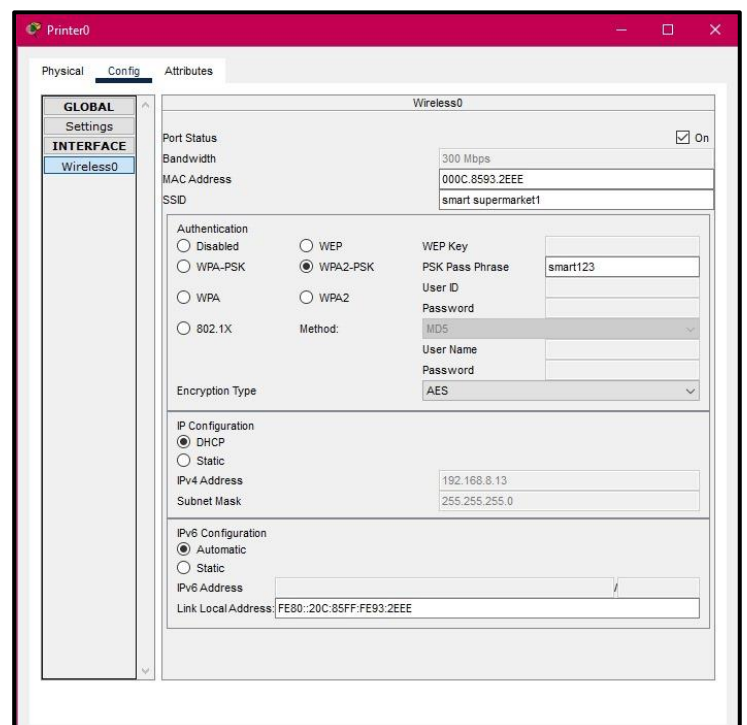
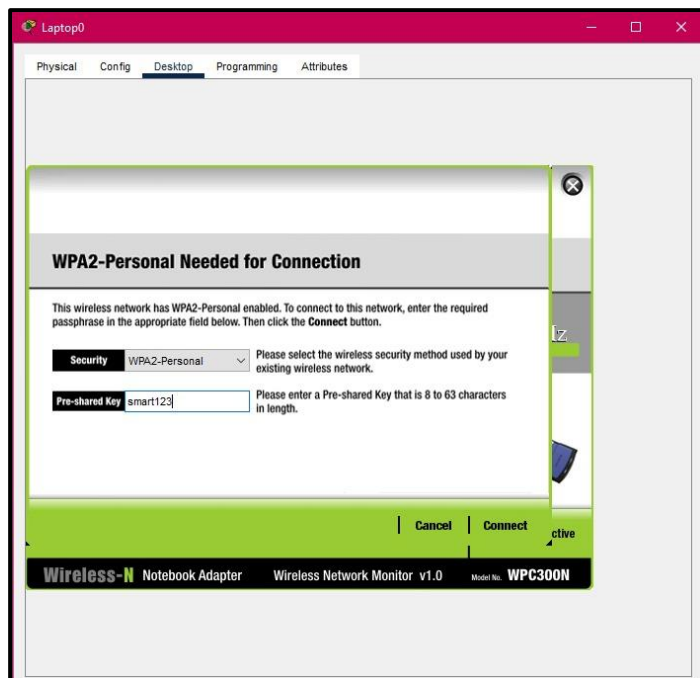
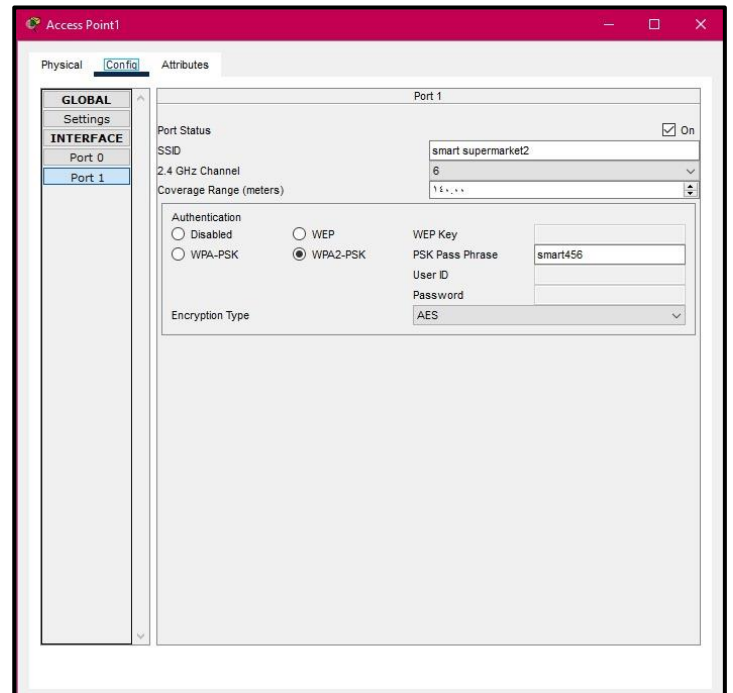
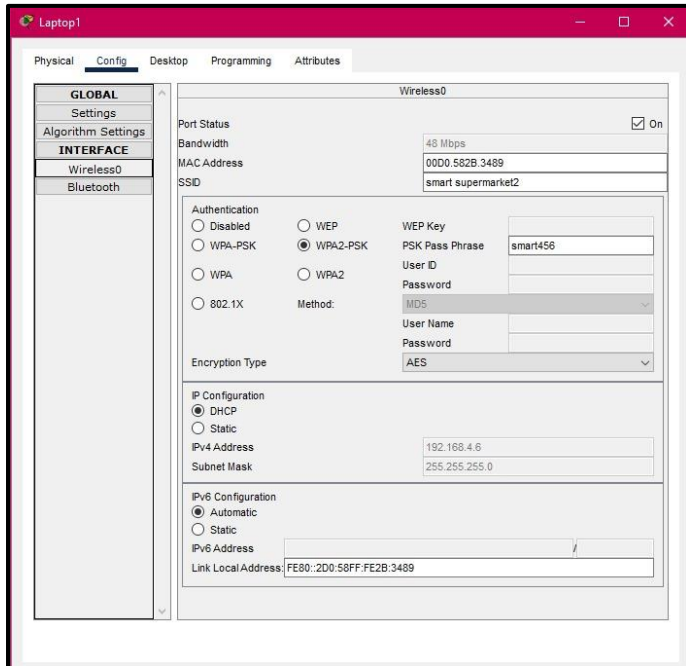
%LINK-5-CHANGED: Interface FastEthernet0/8, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/8, changed state to up

Switch>enable
Switch#config t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#interface range f0/1-24
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport voice vlan 1
Switch(config-if-range)#

Copy Paste
Top
```

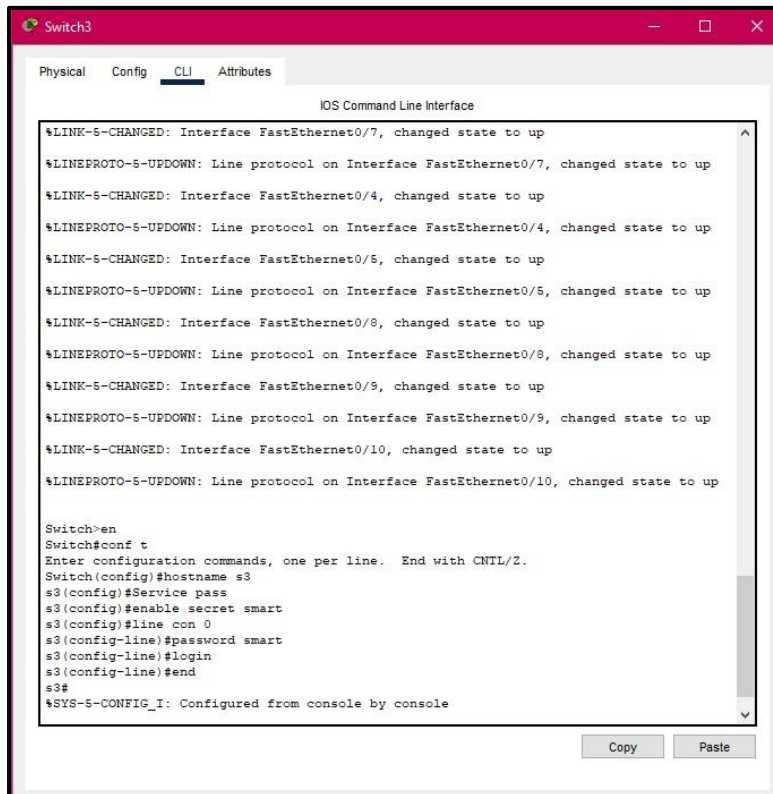
## Access Point connection:

We used wireless access points to allow extending internet signals into rooms that would otherwise receive weak or no signals. We used it for laptops, printers.



# Password configuration:

We set passwords for router and switch to reduce the risk of intrusions.



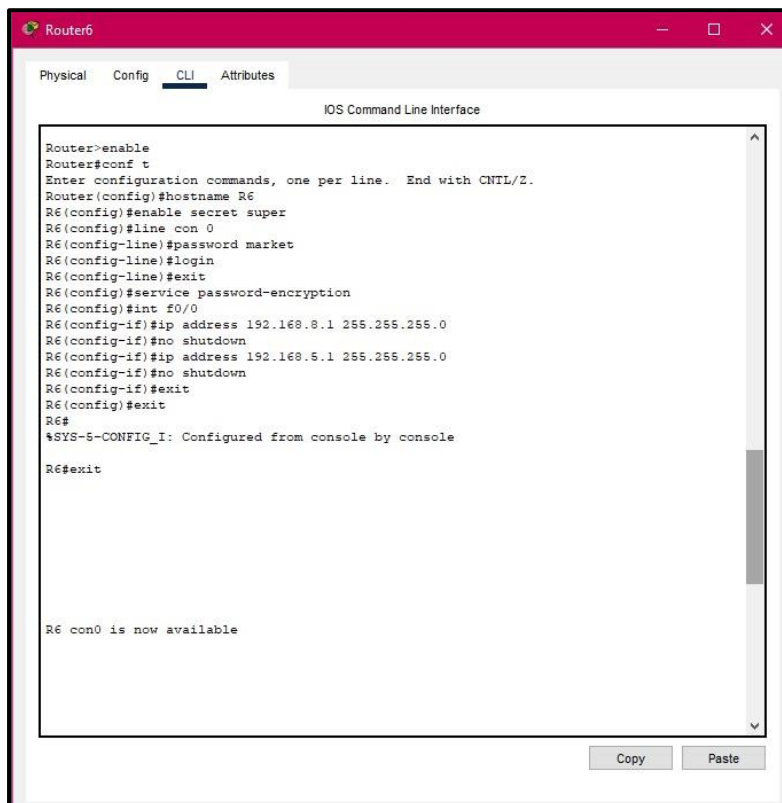
The screenshot shows a network simulator window titled "Switch3". It has tabs for "Physical", "Config", "CLI", and "Attributes", with "CLI" selected. The main area is titled "IOS Command Line Interface" and displays a series of status messages for interfaces FastEthernet0/7 through 0/10, indicating link and line protocol changes. Below these, the configuration session is shown starting with "Switch>en" and "Switch#conf t". The configuration commands entered are: "hostname s3", "enable secret smart", "line con 0", "password smart", "login", and "end". The session ends with "s3#" and a confirmation message "%SYS-5-CONFIG\_I: Configured from console by console". At the bottom right, there are "Copy" and "Paste" buttons.

```
Switch3
Physical Config CLI Attributes
IOS Command Line Interface

%LINK-5-CHANGED: Interface FastEthernet0/7, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/7, changed state to up
%LINK-5-CHANGED: Interface FastEthernet0/4, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/4, changed state to up
%LINK-5-CHANGED: Interface FastEthernet0/5, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/5, changed state to up
%LINK-5-CHANGED: Interface FastEthernet0/8, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/8, changed state to up
%LINK-5-CHANGED: Interface FastEthernet0/9, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/9, changed state to up
%LINK-5-CHANGED: Interface FastEthernet0/10, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/10, changed state to up

Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname s3
s3(config)#enable secret smart
s3(config)#line con 0
s3(config-line)#password smart
s3(config-line)#login
s3(config-line)#end
s3#
%SYS-5-CONFIG_I: Configured from console by console

Copy Paste
```



The screenshot shows a network simulator window titled "Router6". It has tabs for "Physical", "Config", "CLI", and "Attributes", with "CLI" selected. The main area is titled "IOS Command Line Interface" and displays the configuration session starting with "Router>enable" and "Router#conf t". The configuration commands entered are: "hostname R6", "enable secret super", "line con 0", "password market", "login", "service password-encryption", "interface f0/0", "ip address 192.168.8.1 255.255.255.0", "no shutdown", "interface f0/5", "ip address 192.168.5.1 255.255.255.0", "no shutdown", "exit", and "exit". The session ends with "R6#" and a confirmation message "%SYS-5-CONFIG\_I: Configured from console by console". Below this, it says "R6#exit" and "R6 con0 is now available". At the bottom right, there are "Copy" and "Paste" buttons.

```
Router6
Physical Config CLI Attributes
IOS Command Line Interface

Router>enable
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname R6
R6(config)#enable secret super
R6(config)#line con 0
R6(config-line)#password market
R6(config-line)#login
R6(config-line)#exit
R6(config)#service password-encryption
R6(config)#int f0/0
R6(config-if)#ip address 192.168.8.1 255.255.255.0
R6(config-if)#no shutdown
R6(config-if)#ip address 192.168.5.1 255.255.255.0
R6(config-if)#no shutdown
R6(config-if)#exit
R6(config)#exit
R6#
%SYS-5-CONFIG_I: Configured from console by console

R6#exit

R6 con0 is now available

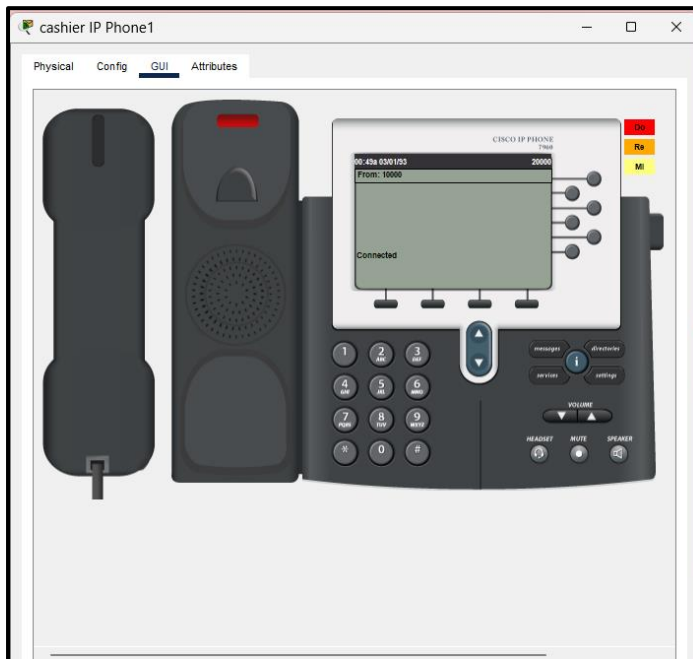
Copy Paste
```

## Simulation and Results:

Simple PDU information transmission

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Failed	PC3	PC6	ICMP		0.000	N	0	(edit)	(delete)
	Successful	PC3	PC6	ICMP		0.000	N	1	(edit)	(delete)
	Successful	PC0	PC2	ICMP		0.000	N	2	(edit)	(delete)

IP phone simulation as it connected to the other one.



We did Ping connection for provides an accurate measurement of your internet speed.

```
cashierPC0
Physical Config Desktop Programming Attributes
Command Prompt

Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.10.7

Pinging 192.168.10.7 with 32 bytes of data:

Reply from 192.168.10.7: bytes=32 time<1ms TTL=128
Reply from 192.168.10.7: bytes=32 time<1ms TTL=128
Reply from 192.168.10.7: bytes=32 time<1ms TTL=128
Reply from 192.168.10.7: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.10.7:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
C:\>
```

## Future Work:

We hope that our project will receive developments in the future, and one of the most important of these developments that we hope to achieve is facilitating communication to become easier and more flexible between the supermarket departments, making different topology connections, and also increasing the efficiency of security within the network and developing and expanding our network.

## Conclusion:

Ultimately, this project ensures the development of supermarkets and the preparation of a safe and efficient network for supermarkets, thus working to significantly reduce theft or errors by sellers by using some protocols in networks and facilitating the shopping process for consumers and making its infrastructure and systems more flexible to achieve our goal, which is Maintaining data security

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